1992

USDA-ARS

Hop Research

1992

Annual Research Summary

HOP BREEDING, GENETICS, CHEMISTRY

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HGA Statistical Snapshot

	1990	1991	1992	% Diff. '91vs. '92
***Hop Production** (million lbs.)*				
U.S.	56.8	69.2	74.3	+ 7.4%
Germany *	66.7	80.3	63.2	- 21.3%
World *	252.2	286.6	263.6	- 8.0%
***Hop Yields** (lbs. per acre)*				
U.S.	1,603	1,748	1,759	+ .6%
Germany *	1,206	1,439	1,117	- 22.4%
World *	1,098	1,237	1,126	- 9.0%
Hop Acreage				
U.S.	35,463	39,553	42,266	+ 6.8%
Germany	55,345	55,785	56,623	+ 1.5%
World *	229,467	231,683	234,120	+ 1.1%
***U.S. Crop Quality** (weighted average)*				
Leaf & Stem Content	1.09%	.85%	.93%	-
Seed Content	.74%	1.15%	.67%	-
***Alpha Acid Production** (1,000 lbs.)*				
U.S.	4,958	6,277	6,953	+ 10.8%
Germany *	3,232	5,042	2,846	- 43.5%
World *	15,124	18,912	16,607	- 12.2%
***Alpha Acid Consumption** (1,000 lbs.)*				
World *	18,159	18,267	18,314	+ .3%
***Beer Production** (million barrels)*				
U.S.	201.2	203.7	202.5	- .6%
World *	975.0	995.0	997.0	+ .2%
***U.S. Hop Exports** (1,000 lbs.)*				
Germany	5,076	5,619	10,137	+ 80.4%
Brazil	9,732	7,566	5,659	- 25.2%
Total Exports	42,878	31,300	48,493	+ 54.9%
***U.S. Imports of Hops** (1,000 lbs.)*				
Germany	11,573	10,264	6,792	- 33.8%
Czechoslovakia	2,561	2,366	4,574	+ 93.3%
China	62	5,355	4,533	- 15.3%
Total Imports	17,243	20,974	18,946	- 9.6%

*1992 figures are estimates.

1 US pound (lb) = 0.453 kg

U.S. HOP PRODUCTION BY STATE AND VARIETY 1988-1992

STATE & VARIETY	HOP PRODUCTION - (Pounds) 1988	1989	1990	1991	1992
IDAHO					
Aquila	-	182,600	164,800	155,500	165,200
Banner	-	234,300	224,700	265,400	331,900
Chinook	338,800	389,400	321,200	567,300	690,700
Cluster	896,700	984,900	1,120,000	1,504,700	1,302,800
Eroica	692,300	574,000	507,200	401,400	-
Galena	951,600	853,200	792,000	793,100	905,900
Other Varieties	978,200	872,200	920,100	1,743,400	2,149,900
Total	3,857,600	4,090,600	4,050,000	5,430,800	5,546,400
OREGON					
Fuggle	926,500	961,200	857,300	375,000	353,400
Galena	282,000	265,200	192,100	201,000	130,000
Mt. Hood	-	-	47,500	71,900	82,800
Nugget	2,998,800	2,594,300	2,744,200	3,042,500	4,736,300
Perle	369,600	436,100	211,700	171,700	376,200
Tettnang	517,000	573,500	797,200	732,800	425,500
Willamette	4,958,000	6,029,300	5,479,700	5,014,400	4,968,000
Other Varieties	973,100	999,400	533,300	564,600	611,800
Total	11,025,000	11,859,000	10,863,000	10,173,900	11,684,000
WASHINGTON					
Aquila	487,000	825,900	741,200	865,000	834,200
Banner	561,000	847,300	732,800	841,800	858,900
Cascade	1,831,000	2,568,000	2,070,100	2,542,000	2,772,000
Chinook	1,990,000	2,385,700	2,777,100	3,780,500	4,626,000
Cluster	16,100,000	13,003,000	11,442,100	13,020,700	13,157,200
Eroica	1,242,000	939,300	799,000	827,800	922,800
Galena	9,252,000	11,011,200	11,089,800	15,332,300	16,760,900
Mt. Hood	-	-	369,400	877,400	1,573,400
Nugget	2,916,000	4,347,500	4,777,600	6,678,300	8,070,800
Olympic	545,000	493,800	476,000	667,300	595,900
Perle	603,000	919,200	798,000	1,023,300	937,400
Tettnang	1,958,000	2,506,400	2,314,800	2,727,300	1,542,500
Willamette	2,091,000	3,284,200	3,333,100	4,055,300	4,116,200
Other Varieties	175,000	245,300	220,800	311,700	338,100
Total	39,751,000	43,376,800	41,941,800	53,550,700	57,106,300
UNITED STATES	**54,633,600**	**59,326,400**	**56,854,800**	**69,155,400**	**74,336,700**

SOURCE: U.S.D.A. Prepared by Hop Growers of America, Inc.

U.S. HOP PRODUCTION, ACREAGE AND YIELDS 1991-1992

STATE & VARIETY	Production 1991	Production 1992	Acreage 1991	Acreage 1992	Yields (lbs./acre) 1991	Yields (lbs./acre) 1992
IDAHO						
Aquila	155,500	165,200	103	103	1,510	1,600
Banner	265,400	331,900	145	162	1,830	2,050
Chinook	567,300	690,700	465	451	1,220	1,530
Cluster	1,504,700	1,302,800	734	627	2,050	2,080
Eroica	401,400	-	243	-	1,650	-
Galena	793,100	905,900	517	512	1,530	1,770
Other Varieties	1,743,400	2,149,900	1,911	2,145	910	1,000
Total	5,430,800	5,546,400	4,118	4,000	1,319	1,387
OREGON						
Fuggle	375,000	353,400	487	570	770	620
Galena	201,000	130,000	99	100	2,030	1,300
Mt. Hood	71,900	82,800	47	90	1,530	920
Nugget	3,042,500	4,736,300	1,695	2,300	1,790	2,060
Perle	171,700	376,200	177	285	970	1,320
Tettnang	732,800	425,500	577	575	1,270	740
Willamette	5,014,400	4,968,000	3,590	3,600	1,400	1,380
Other Varieties	564,600	611,800	518	380	1,090	1,610
Total	10,173,900	11,684,000	7,190	7,900	1,415	1,479
WASHINGTON						
Aquila	865,000	834,200	346	344	2,500	2,430
Banner	841,800	858,900	366	363	2,300	2,370
Cascade	2,542,000	2,772,000	1,240	1,261	2,050	2,200
Chinook	3,780,500	4,626,000	2,112	2,179	1,790	2,120
Cluster	13,020,700	13,157,200	6,230	6,452	2,090	2,040
Eroica	827,800	922,800	398	373	2,080	2,470
Galena	15,332,300	16,760,900	7,628	8,356	2,010	2,010
Mt. Hood	877,400	1,573,400	820	1,429	1,070	1,100
Nugget	6,678,300	8,070,800	2,955	3,606	2,260	2,240
Olympic	667,300	595,900	337	291	1,980	2,050
Perle	1,023,300	937,400	758	725	1,350	1,290
Tettnang	2,727,300	1,542,500	2,254	2,127	1,210	730
Willamette	4,055,300	4,116,200	2,583	2,627	1,570	1,570
Other Varieties	311,700	338,100	218	233	1,430	1,450
Total	53,550,700	57,106,300	28,245	30,366	1,896	1,881
UNITED STATES	**69,155,400**	**74,336,700**	**39,553**	**42,266**	**1,748**	**1,759**

SOURCE: U.S.D.A. Prepared by Hop Growers of America, Inc.

U.S. HOP ACREAGE & YIELDS BY STATE AND VARIETY 1988 -1992

STATE & VARIETY	ACRES HARVESTED 1988	1989	1990	1991	1992	YIELD (lbs/acre) 1988	1989	1990	1991	1992
IDAHO										
Aquila	-	110	103	103	103	-	1,660	1,600	1,510	1,600
Banner	-	110	107	145	162	-	2,130	2,100	1,830	2,050
Chinook	220	220	292	465	451	1,540	1,770	1,100	1,220	1,530
Cluster	490	490	560	734	627	1,830	2,010	2,000	2,050	2,080
Eroica	430	350	317	243	-	1,610	1,640	1,600	1,650	-
Galena	520	540	528	517	512	1,830	1,580	1,500	1,530	1,770
Other Varieties	1,140	980	793	1,911	2,145	970	890	1,160	910	1,000
Total	2,800	2,800	2,700	4,118	4,000	1,400	1,461	1,500	1,319	1,387
OREGON										
Fuggle	850	801	608	487	570	1,090	1,200	1,410	770	620
Galena	150	149	99	99	100	1,880	1,780	1,940	2,030	1,300
Mt. Hood	-	-	47	47	90	-	-	1,010	1,530	920
Nugget	1,470	1,278	1,393	1,695	2,300	2,040	2,030	1,970	1,790	2,060
Perle	330	285	134	177	285	1,120	1,530	1,580	970	1,320
Tettnang	470	531	618	577	575	1,100	1,080	1,290	1,270	740
Willamette	3,700	3,792	3,859	3,590	3,600	1,340	1,590	1,420	1,400	1,380
Other Varieties	530	576	342	518	380	1,840	1,740	1,493	1,090	1,610
Total	7,500	7,412	7,100	7,190	7,900	1,470	1,600	1,530	1,415	1,479
WASHINGTON										
Aquila	320	356	348	346	344	1,520	2,320	2,130	2,500	2,430
Banner	340	356	361	366	363	1,650	2,380	2,030	2,300	2,370
Cascade	920	1,297	1,270	1,240	1,261	1,990	1,980	1,630	2,050	2,200
Chinook	1,000	1,269	1,454	2,112	2,179	1,990	1,880	1,910	1,790	2,120
Cluster	7,950	6,374	6,054	6,230	6,452	2,030	2,040	1,890	2,090	2,040
Eroica	640	472	439	398	373	1,940	1,990	1,820	2,080	2,470
Galena	4,900	5,735	6,161	7,628	8,356	1,890	1,920	1,800	2,010	2,010
Mt. Hood	-	-	513	820	1,429	-	-	720	1,070	1,100
Nugget	1,800	2,241	2,827	2,955	3,606	1,620	1,940	1,690	2,260	2,240
Olympic	270	279	280	337	291	2,020	1,770	1,700	1,980	2,050
Perle	580	779	798	758	725	1,040	1,180	1,000	1,350	1,290
Tettnang	2,200	2,410	2,362	2,254	2,127	890	1,040	980	1,210	730
Willamette	2,050	2,507	2,604	2,583	2,627	1,020	1,310	1,280	1,570	1,570
Other Varieties	130	261	192	218	233	1,350	940	837	1,430	1,450
Total	23,100	24,336	25,663	28,245	30,366	1,721	1,782	1,634	1,896	1,881
UNITED STATES	33,400	34,548	35,463	39,553	42,266	1,638	1,717	1,603	1,748	1,759

SOURCE: U.S.D.A. Prepared by Hop Growers of America, Inc.

1992 US Hop Production by Variety

Variety	State			Total acres harvested	Yield	Total production
	WA	OR	ID			
	-------- acres --------				lb/A	lbs
Aquila	344	-	103	447	2236	999 400
Banner	363	-	162	525	2268	1,190 800
Cascade	1261	-	-	1261	1802	2,772 000
Chinook	2179	-	451	2630	2022	5,316 700
Cluster	6452	-	627	7079	2043	14,460 000
Eroica	373	-	-	373	2474	922 800
Fuggle	-	570	-	570	620	353 400
Galena	8356	100	512	8968	1985	17,796 800
Mt. Hood	1429	90	-	1519	1090	1,656 200
Nugget	3606	2300	-	5906	2168	12,807 100
Olympic	291	-	-	291	2048	595 900
Perle	725	285	-	1010	1301	1,313 600
Tettnanger	2127	575	-	2702	728	1,968 000
Willamette	2627	3600	-	6227	1459	9,084 200
Other[1]	233	380	2145	2758	1124	3,099 800
Totals	30 366	7900	4000	42 266	1759	74,336 700

[1]Includes North Idaho Saazer (about 1400 acres), Hallertauer m.f. (about 500 acres), and experimentals

U.S. / IHGC ALPHA ACID PRODUCTION 1977 - 1992

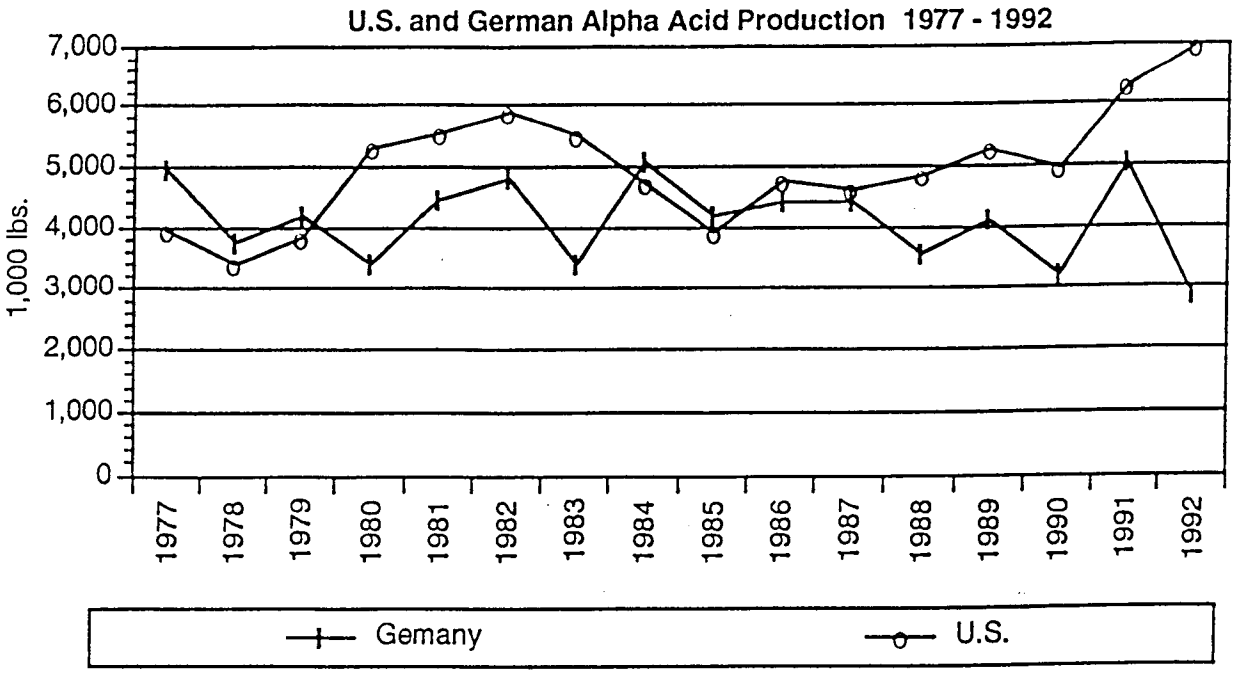
(1,000 pounds)

Crop Year	United States	Germany Δ	IHGC (other)	Total IHGC
1977	3,944	4,967	4,866	13,777
1978	3,417	3,759	4,819	11,995
1979	3,849	4,193	5,664	13,706
1980	5,302	3,397	4,707	13,406
1981	5,556	4,451	5,732	15,739
1982	5,893	4,824	5,957	16,674
1983	5,525	3,397	5,141	14,063
1984	4,718	5,068	5,836	15,622
1985	3,926	4,178	4,769	12,873
1986	4,755	4,407	4,381	13,543
1987	4,630	4,403	4,769	13,801
1988	4,850	3,574	4,795	13,219
1989	5,260	4,114	4,418	13,792
1990	4,958	3,232	3,657	11,848
1991	6,277	5,042	5,084	16,402
1992 *	6,953	2,846	3,638	13,437

Source: IHGC Annual Report of Member Countries: Australia, Belgium, Bulgaria, Germany, Czech, U.K., Spain, Hungary, Slovenia, Yugoslavia, Poland, Ukraine, USA and New Zealand.

Δ 1977 - 1989 German alpha figures reflect West German production only.

* 1992 alpha figures for Germany and IHGC countries are estimates only.



U.S. HOP VARIETIES BY ACREAGE 1981 - 1992

(Acres Harvested)

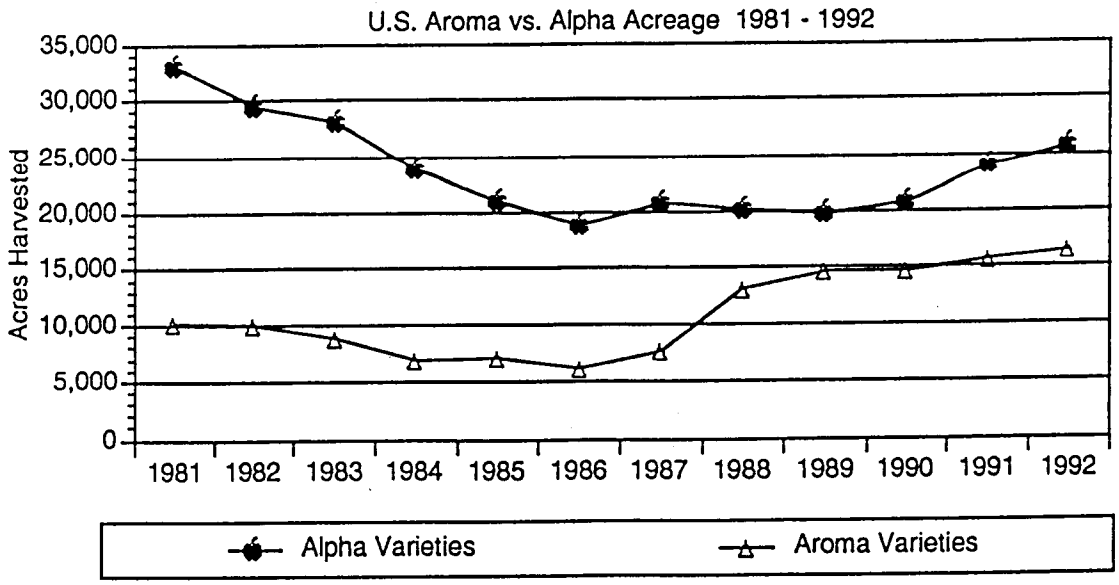
	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Alpha Varieties												
Galena	1,272	2,805	3,847	4,822	5,015	4,396	4,740	5,570	6,424	6,788	8,244	8,968
Cluster 1/	23,561	19,748	17,783	13,785	11,618	9,419	10,410	8,440	6,864	6,614	6,964	7,079
Nugget	-	-	232	1,032	1,992	2,951	2,850	3,270	3,519	4,220	4,650	5,906
Chinook	-	-	-	-	142	231	980	1,220	1,489	1,746	2,577	2,630
Eroica	494	1,072	1,459	1,493	1,726	1,470	1,170	1,070	822	756	641	373
Olympic	-	-	-	84	281	218	230	270	279	280	337	291
Other 2/	7,617	5,902	4,731	2,645	189	199	309	334	363	265	529	552
Total - Alpha	32,944	29,527	28,052	23,861	20,963	18,884	20,689	20,174	19,760	20,669	23,942	25,799
Aroma Varieties												
Willamette	-	899	1,448	2,129	2,486	2,114	2,745	5,880	6,299	6,463	6,173	6,227
Tettnang	-	-	-	-	-	-	650	2,670	2,941	2,980	2,831	2,702
Mt. Hood	-	-	-	-	-	-	-	-	-	560	867	1,519
Cascade	6,349	5,792	4,763	2,768	2,407	2,241	1,650	920	1,297	1,270	1,240	1,261
Perle	-	-	-	-	-	-	410	910	1,064	932	935	1,010
Banner	-	-	-	-	-	-	-	340	466	468	511	525
Fuggle	2,717	2,168	1,877	1,632	1,486	967	920	850	801	608	487	570
Aquila	-	-	-	-	-	-	-	320	466	451	449	447
Other	1,090	1,214	760	410	758	794	1,236	1,336	1,454	1,062	2,118	2,206
Total - Aroma	10,156	10,073	8,848	6,939	7,137	6,116	7,611	13,226	14,788	14,794	15,611	16,467
US TOTALS*	43,100	39,600	36,900	30,800	28,100	25,000	28,300	33,400	34,548	35,463	39,553	42,266

Source: U.S.D.A., U.S. Hop Administrative Committee reports. Prepared by Hop Growers of America, Inc.

* Includes California acreage (1981-1987).

1/ 1981-1986 Cluster acreage totals include Talisman.

2/ "Other" category includes English, Bullion and Brewers Gold varieties (1981-1984)



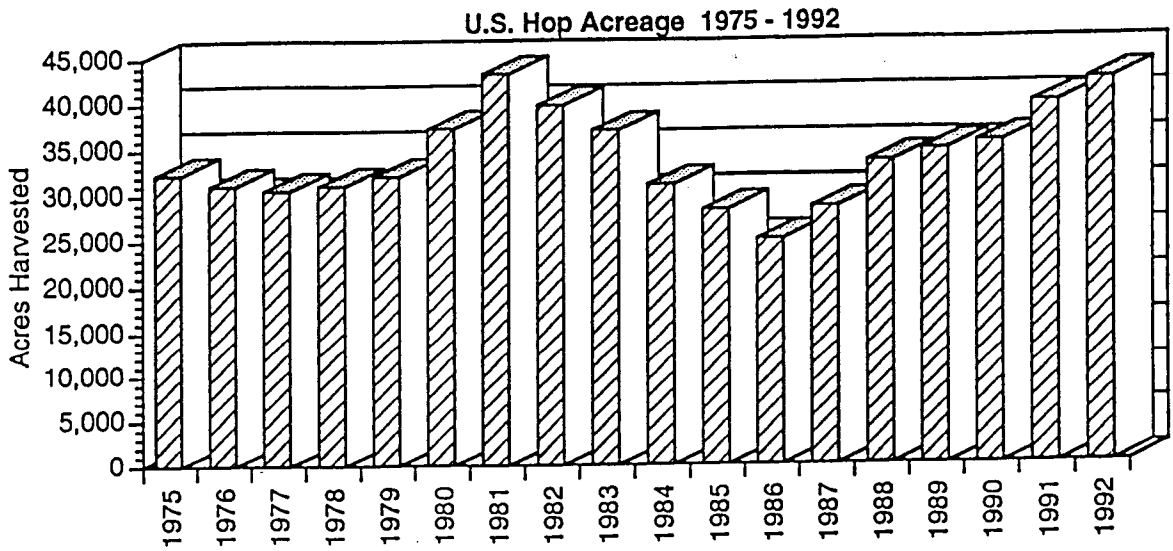
U.S. HOPS: ACREAGE, PRODUCTION, AND PRICE

Mktg Year	Acres Harvested Wash.	Oregon	Idaho	U.S. *	U.S. Production (1,000 lbs)	Season Average Price ($ / lb) Wash.	Oregon	Idaho	U.S.	Total Crop Value (x $1,000)
1980	26,900	6,200	2,800	37,100	75,560	$1.54	$1.44	$1.42	$1.51	$114,194
1981	31,300	7,200	3,400	43,100	79,144	$1.50	$1.47	$1.65	$1.51	$119,220
1982	28,100	7,300	3,700	39,600	78,550	$1.60	$1.97	$2.48	$1.74	$136,884
1983	27,000	6,300	3,600	36,900	68,111	$1.80	$2.15	$2.62	$1.93	$131,483
1984	22,700	4,900	3,100	30,800	56,167	$1.99	$2.10	$2.92	$2.10	$117,701
1985	19,500	5,500	3,100	28,100	49,713	$1.80	$2.36	$3.18	$2.03	$98,433
1986	17,400	5,100	2,500	25,000	49,062	$1.59	$2.08	$2.59	$1.78	$87,087
1987	20,100	6,000	2,200	28,300	50,048	$1.32	$1.78	$2.74	$1.51	$75,578
1988	23,100	7,500	2,800	33,400	54,696	$1.36	$1.64	$1.09	$1.40	$76,415
1989	24,336	7,412	2,800	34,548	59,326	$1.33	$1.58	$1.26	$1.38	$81,583
1990	25,663	7,100	2,700	35,463	56,855	$1.44	$1.63	$1.50	$1.48	$84,178
1991	28,245	7,190	4,118	39,553	69,155	$1.67	$1.71	$1.62	$1.67	$115,625
1992Δ	30,366	7,900	4,000	42,266	74,337	-	-	-	$1.82	$135,293

Source: Hop Administrative Committee, National Agricultural Statistics Service & USDA. Prepared by Hop Growers of America, Inc.

*Includes California Acreage (1980-1987).

Δ 1992 season average price is an estimate only.



U.S. YIELDS / WORLD HOP PRODUCTION 1971 - 1992

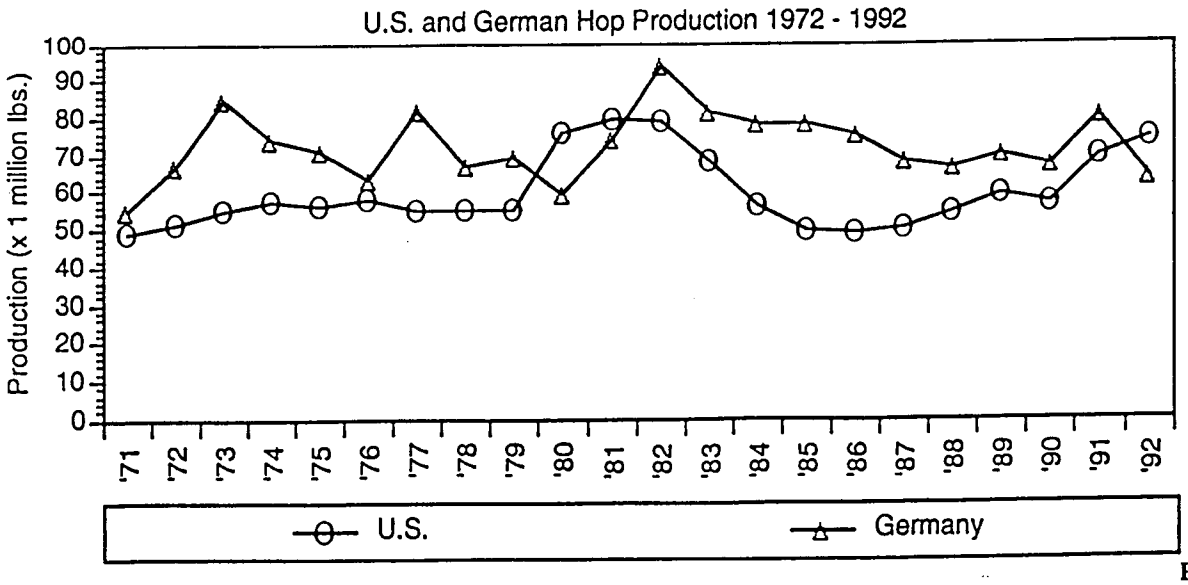
Crop Year	U.S. Yield Per Acre Wash.	Oregon	Idaho	U.S.*	U.S. Production	German Production**	Other World Production	Total World Production
	(lbs / acre)				(million pounds)			
1971	1,730	1,700	1,690	1,718	49.7 (24%)	53.4 (25%)	107.0 (51%)	210.1 (100%)
1972	1,810	1,470	1,710	1,728	51.3 (22%)	66.9 (29%)	112.4 (49%)	230.6 (100%)
1973	1,780	1,670	1,750	1,744	54.8 (20%)	84.9 (32%)	128.8 (48%)	268.5 (100%)
1974	1,830	1,550	1,700	1,759	57.0 (23%)	73.9 (30%)	118.4 (47%)	249.3 (100%)
1975	1,770	1,700	1,660	1,742	55.9 (22%)	71.5 (29%)	122.9 (49%)	250.3 (100%)
1976	1,960	1,660	1,720	1,870	57.8 (25%)	62.6 (27%)	115.0 (49%)	235.4 (100%)
1977	1,840	1,690	1,770	1,796	54.8 (21%)	81.6 (31%)	123.5 (48%)	259.9 (100%)
1978	1,880	1,510	1,790	1,782	55.1 (23%)	66.9 (28%)	117.4 (49%)	239.4 (100%)
1979	1,800	1,540	1,710	1,727	54.9 (21%)	68.8 (26%)	137.2 (53%)	260.9 (100%)
1980	2,080	1,960	1,960	2,037	75.6 (29%)	59.3 (23%)	123.0 (48%)	257.9 (100%)
1981	1,900	1,720	1,650	1,836	79.1 (28%)	74.3 (26%)	132.7 (46%)	286.1 (100%)
1982	2,070	1,800	1,730	1,984	78.6 (25%)	93.7 (30%)	144.9 (46%)	317.2 (100%)
1983	1,930	1,590	1,740	1,846	68.1 (24%)	81.2 (28%)	137.9 (48%)	287.2 (100%)
1984	1,920	1,420	1,750	1,824	56.2 (20%)	78.3 (28%)	148.2 (52%)	282.7 (100%)
1985	1,870	1,470	1,620	1,764	49.7 (18%)	78.5 (28%)	147.4 (53%)	275.6 (100%)
1986	2,040	1,664	2,000	1,968	49.0 (19%)	75.2 (29%)	134.7 (52%)	258.9 (100%)
1987	1,860	1,470	1,750	1,770	50.0 (19%)	68.2 (26%)	141.4 (54%)	259.6 (100%)
1988	1,721	1,470	1,400	1,638	54.7 (21%)	66.2 (25%)	145.5 (55%)	266.4 (100%)
1989	1,782	1,600	1,461	1,717	59.3 (22%)	70.1 (26%)	137.5 (52%)	266.9 (100%)
1990	1,634	1,530	1,500	1,603	56.8 (22%)	66.7 (27%)	128.7 (51%)	252.2 (100%)
1991	1,896	1,415	1,319	1,748	69.2 (25%)	80.3 (29%)	137.1 (46%)	286.6 (100%)
1992Δ	1,881	1,479	1,387	1,759	74.3 (28%)	63.2 (24%)	126.1 (48%)	263.6 (100%)

Sources: U.S.D.A., U.S. Hop Administrative Committee, IHGC and '92 Horst report.

Δ 1992 World production figures are estimates.

*U.S. figures include California acreage yields (1971-1987).

** 1971-1989 German production figures reflect West German production only.



1992 U.S. SOLD AHEAD SURVEY

Year	Pounds Contracted *	% of 1991 Crop
1992	66,957,566	96.8%
1993	64,654,895	93.5%
1994	60,573,732	87.6%
1995	49,327,956	71.3%
1996	23,343,810	33.8%
1997	17,375,517	25.1%

Source: Hop Growers of America, Inc.

* Survey based on responses from 51% of U.S. hop growers, representing 41% of the 1992 acreage strung for harvest.

ESTIMATED FORWARD SALES 1992 - 1996

Country	1991 Hop Crop	1992	1993	1994	1995	1996
	(x 1,000 lbs.)	(percent of 1991 crop sold)				
Germany	80,367	71%	64%	52%	40%	0%
France	1,625	114%	121%	130%	130%	104%
Belgium	1,392	63%	57%	51%	13%	13%
United Kingdom	13,265	75%	66%	50%	17%	8%
Spain	4,234	112%	0%	0%	0%	0%
E.C. Total	100,883	74%	63%	51%	36%	3%
United States	69,155	97%	93%	88%	71%	34%
Australia	6,118	0%	41%	32%	30%	0%
Yugoslavia/Slov.	9,670	80%	56%	50%	47%	27%
Czechoslovakia	24,471	83%	63%	54%	45%	36%
Poland	5,800	2%	2%	2%	2%	1%
Hungary	1,201	42%	0%	0%	0%	0%
Ukraine	13,358	5%	13%	0%	0%	0%
New Zealand	1,002	110%	132%	127%	130%	113%
IHGC Total *	231,658	74%	67%	58%	45%	17%

Source: IHGC summary report - Zalec, Slovenia, August 3, 1992. Prepared by Hop Growers of America, Inc.

* Bulgaria did not submit a report and is not included in IHGC totals.

1992 U.S. HOP INSPECTION REPORT

Prepared by U.S.D.A. Federal Grain Inspection Service

Table 1 : Total Number of Bales Inspected - Weighted Average of Leaf & Stem in Parenthesis

	Washington	(%)	Oregon	(%)	Idaho	(%)	California	(%)	Total	(%)
1985	184,134	(1.25)	42,289	(1.56)	25,595	(1.16)	330	(0.06)	252,348	(1.16)
1986	179,603	(0.95)	43,672	(0.92)	25,301	(0.73)	26	(0.46)	248,602	(0.93)
1987	186,248	(1.14)	43,705	(1.55)	18,880	(1.28)	31	(0.45)	248,864	(1.23)
1988	200,584	(0.92)	55,716	(1.28)	18,992	(1.01)	35	(0.00)	275,327	(1.00)
1989	216,188	(0.96)	63,000	(0.63)	19,881	(1.20)	0		299,069	(0.95)
1990	212,271	(1.01)	56,859	(1.35)	19,033	(1.11)	0		288,163	(1.09)
1991	267,705	(0.78)	52,811	(1.39)	25,371	(0.35)	0		345,887	(0.85)
1992	291,526	(0.96)	59,718	(1.62)	27,732	(1.02)	0		378,976	(0.93)

Table 2 : Number of Bales in Each Leaf & Stem Category - Percent of Total in Parenthesis

	(0%)	(1%)	(2%)	(3%)	(4%)	(5%)	(6%)	(>6%)	Total
WA	92,512 (32)	136,735 (47)	48,680 (17)	10,788 (4)	1,983 (0)	789 (0)	39 (0)	0	291,526 (100)
OR	7,733 (13)	24,326 (41)	16,510 (28)	6,595 (11)	3,805 (6)	355 (1)	157 (0)	237 (0)	59,718 (100)
ID	6,079 (22)	15,680 (57)	5,129 (18)	844 (3)	0	0	0	0	27,732 (100)
Total	106,324	176,741	70,319	18,227	5,788	1,144	196	237	378,976
% of Total	28.1%	46.6%	18.6%	4.8%	1.5%	0.3%	0.1%	0.1%	100.0%

Table 3 : Number of Bales in Each Seed Category - Percent of Total in Parenthesis

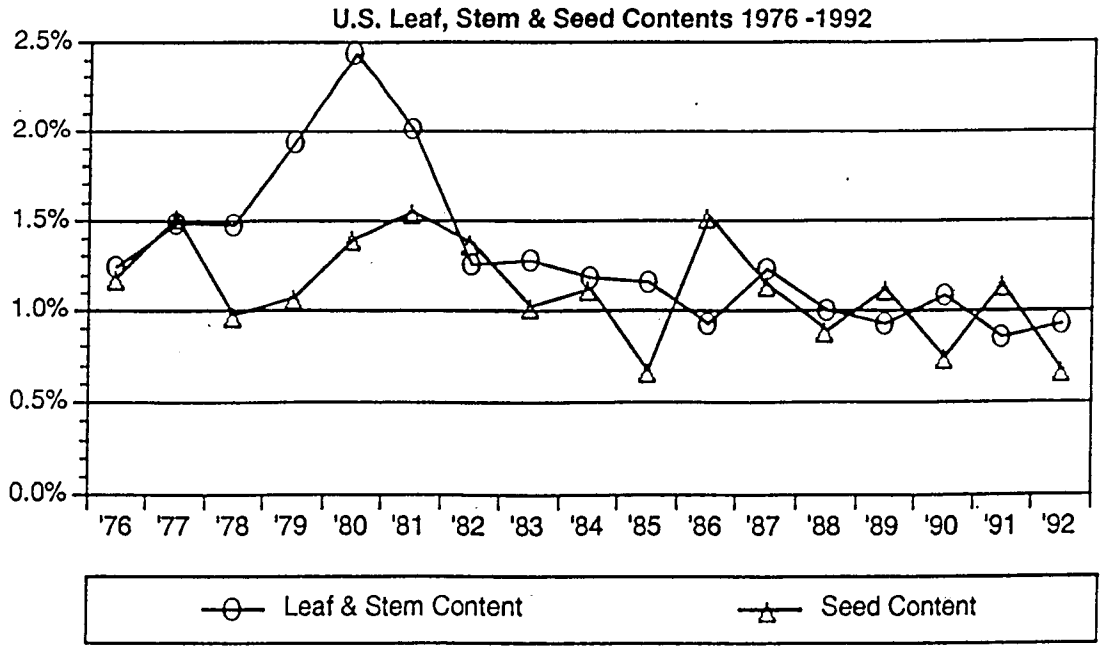
	(0%)	(1%)	(2%)	(3%)	(4%)	(5%)	(6%)	(>6%)	Total
WA	204,818 (70)	52,626 (18)	23,029 (8)	7,054 (3)	2,192 (1)	882 (0)	393 (0)	532 (0)	291,526 (100)
OR	25,655 (43)	12,582 (21)	2,616 (4)	2,406 (4)	2,623 (4)	3,830 (7)	1,892 (3)	8,114 (14)	59,718 (100)
ID	27,732 (100)	0	0	0	0	0	0	0	27,732 (100)
Total	258,205	65,208	25,645	9,460	4,815	4,712	2,285	8,646	378,976
% of Total	68.1%	17.2%	6.8%	2.5%	1.3%	1.2%	0.6%	2.3%	100.0%

U.S. HOP INSPECTION REPORTS 1976-1992
LEAF, STEM & SEED CONTENT (%)

Year	WASHINGTON Leaf & Stem	OREGON Leaf & Stem	IDAHO Leaf & Stem	U.S. AVERAGE* Leaf & Stem	U.S. AVERAGE* Seed
1976	1.23	1.43	1.16	1.24	1.18
1977	1.46	1.91	1.15	1.49	1.52
1978	1.38	2.19	1.34	1.48	0.98
1979	1.92	2.32	1.38	1.93	1.07
1980	2.57	2.19	1.84	2.43	1.40
1981	1.93	2.49	1.60	2.01	1.55
1982	1.13	1.80	1.24	1.26	1.38
1983	1.25	1.44	1.20	1.28	1.02
1984	1.07	1.77	1.27	1.18	1.12
1985	1.25	1.56	1.16	1.16	0.67
1986	0.95	0.92	0.73	0.93	1.52
1987	1.14	1.55	1.28	1.23	1.15
1988	0.92	1.28	1.01	1.00	0.89
1989	0.96	0.83	1.20	0.95	1.12
1990	1.01	1.35	1.11	1.09	0.74
1991	0.78	1.39	0.35	0.85	1.15
1992	0.96	1.62	1.02	0.93	0.67

Source: U.S.D.A. Federal Grain Inspection Service. Prepared by Hop Growers of America, Inc.

* U.S. Averages include California crop figures 1976-1986.



Orego

HOP

COMMISSIO

1992 Oregon Seed Percentage and Leaf & Stem Count

The figures below were obtained from the Oregon Department of Agriculture Seed Lab. These figures were made possible by the new grower lot number system adopted by the Oregon Hop commission and put into effect for the 1992 growing season. This system is strictly for educational purposes only in tracking the seed content in Oregon grown hops. The intended extent of this grower lot number system is to be in effect for five years.

Variety	# of Bales	Seed %	Leaf/Stem
Willamette	25,519	.03	2.1
Nugget	24,107	3.7	0.9
Tettnanger	2,150	4.4	1.8
Perle	1,916	6.2	1.3
Fuggle	1,805	5.9	4.6
Galena	666	3.0	1.2
Mt. Hood	424	0.3	2.0

152 Chemawa Road N
Salem, OR 97303-5356
(503) 393-0368
FAX (503) 393-0677

Five Year Average Seed Counts - State of Oregon

Fuggle	Average:
1988	10.2
1989	8.0
1990	11.2
1991	10.6
1992	6.0

Tettnang	Average:
1988	9.2
1989	5.9
1990	9.1
1991	9.5
1992	4.4

Nuggett	Average:
1988	6.8
1989	10.9
1990	8.5
1991	8.6
1992	4.1

Willamette	Average:
1988	0.9
1989	1.1
1990	1.1
1991	0.9
1992	0.3

Source: SS Steiner, JI Haas, Busch Ag. Recources.

DISPOSITION OF PRODUCTION

SALABLE HOP PRODUCTS

	Exports	(+)	Net Domestic Usage of U.S. Hops*	(+)	Plus or (minus) Unaccountable Difference	(+)	Increase (Decrease) Domestic Stocks	(=)	Salable Product **
					(1,000 lbs.)				
1980-81	41,965		28,346		2,580		1,520		74,411 (100%)
1981-82	43,725		24,493		-1,892		12,600		78,926 (100%)
1982-83	34,733		26,689		2,673		14,050		78,145 (100%)
1983-84	32,181		25,700		3,098		7,016		67,995 (100%)
1984-85	31,352		26,691		-4,354		2,364		56,053 (100%)
1985-86	26,091		22,168		866		490		49,615 (100%)
1986-87	28,380		29,159		-8,239		-320		48,980 (100%)
1987-88 Δ	30,155		34,965		-4,442		-10,630		50,048 (100%)
1988-89 Δ	41,660		31,560		-10,224		-8,300		54,696 (100%)
1989-90 Δ	42,878		26,599		-10,341		190		59,326 (100%)
1990-91 Δ	31,300		24,908		-1,663		2,310		56,855 (100%)
1991-92 Δ	48,493		25,721		-7,109		2,050		69,155 (100%)

Source: U.S.D.A. Hop Market News, FAS. Prepared by Hop Growers of America, Inc.

* Total usage less imports, adjusted for year end inventory changes.

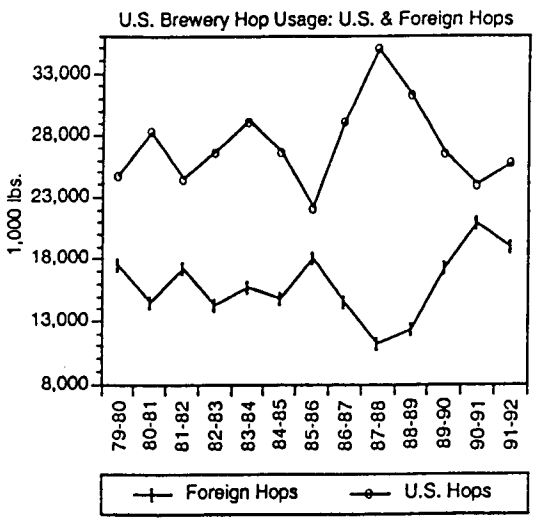
** Total production less fire loss and reserves not yet sold in normal outlets.

Δ 1987-92 figures were revised to reflect a U.S. extract ratio of 3.1 lbs. of raw hops to 1 lb. of hop extract.

U.S. BREWERY USAGE

	Net Usage U.S. Hops	Net Usage Foreign Hops
	(1,000 lbs.)	
1979-80	24,870 (59%)	17,595 (41%)
1980-81	28,346 (66%)	14,601 (34%)
1981-82	24,493 (59%)	17,346 (41%)
1982-83	26,689 (65%)	14,349 (35%)
1983-84	29,195 (65%)	15,672 (35%)
1984-85	26,691 (64%)	14,774 (36%)
1985-86	22,168 (55%)	18,039 (45%)
1986-87	29,159 (67%)	14,626 (33%)
1987-88	34,965 (76%)	11,138 (24%)
1988-89	31,560 (72%)	12,302 (28%)
1989-90	26,599 (61%)	17,243 (39%)
1990-91	24,908 (54%)	20,974 (46%)
1991-92	25,721 (58%)	18,946 (42%)

Source: U.S.D.A. Hop Market News



SUPPLY AND DISPOSITION 1983-84 TO 1991-92 (In 1,000 lbs.)

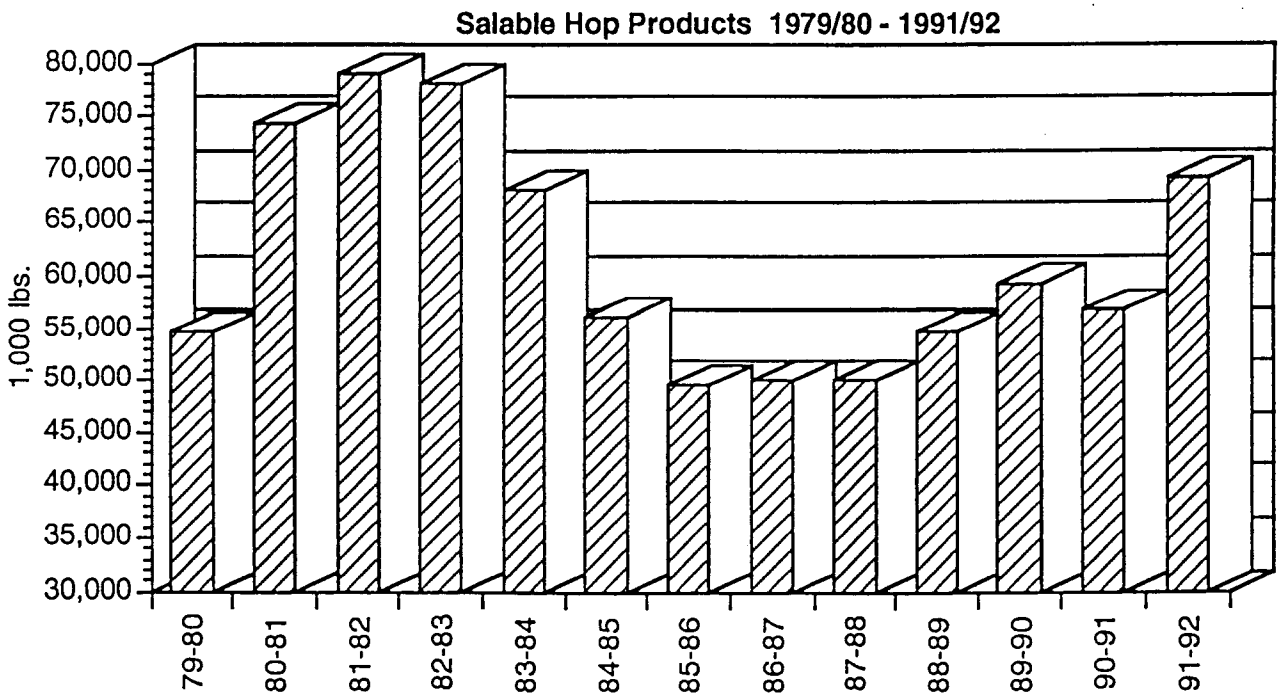
SUPPLY:	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Carryin Stock 1/	61,080	68,096	70,460	70,950	70,630	60,000	51,700	51,890	54,200
Salable Product 2/	67,995	56,053	49,615	48,980	50,048	54,696	59,326	56,855	69,155
Imports	15,629	14,774	18,039	14,626	11,138	12,302	17,243	20,974	18,946
TOTAL	144,704	138,923	138,114	134,556	131,816	126,998	128,269	129,719	142,301
DISPOSITION:									
Brewery Usage	41,329	41,465	40,207	43,785	46,103	43,862	43,842	45,882	44,667
Exported 3/	32,181	31,352	26,091	28,380	30,155	41,660	42,878	31,300	48,493
Carryout Stocks 1/	68,096	70,460	70,950	70,630	60,000	51,700	51,890	54,200	56,250
Balancing Item	3,098	-4,354	866	-8,239	-4,442	-10,224	-10,341	-1,663	-7,109
TOTAL	144,704	138,923	138,114	134,556	131,816	126,998	128,269	129,719	142,301
HOPPING RATE:	0.213	0.214	0.208	0.224	0.233	0.220	0.218	0.226	0.221

Source: U.S.D.A. Hop Market News

1/ Brewer, dealer and grower stocks as of September 1.

2/ Production less fire loss and reserve hops not sold in normal outlets.

3/ 1987-92 export figures were revised to reflect a U.S. extract ratio of 3.1 lbs. of raw hops to 1 lb. of hop extract.



BREAKDOWN OF BREWERY CONSUMPTION AND EXPORTS OF U.S. HOPS - (In 1,000 lbs.)

	EXTRACT CONVERSION *		U.S. BREWERY CONSUMPTION				U.S. HOP EXPORTS					
Marketing Year	Domestic	Export	Cones/ Pellets	Extract (Hop Equiv.)		Total Consump.	Cones	Pellets	Total Hops/ Pellets	Extract (Hop Equiv.)		Total Exports
1978-79	4.4-1	4.0-1	32,632	7,321		39,953	-	-	17,336	15,207		32,543
1979-80	4.4-1	4.0-1	35,582	6,883		42,465	-	-	17,045	19,692	1/	36,737
1980-81	3.5-1	4.0-1	35,331	7,616		42,947	-	-	19,605	22,360		41,965
1981-82	4.4-1	4.0-1	34,644	7,195		41,839	-	-	21,713	22,012		43,725
1982-83	5.0-1	4.0-1	34,476	6,562		41,038	-	-	16,817	17,925		34,742
1983-84	5.1-1	4.0-1	35,078	6,294	2/	41,372	4,785	5,955	10,740	21,441		32,181
1984-85	4.7-1	4.0-1	35,451	6,014		41,465	4,162	5,906	10,068	21,284		31,352
1985-86	5.6-1	4.0-1	34,617	5,590		40,207	3,438	4,365	7,803	18,288		26,091
1986-87	6.6-1	4.0-1	36,220	7,567		43,787	4,997	3,983	8,980	19,400		28,380
1987-88	5.4-1	3.1-1	36,894	9,209		46,103	5,293	6,705	11,998	18,157		30,155
1988-89	5.3-1	3.1-1	34,341	9,283		43,624	4,310	16,977	21,287	20,373		41,660
1989-90	5.5-1	3.1-1	34,485	9,357		43,842	4,902	16,535	21,437	21,441		42,878
1990-91	5.7-1	3.1-1	35,467	10,415		45,882	2,725	12,412	15,137	16,163		31,300
1991-92	5.4-1	3.1-1	34,194	10,473		44,667	5,589	10,933	16,522	31,971		48,493

Source: U.S.D.A. Hop Market News

* Domestic conversion factors are reported by the U.S. Treasury Department. 1987-92 export figures were revised to reflect an extract ratio of 3.1 lbs. to 1 lb. of hop extract.

1/ 5 million pounds minus adjustment to reflect more accurate export extract figure.

2/ Includes 3.5 million pounds minus adjustment to reflect more accurate domestic extract consumption figure.

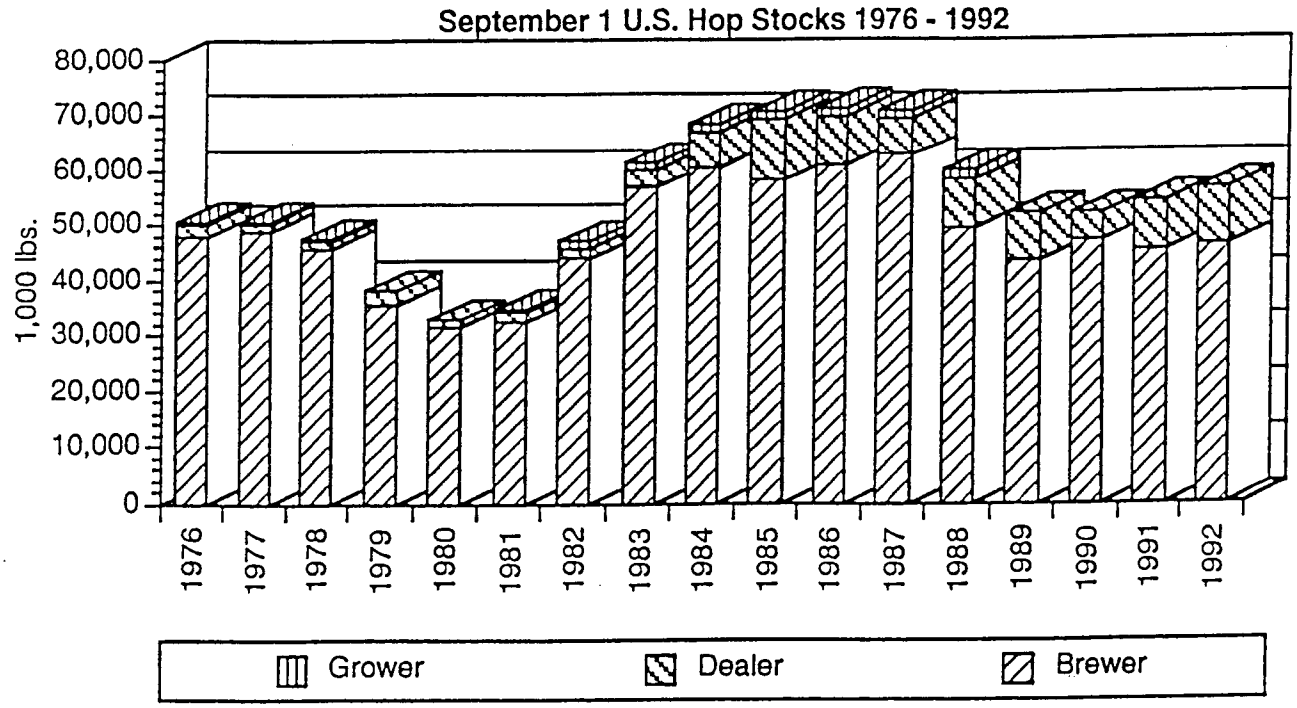
SEPTEMBER 1 U.S. HOP STOCKS 1976 - 1992

(1,000 lbs.)

Year	Brewer	Dealer	Grower	TOTAL
1976	48,050	1,960	390	50,400
1977	48,520	1,580	380	50,480
1978	45,430	1,730	380	47,540
1979	35,270	2,930	0	38,200
1980	31,420	1,380	0	32,800
1981	32,240	1,950	240	34,430
1982	43,740	2,090	1,200	47,030
1983	56,700	3,000	1,380	61,080
1984	60,480	6,256	1,360	68,096
1985	58,130	10,930	1,400	70,460
1986	60,630	8,930	1,390	70,950
1987	62,430	6,580	1,620	70,630
1988	49,090	9,160	1,750	60,000
1989	43,200	8,500	1/	51,700
1990	46,810	5,080	1/	51,890
1991	45,200	9,000	1/	54,200
1992	46,270	9,980	1/	56,250

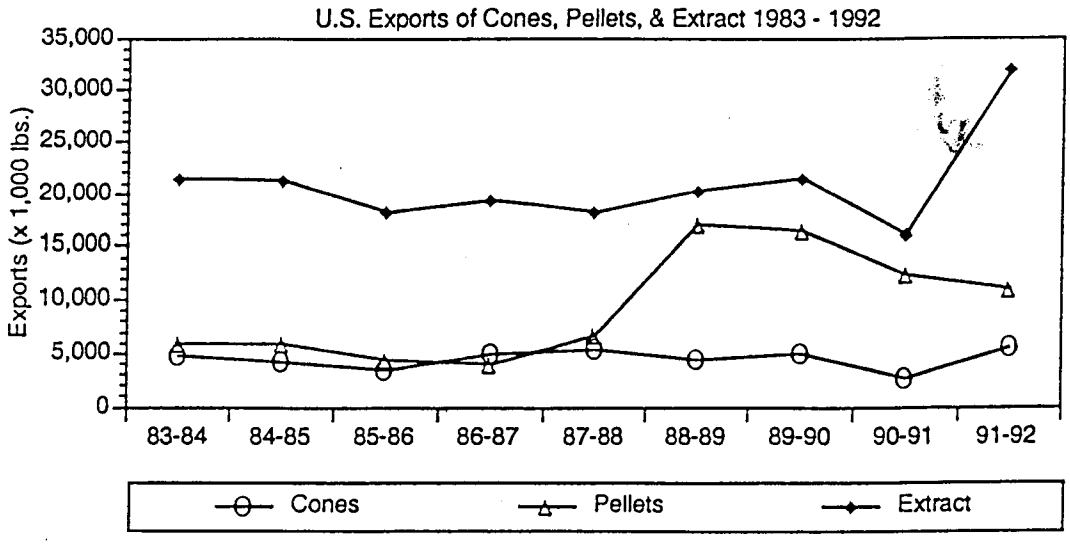
Source: U.S.D.A. Prepared by Hop Growers of America, Inc.

1/ Included in dealer stocks to avoid disclosure of individual operations.



1991-1992 U.S. HOP EXPORTS (Lbs.)

Region / Country	Cones	Pellets	Extract (Hop Equiv x 3.1)	Total
NORTH AMERICA				
Canada	189,596	2,676,386	225,534	3,091,516
Mexico	291,007	742,950	4,216,738	5,250,695
CENTRAL AMERICA				
Guatemala	0	141,094	136,685	277,779
Nicaragua	2,205	101,412	129,850	233,467
Costa Rica	0	0	82,014	82,014
CARIBBEAN				
Dominican Republic	0	158,731	485,237	643,968
Jamaica	0	92,593	239,199	331,792
SOUTH AMERICA				
Brazil	44,092	2,341,286	3,273,612	5,658,990
Columbia	0	165,345	806,443	971,788
Chile	0	0	669,755	669,755
Argentina	2,205	189,595	362,643	554,443
EUROPE				
Germany	3,214,306	690,039	6,232,848	10,137,193
Russia	132,276	972,229	2,638,026	3,742,531
Netherlands	0	110,230	1,981,932	2,092,162
Belgium	286,598	59,524	1,653,890	2,000,012
United Kingdom	379,191	310,850	1,278,006	1,968,047
Ireland	0	165,345	703,929	869,274
AFRICA				
Nigeria	147,708	66,138	34,171	248,017
ASIA				
Korea	341,712	220,460	1,804,247	2,366,419
Phillipines	0	0	1,988,777	1,988,777
Taiwan	0	617,288	0	617,288
OCEANIA / MIDDLE EAST				
Thailand	0	385,805	0	385,805
ALL OTHERS	557,766	725,319	3,027,722	4,310,807
GRAND TOTAL EXPORTS	5,588,662	10,932,619	31,971,258	48,492,539



Source: U.S.D.A. Hop Market News. Prepared by Hop Growers of America, Inc.

SUMMARY OF U.S. HOP EXPORTS BY COUNTRIES & REGIONS (x 1,000 lbs.)

	'82-83	'83-84	'84-85	'85-86	'86-87	'87-88*	'88-89*	'89-90*	'90-91*	'91-92*
Canada	4,692	3,880	3,233	2,071	2,005	2,797	9,779	4,191	2,782	3,092
Mexico	4,982	4,716	8,128	5,028	6,555	5,369	5,897	6,781	3,051	5,251
NORTH AMERICA	9,674	8,596	11,361	7,099	8,560	8,166	15,676	10,972	5,833	8,343
Belize	12	0	0	12	0	0	6	0	0	2
Costa Rica	13	16	28	36	88	90	68	0	41	82
El Salvador	35	20	20	33	40	115	0	0	44	55
Guatemala	94	330	179	139	15	110	121	121	131	278
Honduras	100	80	0	70	0	0	40	50	48	61
Nicaragua	150	12	0	0	0	0	0	46	51	233
Panama	36	56	10	32	184	47	74	59	0	0
CENTRAL AMERICA	440	514	237	322	327	362	309	276	315	711
Bahamas	0	0	0	0	28	8	22	25	27	34
Barbados	5	8	7	7	16	13	9	6	4	7
Dominican Republic	297	252	70	197	179	365	329	536	283	644
Jamaica	270	187	32	84	79	219	323	117	130	332
Leeward & Windward	4	3	16	4	8	8	28	28	139	30
Trinidad - Tobago	33	27	13	17	48	44	40	70	16	27
Other	0	0	0	0	8	8	18	34	37	21
CARIBBEAN	609	477	138	309	366	665	769	816	636	1,095
Argentina	698	476	249	700	709	222	0	186	303	554
Bolivia	12	51	96	13	70	220	108	40	34	264
Brazil	5,803	3,129	5,080	4,848	6,012	7,104	7,985	9,732	7,566	5,659
Chile	388	328	284	247	304	582	431	543	567	670
Colombia	3,314	6,389	2,600	5,411	2,358	2,914	2,865	3,893	555	972
Ecuador	439	322	1,924	498	577	223	0	272	394	112
Paraguay	28	10	44	52	52	28	47	102	34	123
Peru	910	368	220	656	848	589	643	754	226	484
Uruguay	87	80	68	49	92	103	45	56	81	88
Venezuela	874	1,036	1,327	487	887	202	257	501	451	433
Other	0	1	1	1	24	75	52	103	185	27
SOUTH AMERICA	12,553	12,190	11,893	12,962	11,933	12,262	12,433	16,182	10,396	9,386
Belgium	416	839	352	77	144	108	589	962	1,601	2,000
Denmark	3	44	0	0	0	0	0	0	2	124
France	45	1	60	0	0	34	0	2	499	0
Ireland	490	337	516	0	456	516	921	1,182	575	869
Italy	12	0	0	0	37	15	0	0	22	55
Netherlands	1,632	1,148	2,020	834	996	1,203	1,675	1,417	1,267	2,092
Spain	152	149	0	220	0	56	74	136	367	516
Switzerland	308	0	0	0	124	0	0	0	22	31
United Kingdom	322	524	8	103	546	688	655	445	892	1,968
Germany	3,386	3,294	905	1,020	797	1,687	4,200	5,076	5,619	10,137
U.S.S.R./Russia	1,184	166	0	0	0	0	661	1,265	0	3,743
Other	0	148	28	8	0	63	21	338	177	14
EUROPE	7,950	6,650	3,889	2,262	3,100	4,370	8,796	10,823	11,043	21,549

SUMMARY OF U.S. HOP EXPORTS BY COUNTRIES & REGIONS (x 1,000 lbs.)

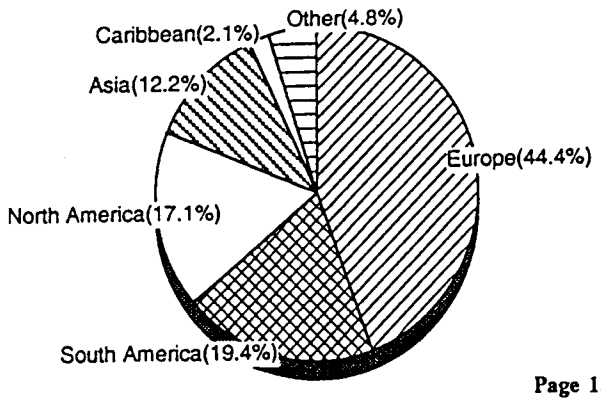
	'82-83	'83-84	'84-85	'85-86	'86-87	'87-88*	'88-89*	'89-90*	'90-91*	'91-92*
Cameroon	44	80	0	0	272	233	211	174	147	110
Ghana	0	0	28	0	116	158	62	16	14	75
Nigeria	484	608	1,005	980	980	828	786	201	24	248
South Africa	230	240	113	160	196	55	150	51	108	160
Togo	0	0	26	0	0	102	22	34	154	62
Zaire	116	108	72	40	28	34	0	0	55	0
Other	217	318	420	60	23	102	6	70	9	129
AFRICA	1,091	1,354	1,664	1,240	1,615	1,512	1,237	546	511	784
Bangladesh	2	9	1	2	28	9	0	0	2	7
China	0	0	0	0	0	0	13	0	77	53
Hong Kong	36	136	64	205	271	136	71	50	95	158
Indonesia	133	98	57	0	52	47	56	19	82	27
Japan	792	986	659	683	1,069	639	333	364	287	426
Korea	82	217	200	119	77	52	94	35	79	2,366
Malaysia	204	116	180	220	192	177	161	31	169	118
Phillipines	808	543	795	329	596	1,235	1,247	2,337	920	1,989
Singapore	248	248	184	292	80	124	171	180	172	175
Taiwan	0	0	0	0	0	9	150	0	571	617
Other	88	0	0	0	0	0	0	34	0	7
ASIA	2,393	2,353	2,140	1,850	2,365	2,428	2,296	3,050	2,454	5,943
Australia	0	0	0	16	64	0	6	28	14	89
Pakistan	23	39	28	31	30	22	22	23	9	9
Papua New Guinea	0	0	0	0	0	0	96	129	89	41
Sri Lanka	0	0	0	0	0	0	7	7	0	11
Thailand	0	8	2	0	12	51	7	0	0	386
Other	0	0	0	0	8	0	0	0	0	7
AUST-OCEANIA	23	47	30	47	114	73	138	187	112	543
Iraq	0	0	0	0	0	317	0	26	0	0
Israel	0	0	0	0	0	0	6	0	0	0
Egypt	0	0	0	0	0	0	0	0	0	137
Saudi Arabia	0	0	0	0	0	0	0	0	0	2
MIDDLE EAST	0	0	0	0	0	317	6	26	0	139
GRAND TOTAL	34,733	32,181	31,352	26,091	28,380	30,155	41,660	42,878	31,300	48,493

Source: U.S.D.A. Hop Market News. Prepared by Hop Growers of America, Inc.

* 1987-92 export figures were revised to reflect an extract ratio of 3.1 lbs. of raw hops to 1 lb. of hop extract.

Top 5 Regions for U.S. Hop Exports '91 vs.'92

Region	% of total U.S. exports 1992	1991
1. Europe	44%	35%
2. South America	19%	33%
3. North America	17%	19%
4. Asia	12%	8%
5. Caribbean	2%	2%



U.S. IMPORTS OF HOPS, PELLETS & HOP EXTRACT (1,000 lbs.)

CONES

Mktg Yr	Aust	Belg	Canada	China	Czech	France	Gemany	N. Zeal.	Poland	U.K.	Yugo	Other	Total
1983-84	0	35	203	0	3,003	240	10,552	0	640	3	0	124	14,800
1984-85	81	25	139	0	1,602	360	11,535	0	520	2	0	102	14,366
1985-86	160	25	67	0	2,713	320	13,422	0	440	3	60	2	17,212
1986-87	0	0	115	0	5,071	280	7,330	0	957	2	0	11	13,766
1987-88	0	0	97	0	1,166	401	8,794	0	320	7	0	7	10,792
1988-89	7	24	359	0	761	591	8,779	0	1,041	4	201	26	11,793
1989-90	0	88	904	62	2,561	560	11,311	0	599	0	40	60	16,185
1990-91	0	95	769	5,245	2,366	441	9,625	18	520	18	0	40	19,137
1991-92	11	0	358	4,489	4,550	586	6,014	55	871	4	0	0	16,938

PELLETS

Mktg Yr	Aust	Belg	Canada	China	Czech	France	Gemany	N. Zeal.	Poland	U.K.	Yugo	Other	Total
1983-84	0	0	1	0	10	0	848	0	0	0	0	1	860
1984-85	0	0	0	0	4	0	360	0	0	2	0	38	404
1985-86	0	0	8	0	28	0	587	0	0	0	190	5	818
1986-87	0	24	0	0	287	0	445	31	0	2	0	71	860
1987-88	7	0	0	0	2	0	168	31	0	0	88	6	302
1988-89	0	0	0	0	0	0	287	60	0	2	148	4	501
1989-90	306	0	0	0	0	0	252	115	0	2	373	0	1,048
1990-91	276	0	0	110	0	0	375	31	0	37	287	0	1,116
1991-92	723	84	0	44	24	0	750	119	0	42	178	0	1,964

EXTRACT - HOP EQUIVALENT (Actual x 4)

Mktg Yr	Aust	Belg	Canada	China	Czech	France	Gemany	N. Zeal.	Poland	U.K.	Yugo	Other	Total
1983-84	0	0	0	0	0	0	10	0	0	1	0	1	12
1984-85	0	0	0	0	0	0	4	0	0	0	0	0	4
1985-86	0	0	0	0	0	0	0	0	0	0	0	9	9
1986-87	0	0	0	0	0	0	0	0	0	0	0	0	0
1987-88	0	0	0	0	0	0	44	0	0	0	0	0	44
1988-89	0	0	0	0	0	0	8	0	0	0	0	0	8
1989-90	0	0	0	0	0	0	10	0	0	0	0	0	10
1990-91	370	0	0	0	0	0	264	0	0	87	0	0	721
1991-92	0	0	0	0	0	0	28	0	0	16	0	0	44

TOTAL HOP IMPORTS

Mktg Yr	Aust	Belg	Canada	China	Czech	France	Gemany	N. Zeal.	Poland	U.K.	Yugo	Other	Total
1983-84	0	35	204	0	3,013	240	11,410	0	640	4	0	126	15,672
1984-85	81	25	139	0	1,606	360	11,899	0	520	4	0	140	14,774
1985-86	160	25	75	0	2,741	320	14,009	0	440	3	250	16	18,039
1986-87	0	24	115	0	5,358	280	7,775	31	957	4	0	82	14,626
1987-88	7	0	97	0	1,168	401	9,006	31	320	7	88	13	11,138
1988-89	7	24	359	0	761	591	9,074	60	1,041	6	349	30	12,302
1989-90	306	88	904	62	2,561	560	11,573	115	599	2	413	60	17,243
1990-91	646	95	769	5,355	2,366	441	10,264	49	520	142	287	40	20,974
1991-92	734	84	358	4,533	4,574	586	6,792	174	871	62	178	0	18,946

Source: U.S.D.A. Hop Market News. Prepared by Hop Growers of America, Inc.

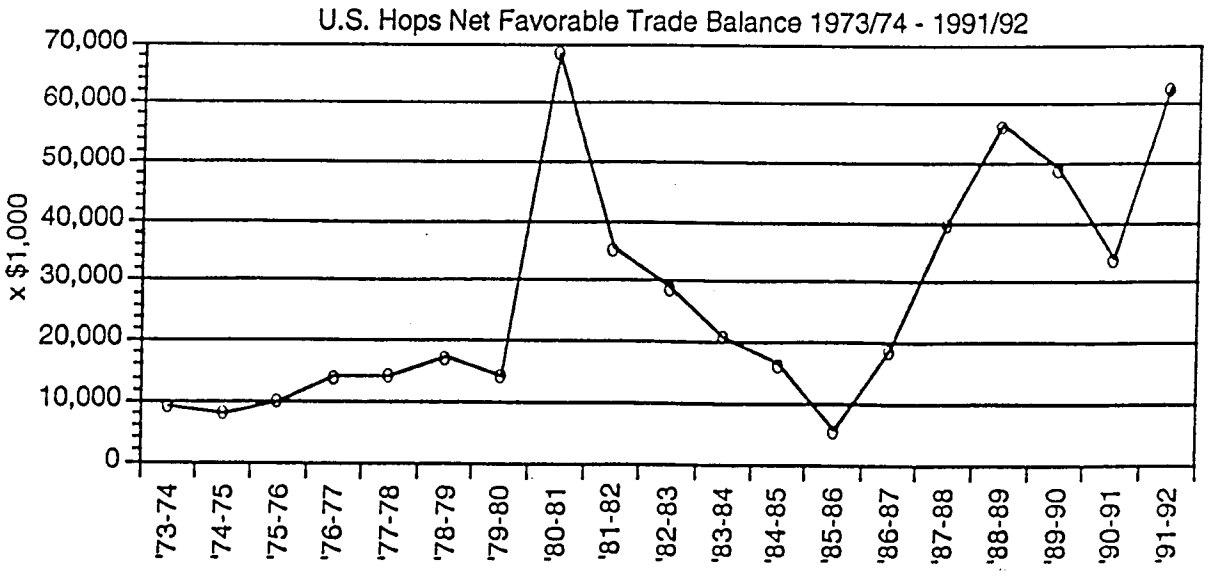
VALUE OF IMPORTS AND U.S. HOP EXPORTS 1973 - 1992

Year	Value of Hop Imports 1/	Value of U.S. Hop Exports 2/	Net Favorable Trade Balance
	(x $1,000)		
1973-74	$17,192	$26,546	$9,354
1974-75	$17,718	$25,920	$8,202
1975-76	$16,616	$26,625	$10,009
1976-77	$15,522	$29,591	$14,069
1977-78	$12,754	$27,008	$14,254
1978-79	$16,969	$34,147	$17,178
1979-80	$37,065	$51,365	$14,300
1980-81	$34,240	$102,669	$68,429
1981-82	$36,944	$72,456	$35,512
1982-83	$33,842	$62,755	$28,913
1983-84	$37,280	$58,191	$20,911
1984-85	$37,611	$54,150	$16,539
1985-86	$47,909	$53,551	$5,642
1986-87	$36,416	$54,795	$18,379
1987-88	$21,891	$61,704	$39,813
1988-89	$27,960	$84,446	$56,486
1989-90	$31,557	$80,643	$49,086
1990-91	$39,787	$73,852	$34,065
1991-92	$41,226	$103,914	$62,688

Source: U.S.D.A. Hop Market News. Prepared by Hop Growers of America, Inc.

1/ Import price is defined generally as market value in foreign country excluding import duties, ocean freight and marine insurance.

2/ Export price is value of exportation based on selling price, inland freight, insurance and other charges to port.

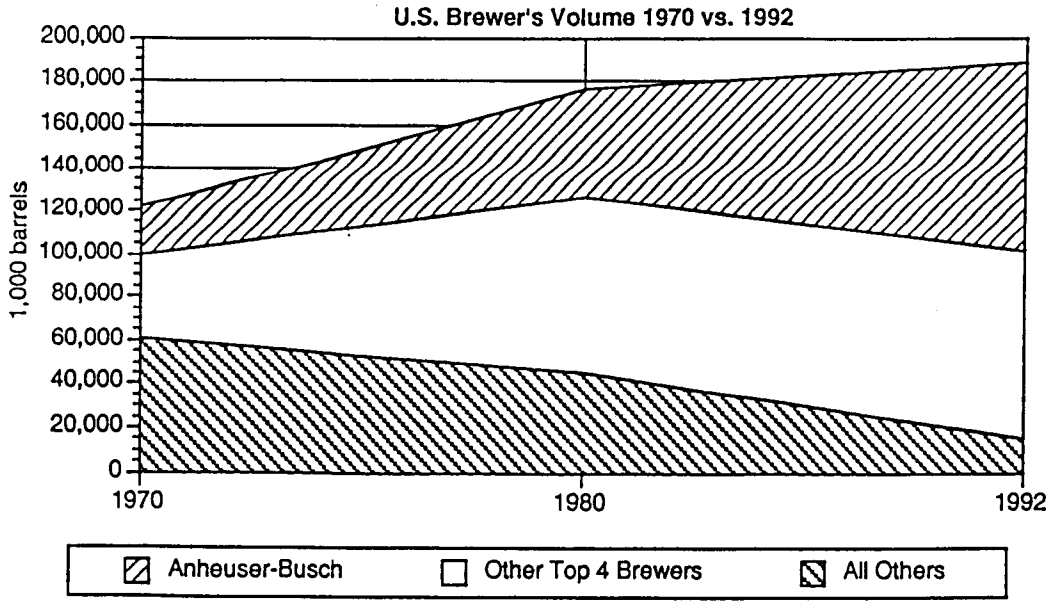


1992 U.S. BREWER'S SHIPMENTS							
	Shipments (barrels x 1,000)		Change		Market Share		
Company	1992*	1991	Barrels	Percentage	1992*	1991	1990
Anheuser-Busch, Inc.	86,800	86,037	763	0.9%	44.2%	43.9%	43.4%
Miller Brewing Co.	42,000	43,600	-1,600	-3.8%	21.4%	22.2%	21.8%
Coors Brewing Co.	20,000	19,550	450	2.3%	10.2%	10.0%	9.7%
The Stroh Brewery Co.	14,025	14,800	-775	-5.5%	7.1%	7.6%	8.1%
G. Heileman Brewing Co.	9,600	9,800	-200	-2.1%	4.9%	5.0%	5.6%
Pabst Brewing Co.	7,000	6,700	300	4.3%	3.6%	3.4%	3.4%
Others	8,775	7,457	1,318	15.0%	4.5%	3.8%	3.4%
Total U.S. Domestics	188,200	187,944	256	0.1%	95.8%	95.9%	95.5%
plus U.S. Imports	8,300	8,031	269	3.2%	4.2%	4.1%	4.5%
TOTAL	**196,500**	**195,975**	**525**	**0.3%**			

Source: Beer Marketer's Insights.
*Estimate

TOP 5 U.S. BREWER'S VOLUME vs. ALL OTHERS						
	Shipments (barrels x 1,000)			Market Share		
Company	1970	1980	1992*	1970	1980	1992*
Anheuser-Busch, Inc.	22,202	50,200	86,800	18.3%	28.5%	44.2%
Other 4 Top Brewers	38,672	81,091	85,625	31.7%	46.0%	43.6%
All Others	60,987	45,109	15,775	50.0%	25.5%	12.2%

Source: Modern Brewery Age, Beer Marketer's Insights. Prepared by Hop Growers of America, Inc.
* Estimate



INTERNATIONAL HOP GROWERS CONGRESS - ECONOMIC COMMITTEE REPORT

December 3, 1992 - Munich, Germany

	1992 Hop Acreage			1992 Hop Production (1,000 lbs.)*			'92 Alpha Acid **	1993 Acreage Estimates			
Country	Aroma	Alpha	Total	Aroma	Alpha	Total	(Metric Tons)	Aroma	Alpha	Total	
Australia	25	2,829	2,854	176	5,941	6,117	264	25	2,829	2,854	
Belgium	284	697	981	452	1,098	1,550	46	284	729	1,013	
Germany	35,701	20,969	56,670	40,234	22,928	63,162	1,291	35,800	21,068	56,868	
Czechoslovakia	28,664	0	28,664	20,393	0	20,393	324	28,664	0	28,664	
United Kingdom	3,091	5,518	8,609	3,968	7,055	11,023	390	2,916	5,436	8,352	
Spain	0	3,385	3,385	0	2,824	2,824	115	0	3,385	3,385	
France	1,384	203	1,587	1,773	249	2,022	21	1,453	217	1,670	
Hungary	25	754	779	15	736	751	22	0	667	667	
USA	16,467	25,812	42,279	21,649	53,793	75,442	-	17,000	25,995	42,995	
Slovenia	5,567	329	5,896	6,929	478	7,407	181	5,584	329	5,913	
Total '92	**91,208**	**60,496**	**151,704**	**95,589**	**95,102**	**190,691**	**2,654**	**91,726**	**60,655**	**152,381**	
Total 1991	87,122	58,198	145,320	107,663	96,384	204,047	3,799	91,282	60,348	151,630	1/
Diff. '92 vs. '91	4,086	2,298	6,384	-12,074	-1,282	-13,356	-1,145	444	307	751	2/
% Diff. '92 vs'91	4.7%	3.9%	4.4%	-11.2%	-1.3%	-6.5%	-30.1%	0.5%	0.5%	0.5%	

Source: IHGC Economic Committee meeting - December 3, 1992.

Bulgaria, Yugoslavia, Poland, Ukraine,and New Zealand did not submit a report.

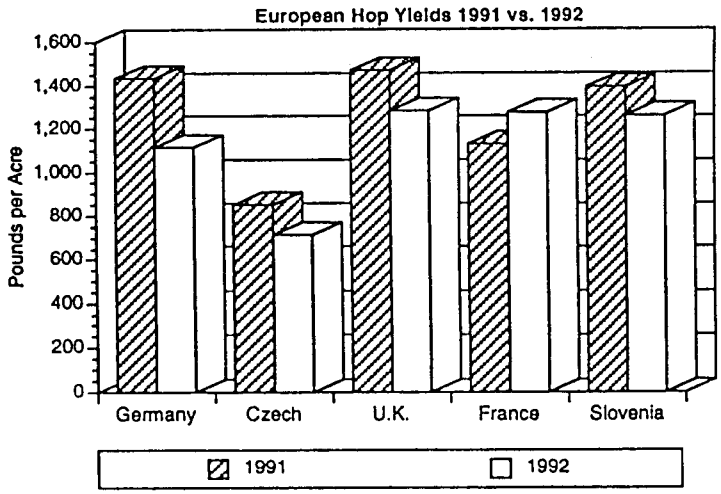
* 1992 production figures are estimates only.

** U.S. alpha acid figures are not included in alpha production totals.

1/ 1992 acreage totals

2/ Diff. between '92 acreage & '93 acreage est.

	Alpha Acid Production (MT)		% Diff.
Country	1992	1991	'92 vs. '91
Australia	264	216	22%
Belgium	46	50	-8%
Germany	1,291	2,287	-44%
Czechoslovakia	324	414	-22%
United Kingdom	390	389	0%
Spain	115	173	-34%
France	21	26	-19%
Hungary	22	29	-24%
Slovenia	181	215	-16%
Total	2,654	3,799	-30%



IHGC AROMA ACREAGE

Year	Australia	Belgium	Bulgaria	Germany	Czech	U.K.	Spain	France	Hungary	Yugo/Slov	Poland	USA	N. Zealand	Ukraine	IHGC Totals
1985	49	289	1,334	26,986	29,528	4,828	77	467	613	8,288	6,012	6,709	-	-	85,180
1986	59	319	1,320	27,616	29,528	4,534	77	596	544	8,083	5,720	5,955	-	-	84,350
1987	59	314	1,186	28,288	29,405	4,319	74	771	457	7,900	5,720	7,497	-	-	85,991
1988	133	319	1,186	30,277	29,528	3,966	49	857	395	7,878	5,572	13,343	-	-	93,505
1989	124	331	897	31,545	29,506	3,632	12	1,001	264	6,457	5,491	14,883	-	-	94,143
1990	86	336	897	32,437	29,281	3,264	7	1,085	133	6,590	5,231	14,683	-	-	94,031
1991	99	329	897	32,385	28,614	3,197	0	1,253	111	6,180	5,103	15,609	44	16,358	110,179
1992*	25	331	897	34,587	28,664	3,091	0	1,384	25	6,212	5,095	16,467	77	15,548	112,401

IHGC ALPHA ACREAGE

Year	Australia	Belgium	Bulgaria	Germany	Czech	U.K.	Spain	France	Hungary	Yugo/Slov	Poland	USA	N. Zealand	Ukraine	IHGC Totals
1985	1,821	1,443	1,063	27,421	0	6,906	4,873	1,154	667	0	173	21,391	-	-	66,912
1986	1,806	1,107	1,063	26,793	0	5,923	4,159	887	722	0	292	19,045	-	-	61,796
1987	1,829	764	1,161	25,268	0	5,528	3,954	610	815	0	321	20,803	-	-	61,053
1988	2,538	714	1,161	24,337	0	5,617	3,904	351	828	0	321	20,056	-	-	59,827
1989	2,627	665	1,161	23,235	0	5,614	3,830	299	825	1,460	371	19,663	-	-	59,750
1990	2,595	576	1,408	22,909	0	5,248	3,583	227	810	1,255	346	20,781	-	-	59,739
1991	2,681	638	1,359	23,400	0	5,483	3,385	190	806	1,282	395	23,944	405	1,334	65,304
1992*	2,829	754	1,384	22,036	0	5,518	2,879	203	754	1,092	494	25,812	571	988	65,313

IHGC TOTAL ACREAGE

Year	Australia	Belgium	Bulgaria	Germany	Czech	U.K.	Spain	France	Hungary	Yugo/Slov	Poland	USA	N. Zealand	Ukraine	IHGC Totals
1985	1,871	1,732	2,397	54,406	29,528	11,735	4,949	1,621	1,280	8,288	6,185	28,100	-	-	152,093
1986	1,866	1,426	2,382	54,409	29,528	10,457	4,235	1,483	1,265	8,083	6,012	25,000	-	-	146,146
1987	1,888	1,077	2,347	53,556	29,405	9,847	4,028	1,381	1,273	7,900	6,042	28,300	-	-	147,044
1988	2,671	1,033	2,347	54,614	29,528	9,583	3,954	1,208	1,223	7,878	5,893	33,400	-	-	153,332
1989	2,750	996	2,058	54,780	29,506	9,246	3,842	1,300	1,090	7,917	5,861	34,546	-	-	153,893
1990	2,681	912	2,305	55,345	29,281	8,513	3,590	1,312	944	7,845	5,577	35,464	-	-	153,770
1991	2,780	966	2,256	55,785	28,614	8,681	3,385	1,443	917	7,462	5,498	39,553	450	17,692	175,483
1992*	2,854	1,085	2,281	56,623	28,664	8,609	2,879	1,586	778	7,304	5,589	42,279	647	16,536	177,714

Source: IHGC annual reports. Prepared by Hop Growers of America, Inc.

* 1992 acreage strung for harvest.

REVIEW OF THE 1991 GERMAN HOP CROP

TABLE #1: PRODUCTION, ACREAGE & PRICES BY GROWING AREA

Growing Area	Acreage	Average Yield/Acre	Ttl Production (lbs x 1,000)	Total Pounds Sold (x1,000) Spots	Total Pounds Sold (x1,000) Contract	Average Price ($/lb.) Spots	Average Price ($/lb.) Contract	Crop Value (Dollars x 1,000) Spots	Crop Value (Dollars x 1,000) Contract	Crop Value (Dollars x 1,000) Total	Crop Value Per Acre	Average Price
Hallertau	42,897	1,486	63,645	20,315	43,330	$2.30	$2.15	46,649	93,062	139,711	$3,257	$2.20
Spalt	1,957	1,164	2,280	750	1,530	$3.11	$3.07	2,335	4,698	7,033	$3,593	$3.08
Hersbruck	289	1,062	307	129	178	$2.26	$2.31	292	411	704	$2,434	$2.29
Jura	1,858	1,726	3,211	695	2,516	$2.13	$2.38	1,483	5,996	7,479	$4,025	$2.33
Tettnang	3,736	1,303	4,864	1,174	3,689	$3.19	$3.18	3,750	11,714	15,464	$4,139	$3.18
Baden-Bitburg	57	1,057	60	0	60	-	$2.54	0	153	153	$2,690	$2.54
Elbe-Saale	4,969	1,182	5,869	0	5,869	-	$2.34	0	13,730	13,730	$2,763	$2.34
TOTAL	55,763	1,441	80,236	23,064	57,172	$2.36	$2.27	$54,509	$129,764	$184,273	$3,305	$2.30

TABLE #2: PRODUCTION, ACREAGE & PRICES BY VARIETY

Growing Area	Acreage	Average Yield	Ttl Production (lbs x 1,000)	Total Pounds Sold Spots	Total Pounds Sold Contract	Average Price ($/lb.) Spots	Average Price ($/lb.) Contract	Crop Value (Dollars x 1,000) Spots	Crop Value (Dollars x 1,000) Contract	Crop Value (Dollars x 1,000) Total	Crop Value Per Acre	Average Price
Hallertauer	2,824	1,298	3,667	1,016	2,651	$2.98	$2.97	3,030	7,877	10,907	$3,862	$2.98
Spalter	578	1,075	623	200	423	$3.14	$3.10	629	1,312	1,940	$3,356	$3.11
Hersbrucker	18,031	1,472	26,540	6,389	20,152	$2.09	$2.28	13,345	45,974	59,319	$3,290	$2.24
Hüller Bitterer	1,045	1,454	1,521	774	747	$2.13	$2.22	1,649	1,656	3,305	$3,162	$2.17
Tettnanger	2,570	1,196	3,075	676	2,399	$3.19	$3.17	2,153	7,608	9,762	$3,799	$3.18
Saazer	42	741	31	0	31	$0.00	$3.18	0	99	99	$2,350	$3.18
Perle	7,329	1,557	11,396	3,914	7,482	$2.87	$2.18	11,243	16,341	27,584	$3,764	$2.42
North Brewer	16,274	1,374	22,325	5,689	16,636	$2.47	$2.27	14,038	37,837	51,875	$3,188	$2.32
Brewers Gold	4,300	1,954	8,407	3,535	4,872	$1.80	$1.55	6,369	7,535	13,905	$3,234	$1.65
Record	482	1,401	675	325	350	$2.26	$2.00	734	698	1,432	$2,973	$2.12
Orion	331	1,860	616	223	393	$2.31	$2.15	516	845	1,361	$4,109	$2.21
Nugget	257	1,178	303	170	132	$2.43	$2.31	413	306	719	$2,797	$2.37
Target	141	1,329	187	112	75	$2.42	$2.30	271	172	443	$3,147	$2.37
Bullion	418	1,624	678	0	678	$0.00	$1.69	0	1,149	1,149	$2,751	$1.69
Other	1,142	170	193	42	151	$2.82	$2.36	119	355	474	$415	$2.46
TOTAL	55,763	1,441	80,236	23,064	57,172	$2.36	$2.27	$54,509	$129,764	$184,273	$3,305	$2.30

Source: Hopfen Rundschau, April 1, 1992. Prepared by Hop Growers of America, Inc.

EUROPEAN COMMUNITY HOP GROWERS 1989 - 1991										
Country	Number of Growers			% Diff.	Total Hop Acres			Acres / Grower		
	1989	1990	1991	91 vs 90	1989	1990	1991	1989	1990	1991
Germany *	4,298	4,119	3,943	-4.3%	49,267	49,699	55,763	11.5	12.1	14.1
France	183	164	163	-0.6%	1,307	1,312	1,438	7.1	8.0	8.8
Belgium	124	118	107	-9.3%	993	912	961	8.0	7.7	9.0
United Kingdom	252	234	242	3.4%	9,249	8,364	8,824	36.7	35.7	36.5
Ireland	2	2	2	0.0%	52	42	30	25.9	21.0	14.8
Spain	1,972	1,865	1,759	-5.7%	3,566	3,489	3,328	1.8	1.9	1.9
Portugal	40	40	34	-15.0%	351	309	225	8.8	7.7	6.6
Euro Community	6,871	6,542	6,250	-4.5%	64,785	64,127	70,572	9.4	9.8	11.3

Source: Report of the European Council, June 29, 1992. Prepared by Hop Growers of America, Inc.

*1991 German acreage includes the former E. Germany.

SPOT AND CONTRACT PRICES 1988 - 1991								
	SPOT PRICES				CONTRACT PRICES			
	1988	1989	1990	1991	1988	1989	1990	1991
Germany								
Aroma	$2.03	$2.05	$7.49	$2.34	$2.03	$2.24	$2.44	$2.26
Alpha	$1.64	$1.46	$6.87	$2.10	$1.64	$1.89	$2.10	$1.98
USA								
Aroma	$1.85	$1.90	$2.23	$2.73	$2.30	$2.10	$2.25	$2.00-2.75
Alpha	$1.16	$1.30	$2.98	$2.10	$1.30	$1.35	$2.00	$1.40-2.20
Czechoslovakia								
Aroma	-	$2.78	$3.05	$3.20	-	$2.78	$3.05	$2.97

Source: IHGC annual reports. Prepared by Hop Growers of America, Inc.

EUROPEAN COMMUNITY HOP GROWING STATISTICS

HOP GROWING SUBSIDIES 1986 - 1991
(Dollars per Acre)

Variety	1986	1987	1988	1989	1990	1991
Aroma	$176	$187	$187	$193	$193	$193
Bitter	$221	$187	$221	$221	$193	$193
Other	$221	$210	$221	$227	$193	$193
Experimental	$221	$210	$221	$227	$193	$193

HOP PRODUCTION COSTS 1988-1991
(Dollars per Acre)

Country	1988	1989	1990	1991	% Change ('88 vs. '91)
Germany	$4,040	$4,192	$4,385	$4,373	8.3%
France	$4,002	$3,759	$3,742	$3,736	-6.7%
Belgium	$5,085	$5,283	$5,039	$5,167	1.6%
United Kingdom	$2,153	$4,577	$5,387	$5,503	155.6%
Ireland	$3,429	$3,254	$3,818	$4,002	16.7%
Spain	$2,172	$2,442	$2,422	$2,593	19.4%
Portugal	$2,153	$2,348	$2,394	$2,660	23.5%
Euro Community	$3,659	$4,148	$4,395	$4,672	27.7%

RETURN ON HOP ACREAGE IN FULL PRODUCTION 1988 - 1991
(Dollars per Acre)

Country	1988	1989	1990	1991	% Change ('88 vs. '91)
Germany	$2,967	$3,006	$3,181	$3,090	4.2%
France	$3,494	$3,156	$4,219	$3,122	-10.7%
Belgium	$2,474	$2,263	$6,319	$3,359	35.8%
United Kingdom	$2,832	$2,592	$3,180	$4,085	44.2%
Ireland	$3,366	$2,992	$6,126	$4,475	32.9%
Spain	$1,797	$2,533	$2,524	$2,515	40.0%
Portugal	$1,389	$2,452	$1,881	$971	-30.1%

SOURCE: Report of the European Council, June 29, 1992.

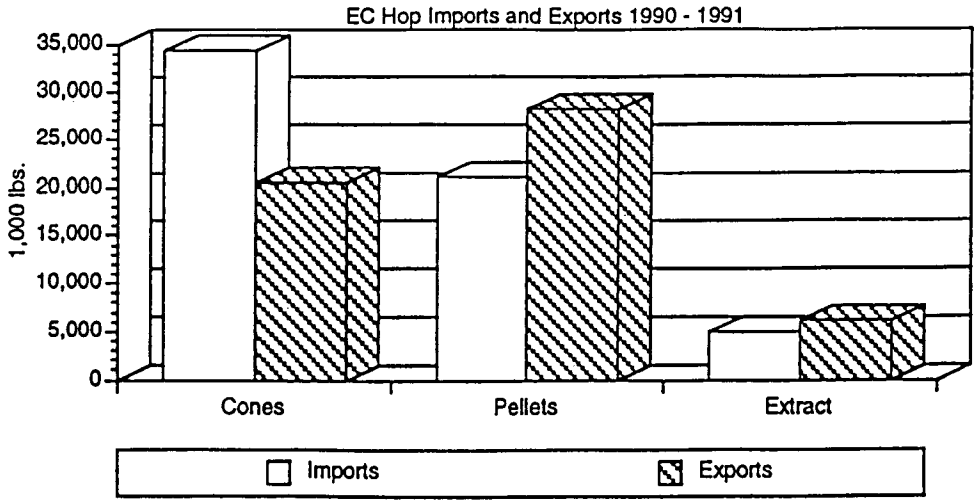
Conversion Rates: 1 ECU = DM 2.35418 (EC Report, June 29, 1992) ; 1 DM = .5945 US $. Acreage planted in 1991 and 1990 are rated at 40% and 65% of maximum production, respectively.

EC HOP IMPORTS/EXPORTS BY COUNTRY Sept 1990 - August 1991

(1,000 lbs.)

	CONES		PELLETS		EXTRACT		TOTALS		
	Import	Export	Import	Export	Import	Export	Import	Export	Net
Germany	28,254	14,806	6,634	24,116	1,287	4,378	40,058	56,659	16,601
France	73	2,145	1,127	465	604	0	3,426	2,657	-769
Belgium	3,704	547	6,521	1,506	483	855	12,567	5,197	-7,370
U.K.	1,378	2,355	1,982	1,477	293	591	4,584	6,047	1,463
Ireland	93	88	1,292	40	430	71	3,018	379	-2,640
Italy	73	66	1,482	0	238	2	2,536	74	-2,462
Denmark	95	0	714	2	187	2	1,536	10	-1,526
Netherlands	2	57	567	2	679	194	3,002	739	-2,263
Spain	668	0	344	725	273	0	2,003	798	-1,205
Portugal	40	377	311	0	331	2	1,539	385	-1,154
Greece	0	0	53	0	214	0	807	0	-807
EC TOTALS	34,379	20,441	21,025	28,334	5,020	6,096	75,077	72,944	-2,133

Source: Report of the European Council, June 29, 1992. Prepared by Hop Growers of America, Inc.



WORLD HOP SURVEY 1990 - 1992

Country	Acreage 1990	Acreage 1991	Acreage 1992*	Production 1990	Production 1991	Production 1992*	% of World 1991	Alpha Acid % 1990	Alpha Acid % 1991	Alpha Acid % 1992*	Alpha Acid Production 1990	Alpha Acid Production 1991	Alpha Acid Production 1992*
					(1,000 lbs.)							(1,000 lbs.)	
Austria	484	492	499	566	584	584	0.2%	6.9%	7.0%	6.9%	39	41	40
Belgium	912	961	1,085	1,324	1,411	1,587	0.5%	6.1%	7.6%	7.9%	81	107	125
Bulgaria	2,305	2,256	2,281	1,279	1,901	1,874	0.7%	6.0%	6.0%	6.0%	77	114	112
Czechoslovakia	29,281	28,614	28,614	23,400	24,266	20,944	8.5%	3.6%	4.2%	2.6%	842	1,019	545
CIS 1/	37,065	36,225	35,088	19,842	21,495	20,944	7.5%	3.1%	3.5%	3.5%	615	752	733
France	1,312	1,443	1,586	1,738	1,625	2,039	0.6%	2.4%	3.5%	3.2%	42	57	65
Germany	55,345	55,785	56,670	66,765	80,367	66,758	28.0%	5.2%	6.2%	4.8%	3,472	4,983	3,204
Hungary	944	924	783	930	1,201	981	0.4%	6.0%	5.3%	5.4%	56	64	53
Poland	5,577	5,498	5,589	5,115	5,800	5,401	2.0%	5.6%	5.7%	5.6%	286	331	302
Romania	5,797	5,881	5,930	4,547	5,771	5,842	2.0%	6.4%	6.4%	6.4%	291	369	374
Spain	3,590	3,385	2,879	4,685	4,234	3,748	1.5%	6.0%	7.2%	7.0%	281	305	262
Slovenia	6,197	5,901	5,893	8,027	8,148	6,614	2.8%	6.2%	6.4%	6.3%	498	521	417
United Kingdom	8,881	8,718	8,609	10,100	13,264	11,574	4.6%	8.3%	8.9%	8.6%	838	1,174	995
Yugoslavia	1,505	1,502	1,557	1,213	1,653	1,433	0.6%	5.0%	5.5%	5.2%	61	91	75
Rest Europe	531	531	531	630	608	595	0.2%	3.5%	4.0%	3.6%	22	24	21
Europe Total	159,728	158,117	157,595	150,160	172,330	150,919	60.1%	5.0%	5.7%	4.9%	7,501	9,952	7,325
Australia	2,681	2,780	2,854	4,624	5,897	6,904	2.1%	10.0%	10.3%	9.5%	458	607	656
China	19,768	19,768	19,768	28,660	28,109	28,660	9.8%	6.0%	6.0%	6.0%	1,720	1,687	1,720
Japan	2,088	1,831	1,831	3,650	2,769	2,866	1.0%	5.9%	5.7%	5.7%	215	158	163
South Africa	1,310	1,450	1,606	1,609	2,227	2,601	0.8%	9.0%	9.3%	9.5%	145	207	247
USA	35,491	39,583	42,311	56,855	69,155	65,918	24.1%	8.6%	9.1%	9.4%	4,890	6,293	6,196
Rest World	8,401	8,154	8,154	6,504	6,063	5,732	2.1%	4.1%	4.3%	4.2%	267	261	241
World Total	229,467	231,683	234,120	252,062	286,551	263,601	100.0%	6.0%	6.6%	6.3%	15,195	19,165	16,548

Source: Horst Report - October, 1992. Prepared by Hop Growers of America, Inc.

* Estimate

1/ CIS refers to the Commonwealth of Independant States and includes the following regions: Ukraine (16,536 acres), Republic of Russia (12,355 acres) and White Russia (6,178 acres).

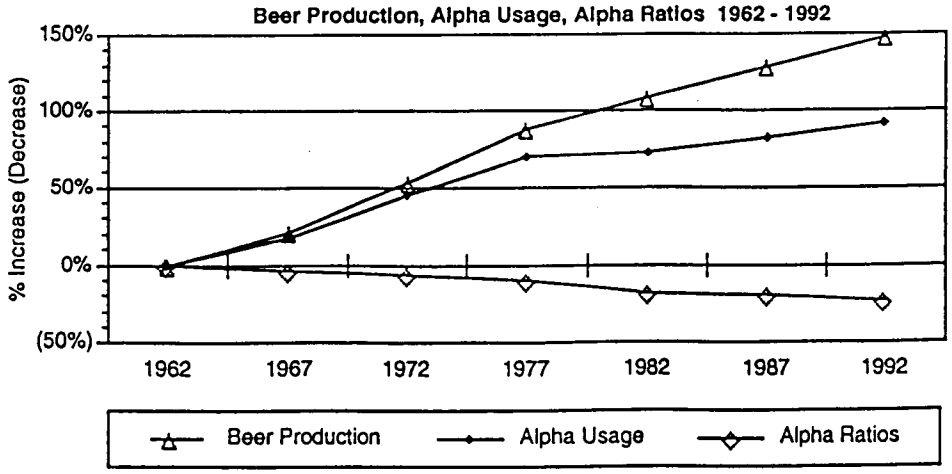
COMPARISON OF WORLD BEER / ALPHA PRODUCTION 1962 - 1992

World Hop Crop						World Beer Production			Balance in Alpha Supply		
Year	Acreage	Hop Production (1,000 lbs)	Yields (lbs/acre)	Alpha Acid (%)	Alpha Production (1,000 lbs)	Year	31 gal. Barrels (million)	Alpha RatioΔ (g/hl)	Alpha Usage	Surplus/ Deficit (1,000 lbs)	Balance
1962	164,099	178,449	1,088	5.6%	9,987	1963	401	9.2	9,533	454	635
1963	172,451	202,459	1,173	5.8%	11,684	1964	437	9.2	10,405	1,280	1,914
1964	175,359	205,176	1,169	5.6%	11,464	1965	439	8.9	10,105	1,359	3,274
1965	176,662	202,837	1,146	5.6%	11,299	1966	452	8.9	10,399	899	4,173
1966	176,924	208,052	1,178	5.7%	11,850	1967	464	8.9	10,693	1,156	5,329
1967	175,182	207,513	1,187	5.8%	12,015	1968	486	8.9	11,184	831	6,161
1968	168,530	202,625	1,204	5.5%	11,023	1969	516	8.9	11,871	-848	5,313
1969	165,535	209,165	1,262	5.6%	11,795	1970	537	8.7	12,083	-289	5,024
1970	174,616	226,059	1,294	6.0%	13,669	1971	564	8.7	12,697	971	5,995
1971	185,429	211,644	1,142	5.5%	11,640	1972	582	8.7	13,100	-1,460	4,536
1972	192,775	231,864	1,204	6.0%	13,962	1973	615	8.7	13,848	114	4,650
1973	200,761	260,809	1,298	6.6%	17,121	1974	653	8.7	14,692	2,429	7,079
1974	202,827	245,101	1,209	6.5%	16,110	1975	670	8.5	14,729	1,381	8,459
1975	198,982	250,229	1,258	6.3%	15,857	1976	694	8.5	15,254	603	9,062
1976	193,247	235,365	1,218	5.9%	13,930	1977	732	8.4	15,908	-1,977	7,085
1977	195,856	259,695	1,325	6.2%	16,009	1978	755	8.3	16,212	-203	6,882
1978	195,506	239,360	1,222	5.8%	13,964	1979	777	8.2	16,487	-2,523	4,359
1979	199,469	260,853	1,307	5.8%	15,272	1980	804	8.1	16,839	-1,567	2,792
1980	210,974	257,883	1,222	6.2%	15,939	1981	828	7.9	16,911	-972	1,820
1981	231,081	285,967	1,236	6.4%	18,196	1982	825	7.7	16,432	1,764	3,584
1982	237,873	317,529	1,334	6.0%	19,043	1983	835	7.6	16,420	2,623	6,207
1983	234,918	287,409	1,222	5.9%	16,820	1984	832	7.6	16,353	467	6,675
1984	226,615	282,928	1,249	6.5%	18,490	1985	849	7.5	16,468	2,022	8,697
1985	217,913	272,182	1,249	5.7%	15,514	1986	862	7.4	16,493	-979	7,717
1986	211,683	253,907	1,200	6.4%	16,203	1987	892	7.3	16,850	-647	7,071
1987	215,832	255,607	1,182	6.7%	17,110	1988	918	7.3	17,333	-223	6,847
1988	222,081	258,766	1,164	6.2%	15,926	1989	944	7.2	17,587	-1,661	5,186
1989	226,475	268,426	1,187	6.2%	16,642	1990	975	7.2	18,159	-1,517	3,669
1990	229,022	252,062	1,097	6.0%	15,124	1991	995	7.1	18,267	-3,143	526
1991	231,683	286,551	1,236	6.6%	18,912	1992*	997	7.1	18,314	599	1,125
1992*	234,120	263,601	1,124	6.3%	16,607	1993*	997	7.1	18,314	-1,707	-582

Source: Horst Report - October 1992. Prepared by Hop Growers of America, Inc.

Δ Alpha ratios represent usage at the brewer level. Adjustments have been made to reflect losses during hop storage & production of hop products.

* Estimate



WORLD BEER PRODUCTION 1984 - 1991

Country/Region	1984	1985	1986	1987	1988	1989	1990	1991	Annual Growth/Decline
				(Million Barrels)					
Germany 1/	78.7	79.5	80.2	79.0	78.9	79.4	102.3	100.6	4.0%
Great Britain	52.4	53.3	50.5	51.1	51.3	51.2	50.8	51.8	-0.2%
CIS (formerly USSR)*	56.3	51.1	46.9	42.6	46.0	47.7	42.6	42.6	-3.5%
Spain	18.6	19.9	20.5	21.3	22.7	23.2	23.3	22.5	3.0%
E. Germany	22.2	21.7	20.7	21.3	20.8	21.1	-	-	-
Czechoslovakia	20.3	19.0	19.4	18.9	19.3	19.3	20.0	20.4	0.1%
France	17.3	17.7	17.6	17.0	17.0	17.8	18.2	19.5	1.8%
Netherlands	14.5	14.9	15.3	14.9	14.9	16.0	17.0	17.0	2.4%
Other	97.9	97.8	101.8	102.7	106.4	108.2	112.6	106.1	1.2%
Europe Total	378.1	375.1	373.0	368.8	377.5	384.1	386.8	380.4	0.1%
USA	193.0	193.3	196.4	195.4	197.3	199.1	203.6	202.2	0.7%
Brazil	24.2	25.8	37.3	40.5	40.7	46.9	49.4	55.4	18.4%
Mexico	21.4	23.4	25.0	26.8	29.1	33.0	33.8	34.7	8.9%
Canada	19.6	18.8	19.4	19.7	20.3	19.3	19.3	18.9	-0.5%
Colombia	12.4	13.5	14.1	15.0	15.3	15.3	14.9	20.5	9.4%
Venezuela	10.1	8.8	9.5	10.3	11.1	9.4	9.4	11.0	1.3%
Other	20.5	21.9	26.5	27.8	26.5	26.3	26.8	30.2	6.7%
America Total	301.2	305.4	328.4	335.5	340.3	349.3	357.2	372.8	3.4%
China *	17.0	27.3	34.1	42.6	46.9	51.1	59.7	68.2	42.9%
Japan	39.8	40.5	42.6	45.6	49.0	52.0	55.9	57.9	6.5%
Phillippines	7.9	6.9	7.1	8.7	10.7	11.6	12.8	13.1	9.5%
Korea	6.6	6.7	7.1	7.5	8.9	8.9	10.8	14.0	15.8%
Other	11.1	11.2	10.2	11.3	11.8	12.7	14.8	13.4	3.0%
Asia Total	82.4	92.6	101.1	115.7	127.2	136.4	154.0	166.6	14.6%
Australia	16.1	15.8	15.4	15.9	16.6	15.9	16.7	16.2	0.1%
South Africa	11.1	11.5	12.4	15.3	16.4	17.9	19.2	19.2	10.4%
Nigeria	7.7	8.5	5.8	6.0	6.2	6.0	6.8	7.1	-1.1%
Turkey	2.2	1.9	1.7	2.1	2.3	2.1	3.2	2.6	2.2%
Other	26.2	27.4	28.1	30.3	30.3	29.4	29.1	28.3	1.2%
Total	63.2	65.1	63.4	69.7	71.8	71.3	74.9	73.3	2.3%
WORLD TOTALS:	825.0	838.3	865.9	889.8	916.7	941.1	972.9	993.1	2.9%

Source: Barth Report (1984-1992). Prepared by Hop Growers of America, Inc.

1/ 1990 and 1991 German beer production includes former East Germany.

*Estimate

TOP 20 BREWERS WORLDWIDE

(Millions of Barrels)

Rank	Brewer	Headquarters	Shipments 1989	Shipments 1990	Shipments 1991	% Diff. 91 vs 90	World Share (%)* 1989	World Share (%)* 1990	World Share (%)* 1991
1	Anheuser-Busch, Inc.	USA	82.9	88.1	88.0	-0.1%	7.4%	8.8%	8.9%
2	Heineken N.V.	Netherlands	42.2	45.6	44.7	-1.9%	3.8%	4.6%	4.5%
3	Miller Brewing Company	USA	43.3	44.3	44.4	0.2%	3.9%	4.4%	4.5%
4	Foster's Brewing Group 1/	Australia	23.4	30.7	29.8	-2.8%	2.1%	3.1%	3.0%
5	Kirin Brewery Company, Ltd.	Japan	25.0	27.5	29.0	5.3%	2.2%	2.8%	2.9%
	Total Top 5			236.2	236.0	-0.1%		23.7%	23.9%
6	Companhia Cervejaria Brahma	Brazil	20.1	24.7	26.1	5.5%	1.8%	2.5%	2.6%
7	Coors Brewing Company	USA	18.6	20.0	20.2	0.9%	1.7%	2.0%	2.0%
8	Groupe BSN	France	21.5	21.3	20.0	-6.0%	1.9%	2.1%	2.0%
9	South Africa Breweries, Ltd.	South Africa	17.3	19.1	19.1	0.0%	1.6%	1.9%	1.9%
10	Carlsberg Ltd.	Denmark	16.3	16.4	18.2	10.4%	1.5%	1.6%	1.8%
	Total Top 10			337.8	339.5	0.5%		33.9%	34.3%
11	Companhia Antartica Paulista	Brazil	16.6	17.0	18.1	6.0%	1.5%	1.7%	1.8%
12	Cerveceria Modelo SA	Mexico	16.7	16.7	18.0	7.7%	1.5%	1.7%	1.8%
13	Guinness PLC	U.K.	15.8	17.0	17.1	1.0%	1.4%	1.7%	1.7%
14	FEMSA 2/	Mexico	16.2	16.6	16.8	1.0%	1.5%	1.7%	1.7%
15	The Stroh Brewery Company	USA	17.4	16.1	14.8	-7.9%	1.6%	1.6%	1.5%
	Total Top 15			421.3	424.3	0.7%		42.2%	42.9%
16	Asahi Breweries, Ltd.	Japan	12.8	13.8	14.1	2.5%	1.1%	1.4%	1.4%
17	Santo Domingo Group	Columbia	12.3	12.8	13.0	1.3%	1.1%	1.3%	1.3%
18	Bass PLC	U.K.	12.4	12.4	12.0	-3.4%	1.1%	1.2%	1.2%
19	San Miguel Corporation	Phillipines	12.5	12.7	10.8	-14.8%	1.1%	1.3%	1.1%
20	Sapporo Breweries Ltd.	Japan	-	10.3	10.8	5.0%	-	1.0%	1.1%
	Total Top 20 Δ			483.3	485.1	0.4%		48.4%	49.1%

Source: Impact Databank. Shipment figures include agency/license brands.

* Market shares overstated because some agency/license brands are double counted.

Δ Addition of columns may not agree because of rounding.

1/ 1990 and 1991 restated to include full year volume from purchase of Grand Metropolitan brands.

2/ Formerly Fomento Proa (recently acquired by Philip Morris, Co.).

U.S. COMMERC

Source: Modern Brewery Age, March 22, 1993

US Commercial Breweries in 1992.

	BREWER	LOCATION	1992 SALES 31-GAL BARRELS	1991 SALES 31-GAL BARRELS	VARIANCE AMOUNT (92-91)	VARIANCE PERCENT	1992 MARKET SHARE OF PROD.	1992 MARKET SHARE SALES
1.	Anheuser-Busch Inc.	St. Louis, MO	86,800,000	86,038,000	762,000	0.89%	46.62%	45.93%
2.	Miller Brewing Co.	Milwaukee, WI	42,221,000	43,600,000	-1,379,000	-3.16%	22.68%	22.34%
3.	Adolph Coors Co.	Golden, CO	19,569,000	19,521,000	48,000	0.25%	10.51%	10.35%
4.	Stroh Brewery Co.	Detroit, MI	14,100,000	15,800,000	-1,700,000	-10.76%	7.57%	7.46%
5.	G. Heileman Brewing Co.	Lacrosse, WI	9,600,000	9,800,000	-200,000	-2.04%	5.16%	5.08%
6.	Pabst Brewing Co.	Milwaukee, WI	7,100,000	6,700,000	400,000	5.97%	3.81%	3.76%
7.	Genesee Brewing Co.	Rochester, NY	2,108,424	2,200,000	-91,576	-4.16%	1.13%	1.12%
8.	Falstaff, Pearl & General	San Antonio, TX	1,200,000	1,400,000	-200,000	-14.29%	0.64%	0.63%
9.	Latrobe Brewing Co.	Latrobe, PA	881,900	803,000	78,900	9.83%	0.47%	0.47%
10.	Pittsburgh Brewing Co.	Pittsburgh, PA	875,000	860,000	15,000	1.74%	0.47%	0.46%
11.	Hudepohl-Schoenling Brewing Co.	Cincinnati, OH	475,000	510,000	-35,000	-6.86%	0.26%	0.25%
12.	Evansville Brewing Co.	Evansville, IN	330,000	360,000	-30,000	-8.33%	0.18%	0.17%
13.	D.G. Yuengling & Son	Pottsville, PA	201,810	157,000	44,810	28.54%	0.11%	0.11%
14.	Minnesota Brewing Co.	St. Paul, MN	150,000	N/A	N/A	N/A	0.08%	0.08%
15.	Jos. Huber Brewing Co.	Monroe, WI	134,500	100,000	34,500	34.50%	0.07%	0.07%
16.	Anchor Brewing Co.	San Francisco, CA	82,653	70,417	12,236	17.38%	0.04%	0.04%
17.	Jones Brewing Co.	Smithton, PA	75,000	90,000	-15,000	-16.67%	0.04%	0.04%
18.	Sierra Nevada Brewing Co.	Chico, CA	68,388	44,516	23,872	53.63%	0.04%	0.04%
19.	Spoetzl Brewery, Inc.	Shiner, TX	52,000	45,906	6,094	13.27%	0.03%	0.03%
20.	Redhook Ale Brewery	Seattle, WA	49,500	34,000	15,500	45.59%	0.03%	0.03%
21.	Stevens Point Brewery	Stevens Point, WI	31,000	32,500	-1,500	-4.62%	0.02%	0.02%
22.	Widmer Brewing Co.	Portland, OR	28,500	17,607	10,893	61.87%	0.02%	0.02%
23.	Full Sail Brewing Co.	Hood River, OR	28,467	20,216	8,251	40.81%	0.02%	0.02%
24.	Straub Brewing Co.	St. Mary's, PA	26,355	26,000	355	1.37%	0.01%	0.01%
25.	August Schell Brewing Co.	New Ulm, MN	25,000	N/A	25,000	N/A	0.01%	0.01%
26.	Hart Brewing Co.	Kalama, WA	17,681	8,300	9,381	113.02%	0.01%	0.01%
27.	Mendocino Brewing Co.	Hopland, CA	12,703	10,872	1,831	16.84%	0.01%	0.01%
28.	Catamount Brewing Co.	White River Jct., VT	11,800	8,150	3,650	44.79%	0.01%	0.01%
29.	Boulder Brewing Co.	Boulder, CO	11,400	6,130	5,270	85.97%	0.01%	0.01%
30.	Abita Brewing Co.	Abita Springs, LA	10,900	6,600	4,300	65.15%	0.01%	0.01%
31.	Frankenmuth Brewery Inc.	Frankenmuth, MI	9,500	8,500	1,000	11.76%	0.01%	0.01%
32.	Oldenberg Brewing Co.	Ft. Mitchell, KY	9,135	6,947	2,188	31.50%	0.00%	0.00%
33.	Portland Brewing Co.	Portland, OR	9,100	5,900	3,200	54.24%	0.00%	0.00%
34.	Hales Ales (#1&#2)	Kirkland, WA	8,637	6,287	2,350	37.38%	0.00%	0.00%
35.	Capital Brewery	Middleton, WI	8,347	4,200	4,147	98.74%	0.00%	0.00%
36.	Sprecher Brewing Co.	Milwaukee, WI	8,140	7,186	954	13.28%	0.00%	0.00%
37.	Boulevard Brewing Co.	Kansas City, MO	7,837	5,000	2,837	56.74%	0.00%	0.00%
38.	Summit Brewing Co.	St. Paul, MN	7,567	5,556	2,011	36.20%	0.00%	0.00%
39.	Stanislaus Brewing Co.	Modesto, CA	7,500	5,800	1,700	29.31%	0.00%	0.00%
40.	Yakima Brewing Co.	Yakima, WA	7,441	6,168	1,273	20.64%	0.00%	0.00%
41.	Mass. Bay Brewing Co.(C)	Boston, MA	7,231	6,800	431	6.34%	0.00%	0.00%
42.	Alaskan Brewing Co.	Douglas, AK	7,000	6,000	1,000	16.67%	0.00%	0.00%
43.	The Florida Brewery, Inc.	Auburndale, FL	6,891	N/A	6,891	N/A	0.00%	0.00%
44.	Buffalo Brewpub+	Lackawanna, NY	6,500	4,274	2,226	52.08%	0.00%	0.00%
45.	Deschutes Brewing Co.+	Bend, OR	6,298	3,954	2,344	59.28%	0.00%	0.00%
46.	Schirf Brewing Co.+	Park City, UT	6,197	3,650	2,547	69.78%	0.00%	0.00%
47.	Old Dominion Brewing Co.	Ashburn, VA	6,092	3,270	2,822	86.30%	0.00%	0.00%
48.	Celis Brewery, Inc.	Austin, TX	5,115	N/A	5,115	N/A	0.00%	0.00%
49.	Redwood Coast Brewing Co.+	Mtn. View, CA	4,350	2,548	1,802	70.72%	0.00%	0.00%
50.	Thomas Kemper Brewing Co.	Poulsbo, WA	4,200	3,533	667	18.88%	0.00%	0.00%
51.	Wild Goose Brewing Co.	Cambridge, MD	4,036	3,041	995	32.72%	0.00%	0.00%
52.	Black Mountain Brewery	Cave Creek, AZ	3,920	3,200	720	22.50%	0.00%	0.00%
53.	Sudwerk Privatbrauerei	Davis, CA	3,482	2,200	1,282	58.27%	0.00%	0.00%
54.	Odell Brewing Co.	Ft. Collins, CO	3,100	1,822	1,278	70.14%	0.00%	0.00%
55.	Stoudt Brewing Co.	Adamstown, PA	3,100	1,400	1,700	121.43%	0.00%	0.00%
56.	Oxford Brewing Co.	Linthicum, MD	3,100	N/A	3,100	N/A	0.00%	0.00%
57.	Coeur d'Alene Brewing Co.+	Coeur d'Alene, ID	2,755	N/A	N/A	N/A	0.00%	0.00%
58.	Gordon Biersch Brewing Co.+	San Francisco, CA	2,741	N/A	2,741	N/A	0.00%	0.00%
59.	Breckenridge Brewery & Pub+	Breckenridge, CO	2,500	1,993	507	25.44%	0.00%	0.00%
60.	Rock Bottom Brewery+*	Denver, CO	2,500	200	2,300	1150.00%	0.00%	0.00%
61.	Wynkoop Brewing Co.+	Denver, CO	2,450	2,130	320	15.02%	0.00%	0.00%
62.	New England Brewing Co.	Norwalk, CT	2,450	1,925	525	27.27%	0.00%	0.00%
63.	Anderson Valley Brewing Co.+	Booneville, CA	2,350	1,800	550	30.56%	0.00%	0.00%
64.	Walnut Brewery+	Boulder, CO	2,160	2,300	-140	-6.09%	0.00%	0.00%
65.	Goose Island Brewing Co.+	Chicago, IL	2,040	1,874	166	8.86%	0.00%	0.00%
66.	Cambridge Brewing Co.+	Cambridge, MA	2,030	1,740	290	16.67%	0.00%	0.00%
67.	Marin Brewing Co.+	Larkspur, CA	2,004	1,560	444	28.46%	0.00%	0.00%
68.	Gordon Biersch Brewing Co. #2+	San Jose, CA	1,947	2,257	-310	-13.74%	0.00%	0.00%
69.	Millstream Brewing Co.	Amana, IA	1,875	1,831	44	2.40%	0.00%	0.00%
70.	Bayern Brewing, Inc.+	Missoula, MT	1,850	1,100	750	68.18%	0.00%	0.00%
71.	Humboldt Brewing Co.	Arcata, CA	1,800	1,500	300	20.00%	0.00%	0.00%
72.	Maritime Pacific Brewing Co.+	Seattle, WA	1,800	776	1,024	131.96%	0.00%	0.00%
73.	Commonwealth Brewing Co.+	Boston, MA	1,750	1,937	-187	-9.65%	0.00%	0.00%
74.	Santa Cruz Brewing Co.+	Santa Cruz, CA	1,721	1,735	-14	-0.81%	0.00%	0.00%
75.	CooperSmith's Brewing Co.+	Ft. Collins, CO	1,700	1,331	369	27.72%	0.00%	0.00%
76.	Great Lakes Brewing Co.	Cleveland, OH	1,700	N/A	1,700	N/A	0.00%	0.00%
77.	H.C. Berger Brewing Co.	Ft. Collins, Co	1,700	N/A	N/A	N/A	0.00%	0.00%
78.	Salt Lake City Brewing Co.+	Salt Lake City, UT	1,604	1,273	331	26.00%	0.00%	0.00%
79.	Pike's Place Brewery+	Seattle, WA	1,601	1,600	1	0.06%	0.00%	0.00%
80.	Golden Pacific Brewing Co.	Emeryville, CA	1,600	920	680	73.91%	0.00%	0.00%
81.	Gordon Biersch Brewing Co.+	Palo Alto, CA	1,575	1,420	155	10.92%	0.00%	0.00%
82.	Kalamazoo Brewing Co.	Kalamazoo, MI	1,530	1,058	472	44.61%	0.00%	0.00%
83.	Ragtime Tavern & Taproom	Atlantic Beach, FL	1,500	N/A	1,500	N/A	0.00%	0.00%
84.	Free State Brewing Co.+	Lawrence, KS	1,445	1,280	165	12.89%	0.00%	0.00%
85.	Oasis Brewery	Boulder, CO	1,435	N/A	1,435	N/A	0.00%	0.00%

KEY: + = Brewpub, * = In business less than one year, (C) = Includes unspecified percentage of contract production.

Note: Barrelage figures are based on reports by brewers. Figures that are starred are MBA estimates.

CIAL BREWERS

	BREWER	LOCATION	1992 SALES 31-GAL BARRELS	1991 SALES 31-GAL BARRELS	VARIANCE AMOUNT (92-91)	VARIANCE PERCENT	1992 MARKET SHARE OF PROD.	1992 MARKET SHARE SALES
86.	Triple Rock Brewing Co.+	Berkeley, CA	1,400	1,400	0	0.00%	0.00%	0.00%
87.	Kessler Brewing Co.	Helena, MT	1,388	N/A	1,388	N/A	0.00%	0.00%
88.	Twenty Tank Brewery+	San Francisco, CA	1,370	N/A	1,370	N/A	0.00%	0.00%
89.	Big Time Brewing Co.+	Seattle, WA	1,355	1,264	91	7.20%	0.00%	0.00%
90.	Gritty McDuff's+	Portland, ME	1,322	1,025	297	28.98%	0.00%	0.00%
91.	James Page Brewing Co.	Minneapolis, MN	1,300	N/A	1,300	N/A	0.00%	0.00%
92.	Woodstock Brewing Co.	Kingston, NY	1,240	N/A	1,240	N/A	0.00%	0.00%
93.	Table Rock Brewpub+	Boise, ID	1,213	740	473	63.92%	0.00%	0.00%
94.	Steelhead Brewing Co.	Eugene, OR	1,200	914	286	31.29%	0.00%	0.00%
95.	Greenshield's Pub & Brewery+	Raleigh, NC	1,171	1,000	171	17.10%	0.00%	0.00%
96.	Champion Brewing Co.+	Denver, CO	1,115	N/A	1,115	N/A	0.00%	0.00%
97.	Hops Bistro & Brewery+	Scottsdale, AZ	1,100	1,200	-100	-8.33%	0.00%	0.00%
98.	Crescent City Brewhouse+	New Orleans, LA	1,050	830	220	26.51%	0.00%	0.00%
99.	New Belgium Brewing Co.	Fort Collins, CO	1,016	225	791	351.56%	0.00%	0.00%
100.	Portsmouth Brewery+	Portsmouth, NH	1,009	750	259	34.53%	0.00%	0.00%
101.	North Coast Brewing Co.+	Ft. Bragg, CA	1,001	800	201	25.13%	0.00%	0.00%
102.	Crested Butte Brewing Co.	Crested Butte, CO	1,000	576	424	73.61%	0.00%	0.00%
103.	The Chickery+	Dayton, OH	1,000	N/A	1,000	N/A	0.00%	0.00%
104.	Nevada City Brewing	Nevada City, CA	968	750	218	29.07%	0.00%	0.00%
105.	Baltimore Brewing Co.+	Baltimore, MD	950	N/A	950	N/A	0.00%	0.00%
106.	Spanish Peaks Brewery	Bozeman, MT	950	N/A	950	N/A	0.00%	0.00%
107.	Loggerhead Brewing Co.	Greensboro, NC	903	812	91	11.21%	0.00%	0.00%
108.	Lost Coast Brewing Co.	Eureka, CA	903	N/A	903	N/A	0.00%	0.00%
109.	Bandersnatch Brewpub+	Tempe, AZ	900	850	50	5.88%	0.00%	0.00%
110.	The Red Kettle+	Encinitas, CA	900	N/A	900	N/A	0.00%	0.00%
111.	Fort Spokane Brewery	Spokane, WA	896	N/A	896	N/A	0.00%	0.00%
112.	The St. Louis Brewer, Inc.+	St. Louis, MO	880	N/A	880	N/A	0.00%	0.00%
113.	Lakefront Brewery+	Milwaukee, WI	863	369	494	133.88%	0.00%	0.00%
114.	Dilworth Brewing Co.+	Charlotte, NC	860	860	0	0.00%	0.00%	0.00%
115.	Vermont Pub & Brewery+	Burlington, VT	847	700	147	21.00%	0.00%	0.00%
116.	Lind Brewing Co.	San Leandro, CA	805	614	191	31.11%	0.00%	0.00%
117.	Northampton Brewing Co.+	Northampton, MA	800	900	-100	-11.11%	0.00%	0.00%
118.	Flying Dog Brewpub+	Aspen, CO	800	N/A	800	N/A	0.00%	0.00%
119.	McGuire's Irish Pub & Brewery+	Pensacola, FL	797	815	-18	-2.21%	0.00%	0.00%
120.	San Francisco Brewing Co.+	San Francisco, CA	750	850	-100	-11.76%	0.00%	0.00%
121.	Lighthouse Brewpub+	Lincoln City, OR	750	675	75	11.11%	0.00%	0.00%
122.	Brewpub on the Green+	Fremont, CA	750	522	228	43.68%	0.00%	0.00%
123.	The Mill #3+	Winter Park, FL	730	500	230	46.00%	0.00%	0.00%
124.	Samuel Adams Brewhouse+	Philadelphia, PA	700	700	0	0.00%	0.00%	0.00%
125.	South Baltimore Brewing Co.+	Baltimore, MD	700	600	100	16.67%	0.00%	0.00%
126.	Willett's Brewing Co.+	Napa, CA	700	117	583	498.29%	0.00%	0.00%
127.	Water Street Brewing Co.+	Milwaukee, WI	694	649	45	6.93%	0.00%	0.00%
128.	Broad Ripple Brewing Co.+	Indianapolis, IN	690	450	240	53.33%	0.00%	0.00%
129.	Eddie McStiff's Brewpub+	Moab, UT	660	315	345	109.52%	0.00%	0.00%
130.	Firehouse Brewing Co.+	Rapid City, SD	650	N/A	650	N/A	0.00%	0.00%
131.	Belmont Brewing Co.+	Long Beach, CA	640	N/A	640	N/A	0.00%	0.00%
132.	Durango Brewing Co.	Durango, CO	630	320	310	96.88%	0.00%	0.00%
133.	Coyote Springs Brewing Co.+	Phoenix, AZ	561	N/A	561	N/A	0.00%	0.00%
134.	Carver Brewing Co.+	Durango, CO	550	450	100	22.22%	0.00%	0.00%
135.	Fitzpatrick's Brewing Co.+	Iowa City, IA	525	450	75	16.67%	0.00%	0.00%
136.	Kelley Brewing Corp.	Colorado Springs, CO	517	230	287	124.78%	0.00%	0.00%
137.	Electric Dave Brewery	South Bisbee, AZ	500	350	150	42.86%	0.00%	0.00%
138.	M.J. Barleyhoppers Brewery+	Moscow, ID	500	N/A	500	N/A	0.00%	0.00%
139.	Pacific Coast Brewery+	Oakland, CA	450	466	-16	-3.43%	0.00%	0.00%
140.	Appleton Brewing Co.+	Appleton, WI	431	277	154	55.60%	0.00%	0.00%
141.	The Hartford Brewery+	Hartford, CT	425	N/A	425	N/A	0.00%	0.00%
142.	San Juan Brewing Co.	Telluride, CO	420	N/A	420	N/A	0.00%	0.00%
143.	Otto Brothers Brewing Co.	Jackson, WY	415	273	142	52.01%	0.00%	0.00%
144.	Umpqua Brewing Co.+	Roseburg, OR	400	146	254	173.97%	0.00%	0.00%
216.	Crown City Brewing Co.+	Pasadena, CA	385	350	35	10.00%	0.00%	0.00%
146.	Burkhardt Brewing Co.	Uniontown, OH	378	N/A	378	N/A	0.00%	0.00%
147.	Monterey Brewing Co.	Monterey, CA	364	N/A	364	N/A	0.00%	0.00%
148.	Cherryland Brewing Co.+	Sturgeon Bay, WI	350	750	-400	-53.33%	0.00%	0.00%
149.	Rochester Brewpub+	Henrietta, NY	345	201	144	71.64%	0.00%	0.00%
150.	Napa Valley Brewing Co.+	Calistoga, CA	328	400	-72	-18.00%	0.00%	0.00%
151.	Roslyn Brewing Co.	Roslyn, WA	320	N/A	320	N/A	0.00%	0.00%
152.	Buffalo Bill's Brewpub+	Hayward, CA	300	330	-30	-9.09%	0.00%	0.00%
153.	Etna Brewing Co.	Etna, CA	300	275	25	9.09%	0.00%	0.00%
154.	Acadia Brewing Co.+	Bar Harbor, ME	280	N/A	280	N/A	0.00%	0.00%
155.	Harrison Hollow Brewhouse+	Boise, ID	246	N/A	246	N/A	0.00%	0.00%
156.	West Seattle Brewing Co.+	Seattle, WA	223	N/A	223	N/A	0.00%	0.00%
157.	Windham Brewery+	Brattleboro, VT	210	147	63	42.86%	0.00%	0.00%
158.	Shields Brewing Co.+	Ventura, CA	167	100	67	67.00%	0.00%	0.00%
159.	Pizza Deli & Brewery+	Cave Junction, OR	145	N/A	145	N/A	0.00%	0.00%
160.	Rowland's Calumet Brewery+	Chilton, WI	101	77	24	31.17%	0.00%	0.00%
161.	Moonlight Brewing Co.	Windsor, CA	23	N/A	23	N/A	0.00%	0.00%
162.	F.X. Matt Brewing Co.	Utica, NY	N/A	206,000	N/A	N/A	0.00%	0.00%
163.	The Lion Inc.-Gibbons	Wilkes-Barre, PA	N/A	163,000	N/A	N/A	0.00%	0.00%
164.	Cold Spring Brewing Co.	Cold Spring, MN	N/A	17,500	N/A	N/A	0.00%	0.00%
165.	BridgePort Brewing Co.	Portland, OR	N/A	11,128	N/A	N/A	0.00%	0.00%
166.	McMenamin's, Inc.+ (chain)	Beaverton, OR	N/A	9,260	N/A	N/A	0.00%	0.00%
167.	Pavichevich Brewing Co.	Elmhurst, IL	N/A	6,500	N/A	N/A	0.00%	0.00%
168.	Pennsylvania Brewing Co.(C)	Pittsburgh, PA	N/A	6,000	N/A	N/A	0.00%	0.00%
169.	D.L. Geary Brewing Co.	Portland, ME	N/A	5,658	N/A	N/A	0.00%	0.00%
170.	Virginia Brewing Co.	Virginia Beach, VA	N/A	5,000	N/A	N/A	0.00%	0.00%

Modern Brewery Age 43(37): pp 52-53; Sept 14, 1992 (Magazine edition)

Beer Analysis

Figures are based on analysis conducted by the Connecticut Agricultural Experiment Station in cooperation with the Excise Tax Division of the Connecticut Department of Revenue Service.

Alcohol content of various beers sold in the US

Brand	Brewer	Country	% Alcohol by Volume	Calories per 12 ounces
Anchor Porter	Anchor	USA	5.66	209
Anchor Steam Beer	Anchor	USA	4.63	153
Andeker	Pabst	USA	4.71	N/A
Asahi Draft Beer	Asahi	Japan	5.21	146
Ballantine India Pale Ale	Falstaff	USA	6.39	192
Ballantine Beer	Falstaff	USA	4.82	153
Ballantine XXX Ale	Falstaff	USA	5.38	170
Bass Pale Ale	Bass	UK	4.83	146
Beamish Irish Stout	Beamish & Crawford	Ireland	3.73	131
Beck's Beer	Brauerei Beck	Germany	5.13	153
Black Horse Ale	Genesee	USA	4.74	160
Blatz Beer	G. Heileman	USA	4.33	136
Blatz Milwaukee 1851	G. Heileman	USA	4.46	136
Boulder Porter	Boulder	USA	6.07	188
Budweiser Beer	Anheuser-Busch	USA	4.65	142
Bud Dry	Anheuser-Busch	USA	4.80	130
Busch Beer	Anheuser-Busch	USA	4.72	153
Carling Black Label	G. Heileman	USA	4.46	136
Carlsberg Beer	Carlsberg	Denmark	5.10	150
Carlsberg Malt Liquor	Carlsberg	Denmark	7.10	212
Carta Blanca Beer	Cuauhtemoc	Mexico	4.02	128
Colt .45 Malt Liquor	G. Heileman	USA	5.59	156
Coors Beer	Coors	USA	4.55	137
Corona Extra Beer	Modelo	Mexico	4.84	160
Dortmunder Union Original	Brau & Brunnen	Germany	5.00	167
Dos Equis XX Beer	Cuauhtemoc	Mexico	4.79	149
Dos Equis Special Lager	Cuauhtemoc	Mexico	4.96	156
Dragon Stout	Desnoes & Geddes	Jamaica	6.79	220
Foster's Lager	Carlton & United	Aus.	5.16	153
Genesee 12 Horse Ale	Genesee	USA	4.87	160
Genesee Beer	Genesee	USA	5.03	153
Genesee Cream Ale	Genesee	USA	4.84	153
George Killian's Red Lager	Coors	USA	5.00	161
Grizzly Beer	Hamilton	Canada	4.97	142
Grolsch Lager Beer	Grolsch	Holland	5.23	156
Guinness Extra Stout	Guinness	Ireland	4.27	153
Haffenreffer Malt Liquor	Falstaff	USA	6.62	178
Hamm's Beer	Pabst	USA	4.40	142
Harp Lager Beer	Harp	Ireland	4.74	149
Heineken Lager Beer	Heineken	Holland	5.00	160
Heineken Dark Beer	Heineken	Holland	5.17	170
Hopfenperle Special Beer	Feldschlosschen	Switz.	5.28	160
Holsten Premium	Holsten Brauerei	Germany	5.20	140
Holsten Dry Beer	Holsten Brauerei	Germany	4.90	129
Kaiserdom Rauchbier	Bamberg Worner	Germany	5.88	174
Keystone	Coors	USA	4.74	121
King Cobra Malt Liquor	Anheuser-Busch	USA	5.90	180
Kirin Beer	Kirin	Japan	6.06	170
Knickerbocker Beer	G. Heileman	USA	4.46	136
Kronenbourg Beer	Kronenbourg	France	4.97	153
Kronenbourg Dark	Kronenbourg	France	5.08	163
Kuppers Kolsch	Kuppers	Germany	5.38	160
Labatt's 50 Ale	John Labatt	Canada	5.34	153
Liberty Ale	Anchor	USA	6.12	188
Lord Chesterfield Ale	D.G. Yuengling	USA	5.49	131
Lowenbrau Special Dark Beer	Miller	USA	4.93	158
Lowenbrau Special Beer	Miller	USA	4.93	158
Magnum Malt Liquor	Miller	USA	5.92	160
McEwan's Scotch Ale	Scottish & Newcastle	UK	9.51	295
Meisterbrau	Miller	USA	4.57	141
Michelob Beer	Anheuser-Busch	USA	4.80	152
Michelob Classic Dark Beer	Anheuser-Busch	USA	4.80	154
Michelob Dry Beer	Anheuser-Busch	USA	4.80	130
Michelob Golden Draft	Anheuser-Busch	USA	4.80	152
Mickey's Malt Liquor	G. Heileman	USA	5.71	160
Miller High Life Beer	Miller	USA	4.67	147
Miller Genuine Draft Beer	Miller	USA	4.67	147
Miller Reserve	Miller	USA	4.71	133
Milwaukee's Best	Miller	USA	4.34	133
Molson Canadian Beer	Molson	Canada	5.00	150
Molson Golden Ale	Molson	Canada	5.20	153
Moosehead Lager Beer	Molson	Canada	4.95	149
O'Keefe Canadian Beer	Molson	Canada	5.01	146
Olde English 800 Malt Liquor	Pabst	USA	5.96	167
Old Milwaukee Beer	Stroh	USA	4.53	145
Olympia Lager Beer	Pabst	USA	4.80	146
Pabst Blue Ribbon Beer	Pabst	USA	4.78	149
Piels Draft-Style Beer	Stroh	USA	4.54	146
Pilsner Urquell	Pilsner Urquell	Czech.	4.25	160

Brand	Brewer	Country	% Alcohol by Volume	Calories per 12 ounces
Red Stripe Lager Beer	Desnoes & Geddes	Jamaica	4.93	153
Red, White & Blue Beer	Pabst	USA	4.79	149
Rheingold Beer	G. Heileman	USA	4.46	136
Rolling Rock Extra Pale	Latrobe	USA	4.64	142
Samuel Adams Boston Lager	Boston Beer	USA	4.76	167
Schaefer Beer	Stroh	USA	4.31	138
Schlitz Beer	Stroh	USA	4.58	145
Schlitz Malt Liquor	Stroh	USA	5.90	177
Sheaf Stout	Carlton & United	Austral.	5.28	174
Schultheiss	Brau & Brunnen	Germany	5.00	155
Sierra Nevada Pale Ale	Sierra Nevada	USA	4.82	160
Sierra Nevada Porter	Sierra Nevada	USA	5.34	170
Sierra Nevada Stout	Sierra Nevada	USA	5.11	199
Signature Beer	Stroh	USA	4.84	153
Sol Beer	Moctezuma	Mexico	4.04	131
Spaten Munich Dark Beer	Spaten	Germany	6.63	185
St. Pauli Girl Beer	St. Pauli	Germany	4.91	160
St. Pauli Girl Dark Beer	St. Pauli	Germany	4.98	160
Stroh's Beer	Stroh	USA	4.39	140
Suntory Draft Beer	Suntory	Japan	4.64	138
Superior Beer	Moctezuma	Mexico	4.34	153
Tecate Beer	Cuauhtemoc	Mexico	4.30	138
Tsingtao Beer	Tsingtao	China	4.79	153
Tusker Malt Liquor	Bia Ni Bora	Kenya	5.24	149
Utica Club Lager Beer	F.X. Matt	USA	4.82	96
Watney's Red Barrel Beer	Stag	UK	3.92	142
Wurzburger Hofbrau Beer	Wurzburger Hofbrau	Germany	5.42	142
Yuengling Pottsville Porter	D.G. Yuengling	USA	4.13	142
Yuengling Premium Beer	D.G. Yuengling	USA	4.38	138
Light Beers				
Amstel Light Beer	Amstel	Holland	3.20	95
Bud Light Beer	Anheuser-Busch	USA	4.16	114
Carlsberg Light	Carlsberg	Denmark	4.21	110
Coors Light Beer	Coors	USA	4.36	107
Corona Light Beer	Modelo	Mexico	N/A	105
Beck's Light Beer	Brauerei Beck	Germany	2.72	96
Genesee Light Beer	Genesee	USA	3.55	96
Henry Weinhard's Light	Blitz-Weinhard	USA	N/A	118
Holsten Light	Holsten Brauerei	Germany	2.50	91
Keystone Light	Coors	USA	4.17	100
Lowenbrau Light Beer	Miller	USA	4.18	98
Meisterbrau Light	Miller	USA	4.18	98
Michelob Light Beer	Anheuser-Busch	USA	4.23	134
Michelob Golden Draft Light	Anheuser-Busch	USA	4.20	110
Miller Genuine Draft Light Beer	Miller	USA	4.18	98
Miller Lite	Miller	USA	4.18	96
Miller Ultra Lite	Miller	USA	3.40	77
Miller Reserve Light	Miller	USA	4.18	106
Milwaukee's Best Light Beer	Miller	USA	4.18	98
Molson Light Beer	Molson	Canada	4.0	109
Moosehead Light Beer	Moosehead	Canada	N/A	99
Natural Light	Anheuser-Busch	USA	4.26	114
Nordik Wolf Light Beer	Pripps Bryggerier	Sweden	4.76	114
Old Milwaukee Light Beer	Stroh	USA	3.82	114
Olympia Gold Light Beer	Pabst	USA	N/A	70
Pabst Extra Light Beer	Pabst	USA	2.51	67
Piels Light Beer	Stroh	USA	4.49	142
Rheingold Extra Light Beer	G. Heileman	USA	4.32	96
Schaefer Light Beer	Stroh	USA	4.07	121
Schlitz Light Beer	Stroh	USA	4.28	110
Stroh's Light Beer	Stroh	USA	4.24	115
Watneys London Light Beer	Watney Combe Reid	UK	3.56	103
Wurzburger Light Beer	Wurzburger Hofbrau	Germany	5.44	153
Non-Alcohol Brews				
Buckler Non-Alcohol Beverage	Heineken	Holland	0.05	75
Clausthaler Non-Alcohol Beverage	Binding Brauerei	Germany	0.44	46
Cutter Non-Alcohol Beverage	Coors	USA	0.40	N/A
Kaliber Light Malt Beverage	Guinness	Ireland	0.11	53
Kingsbury Non-Alcohol Beverage	G. Heileman	USA	0.13	50
Moussy Non-Alcohol Beverage	Cardinal Fribourg	Switz.	0.08	57
Northern Goose NA	Merchant Adventure	Canada	0.05	64
O'Doul's Non-Alcohol Brew	Anheuser-Busch	USA	0.40	70
Old Milwaukee NA	Stroh	USA	0.50	72
Sharp's Non-Alcohol Brew	Miller	USA	0.50	68
St. Michael Non-Alcohol Beverage	St. Michael's	USA	0.73	60
Texas Light	Inter-Floridana	USA	0.05	68
Warteck	Omni Industries	Switz.	0.05	84
Wurzburger Non-Alcohol Beverage	Wurzburger Hofbrau	Germany	0.11	107
Ziegelhof Non-Alcohol Brew	Brauerei Ziegelhof	Switz.	0.05	N/A

Updated alcohol content and calorie information for a cross-section of domestic and imported beers.

MEMORANDUM OF AGREEMENT
Between
Washington Hop Commission, United States
Department of Agriculture, and
Cooperating Grower

The State of Washington, by and through the Washington Hop Commission (Hop Commission), the United States Department of Agriculture, by and through the Agricultural Research Service (ARS), and

Ken Gamache (grower)

enter this memorandum of agreement for the purpose of facilitating cooperative cultivation, research, and evaluation of experimental hop strains for the benefit of the Washington hop industry.

The parties agree that:

1. The U.S. Department of Agriculture, ARS, authorizes the grower to plant a 3 acre plot of the experimental hop selection 21484 in a normal and customary commercial planting (7x7 foot, 7½x7½ foot or equivalent) located at Corner of Ashue and Yost Rds Yakima County

2. Grower shall plant, cultivate, and maintain the rhizomes and rootstock as directed by ARS.

3. Grower shall not propagate additional hop plants for his own use and shall not sell, remove, or otherwise dispose of the rhizomes or rootstock without prior written authorization by ARS and the Hop Commission; grower may not harvest and market the hop cones from the experimental planting for his own use, but shall - in cooperation with the Hop Commission and ARS - sell the total production of this experimental planting to cooperating brewers through the Hop Research Council.

4. At any time during cultivation of the hop strain, the Hop Commission and/or ARS, and their officers, employees, agents, and representatives, shall have access to grower's test plot for the purposes of inspection, sampling, and evaluation of the rhizomes and hop plants and of grower's performance under this agreement, and for all other purposes consistent with this agreement.

5. In the event of disease or infestation of the rhizomes, rootstock, or plants, ARS may prune, treat, destroy, remove, or otherwise dispose of the hop plants as ARS deems necessary, without compensation to the grower.

6. At any time during cultivation of the hop plant, the Hop Commission, after consultation with ARS and grower, may remove rhizomes from grower's test plot for propagation purposes.

7. If and when the hop strain is released as a named variety, the Hop Commission may remove all rhizomes for distribution to Washington hop growers; provided,

   (a) Upon removal, grower may retain all planted crowns and

   (b) Grower shall be entitled to his share of rhizomes distributed to Washington hop growers.

8. Any party may terminate this agreement by providing to all other parties written notice at least thirty (30) days prior to termination; provided; .....

   (a) Termination during a growing season shall not be effective until completion of the growing season, and ...

   (b) Should grower breach or terminate this agreement, the Hop Commission or ARS, respectively, shall have the right to remove all rhizomes and established crowns from the test plot.

9. The parties may modify the terms of this contract by written mutual consent.

STATE OF WASHINGTON
HOP COMMISSION

Chairman

Date March 1, 1989

THE UNITED STATES DEPARTMENT
OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE (ARS)

Title Dr. Alfred Haunold
Research Geneticist

Date ~~March 26, 1992~~

GROWER

Date March 1, 1989

Spring 1993: This plot was removed since the ground was heptachlor land which severely impacted the production at this plot. A new plot of 21484 was established at Olsen Bros. ranch (see later) in spring 1992.

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MEMORANDUM OF AGREEMENT
Between
Washington Hop Commission, United States
Department of Agriculture, and
Cooperating Grower

The State of Washington, by and through the Washington Hop Commission (Hop Commission), the United States Department of Agriculture, by and through the Agricultural Research Service (ARS), and

ROBERT GASSELING (grower)

enter this memorandum of agreement for the purpose of facilitating cooperative cultivation, research, and evaluation of experimental hop strains for the benefit of the Washington hop industry.

The parties agree that:

1. The U.S. Department of Agriculture, ARS, authorizes the grower to plant a 3 acre plot of the experimental hop selection 21484 in a normal and customary ~~commercial planting (7x7 foot 7½x7½ foot or equivalent)~~ nursery located at Wm. Gasseling Ranches.

2. Grower shall plant, cultivate, and maintain the rhizomes and rootstock as directed by ARS.

3. Grower shall not propagate additional hop plants for his own use and shall not sell, remove, or otherwise dispose of the rhizomes or rootstock without prior written authorization by ARS and the Hop Commission; grower may not harvest and market the hop cones from the experimental planting for his own use, but shall - in cooperation with the Hop Commission and ARS - sell the total production of this experimental planting to cooperating brewers through the Hop Research Council.

4. At any time during cultivation of the hop strain, the Hop Commission and/or ARS, and their officers, employees, agents, and representatives, shall have access to grower's test plot for the purposes of inspection, sampling, and evaluation of the rhizomes and hop plants and of grower's performance under this agreement, and for all other purposes consistent with this agreement.

5. In the event of disease or infestation of the rhizomes, rootstock, or plants, ARS may prune, treat, destroy, remove, or otherwise dispose of the hop plants as ARS deems necessary, without compensation to the grower.

6. At any time during cultivation of the hop plant, the Hop Commission, after consultation with ARS and grower, may remove rhizomes from grower's test plot for propagation purposes.

7. If and when the hop strain is released as a named variety, the Hop Commission may remove all rhizomes for distribution to Washington hop growers; provided,

   (a) Upon removal, grower may retain all planted crowns and

   (b) Grower shall be entitled to his share of rhizomes distributed to Washington hop growers.

8. Any party may terminate this agreement by providing to all other parties written notice at least thirty (30) days prior to termination; provided; .....

   (a) Termination during a growing season shall not be effective until completion of the growing season, and ...

   (b) Should grower breach or terminate this agreement, the Hop Commission or ARS, respectively, shall have the right to remove all rhizomes and established crowns from the test plot.

9. The parties may modify the terms of this contract by written mutual consent.

STATE OF WASHINGTON
HOP COMMISSION

Chairman _____

Date _____

GROWER

[illegible]

Date 4-3-92

THE UNITED STATES DEPARTMENT
OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE (ARS)

Title Res. Geneticist

Date Apr. 27 - 1992

Note from Ann George, WA Hop Commission.
the Gasseling planting is strictly for nursery purposes if and when 21484 is released
No testing, no production.

MEMORANDUM OF AGREEMENT
Between
Washington Hop Commission, United States
Department of Agriculture, and
Cooperating Grower

The State of Washington, by and through the Washington Hop Commission (Hop Commission), the United States Department of Agriculture, by and through the Agricultural Research Service (ARS), and

OLSEN BROTHERS (grower)

enter this memorandum of agreement for the purpose of facilitating cooperative cultivation, research, and evaluation of experimental hop strains for the benefit of the Washington hop industry.

The parties agree that:

1. The U.S. Department of Agriculture, ARS, authorizes the grower to plant a 3 acre plot of the experimental hop selection 21484 in a normal and customary commercial planting (7x7 foot, 7½x7½ foot or equivalent) located at ACROSS EVANS ROAD FROM OLSEN BROS. KILN.

2. Grower shall plant, cultivate, and maintain the rhizomes and rootstock as directed by ARS.

3. Grower shall not propagate additional hop plants for his own use and shall not sell, remove, or otherwise dispose of the rhizomes or rootstock without prior written authorization by ARS and the Hop Commission; grower may not harvest and market the hop cones from the experimental planting for his own use, but shall - in cooperation with the Hop Commission and ARS - sell the total production of this experimental planting to cooperating brewers through the Hop Research Council.

4. At any time during cultivation of the hop strain, the Hop Commission and/or ARS, and their officers, employees, agents, and representatives, shall have access to grower's test plot for the purposes of inspection, sampling, and evaluation of the rhizomes and hop plants and of grower's performance under this agreement, and for all other purposes consistent with this agreement.

5. In the event of disease or infestation of the rhizomes, rootstock, or plants, ARS may prune, treat, destroy, remove, or otherwise dispose of the hop plants as ARS deems necessary, without compensation to the grower.

6. At any time during cultivation of the hop plant, the Hop Commission, after consultation with ARS and grower, may remove rhizomes from grower's test plot for propagation purposes.

7. If and when the hop strain is released as a named variety, the Hop Commission may remove all rhizomes for distribution to Washington hop growers; provided,

   (a) Upon removal, grower may retain all planted crowns and

   (b) Grower shall be entitled to his share of rhizomes distributed to Washington hop growers.

8. Any party may terminate this agreement by providing to all other parties written notice at least thirty (30) days prior to termination; provided; .....

   (a) Termination during a growing season shall not be effective until completion of the growing season, and ...

   (b) Should grower breach or terminate this agreement, the Hop Commission or ARS, respectively, shall have the right to remove all rhizomes and established crowns from the test plot.

9. The parties may modify the terms of this contract by written mutual consent.

STATE OF WASHINGTON
HOP COMMISSION

Chairman

Date 3-26-92

GROWER FOR OLSON BROS.

Date 3/26/92

THE UNITED STATES DEPARTMENT
OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE (ARS)

Title Res. Geneticist

Date April 27, 1992

Note from Ann E. George, WA Hop Commission : Bob Gasseling's 21484 are strictly a certified rootstock nursery. There will be no testing done on these. They will supply additional rootstock for growers if 21484 is released. If not, the nursery will be destroyed.
signed: Ann George

Busch Agricultural Resources, Inc.
ONE OF THE ANHEUSER BUSCH COMPANIES

Interoffice Correspondence

June 17, 1992

Dr. A. Haunold
Oregon State University
Department of Crop Science
Corvallis, OR 97331

Dear Al:

This letter is to confirm the arrangement between U.S.D.A. and Busch Agricultural Resources, Inc. regarding the propagation of three triploid Tettnang varieties:

21664 (8802-68)
21665 (8805-40)
21666 (8806-17)

It is understood by BARI and Midvalley Greenhouses that:

1. Mother plants of the three varieties were provided to Midvalley Greenhouses by Dr. Klein, Washington State University, for the specific purpose of propagating hop plants to be sold to BARI.

2. BARI will purchase 6,000 plants of each variety during the summer of 1992.

3. The remaining plant material at Midvalley Greenhouses after the purchase by BARI will be handled according to directions from Dr. Haunold.

4. BARI or Midvalley Greenhouses will not sell or distribute any plants of the above three varieties to other parties.

5. BARI will inform Dr. Haunold of the location of the propagated material.

6. The present plan is to place all plants in a nursery during the 1992 summer months. In the spring of 1993, BARI will establish 3-acre plots in Washington and southwestern Idaho.

7. BARI will cooperate with the Hop Research Council to make available brewer samples and commercial bales to HRC members starting with the 1993 crop.

8. It is understood that after A-B evaluation of Oregon Nursery samples from the 1992 crop, one or more of the varieties may be eliminated from the 3-acre plot program. At the proper time, Dr. Haunold will be informed of such for proper disposal of nursery material.

As always, we appreciate your help in moving forward at a quick pace to evaluate new varieties. The triploid Hallertau program is a No. 1 example of what can be done in a short period of time.

Paul H. Hoskins

pHH/mf

cc. M. Anderson
D. Hysert - HRC
M. Huenefeld - Midvalley Greenhouses
R. Klein - HRC

Dr. Alfred Haunold
Oregon State University
Corvallis, Oregon

Dear Dr. Haunold,

Attached is a "Memorandum of Understanding" we discussed regarding the fertilizer treatments applied to the Hop field at O.S.U. Hop Farm.

Please read and sign this if acceptable. Return to me to this address:

Frank Alexander
1802 NW 124th Street
Vancouver, Wa. 98685

Also, please remember Grace/Sierra will do soil and/or tissue analysis at your convienience for no charge.

We appreciate your interest and support. Please call if I can be of any help.

Sincerely,

Frank Alexander

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GRACE SIERRA

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MEMORANDUM OF UNDERSTANDING BETWEEN
OREGON STATE UNIV./A. HAUNOLD AND GRACE-SIERRA

Testing Program of Grace-Sierra Controlled Release Fertilizer

(1) All information and data supplied by Grace-Sierra under this Agreement shall be considered confidential and shall not be disclosed for publication to any third parties without Grace-Sierra's prior approval.

(2) That product provided for evaluation will not be chemically analyzed or supplied to a third party without Grace-Sierra's permission and that unused product will be returned to Grace-Sierra (Frank Alexander).

(3) The following additional provisions shall apply to this Agreement (if none, so state): NONE

William J. Foster

DATE: 8/12/92

INVESTIGATOR: OREGON STATE UNIV./A. HAUNOLD

SOCIAL SEC. # 585-48-1745

PHONE: 503-737-5841

ACCEPTED:
GRACE-SIERRA

BY: _____
Dr. John A. Neal

TITLE: Vice-President
Research & Dev.

DATE: _____

ACCEPTED:
OREGON STATE UNIV./A. HAUNOLD

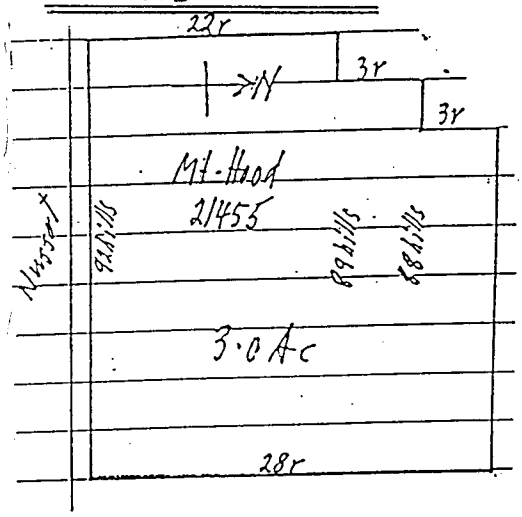
TITLE: Professor (courtesy)
Research Geneticist USDA-ARS

DATE: 7/22-1992

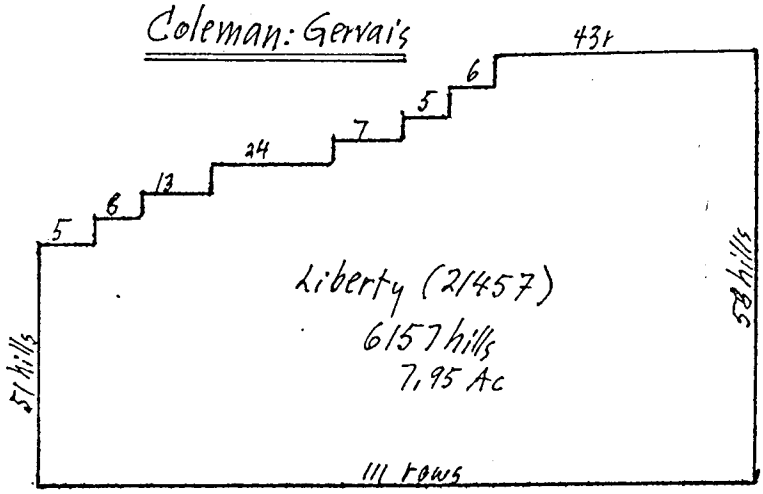
DEPT. CROP & SOIL SCIENCE
CROP SCIENCE BLDG. 451B
OREGON STATE UNIVERSITY

1992 Off-station trials in Oregon.

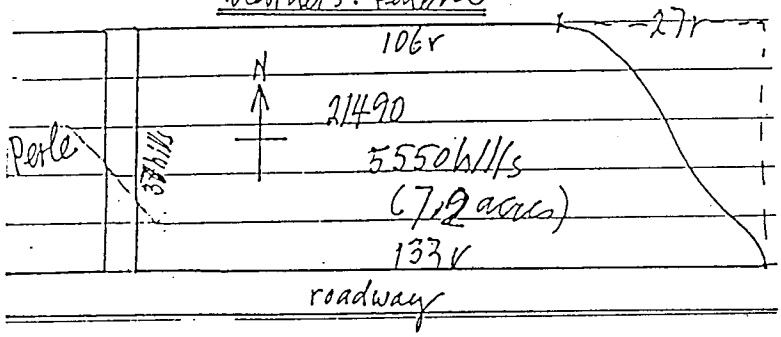
Goschie: Silverton



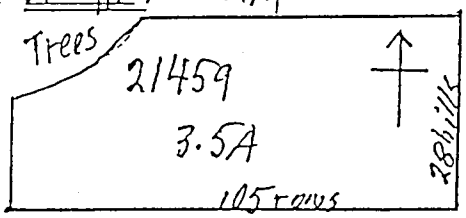
Coleman: Gervais



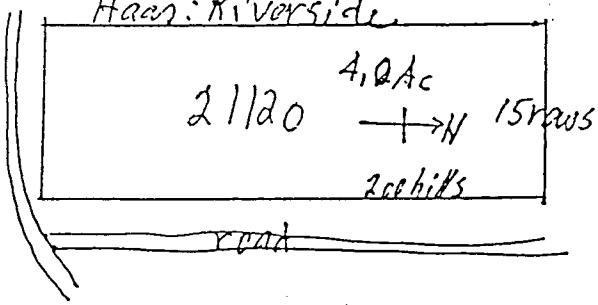
Weathers: Salem



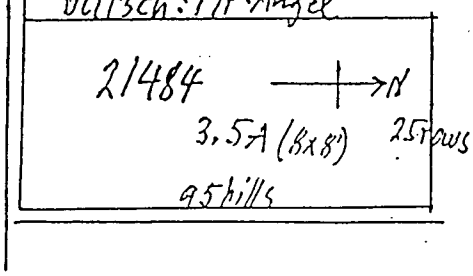
Stauffer: Hubbard



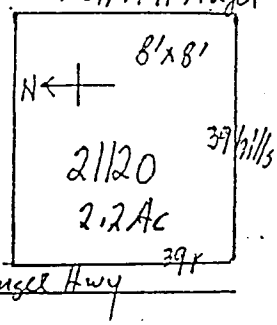
Haas: Riverside



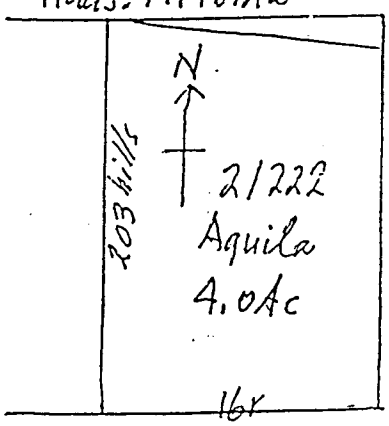
Bertsch: Mt. Angel



Annen: Mt. Angel



Haas: Mitoma



1992: USDA-OSU Main Hop Yard.

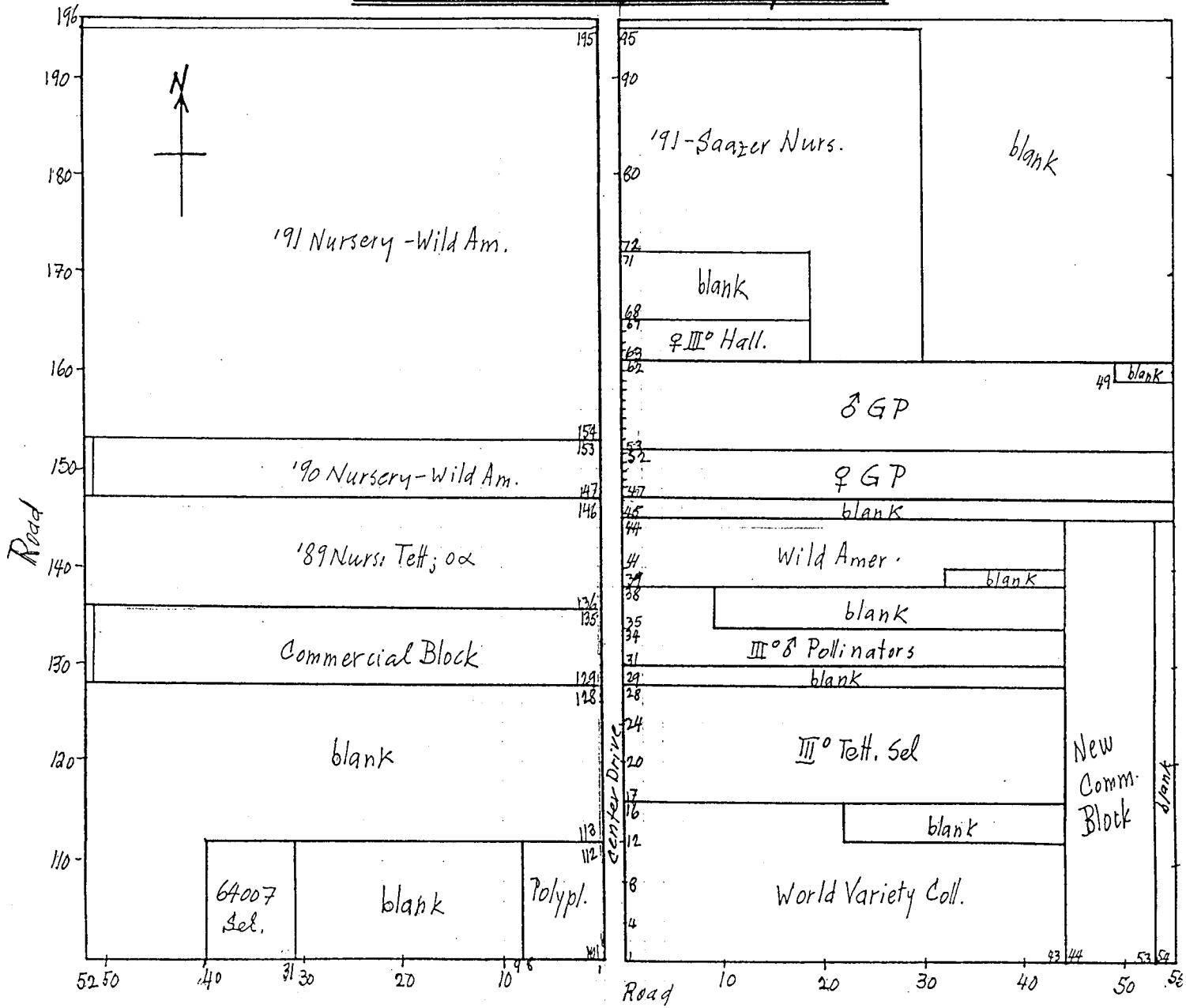


Table 1: Hop germplasm and plant or cone samples distributed in 1992. (rhizomes unless indicated differently)

Recipient	Date sent	Variety or selection	Amount	Reason and remarks
Anderson, Wayne 8793 Arboretum Rd Corvallis, OR 97330	Nov. 13	Blue Northern Brewer, USDA 21079	2	Potted plants, ornamental hop nursery propagation
Anheuser Busch Inc. c/o Dr. Val Peacock St. Louis, MO 63118	Dec. 15	21373 (Technician hop)	100 g	Cone sample, lab studies for form retention
Banichar, Paulette New England Garden Ornamentals North Brookfield, MA 01535	Feb. 27	Blue No. Brewer, 21079	6	Ornamental hop for plant arbor demonstration
Beatson, Dr. Ron Riwaka Res. Station Motueka, New Zealand	March 19	Mt. Hood, 21455 Liberty. 21457	6 6	Experimental testing - " -
Becker, Hank USDA-ARS, Building 419 Beltsville, MD 20705	Oct. 14	Blue No. Brewer, 21079	100 g	Cones for agric. display in New York City
Baisch, Bill Pocatello, ID	March 11	Liberty, 21457 Tettnanger, 21015 Nugget, 21193	6 6 6	Variety testing - " - - " -
Benitez, Ing. Louis R. Sociedad Anonima Espanola Leon, Spain	March 9	Willamette, 21041 Cascade, 56013 Pride of Ringwood, 68052 Southern Brewer, 21187	8 8 8 8	Variety testing - " - - " - - " -
Brits, Gerrie South Afric. Brew. Hop Farms George, South Africa (to Plant Introd. Sta. Stellenbosch)	Jan. 27	Pride of Kent, 21280 Banner, 21287 USDA 65009 USDA 21513 USDA 63012M USDA 19058M	6 6 6 6 6 6	Variety testing - " - - " - - " - - " - - " -
Corliss, Julie, USDA-ARS Albany, CA	May 13	Tettnanger, 21015	200 g	Pellets, aroma demonstration
Criley, Dr. Richard A. Univ. of Hawaii Dept. of Horticulture Honolulu, Hawaii	Aug. 31	Brewer's Gold, 19001 Colorado 2-1, 60026M	Leaves - " -	Specimen for Honolulu police dept. to compare with cannabis
Dorschner, Dr. Keith SWID Res. & Ext. Center Parma, ID 83660	May 1	Sel. 8923-06 Sel. 8941-05	3 6	Baby crowns, wild Am. - " - Insect resistance studies

Table 1. continued

Recipient	Date sent	Variety or selection	Amount	Reason and remarks
Gmelch, Dir. Ing. Franz German Society for Hop Res. Hüll 8069, GERMANY	April 14	Aquila, 21222 Banner, 21287 Mt. Hood, 21455 Liberty, 21457	6 6 6 6	Variety testing - " - - " - - " -
Haas, J.I. (Probasco) Yakima, WA	March 10	Wye Target, 21112 Talisman, 65101 Centennial, 21507 USDA 21180	5 5 5 5	Variety testing - " - - " -
- " -	Oct. 2	Styrian Golding (21049), seedless Styrian Golding (21049), seeded Savinja Golding (61020), seeded Yugosl. Golding (61019), seeded	125 g 125 g 125 g 125 g	Cone sample, hand evaluation - " - - " - - " -
- " -	Oct. 8	Hersbrucker (21515), seedless	125 g	Cone sample, hand evaluation
Haunold, Alexander San Diego, CA	Jan. 27	Nugget, 21193	100 g	Hand evaluation
Heineken, N.V. 2382 Ph. Zoeterwoude The Netherlands	Sept. 28	USDA 21120 USDA 21165 USDA 21373	300 g 600 g 125 g	Cones for lab testg. - " - - " -
James, Rhonda Albany, OR	Oct. 2	Blue No. Brewer, 21079	2	Potted plants, hobby gardening
Kerr, Mike Capitol Farms Inc. Salem, OR 97303	May 7	v.f. Fuggle H (21650) - " -	250 50	Virusfr. potted plants, increase nursery; Virusfree baby crowns, increase nursery
Kirin Brewery Co., Ltd. Tochigi-ken 329-14 Japan c/o Atushi Murakami	Feb. 28	Mt. Hood, 21455 Liberty, 21457 Nugget, 21193	8 8 8	Variety testing - " - - " -
Klein, Dr. Robert WSU, IAREC Prosser, WA 99350-9687	Feb. 19	Sel. 8802-19, 4 hills -24, " -45, " -48, " -68, " Sel. 8805-40, " Sel. 8806-17, " Sel. 21079, 6 hills	2 2 2 2 2 2 2 2	Virus testing, 2 pc. from each hill - " - - " - - " - - " - - " - - " - - " -

Table 1. continued

Recipient	Date sent	Variety or selection	Amount	Reason and remarks
Klein, Dr. Robert WSU IAREC Prosser, WA 99350-9687	Jan. 16	8802-18, -19, -24, -27, -37, -42, -45, -48 -59, -64, -68	2 each	Virus testing
		8805-06, -13, -40	2 each	- " -
		8806-12, -17	2 each	- " -
		8808-09, -11, -22, -46, -65, -80, -134, -136, -142	2 each	- " -
		8809-56, -63, -71, -92, -105	2 each	- " -
		21120 (control)	2	2 hills, virus testing
		61021 (control)	2	4 hills, - " -
		21491 (control)	2	1 hill, - " -
- " -	March 16	21660	25	Virus testg. and incr.
		21661	25	- " -
		21662	25	- " -
		21663	25	- " -
		21664	25	- " -
		21665	25	- " -
		21666	25	- " -
- " -	July 7	Hallert. Magnum, 21670	2	Potted plts., vir. tstg.
		Hallertauer Gold, 21671	2	- " -
		Hallert. Tradition, 21672	2	- " -
		Spalter Select, 21674	2	- " -
		Hersbrucker Pure, 21673	2	- " -
		Orion, 21675	2	- " -
		Whitbread's Golding, 21668	2	- " -
		Eastwell Golding, 21669	2	- " -
		Kitamidori, 21677	2	- " -
		Toyomidori, 21676	2	- " -
		Eastern Gold, 21678	2	- " -
		Blue No. Brewer, 21079	2	Retest for viruses
Locke, Kerry Klamath County Ext. Service Klamath Falls, OR 97603	Sept. 29	Cross 9036 selections	2 lbs	Cone sample of 3 diff. sel.; hand eval. and home brewing
Maier, Dr. Johann German Soc. Hop Res. Hüll 8069, Germany	Oct. 1	Bullion (21056), seedless	1 lb	Cone sample, lab testg.
		Hersbr. (21515), seedless	1 lb	- " -
		Perle (21227), semiseeded	1 lb	- " -
Morris-Hanbury c/o C.E. Zimmermann Yakima, WA 98907	Feb. 2	Sel. 8802-02	300 g	Hand evaluation, cone morphology
		Sel. 8802-12	300 g	- " -

Table 1. concluded

Recipient	Date sent	Variety or selection	Amount	Reason and remarks
Miller Brewing Co. c/o Dr. Jim Munroe Milwaukee, WI 53208	Dec. 15	USDA 21660 USDA 21661 USDA 21662 USDA 21663 USDA 21664 USDA 21665 USDA 21666 USDA 21015 USDA 21497	30 g 30 g 30 g 30 g 120 g 120 g 120 g 30 g 30 g	Cones for hand eval. - " - - " - - " - Pilot brewing - " - - " - Hand evaluation - " -
Oregon Hop Commission c/o Allen Wineland Salem, OR 97303	March 20	Triploid pollinators, 47 diff. genotypes, see list on p. , Table 1a	2762	Rhizomes for yield stimulation without seed set
Sanders, Steven Amity, OR	Dec. 23	Blue No. Brewer, 21079	1	Potted plant, ornamental
Signorotti, George W. Sloughhouse, CA 95683	March 3	Blue No. Brewer (21079) USDA 21315M USDA 21358M	1 4 4	Rooted cutting, ornam. Rhiz., yellow leaf type - " -
Weiler, Dee Salem, OR 97304	Feb. 27	Cascade, 56013	10	Hobby gardening
Whitney, Peggy Redmond, OR 97756	June 11	Mt. Hood, 21455 Liberty, 21457	6 6	Demonstration plot - " -
Woodend, Dr. John National Breweries Harare, Zimbabwe	Jan. 14	Hüller Bitterer, 21097 Willamette, 21041 Styrian, 21049 No. Brewer, 21093 Aurora, 21053 Blisk, 21238 Eroica, 21220 Galena, 21182 Nugget, 21193 Talisman, 65101 Columbia, 21040 Bullion 10A, 21056 Spalter, 21186 Cascade, 21092 Olympic, 21225 Record, 21078 Sticklebract, 21403 Green Bullet, 21404 SuperAlpha, 21405	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	Variety testing - " - - " - - " - - " - - " - - " - - " - - " - - " - - " - - " - - " - - " - - " - - " - - " - - " - - " - - " -
- " -	March 18	Pacific Gem, 21609 Sticklebract, 21403	6 6	Variety testing - " -
- " -	June 12	Mt. Hood, 21455 Liberty, 21457	5 5	Variety testing - " -

Table 1a. Triploid (nearly sterile) males for distribution to Oregon growers. (47 genotypes), distributed March 20, 1992.

Accession No.	1991 Location	Pedigree[1]	Maturity[2]	No. of rhizomes available	Remarks
21102M	105:5-6	21003 x 19040M	E-M	48	
21175M	109:11-12	56008 x OP[2]	E	79	
21176M	110:11-12	"	M	73	
21177M	102:13-14	"	E	46	
21178M	104:13-14	"	E	40	
21189M	105:11-12	"	E	82	
21190M	107:11-12	"	E	43	
21191M	108:11-12	"	E	137	♂, fair
21192M	101:13-14	"	E	33	
21539M	123:1-2	21397 x 64035M	E-ME	56	
21540M	114:3-4	"	ME	43	
21541M	120:5-6	21397 x 21362M	E	50	
21542M	122:5-6	"	E	43	
21543M	123:5-6	"	ME-M	46	
21544M	125:5-6	"	E	59	
21545M	126:5-6	"	E-ME	45	
21546M	114:9-10	21397 x21381M	E	58	
21547M	115:9-10	"	E-ME	66	
21548M	116:9-10	"	E-ME	38	
21620M	127:1-2	21397 x 64035M	E-ME	37	
21621M	115:3-4	21397 x 64037M	E-ME	46	
21622M	117:3-4	"	ME	57	
21623M	123:3-4	"	E-ME	50	
21624M	114:5-6	21397 x 21361M	E-ME	40	
21625M	115:5-6	"	ME-M	57	
21626M	119:5-6	21397 x 21362M	ME	40	
21627M	127:5-6	"	ME	40	
21628M	113:7-8	21397 x 21381M	ME	52	
21629M	116:7-8	"	E-ME	51	

continued

Table 1 a: Concluded

Accession No.	1991 Location	Pedigree[1]	Maturity[2]	No. of rhizomes available	Remarks
21630M	126:7-8	21397 x 21337M	E-ME	71	
21631M	127:7-8	21397 x 21362M	E-ME	45	
21632M	128:7-8	"	E	16	
21633M	118:9-10	21397 x 19172M	ME	45	
21634M	121:9-10	21397 x 21087M	E	49	
21635M	120:11-12	21397 x 21337M	E-ME	63	
21636M	126:11-12	21397 x 21361M	ME	40	
21637M	128:11-12	"	ME	20	
21638M	125:13-14	21397 x 21381M	E-ME	43	
21651M	136:39 29:17-20	61021 x 21617M	E	89	
21652M	137:05 2:21-24	61021 x 21618M	E	91	
21653M	137:15 12:21-24	"	E-ME	87	
21654M	137:31 26:21-24	21497 x 21617M	E	56	
21655M	137:39 27:21-24	"	ME	73	
21656M	138:43 7:25-28	21497 x 21618M	ME	120	
21657M	139:05 19:25-28	21497 x 21617/618 mix	ME	142	
21658M	139:06 20:25-28	"	E-ME	48	
21659M	139:28 41:25-28	"	ME-M	109	
Total				2762	

[1]21003 = tetraploid Fuggle
56008 = XS x (Fuggle x EG - EC Seedling)
21397 = tetraploid Hallertauer m.f.
61021 = Swiss Tettnanger
21497 = Tettnanger B
[2]E, ME, M = early (1st week of July), medium early (July 10), medium (mid-July)

Table 2. Germplasm or cone samples received at Corvallis in 1992. (rhizomes unless indicated differently)

Supplier	Date received	Amount	Variety/Pedigree	Remarks
Bero, Robert Canfield, OH	Sept. 23	250 g	Brewer's Gold	hand harv. 8/6-92
		250 g	Cascade	hand harv. 8/18-92
		250 g	Nugget	hand harv. early Sept. 92
		250 g	Canadian Redvine	- " -
Darby, Dr. Peter Dept. Hop Research Wye College, England	Dec. 21	10	Omega, USDA 21667	new variety
English Hop Prod. Ltd. Paddock Wood, Tonbridge Kent, England	April 10	8	Whitbread's Golding, USDA 21668	old English aroma hop
		8	Eastwell Golding, USDA 21669	- " -
German Soc. for Hop Res. Hans Pfülf Institut D 8069 Hüll Germany	April 7	6	Hallertauer Magnum, USDA 21670	new high-alpha hop
		6	Hallertauer Gold, USDA 21671	New aroma hop
		6	Hallertauer Tradition, USDA 21672	- " -
		6	Hersbrucker Pure, USDA 21673	- " -
		6	Spalter Select, USDA 21674	- " -
		6	Orion, USDA 21675	new alpha + aroma hop
Kirin Brewery Co. Ltd Tochigi-ken 329-14 Japan (Dr. Atsushi Murakami)	April 20	8	Toyomidori, USDA 21676	new high alpha hop
		8	Kitamidori, USDA 21677	new high alpha hop
		8	Eastern Gold, USDA 21678	new high alpha hop
Sever, Marija Inst. Hop Research 21470 Backi Petrovac Yugoslavia	Jan. 8	500 g	unidentified	cone sample for chem analysis (α 0.9, ß 2.3, HSI 0.764, CoH 32)

Table 3. New Accession Numbers Assigned in 1992.

Accession number	1992 location	Source	Name or pedigree	Remarks
21667	Greenhouse	Wye College, England	Omega Wye Challenger (21043) x English ♂	carries hop latent viroid high yield, alpha 11-13, resistant to wilt
21668	Greenhouse	English Hop Prod. Ltd., Kent, England	Whitbread's Golding	old English variety; late; (seedlingof Bate's Brewer) raised in 1911 acc. to Burgess; tolerant to progressive wilt; susceptible to downy mildew; diploid 2n = 20
21669	Greenhouse	- " -	Eastwell Golding	old English variety; med. late; selected about 1889 in Kent; similar to Petham Golding; diploid 2n = 20; alpha 5-7%
21670	Greenhouse	German Soc. Hop Res., Hüll, Germany	Hallertauer Magnum Galena (USDA 21182) x German ♂ 75/5/3	new high-alpha hop, low CoH; male parent about 50% Hall. m.f., diploid 2n=20; α 12-17, ß 5-6, CoH 28; susc. to powdery mildew, res. to vert. wilt and downy mildew
21671	Greenhouse	- " -	Hallertauer Gold 50/1/392 x 61/28/6	aroma variety derived from Hallertauer m.f., released about 1970; α 6-8, ß 9; med. early; susc. to vert. wilt; resistant to downy mildew; diploid 2n = 20
21672	Greenhouse	- " -	Hallertauer Tradition Hall. Gold x German ♂ 75/15/106	new aroma hop of interest to Anh. Busch; released 1989 (47% Hallertauer; 15% Saazer, 22% wild hop); α 5-6, ß 4-5, CoH 26%; res. to vert. wilt and downy mildew; med. early; diploid 2n = 20
21673	Greenhouse	- " -	Hersbrucker Pure (73/10/16 x 78/18/145)	new aroma hop, released 1989 (42% Hall. m.f., 13% Saazer, 22% wild hop); med. late; α 3-5, ß 2; CoH 28-30; res. to vert. wilt and downy mildew; diploid, 2n = 20
21674	Greenhouse	- " -	Spalter Select (76/18/80 x 71/16/07)	new aroma hop of interest to Anh. Busch; released 1989; res. to vert. wilt and downy mildew; α 4-6, ß 3-4, CoH 23; exceptionally fine aroma; medium to med. late; diploid 2n = 20
21675	Greenhouse	German Soc. Hop Research Hüll, Germany	Orion Perle (21227) x German male 70/10/15	medium high alpha /aroma hop released in 1984; med. late, α 7-12; ß not reported; res. to vert. wilt and downy mildew; diploid 2n = 20
21676	Greenhouse	Kirin Brew. Co. Ltd. Tokyo, Japan	Toyomidori No. Brewer (64107) x Wye OB79 (USDA 64103M)	new high alpha hop released in 1989; early, α 12, ß 7; CoH 41; H/C 2.0; no farnesene; diploid 2n = 20
21677	Greenhouse	- " -	Kitamidori (C79-27-01) x (C79-64-110)	new high alpha hop released in 1989; early; α 13-17, ß 7-9; CoH 17-20; H/C 3.40; v. high humulene, farnesene 10%; diploid 2n = 20
21678	Greenhouse	- " -	Eastern Gold C76/64/17 x Wye OB79 (USDA 64103M)	new superalpha hop, release in progress; late; α 15-20, ß 10, CoH 22, H/C 2.50; high humulene; farnesene 5-6%; diploid 2n = 20

Table 4: Hop genotypes discarded in 1992

Accession Number	1992 Location	Name or Pedigree	Reason
21616M	103:3-4	21397 x 21237M	tetraploid; v. weak, lost in the field
21390	107:5-6	56008 x 51114M	tetraploid, weak, yellow fleck
21391	108:5-6	56008 x OP	tetraploid, does not climb, poor
21525	10:13-16	Osvald Clone 72Y	v. poor, virus infected, replaced by 21535 (v. free)
21552	6:39-40	Nebraska 4	too late, flowered August 20-25
21553	7: "	Nebraska 5	- " - - " -
21562	12: "	Iowa 2	- " - - " -
21564	13: "	Iowa 4	- " - - " -
21549M	21:41-44	Nebraska 1	- " - - " -
21551M	22: "	Nebraska 3	- " - - " -
21554	23: "	Nebraska 6	- " - - " -
21556	24: "	Missouri 2	- " - - " -
21559	25: "	Missouri 5	- " - - " -
21560	26: "	Missouri 6	- " - - " -
21568	30: "	No. Dakota 1	- " - - " -
21587	38: "	Montana 13	- " - - " -
21123	4:47-48	19005 x 19046M	poor vigor, died out
21208	52:47-48	Yug. Wild Hop 32P02	too late, poor flowering
58112	19:49-50	(Bu x Fu-FuS) x OP	very poor, late
21084	37: "	Yug. Sel. IV/12	very poor, weak, died out
50075	47:49-50	(EKGxEG-KGS) x 19009M	very poor, weak
61008	37:51-52	Polish CZ/C6	very poor, short arms, few cones
61011	38: "	Polish P/K1	- " - - " -
64106	46: "	German x OP	v. weak, crown dieout
21149	48: "	19001 x Fu-Colo 2-1	poor cone type, weak
21143	50: "	Ha x 19040M	weak, few cones, not Ha type
19170M	23:53-54	XS x (EKGxEG-KGS)	weak, poor flowering, short arms
19183M	27: "	Fu x EG-ECS	weak, v. short arms
21468M	53: "	62013 x 21110M	weak, short arms, yellow leaves
21367M	1:55-56	21053 x 21087M	very poor, short arms, little pollen
51060M	2: "	Verte-LCS x 19061M	low α
51061M	3: "	19119 x (Saml x B31S-B31)	too late
51101M	4: "	FuS x 19085^2	weak, very short arms, little pollen
21445M	39: "	62013 x 2111M	v. short arms, little pollen, yellow leaves
21234M	26:57-58	Ha x OP	not Ha. type, crinkled leaves, little pollen
21237M	29: "	Saazer x OP	not Saazer type, v. short arms, little pollen
65034M	38: "	Ha^2 x 19040M	v. short arms, little pollen, not Ha type
21441M	44: "	Bu x 19043M	mostly female, too late, crinkled leaves
21133M	45: "	Comet x Bu-OP	too late, little pollen
21472	4:63-67	21397 x 64033M	v. short arms, poor yield, α too low
21473	5: "	21397 x 64037M	- " - - " -
21475	7: "	- " -	v. short arms, poor yield
21481	13: "	- " -	- " - - " -

Table 5. Crosses (open pollinated seed collections) for estimating fertility of monoecious hops in 1992. Cold pretreatment: Dec. 29, 1992 to March 3, 1993.

Cross No.	Location of ♀	Pedigree[1]	Sex of ♀ parent	Cones		Seeds		Seeds per cone	Seed set	Date collected	Remarks
				no.	wt. of 1	total no.	1000 seed wt.				
					mg		g		%	August	
9201	147:22	8901-22 x OP	mostly female	29	293	338	5.283	11.7	21.0	28	only 1 arm ♂
9202	147:34	-34 x OP	mostly male	35	97	100	2.887	2.9	8.5	24	
9203	148:08	-59 x OP	"	35	89	67	2.101	1.9	4.5	"	
9204	148:22	-73 x OP	"	32	100	53	2.653	1.7	4.4	"	
9205	148:31	-82 x OP	mostly female	77	106	760	3.584	9.9	33.2	28	a few ♂, non-dehiscing
9206	150:30	8924-04 x OP	"	39	477	1168	5.078	29.9	31.9	"	
9207	152:42	8946-04 x OP	"	38	453	1035	4.712	27.2	28.4	24	
9208	152:43	-05 x OP	mostly male	85	155	180	3.162	2.1	4.3	"	mostly normal cones
9209	169:07	9011-34 x OP	female	31	503	790	5.186	25.5	26.3	28	all female
9210	169:37	-64 x OP	mostly female	49	735	1653	6.085	33.7	27.9	24	
9211	177:35	9019-25 x OP	"	41	717	1734	5.516	42.3	32.5	"	v. large cones
9212	178:04	-46 x OP	female	38	574	1560	4.223	41.1	30.2	28	all female
9213	189:27	9032-15 x OP	mostly male	64	145	83	3.436	1.3	3.1	24	
9214	189:40	-28 x OP	"	69	168	159	3.735	2.3	5.1	"	
9215	189:50	-38 x OP	"	25	136	37	2.911	1.5	3.2	"	
9216	190:03	-43 x OP	female	45	400	950	4.752	21.1	25.1	28	all female
9217	190:05	-45 x OP	mostly male	118	164	166	4.063	1.4	3.5	24	
9218	190:14	-54 x OP	"	84	173	136	3.364	1.6	3.2	"	
9219	190:19	-59 x OP	"	16	138	26	2.565	1.6	3.0	"	
9220	190:23	-63 x OP	"	87	180	191	3.516	2.2	4.3	"	
9221	129:03	56013 x OP	female	56	230	658	3.645	11.8	18.6	28	control
9222	133:01	21193 x OP	female	51	273	679	2.841	13.3	13.9	28	control

[1]OP = open pollinated

Table 6. Agronomic and quality data of hops grown in the Seeded Hop Variety World Collection, Corvallis. 1992. Pruned March 11; trained May 13.

Accession No.	Location Row:Hill	Name	Full bloom	Harvest date	Yield[1]	Quality α	ß	ratio	CoH	CoL	Remarks
			July	Sept.	lb/A	%	%		%	%	
19001	1:1-4	Brewer's Gold	28	1	1000e	9.7	2.7	78	30	56	
21403	2: "	Sticklebract	15	11	1003	7.4	3.6	67	40	64	picked green
21404	3: "	Green Bullet	15	11	1141	8.8	4.0	69	42	66	picked green
21185	4: "	Hersbrucker - G	30	1	300e	3.7	4.6	44	19	37	
21011	5: "	Late Cluster, L-16	28	9	400e	2.9	2.0	59	38	67	
21179	6: "	Hersbrucker-E	28	1	500e	2.0	2.8	42	19	36	
21014	7: "	Hallertauer m.f.	24	8/17	71	3.3	3.3	50	18	36	
21015	8: "	Tettnanger	15	8/17	64	3.7	2.9	56	18	43	
21016	9: "	Fuggle-N	5	8/17	480	4.5	2.9	68	19	55	bronze leaves
48209	10: "	Fuggle-H	5	8/17	587	4.5	2.2	67	19	54	
56001	11: "	Hallertauer	15	8/17	142	3.7	4.1	47	16	37	
56002	12: "	Backa	30	1	600e	2.4	2.6	48	18	37	
56013	13: "	Cascade	10	1	630	5.1	4.4	54	36	54	
21167	14: "	Hybrid-2	26	9	600e	9.9	4.6	68	32	52	
21039	15: "	Golden Star	28	1	1800e	4.4	2.8	61	44	70	
60042	16: "	Shinshuwase	28	1	1800e	4.1	2.9	58	47	71	
61019	17: "	Yugoslavian Golding	15	8/17	96	4.0	2.0	66	24	47	bronze leaves
61020	18: "	Savinja Golding	15	8/17	498	4.8	2.0	70	28	50	bronze leaves
61021	19: "	Swiss Tettnanger	24	8/17	200e	5.7	4.4	57	20	41	
62013	20: "	Comet	15	1	1800e	11.8	3.3	78	41	63	
21650	21: "	Fuggle-H v.f.	15	8/17	43	3.8	1.7	69	21	42	
21186	22: "	Spalter	5	8/17	43	3.5	3.0	54	20	40	
21168	23: "	Precoce de Bourgogne	10	1	200e	3.3	2.8	54	19	39	
21169	24: "	Tardif de Bourgogne	24	8/17	200e	2.9	4.6	39	11	34	CoH questionable
21170	25: "	Elsässer	24	1	600e	3.7	4.0	48	18	36	
21406	26: "	AlphAroma	22	11	2450	7.7	2.7	74	23	47	picked green
21172	27: "	Landhopfen	20	8/17	300e	5.1	4.5	53	19	39	
21187	28: "	Southern Brewer	5	1	800e	5.7	2.1	73	35	63	♀,some male flowers
21188	29: "	NP 2/55	5	1	800e	4.4	2.5	63	26	49	
21284	30: "	Bramling		1	400e	3.4	1.6	68	22	43	
21173	31: "	Strisselspalt	18	1	500e	3.3	2.6	56	23	51	
21227	32: "	Perle		1	400e	7.4	1.8	81	22	45	
21405	33: "	SuperAlpha	20	11	352	9.9	4.4	69	36	60	
21498	34: "	Yeoman	12	3	587	11.7	3.6	76	18	44	red stem
21499	35: "	Zenith	24	1	181	8.0	2.7	76	16	53	
21193	36: "	Nugget	18	1	2000e	10.9	3.5	76	21	43	
21225	37: "	Olympic	24	1	1800e	9.9	3.7	73	32	59	
21226	38: "	Chinook	18	1	2000e	10.5	2.8	79	33	56	
21286	39: "	Kirin II	24	1	1800e	2.5	2.3	52	41	66	
21496	40: "	Tettnanger-A	18	8/17	300e	4.9	4.8	51	19	39	
21497	41: "	Tettnanger-B	5	8/17	128	4.2	3.7	53	22	42	bronze leaves

Table 6 - continued

Accession No.	Location Row:Hill	Name	Full bloom	Harvest date	Yield[1]	Quality α	Quality ß	Quality ratio	Quality CoH	Quality CoL	Remarks
			July	Sept.	lb/A	%	%		%	%	
62052	1:5-8	Density	24	1	600e	1.6	0.9	65	33	66	
62053	2: "	Defender	5	8/17	64	2.4	1.2	68	27	49	
64100	3: "	Bullion	15	1	1800e	5.2	2.8	65	35	64	alpha too low
64107	4: "	Northern Brewer	15	1	900e	5.9	2.1	74	24	44	
65101	5: "	Talisman	24	1	2000e	3.9	1.9	67	49	75	
65102	6: "	Yakima Cluster, L-1	15	3	668	6.3	3.6	64	28	67	CoH too low
21196	7: "	Bullion 6A	15	1	1700e	9.3	3.1	75	35	63	bronze leaves
21182	8: "	Galena	18	1	1800e	8.4	6.3	57	43	67	
66051	9: "	Progress	22	8/19	213	5.2	2.1	71	27	49	
66052	10: "	Pride of Ringwood	24	9	1600e	6.3	4.0	61	33	51	alpha too low
66050	12: "	Alliance	15	8/19	405	5.3	2.0	72	30	53	bronze leaves
21183	13: "	Eroica	24	1	2000e	5.9	2.1	73	38	66	alpha too low
66054	14: "	Calicross	24	1	1900e	4.4	2.8	61	30	58	
66055	15: "	First Choice	20	1	1800e	3.0	3.2	49	34	62	
66056	16: "	Smooth Cone	20	1	1900e	6.2	3.3	65	21	48	
68052	17: "	Petham Golding	15	1	587	7.2	2.1	77	27	50	HMV sensitive
21043	18: "	Wye Challenger		1	500e	6.3	3.1	67	18	41	
21044	19: "	Wye Northdown	20	8/17	400e	6.9	4.2	62	21	47	
21049	20: "	Styrian Golding	18	8/17	331	4.5	2.1	68	28	50	bronze leaves
21077	21: "	Saazer	15	8/17	100e	4.1	3.4	55	15	39	
21238	22: "	Blisk	15	1	2200e	9.2	2.6	78	32	55	
21040	23: "	Columbia		1	800e	4.3	2.3	65	35	60	
21041	24: "	Willamette	20	1	1200e	3.6	2.0	65	25	47	bronze leaves
21213	25: "	Aromat	12	8/17	200e	2.7	2.7	50	15	40	
21214	26: "	Sirem	10	8/17	100e	5.0	4.0	56	18	38	
21215	27: "	Nordgaard 1478	5	8/17	200e	7.6	2.6	75	24	51	
21216	28: "	Groene Bel	15	8/17	400e	4.6	3.5	57	24	49	
21217	29: "	Star	15	8/17	213	2.7	1.6	64	18	51	bronze leaves
21097	30: "	Hüller Bitterer	28	1	600e	8.0	3.3	70	24	43	yellow fleck 2
21220	31: "	Eroica v.f.	28	1	900e	3.8	1.5	72	39	68	alpha too low
21055	33: "	Com x (BGxFu-Colo2-1)	15	1	1200e	14.2	3.4	81	46	69	
21514	34: "	Hersbrucker-6	15	1	2000e	1.8	2.0	47	11	33	
21515	35: "	Hersbrucker-8	18	1	2000e						sample lost
21516	36: "	Hersbrucker-9	28	1	1900e	5.6	3.4	62	15	32	
21517	37: "	Hersbrucker- red stem	26	1	1500e	3.3	2.2	60	14	36	
21518	38: "	Hersbrucker- alpha	22	1	1600e	5.7	3.5	62	16	36	
21519	39: "	Ap 71/24-2a	20	1	1200e	5.0	2.1	70	27	49	
21222	40: "	Aquila	18	1	1400e	6.5	3.0	68	45	71	ruffled cones
65102	41: "	Yakima Cluster L-1	15	1	300e	4.2	2.5	63	35	61	pale leaves

Table 6 - concluded

Accession No.	Location Row:Hill	Name	Full bloom	Harvest date	Yield[1]	Quality α	ß	ratio	CoH	CoL	Remarks
			July	Sept.	lb/A	%	%		%	%	
21050	1:9-12	Ahil	15	1	1600e	6.1	3.5	64	25	46	
21052	2: "	Atlas		1	800e	12.9	4.3	75	33	60	
21053	3: "	Aurora	28	8/19	117	7.3	2.6	74	16	41	
21051	4: "	Apolon	20	1	800e	7.4	3.3	70	22	44	
21081	5: "	Dunav	20	1	1900e	5.6	3.5	62	27	63	
21082	6: "	Neoplanta	24	1	600e	7.2	2.9	72	33	62	
21083	7: "	Vojvodina		1	700e	6.4	2.7	70	25	55	
21080	8: "	Backa	20	1	600e	3.8	4.2	47	13	39	heavy mite infest.
21079	9: "	Blue No. Brewer	5	1	100e	5.1	2.1	70	18	39	
21455	10: "	Mt. Hood	20	1	400e	4.7	5.7	45	19	44	
21093	12: "	Northern Brewer v.f.	18	8/19	171	9.6	3.2	75	19	54	
21056	13: "	Bullion 10A	20	1	1400e	9.2	3.9	70	34	63	
21092	14: "	Cascade v.f.	15	1	235	5.2	4.8	54	36	54	bronze leaves
21116	15: "	Brewer's Gold v.f.		1	1200e	12.2	4.5	73	33	60	
21112	16: "	Wye Target	20	1	1900e	10.5	4.6	69	32	60	
21239	17: "	Bobek	15	1	1200e	4.6	3.5	57	20	43	
21113	18: "	Lublin	10	8/17	400e	4.6	3.9	54	19	37	bronze leaves
21114	19: "	Nadwislanska		8/17	100e	3.5	2.4	59	17	33	
21115	20: "	Pocket Talisman		9	1200e	3.4	1.8	65	51	75	ruffled cones
21078	21: "	Record	15	1	1000e	3.6	3.7	50	23	45	ruffled leaves, α too low
21240	22: "	Buket	20	1	1000e	10.4	4.8	68	21	48	α too high
21276	23: "	Early Prolific	15	8/17	400e	4.8	2.3	68	21	42	
21277	24: "	Early Promise		1	100e	4.2	1.3	76	26	49	
21278	25: "	Keyworth's Early	24	1	400e	5.2	1.5	77	29	48	striped stems
21279	26: "	Keyworth's Midseason	18	1	1200e	7.2	3.2	69	42	70	CoH too high
21280	27: "	Pride of Kent	5	8/19	597	9.6	6.2	61	27	63	very early
21282	29: "	Wye Saxon		8/17	100e	8.8	3.5	71	16	36	
21283	30: "	Wye Viking	20	8/17	400e	6.9	3.4	67	21	40	
21507	31: "	Centennial	15	1	600e	12.5	4.5	74	25	58	
21396	32: "	Tolhurst		1	200e	0.9	2.4	27	19	43	alpha too low
65104	33: "	Late Cluster L-8		1	1000e	5.4	3.6	60	38	67	
21520	39: "	Ba 11/72-19a	18	1	1400e	5.3	2.3	69	27	52	pale yellow leaves
21521	1:13-16	Saazer 36 v.f.	10	1	200e	2.8	2.1	56	20	41	
21522	2: "	Saazer 38 v.f.	10	8/19	100e	2.9	3.5	45	20	43	
21523	3: "	Lubelska v.f.	5	8/19	256	4.4	3.1	59	21	40	
21524	4: "	Nadwislanska v.f.	5	8/19	181	3.9	3.2	55	19	39	
21526	5: "	Osvald Clone 126	5	8/19	789	4.7	2.2	68	22	55	bronze lvs, Fu-type
21527	6: "	Blato	10	8/19	100	4.5	3.1	59	20	40	
21528	7: "	Lucan	18	8/17	100e	3.4	3.0	52	16	42	red stem
21529	8: "	Osvald Clone 31		8/17	100e	4.4	3.7	55	19	43	
21530	9: "	Osvald Clone 114	18	8/17	200e	4.5	3.6	56	19	40	
21532	11: "	Osvald Clone 72C	18	8/17	200e	4.6	4.3	52	21	40	
21533	12: "	Zlatan	15	8/17	200e	4.3	3.7	54	18	39	red stem
21535	13: "	Osvald Clone 72Y v.f.	5	8/19	149	3.5	3.1	53	22	42	
21538	14: "	Osvald Clone 72C v.f.	15	8/19	149	3.4	2.8	55	21	42	
21531	15: "	Universal	18	8/17	200e	4.5	3.9	54	18	37	
21287	16: "	Banner	18	1	200e	11.2	6.4	64	28	62	pale yellow lvs
21609	17: "	Pacific Gem	15	1	1800e	4.5	2.3	66	29	58	alpha too low
21610	18: "	N.Z. Hallertau	10	1	1800e	6.4	3.0	68	34	60	early
21613	19: "	Cekin	20	1	800e	3.0	1.3	70	20	41	bronze leaves
21611	20: "	Celeia	18	8/19	309	5.2	3.2	62	22	50	bronze leaves
21612	21: "	Cerera	18	1	569	6.3	2.9	69	18	57	

[1] Green weight/4-hill plot x 0.10665; e = visual estimate

Table 7. Hop varieties and selections grown in the Seedless Observation Nursery (Smith Yard), Corvallis, 1992. Pruned March 20; trained May 13-14.

Accession No.	Location Row:Hill	Name	Full bloom	Harv. date	Yield[1]	Quality α	Quality ß	Quality ratio	Quality CoH	Quality CoL	Remarks
			July	Sept.	lb/A	%	%		%	%	
21368	201:1-5	tetr. Atlas x (NBxSavG-TG)	22	8	776	10.6	4.2	71	29	67	triploid, late
21369	202: "	- " -	24	8	845	8.8	4.3	67	27	65	- " -, - " -
21498	203: "	Yeoman	12	8/25	273	13.2	4.6	74	21	52	early
21370	204: "	tetr. Atlas x (NBxSavG-TG)	18	8	793	8.7	3.3	72	27	63	triploid
21056	206: "	Bullion 10A	18	8	981	11.2	5.1	69	31	54	
21514	207: "	Hersbrucker-6	15	8	1081	4.3	4.9	47	17	41	
21499	209: "	Zenith	20	8	375	8.9	2.8	76	19	56	
21610	210: "	NZ Hallertau	12	8	247	5.3	4.3	55	30	63	
21609	211: "	Pacific Gem	12	8	768	11.5	4.8	71	32	67	top crop
21614	212: "	Cicero		9	100e	4.5	2.2	67	22	41	
21287	213: "	Banner	15	8	1851	11.2	6.4	64	28	62	
21049	214: "	Styrian	5	8/25	350	4.5	2.4	65	30	49	early
21650	215: "	Fuggle H v.f.	8/2	9	100e	4.5	2.6	64	24	47	baby
21515	216: "	Hersbrucker-8	12	8	1570	3.9	4.9	45	18	40	
8802-02	218: "	61021 x 21618M	8	9	1000e	4.4	6.7	39	24	38	
21613	219: "	Cekin	24	8/25	327	5.2	2.0	73	20	53	early
21227	220: "	Perle	24	8	495	8.5	2.8	75	28	51	
21519	222: "	Apolon x (Dunav[2] x NB[2]-OP)	12	8	973	7.7	3.2	71	24	58	
8601-25	223: "	61021 x 21617M	26	9	1000e	8.1	4.4	65	23	44	small, comp. c.
8020-32	224: "	19185 x 21267M	5	8/25	1058	9.0	3.5	72	35	66	early
8802-12	226: "	61021 x 21618M	8	8	469	4.9	3.9	56	22	45	early
21041	227: "	Willamette	24	8	273	5.6	3.2	64	26	57	sleeper
21520	228: "	Ba x(Gr.Bel[2] x NB[2]-OP)	26	8	1391	5.1	2.8	64	30	63	some ♂ flowers
21403	229: "	Stickelbract	24	11	546	7.8	3.8	68	38	63	picked green
8401-68	230: "	21397 x 19172M	26	9	1200e	4.6	3.8	54	26	42	large cones
21404	231: "	Green Bullet	20	11	444	11.6	4.6	72	41	66	picked green
64007	232: "	19105 x 19058M	22	8	1655	2.3	5.5	29	31	62	
21238	234: "	Blisk	16	8/25	1758	10.3	3.7	74	29	63	early
21612	235: "	Cerera	18	8	939	5.2	3.4	60	23	56	early
21193	237: "	Nugget	18	8	2278	12.8	3.8	77	23	45	
8802-18	238: "	61021 x 21618M	15	9	600e	6.7	7.1	49	20	40	early
21182	239: "	Galena	5	8/25	870	13.4	8.8	60	34	66	med. early
21405	240: "	SuperAlpha	15	11	410	9.5	4.2	69	37	62	picked green
21406	241: "	AlphAroma	26	11	1399	9.4	3.1	75	24	48	picked green
21003	242: "	tetr. Fuggle	18	9	400e	3.9	2.6	60	23	44	
8401-76	243: "	21397 x 19172M	15	8	708	4.1	3.2	56	22	50	
21397	245: "	tetr. Hallertau m.f.		9	100e	4.5	3.8	54	22	41	
21660	247: "	61021 x 21618M	18	9	400e	4.2	6.6	39	19	41	
21661	248: "	- " -	12	9	400e	8.2	7.9	51	16	32	red stem
8802-27	249: "	- " -	5	9	200e	5.3	5.9	47	18	38	

Table 7 - continued

Accession No.	Location Row:Hill	Name	Full bloom	Harv. date	Yield[1]	Quality α	ß	ratio	CoH	CoL	Remarks
			July	Sept.	lb/A	%	%		%	%	
65102	201:6-10	Yakima Cluster L-1	20	9	400e	5.5	4.0	58	35	59	
8401-132	202: "	31397 x 19172M	5	8/25	392	5.5	5.6	49	19	45	early
8802-29	203: "	61021 x 21618M	5	9	400e	4.6	4.8	49	21	39	
-37	206: "	- " -	10	9	400e	5.4	6.2	46	24	42	
-42	207: "	- " -	20	9	200e	8.1	5.8	58	18	34	
21521	208: "	Saazer-36 v.f.	15	9	100e	4.9	5.5	47	22	40	early
21522	209: "	Saazer-38 v.f.	15	9	100e	3.9	4.0	49	24	43	
8301-21	210: "	21397 x 19058M		9	200e	4.8	4.3	53	21	41	baby
8406-16	212: "	21397 x 21361M		9	100e	5.5	4.4	56	23	42	baby
21535	214: "	Osvald 72Y v.f.	22	9	100e	3.7	3.5	51	32	55	CoH too high
21485	216: "	SBx(Ha-OP x(Saaz x Ha-OP))	12	8	1109	11.2	4.7	70	15	48	red stem
21516	217: "	Hersbrucker-9	24	9	683	5.0	4.1	55	15	34	
21517	218: "	Hersbrucker red-stem	20	9	717	5.4	4.5	54	16	35	
21518	219: "	Hersbrucker-alpha	15	9	580	4.4	4.6	49	17	36	
21523	222: "	Lubelska v.f.	8	8/25	119	6.6	5.0	57	25	44	early
21524	223: "	Nadwislanska v.f.	10	8/26	154	5.2	4.5	54	21	44	early
21662	227: "	61021 x 21618M	12	9	267	5.7	4.6	55	21	39	
8408-12	228: "	21397 x 21381M	26	9	100e	5.3	3.8	59	29	36	baby
8802-46	229: "	61021 x 21618M	15	9	213	5.6	4.4	56	21	41	
8408-115	230: "	21397 x 21381M	26	9	200e	6.3	4.8	57	21	41	baby
8602-35	231: "	61021 x 21617M	18	8/26	776	12.2	4.5	73	22	46	early
-55	232: "	- " -	15	9	555	8.8	5.2	63	22	42	red bracts
8412-138	233: "	64007 x 21361M	8/2	9	400e	7.3	4.1	64	22	44	baby
8154-230	236: "	21185 x OP	8/2	9	100e	4.5	3.7	55	26	46	red stem, baby
21663	237: "	61021 x 21618M	20	9	213	7.2	5.8	55	22	38	early
8602-119	238: "	61021 x 21617M	26	9	299	5.2	3.0	63	27	49	red stem
8405-101	239: "	21397 x 21337M	20	9	256	4.4	3.2	58	19	38	
8602-162	242: "	61021 x 21617M	28	9	370	8.4	4.2	67	19	39	red stem
21407	245: "	Cascade x OP	12	9	282	9.9	4.3	70	38	67	red stem
21408	247: "	65009 x 63012M	18	9	1126	11.0	5.9	65	37	60	
8802-84	248: "	61021 x 21618M	12	9	400e	6.1	3.9	61	22	37	early
21664	201:12-16	61021 x 61618M	15	11	100e	10.0	7.1	58	19	39	
21513	202: "	Cascade x 19058M	20	9	1937	12.8	5.5	70	28	46	
8602-207	204: :	61021 x OP	24	9	427	11.5	5.3	68	21	45	
21500	205: "	Cascade x 19058M	24	9	1008	11.6	5.5	68	20	45	
8602-274	207: "	61021 x OP	24	9	1177	6.8	7.3	48	20	36	
-278	208: "	- " -	20	8/27	538	8.7	3.7	70	21	51	early
8805-06	211: "	21497 x 21618M	18	11	200e	3.7	4.9	43	19	36	
8809-115	212: "	21120 x 21119M	26	11	100e	1.1	7.6	12	0	43	baby
9036-04	213: "	21534 x 21088M		11	100e	5.1	4.6	52	16	41	baby

Table 7. continued

Accession No.	Location Row:Hill	Name	Full bloom	Harvest date	Yield[1]	Quality α	ß	ratio	CoH	CoL	Remarks
			July	Sept.	lb/A	%	%		%	%	
9036-07	214:12-16	21534 x 21088M			100e	1.1	4.3	21	21	41	baby
8805-07	215: "	21497 x 21618M	16	9	683	4.9	2.6	65	23	42	
9036-16	216: "	21534 x 21088M		11	200e	2.5	2.0	55	25	42	
-43	217: "	- " -		11	100e	5.1	3.3	61	19	42	
-45	218: "	- " -		11	100e	5.4	3.9	58	23	50	
-54	219: "	- " -		11	100e	4.0	3.6	52	29	42	
8805-11	220: "	21497 x 21618M	15	11	400e	8.9	6.4	58	24	42	
-13	221: "	- " -	5	11	600e	4.7	4.8	49	22	40	
9037-07	222: "	21534 x 21361M		11	200e	8.4	3.6	70	24	43	red stem
-20	223: "	- " -		11	100e	6.0	2.9	68	26	43	- " -
9038-02	224: "	21534 x 21429M		11	100e	4.0	4.3	48	31	55	
21251	225: "	21055 x 21109M	28	9	964	15.8	4.8	77	36	57	
8602-305	227: "	61021 x OP	24	8/27	683	8.6	3.7	70	19	51	early
9038-11	228: "	21534 x 21429M		11	100e	5.5	4.8	53	28	47	baby
9039-14	230: "	21534 x 64035M		11	100e	4.6	2.6	64	23	41	- " -
8602-411	231: "	61021 x OP	18	8/27	691	7.2	6.1	54	20	46	early
-578	232: "	- " -	26	10	273	7.9	4.3	64	20	40	
21503	234: "	Cascade x 19058M	22	10	1698	9.0	7.7	54	31	53	
9039-17	235: "	21534 x 64035M		11	100e	4.5	3.4	57	23	42	baby
-24	236: "	- " -		11	100e	5.7	3.3	63	21	39	- " -
9039-34	237: "	- " -		11	100e	5.2	2.4	68	26	44	baby
8603-73	239: "	61021 x 21618M	30	10	597	8.2	5.3	61	22	40	
-77	240: "	61021 x OP	24	10	1468	6.8	5.0	58	22	41	
21665	241: "	21497 x 21618M	10	10	546	6.5	4.7	58	20	38	early
8603-232	243: "	61021 x OP	20	10	853	7.7	5.5	58	20	38	
-314	204:17-21	61021 x 21618M	28	11	200e	4.2	5.1	45	20	36	
8805-18	206: "	21497 x 21617M		11	100e	10.5	7.2	59	21	41	baby
8603-346	208: "	61021 x OP	16	8/27	358	10.8	4.6	70	17	49	
8408-70	209: "	21397 x 21381M	15	10	725	5.2	5.6	48	23	40	
8806-12	210: "	21497 x 21617M	18	10	341	8.4	7.4	53	21	38	
-13	211: "	- " -	15	10	495	7.3	5.2	50	20	40	
21199	212: "	65009 x 19182M	15	10	614	4.1	7.5	36	22	43	α, CoH too low
21666	213: "	21497 x 21617M	12	8/27	235	3.7	5.6	39	19	43	♂, male flowers
9040-08	214: "	21534 x 64037M		11	100e	2.9	3.1	48	23	47	baby
-22	215: "	- " -		11	100e	4.0	5.2	43	21	41	baby
8808-03	216: "	21120 x 19046M	24	11	400e	1.0	8.9	10	22	43	bronze leaves
9046-26	217: "	21534 x 64037M		11	100e	3.7	3.3	53	24	46	baby
8808-09	218: "	21120 x 19046M	18	10	299	3.5	8.2	30	31	40	top crop
9040-29	219: "	21534 x 64037M		11	100e	5.9	4.7	56	23	41	baby
-38	221: "	- " -		11	100e	5.4	2.7	66	23	35	baby

Table 7 - concluded

Accession No.	Location Row:Hill	Name	Full bloom	Harvest date	Yield[1]	Quality α	Quality ß	Quality ratio	Quality CoH	Quality CoL	Remarks
			July	Sept.	lb/A	%	%		%	%	
8808-25	223:17-21	21120 x 19046M	24	11	600e	0.9	6.0	13	30	47	top crop
9040-47	224: "	21534 x 64037M		11	100e	6.5	5.9	52	19	41	baby
8808-34	225: "	21120 x 19046M	26	11	800e	0.4	5.7	6	28	42	red stem
8603-481	228: "	61021 x 21618M	10	8/27	392	8.4	6.0	58	18	40	early
8808-46	229: "	21120 x 19046M	20	11	600e	0.2	3.4	5	0	33	
-55	230: "	- " -	18	11	800e	1.2	8.8	12	38	51	ruffled cones
-74	233: "	- " -		11	100e	0.2	6.2	3	0	50	
8603-504	238: "	61021 x OP	10	8/27	435	7.6	3.5	68	21	52	bronze leaves
21120	240: "	19005 x 19046M	24	10	469	1.0	11.9	8	73	44	red stem
21455	242: "	Mt. Hood	20	11	200e	6.7	6.3	51	20	38	sleeper
8808-136	211:23-27	21120 x 19046M	28	11	200e	0.0	6.0	0	26	51	
-142	212: "	- " -	16	11	400e	0.0	11.3	0	0	47	
8809-22	213: "	21120 x 21119M		9	200e	0.2	6.5	4	25	48	
-56	216: "	- " -	18	10	307	1.8	11.0	14	32	56	
-63	217: "	- " -	22	11	400e	0.0	6.5	0	0	43	compact cones
8809-71	218: "	- " -	22	10	222	1.1	7.1	14	34	48	red stem
21256	219: "	21055 x 21110M	24	10	1365	13.5	4.7	74	40	67	
21457	220: "	Liberty	22	11	300e	4.1	3.7	52	23	39	
8809-105	222: "	21120 x 21119M	20	10	587	9.0	4.2	68	34	58	red stem,α wrong
21257	224: "	21055 x 21110M	5	10	1433	15.6	7.0	69	38	63	early
5254-167	225: "	21285 x 64037	12	11	606	7.4	7.5	50	14	33	
8809-132	226: "	21120 x 21119M	24	11	400e	0.4	8.0	5	0	49	
8254-244	227: "	21285 x 64037M	20	11	520	5.4	7.1	43	19	38	
65009	228: "	BG x EG-XS	22	10	1118	12.2	8.1	60	33	57	
21491	230: "	21397 x 21337M	18	8/27	222	5.1	4.0	56	19	42	early
21505	234: "	64003 x 21268M	22	11	461	5.8	2.5	70	27	52	
21611	236: "	Celeia	24	11	400e	5.6	3.5	62	20	51	
21486	239: "	Cas x 21137M	24	11	1058	10.6	5.1	68	27	46	
21459	240: "	21397 x 21362M	20	11	300e	3.1	3.0	50	23	42	
21507	216:28-32	Centennial	8	8/27	205	12.5	4.5	74	25	58	early
21226	226: "	Chinook	22	11	811	14.0	3.3	81	32	54	MMV, red stem
21490	229: "	Crystal	20	11	418	6.1	6.0	50	20	35	
21120	230: "	19005 x 19046M	24	11	239	1.0	10.1	9	67	44	
21536	231: "	65009 x 19046M	24	11	469	11.2	7.7	59	40	69	
21493	233: "	21397 x 21381M	16	8/27	111	5.6	4.1	58	19	46	early
21222	234: "	Aquila	18	11	427	8.4	3.9	68	47	71	

[1] Green weight/5-hill plot x 0.08532; e = visual estimate

Table 8 : Agronomic, quality, and virus data of triploid Tettnanger-type and Hallertauer-type selections and controls. Corvallis, 1992. (For planting in new seedless yard in 1993)

Accession or Sel. No.	Location Row:Hill	Pedigree[1]	Maturity[2]	Yield	Quality α	Quality ß	Quality ratio	Quality CoH	Quality CoL	Viruses[3] NRSV	Viruses[3] ApMV	Viruses[3] HMV	Viruses[3] HLV	Viruses[3] AHLV	Remarks
Tettnanger types				lbs/A	%	%		%	%						
8802-02	7:17-20	61021 x 21618M	E	1098	7.0	6.4	52	22	42						
8802-18	23:17-20	- " -	ME	1024	7.1	6.2	53	20	39	-	-	-	+	-	v. poor storage
21660	24:17-20	- " -	E	651	5.4	5.3	51	16	48	-	-	-	-	-	formerly Sel. 8802-19
21661	28:17-20	- " -	ME	683	7.8	7.1	52	14	41	-	-	-	+	+	formerly Sel. 8802-24
8802-27	31:17-20	- " -	ME	747	5.0	5.3	48	19	38	-	-	-	-	-	
21662	4:21-24	- " -	ME	853	7.9	5.0	61	17	46	-	-	+	+	-	formerly Sel. 8802-45
21663	7:21-24	- " -	ML	1056	7.2	5.8	55	22	38	-	-	-	+	-	formerly Sel. 8802-48
8802-59	18:21-24	- " -	ME	1099	8.9	6.1	59	21	39	-	-	-	-	-	
21664	25:21-24	- " -	ME	917	8.0	6.2	56	17	42	-	-	-	-	-	formerly Sel. 8802-68
8805-06	33:21-24	21497 x 21618M	ME	1088	6.9	4.2	62	19	37	-	-	+	-	-	good storage
8805-11	34:21-24	- " -	E	1173	8.0	5.3	60	25	45						red stem, no farnesene
-13	35:21-24	- " -	ME	789	6.8	5.7	55	22	41	-	-	-	+	-	
21665	9:25-28	- " -	ME	938	7.7	5.1	60	18	42	-	-	-	-	-	formerly Sel. 8805-40
8806-12	24:25-28	21497 x 21617M	ME	971	6.5	7.6	46	19	35	-	-	-	+	-	
21666	29:25-28	- " -	E	1003	4.8	5.7	46	17	42	-	-	-	+	-	formerly Sel. 8806-17, ♂
61021	19:1	Swiss Tettnanger	E	200e	4.6	3.4	57	20	42	-	+	-	+	-	
	2	"	E							-	+	+	+	-	
	3	"	E							-	+	-	+	-	
	4	"	E							-	+	-	+	-	
21497	41:01	Tettnanger B	E	128	4.2	3.7	53	22	42	-	-	-	+	-	
Hallertauer-types															
21469	1:63-67	21397 x 19058M	M	1800e	5.7	4.6	55	19	42						
21470	2:-"-	- " -	M	1600e	2.6	3.5	42	14	46						
21471	3: -"-	- " -	M	1600e	6.5	4.9	57	19	39						
21484	16:-"-	21397 x 21237M	ML	400e	3.4	3.5	49	20	41						
21455	17:-"-	Mt. Hood	ME	1000e	4.7	5.7	45	19	44						
21457	19: -"-	Liberty	ME	800e	4.3	2.9	59	19	40						

[1]61021 = Swiss Tettnanger
21497 = Tettnanger B
21397 = tetraploid Hall. m.f.
19058M = EG - unknown seedling
21237M = Saazer-OP
21617M = Cacade x 65009-64035M (tetraploid)
21618M = - " -

[2]E, ME = early, medium early
[3]Prunus necrotic ringspot; Apple mosaic, Hop mosaic, Hop latent, American hop latent
+ = positive; - = negative

Table 9: Triploid female Tettnanger-type selections for 1992 increase and possible 1993 off-station tests. (Compiled spring 1992)
(1991 data - averages of 2 plots each; 5 digit accession Nos. assigned fall 1992)

Selection Number	1991 Location Row:Hill	Pedigree[1]	Matur-ity[2]	Yield	Quality					Oil composition[3]					Hand evaluation[4] brewers or dealers					virus status[5]
					α	ß	ratio	CoH	Oil	M	C	F	H	H/C	1	2	3	4	5	
				lbs/A	%	%		%	ml/100g	%	%	%	%							
8802-19 = 21660	136:33 24:17-20	61021 x 21618M	M	1394	7.4	5.6	57	22	1.01	44.7	7.0	9.0	21.9	3.16	G	Avg	VG	VG	G	free of all viruses
8802-24 = 21661	136:38 28:17-20	"	E-ME	1465	9.6	7.3	57	20	1.31	41.3	7.3	9.7	21.9	2.99	G	Avg	VG	P	G	slight HLV
8802-45 = 21662	137:07 4:21-24	"	M	1349	8.7	6.3	58	22	1.05	42.2	6.3	10.0	20.7	3.30	G	Avg	Avg-G	P	G	slight HMV, HLV
8802-48 = 21663	137:10 7:21-24	"	M	1829	10.0	5.6	64	24	0.98	44.0	6.6	9.0	19.6	3.00	G	VG	Avg-G	P	G	slight HLV
8802-68 = 21664	137:30 25:21-24	"	M	1781	8.1	6.8	55	22	1.34	36.2	7.5	12.1	22.4	3.01	VG	Avg	G, mild	VG	G	free of all viruses
8805-40 = 21665	138:45 9:25-28	21497 x 21618M	E-ME	1760	7.8	4.9	61	20	1.03	34.5	8.0	12.0	24.9	3.12	VG (best)	Avg	G-VG	P	G	free of all viruses
8806-17 = 21666	139:15 29:25-28	21497 x 21647 /618 mix	E-ME	1806	5.8	6.5	47	20	0.86	41.8	6.5	12.4	20.2	3.16	VG	Avg	Avg-G	P	G, mild	free of all viruses
61021 21497	19:1-4 237:23-27	Tett., control " "	E	699	5.9	5.5	53	21	0.67	40.3	5.6	11.5	16.9	3.18	no hand sample					ApMV, HMV, HLV

[1] 61021 = Swiss Tettnanger (diploid)
21497 = Tettnanger B (diploid)
21617M = tetr. Ha mf x 21381M (tetraploid)
21618M = " (tetraploid)

[2]E, ME, M = early, med. early, medium
[3]M, C, F, H = myrcene, caryophyllene, farnesene, humulene
[4]Vg, G., Avg, P = very good, good, average, poor
[5]ApMV; HMV, HLV = apple mosaic, hop mosaic, hop latent virus

Table 10: Detailed ELISA tests of triploid Tettnanger Selections for propagation in 1992 (analyses from 2 rhizomes of each hill). Feb. 27-28. 1992.

Accession Number	Location Row:Hill	Pedigree	Viruses[1]					Remarks
			NRSV	ApMV	HMV	HLV	AHLV	
21660	24:17	61021 x 21618	-	-	-	-	-	Sel. 8802-19
	18		-	-	-	-	-	
	19		-	-	-	-	-	
	20		-	-	-	-	-	
21661	28:17	- " -	-	-	-	+	-	Sel. 8802-24
	18		-	-	-	-	-	
	19		no	plant				
	20		-	-	-	+	-	
21662	4:21	- " -	-	-	+	+	-	Sel. 8802-45
	22		-	-	-	-	-	
	23		-	-	-	-	-	
	24		-	-	-	+	-	
21663	7:21	- " -	-	-	-	+	-	Sel. 8802-48
	22		-	-	-	+	-	
	23		-	-	-	-	-	
	24		-	-	-	+	-	
21664	25:21	- " -	-	-	-	-	-	Sel. 8802-68; AB
	22		-	-	-	-	-	
	23		-	-	-	-	-	
	24		-	-	-	-	-	
21665	9:25	21497 x 21618M	-	-	-	-	-	Sel. 8805-40; AB
	26		-	-	-	-	-	
	27		-	-	-	-	-	
	28		-	-	-	-	-	
21666	29:25	21497 x 21617M	-	-	-	-	-	Sel. 8806-17; AB
	26		-	-	-	-	-	
	27		-	-	-	-	-	
	28		-	-	-	-	-	

[1]Prunus necrotic ringspot; Apple mosaic; Hop mosaic; Hop latent; American hop latent.
+ = positive; - = negtive

Table 11. Promising female Saazer-type nursery selections. Corvallis, 1992.

Selection No.	Location Row:Hill	Pedigree[1]	Prefer-ence	Chrom. No.	Matur-ity[2]	Yield	Quality α	Quality ß	Quality ratio	Quality CoH	Quality CoL	Oil	Composition[3] M	Composition[3] C	Composition[3] F	Composition[3] H	H/C	Major hydroc	Remarks
						lbs/A	%	%		%	%	ml/100g	%	%	%	%			
9036-16	1:87	21534x21088M		30	E	1578	4.6	3.1	60	23	42	0.80	26.9	9.5	12.9	32.2	3.37	81.5	
-20	91	•	•		ME	2346	5.7	3.4	63	24	41	0.76	28.8	7.6	14.8	24.4	3.23	75.6	red stem
-36	2:83	•	•?		ME	1493	5.1	3.3	61	20	43	0.51	27.1	8.4	12.6	29.9	3.57	78.0	red stem
-45	92	•	•?	30	E	2005	4.8	3.5	58	25	46	0.89	29.0	8.5	13.1	29.6	3.47	80.2	red stem
9037-03	3:84	21534x21361M	•?	30	ME	1600	7.0	2.7	72	24	40	1.21	46.2	3.8	17.6	13.8	3.64	81.4	red stem
-07	88	•	•?	30	E	1109	8.6	3.6	70	24	43	0.99	39.9	4.5	15.6	16.7	3.70	76.7	red stem
9039-21	5:91	21534x64035M	•		ME	1024	6.2	2.8	69	23	42	0.88	35.7	5.6	21.5	20.2	3.60	83.0	AB
-40	6:86	•	•?		ME	1962	5.2	2.7	65	23	41	0.75	34.7	7.5	13.6	25.9	3.46	81.7	
-45	91	•	•		ME	2432	5.3	3.4	60	21	45	0.90	21.4	9.7	13.3	34.5	3.56	78.9	
9040-29	8:80	21534x64037M	•?	30	ME	1877	5.0	3.4	59	20	37	0.84	47.3	4.6	11.5	16.5	3.57	79.9	red stem
-36	87	•	•		ME	1621	5.8	3.8	60	22	43	0.79	24.5	7.2	23.3	25.7	3.56	80.7	
-38	89	•	•?		E	1792	8.1	3.5	70	25	43	1.19	51.0	4.4	12.2	16.4	3.75	84.0	AB, red stem
-43	94	•	•	30	ME	1066	4.9	4.6	51	21	43	0.69	27.0	9.0	13.3	31.7	3.50	81.0	red stem
9041-27	11:78	21521x64035M	•?		ME	1621	6.5	2.3	74	20	44	0.76	36.7	6.4	12.0	24.1	3.75	79.2	red stem
-34	85	•	•?		E	1322	7.1	2.9	71	19	36	0.72	36.6	6.5	14.6	23.5	3.62	81.2	red stem
-52	12:79	•	•		ME	1664	8.6	3.9	68	17	39	0.93	37.5	4.8	20.1	18.1	3.73	80.5	
-65	92	•	•?		E	1706	5.0	4.0	56	21	40	0.75	30.1	6.6	20.0	23.6	3.59	80.3	red stem
-86	13:89	•	•		E	1962	6.8	4.1	62	16	40	0.74	35.0	6.0	16.5	21.7	3.61	79.2	red stem
-101	14:80	•	•		ME	1834	8.0	4.8	62	22	45	0.98	38.4	6.2	15.2	22.0	3.55	81.8	
-106	85	•	•		ME	1109	6.0	4.1	60	20	39	0.56	37.5	4.9	19.4	18.2	3.75	80.8	red stem
9042-03	14:93	21522x64035M	•		ME	1237	6.3	3.1	67	21	42	0.94	22.8	7.4	22.8	26.9	3.64	79.9	
-10	15:76	•	•		E	1578	6.9	3.9	64	18	39	0.69	29.9	6.3	19.9	23.5	3.75	79.6	red stem
-12	78	•	•		E	2133	6.8	3.6	66	21	44	1.02	40.2	4.8	13.4	17.8	3.74	76.2	red stem
-17	83	•	•		E	1536	6.7	3.4	66	19	40	0.65	38.9	5.2	15.7	19.2	3.70	79.0	red stem
-19	85	•	•?		E	2005	7.2	2.7	73	20	41	0.88	38.5	6.1	16.1	22.5	3.68	83.2	red stem
-22	88	•	•?		ME	1408	7.4	3.4	69	19	40	0.64	48.8	3.9	9.4	15.6	3.98	77.7	
-24	90	•	•		E	1493	5.3	3.7	59	19	36	0.82	33.6	5.8	16.6	21.4	3.72	77.4	red stem
-34	16:76	•	•?		E	1365	6.0	2.5	71	22	42	0.73	36.0	6.1	14.1	22.7	3.72	78.9	red stem
9043-01	16:77	21522x21361M	?		ME	1578	8.3	3.6	70	23	44	0.97	50.2	3.4	14.8	13.8	4.12	82.2	red stem
-23	17:75	•	?		E	1920	7.6	2.7	73	17	36	0.81	41.2	3.3	14.0	13.9	4.19	72.4	
-30	82	•			ME	1450	9.9	3.7	73	24	45	1.02	47.8	3.5	12.2	14.1	4.01	77.6	
-39	91	•	?		ME	2133	8.3	3.8	69	24	46	1.38	56.0	2.8	11.9	10.5	3.74	81.2	rich, nice cone
-52	18:80	•	•?		ME	3242	10.1	3.5	74	24	47	1.08	41.1	5.7	14.6	22.0	3.85	83.4	
9044-39	20:67	21522x21429M	?		ME	1280	5.0	2.8	64	21	44	0.34	19.9	9.5	12.1	29.8	3.14	71.3	red stem, top crop
9045-30	21:82	21522x21617M	•?		E	2218	5.5	5.0	52	22	44	1.17	49.0	6.1	10.4	17.3	2.84	82.8	
9046-37	25:67	21522x21618M	•?		E	1237	5.9	2.1	74	26	49	0.81	38.1	5.1	11.1	18.7	3.69	73.0	
-53	83	•	•		ME	1237	6.0	3.9	60	21	43	1.12	26.4	6.7	23.8	23.2	3.45	80.1	compact cones
-65	95	•	•		ME	1109	7.4	5.6	57	22	38	1.49	45.1	4.6	9.3	16.7	3.67	75.7	
-92	26:89	•	•?		E	1493	9.1	6.3	59	22	37	1.31	55.0	3.7	11.3	13.0	3.51	83.0	
-102	27:66	•	•		E	1450	7.8	5.6	58	21	36	2.12	53.1	4.9	8.2	18.3	3.73	84.5	
21538	14:13-16	Osvald 72C v.f.			E	150	3.4	2.8	55	21	42	0.45	46.8	4.5	11.6	16.2	3.59	79.1	Saazer, control
21015	8:1-4	Tettnanger			E	65	3.7	2.9	56	18	43	0.33	26.7	7.5	12.8	27.1	3.62	74.1	control

[1]21534 = tetraploid Saazer
21088M = Yugoslavian sel. 5/9
64035M = Zattler seedling
64037M = •

[2]E; ME = early, medium early

[3]M, C, F, H = myrcene, caryophyllene, farnesene, humulene

Table 12.

Promising female Saazer-type nursery selections
1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Remain (July 26, 1993) n = 26

Accession or Nursery Number	Identification	Location	T Y P	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% ß	Alpha Ratio	HSI	Coα	Coß	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
9039-021		005:91	B	8/28/92	1024	8.05	6.2	2.8	69	0.27	22	40	0.41	77	0.88	0.00	35.7	5.6	21.5	20.2	3.60	1486
9040-029		008:80	B	8/28/92	1877	9.90	5.0	3.4	59	0.25	18	35	0.47	68	0.84	0.00	47.3	4.6	11.5	16.5	3.57	1493
9040-036		008:87	B	8/28/92	1621	10.20	5.8	3.8	60	0.25	21	41	0.50	62	0.79	0.34	24.5	7.2	23.3	25.7	3.56	1495
9040-043		008:94	B	8/28/92	1066	11.10	4.9	4.6	51	0.28	24	40	0.51	64	0.69	0.00	27.0	9.0	13.3	31.7	3.50	1481
9041-027		011:78	B	8/28/92	1621	9.95	6.5	2.3	74	0.26	20	44	0.37	85	0.76	0.00	36.7	6.4	12.0	24.1	3.75	1483
9041-034		011:85	B	8/27/92	1322	10.30	7.1	2.9	71	0.26	19	36	0.35	84	0.72	0.00	36.6	6.5	14.6	23.5	3.62	986
9041-052		012:79	B	8/28/92	1664	9.30	8.6	3.9	68	0.25	17	39	0.31	89	0.93	0.00	37.5	4.8	20.1	18.1	3.73	1485
9041-065		012:92	B	8/28/92	1706	8.90	5.0	4.0	56	0.26	21	40	0.51	66	0.75	0.00	30.1	6.6	20.0	23.6	3.59	1497
9041-086		013:89	B	8/31/92	1962	6.60	6.8	4.1	62	0.24	16	40	0.40	78	0.74	0.00	35.0	6.0	16.5	21.7	3.61	1527
9041-101		014:80	B	8/31/92	1834	9.35	8.0	4.8	62	0.23	22	45	0.43	69	0.98	0.00	38.4	6.2	15.2	22.0	3.55	1272
9041-106		014:85	B	8/31/92	1109	8.30	6.0	4.1	60	0.26	20	39	0.37	80	0.56	0.00	37.5	4.9	19.4	18.2	3.75	1301
9042-003		014:93	B	8/31/92	1237	8.85	6.3	3.1	67	0.28	21	42	0.44	74	0.94	0.00	22.8	7.4	22.8	26.9	3.64	1545
9042-010		015:76	B	8/31/92	1578	9.90	6.9	3.9	64	0.25	18	39	0.45	64	0.69	0.00	29.9	6.3	19.9	23.5	3.75	1549
9042-012		015:78	B	8/31/92	2133	8.25	6.8	3.6	66	0.25	21	44	0.41	80	1.02	0.00	40.2	4.8	13.4	17.8	3.74	1537
9042-017		015:83	B	9/03/92	1536	9.95	6.7	3.4	66	0.26	19	40	0.40	78	0.65	0.00	38.9	5.2	15.7	19.2	3.70	1369
9042-019		015:85	B	8/31/92	2005	7.45	7.2	2.7	73	0.28	20	41	0.42	76	0.88	0.00	38.5	6.1	16.1	22.5	3.68	1539
9042-022		015:88	B	8/31/92	1408	8.10	7.4	3.4	69	0.27	19	40	0.39	84	0.64	0.00	48.8	3.9	9.4	15.6	3.98	1294
9042-024		015:90	B	8/31/92	1493	9.05	5.3	3.7	59	0.26	19	36	0.42	81	0.82	0.00	33.6	5.8	16.6	21.4	3.72	1533
9042-034		016:76	B	8/31/92	1365	11.20	6.0	2.5	71	0.29	22	42	0.43	75	0.73	0.00	36.0	6.1	14.1	22.7	3.72	1554
9043-001		016:77	B	8/31/92	1578	9.90	8.3	3.6	70	0.27	23	44	0.44	72	0.97	0.00	50.2	3.4	14.8	13.8	4.12	1548
9043-023		017:75	B	8/31/92	1920	9.30	7.6	2.7	73	0.30	17	36	0.37	85	0.81	0.00	41.2	3.3	14.0	13.9	4.19	1557
9043-030		017:82	B	8/31/92	1450	8.45	9.9	3.7	73	0.27	24	45	0.49	68	1.02	0.00	47.8	3.5	12.2	14.1	4.01	1559
9043-039		017:91	B	8/31/92	2133	9.95	8.3	3.8	69	0.27	24	46	0.46	75	1.38	0.00	56.0	2.8	11.9	10.5	3.74	1543
9043-052		018:80	B	8/31/92	3242	9.20	10.1	3.5	74	0.26	24	47	0.39	84	1.08	0.00	41.1	5.7	14.6	22.0	3.85	1541
9044-039		020:67	B	9/01/92	1280	8.00	5.0	2.8	64	0.27	21	44	0.44	75	0.34	0.00	19.9	9.5	12.1	29.8	3.14	1564
9046-102		027:66	B	9/04/92	1450	5.95	7.8	5.6	58	0.26	20	34	0.62	56	2.12	0.80	53.1	4.9	8.2	18.3	3.73	1643

Note: all had substantial amounts of farnesene, all were planted in the new Peoria seedless yard in June 1993 from potted greenhouse-grown plants.

Table 13: Promising low cohumulone, high humulene seedling selections from 1990 Saazer crosses with little or no farnesene. (potentially Hallertauer m.f. types) Corvallis, 1992.

Selection No.	Location Row:Hill	Pedigree[1]	Chrom. No.	Matur-ity[2]	Yield	Quality						Oil Composition[2]					Major hydroc.	Remarks
						α	ß	ratio	CoH	CoL	oil	M	C	F	H	H/C		
					lbs/A	%	%		%	%	ml/100g	%	%	%	%			
9041-01	10:76	21521 x 64035M		ME	1536	6.9	3.4	67	19	51	0.59	27.3	10.4	1.1	37.1	3.56	75.9	
-09	84	"		E	1109	7.0	2.6	73	22	46	1.03	32.1	9.4	0.4	34.7	3.67	76.6	red stem
-24	11:75	"		E	1621	7.6	2.7	74	19	42	0.64	24.3	11.2	0.1	41.2	3.69	76.8	red stem
-36	87	"		ME	1408	5.7	3.9	60	19	41	0.74	23.3	22.3	0.5	40.0	1.79	86.1	red stem, high C
-42	93	"		ME	1237	5.8	4.2	58	23	47	0.87	27.3	11.3	1.7	40.1	3.54	80.4	red stem
-75	13:78	"		ME	1621	6.6	4.1	61	20	43	1.28	38.7	8.3	1.6	29.5	3.54	78.1	red stem
-85	88	"		E	1493	4.7	3.6	57	20	42	0.53	30.4	9.9	2.5	34.7	3.49	77.5	red stem
-98	14:77	"		E	1600	7.2	2.8	72	21	43	1.16	39.0	8.9	0.3	33.2	3.75	81.4	red stem
-110	89	"		E	2005	6.1	2.4	72	23	46	0.52	49.5	7.7	0.3	26.3	3.42	83.8	red stem
9042-13	15:79	21522 x 64035MM		ME	2218	6.7	3.8	63	24	44	0.88	35.0	8.6	2.0	31.7	3.70	77.3	red stem
-20	86	"		E	1621	5.0	3.9	57	21	40	0.65	25.0	10.5	0.4	38.7	3.67	74.6	red stem
-25	91	"		E	2730	6.5	2.7	70	21	43	0.83	33.6	9.4	1.5	34.5	3.69	79.0	red stem
-29	95	"		ME	1920	6.9	3.1	69	24	45	0.68	20.8	11.1	1.6	40.9	3.68	74.4	red stem
9043-02	16:78	21522 x 21361M		E	1706	7.2	3.2	70	25	48	0.84	57.8	6.4	2.5	21.2	3.32	87.9	high M
-05	81	"		E	1493	8.1	3.5	70	22	46	1.19	45.4	6.7	1.3	24.7	3.69	78.1	red stem
-09	85	"		E	1195	7.6	3.3	70	21	44	1.40	61.7	4.6	3.0	16.7	3.65	86.0	high M
-14	90	"		E	2005	7.7	3.0	72	25	48	1.10	51.3	4.7	4.0	17.5	3.73	77.5	
-24	17:76	"		E	1280	8.5	3.4	72	25	48	1.01	48.0	6.0	4.2	22.6	3.79	80.8	
-26	78	"		E	1920	5.0	2.5	67	24	47	0.88	34.7	7.8	2.8	29.1	3.73	74.4	red stem
-36	88	"		E	1493	8.7	3.3	73	25	47	0.73	51.5	4.9	4.3	19.3	3.97	80.0	red stem
-37	89	"		E	2773	7.1	3.1	70	24	48	1.07	44.7	6.5	2.0	23.9	3.69	77.1	
-38	90	"		E	2176	9.1	3.9	70	25	47	1.04	54.1	4.2	5.5	16.3	3.90	80.1	
9046-20	24:83	21522 x 21618M		ME	1066	6.9	4.3	61	17	45	1.63	61.2	4.5	0.3	16.9	3.77	82.9	high M
-36	25:66	"		E	1024	7.2	6.4	53	24	47	1.42	41.6	8.7	0.1	31.5	3.64	81.9	very early
-85	26:82	"		ME	1152	7.6	5.2	59	22	38	1.53	42.2	7.8	0.0	28.4	3.65	78.4	compact cone
-96	93	"		E	1536	6.2	3.4	65	22	39	1.31	40.5	9.0	0.4	31.8	3.55	81.7	very early
-103	27:67	"		E	938	7.7	4.4	64	21	48	1.74	50.6	6.1	0.0	22.7	3.71	79.4	very early
-104	68	"		E	1493	8.7	5.1	63	25	43	1.54	46.3	7.1	0.2	25.8	3.66	79.4	very early
-107	71	"		E	2133	8.0	3.2	71	26	45	1.32	34.8	12.2	0.2	32.6	2.67	79.8	compact cone
9048-46	28:84	8802-35 x OP		E	811	7.0	4.3	62	25	53	1.56	44.6	7.6	0.2	26.3	3.45	78.7	

[1]21534 = tetraploid Saazer
21088 = Yugoslavian Sel. 5/9
64035M = Zattler Seedling
64037M = - " -
OP = open pollinated

[2]E; ME = early; medium early
[3]M, C, F, H = myrcene, caryophyllene, farnesene, humulene

Table 14. Promising low alpha/high beta selections and control from the 1989 Nursery grown at two locations in 1991. Corvallis. Selections made in 1992.

Selection Number	Location Row:Hill	Pedigree[1]	Maturity[2]	1990 Yield[3]	1990 Quality α	1990 Quality ß	1990 Quality ratio	1990 Quality CoH	HSI_6	1991 Yield	1991 Quality α	1991 Quality ß	1991 Quality ratio	1991 Quality CoH	1991 Quality Col	HSI_6	Storage[4]
				lb/A	%	%		%		lbs/A	%	%		%	%		
8808-09	139:38	21120 x 19046M	L	1408	0.5	8.1	5	53	1.63	1706	0.4	7.7	5	60	36		poor
	218:17-21									100e	0.1	9.3	1	29	44		
-11	139:40	"	L	1792	0.3	7.6	4	27	1.49	1408	1.0	8.0	11	42	43		poor
-22	139:51	"	L	1792	0.4	7.5	5	50	1.55	1408	0.6	6.6	9	54	46		poor
-46	140:23	"	L	1194	0.0	8.8	0	41	1.93	1706	0.7	8.5	7	69	39		poor
-65	140:42	"	ME	2560	1.2	8.7	12	38	1.70	1962	1.1	8.5	12	41	54		poor
	231:17-21									100e	0.8	7.7	9	29	56		
-80	141:05	"	L	1706	0.8	6.9	10	44	1.48	2304	1.2	9.6	11	49	44		poor
-134	142:07	"	L	1621	0.1	6.3	2	41	1.91	2602	0.0	10.8	0	61	39	1.62	poor
-136	142:09	"	ML	1200e	0.9	7.5	11	37	1.14	2218	1.1	9.5	11	35	51		poor
	211:23-27									100e	1.4	10.6	11	31	52		
-142	142:15	"	E	1400e	0.4	9.7	4	43	1.44	2004	0.0	10.8	0	72	45	2.18	poor
	212:23-27									200e	0.0	12.9	0	35	46		
8809-56	143:37	21120 x 21119M	L	1024	0.4	7.5	5	35	1.85	1834	1.4	10.8	12	37	55	1.09	poor
	216:23-27									200e	1.1	12.2	8	31	56		
-63	143:44	"	L	1300e	0.8	7.1	10	53	1.66	1280	0.8	6.9	11	61	48		poor
	217:23-27									400e	0.4	8.4	5	38	46		
-71	143:52	"	L	1200e	0.1	6.9	2	52	1.41	1664	0.2	7.2	2	53	48		poor
	218:23-27									200e	0.0	9.5	0	21	46		
-92	144:21	"	L	1200e	2.1	8.0	21	32	0.52	1536	1.8	7.0	20	32	47		good
-105	144:34	"	L	1200e	0.0	8.9	0	43	1.28	2261	0.4	7.5	5	58	42		poor
	222:23-27									100e	0.1	8.1	1	28	44		
21120	1:47-48	19005 x 19046M	ML	1216	1.6	5.8	21	40	1.36	1130	1.1	7.9	12	50	48		poor
	240:17-21	- " -		200e	1.0	6.3	13	52	1.12	683	1.0	13.6	7	65	45		poor

[1]21120 = (LGrape Seedlg x Fu-Fu Seedlg) x L Cluster Seedlg x - Fu Seedlg; control
21119 = brother of 21120
[2]E, ME, ML, L = early, med. early, med. late, late
[3]e = estimate; 5 cone analysis for quality

Table 15: Low alpha - high beta special aroma selections in the seedless yard, Corvallis, 1992 (1st year on string).

Selection No.	Location Row:Hill	Pedigree[1]	Maturity	Yield	Quality α	ß	ratio	CoH	CoL	HSI fresh	Remarks
				lb/A	%	%		%	%		
8808-03	216:17-21	21120 x 19046M	L	400e	1.0	8.9	10	22	43	0.30	top crop
-09	218: - " -	- " -	L	299	3.5	8.2	30	30	40	0.28	top crop
-25	223: - " -	- " -	L	600e	0.9	6.0	13	30	47	0.32	
-34	225: - " -	- " -	L	800e	0.4	5.7	6	28	42	0.27	red stem
-46	229: - " -	- " -	L	600e	0.2	3.4	5	0	33	0.42	
-55	230: - " -	- " -	L	800e	1.2	8.8	12	38	51	0.27	red stem
-65	231: - " -	- " -	L	800e							sample lost
-74	233: - " -	- " -	L	100e	0.2	6.2	3	0	50	0.39	
-136	211: 23-27	- " -	L	200e	0.0	6.0	0	26	51	0.54	
-142	212: - " -	- " -	L	400e	0.0	11.3	0	0	47	0.29	compact cones
8809-22	213: - " -	21120 x 21119M	L	200e	0.2	6.5	4	25	48	0.43	
-56	216: - " -	- " -	L	307	1.8	11.0	14	32	56	0.21	oil: 1.06 ml/100g; high F
-63	217: - " -	- " -	L	400e	0.0	6.5	0	0	43	0.78	compact cones, rst
-71	218: - " -	- " -	L	222	1.1	7.1	14	34	48	0.28	oil: 1.04 ml/100g
-105	222: - " -	- " -	L	587	9.0	4.2	6.8	34	58	0.27	red stem, sample mixup

[1]21120 = 19105 x 19046M
19046M = LCS x FuS
21119M = 19105 x 19046M (brother of 21120)
19105 = LGpS x Fu-FuS

Table 16: ELISA analysis of zero-alpha selections and the ornamental Blue Northern Brewer. Jan. 24, 1992.

Accesion or Sel. No.	Location Row:Hill	Pedigree[1]	Viruses[2] NRSV	ApMV	HMV	HLV	AHLV	Remarks
8808-9	139:38	21120 x 19046M	-	-	-	-	-	red stem
-11	139:40	- " -	-	-	-	-	-	red stem, bronze leaves
-22	139:51	- " -	-	-	-	-	-	
-46	140:23	- " -	-	-	-	-	-	
-65	140:42	- " -	-	-	-	+	-	red stem
-80	141:05	- " -	-	-	-	+	-	
-134	142:07	- " -	-	-	-	-	-	
-136	142:09	- " -	-	-	-	-	-	
-142	142:15	- " -	-	-	-	-	-	
8809-56	143:37	21120 x 21119M	-	-	-	-	-	high beta
-63	143:44	- " -	-	-	-	-	-	red stem
-71	143:52	- " -	-	-	-	-	-	red stem
-92	144:21	- " -	-	-	-	-	-	red stem, bronze leaves
-105	144:34	- " -	-	-	-	-	+	
21120	1:47	(LGpSxFu-FuS)xLCS-FuS	-	-	+	+	+	
	1:48	- " -	+?	-	+	+	-	
21079	9:09	Blue Northern Brewer	-	-	+	+	-	
	9:10	- " -	-	-	+	-	-	
	9:11	- " -	-	-	+	-	-	
	9:12	- " -	-	-	-	-	-	
	8:51	- " -	-	-	-	-	-	
	8:52	- " -	-	-	+	+	-	

[1](LGpSxFu-FuS)xLCS-FuS
[2]Prunus necrotic ringspot; Apple mosaic; Hop mosaic; Hop latent; American hop latent
+ = positive; - = negative

Table 17 Agronomic and quality data of North American female hops grown in 2 or 4-hill plots at Corvallis, OR in 1992. Pruned: March 11-12; trained March 12-13.

Accession Number	Location Row:Hill	Name or Pedigree	Harvest Date	Yield[1]	Quality α	ß	ratio	CoH	CoL	Oil	Remarks[2]
			Aug	lb/A	%	%		%	%	ml/100 g	
21596	2:39-40	Utah 11	9/8	384	3.2	3.2	50	70	88		DM/crown; fluffy cones
21599	3: "	Utah 12	9/8	100e	3.2	2.4	57	74	88		compact cone, late
21600	4: "	Utah 13	9/8	427	2.5	1.8	57	76	88		
21557	9: "	Missouri 3	9/8	1800e	1.3	1.5	46	59	83		VL, immature, compact con
21565	14: "	Iowa 5	9/8	704	1.4	2.6	34	53	75		⚥, very late
21578	21: "	Montana 6	17	107	4.0	3.4	54	52	84	0.45	compact cones
21580	22: "	Montana 8	17	171	6.4	3.7	64	48	81		compact cones
21583	24: "	Montana 10	17	320	5.0	2.7	65	67	84		compact cones
21586	25: "	Montana 12	21	341	4.8	6.6	42	60	79	1.14	⚥, compact cones
21593	26: "	Montana 19	21	85	3.7	2.3	62	66	83	0.26	
21594	27: "	Montana 20	21	320	5.6	4.4	56	59	80		⚥, red stem, compact cones
21602	30: "	Montana 24	21	341	4.6	5.9	44	63	79		⚥ in 1992
21605	31: "	Minnesota 1	21	277	1.7	3.9	30	54	74	0.34	late
58016	1:41-44	Utah 526-5	9/8	843	3.0	1.5	66	25	48		v. low CoH
60020	3: "	New Mexico 2-4	21	412	3.0	4.0	43	49	68		
60021	4: "	New Mexico 3-1	17	299	4.4	1.9	70	52	79	0.22	ruffled cones
60024	6: "	Colo 2-1	17	128	4.2	3.3	56	46	80	0.45	large ruffled cones
60027	8: "	Colo 2-2	9/8	491	1.5	2.5	37	51	71		ruffled cones
60029	10: "	Colo 3-1	9/8	512	7.6	5.4	58	66	82		⚥
60032	11: "	Colo 5-1	21	298	2.4	2.1	54	46	66	0.15	⚥
60037	12: "	Wyoming 2-1	9/8	1600	7.5	4.7	62	40	65	0.71	late, nice compact c.
60038	13: "	Wyoming 3-1	21	213	2.4	4.7	34	66	80		
60015	15: "	Arizona 1-4	9/8	448	3.7	4.1	48	66	81		late
60016	16: "	New Mexico 1-3	17	427	2.7	2.6	51	59	90		very early
60025	17: "	Colo 1-3	21	725	5.1	2.3	69	53	78	0.39	⚥, very early
60033	19: "	Colo 6-1	21	651	1.7	2.9	38	69	86		⚥, early
60035	20: "	Colo 7-2	9/8	149	3.2	3.3	49	50	73		early, red stem
21563	27: "	Iowa 3	9/8	245	1.4	2.4	38	63	81		
21566	28: "	Iowa 6	9/8	277	4.0	3.9	51	58	78		very late
21567	29: "	Iowa 7	9/8	754	3.3	4.5	42	81	88		very late
21576	33: "	Montana 4	17	128	4.0	4.1	49	47	97		
21579	34: "	Montana 7	17	75	3.3	3.5	49	58	81		
21581	35: "	Montana 9	21	256	3.3	3.3	50	84	91		
21584	36: "	Iowa 8	9/8	100e	3.4	1.8	66	62	83		⚥, very early, large cone
21585	37: "	Montana 11	21	53	4.3	2.5	63	66	82		
21590	41: "	Montana 16	17	117	4.7	2.6	64	57	86	0.72	
21591	42: "	Montana 17	17	64	1.6	3.6	31	34	82		
21592	43: "	Montana 18	17	100e	3.6	3.8	49	59	79	1.11	

[1]Calculated from 2 or 4-hill plot, respectively (green wt/plot x 0.21329 or 0.10665)
e = visual estimate (analysis on 5-cone hand sample)
[2]DM = downy mildew

Table 18. Native North American male hops grown in 2- or 4-hill plots at Corvallis, OR in 1992.
Pruned: March 11-12; trained: May 12-13.

Accession Number	Location Row:Hill	Name or Pedigree	Arm length	Laterals[1]	Pollen shedding[1]	Maturity[2]	Quality[3] α	ß	ratio	CoH	CoL
			inches				%	%		%	%
21595M	1:39-40	Montana 21	6-12	3	2	E	19.1	45.3	30	57	72
21550M	5: "	Nebraska 2	6	3	3	E	28.4	36.7	44	49	73
21569M	15: "	No. Dakota 2	6	1	1	ME	29.8	43.2	41	44	65
21570M	16: "	No. Dakota 3	4	3	2	E	28.6	43.6	40	47	71
21572M	17: "	No. Dakota 5	6	3	1	E	29.0	36.3	44	44	59
21573M	18: "	No. Dakota 6	6	3	2	ME	36.5	37.4	49	37	61
21575M	19: "	No. Dakota 8	4	4	4	ME	30.3	35.3	46	43	67
21577M	20: "	Montana 5	4	4	4	ME	14.8	44.6	25	34	74
21597M	28: "	Montana 21	6	3	3	E	12.7	42.0	23	43	67
21601M	29: "	Montana 23	6-12	3	2	ME	21.1	48.8	30	41	72
60013M	2:41-44	Arizona 1-2	6-10	2	1	E	34.5	28.2	55	62	76
60026M	7: "	Colo 2-1	6	2	1	E	36.4	35.4	51	59	77
60028M	9: "	Colo 2-3	4	4	4	E	45.4	29.1	61	53	70
21117M	14: "	Native Wisconsin	20	1	1	M	31.7	40.0	44	31	59
21571M	31: "	No. Dakota 4	6	3	1	ME	29.3	44.4	40	44	66
21574M	32: "	No. Dakota 7	4	3	2	E	28.9	36.4	44	47	40
21588M	39: "	Montana 14	6	3	1	ME	20.9	44.2	32	40	67
21589M	40: "	Montana 15	6	3	2	E	14.9	53.9	22	65	70

[1]Visual rating 1-4 (1 = best)
[2]E, ME, M = early, medium early, medium
[3]Lupulin analysis

Table 19: Female Wild American selections from the 1990 Nursery. Corvallis, 1991-92.

Selection Number	Location Row:Hill	Pedigree	Maturity[1]	1991 Yield[2]	1991 α	1991 ß	1991 ratio	1991 CoH	1991 CoL	1992 Yield[2]	1992 α	1992 ß	1992 ratio	1992 CoH	1992 CoL	Remarks
				lbs/A	%	%		%	%	lbs/A	%	%		%	%	
8901-02	147:02	Souris-2	E	426	4.1	3.1	57	61	82	128	4.1	2.5	61	58	82	compact cones, ♀
-16	16	Souris-16	E	50e	4.7	2.9	62	59	79	200e	4.7	2.8	63	61	80	♀, Idaho, mite res.
-22	22	Souris-22	E	200e	5.2	3.2	61	60	79	not harvested						
-25	25	Souris-25	E	400e	4.6	2.4	65	60	78	400e	5.1	2.6	66	59	44	♀
-48	48	Souris-48	E	150e	5.5	2.7	67	59	79	300e	4.3	2.5	63	56	76	♀
8913-01	148:46	Burlington A-1	E	171	1.9	2.4	43	61	80	171	2.3	2.0	53	60	82	compact cones
8917-05	148-51	Burlington A-5	E	100e	1.8	1.8	49	68	?	800e	2.3	2.0	53	65	84	♀
-07	149:02	Burlington B-7	E	512	2.5	1.5	62	67	85	500e	3.8	2.3	62	62	84	♀, Idaho, mite res.
8918-12	149:24	Burlington C-12	E	213	3.4	2.6	56	58	78	470	3.2	2.7	55	58	77	
-41	150:02	Burlington C-41	E	427	3.0	2.9	51	54	73	200e	3.0	2.7	53	54	73	compact c., ♀, ID, mite res.
8921-03	150:10	Burlington D-3	E	640	3.0	1.8	63	59	80	811	3.6	2.2	62	58	92	
8923-02	150:12	Mohall A-2	E	300e	4.2	2.3	65	69	88	489	4.3	2.3	65	67	86	♀, heavily seeded
-09	19	Mohall A-9	E	213	5.5	2.6	68	62	84	128	4.5	2.4	65	62	82	compact cones
-13	23	Mohall A-13	E	384	5.8	2.4	71	70	87	683	4.9	2.1	70	70	86	♀, compact c., Idaho
8924-01	150:27	Mohall B-1	E	853	2.5	3.0	45	65	84	2005	2.6	3.4	43	65	85	mite resistant
-03	29	Mohall B-3	E	1024	3.9	3.5	53	65	83	1280	4.5	3.7	55	66	83	
-05	31	Mohall B-5	E	640	5.1	2.2	69	58	78	1450	6.1	2.6	70	55	76	to Idaho, mite res.
8936-10	150:46	Northgate B-10	E	200e	5.0	4.5	53	67	83	400e	4.9	4.3	53	67	82	
-22	151:07	Northgate B-22	E	725	6.8	3.7	65	81	93	300e	5.9	3.8	61	76	91	♀
-28	13	Northgate B-28	E	200e	4.7	6.3	43	69	89	341	4.0	5.8	40	70	89	♀, small compact c.
8940-01	151:18	Oxbow A-1	E	469	2.3	3.2	42	61	81	512	3.0	2.7	53	60	81	
-10	:27	- " - A-10	E	200e	2.9	2.7	52	55	74	not harvested						to Idaho; ruffled c.
8943-10	152:10	Oxbow D-10	E	640	2.7	2.8	50	55	75	512	2.0	2.0	49	54	74	
8949-06	153:06	Indian Head A-6	E	150e	2.1	1.9	52	70	89	400e	1.6	1.9	45	65	88	♀, deep lobes
8950-04	153:16	Indian Head B-4	E	50e	2.4	1.7	58	71	99	640	3.0	1.3	70	73	90	♀, compact cones
8951-02	153:19	Indian Head C-2	E	50e	3.7	2.8	56	71	88	600e	2.3	0.9	73	69	94	♀
-05	22	Indian Head C-5	E	150e	3.0	3.6	45	63	85	500e	2.4	2.3	51	62	85	♀, compact cones

[1]E = early
[2]calculated from single plant; e = estimate

Table 20: Male Wild American Selections from the 1990 Nursery. Corvallis, 1991-92.

Selection Number	Location Row:Hill	Pedigree	Maturity[1]	1991 α	1991 ß	1991 ratio	1991 CoH	1991 CoL	1992 α	1992 ß	1992 ratio	1992 CoH	1992 CoL	Remarks[2]
				%	%		%	%	%	%		%	%	
8901-11M	147:11	Souris-11	E	28.0	31.5	47	46	59						to Idaho, mite res.
-34M	34	Souris-34	L	25.6	32.6	44	55	69	33.5	40.7	45	44	67	male + female fertile ⚥
-59M	148:08	Souris-59	M	24.3	34.9	41	57	69	33.8	36.9	48	47	62	male + female fertile ⚥
-73M	22	Souris-73	ME	21.0	32.0	40	60	71	39.3	37.9	51	47	67	male + female fertile ⚥
-81M	30	Souris-81		24.0	36.8	39	49	65	24.7	29.4	46	44	65	
8917-06M	149:01	Burlington B-6		23.0	42.2	35	61	69						to Idaho, mite res.
8918-30M	149:42	Burlington C-20		25.7	41.6	38	37	63	16.8	49.3	25	45	67	
-39M	51	Burlington C-39		21.5	40.4	35	62	66	27.0	39.7	41	45	63	
8923-05M	150:15	Mohall A-5	E	26.4	28.9	48	55	68	39.5	31.6	56	47	70	to Idaho, mite res.
-06M	16	Mohall A-6												to Idaho, mite res.
-11M	21	Mohall A-11		42.6	33.5	56	57	75						to Idaho, mite res.
8924-07M	150:33	Mohall B-7	L	20.6	45.2	31	55	72						to Idaho, mite res.
-08M	34	Mohall B-8	L	20.2	35.2	36	58	67	25.5	42.4	38	44	66	
-09M	35	Mohall B-9		25.5	30.2	46	53	63	36.4	35.2	51	42	61	
8936-05M	150:41	Northgate B-5	E	21.3	34.1	38	64	74	33.9	36.9	48	54	74	
-18M	151:03	Northgate B-18	E	19.8	37.1	35	68	78	25.9	35.8	42	54	75	
8940-15M	151:32	Oxbow A-15	E	18.6	45.3	29	77	64	24.4	49.9	33	46	63	to Idaho, mite res.
8941-05M	151:38	OxbowB-5		14.3	29.0	33	47	56	24.3	40.9	37	45	62	to Idaho, mite res.
-07M	40	Oxbow B-7		21.4	53.5	29	49	58	19.7	53.5	27	40	60	to Idaho, mite res.
8946-05M	152:43	Midale-5		29.5	43.8	40	65	79	31.9	43.6	42	54	77	male + female fertile ⚥

[1]E, ME, M, L = early, medium early, medium, late
[2]all male unless indicated differently

Table 21 :Summary of agronomic and quality data of female Wild American hops grown in the 1991 Nursery, Corvallis, in 1992.

Cross Number	Collection site	No. analyzed	Maturity[1]	Avg. yield[2]	Average α	Average β	α-range	α-ratio	CoH	CoL	Oil	Composition[3] M	C	F	H	H/C	Major hydroc.
				lb/A	%	%			%	%	ml/100 g	%	%	%	%		%
9001	Logan W-1E	6	early	457	3.3	2.5	2.7-4.2	57	69	86	0.55	70	2	trace	2	1.11	74
9002	-2E	13	"	456	3.4	2.6	2.6-4.4	57	60	80	0.39	56	6	"	2	0.57	64
9003	-3E	10	"	458	3.1	2.7	1.4-4.3	54	68	86	0.50	66	3	"	3	1.41	72
9004	-4E	8	"	370	2.6	1.7	1.7-4.2	60	61	80	0.37	61	4	"	3	1.03	68
9005	Minot E-1S	14	"	415	3.2	1.8	1.2-4.4	63	61	80	0.42	63	6	"	2	0.39	71
9006	-2S	6	"	373	3.5	2.9	2.9-4.1	55	48	72	0.82	69	5	"	1	0.35	75
9007	-3S	11	"	376	3.4	3.1	1.8-4.7	53	52	73	0.46	55	6	"	7	0.96	68
9008	-4S	8	"	339	3.5	3.2	1.7-6.0	50	58	80	0.59	66	4	"	2	0.64	72
9009	-5S	4	"	335	2.3	1.4	1.3-3.9	62	63	83	0.23	50	12	"	2	0.39	64
9010	Minot W-1	18	"	454	2.8	2.5	1.8-4.7	52	67	85	0.53	58	2	"	3	1.32	63
9011	-2	14	"	479	2.0	1.6	1.2-2.9	57	73	87	0.47	60	1	"	3	2.54	64
9012	Burlington N-1	5	"	424	3.2	2.6	2.7-3.7	56	63	82	not yet analyzed						
9013	-2	7	"	543	2.8	3.0	2.4-3.9	48	61	82	0.67	67	5	"	2	0.30	74
9014	-3	11	"	477	2.3	2.5	1.3-3.1	48	65	84	0.36	62	8	"	1	0.27	71
9015	White Earth S-1	1	"	300e	2.6	1.9		58	55	72	5-cones: no oil sample						
9016	- 2	6	"	473	3.6	2.6	2.5-4.4	58	65	81	0.49	59	4	"	4	1.04	67
9017	- 3	11	"	570	4.4	2.5	3.3-5.6	63	65	83	0.74	77	3	"	3	1.10	83
9018	Mohall W-1	4	"	479	4.0	2.4	3.0-4.4	62	63	82	not yet analyzed						
9019	-2	10	"	402	2.4	3.0	2.0-3.5	45	70	88	0.33	62	6	"	3	0.58	71
9020	-3	6	"	389	3.6	2.6	2.6-4.4	58	66	85	not yet analyzed						
9021	-4	5	"	441	3.2	2.4	2.7-3.7	57	67	85	0.67	72	1	"	2	1.42	75
9022	Northgate E-1	4	"	355	2.0	2.5	1.7-2.7	45	61	82	not yet analyzed						
9023	-2	3	"	582	3.2	5.3	2.7-3.9	38	55	81	1.21	67	3	"	1	0.33	71
9024	-3	2	"	372	1.9	3.1	1.7-2.2	38	59	82	0.38	59	2	"	2	0.80	63
9025	-4	5	"	360e	2.3	2.1	1.6-3.2	52	59	78	5-cones: no oil sample						
9026	-5	3	"	467e	3.0	2.8	2.7-3.3	52	68	86	- " -						
9027	-6	6	"	219e	2.6	2.0	1.7-3.9	57	67	85	- " -						
9028	-7	4	"	327	3.2	1.9	2.4-3.7	62	67	87	not yet analyzed						
9029	Oxbow S-1	1	"	648	5.3	4.3		55	66	88	not yet analyzed						
9030	-2	8	"	555	3.2	3.3	1.9-4.5	49	65	86	0.99	72	2	"	2	1.22	76
9031	-3	3	"	383	2.1	3.1	2.1-2.2	41	61	84	not yet analyzed						
9032	-4	4	"	250e	2.7	3.2	1.5-4.7	45	65	80	5-cones: no oil sample						
9033	Indian Head B	16	"	396	2.7	2.5	1.5-3.4	52	68	89	0.81	74	2	"	2	0.88	78
9034	Qu'Apelle E-1	7	late	360	3.3	2.6	2.4-3.9	56	56	80	not yet analyzed						
9035	-2	6	"	462	3.2	2.2	2.0-4.2	59	55	80	- " -						

[1]Fully mature about Aug 20-24 at Corvallis
2 yield calculated from single hill; e=visual estimate
3 Myrcene, Caryophyllene, Farnesene, Humulene; H/C ratio

Table 22. Selections from the 1991 Wild American Nursery.
Grown for 2 years. Corvallis, OR 1992. To be transplanted to 2-hill plots in 1993.

Selection Number	Location Row:Hill	Pedigree	Sex[1]	Yield	Quality[2] α	ß	ratio	CoH	CoL	Storage	Remarks[3] (?)
				lb/A	%	%		%	%	% α remain	
9004-72	159:52	Logan W-4E	F	896	4.1	2.4	64	62	80	64	E, high α/ß
9008-10	164:33	Minot E-4S	F	555	6.0	3.0	67	59	79	58	E, H/C 1.68
-42	165:13	- " -	F	600e	not	analyzed					E, compact cone
9010-43	167:43	Minot W-1	F	384	2.9	3.0	49	79	93		E, v. high CoH
9011-64	169:37	Minot W-2	⚥	300e	2.8	0.8	78	78	92		female and male fertile (28%)
9017-13	175:27	White Earth S-3	F	1237	5.1	2.7	66	66	83	65	red stem, red stripes
9019-25	177:35	Mohall W-2	⚥	400e	1.8	1.5	54	70	87		Female and male fertile (33%)
-27	37	- " -	F	341	2.0	2.9	40	75	91	36	E, v. high CoH
9028-42M	186:42	Northgate E-7	M		28.3	32.4	4.7	56	69		v. dark leaves
9030-37	188:11	Oxbow S-2	F	1640	3.3	3.1	52	72	90	52	v. high CoH
-55	29	- " -	F	1152	4.5	3.5	56	74	91	25	v. high CoH, H/C 1-26
9032-15	189:27	Oxbow S-4	⚥				not analyzed				female and male fertile (3%)
-28	40	- " -	"				- " -				- " - (5%)
-38	50	- " -	"				- " -				- " - (2%)
-45	190:05	- " -	"				- " -				- " - (4%)
-54	14	- " -	"				- " -				- " - (3%)
-59	19	- " -	"				- " -				- " - (3%)
-63	23	- " -	"				- " -				- " - (4%)

[1]F, M = female, male; remainder monoecious
[2]1992 data; nursery not strung in 1993
[3]E = early; open pollinated seed set in ( )

Information Sheet - USDA 21120
(Selection No. 7001-13)

Pedigree: 19105 x 19046M
(Late Grape Seedlg x Fuggle-Fuggle Seedlg) x Late Cluster Seedlg-Fuggle Seedlg

Genetic Composition: 5/16 Fuggle; 1/8 Late Grape; 1/8 Late Cluster; 7/16 unknown.
Fertile diploid: 2n = 20.

Maturity: late

History:

1970: Cross 7001 made at Oregon State University.
1971: Seeds germinated; 133 seedlings field planted.
1972-74: Agronomic and quality evaluations.
1975: Established in a seeded 2-hill observation plot, OSU Hop Yard.
1976: USDA Accession No. 21120 assigned.
1977: Moved to a 2-hill seeded observation plot, OSU Hop Yard.
1979: Moved to 2-hill Germplasm Block, OSU Main Yard.
1982: Propagated from both hills to establish 1-acre commercial plot at J.I. Haas Alluvial Ranch, Independence, OR for the Hop Research Council.
1983: Hop Research Council drops 21120; Miller Brewing Co. buys first commercial crop and contracts for another year. Second commercial crop in Oregon in a seedless location (J.I. Haas, Alluvia Ranch) had very small cones and only 1200 lb/acre (5 bales). Miller Brewing Co. drops the selection from future testing.
1988: Virus testing of both hills of USDA 21120.
Hill 1:47 free of prunus necrotic ringspot and hop latent virus (moderate infection with hop mosaic and American hop latent virus). Used for increase by softwood propagation. Two-acre test plot established near Mt. Angel, OR (Annen Bros. Farm).
1989: Harvested first commercial crop from 2-acre Annen plot.
510 lbs/a; alpha 1.5, beta 9.0.
Replaced missing hills (about 1/3 of original planting). Hilled up older hills to plant one additional 4-acre plot in 1990 at J.I. Haas Riverside Ranch, St. Paul, OR.
1991: First production (baby year) at J.I. Haas Riverside Ranch was 636 lbs/acre, with a total of 2353 lbs from 3.7 acres. There were no plants at the poles. The three-year old Annen plot yielded 1645 lb/acre (total production: 2353 lbs on 2 acres).
1992: Mature yard at Riverside (3.7 acres) produced 5783 lbs (1563 lbs/acre); 2-acre Annen plot produced 3335 lbs (1668 lbs/acre). The pick was satisfactory at both locations, but had a slightly

higher leaf and stem count at the Annen plot.
The Annen plot will be discontinued after the 1992 season.

Pruning and training: Once established, hills can be pruned like any other hop. Occasionally sparse spring regrowth but sufficient shoots for training; good climber.

Picking and drying: If grown seedless, cones tend to be small but pick well and do not shatter; seeded cones weigh about 200 mg, seedless cones about 140 mg, somewhat difficult to clean.

Storage stability: Has varied from poor to excellent. HSI (6 months) varied from 0.4 to over 1.00 with an average above 0.65.

Diseases: No problems with downy mildew or verticillium wilt. Free of prunus necrotic ringspot virus (PNRV) and apple mosaic virus (ApMV).

Yield and Quality - USDA 21120

Nursery Plots:

Year		Yield lb/A	Alpha %	Beta %	Ratio	CoH %	CoL %	6 mo stor % α remain	Ess. oil ml/100 g
1971	single plant	?	1.9	6.5	24				
1975	- " -	938	0.7	10.9	6				
1976	2-hill plot	960	0.9	8.5	10			31	0.32
1977	- " -	?	1.0	8.3	10				
1982	- " -	855	1.0	7.1	12	49			
1983	- " -	1152	1.2	7.8	13	39			0.96
1984	- " -	896	1.1	9.1	11	60		70	0.95
1984	1 acre	?	1.8	9.1	16	55			1.20
1988	2-hill plot	896	1.4	6.9	17	41			0.67
1989	- " -	768	1.4	7.1	17	68	50	21	1.00
1990	- " -	1216	1.6	5.8	21	40		46	1.00
1991	- " -	1130	1.1	7.9	12	50	48	17	
1991	5-hill plot (seedless)	683	1.0	13.6	7	65	45	11	

Oil Composition:

Year	Total oil ml/100 g	Myrcene	Humulene	Caryoph.	Farnesene	Ratio H/C
1976	0.32	20.8	3.3	3.7	0	0.89
1983	0.96	46.1	2.5	3.1	0	0.81
1984	0.95	77.7	0.5	1.9		0.27
1984*	0.95	54.9	1.6	2.4	0	0.66
1984 (commercial)	1.20	64.8	1.3	2.2		0.58
1988	0.67	56.3	1.0	2.7	0.13	0.37
1989	0.90	55.8	1.0	1.8	0	0.54
1990	1.00	54.9	1.6	2.5	0	0.65
1991	0.70	55.8	2.6	2.8	0.2	0.93

*Analyzed in 1990.

Commercial 2- or 4-acre plots:

Grower	Year	Size	Yield	α	ß	Ratio	Remarks
		Acres	lb/A	%	%		
Annen	1990	2.0	1600	1.2	7.1	15	
Annen	1991	2.0	1465				
JIH Riverside	1991	3.7	700				baby planting
Annen	1992	2.0	1668				plot to be discontinued
JIH Riverside	1992	3.7	1563	0.9	7.3	11	LS 5%, seeds 4%

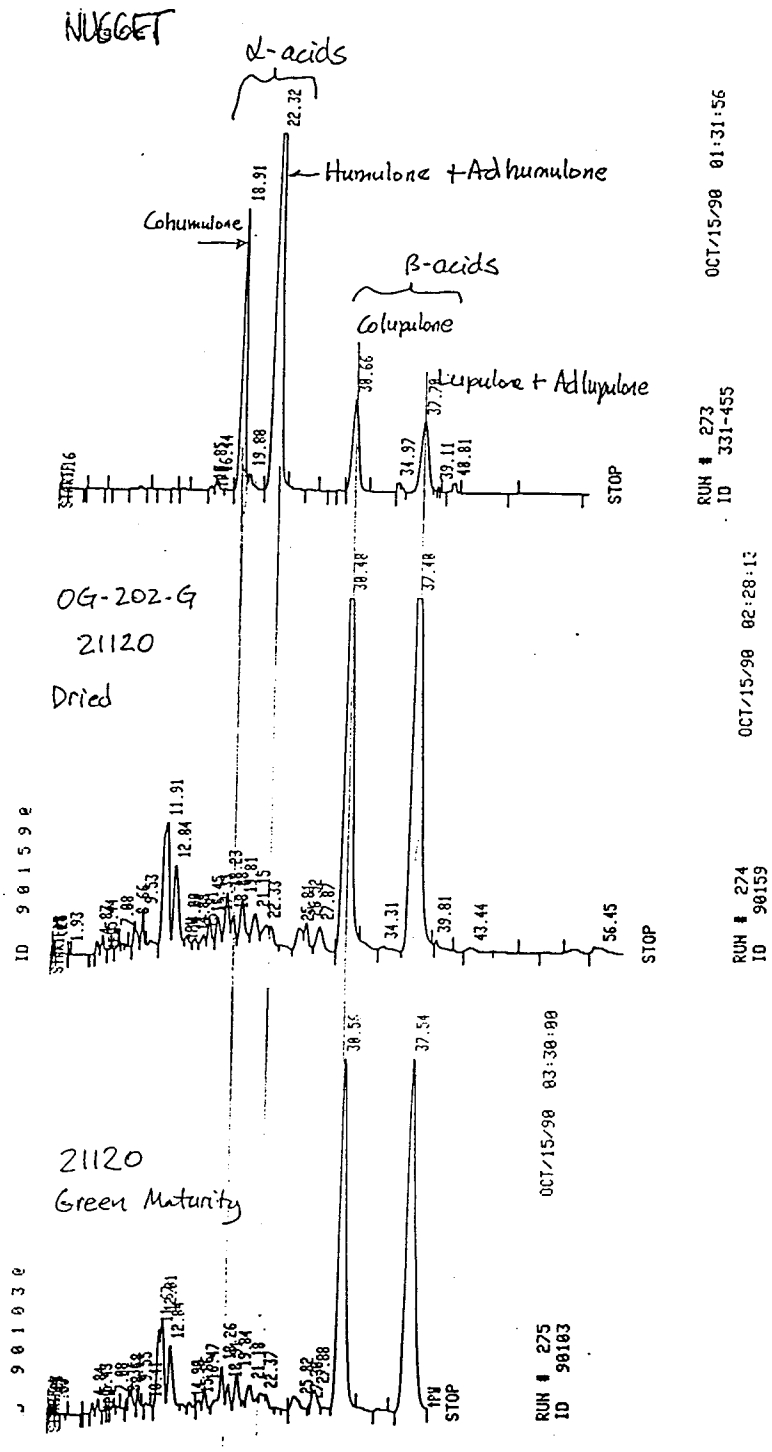


Figure 1. HPLC chromatograms of Nugget and USDA 21120. HPLC conditions: 5 micron Nucleosil RP C19, 25 x 0.46 cm, Methanol:water:phosphoric acid (85:17:0.25) 0.8 mL/min. Top: Nugget, middle: bale sample 21120, bottom: green extract 21120.

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
WASHINGTON, DC 20250

and

OREGON AGRICULTURAL EXPERIMENT STATION
OREGON STATE UNIVERSITY
CORVALLIS, OR 97331

and

WASHINGTON AGRICULTURAL EXPERIMENT STATION
WASHINGTON STATE UNIVERSITY
PULLMAN, WA 99163

and

IDAHO AGRICULTURAL EXPERIMENT STATION
UNIVERSITY OF IDAHO
MOSCOW, ID 83843

NOTICE OF RELEASE OF BLUE NORTHERN BREWER HOP, AN ORNAMENTAL

Hop, *Humulus lupulus* L., is widely recognized as a key flavoring ingredient for fermented malt beverages. In recent years, however, the U.S. Department of Agriculture has increasingly received inquiry regarding the use of the plant for ornamental purposes. The perennial nature of the plant and its rapid growth during spring and early summer has attracted people who wanted to use the plant as an arbor to provide partial shade during warm summer days regardless of cone yield potential. Private and public herb gardens in various parts of the country have expressed a desire to include hop plants in their collections, and particularly with plant displays having a "colonial" flavor.

The World Hop Cultivar Collection of the U.S. Department of Agriculture, Corvallis, Oregon since 1974 has had a unique hop genotype that is remarkable because of its attractive leaf color. The plant, originally obtained through germplasm exchange with the Ministry of Agriculture, Belgium, has bluish-purple leaves and a dark purple stem. It was called "Blue Northern Brewer" since it was reportedly first observed in a commercial Northern Brewer yard. Blue Northern Brewer (USDA Accession No. 21079) exhibits all the typical traits of a hop plant. It is a female, climbs clockwise, and has predominantly 3 or 5-lobed leaves with relatively large lobes and, except for the dark

leaf color, closely resembles Northern Brewer. It readily climbs a supporting string or arbor but rarely reaches the top wire (5.5 m, 18 ft) in Western Oregon, indicating below average vigor as compared to most hops grown commercially in the area. It flowers in early July, but sidearms rarely exceed 12 inches (30 cm) in length. Cone set is sparse, usually confined to small clusters on the main stem nodes and short sidearms in the upper half of the plant. Like leaves and stems, cones also have a reddish-purple coloration. Cones mature in mid-August and can be harvested but cone yield is substantially lower than that of commercial hops grown for brewing purposes. Like other hops, Blue Northern Brewer plants die back to the ground level in late fall but will readily resprout from underground buds on the main crown in early spring. Rhizome production is minimal but can be enhanced by hilling during the growing season.

Blue Northern Brewer is moderately resistant to hop downy mildew, incited by *Pseudoperonospora humuli* Mij. et Tak. G.W. Wilson, the major fungal hop pathogen in Western Oregon. Crown dieout due to downy mildew has never been observed in the 18 years the plant has been grown in the germplasm plots near Corvallis. *Verticillium* wilt, incited by various *Verticillium* species, also has never been observed under our field conditions. The virus status of Blue Northern Brewer is unknown. In mid-summer plants are subject to attack by two-spotted spider mites (*Tetranichus urticae* Koch), a common pest in commercial hop yards which, however, can readily be controlled with registered miticides. Hop aphids (*Phorodon humuli* Schrank) rarely are a problem in Blue Northern Brewer, in part perhaps because of its relatively sparse foliage, which does not provide a hospitable microclimate.

Blue Northern Brewer - although unlikely to be used for brewing - has all the quality characteristics of commercial hops. Its alpha and beta acids content, however, is about one half that of Northern Brewer from which it presumably originated. Over a six-year test period (1986-91) it averaged 4.9% alpha and 2.0% beta acids, respectively, a cohumulone content of 25%, and an oil content of 0.60 ml/100 g. During that period Northern Brewer averaged 9.5% alpha and 3.8% beta acids, a 24% cohumulone content and 1.12 ml oil in 100 g of dried hop cones. The humulene content of the essential oil averaged about 25 percent similar to that of Northern Brewer, with a characteristic absence of farnesene. Myrcene content in the essential oil averaged 57% and the humulene/caryophyllene (H/C) ratio was 2.88, almost identical to Northern Brewer.

In recent years one of the four hills in the Blue Northern Brewer field plot near Corvallis produced a single shoot with dark green leaves and a green stem, perhaps due to a reverse mutation. The proportion of green leaves - always confined to a single shoot - has not increased in the past four years. The remaining three hills in the plot continued to have dark purple leaves and stems exclusively.

Blue Northern Brewer, a slow growing, low-yielding female hop with purple colored leaves, is ideally suited as an ornamental. It should grow reasonably well in

many areas of the United States where hops have been grown in the past or are found in the wild today. Like other hops, Blue Northern Brewer requires near-freezing temperatures during the off-season to break the dormancy and therefore may not be suited to extreme southern locations.

The Agricultural Research Service, USDA, will maintain Blue Northern Brewer as part of the hop germplasm cultivar collection of the National Clonal Germplasm Repository near Corvallis, OR. Small amounts of planting stock or potted plants will be made available to interested persons upon written request to Dr. Alfred Haunold, USDA, ARS, Dep. of Crop and Soil Science, Crop Science 451B, Oregon State University, Corvallis, OR 97331-3002.

The date of release is that of the final signature.

for Director, Oregon Agricultural Experiment Station	9.21.92 Date
Director, Washington Agricultural Experiment Station	9-25-92 Date
Director, Idaho Agricultural Experiment Station	10-7-92 Date
for Administrator, Agricultural Research Service, USDA	OCT 27 1992 Date

1991-92 ANNUAL REPORT FORM — Agricultural Research Foundation

ACCOUNT: 3618 US Hop Research Council — Oct. 1, 1992.

PROJECT LEADER: Haunold DEPARTMENT: Crop Science

INSTRUCTIONS:

1. Limit your report to no more than 100 words.
2. Describe the account highlighting accomplishments and explain how funds were spent. If no funds were spent, describe the purpose of the account.
3. Our office is required to report to the Board of Directors on all accounts for the 1991-92 Fiscal Year, including those accounts with low balances and no activity.
4. Return to: AGRICULTURAL RESEARCH FOUNDATION, Snell Hall 537, before October 12, 1992.
5. If you have any questions, please call x7-3228.

DESCRIPTION OF PROJECT (Please type):

USDA 21457 (now Liberty) was expanded to 7 acres to satisfy increased demand from brewer members. USDA 21484 produced 6728 lbs (1922 lbs/acre) on a 3.5 acre commercial plot. USDA 21490 and 21491 were discarded. Three triploid Tettnanger-type selections (8802-68, 8805-40, and 8806-17--now permanent USDA Accession numbers 21664, 21665, and 21666, respectively) were increased for possible off-station tests in 1993. Two additional selections (8802-19 and 8802-24--now USDA 21660 and 21661) may be added in the spring. Female and male native American hops were evaluated in 2 large field nurseries. Over 300 single plants were harvested from the Saazer-type aroma nursery. Laboratory analyses are underway. The slow-release pelletized fertilizer Osmocote was evaluated in replicated plots on Cascade and Nugget hops.

Use of funds: Salary of Research Assistant, supplies.

1991-92 ANNUAL REPORT FORM **Agricultural Research Foundation**

ACCOUNT: 3625 Oregon Hop Commission Oct. 1, 1992

PROJECT LEADER: Haunold DEPARTMENT: Crop Science

INSTRUCTIONS:
1. Limit your report to **no more than 100 words.**
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5. If you have any questions, please call x7-3228.

DESCRIPTION OF PROJECT (Please type):

USDA 21484, sponsored by the Hop Research Council (HRC) produced 1922 lbs/acre. USDA 21490 (over 2000 lbs/acre) and 21459 (1153 lbs/acre) are now sponsored by individual hop dealers without involvement of the HRC. USDA 21491 was discontinued. Three triploid selections, 8802-68, 8805-40, and 8806-17 (now permanent USDA Accession numbers 21664, 21665, and 21666) were increased for potential off-station trials in 1993. USDA 21120 was harvested from 2 commercial plots and yielded 1500 and 1400 lbs/acre, respectively. Tettnanger B (USDA 21497) was discarded due to disappointing yield performance. Over 300 Saazer-derived seedlings were harvested as single plants. Two large Native American seedling nurseries were evaluated. Over 3000 rhizomes of triploid males were distributed to Oregon growers as yield stimulators to reduce seedset.

Use of funds: Equipment repair, hourly help, travel.

1991-92 ANNUAL REPORT FORM | Agricultural Research Foundation

Oct. 1, 1992

ACCOUNT: 3634 Miller Brewing Company

PROJECT LEADER: Haunold DEPARTMENT: Crop Science

INSTRUCTIONS:
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5. If you have any questions, please call x7-3228.

DESCRIPTION OF PROJECT (Please type):

USDA 21120 averaged from 7 to 7½ bales (1400 to 1500 lbs) per acre at two Oregon off-station locations in 1992. Additional special aroma selections were established as 5-hill plots in a seedless location. A new 4-acre seedless hop yard was established at the USDA Clonal Germplasm Repository on Peoria Road within easy driving distance to the main hop yard and the harvesting facilities. Due to its location the new yard is expected to be essentiall seedless like the previous seedless yard leased on Peoria Rd.

Use of funds: Partial salary of research assistant; establishment of new seedless hop yard.

1991-92 ANNUAL REPORT FORM — Agricultural Research Foundation

ACCOUNT: 4520 Miller Brewing Company

PROJECT LEADER: Haunold/Nickerson DEPARTMENT: Agricultural Chemistry

INSTRUCTIONS:
1. Limit your report to **no more than 100 words.**
2. Describe the account highlighting accomplishments and explain how funds were spent. If no funds were spent, describe the purpose of the account.
3. Our office is required to report to the Board of Directors on all accounts for the 1991-92 Fiscal Year, including those accounts with low balances and no activity.
4. Return to: AGRICULTURAL RESEARCH FOUNDATION, Snell Hall 537, before October 12, 1992.
5. If you have any questions, please call x7-3228.

DESCRIPTION OF PROJECT (Please type):

Hop samples from the germ plasm collection and selections from crosses made by Dr. Haunold (USDA Hop Geneticist) were analyzed for characteristics that contribute to flavor and aroma in beer. Selections were compared to imported hop varieties to see if they would make suitable replacements in brewing. Off-station plots of experimental varieties were monitored for quality and maturity. Selections were stored at ambient temperature (equivalent to 2 yrs cold storage) and reanalyzed after six months to evaluate keeping characteristics. A formal report was presented to Miller Brewing Company in February.

This grant funded about 15% of FT chemist's salary and 25% of research assistant's wages.

1991-92 ANNUAL REPORT FORM **Agricultural Research Foundation**

ACCOUNT: 4522 Hop Research Council

PROJECT LEADER: Haunold/Nickerson DEPARTMENT: Agricultural Chemistry

INSTRUCTIONS:
1. Limit your report to **no more than 100 words.**
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3. Our office is required to report to the Board of Directors on all accounts for the 1991-92 Fiscal Year, including those accounts with low balances and no activity.
4. Return to: AGRICULTURAL RESEARCH FOUNDATION, Snell Hall 537, before October 12, 1992.
5. If you have any questions, please call x7-3228.

DESCRIPTION OF PROJECT (Please type):

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This grant funded about 50% of FT chemist's and 75% of research assistant's salary and benefits.

1991-92 ANNUAL REPORT FORM **Agricultural Research Foundation**

ACCOUNT: 4528 Hops/Boston Beer

PROJECT LEADER: Gail Nickerson DEPARTMENT: Agricultural Chemistry

INSTRUCTIONS:
1. Limit your report to **no more than 100** words.
2. Describe the account highlighting accomplishments and explain how funds were spent. If no funds were spent, describe the purpose of the account.
3. Our office is required to report to the Board of Directors on all accounts for the 1991-92 Fiscal Year, including those accounts with low balances and no activity.
4. Return to: AGRICULTURAL RESEARCH FOUNDATION, Snell Hall 537, before October 12, 1992.
5. If you have any questions, please call x7-3228.

DESCRIPTION OF PROJECT (Please type):

This special grant from Boston Brewing Company was used to purchase glassware and equipment used in the distillation and measurement of volatiles from hops so that our laboratory could perform more analyses used in the evaluation of hop samples.

United States Department of Agriculture
Agricultural Research Service
Pacific West Area
Forage Seed & Cereal Res. Unit
Dept. Crop and Soil Science
Crop Science Building 451B
Oregon State University
Corvallis, Oregon 97331-3002
FAX: 503 737-1589

August 3, 1992.

Elizabeth Beitel
Oregon Department of Agriculture
635 Capitol street
Salem OR. 97310.

From: Dr. Al Haunold
USDA Hop Research
Corvallis, OR. 97331-3002

Subject: Virus data of recently introduced foreign hop varieties, analyses done on vegetative plant tissue by Dr. Robert Klein, plant pathologist, Prosser, WA 99350-9687.

Variety/ Cultivar	PNRV	ApMV	HMV	HLV	AmHLV	Country of origin
Hallertauer Magnum	-	-	-	-	-	Germany
Hallertauer Gold	-	-	-	-	-	"
Orion	-	-	-	-	-	"
Hersbrucker Pure	-	-	-	-	-	"
Hallertauer Tra= dition	-	-	-	-	-	"
Spalter Select	-	-	-	+	-	"
Toyamidori	-	-	-	-	-	Japan
Kitamidori	-	-	-	-	-	"
Eastern Gold	-	-	-	-	-	"
Whitbread's Golding	-	-	+	-	-	England
Eastwell Golding	+	-	-	-	-	"

- means negative; + means positive test according to ELISA

According to these preliminary tests, only Spalter Select, Eastwell Golding and Whitbread's Golding show some virus infection with viruses that are already present in US cultivars being grown commercially. We will do additional tests on dormant bud tissue later this winter.

ASHFORD, KENT
TN25 5AH

DEPARTMENT OF HOP RESEARCH

812401 (STD 0233)

Dr. A. Haunold
Department of Crop Science
Agricultural Hall 37
Oregon State University
Corvallis
Oregon 97331
U.S.A.

10th October 1979

a true Golding type (Neebak p. 149)
Bramling: Burgen p. 39 & 4.5 — 8
Braml. cross: & 4.8, Burgen p. 49

Dear Al,

Thank you for your letter about the Petham Golding. I thought I had written to you about this but it appears that although I intended to I have not done so.

East Malling checked the plants you sent by ELISA and found them to be infected with hop mosaic virus but the plants have remained symptomless. The outstanding feature of all the true Goldings is that they are susceptible to this virus and invariably show symptoms. For this reason alone I would say quite positively that your plants were not Petham Golding. = USDA 68052

So far as I can tell all the various Goldings are merely clonal selections of the same thing the differences being principally in time of maturity. The only clones which we have here are Bramling, Early Bird, Eastwell Golding, Cobbs and Mathon. The first two are available as virus-free meristem clones while all except Bramling are available free from hop mosaic by infected with Prunus Necrotic Ring Spot Virus.

It would probably be possible to obtain Petham Golding from a Grower but because there is no clear distinction between clones I could not guarantee that it is any closer to Cal's original introduction than our Eastwell Golding would be. There would also be problems of unknown disease status compared with our glasshouse material.

From our stocks the closest to the original would probably be our Eastwell Golding clone both for time of maturity and virus status. If you wanted a meristem clone I would suggest the Early Bird.

We have propagated the other varieties you want and could send the Golding material with them although we can only provide unrooted cuttings of the Goldings whereas the others will be rooted. Let me know what you would like me to do.

Yours sincerely,

Ray

R.A. Neve.

Bramling cross #68051
a Golding type
a cross Bramling × ♂ Manitoba Wild Am.

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

B= bale sample. C= cone sample

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	♀ Identification	Location	Type	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coβ	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
19001	Brewers Gold	001:01-04	C	9/01/92	1000	241	9.7	2.7	78	0.29	30	56	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1169
19027	Fu x Fu-S	033:49-50	C	9/09/92	1400	395	0.1	0.3	15	0.49	43	53	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1839
19028	EGr x EC-S	034:49-50	C	9/09/92	1600	158	3.5	4.3	45	0.26	38	64	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1835
19105	LGp-S(Fu Fu-S)	001:49-50	C	9/09/92	2000	198	1.3	4.7	21	0.30	30	55	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1791
19110	Belg 31-S OP	002:49-50	C	9/09/92	1400	225	3.7	3.0	55	0.27	53	76	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1795
19120	Sunshine-S	003:49-50	C	9/09/92	800	184	5.7	1.8	76	0.31	26	50	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1811
19137	Sunshine-S	004:49-50	C	9/09/92	600	209	5.3	2.0	72	0.30	26	48	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1786
19151	Fu-RedV-OP	005:49-50	C	9/09/92	1400	176	1.3	2.6	34	0.34	53	69	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1798
19185	LGpFuRedV-OP	006:49-50	C	9/09/92	800	292	2.3	1.6	59	0.30	39	58	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1810
21003	Fu T4	242:01-05	C	9/09/92	400	128	3.9	2.6	60	0.38	23	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1852
21007	6735-005	041:49-50	C	9/09/92	800	232	2.1	1.7	55	0.31	32	54	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1829
21011	L-16	005:01-04	C	9/09/92	400	231	2.9	2.0	59	0.29	38	67	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1735
21014	Hallertau MF	007:01-04	B	8/17/92	71	10.95	3.3	3.3	50	0.27	18	36	0.00	0	0.53	0.00	0.0	0.0	0.0	0.0	0.00	655
21015	Tettnanger	008:01-04	B	8/17/92	64	9.20	3.7	2.9	56	0.29	18	43	0.00	0	0.33	0.00	38.8	10.5	3.6	29.3	2.80	1075
21016	Fu N, VF	009:01-04	B	8/17/92	480	10.10	4.5	2.1	68	0.28	19	55	0.37	86	0.72	0.27	30.8	11.7	4.4	33.3	2.84	1076
21030	6616-019	024:51-52	C	9/09/92	400	115	6.9	5.2	57	0.29	36	60	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1793
21039	Golden Star	015:01-04	C	9/01/92	1800	169	4.4	2.8	61	0.33	44	70	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1164
21040	Columbia	023:05-08	C	9/02/92	800	182	4.3	2.3	65	0.29	35	60	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1210
21041	Willamette	024:05-08	C	9/02/92	1200	113	3.6	2.0	65	0.36	25	47	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1212
21041	Willamette	227:01-05	B	9/08/92	273	8.95	5.6	3.2	64	0.26	30	50	0.56	64	1.68	0.00	49.9	7.8	5.4	21.6	2.78	1749
21042	6769-002	103:07-08	C	9/09/92	100	144	2.1	1.0	68	0.37	24	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1740
21043	Wye Challenger	018:05-08	C	9/02/92	500	197	6.3	3.1	67	0.30	18	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1209
21044	Wye Northdown	019:05-08	C	8/17/92	400	221	6.9	4.2	62	0.27	21	47	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	12
21049	Styrian, Yugo	020:05-08	B	8/17/92	331	11.40	4.5	2.1	68	0.31	28	50	0.00	0	0.51	0.00	45.9	8.9	2.9	25.8	2.90	1071
21049	Styrian, Yugo	214:01-05	B	8/25/92	350	8.80	4.5	2.4	65	0.28	30	49	0.00	0	1.14	0.00	54.7	6.5	3.7	20.4	3.15	1121
21050	Ahil,Yugo	001:09-12	C	9/01/92	1600	194	6.1	3.5	64	0.35	25	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1146
21051	Apolon, Yugo	004:09-12	C	9/01/92	800	203	7.4	3.3	70	0.28	22	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1142
21052	Atlas,Yugo	002:09-12	C	9/01/92	800	303	12.9	4.3	75	0.27	33	60	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1141
21053	Aurora, Yugo	003:09-12	B	8/19/92	117	8.35	7.3	2.6	74	0.25	16	41	0.00	0	0.52	0.00	21.4	10.9	5.0	36.1	3.30	1087
21055	6806-080	033:05-08	C	9/02/92	1200	283	14.2	3.4	81	0.32	46	69	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1233
21055	6806-080	044:47-48	C	9/08/92	800	175	18.3	4.4	80	0.31	47	71	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1687
21056	Bullion, 10A,VF	013:09-12	C	9/01/92	1400	274	9.2	3.9	70	0.26	34	63	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1133
21056	Bullion, 10A,VF	206:01-05	B	9/08/92	981	8.30	11.2	5.1	69	0.27	31	54	0.51	67	1.95	0.00	68.8	4.9	0.2	7.8	1.58	1764
21057	PrRingwood Sel	036:49-50	C	9/09/92	1000	166	5.0	3.0	62	0.27	34	59	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1840
21062	6512-024	043:51-52	B	8/17/92	469	9.80	4.0	2.1	66	0.28	39	73	0.43	79	0.49	0.25	68.9	5.6	0.7	1.1	0.20	1077
21077	Saazer, Czech	021:05-08	C	8/17/92	100	162	4.1	3.4	55	0.31	15	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	15
21078	Record, Belg	021:09-12	C	9/01/92	1000	141	3.6	3.7	50	0.30	23	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1130
21079	Blue N.B.,Belg	008:51-52	C	9/09/92	200	200	3.5	1.4	72	0.32	23	50	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1816
21079	Blue N.B.,Belg	009:09-12	C	9/01/92	100	189	5.1	2.1	70	0.37	18	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1136
21080	Backa, Yugo	008:09-12	C	9/01/92	600	195	3.8	4.2	47	0.27	13	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1145
21081	Dunav	005:09-12	C	9/01/92	1900	215	5.6	3.5	62	0.31	27	63	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1147
21082	Neoplanta,Yugo	006:09-12	C	9/01/92	600	192	7.2	2.9	72	0.29	33	62	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1143
21083	Vojvodina,Yugo	007:09-12	C	9/01/92	700	234	6.4	2.7	70	0.31	25	55	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1137
21085	Yugo VII/23	039:49-50	C	9/09/92	200	179	3.6	2.6	58	0.31	20	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1820
21086	Yugo VIII/27	040:49-50	C	9/09/92	100	180	2.2	2.4	49	0.32	21	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1826
21092	Cascade VF	014:09-12	B	9/02/92	235	9.50	5.2	4.5	54	0.26	36	54	0.55	65	1.12	0.00	66.8	4.0	3.9	9.2	2.30	1346
21092	Cascade VF	014:09-12	C	9/01/92	235	301	6.3	3.7	63	0.25	36	55	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1135
21093	N. Brewer VF	012:09-12	B	8/19/92	171	9.90	9.6	3.2	75	0.28	19	54	0.35	83	1.00	0.00	46.8	9.2	0.1	23.2	2.52	1409

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	T Y P	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% B	Alpha Ratio	HSI	Coα	Coß	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
21094	6903-112	009:49-50	C	9/09/92	800	450	5.7	4.1	58	0.28	35	59	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1799
21095	6903-259	010:49-50	C	9/09/92	1400	228	4.6	3.2	59	0.25	35	59	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1788
21097	Huller Bitter	030:05-08	C	9/02/92	600	272	8.0	3.3	70	0.26	24	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1230
21098	6913-068	112:03-04	C	9/09/92	2000	346	7.2	4.4	62	0.27	22	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1741
21112	Wye Target	016:09-12	C	9/01/92	1900	207	10.5	4.6	69	0.29	32	60	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1144
21113	Lubelska, Pol	018:05-08	C	8/17/92	500	212	4.6	3.9	54	0.27	19	37	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	11
21114	Nadwislanska	019:05-08	C	8/17/92	400	103	3.5	2.4	59	0.35	17	33	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	10
21115	Pocket Talisman	020:09-12	C	9/09/92	1200	152	3.4	1.8	65	0.31	51	75	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1733
21116	Brewers Gold VF	015:09-12	C	9/01/92	1200	310	12.2	4.5	73	0.26	33	60	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1139
21120	7001-013	001:47-48	B	9/02/92	1088	8.90	0.8	5.4	13	0.27	60	46	0.98	36	0.65	0.00	55.5	3.0	0.8	3.3	1.11	1345
21120	7001-013	230:28-32	B	9/11/92	239	8.20	1.0	10.1	9	0.22	67	44	1.20	24	1.27	0.00	60.6	2.3	0.1	2.4	1.05	1988
21120	7001-013	240:17-21	B	9/10/92	469	12.20	1.0	11.9	8	0.22	73	44	1.40	14	1.73	0.00	62.0	2.3	0.5	2.7	1.18	1957
21121	7001-039	002:47-48	C	9/08/92	800	280	0.4	6.6	6	0.34	0	53	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1726
21122	7001-047	003:47-48	C	9/08/92	1400	124	1.1	2.8	29	0.40	48	66	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1714
21125	7001-067	006:47-48	C	9/08/92	1800	111	1.5	2.4	38	0.38	35	58	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1716
21127	7001-081	008:47-48	C	9/08/92	800	108	0.2	4.3	4	0.41	0	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1707
21138	6701-054	016:49-50	C	9/09/92	600	253	2.1	1.7	55	0.31	25	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1837
21139	6704-138	024:49-50	C	9/09/92	2000	395	1.9	3.7	34	0.28	47	67	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1834
21143	6028-001	050:51-52	C	9/09/92	200	188	2.0	1.2	63	0.37	27	48	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1802
21144	6185-001	051:51-52	C	9/09/92	800	250	5.3	5.1	51	0.29	36	58	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1796
21145	6305-004	052:51-52	C	9/09/92	1200	169	2.6	2.8	47	0.31	35	63	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1806
21149	6616-002	048:51-52	C	9/09/92	400	408	9.4	6.0	61	0.26	41	67	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1801
21150	6616-010	049:51-52	C	9/09/92	1800	192	5.4	4.0	58	0.31	36	57	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1804
21151	6616-020	030:51-52	C	9/09/92	1800	106	5.4	3.2	63	0.31	38	62	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1792
21156	6806-094	009:51-52	B	8/17/92	256	9.70	6.8	2.7	72	0.31	38	59	0.00	0	0.75	0.00	56.3	4.4	0.1	14.6	3.35	1326
21158	6806-099	049:49-50	C	9/09/92	1000	421	10.8	3.0	78	0.28	32	54	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1817
21159	6818-043	010:51-52	C	9/09/92	200	304	4.0	6.0	40	0.23	21	38	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1815
21160	6901-140	051:49-50	C	9/09/92	1200	228	4.1	4.0	51	0.25	28	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1813
21161	6903-226	039:51-52	C	9/09/92	800	180	3.0	3.8	44	0.28	22	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1777
21162	6903-263	040:51-52	C	9/09/92	1200	145	3.5	2.9	54	0.30	30	55	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1779
21163	6907-058	052:49-50	C	9/09/92	1200	276	4.6	5.9	44	0.26	28	47	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1822
21164	6907-077	055:49-50	C	9/09/92	1000	343	4.6	6.0	43	0.24	35	64	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1812
21167	Hybrid 2, India	014:01-04	C	9/09/92	600	287	9.9	4.6	68	0.26	32	52	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1729
21168	Prec d Bourg	023:01-04	C	9/01/92	200	174	3.8	3.0	56	0.35	16	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1156
21168	Prec d Bourg	023:01-04	C	8/17/92	200	205	3.3	2.8	54	0.32	19	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	22
21169	Tardif d Bourg	024:01-04	C	9/01/92	200	230	2.9	4.6	39	0.27	12	34	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1158
21170	Elsasser	025:01-04	C	9/01/92	600	191	3.7	4.0	48	0.28	18	36	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1168
21172	Landhopfen	027:01-04	C	8/17/92	300	200	5.1	4.5	53	0.28	19	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	23
21173	Strisselspalter	031:01-04	C	9/01/92	500	173	3.3	2.6	56	0.34	23	51	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1152
21179	Hersbrucker Eng	006:01-04	C	9/01/92	500	98	2.0	2.8	42	0.40	19	36	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1165
21180	7003-143	034:51-52	C	9/09/92	2200	188	4.7	3.7	56	0.28	29	53	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1776
21181	7003-243	035:51-52	C	9/09/92	200	146	4.3	4.4	49	0.29	37	61	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1783
21182	Galena (43-16)	008:05-08	C	9/02/92	1800	328	8.4	6.3	57	0.28	43	67	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1229
21182	Galena (43-16)	239:01-05	B	8/25/92	870	9.00	13.4	8.8	60	0.22	39	63	0.32	87	1.60	0.57	53.9	5.0	0.3	11.0	2.19	1469
21183	Eroica (34-5)	013:05-08	C	9/02/92	2000	132	11.8	4.3	73	0.32	38	66	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1216
21185	Hersbrucker Ger	004:01-04	C	9/01/92	300	208	3.7	4.6	44	0.28	19	37	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1161
21186	Spalter	022:01-04	B	8/17/92	43	10.65	3.5	3.0	54	0.26	20	40	0.00	0	0.56	0.00	55.1	4.2	3.7	9.9	2.38	654
21187	Southern Brewer	028:01-04	C	9/01/92	600	248	5.7	2.1	73	0.29	35	63	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1157

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	T Y P	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coβ	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
21188	S.Af. NP2/55	017:47-48	C	9/08/92	200	284	4.5	3.5	56	0.29	24	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1711
21188	S.Af. NP2/55	029:01-04	C	9/01/92	800	268	4.4	2.5	63	0.28	26	49	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1154
21193	Nugget	036:01-04	C	9/01/92	2000	261	10.9	3.5	76	0.29	21	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1150
21193	Nugget	237:01-05	B	9/08/92	2278	8.10	12.8	3.8	77	0.26	23	45	0.34	90	1.73	1.05	48.8	8.4	0.2	21.1	2.51	1771
21193(0)	Nugget	133:16-20	B	9/03/92	0	8.50	12.0	3.9	75	0.25	20	43	0.32	90	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1349
21193(0)	Nugget	133:01-05	B	9/03/92	0	9.25	12.5	3.7	77	0.25	21	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1359
21193(0)	Nugget	134:01-05	B	9/03/92	0	9.20	12.1	3.7	76	0.26	22	47	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1360
21193(0)	Nugget	134:16-20	B	9/03/92	0	9.30	12.8	3.7	78	0.24	21	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1391
21193(6)	Nugget	133:26-30	B	9/03/92	0	8.70	11.2	3.7	75	0.25	22	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1358
21193(6)	Nugget	133:11-15	B	9/03/92	0	9.40	11.4	3.7	75	0.26	24	47	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1347
21193(6)	Nugget	134:11-15	B	9/03/92	0	9.25	12.0	3.6	77	0.25	23	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1365
21193(6)	Nugget	134:26-30	B	9/03/92	0	8.50	12.0	3.4	78	0.25	22	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1350
21193(9)	Nugget	133:21-25	B	9/03/92	0	9.80	12.2	3.5	78	0.24	21	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1366
21193(9)	Nugget	133:06-10	B	9/03/92	0	9.25	11.8	3.8	76	0.25	21	45	0.33	91	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1393
21193(9)	Nugget	134:21-25	B	9/03/92	0	9.25	11.9	3.5	77	0.26	22	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1392
21193(9)	Nugget	134:06-10	B	9/03/92	0	9.20	12.4	3.6	77	0.25	21	43	0.35	87	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1361
21194	7006-311	032:51-52	C	9/09/92	400	260	12.3	4.3	74	0.26	24	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1789
21195	7006-408	036:51-52	C	9/09/92	1200	253	11.3	3.3	77	0.28	28	48	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1778
21196	Bullion 6A	007:05-08	C	9/02/92	1700	375	9.3	3.1	75	0.27	35	63	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1224
21198	7003-038	010:47-48	C	9/08/92	600	240	9.7	5.8	63	0.25	31	56	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1708
21199	7004-003	212:17-21	B	9/10/92	614	9.40	4.1	7.5	35	0.25	22	43	0.67	60	2.12	0.00	59.2	7.4	0.1	15.3	2.07	1969
21201	7005-070	046:47-48	C	9/08/92	1800	298	11.0	7.3	60	0.27	33	59	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1697
21202	6903-107	014:47-48	C	9/08/92	1000	305	5.2	4.3	55	0.27	19	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1722
21203	Yugo 20P14	047:47-48	C	9/08/92	1600	143	3.7	3.4	53	0.30	14	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1699
21204	Yugo 21P01	048:47-48	C	9/08/92	800	78	2.2	7.2	23	0.36	11	36	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1690
21205	Yugo 24P07	049:47-48	C	9/08/92	1000	126	1.9	2.5	43	0.35	19	55	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1701
21207	Yugo 27P04	051:47-48	C	9/08/92	1000	107	3.4	3.8	48	0.33	17	56	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1695
21209	Yugo 33P13	053:47-48	C	9/08/92	600	93	3.5	2.4	59	0.32	15	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1689
21210	Yugo 33P4	054:47-48	C	9/08/92	600	226	2.1	3.4	38	0.27	14	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1692
21211	Yugo 40P19	055:47-48	C	9/08/92	1400	101	3.9	3.4	53	0.35	12	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1700
21213	Aromat, Yugo	025:05-08	C	8/17/92	200	174	2.7	2.7	50	0.36	15	40	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	16
21214	Sirem, Yugo	026:05-08	C	8/17/92	100	156	5.0	4.0	56	0.31	18	38	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	19
21215	Norgard 1478, Y	027:05-08	C	8/17/92	200	222	7.6	2.6	75	0.27	24	51	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	17
21216	Groene Bel	028:05-08	C	8/17/92	400	222	4.6	3.5	57	0.27	24	49	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	20
21217	Star, Belg	029:05-08	B	8/17/92	213	10.75	2.7	1.6	64	0.30	18	51	0.42	86	0.34	0.28	16.6	15.0	3.4	43.7	2.91	1074
21218	7005-149	045:47-48	C	9/08/92	2000	160	13.6	3.6	79	0.26	37	59	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1691
21219	65009 VF	008:49-50	C	9/09/92	2200	242	8.6	6.0	59	0.27	33	59	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1787
21220	Eroica VF	031:05-08	C	9/02/92	900	111	7.5	2.9	72	0.35	39	68	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1227
21222	Aquila, Id 33-6	040:05-08	C	9/02/92	1400	163	6.5	3.0	68	0.30	45	71	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1236
21222	Aquila, Id 33-6	234:28-32	B	9/11/92	427	8.45	8.4	3.9	68	0.25	47	71	0.55	61	1.75	0.98	64.2	2.8	0.1	1.6	0.57	1985
21225	Olympic	037:01-04	C	9/01/92	1800	172	9.9	3.7	73	0.29	32	59	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1149
21226	Chinook	038:01-04	C	9/01/92	2000	201	10.5	2.8	79	0.28	33	56	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1126
21226	Chinook	226:28-32	B	9/11/92	811	7.85	14.0	3.3	81	0.25	32	54	0.42	78	0.93	0.93	61.0	3.1	0.2	8.1	2.59	1986
21227	Perle	032:01-04	C	9/01/92	400	207	7.4	1.8	81	0.31	22	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1155
21227	Perle	220:01-05	B	9/08/92	495	8.30	8.5	2.8	75	0.29	28	51	0.44	75	0.70	0.75	66.9	5.3	0.2	14.3	2.73	1773
21232	Jap 69K-BH66	034:47-48	C	9/08/92	1400	511	8.1	3.7	68	0.31	39	65	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1710
21233	Jap 70K-SH6	035:47-48	C	9/08/92	400	231	8.4	4.1	67	0.28	38	68	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1694
21238	Blisk, Yugo	022:05-08	C	9/02/92	2200	242	9.2	2.6	78	0.27	32	55	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1208

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	T Y P	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coβ	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
21238	Blisk, Yugo	234:01-05	B	8/25/92	1758	8.50	10.3	3.7	74	0.27	33	57	0.71	46	1.96	0.48	47.7	5.0	22.5	11.5	2.31	1044
21239	Bobek, Yugo	017:09-12	C	9/01/92	1200	133	4.6	3.5	57	0.32	20	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1140
21240	Buket, Yugo	022:09-12	C	9/01/92	1000	302	10.4	4.8	68	0.26	21	48	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1138
21243	Pol Klon 30	038:47-48	C	9/08/92	200	206	6.2	2.3	73	0.34	23	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1696
21246	7311-032	023:47-48	C	9/08/92	2200	278	11.7	3.2	78	0.29	38	64	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1721
21248	7311-095	027:47-48	C	9/08/92	1800	180	13.6	3.0	82	0.34	39	65	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1718
21250	7311-152	029:47-48	C	9/08/92	2000	647	10.7	2.4	82	0.30	24	32	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1704
21251	7312-009	028:49-50	C	9/09/92	1600	273	9.8	2.9	77	0.31	35	56	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1823
21251	7312-009	225:12-16	B	9/09/92	964	12.25	15.8	4.8	77	0.28	36	57	0.45	75	2.33	0.00	67.5	4.1	2.5	9.5	2.32	1923
21252	7312-036	040:47-48	C	9/08/92	725	519	13.2	3.1	81	0.30	28	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1693
21253	7312-041	041:47-48	C	9/08/92	800	267	14.5	4.5	76	0.30	39	63	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1688
21255	7312-134	042:47-48	C	9/08/92	1600	220	14.6	3.7	80	0.31	47	70	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1698
21256	7312-032	054:51-52	C	9/09/92	1400	324	15.2	4.2	79	0.28	38	63	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1809
21256	7312-032	219:23-27	B	9/10/92	1365	9.80	13.5	4.7	74	0.27	40	67	0.50	68	2.26	1.07	66.4	2.3	0.3	9.6	4.21	1955
21257	7313-083	224:23-27	B	9/10/92	1433	10.05	15.6	7.0	69	0.29	38	63	0.49	71	0.81	1.17	71.8	2.8	0.0	4.0	1.41	1953
21261	7003-075	055:51-52	C	9/09/92	1600	185	5.8	3.6	62	0.25	18	40	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1808
21276	Early Prolific	023:09-12	C	8/17/92	400	163	4.8	2.3	68	0.30	21	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	14
21277	Early Promise	024:09-12	C	9/01/92	100	198	4.2	1.3	76	0.34	26	49	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1131
21278	Keyworths Early	025:09-12	C	9/01/92	400	142	5.2	1.5	77	0.34	29	48	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1132
21279	Keyworths Mids	026:09-12	C	9/01/92	1200	161	7.2	3.2	69	0.29	42	70	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1124
21280	Pride of Kent	027:09-12	B	8/19/92	597	11.50	9.6	6.2	61	0.25	27	63	0.74	43	0.00	0.88	0.0	0.0	0.0	0.0	0.00	1417
21282	Wye Saxon	029:09-12	C	8/17/92	100	213	8.8	3.5	71	0.26	16	36	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	13
21283	Wye Viking	030:09-12	C	8/17/92	0	262	6.9	3.4	67	0.27	21	40	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	9
21284	Bramling	030:01-04	C	9/01/92	400	149	3.4	1.6	68	0.35	22	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1151
21286	Kirin II	039:01-04	C	9/01/92	1800	146	2.5	2.3	52	0.37	41	66	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1148
21287	Banner	016:13-16	C	9/02/92	2000	353	6.9	4.5	61	0.32	34	59	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1223
21287	Banner	213:01-05	B	9/08/92	1851	9.45	11.2	6.4	64	0.22	28	62	0.62	57	2.11	0.00	74.3	2.6	0.2	7.4	2.80	1746
21289	7312-053	012:49-50	C	9/09/92	600	173	5.9	1.5	80	0.35	20	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1794
21290	7312-057	015:49-50	C	9/09/92	1200	210	6.1	1.1	85	0.35	31	50	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1821
21292	7312-081	020:49-50	C	9/09/92	2200	235	6.5	1.6	81	0.34	30	58	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1833
21293	7312-084	021:49-50	C	9/09/92	1600	187	8.6	1.9	82	0.33	26	47	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1824
21294	7312-106	022:49-50	C	9/09/92	1600	279	11.6	2.9	80	0.29	39	60	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1828
21295	7312-115	023:49-50	C	9/09/92	1800	403	9.0	2.2	81	0.33	24	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1838
21296	7312-128	032:49-50	C	9/09/92	1600	192	6.9	1.7	80	0.32	33	56	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1831
21298	7315-035	038:49-50	C	9/09/92	800	426	10.7	2.8	79	0.28	23	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1825
21368	Yugo 88/150	031:47-48	C	9/08/92	1200	197	12.2	4.3	74	0.26	33	59	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1702
21368	Yugo 88/150	201:01-05	B	9/08/92	776	9.30	10.6	4.2	71	0.24	36	60	0.70	47	2.90	0.80	59.1	4.7	10.6	9.6	2.03	1761
21369	Yugo 88/187	032:47-48	C	9/08/92	1000	148	5.3	2.2	71	0.27	31	58	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1709
21369	Yugo 88/187	202:01-05	B	9/08/92	845	10.15	8.8	4.3	67	0.24	27	65	0.82	38	2.23	0.00	68.9	3.3	7.6	7.3	2.20	1748
21370	Yugo 88/201	033:47-48	C	9/08/92	1400	309	10.3	4.0	72	0.26	31	55	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1703
21370	Yugo 88/201	204:01-05	B	9/08/92	793	10.40	8.7	3.3	72	0.28	27	63	0.72	47	2.61	0.54	56.9	2.6	12.4	7.5	2.89	1742
21371	7003-066	011:47-48	C	9/08/92	2000	108	5.3	4.4	55	0.29	29	53	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1706
21372	7006-061	020:47-48	C	9/08/92	800	133	7.6	1.9	80	0.37	23	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1713
21373	7006-398	026:47-48	B	9/02/92	491	8.75	13.8	4.6	75	0.24	18	37	0.34	90	1.97	0.81	62.7	6.2	1.8	10.1	1.63	1339
21386	6929-042	102:03-04	C	9/09/92	800	350	4.6	3.7	56	0.29	29	55	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1728
21387	7013-003	104:03-04	C	9/09/92	600	429	1.0	4.8	17	0.32	34	50	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1731
21389	56008x19058M	106:05-06	C	9/09/92	1200	337	4.0	3.2	55	0.28	40	62	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1736
21393	6751-121	111:05-06	C	9/09/92	600	258	4.0	2.9	58	0.27	41	63	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1737

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	T Y P	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coβ	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
21394	6751-136	112:05-06	C	9/09/92	600	436	4.4	4.0	53	0.29	37	65	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1727
21396	Tolhurst	032:09-12	C	9/01/92	200	162	0.9	2.4	27	0.37	19	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1127
21397	Hallertau MF T4	245:01-05	C	9/09/92	100	161	4.5	3.8	54	0.29	22	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1854
21403	Sticklebract	002:01-04	B	9/11/92	1003	8.65	7.4	3.6	67	0.27	40	64	0.38	80	0.70	0.00	66.1	4.0	3.9	8.7	2.15	1992
21403	Sticklebract	229:01-05	B	9/11/92	546	8.60	7.8	3.8	68	0.26	38	63	0.38	86	1.02	0.58	59.1	1.1	4.5	5.3	4.65	1982
21404	Green Bullet	003:01-04	B	9/11/92	1141	9.75	8.8	4.0	69	0.24	42	66	0.33	84	0.50	0.55	73.5	4.0	0.1	11.7	2.96	2001
21404	Green Bullet	231:01-05	B	9/11/92	444	7.55	11.6	4.6	72	0.23	41	66	0.34	82	1.19	0.00	64.4	5.2	0.1	16.4	3.18	1987
21405	Superalpha	033:01-04	B	9/11/92	352	8.85	9.9	4.4	69	0.23	36	60	0.40	73	1.69	0.00	61.6	4.9	0.3	16.2	3.29	1997
21405	Superalpha	240:01-05	B	9/11/92	410	8.05	9.5	4.2	69	0.24	37	62	0.39	79	1.42	0.82	60.8	4.7	0.2	17.0	3.64	1989
21406	AlphaAroma	026:01-04	B	9/11/92	2450	9.60	7.7	2.7	74	0.25	23	47	0.41	80	1.02	0.67	0.0	0.0	0.0	0.0	0.00	1993
21406	AlphaAroma	241:01-05	B	9/11/92	1399	9.25	9.4	3.1	75	0.28	24	48	0.39	78	1.06	0.00	50.5	6.6	4.9	22.2	3.38	2003
21407	Id 51-8A	245:06-10	B	9/09/92	282	9.25	9.9	4.3	70	0.25	38	67	0.57	64	1.62	0.00	58.0	2.1	4.1	5.7	2.68	1929
21408	W402-49	247:06-10	B	9/09/92	1126	11.75	11.0	5.9	65	0.26	37	60	0.78	42	2.25	0.00	67.8	4.1	0.1	5.9	1.44	1925
21412	7013-051	106:03-04	C	9/09/92	400	241	1.6	2.1	44	0.31	27	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1738
21441	7710-034M	048:49-50	C	9/09/92	1000	219	3.0	3.5	46	0.31	36	55	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1836
21443	7727-044	017:51-52	C	9/09/92	1000	196	5.2	1.8	75	0.26	19	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1868
21450	7304-107	023:51-52	C	9/09/92	1400	360	8.4	2.2	79	0.28	28	52	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1797
21451	7306-193	025:51-52	C	9/09/92	1200	278	7.9	2.8	74	0.29	26	48	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1780
21452	7311-028	026:51-52	C	9/09/92	1600	305	12.6	3.5	78	0.28	35	56	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1790
21453	7314-033	027:51-52	C	9/09/92	800	352	10.5	3.3	76	0.27	32	56	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1785
21454	7007-339	033:51-52	C	9/09/92	600	216	10.9	3.7	74	0.29	37	62	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1782
21455	Mt Hood	010:09-12	C	9/01/92	400	164	3.9	4.0	50	0.31	19	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1134
21455	Mt Hood	017:63-67	C	9/08/92	1000	257	4.7	5.7	45	0.27	19	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1599
21455	Mt Hood	242:17-21	C	9/10/92	200	207	6.7	6.3	51	0.28	20	38	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1875
21456	8303-046	111:03-04	C	9/09/92	800	183	2.6	3.8	41	0.29	23	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1730
21457	Liberty	019:63-67	C	9/08/92	800	199	4.3	2.9	59	0.39	19	40	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1602
21457	Liberty	220:23-27	C	9/10/92	300	120	4.1	3.7	52	0.43	23	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1893
21459	8308-066	240:23-27	C	9/10/92	300	118	3.1	3.0	50	0.46	23	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1896
21460	HP1/86 S. Afr.	041:51-52	C	9/09/92	1200	110	3.5	2.6	57	0.34	31	50	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1775
21469	8301-011	001:63-67	C	9/08/92	1800	300	5.7	4.6	55	0.26	19	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1605
21470	8301-018	002:63-67	C	9/08/92	1600	197	2.6	3.5	42	0.41	14	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1607
21471	8301-062	003:63-67	C	9/08/92	1600	244	6.5	4.9	57	0.27	19	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1606
21484	8305-017	016:63-67	C	9/08/92	400	145	3.4	3.5	49	0.33	20	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1601
21485	S Afr Rf5/54	019:47-48	C	9/08/92	1600	347	11.4	5.3	68	0.25	17	38	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1724
21485	S Afr Rf5/54	112:39-40	B	9/11/92	1962	9.05	9.6	4.4	69	0.26	18	39	0.58	57	1.17	0.00	61.5	6.6	0.1	11.8	1.79	2004
21485	S Afr Rf5/54	216:06-10	B	9/08/92	1109	9.10	11.2	4.7	70	0.25	15	48	0.58	59	1.87	0.81	59.1	5.2	2.7	9.2	1.76	1754
21486	7507-109	012:47-48	C	9/08/92	100	226	7.6	3.9	66	0.27	20	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1705
21486	7507-109	239:23-27	B	9/11/92	1058	10.75	10.6	5.1	68	0.25	27	46	0.66	53	2.09	0.65	65.8	2.2	8.2	1.5	0.70	1983
21490	8309-037	229:28-32	B	9/11/92	418	9.60	6.1	6.0	50	0.26	20	35	1.15	24	2.00	0.53	64.7	4.1	0.1	15.9	3.86	1998
21491	8405-026	230:23-27	B	8/27/92	222	12.20	5.1	4.0	56	0.23	19	42	0.81	41	1.20	0.00	54.7	8.0	0.1	21.6	2.70	964
21493	8408-096	233:28-32	B	8/27/92	111	10.55	5.6	4.1	58	0.24	19	46	0.53	64	1.40	0.00	48.3	6.4	1.6	23.5	3.64	955
21496	Tettnanger A	040:01-04	C	8/17/92	300	176	4.9	4.8	51	0.30	19	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	18
21497	Tettnanger B	041:01-04	B	8/17/92	128	9.85	4.2	3.7	53	0.28	22	42	0.00	0	0.70	0.00	40.1	6.4	11.4	22.9	3.60	653
21498	Yeoman	034:01-04	B	9/03/92	587	9.15	11.7	3.6	76	0.31	18	44	0.43	77	1.67	1.23	40.3	9.1	0.2	24.1	2.65	1387
21498	Yeoman	203:01-05	B	8/25/92	273	7.95	13.2	4.6	74	0.30	21	52	0.39	84	1.60	0.00	55.2	5.3	0.1	16.3	3.08	1266
21499	Zenith	035:01-04	B	9/02/92	181	9.90	8.0	2.5	76	0.29	16	53	0.48	71	1.77	0.98	45.4	6.3	0.3	21.2	3.35	1341
21499	Zenith	035:01-04	C	9/01/92	181	220	6.3	2.1	75	0.31	20	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1153
21499	Zenith	209:01-05	B	9/08/92	375	9.40	8.9	2.8	76	0.28	19	56	0.56	59	1.76	0.00	57.2	4.5	0.5	15.6	3.50	1760

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	T Y P	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coβ	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
21500	7504-026	205:12-16	B	9/09/92	1008	8.10	11.6	5.5	68	0.24	20	45	0.37	82	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1943
21503	7504-137	234:12-16	B	9/10/92	1698	10.70	9.0	7.7	54	0.22	31	53	0.85	31	1.62	0.54	69.5	2.6	3.0	6.6	2.59	1952
21505	8036-099	234:23-27	B	9/11/92	461	10.45	5.8	2.5	70	0.29	27	52	0.55	64	1.01	0.49	66.4	2.3	0.0	9.1	3.98	1984
21507	Centennial	031:09-12	C	9/01/92	600	242	11.0	3.9	74	0.28	24	48	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1125
21507	Centennial	216:28-32	B	8/27/92	205	13.10	12.5	4.5	74	0.23	25	58	1.14	24	1.48	0.00	87.3	1.0	0.0	2.0	2.09	969
21511	7610-104	015:47-48	C	9/08/92	2200	189	10.6	3.1	77	0.32	28	49	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1719
21512	7611-025	018:47-48	C	9/08/92	1600	201	5.2	1.0	84	0.35	24	48	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1725
21513	7504-004	035:05-08	C	9/02/92	2000	145	3.8	3.3	53	0.28	13	33	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1238
21513	7504-004	202:12-16	B	9/09/92	1937	10.75	12.8	5.5	70	0.24	28	46	0.48	66	1.47	0.00	66.8	1.4	3.2	5.7	4.06	1921
21514	Hersbrucker-6	034:05-08	C	9/02/92	2000	115	1.8	2.0	47	0.37	11	33	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1222
21514	Hersbrucker-6	207:01-05	B	8/09/92	1081	10.70	4.3	4.9	47	0.27	17	41	0.55	60	1.37	0.72	48.6	5.3	0.6	11.5	2.19	1769
21515	Hersbrucker-8	216:01-05	B	9/08/92	1570	10.50	3.9	4.9	45	0.23	18	40	0.48	69	1.32	0.54	57.2	3.9	0.1	7.8	2.01	1743
21516	Hersbrucker-9	036:05-08	C	9/02/92	1900	210	5.6	3.4	62	0.25	15	32	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1237
21516	Hersbrucker-9	217:06-10	B	9/09/92	683	9.00	5.0	4.1	55	0.26	15	34	0.42	75	1.03	0.00	53.3	3.8	0.3	8.5	2.26	1949
21517	Hersb red stem	037:05-08	C	9/02/92	1500	153	3.3	2.2	60	0.31	14	36	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1232
21517	Hersb red stem	218:06-10	B	9/09/92	717	9.35	5.4	4.5	54	0.24	16	35	0.44	69	1.26	0.00	48.7	5.0	0.3	11.7	2.34	1946
21518	Hersb alpha	038:05-08	C	9/02/92	1600	151	5.7	3.5	62	0.27	16	36	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1234
21518	Hersb alpha	219:06-10	B	9/09/92	580	11.65	4.4	4.6	49	0.27	17	36	0.55	63	1.33	0.00	46.2	5.2	0.4	11.9	2.27	1919
21519	Ap71/74-2a Yugo	013:47-48	C	9/08/92	100	190	4.9	1.9	71	0.31	23	48	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1723
21519	Ap71/74-2a Yugo	039:05-08	C	9/02/92	1200	140	5.0	2.1	70	0.34	27	49	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1235
21519	Ap71/74-2a Yugo	222:01-05	B	9/08/92	973	8.25	7.7	3.2	71	0.32	24	58	0.50	74	1.34	0.68	41.2	6.2	19.8	15.7	2.54	1767
21520	Ba 11/72/19a Yu	016:47-48	C	9/08/92	0	249	11.4	5.1	69	0.27	29	54	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1720
21520	Ba 11/72/19a Yu	039:09-12	C	9/01/92	1400	195	5.3	2.3	69	0.28	27	52	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1129
21520	Ba 11/72/19a Yu	228:01-05	B	9/08/92	1391	9.25	5.1	2.8	64	0.28	30	63	0.49	68	0.88	0.00	55.3	2.1	22.0	2.2	1.03	1755
21521	Saazer-36	001:13-16	C	9/02/92	200	168	2.8	2.1	56	0.35	20	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1214
21521	Saazer-36	001:13-16	C	8/17/92	200	187	2.4	2.5	49	0.31	15	40	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	3
21521	Saazer-36	208:06-10	C	9/09/92	100	141	4.9	5.5	47	0.29	22	40	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1858
21522	Saazer-38	002:13-16	C	8/17/92	100	182	2.9	3.5	45	0.35	20	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1
21522	Saazer-38	002:13-16	C	9/02/92	100	239	2.5	2.1	54	0.37	16	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1215
21522	Saazer-38	209:06-10	C	9/09/92	100	135	3.9	4.0	49	0.31	24	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1841
21523	21113 vf	003:13-16	B	8/19/92	256	8.00	4.4	3.1	59	0.27	21	40	0.48	70	0.50	0.00	41.3	6.3	11.7	22.0	3.50	1418
21523	21113 vf	222:06-10	B	8/25/92	119	9.90	6.6	5.0	57	0.24	23	39	0.62	53	1.18	0.29	39.6	5.0	16.3	18.5	3.67	1473
21524	21114 vf	004:13-16	B	8/19/92	181	8.85	3.9	3.2	55	0.27	19	39	0.62	60	0.45	0.00	43.2	5.2	12.2	18.9	3.64	1415
21524	21114 vf	223:06-10	B	8/25/92	154	8.30	5.2	4.5	54	0.28	21	44	0.72	45	0.91	0.35	55.5	3.7	10.8	14.1	3.76	1041
21526	Osvald #126	005:13-16	B	8/19/92	789	9.30	4.7	2.2	68	0.29	22	55	0.43	80	0.84	0.56	33.9	11.6	4.1	31.6	2.74	1416
21527	Blato (CSR)	006:13-16	B	8/19/92	100	8.10	4.5	3.1	59	0.26	20	40	0.00	0	0.56	0.00	45.0	5.2	11.3	19.3	3.69	1083
21528	Lucan (CSR)	007:13-16	C	8/17/92	100	163	3.4	3.0	52	0.32	16	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	5
21529	Osvald #31	008:13-16	C	8/17/92	100	167	4.4	3.7	55	0.31	19	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	4
21530	Osvald #114	009:13-16	C	8/17/92	200	198	4.5	3.6	56	0.29	19	40	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	6
21531	Universal	015:13-16	C	8/17/92	200	238	4.5	3.9	54	0.26	18	37	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	2
21532	Osvald #72 (CSR	011:13-16	C	8/17/92	200	228	4.6	4.3	52	0.26	21	40	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	8
21533	Zlatan	012:13-16	C	8/17/92	200	253	4.3	3.7	54	0.30	18	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	7
21535	21525 vf	013:13-16	B	8/19/92	149	9.10	3.5	3.1	53	0.28	22	42	0.00	0	0.41	0.00	48.8	4.4	12.2	16.0	3.65	1086
21535	21525 vf	214:06-10	C	9/09/92	100	112	3.7	3.5	51	0.34	32	55	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1848
21536	7003-154	231:28-32	B	9/11/92	469	8.30	11.2	7.7	59	0.25	40	69	0.37	81	1.34	0.89	67.4	2.5	0.0	1.2	0.48	1999
21537	7006-370	024:47-48	C	9/08/92	1200	305	14.7	3.6	80	0.29	36	62	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1712
21537	7006-370	025:47-48	C	9/08/92	600	255	10.6	7.6	58	0.26	17	34	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1715
21538	21532 vf	014:13-16	B	8/19/92	149	8.75	3.4	2.8	55	0.29	21	42	0.00	0	0.45	0.00	46.8	4.5	11.6	16.2	3.59	1088

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	T Y P	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coβ	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
21557	W Am Hum 498	009:39-40	C	9/08/92	1800	77	1.3	1.5	46	0.56	59	83	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1608
21563	W Am Hum 505	027:41-44	B	9/08/92	245	7.15	1.4	2.4	38	0.31	63	81	0.59	62	0.20	0.00	18.8	8.7	0.2	5.5	0.63	1770
21565	W Am Hum 507	014:39-40	B	9/08/92	704	7.90	1.4	2.6	34	0.26	53	75	0.47	80	0.20	0.00	0.0	0.0	0.0	0.0	0.00	1753
21566	W Am Hum 509	028:41-44	B	9/08/92	277	8.00	4.0	3.9	51	0.29	58	78	0.64	57	0.34	0.00	0.0	0.0	0.0	0.0	0.00	1774
21567	W Am Hum 510	029:41-44	B	9/08/92	754	8.55	3.3	4.5	42	0.29	81	88	0.61	58	0.30	0.00	64.1	3.8	0.1	4.1	1.09	1750
21568	W Am Hum 513	030:41-44	B	9/08/92	341	11.90	3.0	3.9	44	0.30	61	77	0.61	58	0.33	0.00	31.3	6.6	0.7	12.8	1.94	1756
21576	W Am Hum 523	033:41-44	B	8/17/92	128	10.65	4.0	4.1	49	0.28	47	97	0.42	83	0.19	0.00	47.9	7.8	0.0	2.4	0.31	1069
21578	W Am Hum 525	021:39-40	B	8/17/92	107	10.60	4.0	3.4	54	0.33	52	84	0.57	66	0.45	0.00	46.3	5.7	0.0	3.2	0.56	1073
21579	W Am Hum 526	034:41-44	B	8/17/92	75	10.50	3.3	3.5	49	0.36	58	81	0.62	58	0.73	0.00	74.9	2.8	0.2	0.8	0.30	659
21580	W Am Hum 527	022:39-40	B	8/17/92	171	9.35	6.4	3.7	64	0.28	48	81	0.55	60	1.14	0.57	64.5	2.0	1.7	0.8	0.39	662
21581	W Am Hum 528	035:41-44	B	8/21/92	256	8.80	3.3	3.3	50	0.31	84	91	0.54	64	0.57	0.00	60.7	2.4	1.2	1.9	0.78	587
21583	W Am Hum 536	024:39-40	B	8/17/92	320	12.70	5.0	2.7	65	0.29	67	84	0.65	59	0.74	0.00	65.5	4.4	0.1	1.2	0.27	660
21584	W Am Hum 537	036:41-44	C	9/08/92	100	548	3.4	1.8	66	0.44	62	83	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1600
21585	W Am Hum 538	037:41-44	B	8/21/92	53	9.65	4.3	2.5	63	0.28	66	82	0.00	0	0.52	0.00	59.1	3.4	0.9	3.7	1.11	567
21586	W Am Hum 541	025:39-40	B	8/21/92	341	9.05	4.8	6.6	42	0.26	60	79	0.46	68	1.14	0.00	57.0	4.1	0.0	1.1	0.26	615
21590	W Am Hum 545	041:41-44	B	8/17/92	117	14.05	4.7	2.6	64	0.28	57	86	0.55	69	0.72	0.00	58.8	3.6	0.3	3.7	1.03	1081
21591	W Am Hum 546	042:41-44	B	8/17/92	64	11.30	1.6	3.6	31	0.37	34	82	0.78	51	0.58	0.00	58.5	4.3	0.7	1.6	0.37	1072
21592	W Am Hum 547	043:41-44	B	8/17/92	100	11.25	3.6	3.8	49	0.29	59	79	0.00	0	1.11	0.00	66.7	3.7	0.0	2.3	0.61	658
21594	W Am Hum 549	027:39-40	B	8/21/92	320	11.25	5.6	4.4	56	0.26	59	80	0.48	63	0.61	0.00	64.6	6.7	0.1	1.1	0.17	611
21595	Hum 548 Mont 19	026:39-40	B	8/21/92	85	9.70	3.7	2.3	62	0.29	66	83	0.00	0	0.26	0.00	35.4	6.3	0.7	5.5	0.87	569
21596	W Am Hum 552	002:39-40	B	9/08/92	384	9.75	3.2	3.2	50	0.27	70	88	0.50	69	0.18	0.00	5.7	8.4	0.7	13.2	1.57	1759
21596	W Am Hum 552	002:39-40	C	9/08/92	384	197	2.1	1.7	55	0.44	71	87	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1603
21599	W Am Hum 555	003:39-40	C	9/08/92	100	220	3.2	2.4	57	0.32	74	88	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1604
21600	W Am Hum 556	004:39-40	B	9/08/92	427	8.75	2.5	1.8	57	0.32	76	88	0.53	65	0.14	0.00	41.2	10.4	0.2	6.9	0.67	1758
21602	W Am Hum 570	030:39-40	B	8/21/92	341	10.45	4.6	5.9	44	0.25	63	79	0.00	0	1.12	0.00	64.6	2.3	3.8	0.8	0.34	564
21605	W Am Minn	031:39-40	B	8/21/92	277	9.25	1.7	3.9	30	0.27	54	74	0.00	0	0.34	0.00	13.1	10.4	0.2	6.8	0.65	577
21606	W Am 511 (Wye)	005:47-48	C	9/08/92	800	375	5.7	4.6	55	0.26	53	71	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1717
21607	W Am 572 (Wye)	007:47-48	B	8/17/92	64	11.00	3.3	2.4	57	0.30	61	77	0.00	0	0.14	0.00	29.5	27.2	1.2	4.3	0.16	650
21609	Pacific Gem	017:13-16	C	9/02/92	1800	227	4.5	2.3	66	0.28	29	58	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1226
21609	Pacific Gem	211:01-05	B	9/08/92	768	8.20	11.5	4.8	71	0.24	32	67	0.38	80	1.48	0.64	57.6	5.6	0.1	18.4	3.26	1752
21610	NZ Hallertauer	018:13-16	C	9/02/92	1800	218	6.4	3.0	68	0.29	34	60	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1221
21611	Celeia	020:13-16	B	8/19/92	309	11.70	5.2	3.2	62	0.23	22	50	0.41	83	0.58	0.00	36.7	11.0	3.9	24.4	2.21	1429
21611	Celeia	236:23-27	C	9/10/92	400	177	5.6	3.5	62	0.33	20	51	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1889
21612	Cerera	021:13-16	B	9/03/92	569	10.30	6.3	2.9	69	0.27	18	57	0.52	63	1.46	0.73	54.3	7.1	3.1	14.6	2.05	1388
21612	Cerera	021:13-16	C	9/02/92	569	158	3.9	2.8	58	0.32	20	52	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1218
21612	Cerera	235:01-05	B	9/08/92	939	10.00	5.5	3.2	64	0.30	23	56	0.77	47	1.82	0.65	61.9	4.8	2.9	11.4	2.40	1766
21613	Cekin	019:13-16	C	9/02/92	800	130	3.0	1.3	70	0.37	20	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1219
21613	Cekin	219:01-05	B	8/25/92	327	9.50	5.2	2.0	73	0.27	20	53	0.40	79	0.77	0.00	40.6	7.4	11.5	23.0	3.11	1470
21614	Cicero	212:01-05	C	9/09/92	100	170	4.5	2.2	67	0.38	22	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1864
21616	8305-021M	210:01-05	B	9/08/92	247	8.10	5.3	4.3	55	0.24	30	63	0.43	74	1.56	0.70	47.2	2.8	12.5	10.4	3.65	1744
21618M	8309-032M	107:03-04	C	9/09/92	100	220	3.6	3.6	50	0.32	25	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1732
21650	Fuggle vf (4820	021:01-04	C	8/17/92	200	276	4.9	2.1	70	0.28	21	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	24
21650	Fuggle vf (4820	021:01-04	C	9/01/92	200	359	3.8	1.7	69	0.32	21	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1167
21650	Fuggle vf (4820	215:01-05	C	9/09/92	100	159	4.5	2.6	64	0.31	24	47	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1859
21660	8802-019	024:17-20	B	9/02/92	651	8.85	5.4	5.3	51	0.25	16	48	0.77	44	1.30	0.51	56.8	4.8	6.8	17.8	3.70	1334
21660	8802-019	247:01-05	C	9/09/92	400	170	4.2	6.6	39	0.27	19	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1855
21661	8802-024	028:17-20	B	9/02/92	683	11.00	7.8	7.1	52	0.24	14	41	0.80	42	2.28	0.53	48.2	4.8	9.3	19.1	3.99	1330
21661	8802-024	248:01-05	C	9/09/92	400	213	8.2	7.9	51	0.24	16	32	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1865

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	TYP	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coβ	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
21662	8802-045	004:21-24	B	9/02/92	853	11.55	7.9	5.0	61	0.27	17	46	0.63	55	1.57	0.73	37.3	6.1	12.3	23.0	3.79	1333
21662	8802-045	227:06-10	B	9/09/92	267	9.45	5.7	4.6	55	0.28	21	39	0.68	56	1.23	0.00	54.8	4.4	9.2	15.9	3.58	1927
21663	8802-048	007:21-24	B	9/02/92	1056	8.80	7.2	5.8	55	0.24	22	38	0.77	47	1.45	0.61	68.5	3.1	6.5	10.6	3.39	1317
21663	8802-048	237:06-10	B	9/09/92	213	8.90	7.2	5.8	55	0.24	22	38	0.74	46	2.24	0.55	61.7	3.2	8.1	11.7	3.68	1948
21664	8802-068	025:21-24	B	9/02/92	917	7.90	8.4	6.3	57	0.23	18	37	0.66	51	0.93	0.97	65.2	3.2	5.0	10.4	3.25	1342
21664	8802-068	025:21-24	B	9/02/92	917	8.25	8.0	6.2	56	0.25	19	36	0.60	56	1.65	0.78	32.7	6.0	13.5	23.2	3.89	1314
21664	8802-068	201:12-16	C	9/10/92	100	272	10.0	7.1	58	0.26	19	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1912
21665	8805-040	009:25-28	B	9/02/92	938	10.80	7.7	5.1	60	0.26	18	42	0.63	51	1.57	0.72	50.3	4.9	8.7	18.7	3.83	1320
21665	8805-040	241:12-16	B	9/10/92	546	11.60	6.5	4.7	58	0.24	20	38	0.72	48	1.56	0.48	63.6	3.3	5.9	12.2	3.70	1974
21666	8806-017	029:25-28	B	9/02/92	1003	8.95	4.8	5.7	46	0.26	17	42	0.56	64	1.15	0.37	39.9	5.8	11.3	22.1	3.78	1325
21666	8806-017	213:17-21	B	8/27/92	235	9.15	3.7	5.6	39	0.24	19	43	0.67	50	0.84	0.38	58.0	3.5	10.6	13.3	3.75	980
48209	Fuggle H	010:01-04	B	8/17/92	587	12.50	4.2	2.1	66	0.31	25	47	0.39	90	0.83	0.00	38.8	10.5	3.6	29.3	2.80	1068
48209	Fuggle H	044:01-45	B	8/17/92	64	11.85	4.5	2.1	68	0.29	28	49	0.41	83	0.55	0.92	40.5	10.6	3.4	28.9	2.74	661
50024	BB 301-2	011:49-50	C	9/09/92	1200	481	7.0	2.6	73	0.26	42	64	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1805
50040	BB 301-1	046:49-50	C	9/09/92	800	182	1.2	2.8	30	0.30	28	49	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1819
54003	BB 504-2	031:51-52	C	9/09/92	1400	354	4.0	2.4	63	0.30	62	77	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1784
56001	Hallertauer	011:01-04	B	8/17/92	142	12.05	3.7	4.1	47	0.26	16	37	0.43	72	0.60	0.00	50.4	8.4	0.3	27.9	3.33	663
56002	Backa	012:01-04	C	9/01/92	600	152	2.4	2.6	48	0.35	18	37	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1160
56008	OB 826	013:49-50	C	9/09/92	600	266	8.2	4.8	63	0.26	38	61	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1807
56012	73-S	014:49-50	C	9/09/92	1000	200	3.3	1.5	69	0.31	22	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1827
56013	Cascade	013:01-04	B	9/02/92	630	8.70	5.1	4.4	54	0.25	36	54	0.00	0	0.81	0.00	67.6	3.9	3.5	9.2	2.35	1318
56013	Cascade	013:01-04	C	9/01/92	630	199	3.3	3.5	49	0.30	35	53	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1163
56013(0)	Cascade	129:16-20	B	9/03/92	0	9.60	5.3	4.2	56	0.26	36	54	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1364
56013(0)	Cascade	129:01-05	B	9/03/92	0	9.95	5.4	5.2	51	0.24	37	54	0.72	47	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1362
56013(0)	Cascade	130:01-05	B	9/03/92	0	10.50	5.3	4.6	54	0.25	34	54	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1390
56013(0)	Cascade	130:16-20	B	9/03/92	0	9.10	5.1	4.0	56	0.26	36	53	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1357
56013(6)	Cascade	129:26-30	B	9/03/92	0	10.20	5.7	4.6	56	0.26	37	54	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1354
56013(6)	Cascade	129:11-15	B	9/03/92	0	8.75	4.9	4.6	51	0.26	37	53	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1352
56013(6)	Cascade	130:11-15	B	9/03/92	0	8.65	5.0	4.3	54	0.25	36	54	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1363
56013(6)	Cascade	130:26-30	B	9/03/92	0	9.15	4.7	4.1	53	0.26	36	53	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1351
56013(9)	Cascade	129:21-25	B	9/03/92	0	11.25	4.6	4.6	50	0.27	36	52	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1355
56013(9)	Cascade	129:06-10	B	9/03/92	0	11.20	5.0	4.8	51	0.26	37	53	0.81	41	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1356
56013(9)	Cascade	130:06-10	B	9/03/92	0	9.05	4.8	5.0	49	0.26	37	54	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1353
56013(9)	Cascade	130:21-25	B	9/03/92	0	9.55	4.7	4.6	50	0.27	37	53	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1348
58016	Utah 526-5	001:41-44	B	9/08/92	843	8.10	3.0	1.5	66	0.33	23	46	0.48	76	0.41	0.00	47.4	11.9	0.4	25.1	2.12	1772
60015	Ariz 1-3	015:41-44	B	9/08/92	448	8.55	3.7	4.1	48	0.26	66	81	0.42	78	0.37	0.00	49.9	12.7	0.5	3.4	0.27	1757
60016	NM 1-3	016:41-44	B	8/17/92	427	9.35	2.7	2.6	51	0.31	59	90	0.38	82	0.21	0.10	47.6	9.1	0.3	14.7	1.61	1070
60020	NM 2-4	003:41-44	B	8/21/92	412	7.95	3.0	4.0	43	0.25	49	68	0.38	79	0.25	0.00	41.4	20.5	0.3	1.7	0.08	608
60021	NM 3-1	004:41-44	B	8/17/92	299	10.70	4.4	1.9	70	0.29	52	79	0.44	78	0.22	0.24	58.7	12.2	0.0	3.3	0.27	1080
60024	Colo 1-2	006:41-44	B	8/17/92	128	11.15	4.2	3.3	56	0.30	46	80	0.50	74	0.45	0.00	54.0	4.7	0.1	6.6	1.38	1067
60024	Colo 1-2	008:41-44	B	9/08/92	491	7.15	1.5	2.5	37	0.32	51	71	0.52	73	0.19	0.00	24.5	7.5	1.0	11.6	1.54	1763
60025	Colo 1-3	017:41-44	B	8/21/92	725	9.50	5.1	2.3	69	0.28	53	78	0.36	90	0.39	0.00	63.0	6.8	0.1	1.6	0.24	612
60029	Colo 3-1	010:41-44	B	9/08/92	512	6.50	7.6	5.4	58	0.26	66	82	0.50	63	0.87	0.00	71.1	2.8	0.1	3.6	1.28	1747
60032	Colo 5-1	002:51-52	C	9/09/92	600	229	1.3	1.6	43	0.30	9	19	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1814
60032	Colo 5-1	011:41-44	B	8/21/92	298	9.45	2.4	2.1	54	0.29	46	66	0.00	0	0.15	0.00	11.8	10.6	0.2	7.0	0.66	573
60033	Colo 6-1	019:41-44	B	8/21/92	651	6.30	1.7	2.9	38	0.26	69	86	0.36	87	0.05	0.00	28.3	29.0	0.4	1.8	0.06	583
60035	Colo 7-2	020:43-44	B	9/08/92	149	7.30	3.2	3.3	49	0.28	50	73	0.43	75	0.25	0.00	32.5	20.4	0.0	1.9	0.09	1745
60037	Wyo 2-1	012:41-44	B	9/08/92	1600	8.25	7.5	4.7	62	0.23	40	65	0.30	85	0.71	0.00	53.4	7.0	0.2	16.3	2.32	1751

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	TYP	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coβ	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
60038	Wyo 3-1	013:41-44	B	8/21/92	213	7.80	2.4	4.7	34	0.25	66	80	0.56	60	0.57	0.00	68.8	11.5	0.0	1.0	0.09	586
60042	Shinshuwase	016:01-04	C	9/01/92	1800	259	4.1	2.9	58	0.29	47	71	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1162
61008	Pol C2/66	037:51-52	C	9/09/92	100	192	3.2	2.7	54	0.38	19	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1781
61011	Pol P/K1	038:51-52	B	8/17/92	64	10.95	4.9	3.6	58	0.27	22	40	0.00	0	0.52	0.00	34.5	6.8	12.9	25.0	3.69	649
61019	Yugo Golding	017:01-04	B	8/17/92	96	11.90	4.0	2.0	66	0.31	24	47	0.00	0	0.55	0.00	33.8	11.6	3.9	31.0	2.68	652
61020	Savj Golding	018:01-04	B	8/17/92	498	10.80	4.8	2.0	70	0.28	28	50	0.38	88	0.65	0.00	30.8	11.7	4.7	33.4	2.85	1066
61021	Tettnanger	019:01-04	C	8/17/92	200	148	5.7	4.4	57	0.26	20	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	21
61021	Tettnanger	019:01-04	C	9/01/92	200	217	4.6	3.4	57	0.29	20	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1159
62013	Comet	020:01-04	C	9/01/92	1800	531	11.8	3.3	78	0.29	41	63	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1166
62052	Density	001:05-08	C	9/02/92	600	140	1.6	0.9	65	0.42	33	66	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1211
62053	Defender	002:05-08	B	8/17/92	64	11.55	2.4	1.2	68	0.36	27	49	0.55	74	0.36	0.28	23.9	14.2	2.5	35.1	2.48	1079
63008	N 48-8	011:51-52	C	9/09/92	800	214	4.9	3.9	56	0.27	37	64	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1818
63018	N 47-35	012:51-52	C	9/09/92	600	150	5.7	4.3	57	0.27	19	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1869
63019	N 47-40	013:51-52	C	9/09/92	1000	164	3.7	1.8	67	0.29	32	52	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1873
63020	N 47-42	014:51-52	C	9/09/92	800	205	5.2	2.7	66	0.28	30	50	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1866
63021	N48-1	015:51-52	C	9/09/92	1000	183	4.3	3.5	55	0.29	48	70	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1874
63027	BG x 19040M	016:51-52	C	9/09/92	1400	147	4.3	4.9	46	0.26	40	58	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1871
63032	BG x 58015M	035:49-50	C	9/09/92	600	530	8.2	4.2	66	0.27	62	80	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1832
64003	19105 x 19173M	018:51-52	C	9/09/92	2000	102	1.0	2.6	28	0.36	33	51	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1867
64007	19105 x 19058M	017:49-50	C	9/09/92	1400	216	4.0	6.0	40	0.25	29	55	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1830
64007	19105 x 19058M	232:01-05	B	9/08/92	1655	9.65	2.3	5.5	29	0.27	31	62	0.61	55	0.87	0.34	67.3	4.8	0.0	10.5	2.17	1768
64008	Zattler 2L1180P	019:51-52	C	9/09/92	600	236	4.8	2.8	63	0.27	23	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1872
64010	Zattler 7K4910P	021:51-52	C	9/09/92	600	117	3.9	2.9	57	0.28	22	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1870
64020	Backa x 19062M	044:51-52	C	9/09/92	1200	171	2.0	1.0	67	0.34	25	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1803
64026	BG x 19182M	045:51-52	C	9/09/92	1200	133	2.9	2.1	58	0.32	20	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1800
64100	Bullion	003:05-08	C	9/02/92	1800	119	10.4	5.6	65	0.29	35	64	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1228
64107	Northern Brewer	004:05-08	C	9/02/92	900	202	5.9	2.1	74	0.30	24	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1225
65009	BG x 19058M	228:23-27	B	9/11/92	1118	10.25	12.2	8.1	60	0.24	33	57	1.14	23	2.18	0.99	68.3	5.8	0.1	8.0	1.37	1995
65101	Talisman	005:05-08	C	9/02/92	2000	183	3.9	1.9	67	0.31	49	75	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1217
65102	Cluster (L1)	006:05-08	B	9/03/92	668	9.75	6.3	3.6	64	0.27	45	67	0.34	85	0.52	0.00	57.4	4.9	0.0	12.2	2.50	1368
65102	Cluster (L1)	041:05-08	C	9/02/92	300	222	4.2	2.5	63	0.28	35	61	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1239
65102	Cluster (L1)	201:06-10	C	9/09/92	400	168	5.5	4.0	58	0.29	35	59	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1847
65104	Cluster (L8)	033:09-12	C	9/01/92	1000	173	5.4	3.6	60	0.28	38	67	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1128
66050	Alliance	012:05-08	B	8/19/92	405	11.00	5.3	2.0	72	0.25	30	53	0.35	89	0.62	0.00	18.8	14.5	1.9	44.0	3.03	1425
66051	Progress	009:05-08	B	8/19/92	213	8.60	5.2	2.1	71	0.28	27	49	0.35	86	0.54	0.27	23.2	12.3	0.3	44.6	3.63	1427
66052	Pride of Ringwo	010:05-08	C	9/09/92	1600	228	6.3	4.0	61	0.26	33	51	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1739
66054	Calicross	014:05-08	C	9/02/92	1900	191	4.4	2.8	61	0.29	30	58	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1220
66055	First Choice	015:05-08	C	9/02/92	1800	158	3.0	3.2	49	0.33	34	62	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1231
66056	Smoothcone	016:05-08	C	9/02/92	1900	145	6.2	3.3	65	0.36	21	48	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1207
6763-010		110:05-06	C	9/09/92	1600	207	0.9	1.9	32	0.38	47	69	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1734
68052	Petham Golding	017:05-08	B	9/02/92	587	9.55	7.2	2.1	77	0.28	27	50	0.50	69	1.19	0.00	54.6	8.3	0.4	17.6	2.13	1340
68052	Petham Golding	017:05-08	C	9/02/92	587	258	6.6	2.1	76	0.27	27	49	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1213
8020-032		224:01-05	B	8/25/92	1058	9.15	9.0	3.5	72	0.25	35	66	0.00	0	1.09	0.00	65.9	3.6	0.0	9.2	2.55	1468
8154-230		236:06-10	C	9/09/92	100	78	4.5	3.7	55	0.45	26	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1856
8154-274		103:31-32	B	9/09/92	960	9.60	7.3	3.9	65	0.28	20	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1941
8252-112		104:31-32	B	9/09/92	256	8.60	6.5	4.9	57	0.26	23	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1934
8252-112		109:31-32	B	9/09/92	384	8.45	3.5	4.4	44	0.29	16	33	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1933
8252-165		108:31-32	B	9/09/92	256	8.10	2.6	5.3	33	0.24	19	32	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1936

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	T Y P	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% ß	Alpha Ratio	HSI	Coα	Coß	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
8252-267		110:31-32	B	9/04/92	811	9.65	3.9	6.3	38	0.25	18	42	0.00	0	1.06	0.00	30.4	11.1	0.4	38.6	3.46	1665
8254-167		225:23-27	B	9/11/92	606	9.90	7.4	7.5	50	0.24	14	33	0.00	0	1.39	0.00	42.8	7.8	0.2	28.3	3.64	1981
8254-244		227:23-27	B	9/11/92	520	7.70	5.4	7.1	43	0.23	19	38	0.00	0	1.69	0.00	34.6	9.4	3.3	33.7	3.57	1990
8301-021		210:06-10	C	9/09/92	200	164	4.8	4.3	53	0.28	21	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1844
8401-068		230:01-05	C	9/09/92	1200	178	4.6	3.8	54	0.45	26	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1861
8401-076		243:01-05	B	9/08/92	708	8.85	4.1	3.2	56	0.29	22	50	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1762
8401-132		202:06-10	B	8/25/92	392	10.05	5.5	5.6	49	0.21	19	45	0.00	0	1.76	0.00	57.4	7.5	0.1	19.4	2.59	1474
8405-101		239:06-10	B	9/09/92	256	9.30	4.4	3.2	58	0.29	19	38	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1931
8406-016		212:06-10	C	9/09/92	100	163	5.5	4.4	56	0.27	23	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1851
8408-012		210:17-21	B	9/10/92	341	8.90	8.4	7.4	53	0.22	21	38	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1971
8408-012		228:06-10	C	9/09/92	100	153	5.3	3.8	59	0.27	29	36	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1842
8408-070		209:17-21	B	9/10/92	725	10.95	5.2	5.6	48	0.24	23	40	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1963
8408-115		230:06-10	C	9/09/92	200	192	6.3	4.8	57	0.25	21	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1845
8411-015		111:31-32	B	9/04/92	789	10.85	6.1	3.3	65	0.28	21	43	0.00	0	1.06	0.00	32.3	11.6	0.4	30.6	2.63	1648
8411-025		112:31-32	B	9/04/92	1356	10.35	5.2	2.7	66	0.29	25	49	0.00	0	1.06	0.00	40.4	9.9	0.4	28.0	2.83	1662
8411-027		101:33-34	B	9/09/92	1088	9.55	5.8	2.4	71	0.29	23	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1937
8411-029		102:33-34	B	9/09/92	1600	11.20	5.5	2.6	68	0.29	24	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1939
8411-040		103:33-34	B	9/09/92	747	10.05	4.6	3.5	57	0.29	24	47	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1940
8411-042		104:33-34	B	9/09/92	1536	8.80	7.7	3.1	71	0.27	27	50	0.00	0	1.47	0.00	47.6	8.0	0.3	22.2	2.76	1938
8411-064		106:33-34	B	9/09/92	1450	7.75	5.8	3.2	64	0.28	31	54	0.00	0	1.32	0.00	39.0	9.1	0.6	29.6	3.26	1935
8411-135		108:33-34	B	9/09/92	1130	9.85	5.6	3.1	64	0.30	26	51	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1918
8411-150		109:33-34	B	9/09/92	1280	8.35	5.6	3.4	62	0.28	24	47	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1924
8411-157		110:33-34	B	9/09/92	875	9.20	3.7	2.8	57	0.30	27	52	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1944
8411-204		101:35-36	B	9/09/92	1066	10.85	6.3	3.1	67	0.28	20	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1922
8411-229		102:35-36	B	9/09/92	725	9.90	5.7	2.7	68	0.28	30	55	0.00	0	1.11	0.00	50.8	8.5	0.2	18.0	2.11	1920
8411-262		103:35-36	B	9/10/92	1066	8.95	5.5	2.9	65	0.29	26	47	0.00	0	1.19	0.00	47.1	9.1	0.4	24.9	2.73	1980
8412-002		104:35-36	B	9/10/92	789	9.80	8.9	4.6	66	0.25	39	64	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1954
8412-010		105:35-36	B	9/10/92	1493	12.60	6.8	5.3	56	0.27	42	65	0.00	0	2.15	0.00	59.3	5.5	1.4	16.9	3.07	1959
8412-016		107;35-36	B	9/10/92	1493	10.25	7.9	4.0	67	0.28	30	56	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1978
8412-019		108:35-36	B	9/10/92	940	10.60	8.1	3.8	68	0.28	19	41	0.00	0	1.85	0.00	55.1	5.1	2.3	16.2	3.17	1950
8412-022		109:35-36	B	9/10/92	1770	9.10	6.7	3.5	66	0.29	27	50	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1968
8412-034		111:35-36	B	9/10/92	1344	9.55	6.1	3.0	67	0.27	26	51	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1977
8412-058		102:37-38	B	9/10/92	1152	11.10	9.7	4.3	69	0.24	19	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1966
8412-075		103:37-38	B	9/10/92	1173	9.50	7.8	3.8	67	0.28	21	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1964
8412-079		105:37-38	B	9/10/92	1493	11.00	6.6	4.8	58	0.26	31	60	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1975
8412-088		106:37-38	B	9/10/92	1365	11.80	6.3	3.1	67	0.29	21	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1973
8412-101		107:37-38	B	9/10/92	1813	9.85	8.2	4.5	65	0.27	19	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1961
8412-125		109:37-38	B	9/10/92	1962	11.65	7.0	3.9	64	0.27	25	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1960
8412-138		111:37-38	B	9/10/92	1813	10.65	9.0	3.9	70	0.28	22	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1976
8412-138		233:06-10	C	9/09/92	400	171	7.3	4.1	64	0.31	22	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1850
8412-150		101:39-40	B	9/11/92	1557	10.45	3.8	3.4	52	0.31	34	56	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1994
8412-183		103:39-40	B	9/11/92	938	9.50	6.9	3.5	66	0.29	23	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1991
8412-196		105:39-40	B	9/11/92	1792	8.75	7.7	4.8	62	0.33	34	59	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	2002
8412-207		107:39-40	B	9/11/92	704	9.15	6.5	2.5	72	0.30	21	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1996
8412-214		108:39-40	B	9/01/92	938	9.20	5.4	2.6	68	0.31	21	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	2000
8601-025		223:01-05	C	9/09/92	1000	122	8.1	4.4	65	0.32	23	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1857
8602-002		205:17-21	C	9/10/92	400	110	5.9	4.4	57	0.38	22	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1878
8602-035		231:06-10	B	8/05/92	776	8.70	12.2	4.5	73	0.25	22	46	0.00	0	1.06	0.00	70.3	5.3	6.7	4.3	0.82	1471

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	T Y P	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coβ	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
8602-119		238:06-10	B	9/09/92	299	8.50	5.2	3.0	63	0.31	27	49	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1930
8602-162		242:06-10	B	9/09/92	370	8.40	8.4	4.2	67	0.26	19	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1947
8602-207		204:12-16	B	9/09/92	427	8.00	11.5	5.3	68	0.24	21	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1928
8602-274		207:12-16	B	9/09/92	1177	8.45	6.8	7.3	48	0.25	20	36	0.00	0	1.46	0.00	59.8	4.1	0.5	15.8	3.87	1945
8602-278		208:12-16	B	8/27/92	538	11.20	8.7	3.7	70	0.27	21	51	0.00	0	1.24	0.00	54.7	2.8	12.6	10.4	3.68	981
8602-300		227:12-16	B	8/27/92	683	11.80	8.6	3.7	70	0.26	19	51	0.00	0	1.06	0.00	45.9	6.5	0.6	19.4	3.01	978
8602-411		231:12-16	B	8/27/92	691	11.30	7.2	6.1	54	0.26	20	46	0.00	0	1.49	0.00	56.1	2.2	15.4	8.0	3.62	970
8602-578		232:12-16	B	9/10/92	273	10.80	7.9	4.3	64	0.26	20	40	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1951
8603-073		239:12-16	B	9/10/92	597	8.40	8.2	5.3	61	0.23	22	40	0.00	0	1.77	0.00	50.7	6.7	0.2	24.9	3.72	1967
8603-077		240:12-16	B	9/10/92	1468	11.20	6.8	5.0	58	0.24	22	41	0.00	0	1.48	0.00	40.7	6.5	21.2	14.2	2.18	1965
8603-232		243:12-16	B	9/10/92	853	10.00	7.7	5.5	58	0.24	20	38	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1972
8603-314		204:17-21	C	9/10/92	200	137	4.2	5.1	45	0.33	20	36	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1881
8603-346		208:17-21	B	8/27/92	358	11.95	10.8	4.6	70	0.24	17	49	0.00	0	1.55	0.00	66.0	2.6	7.9	6.6	2.57	975
8603-481		228:17-21	B	8/27/92	420	11.20	8.4	6.0	58	0.24	18	40	0.00	0	1.65	0.00	48.2	4.3	12.7	16.8	3.89	971
8603-481		238:17-21	B	8/27/92	435	12.40	7.6	3.5	68	0.24	21	52	0.00	0	1.21	0.00	57.5	3.5	13.8	10.6	3.02	958
8802-002		007:17-20	B	9/02/92	1098	9.00	7.0	6.4	52	0.24	22	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1573
8802-002		218:01-05	C	9/09/92	1000	269	4.4	6.7	39	0.27	24	38	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1862
8802-012		017:17-20	B	9/02/92	842	10.05	5.3	5.1	51	0.24	21	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1568
8802-012		226:01-05	B	9/08/92	469	8.95	4.9	3.9	56	0.28	22	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1765
8802-018		023:17-20	B	9/02/92	1024	9.20	7.1	6.2	53	0.26	20	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1329
8802-018		238:01-05	C	9/09/92	600	195	6.7	7.1	49	0.28	20	40	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1860
8802-027		031:17-20	B	9/02/92	747	8.80	5.0	5.3	48	0.26	19	38	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1312
8802-027		249:01-05	C	9/09/92	200	145	5.3	5.9	47	0.36	18	38	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1863
8802-029		033:17-20	B	9/02/92	683	12.35	7.7	4.9	61	0.25	24	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1324
8802-029		203:06-10	C	9/09/92	400	156	4.6	4.8	49	0.33	21	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1846
8802-037		040:17-20	B	9/02/92	672	8.75	8.5	5.5	61	0.24	24	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1313
8802-037		206:06-10	C	9/09/92	400	217	5.4	6.2	46	0.27	24	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1849
8802-041		001:21-24	B	9/02/92	1514	9.20	8.8	3.1	74	0.25	20	36	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1337
8802-042		207:06-10	C	9/09/92	200	168	8.1	5.8	58	0.29	18	34	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1853
8802-046		005:21-24	B	9/02/92	533	10.75	6.4	5.9	52	0.25	22	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1332
8802-046		229:06-10	B	9/09/92	213	8.85	5.6	4.4	56	0.27	21	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1932
8802-055		232:06-10	B	9/09/92	555	8.90	8.8	5.2	63	0.24	22	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1942
8802-059		018:21-24	B	9/02/92	1099	10.65	8.9	6.1	59	0.25	21	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1319
8802-061		020:21-24	B	9/02/92	1056	10.60	11.9	9.1	57	0.26	22	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1343
8802-064		248:06-10	C	9/09/92	400	174	6.1	3.9	61	0.32	22	37	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1843
8805-006		033:21-24	B	9/02/92	1088	7.10	6.9	4.2	62	0.26	19	37	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1327
8805-006		211:12-16	C	9/10/92	200	210	3.7	4.9	43	0.31	19	36	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1916
8805-007		215:12-16	B	9/09/92	683	9.20	4.9	2.6	65	0.31	23	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1926
8805-011		034:21-24	B	9/02/92	1173	9.00	8.0	5.3	60	0.26	25	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1338
8805-011		220:12-16	C	9/10/92	400	210	8.9	6.4	58	0.24	24	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1901
8805-013		035:21-24	B	9/02/92	789	8.60	6.8	5.7	55	0.26	22	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1331
8805-013		221:12-16	C	9/10/92	600	267	4.7	4.8	49	0.37	22	40	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1910
8805-015		238:12-16	B	8/27/92	416	12.85	7.2	5.5	57	0.22	19	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	963
8805-018		206:17-21	C	9/10/92	100	184	10.5	7.2	59	0.27	21	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1898
8806-001		014:25-28	B	9/02/92	928	9.45	8.2	3.9	68	0.27	21	37	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1336
8806-012		024:25-28	B	9/02/92	971	8.35	6.5	7.6	46	0.22	19	35	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1315
8806-013		025:25-28	B	9/02/92	629	9.45	7.3	5.3	58	0.25	20	38	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1344
8806-013		211:17-21	B	9/10/92	495	11.60	7.3	5.2	58	0.24	20	40	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1979

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	TYP	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coβ	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
8806-021		033:25-28	B	9/02/92	1067	9.15	12.2	10.3	54	0.26	22	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1335
8806-022		034:25-28	B	9/02/92	896	8.35	5.6	5.7	50	0.25	22	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1316
8808-003		216:17-21	C	9/10/92	400	138	1.0	8.9	10	0.30	22	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1903
8808-009		218:17-21	B	9/10/92	299	9.60	3.5	8.2	30	0.28	30	40	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1962
8808-025		223:17-21	C	9/10/92	600	166	0.9	6.0	13	0.32	30	47	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1911
8808-034		225:17-21	C	9/10/92	800	165	0.4	5.7	6	0.27	28	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1887
8808-046		229:17-21	C	9/10/92	600	247	0.2	3.4	5	0.42	0	33	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1914
8808-055		230:17-21	C	9/10/92	800	95	1.2	8.8	12	0.27	38	51	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1902
8808-074		233:17-21	C	9/10/92	100	147	0.2	6.2	3	0.39	0	50	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1882
8808-136		211:23-27	C	9/10/92	200	114	0.0	6.0	0	0.54	26	51	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1894
8808-142		212:23-27	C	9/10/92	400	87	0.0	11.3	0	0.29	0	47	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1891
8809-022		213:23-27	C	9/10/92	200	88	0.2	6.5	4	0.43	25	48	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1888
8809-056		216:23-27	B	9/10/92	307	10.25	1.8	11.0	14	0.21	32	56	0.00	0	1.06	0.00	40.2	6.4	20.9	14.0	2.18	1956
8809-063		217:23-27	C	9/10/92	400	81	0.0	6.5	0	0.78	0	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1892
8809-071		218:23-27	B	9/10/92	222	9.80	1.1	7.1	14	0.28	34	48	0.00	0	1.04	0.00	56.8	4.8	0.8	10.0	2.07	1958
8809-105		222:23-27	B	9/10/92	587	10.15	9.0	4.2	68	0.27	34	58	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1970
8809-115		212:12-16	C	9/10/92	100	122	1.1	7.6	12	0.37	0	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1913
8809-132		226:23-27	C	9/10/92	400	224	0.4	8.0	5	0.30	0	49	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1895
8901-002		147:02	B	8/17/92	128	9.00	4.1	2.5	61	0.33	58	82	0.00	0	0.70	0.00	55.6	4.6	0.1	3.5	0.76	656
8901-006		147:06	C	8/17/92	100	313	3.1	0.8	79	0.52	61	84	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	80
8901-016		147:16	C	8/17/92	200	338	4.7	2.8	63	0.37	61	80	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	55
8901-019		147:19	C	8/17/92	200	289	3.9	2.9	58	0.36	56	76	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	76
8901-020		147:20	C	8/17/92	400	344	4.1	2.6	61	0.32	54	77	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	52
8901-021		147:21	C	8/17/92	400	309	3.8	2.4	62	0.37	59	81	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	82
8901-025		147:25	C	8/17/92	400	425	5.1	2.6	66	0.34	59	77	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	50
8901-031		147:31	C	8/17/92	400	388	3.7	2.1	64	0.38	55	76	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	65
8901-040		147:40	C	8/17/92	200	339	5.1	3.3	60	0.37	58	77	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	46
8901-046		147:46	C	8/17/92	100	421	3.8	1.9	67	0.39	57	76	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	54
8901-048		147:48	C	8/17/92	300	348	4.3	2.5	63	0.36	56	76	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	78
8901-052		148:01	C	8/17/92	200	185	6.7	5.4	55	0.39	61	77	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	36
8901-057		148:06	C	8/17/92	200	331	3.2	2.9	52	0.70	50	72	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	43
8901-066		148:15	C	8/17/92	100	411	1.7	1.4	55	0.40	73	90	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	68
8901-072		148:21	C	8/17/92	200	550	3.9	1.8	68	0.42	60	78	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	41
8901-077		148:26	C	8/17/92	500	227	4.0	3.3	55	0.34	55	76	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	70
8901-082		148:31	C	8/24/92	100	100	2.3	2.0	53	0.48	64	85	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	532
8901-084		148:33	C	8/17/92	500	351	3.0	2.2	57	0.36	65	84	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	49
8901-086		148:35	C	8/17/92	100	523	2.6	1.9	57	0.33	56	78	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	69
8901-091		148:40	C	8/17/92	200	330	1.9	2.1	47	0.93	55	77	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	47
8901-094		148:43	C	8/17/92	50	465	3.9	0.5	89	0.56	56	91	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	72
8906-001		148:44	B	8/17/92	128	11.25	4.0	2.8	59	0.32	58	77	0.00	0	0.79	0.00	55.5	3.3	0.6	5.4	1.66	657
8906-002		148:45	C	8/17/92	400	507	4.5	2.5	64	0.34	64	82	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	44
8913-001		148:46	B	8/17/92	171	10.40	2.3	2.0	53	0.37	60	82	0.00	0	0.47	0.00	72.0	2.9	0.1	3.9	1.36	651
8917-001		148:47	B	8/17/92	213	9.85	1.3	0.9	58	0.37	48	72	0.87	49	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1078
8917-002		148:48	C	8/17/92	400	427	2.0	1.9	50	0.38	56	80	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	85
8917-003		148:49	C	8/17/92	200	683	2.2	2.2	51	0.31	66	84	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	51
8917-004		148:50	C	8/17/92	400	711	2.7	2.0	57	0.29	61	81	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	79
8917-005		148:51	C	8/17/92	800	406	2.3	2.0	53	0.33	65	84	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	53
8917-007		149:02	C	8/17/92	500	499	3.8	2.3	62	0.32	62	84	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	84

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	Type	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coβ	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
8917-008		149:03	C	8/17/92	200	333	1.4	2.2	39	0.48	47	70	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	77
8917-009		149:04	B	8/18/92	85	7.80	1.8	2.3	44	0.37	52	74	0.00	0	0.29	0.00	57.1	3.2	0.0	3.0	0.94	645
8917-012		149:07	C	8/17/92	100	379	2.6	2.2	54	0.39	71	86	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	35
8917-014		149:09	C	8/17/92	200	415	3.4	3.0	53	0.27	51	73	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	75
8918-001		149:13	C	8/17/92	200	417	1.6	0.9	64	0.50	54	78	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	37
8918-002		149:14	B	8/18/92	85	8.10	1.3	1.5	47	0.34	50	71	0.00	0	0.23	0.00	54.8	6.1	0.3	6.4	1.05	641
8918-003		149:15	C	8/17/92	200	202	2.7	2.4	53	0.43	59	82	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	71
8918-004		149:16	C	8/17/92	100	264	0.8	1.6	33	0.39	47	77	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	83
8918-005		149:17	B	8/18/92	300	6.00	1.4	2.3	38	0.33	55	77	0.85	45	0.41	0.00	57.8	4.1	0.1	3.9	0.96	624
8918-009		149:21	C	8/17/92	400	359	1.9	1.0	66	0.60	57	80	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	38
8918-011		149:23	C	8/17/92	100	914	3.0	2.6	54	0.30	52	74	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	67
8918-012		149:24	B	8/18/92	470	6.25	3.2	2.7	55	0.31	58	77	0.55	70	0.54	0.00	54.0	4.8	0.1	4.5	0.93	629
8918-013		149:25	B	8/18/92	171	8.45	1.3	2.1	38	0.38	51	70	0.00	0	0.47	0.00	67.1	2.2	0.0	3.4	1.56	644
8918-014		149:26	C	8/17/92	100	446	1.6	0.5	75	0.59	59	69	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	34
8918-015		149:27	C	8/17/92	100	467	2.2	1.7	56	0.40	61	99	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	48
8918-016		149:28	C	8/17/92	300	654	0.8	1.9	31	0.38	45	72	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	66
8918-018		149:30	B	8/18/92	512	6.85	1.4	1.5	49	0.36	52	74	0.86	47	0.28	0.00	63.1	4.5	0.0	4.5	1.01	632
8918-020		149:32	B	8/18/92	213	7.60	0.6	1.0	37	0.46	55	72	0.00	0	0.20	0.00	61.5	3.3	0.1	4.1	1.23	647
8918-021		149:33	C	8/17/92	200	411	0.4	1.0	29	0.75	66	67	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	45
8918-023		149:35	C	8/17/92	200	447	2.8	1.8	61	0.35	57	79	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	81
8918-025		149:37	C	8/17/92	200	271	1.2	2.8	30	0.44	40	62	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	40
8918-028		149:40	C	8/17/92	150	695	1.7	1.7	49	0.33	68	86	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	74
8918-029		149:41	C	8/17/92	150	416	1.0	1.9	36	0.41	59	80	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	42
8918-031		149:43	B	8/18/92	130	8.70	0.9	1.3	41	0.40	50	73	0.00	0	0.21	0.00	51.1	6.0	0.0	5.6	0.94	648
8918-033		149:45	C	8/17/92	100	333	0.4	1.1	28	0.49	47	68	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	56
8918-037		149:49	B	8/18/92	555	9.70	0.9	1.1	46	0.40	55	76	0.00	0	0.20	0.00	48.0	4.5	0.1	6.1	1.36	636
8918-041		150:02	C	8/17/92	200	780	3.0	2.7	53	0.32	54	73	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	58
8918-046		150:07	B	8/18/92	256	6.85	1.6	1.7	48	0.35	46	64	0.90	48	0.25	0.00	54.2	5.0	0.1	3.0	0.60	630
8921-002		150:09	C	8/17/92	200	452	3.9	0.3	92	0.65	70	86	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	28
8921-003		150:10	B	8/18/92	811	6.25	3.6	2.2	62	0.34	58	92	0.59	62	0.41	0.00	51.2	6.8	0.1	2.7	0.40	627
8923-002		150:12	B	8/18/92	469	8.80	4.3	2.3	65	0.33	67	86	0.54	71	0.21	0.00	29.1	6.2	0.1	6.3	1.02	634
8923-003		150:13	B	8/18/92	300	7.10	4.2	2.5	63	0.31	72	89	0.00	0	0.24	0.00	44.3	6.9	1.3	11.9	1.72	646
8923-009		150:19	B	8/18/92	128	8.80	4.5	2.4	65	0.29	62	82	0.00	0	0.33	0.00	55.3	6.1	0.3	6.4	1.05	642
8923-013		150:23	B	8/18/92	683	6.95	4.9	2.1	70	0.31	70	86	0.61	63	0.43	0.00	70.1	8.4	0.0	1.9	0.23	631
8923-014		150:24	C	8/17/92	200	447	3.6	2.0	65	0.38	62	84	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	60
8923-015		150:25	B	8/18/92	555	6.65	3.6	2.2	62	0.33	67	86	0.59	68	0.23	0.00	46.7	5.2	0.1	4.7	0.90	633
8924-001		150:27	B	8/18/92	2005	6.45	2.6	3.4	43	0.32	65	85	0.61	66	0.41	0.00	68.2	2.0	0.0	2.2	1.08	625
8924-003		150:29	B	8/18/92	1280	6.55	4.5	3.7	55	0.30	66	83	0.59	63	0.63	0.00	57.5	4.4	0.1	4.5	1.03	628
8924-005		150:31	B	8/18/92	1450	8.45	6.1	2.6	70	0.34	55	76	1.04	32	1.00	0.00	77.5	1.8	0.0	1.9	1.09	618
8924-010		150:36	B	8/18/92	938	8.75	3.6	2.0	64	0.35	66	86	0.85	44	0.32	0.00	69.1	2.6	0.3	3.2	1.25	621
8936-004		150:40	C	8/17/92	200	460	3.9	0.6	86	0.60	80	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	31
8936-006		150:42	C	8/17/92	400	710	4.0	3.8	51	0.32	79	91	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	57
8936-010		150:46	C	8/17/92	400	695	4.9	4.3	53	0.28	67	82	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	26
8936-015		150:51	B	8/18/92	427	7.45	4.8	4.3	53	0.29	67	86	0.00	0	0.99	0.00	67.5	1.2	0.3	1.6	1.33	643
8936-022		151:07	C	8/17/92	300	425	5.9	3.8	61	0.28	76	91	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	73
8936-027		151:12	C	8/17/92	100	655	3.4	2.1	62	0.34	66	84	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	29
8936-028		151:13	B	8/18/92	341	7.45	4.0	5.8	40	0.27	70	89	0.00	0	0.54	0.00	58.5	3.7	0.0	1.5	0.41	640
8939-001		151:16	B	8/18/92	213	8.50	4.7	3.0	61	0.28	65	83	0.00	0	1.18	0.00	73.6	2.4	0.0	2.3	0.97	639

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	T Y P	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coß	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
8940-001		151:18	B	8/18/92	512	9.55	3.0	2.7	53	0.36	60	81	0.84	45	0.42	0.00	57.7	4.1	0.1	5.8	1.42	619
8940-002		151:19	B	8/18/92	384	8.40	2.3	2.5	48	0.37	60	80	0.84	49	0.36	0.00	60.5	4.2	0.1	4.4	1.07	620
8940-004		151:21	C	8/17/92	400	310	1.7	1.6	51	0.43	44	74	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	64
8940-008		151:25	B	8/18/92	597	6.55	2.0	2.7	43	0.34	56	75	0.87	48	0.47	0.00	63.2	3.7	0.0	5.3	1.46	622
8940-009		151:26	B	8/18/92	469	6.15	2.2	2.7	44	0.34	48	70	0.70	59	0.26	0.00	58.4	3.8	0.0	5.6	1.46	623
8940-011		151:28	C	8/17/92	600	370	3.2	2.4	57	0.40	53	82	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	25
8940-013		151:30	B	8/18/92	427	8.55	1.8	1.5	54	0.47	52	72	1.06	39	0.20	0.00	41.8	5.8	0.2	7.7	1.32	617
8940-014		151:31	B	8/18/92	427	9.05	2.0	2.5	44	0.31	57	78	0.00	0	0.28	0.00	11.6	11.4	0.2	12.4	1.08	637
8940-016		151:33	B	8/18/92	384	8.25	2.8	2.6	52	0.32	58	76	0.63	65	0.37	0.00	59.5	4.4	0.1	5.8	1.33	635
8941-002		151:35	B	8/18/92	341	9.50	2.9	2.4	54	0.44	35	75	0.00	0	0.71	0.00	66.9	2.3	0.1	2.9	1.29	638
8941-003		151:36	B	8/18/92	512	6.75	1.7	4.0	30	0.30	59	75	0.68	54	0.58	0.00	21.4	2.9	0.2	4.4	1.50	626
8941-004		151:37	C	8/17/92	600	589	2.0	0.1	97	0.71	62	96	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	61
8942-001		151:41	B	8/19/92	683	9.35	1.9	1.5	56	0.42	50	71	1.01	42	0.37	0.00	63.0	4.1	0.1	3.6	0.87	1420
8942-003		151:43	C	8/17/92	600	545	1.7	0.5	79	0.58	47	68	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	27
8942-005		151:45	B	8/19/92	384	11.05	2.2	2.7	45	0.32	43	67	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1084
8942-006		151:46	C	8/17/92	600	433	1.7	3.3	33	0.32	51	73	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	59
8942-009		151:49	B	8/19/92	640	13.15	1.9	2.1	48	0.46	58	74	1.56	14	0.45	0.00	64.5	3.5	0.3	4.2	1.20	1421
8943-001		152:01	C	8/17/92	200	639	2.6	2.0	56	0.47	58	79	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	39
8943-004		152:04	B	8/19/92	555	10.10	1.5	2.2	41	0.47	59	72	1.19	31	0.25	0.00	66.2	2.5	0.1	3.9	1.57	1422
8943-007		152:07	C	8/17/92	300	601	1.9	1.9	49	0.39	54	81	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	33
8943-008		152:08	B	8/19/92	469	9.95	2.0	2.0	49	0.36	54	74	0.66	66	0.29	0.00	48.5	4.6	0.1	2.4	0.53	1423
8943-010		152:10	B	8/19/92	512	10.20	2.2	2.5	47	0.30	56	72	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1410
8945-007		152:19	C	8/17/92	100	559	2.3	1.8	56	0.61	60	77	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	62
8945-009		152:21	C	8/17/92	600	366	2.9	2.1	58	0.58	67	85	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	32
8945-010		152:22	B	8/19/92	512	10.25	2.9	5.1	37	0.33	59	85	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1095
8945-021		152:33	B	8/19/92	768	8.25	2.2	3.9	36	0.34	58	80	1.12	30	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1414
8946-003		152:41	C	8/17/92	200	696	2.1	1.8	54	0.37	68	88	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	63
8946-004		152:42	C	8/17/92	500	531	2.7	2.0	57	0.38	66	82	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	30
8946-006		152:44	B	8/19/92	427	8.90	2.2	3.0	42	0.31	61	83	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1094
8949-001		153:01	B	8/19/92	384	10.30	3.4	2.8	55	0.32	74	92	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1092
8949-003		153:03	B	8/19/92	811	10.45	3.3	2.8	54	0.44	64	84	1.06	33	0.40	0.00	55.7	5.6	0.1	3.9	0.69	1424
8949-006		153:06	C	8/18/92	400	279	1.6	1.9	45	0.53	65	88	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	162
8949-007		153:07	C	8/18/92	600	234	2.8	2.2	57	0.51	71	91	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	123
8949-010		153:10	B	8/19/92	938	8.60	2.3	3.6	40	0.34	67	88	1.18	27	0.37	0.00	51.4	7.1	0.1	2.2	0.31	1428
8949-011		153:11	C	8/18/92	500	577	1.8	0.6	75	0.54	69	94	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	154
8950-001		153:13	C	8/18/92	600	300	2.4	1.4	63	0.52	74	97	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	117
8950-004		153:16	B	8/19/92	640	9.00	3.0	1.3	70	0.48	73	90	1.65	11	0.60	0.00	69.4	6.9	0.1	1.8	0.26	1419
8950-005		153:17	C	8/18/92	600	176	1.9	2.9	40	0.40	70	91	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	152
8951-001		153:18	C	8/18/92	200	226	1.9	1.6	54	0.84	70	97	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	120
8951-002		153:19	C	8/18/92	600	415	2.3	0.9	73	0.60	69	94	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	124
8951-005		153:22	C	8/18/92	500	363	2.4	2.3	51	0.41	62	85	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	160
9001-058		155:06	B	8/19/92	1066	11.20	2.7	2.4	53	0.37	68	86	0.75	57	0.31	0.00	75.8	1.5	0.0	2.0	1.30	1412
9001-062		155:10	B	8/19/92	384	9.60	4.1	1.9	69	0.39	74	92	0.00	0	0.90	0.00	72.0	2.3	0.0	2.9	1.23	1405
9001-063		155:11	B	8/19/92	384	7.60	3.0	3.2	48	0.29	70	86	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1082
9001-064		155:12	B	8/19/92	469	8.05	2.9	2.1	58	0.32	67	84	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1085
9001-067		155:15	B	8/19/92	300	8.20	3.2	2.2	59	0.30	71	86	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1090
9001-073		155:21	B	8/19/92	300	9.90	3.8	3.3	53	0.29	65	84	0.00	0	0.45	0.00	63.0	3.1	0.0	2.4	0.78	1406
9002-006		155:34	B	8/19/92	427	9.50	4.4	3.1	58	0.31	62	81	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1093

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	T Y P	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coβ	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
9002-013		155:41	B	8/19/92	469	10.55	2.6	2.2	54	0.32	62	81	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1091
9002-015		155:43	B	8/19/92	384	9.90	2.9	2.3	56	0.32	63	82	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1411
9002-022		155:50	B	8/19/92	256	11.15	3.5	2.3	60	0.32	62	82	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1089
9002-026		156:02	B	8/19/92	384	10.35	4.1	2.6	62	0.27	56	77	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1408
9002-027		156:03	B	8/19/92	725	10.15	3.5	2.4	59	0.33	59	80	0.00	0	0.38	0.00	60.6	3.8	0.3	2.1	0.57	1413
9002-034		156:10	B	8/24/92	555	9.10	3.3	2.0	62	0.33	66	90	0.49	76	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1455
9002-037		156:13	B	8/19/92	341	10.40	3.2	2.4	57	0.30	57	77	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1404
9002-039		156:15	B	8/19/92	725	8.75	4.0	3.9	51	0.26	58	78	0.73	44	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1426
9002-056		156:32	B	8/19/92	341	10.50	2.7	2.6	50	0.32	58	78	0.00	0	0.47	0.00	54.2	4.4	0.1	1.6	0.36	1407
9002-062		156:38	B	8/20/92	853	8.45	4.1	2.3	64	0.33	66	83	0.51	76	0.62	0.00	63.5	1.9	0.0	2.4	1.27	594
9002-071		156:47	B	8/20/92	597	8.35	3.5	2.7	57	0.31	62	81	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1436
9002-076		156:52	B	8/20/92	640	9.10	3.0	2.5	54	0.32	50	68	0.75	53	0.09	0.00	43.9	15.6	0.2	1.2	0.08	1435
9003-005		157:09	B	8/20/92	896	8.65	4.3	3.1	58	0.29	71	90	0.00	0	0.47	0.00	0.0	0.0	0.0	0.0	0.00	600
9003-009		157:13	B	8/20/92	640	8.40	3.2	2.0	62	0.33	68	83	0.45	80	0.36	0.00	67.2	8.7	0.1	0.4	0.04	591
9003-014		157:18	B	8/20/92	512	10.90	1.4	2.8	33	0.31	73	91	0.69	58	0.46	0.00	65.8	2.0	0.1	2.3	1.17	1065
9003-033		157:37	B	8/20/92	597	10.75	3.9	2.6	60	0.28	66	84	0.45	78	0.55	0.00	63.1	3.5	0.1	3.5	1.00	1439
9003-035		157:39	B	8/20/92	725	8.55	3.8	2.5	60	0.31	70	87	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1441
9003-039		157:43	B	8/20/92	683	7.80	2.6	2.4	52	0.34	61	79	0.57	70	0.60	0.00	71.4	2.3	0.0	2.6	1.13	595
9003-049		158:01	B	8/20/92	469	7.05	3.0	4.2	41	0.29	65	86	0.00	0	0.80	0.00	82.6	1.0	0.0	1.1	1.13	1395
9003-050		158:02	B	8/20/92	256	7.10	2.7	2.0	58	0.34	64	83	0.00	0	0.11	0.00	35.5	6.4	0.1	6.3	0.99	1394
9003-058		158:10	B	8/20/92	427	7.50	3.0	1.9	61	0.34	68	88	1.02	34	0.52	0.00	76.9	1.4	0.0	2.0	1.41	596
9003-078		158:30	B	8/20/92	469	11.10	3.7	3.4	52	0.28	70	87	0.57	61	0.63	0.00	64.9	2.2	0.0	2.5	1.17	1064
9004-007		158:39	B	8/20/92	341	9.95	1.8	1.6	53	0.32	63	80	0.00	0	0.22	0.00	78.7	0.8	0.0	2.0	2.55	1401
9004-024		159:04	B	8/20/92	341	8.95	3.9	2.0	66	0.30	57	77	0.00	0	0.75	0.00	70.8	3.7	0.1	1.4	0.38	1396
9004-027		159:07	B	8/20/92	341	8.65	2.5	2.1	55	0.34	64	81	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1062
9004-029		159:09	B	8/20/92	427	10.35	1.9	1.8	51	0.39	62	81	0.84	47	0.15	0.00	28.3	6.7	0.1	5.8	0.88	1442
9004-044		159:24	B	8/20/92	811	10.75	2.6	1.6	63	0.38	67	83	0.78	58	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1437
9004-053		159:33	B	8/20/92	300	7.80	2.0	1.3	61	0.34	62	83	0.00	0	0.35	0.00	65.6	4.4	0.1	1.4	0.32	1399
9004-054		159:34	B	8/20/92	341	7.50	1.7	1.0	63	0.35	55	73	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1059
9004-072		159:52	B	8/20/92	896	8.60	4.1	2.4	64	0.34	62	80	0.59	64	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1440
9005-003		160:11	B	8/20/92	512	8.30	2.6	1.8	59	0.36	57	79	0.00	0	0.54	0.00	61.9	4.0	0.0	3.2	0.81	590
9005-008		160:16	B	8/20/92	640	8.20	1.8	1.1	61	0.36	65	86	0.57	73	0.22	0.00	67.1	8.7	0.0	1.5	0.17	592
9005-009		160:17	B	8/20/92	341	9.85	3.4	1.9	64	0.31	53	74	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1060
9005-020		160:28	B	8/20/92	213	9.60	3.3	1.6	67	0.32	56	77	0.00	0	0.38	0.00	59.8	12.0	0.1	1.3	0.11	1400
9005-025		160:33	B	8/20/92	469	10.15	3.9	1.6	71	0.34	58	78	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1433
9005-027		160:35	B	8/20/92	512	9.25	3.1	2.1	59	0.33	68	82	0.56	77	0.37	0.00	64.1	10.5	0.2	1.6	0.15	1432
9005-028		160:36	B	8/20/92	469	9.40	3.0	2.2	58	0.36	59	78	0.67	59	0.50	0.00	62.6	9.3	0.1	1.2	0.12	597
9005-035		160:43	B	8/20/92	725	7.15	2.9	1.8	61	0.34	60	85	0.75	55	0.52	0.00	69.2	2.9	0.1	1.4	0.48	593
9005-040		160:48	B	8/20/92	341	7.50	3.2	2.3	58	0.31	64	83	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1061
9005-046		161:02	B	8/20/92	300	9.80	4.1	1.8	69	0.32	64	82	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1063
9005-048		161:04	B	8/20/92	1408	15.90	1.2	1.0	55	0.51	61	80	1.41	20	0.17	0.00	55.1	6.2	0.2	0.2	0.03	1438
9005-054		161:10	B	8/20/92	981	8.40	3.8	2.2	64	0.33	60	78	0.42	84	0.36	0.00	63.5	2.3	0.0	2.7	1.19	598
9005-072		161:28	B	8/20/92	341	8.00	4.1	2.3	65	0.31	62	81	0.00	0	0.39	0.00	58.0	4.6	0.0	2.1	0.47	1402
9005-080		161:36	B	8/20/92	469	9.95	4.4	1.9	70	0.33	63	82	0.00	0	0.79	0.00	63.3	3.5	0.0	1.1	0.32	599
9006-004		161:40	B	8/20/92	384	9.05	4.1	2.9	59	0.30	51	74	0.52	73	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1430
9006-047		162:31	B	8/20/92	341	7.95	3.6	2.2	62	0.33	57	76	0.52	72	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1434
9006-049		162:33	B	8/20/92	341	9.50	3.3	3.8	46	0.31	41	67	0.00	0	0.85	0.00	66.7	7.5	0.1	1.3	0.18	1397
9006-055		162:39	B	8/20/92	427	7.40	3.5	3.5	50	0.29	44	70	0.00	0	0.80	0.00	70.6	2.7	0.0	1.4	0.53	1398

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	T Y P	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coβ	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
9006-058		162:42	B	8/20/92	384	8.05	2.9	2.4	55	0.32	48	72	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1403
9006-060		162:44	B	8/20/92	512	9.50	3.8	2.6	59	0.32	44	71	0.54	70	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1431
9007-001		162:48	B	8/20/92	384	6.75	4.2	4.4	49	0.30	44	66	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1058
9007-021		163:16	B	8/21/92	1300	8.55	3.4	5.3	39	0.29	62	80	0.64	59	0.78	0.00	68.9	5.3	1.2	0.8	0.14	607
9007-041		163:36	B	8/21/92	384	7.70	1.8	3.4	34	0.32	46	63	0.52	73	0.32	0.00	46.7	4.3	0.2	4.0	0.92	604
9007-043		163:38	B	8/21/92	427	8.75	3.1	2.9	52	0.32	48	72	0.78	49	0.47	0.00	61.0	7.6	0.0	1.3	0.18	610
9007-046		163:41	B	8/21/92	341	8.55	4.6	2.5	65	0.30	54	75	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	565
9007-047		163:42	B	8/21/92	384	8.55	3.1	2.3	57	0.36	47	70	0.73	62	0.55	0.00	52.2	5.3	0.0	3.9	0.75	601
9007-052		163:47	B	8/21/92	300	9.55	4.4	3.2	58	0.28	51	73	0.00	0	0.36	0.00	0.0	0.0	0.0	0.0	0.00	579
9007-064		164:07	B	8/21/92	300	8.75	2.8	3.3	46	0.32	45	66	0.00	0	0.47	0.00	69.0	5.3	0.0	1.2	0.24	609
9007-065		164:08	B	8/21/92	341	9.50	3.2	2.1	60	0.31	60	78	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	581
9007-069		164:12	B	8/21/92	341	8.30	3.4	2.1	62	0.33	58	78	0.00	0	0.26	0.00	0.0	0.0	0.0	0.0	0.00	575
9007-078		164:21	B	8/21/92	384	7.75	3.3	2.4	58	0.35	53	75	0.00	0	0.48	0.00	30.2	9.4	0.3	32.9	3.51	570
9008-007		164:30	B	8/21/92	341	8.80	4.1	3.7	53	0.30	49	73	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	572
9008-010		164:33	B	8/21/92	555	7.80	6.0	3.0	67	0.34	59	79	0.68	58	0.89	0.00	59.4	2.2	0.0	3.6	1.68	614
9008-012		164:35	B	8/21/92	213	8.10	3.2	3.5	48	0.32	55	77	0.00	0	0.34	0.00	75.4	3.0	0.0	1.7	0.58	576
9008-015		164:38	B	8/21/92	427	8.45	1.8	3.2	36	0.30	62	84	0.00	0	0.49	0.00	73.5	9.0	0.0	0.8	0.09	578
9008-021		164:44	B	8/21/92	427	8.50	4.0	3.6	53	0.32	58	80	0.73	50	0.67	0.00	60.1	4.1	0.1	1.5	0.36	588
9008-031		165:02	B	8/21/92	300	8.80	2.1	2.7	43	0.33	57	76	0.91	39	0.65	0.00	61.6	1.5	0.0	1.5	1.05	613
9008-063		165:34	B	8/21/92	300	8.95	4.9	4.3	54	0.28	62	81	0.00	0	0.84	0.00	76.9	4.7	0.0	1.2	0.26	574
9009-034		166:18	B	8/21/92	384	8.90	1.2	1.2	50	0.46	63	81	0.99	40	0.16	0.00	24.7	22.4	0.1	1.7	0.08	616
9009-036		166:20	B	8/21/92	384	8.65	2.1	1.6	56	0.39	64	83	0.74	52	0.21	0.00	59.5	11.0	0.0	1.0	0.09	606
9009-040		166:24	B	8/21/92	427	8.85	3.9	2.1	65	0.35	66	82	0.73	48	0.34	0.00	0.0	0.0	0.0	0.0	0.00	585
9009-049		166:33	B	8/21/92	555	8.90	2.1	0.7	75	0.53	60	84	0.90	54	0.21	0.00	65.5	3.4	0.1	3.3	0.99	602
9009-054		166:38	B	8/25/92	256	9.30	1.7	1.8	48	0.37	65	89	0.00	0	0.22	0.00	56.7	5.7	0.2	2.8	0.49	563
9010-004		167:07	B	8/21/92	597	9.65	3.3	3.3	50	0.34	67	88	0.81	43	0.49	0.00	54.0	2.3	0.1	3.3	1.40	589
9010-011		167:14	B	8/21/92	300	7.45	2.3	2.3	50	0.33	72	88	0.00	0	0.66	0.00	0.0	0.0	0.0	0.0	0.00	571
9010-013		167:16	B	8/21/92	256	9.05	2.4	2.4	50	0.32	59	79	0.00	0	0.59	0.00	74.5	1.5	0.0	0.6	0.39	582
9010-014		167:17	B	8/21/92	341	8.40	2.3	2.1	53	0.41	66	84	0.88	47	0.24	0.00	30.3	2.2	0.2	7.3	3.33	605
9010-016		167:19	B	8/21/92	555	8.60	3.3	2.9	53	0.32	63	83	0.69	58	0.53	0.00	59.4	1.1	0.1	1.2	1.15	603
9010-018		167:21	B	8/21/92	768	7.55	3.4	2.8	55	0.31	64	83	0.00	0	0.65	0.00	72.2	2.1	0.0	1.2	0.58	580
9010-022		167:25	B	8/21/92	427	8.85	2.1	2.1	50	0.35	65	83	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	562
9010-023		167:26	B	8/21/92	341	9.40	2.4	2.4	50	0.33	59	82	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	568
9010-030		167:33	B	8/21/92	640	9.50	3.4	2.1	62	0.36	64	83	0.85	44	0.50	0.00	56.4	0.9	0.1	1.3	1.48	584
9010-031		167:34	B	8/21/92	469	8.25	2.4	2.1	53	0.33	64	82	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	566
9010-043		167:46	B	8/24/92	384	8.95	2.9	3.0	49	0.28	79	93	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1105
9010-045		167:48	B	8/24/92	299	9.50	1.8	2.2	45	0.35	76	91	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1108
9010-047		167:50	B	8/24/92	469	5.75	1.9	1.7	53	0.43	70	87	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1460
9010-053		168:04	B	8/24/92	683	8.35	2.2	1.9	54	0.36	67	84	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1098
9010-058		168:09	B	8/24/92	725	5.60	3.2	2.3	58	0.32	71	89	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1466
9010-059		168:10	B	8/24/92	640	7.90	4.7	3.8	55	0.30	64	81	0.00	0	0.61	0.00	56.1	2.8	0.1	2.6	0.93	1453
9010-062		168:13	B	8/24/92	640	6.45	2.8	3.3	46	0.29	68	85	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1467
9010-071		168:22	B	8/24/92	512	8.25	3.0	2.9	50	0.31	68	85	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1448
9011-003		168:28	B	8/24/92	555	7.80	2.9	2.8	51	0.32	83	89	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1103
9011-005		168:30	B	8/24/92	555	8.60	2.5	1.7	59	0.37	75	89	0.00	0	0.47	0.00	60.4	1.2	0.2	3.0	2.54	1101
9011-012		168:37	B	8/24/92	469	10.55	1.5	1.0	61	0.44	80	86	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1456
9011-018		168:43	B	8/24/92	384	8.50	1.9	1.9	51	0.39	63	85	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1104
9011-023		168:48	B	8/24/92	512	9.95	1.9	1.4	57	0.35	73	87	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1459

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	T Y P	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coß	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
9011-029		169:02	B	8/24/92	427	9.15	2.2	1.4	61	0.34	69	85	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1112
9011-033		169:06	B	8/24/92	427	7.85	1.3	1.2	53	0.51	68	87	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1465
9011-036		169:09	B	8/24/92	300	7.85	1.2	0.8	61	0.39	80	86	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1451
9011-045		169:18	B	8/24/92	555	7.85	2.8	1.7	62	0.32	73	88	0.53	73	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1097
9011-058		169:31	B	8/24/92	341	8.85	2.5	1.8	58	0.34	72	88	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1461
9011-064		169:37	C	8/20/92	300	594	2.8	0.8	78	0.50	78	92	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	324
9011-065		169:38	B	8/24/92	512	10.10	1.3	1.4	48	0.41	73	87	0.86	49	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1114
9011-076		169:49	B	8/24/92	555	6.65	2.7	1.9	59	0.30	68	84	0.72	51	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1447
9011-077		169:50	B	8/24/92	341	11.25	1.6	1.4	54	0.39	69	85	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1110
9011-079		169:52	B	8/24/92	512	9.70	2.0	1.5	56	0.33	70	86	0.88	42	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1463
9012-003		170:04	B	8/24/92	383	7.70	2.7	2.8	49	0.36	63	84	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1096
9012-014		170:15	C	8/20/92	400	825	2.6	1.8	60	0.42	69	87	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	295
9012-022		170:23	B	8/24/92	811	7.90	2.9	2.6	52	0.31	65	84	0.88	42	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1100
9012-032		170:33	B	8/24/92	341	9.10	3.7	2.4	61	0.35	60	80	0.60	63	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1458
9012-039		170:40	B	8/24/92	597	7.85	3.1	2.5	55	0.31	64	82	0.85	43	0.39	0.00	64.5	8.1	0.0	1.5	0.18	1099
9012-066		171:15	B	8/24/92	0	6.11	3.6	2.4	60	0.33	61	82	0.63	60	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1446
9013-015		171:34	B	8/24/92	555	8.20	2.6	3.4	43	0.29	67	86	0.87	42	0.60	0.00	67.5	5.2	0.1	1.7	0.34	1106
9013-020		171:39	B	8/24/92	725	10.75	2.4	2.8	45	0.32	66	85	0.81	45	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1113
9013-031		171:50	B	8/24/92	469	9.65	3.9	3.2	55	0.28	68	85	0.00	0	0.74	0.00	67.3	4.7	0.0	1.2	0.26	1111
9013-044		172:11	B	8/24/92	512	8.15	3.0	2.8	51	0.29	57	78	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1462
9013-051		172:18	B	8/24/92	1024	7.35	2.6	2.9	47	0.32	62	82	0.58	66	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1449
9013-056		172:23	B	8/24/92	896	7.60	2.7	2.7	49	0.32	62	83	0.71	55	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1445
9013-058		172:25	B	8/24/92	853	6.45	2.4	2.8	46	0.34	48	72	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1464
9014-002		172:34	B	8/24/92	299	7.85	2.3	2.4	49	0.34	60	78	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1107
9014-003		172:35	B	8/24/92	427	9.35	2.5	2.1	54	0.32	66	83	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1117
9014-005		172:37	B	8/24/92	683	10.75	3.0	3.3	48	0.32	68	88	0.83	43	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1457
9014-012		172:44	B	8/24/92	427	8.35	2.5	1.8	58	0.34	66	88	0.74	51	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1454
9014-032		173:12	B	8/24/92	811	8.05	2.8	2.6	52	0.34	63	78	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1116
9014-040		173:20	B	8/24/92	341	8.50	2.1	2.2	48	0.30	62	83	0.68	56	0.36	0.00	62.8	7.9	0.3	0.9	0.12	1452
9014-042		173:22	B	8/24/92	384	6.50	1.3	2.8	31	0.30	69	90	0.00	0	0.57	0.00	78.5	2.9	0.0	1.7	0.59	1265
9014-051		173:31	B	8/24/92	341	9.10	2.1	2.3	47	0.31	67	83	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1102
9014-057		173:37	B	8/24/92	384	9.50	2.4	3.8	39	0.30	59	79	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1119
9014-058		173:38	B	8/24/92	640	10.90	3.1	2.3	57	0.31	65	84	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1118
9014-061		173:41	B	8/24/92	300	10.65	1.7	1.8	48	0.37	71	88	1.08	34	0.16	0.00	45.6	14.5	0.3	1.3	0.09	1450
9015-003		173:47	C	8/21/92	300	500	2.6	1.9	58	0.38	55	72	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	429
9016-015		174:11	B	8/24/92	640	7.60	3.6	2.1	64	0.33	68	84	0.65	59	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1443
9016-019		174:15	B	8/24/92	896	15.20	4.3	2.3	66	0.35	60	78	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1115
9016-027		174:23	B	8/24/92	896	9.80	4.4	2.6	63	0.29	65	84	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1444
9016-031		174:27	B	8/24/92	725	8.50	2.9	3.0	50	0.31	67	84	0.83	44	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1109
9016-038		174:34	C	8/21/92	300	615	4.4	3.5	56	0.31	67	83	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	415
9016-039		174:35	B	8/25/92	427	10.30	2.5	2.4	51	0.30	64	81	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1289
9016-043		174:39	B	8/26/92	640	9.40	3.8	3.2	54	0.30	63	73	0.59	60	0.49	0.00	59.2	3.8	0.1	3.9	1.04	1045
9017-006		175:20	B	8/25/92	427	7.90	3.3	1.9	63	0.30	65	83	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1268
9017-007		175:21	B	8/25/92	469	8.55	4.4	2.8	61	0.31	73	88	0.00	0	0.76	0.00	77.0	2.2	0.4	1.9	0.86	1122
9017-008		175:22	B	8/25/92	1900	8.45	5.6	2.8	67	0.27	62	80	0.52	67	0.72	0.00	76.2	2.8	0.4	3.7	1.34	1269
9017-013		175:27	B	8/25/92	1237	7.40	5.1	2.7	66	0.29	66	83	0.55	65	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1267
9017-015		175:29	B	8/25/92	597	9.30	4.4	2.7	62	0.29	67	83	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1123
9017-020		175:34	B	8/25/92	597	9.95	3.4	1.9	65	0.30	66	84	0.58	60	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1282

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	T Y P	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coβ	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
9017-023		175:37	B	8/25/92	597	9.40	4.4	2.9	60	0.29	63	82	0.74	48	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1287
9017-032		175:46	B	8/25/92	981	7.05	4.3	2.5	63	0.31	62	82	0.64	60	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1038
9017-033		175:47	B	8/25/92	512	6.60	4.4	2.4	64	0.31	68	85	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1477
9017-044		176:06	B	8/25/92	512	7.80	4.1	2.6	61	0.32	59	78	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1036
9017-053		176:15	B	8/25/92	981	8.40	4.6	2.7	63	0.27	67	83	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1288
9018-012		176:33	B	8/25/92	1066	7.75	4.2	2.6	62	0.34	63	84	0.66	57	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1037
9018-019		176:40	B	8/25/92	640	8.70	3.0	2.3	57	0.34	66	83	0.85	44	0.44	0.00	55.5	2.1	0.1	1.5	0.71	1281
9018-023		176:44	B	8/25/92	384	7.95	4.3	1.8	70	0.31	58	78	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1284
9018-024		176:45	B	8/25/92	384	8.05	4.4	2.8	61	0.28	64	83	0.52	66	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1286
9019-017		177:27	B	8/25/92	640	7.90	2.2	2.4	48	0.36	73	90	0.80	50	0.33	0.00	61.5	5.9	0.0	3.4	0.58	1040
9019-025		177:35	C	8/24/92	400	743	1.8	1.5	54	0.45	70	87	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	542
9019-027		177:37	B	8/25/92	341	8.40	2.0	2.9	40	0.34	75	91	1.01	36	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1033
9019-033		177:43	B	8/25/92	384	8.15	2.0	3.5	36	0.29	72	91	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1290
9019-036		177:46	B	8/25/92	384	8.50	2.3	2.7	46	0.36	74	91	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1283
9019-046		178:04	C	8/24/92	600	649	1.9	2.7	42	0.39	49	91	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	499
9019-047		178:05	B	8/25/92	981	8.65	2.0	2.4	45	0.32	75	86	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1292
9019-065		178:23	B	8/25/92	0	8.55	2.5	3.2	44	0.34	61	83	0.86	44	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1039
9019-067		178:25	B	8/25/92	640	9.55	2.1	2.5	45	0.32	70	88	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1034
9019-068		178:26	B	8/25/92	853	7.45	3.3	4.5	42	0.28	67	90	0.64	54	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1478
9019-070		178:28	B	8/25/92	811	11.00	2.4	2.1	53	0.30	67	86	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1120
9019-071		178:29	B	8/25/92	341	7.65	3.5	3.3	52	0.27	67	83	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1285
9020-024		179:02	C	8/24/92	400	603	3.0	2.5	54	0.28	71	88	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	475
9020-044		179:22	C	8/24/92	600	723	4.4	2.6	63	0.31	71	90	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	537
9020-045		179:23	C	8/24/92	600	595	4.2	3.2	57	0.31	59	78	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	535
9020-051		179:29	C	8/24/92	600	648	4.0	2.6	61	0.34	66	86	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	716
9020-052		179:30	B	8/25/92	683	8.30	3.6	2.6	58	0.30	65	85	0.47	77	0.42	0.00	75.9	2.3	0.0	1.2	0.54	1043
9020-057		179:35	C	8/24/92	500	753	2.6	2.3	54	0.34	66	86	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	717
9021-027		180:20	B	8/25/92	768	7.55	3.0	2.1	59	0.33	66	84	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1475
9021-028		180:21	B	8/25/92	1194	8.95	3.7	2.8	57	0.37	66	84	1.65	10	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1035
9021-038		180:31	B	8/25/92	427	9.45	2.7	2.1	57	0.37	64	83	0.98	41	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1042
9021-039		180:32	B	8/25/92	896	8.35	3.3	2.3	59	0.32	71	88	0.73	56	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1476
9021-045		180:38	B	8/25/92	768	9.45	3.2	2.7	55	0.34	70	87	0.76	51	0.67	0.00	72.1	1.4	0.0	2.0	1.42	1472
9022-057		182:16	B	8/25/92	512	8.05	2.7	2.5	53	0.31	63	81	0.66	54	0.50	0.00	64.5	3.4	0.1	2.8	0.84	1291
9022-067		182:26	B	8/26/92	427	11.85	1.8	3.0	38	0.31	51	76	0.85	44	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1029
9022-068		182:27	B	8/26/92	300	6.70	1.7	1.9	48	0.37	64	85	0.80	55	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1030
9022-069		182:28	B	8/26/92	427	6.85	1.7	2.5	41	0.34	66	86	0.74	56	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1028
9023-001		182:29	B	8/26/92	427	12.55	3.9	6.2	39	0.26	70	87	0.74	45	1.21	0.00	67.4	2.7	0.3	0.9	0.33	1051
9023-007		182:35	B	8/26/92	981	6.90	3.0	5.4	36	0.28	47	77	0.81	46	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1014
9023-013		182:41	B	8/26/92	0	7.10	2.7	4.2	39	0.29	50	78	0.72	55	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1003
9024-006		182:48	B	8/26/92	171	7.45	1.7	2.8	37	0.33	66	85	0.89	43	0.38	0.00	58.8	2.3	0.0	1.9	0.80	1057
9024-020		183:10	B	8/26/92	256	11.40	2.2	3.4	39	0.31	52	79	0.69	57	0.00	0.00	0.0	0.0	0.0	0.0	0.00	999
9024-042		183:32	C	8/24/92	400	699	2.7	2.9	48	0.30	61	80	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	530
9025-002		184:13	C	8/24/92	200	428	2.4	1.9	56	0.31	58	77	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	516
9025-007		184:18	C	8/24/92	300	348	2.3	2.1	52	0.32	56	76	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	514
9025-012		184:23	C	8/24/92	500	652	2.0	1.7	53	0.36	65	81	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	509
9025-016		184:27	C	8/24/92	300	478	3.2	2.6	55	0.33	56	75	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	508
9025-017		184:28	C	8/24/92	500	589	1.6	2.2	42	0.32	61	79	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	510
9026-002		184:30	C	8/24/92	400	653	2.8	2.7	51	0.32	74	90	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	507

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	T Y P	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coß	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
9026-004		184:32	C	8/24/92	500	585	3.3	2.9	53	0.30	71	89	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	505
9026-005		184:33	C	8/24/92	500	575	2.7	2.7	50	0.31	57	78	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	506
9027-009		184:43	C	8/24/92	300	447	2.3	3.7	39	0.28	59	81	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	501
9027-017		184:51	C	8/24/92	300	761	2.2	1.0	68	0.39	66	82	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	504
9027-048		185:30	C	8/24/92	300	512	1.7	2.3	42	0.47	65	85	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	898
9027-049		185:31	C	8/24/92	300	776	3.9	1.7	70	0.33	74	91	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	896
9027-054		185:36	C	8/24/92	400	615	3.4	1.9	64	0.34	67	84	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	895
9027-056		185:38	C	8/24/92	400	626	1.9	1.2	61	0.38	70	87	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	888
9028-021		186:21	B	8/26/92	384	11.55	2.4	1.8	57	0.43	73	89	1.61	13	0.57	0.00	68.0	1.0	0.0	3.1	2.98	1047
9028-059		187:07	B	8/26/92	1066	7.65	3.7	2.0	64	0.32	62	84	0.42	86	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1048
9028-067		187:15	B	8/26/92	469	8.25	3.7	2.2	63	0.33	66	86	1.10	30	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1027
9028-068		187:16	B	8/26/92	341	11.60	2.9	1.8	63	0.36	66	87	1.01	34	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1000
9029-007		187:23	B	8/26/92	696	8.25	5.3	4.3	55	0.32	66	88	0.79	47	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1052
9030-003		187:29	B	8/26/92	1066	7.85	1.9	2.3	45	0.37	58	87	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1016
9030-004		187:30	B	8/26/92	896	7.30	4.0	3.7	52	0.33	56	80	1.32	20	1.07	0.00	71.7	2.0	0.0	2.3	1.18	1031
9030-017		187:43	B	8/26/92	384	6.75	2.3	3.8	38	0.33	63	85	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1026
9030-022		187:48	B	8/26/92	725	6.45	2.5	3.1	44	0.41	59	85	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1002
9030-037		188:11	B	8/26/92	640	8.10	3.3	3.1	52	0.31	72	90	0.72	52	0.00	0.00	0.0	0.0	0.0	0.0	0.00	998
9030-042		188:16	B	8/26/92	1109	8.45	4.4	3.3	58	0.32	74	91	0.99	36	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1006
9030-055		188:29	B	8/26/92	1152	10.00	4.5	3.5	56	0.30	74	91	1.15	25	0.92	0.00	71.5	1.2	0.0	1.6	1.26	990
9030-059		188:33	B	8/26/92	597	10.85	2.6	3.2	45	0.35	61	83	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1019
9031-004		188:37	B	8/26/92	640	13.00	2.2	3.2	41	0.35	60	88	1.30	22	0.78	0.00	72.7	2.2	0.0	2.4	1.07	1009
9031-008		188:41	B	8/26/92	768	7.25	2.1	2.8	43	0.39	63	83	1.53	15	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1054
9031-010		188:43	B	8/26/92	597	8.20	2.1	3.4	38	0.40	60	81	1.47	18	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1056
9032-001		189:13	C	8/24/92	400	375	1.5	4.1	26	0.31	77	81	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	851
9032-020		189:32	C	8/24/92	100	323	1.6	4.6	26	0.31	61	79	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	833
9032-051		190:11	C	8/25/92	400	411	4.7	2.1	69	0.31	59	79	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	936
9032-060		190:20	C	8/25/92	400	326	3.0	2.1	59	0.33	63	82	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	951
9033-004		190:29	B	8/26/92	384	11.35	2.3	2.2	51	0.38	67	90	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1001
9033-008		190:33	B	8/26/92	640	7.50	2.5	2.4	51	0.38	75	91	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1013
9033-032		191:05	B	8/26/92	512	8.55	3.1	2.6	55	0.32	55	82	0.80	47	0.00	0.00	0.0	0.0	0.0	0.0	0.00	997
9033-039		191:12	B	8/26/92	341	9.30	2.3	2.4	49	0.38	68	88	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1022
9033-040		191:13	B	8/26/92	512	9.10	3.4	2.8	55	0.32	69	89	1.03	34	0.70	0.00	68.9	3.0	0.0	2.9	0.97	1049
9033-041		191:14	B	8/26/92	768	6.95	2.9	3.0	49	0.32	63	86	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1004
9033-042		191:15	B	8/26/92	213	6.95	2.2	2.0	53	0.32	69	88	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1053
9033-043		191:16	B	8/26/92	469	12.05	1.8	1.9	49	0.40	65	92	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1012
9033-046		191:19	B	8/26/92	811	8.20	3.0	2.8	51	0.35	75	91	1.43	16	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1032
9033-048		191:21	B	8/26/92	300	7.60	1.5	1.8	46	0.39	66	89	1.56	15	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1024
9033-049		191:22	B	8/26/92	427	7.40	3.1	2.5	56	0.33	67	89	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1017
9033-050		191:23	B	8/26/92	384	12.05	3.2	2.6	56	0.35	66	88	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1023
9033-051		191:24	B	8/26/92	938	9.95	3.2	2.5	57	0.37	76	93	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1046
9033-058		191:31	B	8/26/92	512	6.45	3.0	3.3	48	0.28	69	89	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1005
9033-062		191:35	B	8/26/92	128	6.25	2.4	2.8	46	0.30	70	88	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1018
9033-069		191:42	B	8/26/92	256	11.70	2.8	2.8	50	0.32	68	87	0.00	0	0.92	0.00	78.0	1.3	0.0	1.0	0.79	1050
9034-011		192:11	C	8/24/92	500	402	3.9	3.5	52	0.28	48	73	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	927
9034-016		192:16	B	8/26/92	384	10.90	3.5	2.7	56	0.36	62	83	1.46	15	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1010
9034-023		192:23	C	8/24/92	600	531	2.9	2.0	59	0.41	51	75	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	926
9034-028		192:28	B	8/26/92	300	7.20	2.4	2.5	49	0.35	54	78	1.42	17	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1025

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	TYP	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coβ	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
9034-032		192:32	B	8/26/92	213	10.10	3.7	2.7	58	0.32	59	82	1.00	36	0.65	0.00	73.2	3.5	0.1	0.7	0.20	1015
9034-050		192:50	C	8/24/92	500	346	3.8	3.2	54	0.29	59	83	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	923
9034-069		193:17	C	8/24/92	500	462	3.2	1.8	64	0.37	60	82	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	669
9035-002		193:24	C	8/24/92	500	403	3.1	2.4	57	0.34	58	80	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	668
9035-034		194:04	B	8/26/92	171	10.70	2.0	0.8	71	0.48	53	80	1.69	10	0.44	0.00	67.5	2.2	0.0	3.2	1.45	1055
9035-035		194:05	C	8/24/92	600	427	4.2	2.8	60	0.33	46	74	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	700
9035-039		194:09	C	8/24/92	500	287	3.7	2.3	62	0.33	66	87	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	704
9035-044		194:14	C	8/24/92	500	318	2.8	2.2	57	0.33	55	78	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	703
9035-047		194:17	C	8/24/92	500	281	3.6	2.7	58	0.34	51	78	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	695
9036-003		001:74	B	8/26/92	853	19.10	4.5	2.7	63	0.28	24	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1011
9036-004		001:75	B	8/26/92	896	10.70	4.6	3.1	59	0.29	22	46	0.00	0	1.14	0.00	45.3	8.8	0.1	17.0	1.94	992
9036-004		213:12-16	C	9/10/92	100	134	5.1	4.6	52	0.30	16	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1917
9036-005		001:76	C	9/02/92	500	210	1.7	2.1	46	0.41	21	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1250
9036-006		001:77	B	8/26/92	1152	10.80	3.0	3.9	43	0.25	23	39	0.00	0	0.98	0.00	56.6	5.3	7.8	16.4	3.09	994
9036-007		214:12-16	C	9/10/92	100	171	1.1	4.3	21	0.45	21	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1915
9036-010		001:81	B	8/26/92	1152	12.30	4.5	2.4	65	0.24	21	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	991
9036-011		001:82	C	9/02/92	700	271	2.5	3.3	43	0.35	19	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1184
9036-015		001:86	B	8/26/92	1493	10.50	5.2	3.7	58	0.27	25	41	0.00	0	1.17	0.00	39.6	7.8	11.8	22.5	2.88	996
9036-016		001:87	B	8/26/92	1578	9.90	4.6	3.1	60	0.27	23	42	0.00	0	0.80	0.00	26.9	9.5	12.9	32.2	3.37	1007
9036-016		216:12-16	C	9/10/92	200	136	2.5	2.0	55	0.32	25	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1904
9036-017		001:88	B	8/26/92	2346	11.40	2.3	2.2	52	0.24	23	38	0.00	0	0.41	0.00	28.3	9.8	15.0	30.0	3.07	988
9036-018		001:89	B	8/27/92	1322	9.85	2.7	3.8	42	0.26	22	37	0.00	0	0.50	0.00	27.8	9.8	14.8	30.3	3.08	961
9036-019		001:90	B	8/26/92	1109	8.65	4.5	3.3	58	0.27	25	46	0.00	0	1.10	0.00	25.3	9.9	12.3	34.3	3.47	1021
9036-020		001:91	B	8/27/92	2346	9.65	5.7	3.4	63	0.24	24	41	0.00	0	0.76	0.00	28.8	7.6	14.8	24.4	3.23	984
9036-021		001:92	C	9/02/92	700	228	6.2	5.1	55	0.35	24	48	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1188
9036-023		001:94	C	9/02/92	80	185	1.5	2.0	43	0.51	23	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1254
9036-024		001:95	B	8/26/92	896	11.55	2.5	3.1	45	0.28	26	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	995
9036-026		002:73	C	9/02/92	600	208	4.7	3.9	55	0.37	18	38	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1191
9036-028		002:75	B	8/27/92	1621	10.00	4.3	2.9	60	0.27	21	46	0.00	0	0.52	0.00	36.5	9.1	8.7	28.7	3.15	985
9036-032		002:79	B	8/26/92	768	11.30	1.8	3.7	32	0.31	24	40	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	993
9036-036		002:83	B	8/27/92	1493	10.80	5.1	3.3	61	0.25	20	43	0.00	0	0.51	0.00	27.1	8.4	12.6	29.9	3.57	982
9036-037		002:84	B	8/26/92	1109	9.65	4.0	2.6	60	0.29	21	39	0.00	0	0.47	0.00	23.7	13.8	0.7	41.6	3.01	1008
9036-038		002:85	B	8/26/92	1152	9.10	4.3	3.3	57	0.27	23	48	0.00	0	0.90	0.00	37.8	10.4	0.2	32.5	3.13	1020
9036-040		002:87	B	8/27/92	1450	8.70	4.3	2.7	61	0.30	18	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	967
9036-041		002:88	B	8/26/92	653	10.35	3.5	3.3	51	0.28	15	43	0.00	0	0.96	0.00	66.1	3.8	6.6	13.4	3.47	989
9036-043		002:90	B	8/27/92	1066	9.15	3.8	3.5	52	0.26	18	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	987
9036-043		217:12-16	C	9/10/92	100	173	5.1	3.3	61	0.27	19	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1905
9036-045		002:92	B	8/27/92	2005	9.30	4.8	3.5	58	0.26	25	46	0.00	0	0.89	0.00	29.0	8.5	13.1	29.6	3.47	959
9036-045		218:12-16	C	9/10/92	100	225	5.4	3.9	58	0.25	23	50	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1906
9036-048		002:95	C	9/02/92	700	158	5.2	3.4	60	0.36	26	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1251
9036-051		003:74	C	9/02/92	600	75	0.7	1.2	37	0.67	19	47	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1205
9036-054		003:77	B	8/27/92	1280	10.85	3.4	3.8	47	0.49	22	44	0.00	0	0.95	0.00	29.1	11.9	0.2	41.0	3.45	957
9036-054		219:12-16	C	9/10/92	100	210	4.0	3.6	52	0.38	29	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1886
9036-057		003:80	B	8/27/92	857	9.85	4.0	3.0	57	0.28	25	41	0.00	0	0.90	0.00	29.3	9.8	13.9	26.3	2.68	956
9036-058		003:81	B	8/27/92	1066	11.20	4.6	3.1	59	0.27	22	49	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	954
9037-003		003:84	B	8/27/92	1600	9.55	7.0	2.7	72	0.27	24	40	0.00	0	1.21	0.00	46.2	3.8	17.6	13.8	3.64	976
9037-007		003:88	B	8/27/92	1109	11.00	8.6	3.6	70	0.26	24	43	0.00	0	0.99	0.00	39.9	4.5	15.6	16.7	3.70	974
9037-007		222:12-16	C	9/10/92	200	156	8.4	3.6	70	0.33	24	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1883

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	T Y P	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coβ	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
9037-009		003:90	B	8/27/92	427	10.55	5.8	3.3	64	0.27	25	42	0.00	0	0.94	0.00	60.8	4.4	2.6	15.2	3.46	968
9037-010		003:91	B	8/27/92	427	10.20	6.9	3.4	67	0.25	23	40	0.00	0	0.96	0.00	48.1	4.2	17.6	12.6	3.00	965
9037-011		003:92	B	8/27/92	640	9.95	3.8	2.2	64	0.29	27	47	0.00	0	0.72	0.00	63.9	4.6	5.4	14.8	3.24	960
9037-012		003:93	C	9/02/92	700	158	2.1	1.7	56	0.41	24	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1197
9037-016		004:73	B	8/27/92	1365	10.75	5.3	2.3	70	0.27	26	47	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	973
9037-018		004:75	B	8/27/92	768	9.60	5.5	2.9	66	0.27	22	40	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	977
9037-020		004:77	C	9/02/92	700	124	5.3	2.4	69	0.33	24	51	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1196
9037-020		223:12-16	C	9/10/92	100	194	6.0	2.9	68	0.30	26	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1884
9038-002		004:80	B	8/27/92	981	11.55	5.9	4.7	56	0.26	33	57	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	972
9038-002		224:12-16	C	9/10/92	100	139	4.0	4.3	48	0.37	31	55	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1897
9038-009		004:87	C	9/02/92	700	269	4.7	2.8	62	0.35	27	53	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1203
9038-011		004:89	B	8/27/92	1600	13.95	5.9	5.4	52	0.22	26	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	962
9038-011		228:12-16	C	9/10/92	100	246	5.5	4.8	53	0.26	28	47	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1900
9039-002		005:72	B	8/27/92	640	10.40	5.5	3.5	61	0.27	19	37	0.00	0	0.97	0.00	30.9	7.3	11.6	27.3	3.72	966
9039-007		005:77	C	9/02/92	600	157	4.5	2.5	64	0.36	20	34	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1202
9039-012		005:82	B	8/27/92	938	10.90	6.4	2.6	71	0.27	24	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	983
9039-014		005:84	B	8/27/92	896	13.90	6.0	2.6	70	0.26	23	42	0.00	0	0.92	0.00	37.8	5.3	20.9	19.3	3.62	979
9039-014		230:12-16	C	9/10/92	100	93	4.6	2.6	64	0.35	23	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1880
9039-016		005:86	B	8/28/92	640	7.95	6.8	2.9	70	0.26	25	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1378
9039-017		005:87	B	8/28/92	725	8.75	5.9	3.4	63	0.26	23	42	0.00	0	0.92	0.00	37.0	7.3	9.3	26.0	3.57	1505
9039-017		235:12-16	C	9/10/92	100	143	4.5	3.4	57	0.54	23	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1908
9039-019		005:89	B	8/28/92	1450	12.20	4.8	2.3	68	0.28	24	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1506
9039-021		005:91	B	8/28/92	1024	8.05	6.2	2.8	69	0.27	22	40	0.41	77	0.88	0.23	35.7	5.6	21.5	20.2	3.60	1486
9039-022		005:92	B	8/28/92	683	8.75	5.1	2.7	66	0.28	24	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1381
9039-023		005:93	C	9/02/92	1000	199	5.2	2.7	66	0.36	25	47	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1200
9039-024		005:94	B	8/28/92	1066	8.60	7.0	3.0	70	0.27	25	47	0.00	0	0.69	0.00	28.9	5.6	26.3	20.5	3.63	1490
9039-024		236:12-16	C	9/10/92	100	102	5.7	3.3	63	0.33	21	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1885
9039-025		005:95	C	9/02/92	700	151	4.6	3.4	58	0.37	22	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1204
9039-031		006:77	B	8/28/92	640	8.70	5.1	3.4	60	0.26	24	42	0.00	0	0.74	0.00	38.0	7.5	9.2	26.4	3.50	1508
9039-034		006:80	B	8/28/92	853	8.50	6.7	2.8	71	0.28	23	49	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1507
9039-034		237:12-16	C	9/10/92	100	238	5.2	2.4	68	0.30	26	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1909
9039-035		006:81	B	8/28/92	1280	9.00	6.0	2.5	71	0.27	23	41	0.00	0	0.99	0.00	49.9	4.9	10.9	17.8	3.59	1489
9039-036		006:82	B	8/28/92	1024	8.45	6.0	2.3	72	0.28	22	40	0.00	0	0.87	0.00	31.7	5.5	23.4	19.9	3.60	1377
9039-040		006:86	B	8/28/92	1962	8.65	5.2	2.7	65	0.24	23	41	0.00	0	0.75	0.00	34.7	7.5	13.6	25.9	3.46	1385
9039-041		006:87	B	8/28/92	1024	8.75	4.8	2.7	64	0.27	22	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1487
9039-045		006:91	B	8/28/92	2432	8.70	5.3	3.4	60	0.26	21	45	0.00	0	0.90	0.00	21.4	9.7	13.3	34.5	3.56	1379
9039-051		007:73	C	9/02/92	700	177	4.4	2.6	63	0.32	21	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1206
9040-001		007:76	B	8/28/92	299	8.65	2.9	3.8	43	0.29	23	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1376
9040-002		007:77	B	8/28/92	768	8.80	4.9	4.2	54	0.24	23	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1383
9040-003		007:78	B	8/28/92	640	8.80	6.6	4.3	61	0.25	24	44	0.00	0	1.06	0.00	47.5	7.9	0.4	27.9	3.54	1380
9040-004		007:79	B	8/28/92	725	9.90	5.1	4.3	54	0.25	24	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1499
9040-008		007:83	B	8/28/92	938	9.20	2.7	4.5	37	0.30	23	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1374
9040-008		214:17-21	C	9/10/92	100	134	2.9	3.1	48	0.38	23	47	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1877
9040-010		007:85	B	8/28/92	938	9.45	5.0	3.9	56	0.24	25	51	0.00	0	0.70	0.00	28.3	6.3	22.6	22.3	3.53	1504
9040-013		007:88	B	8/28/92	811	13.15	2.2	3.7	38	0.25	24	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1498
9040-014		007:89	B	8/28/92	512	8.20	4.1	3.5	54	0.27	26	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1373
9040-017		007:92	B	8/28/92	811	13.10	5.3	4.3	55	0.25	25	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1375
9040-022		008:73	C	9/02/92	800	244	5.3	3.2	62	0.31	24	40	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1243

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	T Y P	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coβ	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
9040-022		215:17-21	C	9/10/92	100	152	4.0	5.2	43	0.41	21	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1876
9040-024		008:75	B	8/28/92	640	11.15	3.0	4.4	41	0.25	20	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1502
9040-026		008:77	B	8/28/92	512	6.45	4.1	3.8	52	0.26	27	47	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1479
9040-026		217:17-21	C	9/10/92	100	154	3.7	3.3	53	0.34	24	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1907
9040-027		008:78	B	8/28/92	1024	12.90	4.1	3.9	52	0.26	24	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1496
9040-029		008:80	B	8/28/92	1877	9.90	5.0	3.4	59	0.25	18	35	0.47	68	0.84	0.35	47.3	4.6	11.5	16.5	3.57	1493
9040-029		219:17-21	C	9/10/92	100	158	5.9	4.7	56	0.35	23	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1890
9040-031		008:82	B	8/28/92	853	9.90	4.3	4.4	50	0.30	24	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1482
9040-033		008:84	B	8/28/92	1408	8.10	4.4	3.3	57	0.26	22	39	0.00	0	0.88	0.00	49.2	4.5	11.9	16.2	3.63	1382
9040-036		008:87	B	8/28/92	1621	10.20	5.8	3.8	60	0.25	21	41	0.50	62	0.79	0.34	24.5	7.2	23.3	25.7	3.56	1495
9040-037		008:88	C	9/02/92	1000	224	5.2	2.9	64	0.32	22	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1242
9040-038		008:89	B	8/28/92	1792	8.30	8.1	3.5	70	0.27	25	43	0.00	0	1.19	0.00	51.0	4.4	12.2	16.4	3.75	1384
9040-038		221:17-21	C	9/10/92	100	172	5.4	2.7	66	0.28	23	35	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1899
9040-043		008:94	B	8/28/92	1066	11.10	4.9	4.6	51	0.28	24	40	0.51	64	0.69	0.43	27.0	9.0	13.3	31.7	3.50	1481
9040-045		009:72	B	8/28/92	512	12.85	3.4	4.5	43	0.26	16	37	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1484
9040-047		009:74	B	8/28/92	1195	8.15	5.3	3.5	60	0.24	21	40	0.00	0	0.58	0.00	18.4	9.9	14.1	34.7	3.51	1488
9040-047		224:17-21	C	9/10/92	100	191	6.5	5.9	52	0.32	19	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1879
9040-050		009:77	B	8/28/92	512	9.30	5.7	5.3	52	0.24	23	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1492
9040-051		009:78	B	8/28/92	853	8.35	4.7	3.4	58	0.27	22	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1512
9040-052		009:79	B	8/28/92	640	11.25	4.6	4.1	53	0.25	24	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1503
9040-053		009:80	B	8/28/92	597	9.30	4.9	4.7	51	0.25	24	43	0.00	0	1.03	0.00	25.6	11.8	1.3	40.4	3.41	1518
9040-056		009:83	B	8/28/92	555	8.70	5.7	4.5	56	0.27	25	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1526
9040-057		009:84	B	8/28/92	853	8.85	6.3	4.3	59	0.26	23	46	0.00	0	1.33	0.00	40.4	5.1	18.6	18.6	3.61	1522
9040-063		009:90	B	8/28/92	1237	8.90	5.8	4.7	55	0.29	25	44	0.00	0	1.37	0.00	29.4	8.6	14.7	29.4	3.42	1516
9040-065		009:92	B	8/28/92	1066	8.95	6.3	4.3	60	0.24	24	44	0.00	0	1.01	0.00	42.4	6.0	10.0	22.2	3.70	1275
9040-066		009:93	B	8/28/92	981	8.25	5.6	4.7	54	0.26	23	48	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1524
9040-067		009:94	B	8/28/92	512	8.50	5.2	3.5	59	0.27	23	40	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1513
9040-067 19		010:72	B	8/28/92	555	10.20	4.4	3.3	57	0.25	26	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1480
9040-071		010:74	C	9/02/92	800	278	5.6	5.0	53	0.30	25	47	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1241
9041-001		010:76	B	8/28/92	1536	7.10	6.9	3.4	67	0.25	19	51	0.00	0	0.59	0.00	27.3	10.4	1.1	37.1	3.56	1519
9041-002		010:77	B	8/28/92	1152	9.90	6.1	2.5	71	0.27	23	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1501
9041-003		010:78	B	8/28/92	1621	8.15	5.0	3.9	56	0.27	22	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1273
9041-004		010:79	B	8/28/92	1109	8.40	5.5	3.8	59	0.27	23	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1304
9041-005		010:80	B	8/28/92	1066	7.10	6.2	2.7	69	0.26	23	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1309
9041-009		010:84	B	8/28/92	1109	7.60	7.0	2.6	73	0.27	22	46	0.00	0	1.03	0.00	32.1	9.4	0.4	34.7	3.67	1306
9041-013		010:88	C	9/02/92	800	233	4.1	2.2	65	0.36	21	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1244
9041-014		010:89	C	9/02/92	600	176	4.1	2.3	64	0.38	19	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1246
9041-015		010:90	B	8/28/92	1066	6.60	6.2	2.8	69	0.26	19	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1310
9041-017		010:92	B	8/28/92	1365	7.55	5.6	2.5	69	0.28	29	53	0.00	0	1.05	0.00	31.8	10.7	2.0	38.1	3.57	1308
9041-018		010:93	B	8/28/92	512	9.15	5.7	2.3	72	0.27	17	35	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1517
9041-024		011:75	B	8/28/92	1621	9.95	7.6	2.7	74	0.24	19	42	0.00	0	0.64	0.00	24.3	11.2	0.1	41.2	3.69	1500
9041-026		011:77	B	8/28/92	1066	7.65	6.2	2.5	72	0.28	16	35	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1274
9041-027		011:78	B	8/28/92	1621	9.95	6.5	2.3	74	0.26	20	44	0.37	85	0.76	0.00	36.7	6.4	12.0	24.1	3.75	1483
9041-033		011:84	C	9/02/92	800	175	4.0	3.1	56	0.37	21	38	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1252
9041-034		011:85	B	8/27/92	1322	10.30	7.1	2.9	71	0.26	19	36	0.35	84	0.72	0.00	36.6	6.5	14.6	23.5	3.62	986
9041-035		011:86	B	8/28/92	426	8.55	5.8	3.3	64	0.25	16	35	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1278
9041-036		011:87	B	8/28/92	1408	9.45	5.7	3.9	60	0.25	19	41	0.00	0	0.74	0.00	23.3	22.3	0.5	40.0	1.79	1494
9041-039		011:90	B	8/28/92	640	8.00	5.6	4.5	56	0.25	24	48	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1305

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	T Y P	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coβ	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
9041-040		011:91	B	8/28/92	512	8.70	4.3	3.3	57	0.27	18	37	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1307
9041-041		011:92	B	9/03/92	938	10.35	3.8	3.3	53	0.25	22	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1372
9041-042		011:93	B	8/28/92	1237	7.30	5.8	4.2	58	0.26	23	47	0.00	0	0.87	0.00	27.3	11.3	1.7	40.1	3.54	1302
9041-045		012:72	B	8/28/92	1024	7.80	6.5	2.5	73	0.26	19	40	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1515
9041-050		012:77	C	9/02/92	800	233	4.6	2.1	69	0.31	18	37	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1240
9041-051		012:78	B	8/28/92	725	8.75	7.2	3.2	69	0.25	19	38	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1514
9041-052		012:79	B	8/28/92	1664	9.30	8.6	3.9	68	0.25	17	39	0.31	89	0.93	0.46	37.5	4.8	20.1	18.1	3.73	1485
9041-054		012:81	B	8/28/92	1322	7.80	5.6	2.1	72	0.29	19	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1510
9041-056		012:83	B	8/28/92	1621	7.65	6.4	2.6	71	0.27	19	39	0.00	0	1.16	0.00	0.0	0.0	0.0	0.0	0.00	1520
9041-058		012:85	C	9/02/92	800	282	5.4	2.5	68	0.37	19	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1245
9041-060		012:87	B	8/28/92	555	9.10	4.3	2.7	61	0.28	17	34	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1280
9041-062		012:89	C	9/02/92	1000	229	4.7	3.2	60	0.36	20	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1248
9041-063		012:90	C	9/02/92	1000	180	3.3	2.4	58	0.53	18	32	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1249
9041-065		012:92	B	8/28/92	1706	8.90	5.0	4.0	56	0.26	21	40	0.51	66	0.75	0.00	30.1	6.6	20.0	23.6	3.59	1497
9041-068		012:95	B	8/28/92	427	8.55	4.1	2.5	62	0.30	17	35	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1511
9041-070		013:73	B	8/28/92	725	8.10	5.8	3.2	65	0.26	18	38	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1311
9041-072		013:75	B	8/30/92	469	8.70	4.6	1.8	72	0.30	20	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1532
9041-073		013:76	B	8/31/92	725	8.35	5.8	2.6	69	0.26	21	41	0.00	0	0.66	0.00	23.1	8.6	17.0	30.3	3.52	1509
9041-074		013:77	B	8/31/92	747	7.45	5.7	2.6	69	0.26	19	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1303
9041-075		013:78	B	8/31/92	1621	7.35	6.6	4.1	61	0.25	20	43	0.00	0	1.28	0.00	38.7	8.3	1.6	29.5	3.54	1523
9041-077		013:80	C	9/02/92	700	151	5.9	2.4	71	0.33	19	50	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1190
9041-079		013:82	B	8/31/92	725	8.45	5.6	3.8	59	0.27	21	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1530
9041-082		013:84	B	8/31/92	938	8.30	6.5	2.4	74	0.28	18	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1271
9041-084		013:87	B	8/31/92	853	8.15	6.6	2.2	75	0.27	16	36	0.00	0	0.88	0.00	42.5	7.8	1.2	27.5	3.54	1277
9041-085		013:88	B	8/31/92	1493	7.00	4.7	3.6	57	0.25	20	42	0.00	0	0.53	0.00	30.4	9.9	2.5	34.7	3.49	1525
9041-086		013:89	B	8/31/92	1962	6.60	6.8	4.1	62	0.24	16	40	0.40	78	0.74	0.44	35.0	6.0	16.5	21.7	3.61	1527
9041-087		013:90	B	8/31/92	1685	6.80	6.3	2.5	72	0.27	20	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1270
9041-089		013:92	C	9/02/92	800	193	7.0	3.5	67	0.35	20	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1193
9041-092		013:95	B	8/31/92	491	8.05	5.8	3.3	64	0.25	16	37	0.00	0	0.70	0.00	39.4	5.2	15.0	19.6	3.75	1279
9041-094		014:73	C	9/02/92	800	259	5.4	2.3	70	0.33	19	47	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1185
9041-096		014:75	B	8/31/92	1066	6.65	6.6	2.6	72	0.24	20	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1528
9041-098		014:77	B	8/31/92	1600	7.60	7.2	2.8	72	0.25	21	43	0.00	0	1.16	0.00	39.0	8.9	0.3	33.2	3.75	1521
9041-099		014:78	B	9/03/92	640	10.75	2.9	2.0	59	0.31	23	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1371
9041-101		014:80	B	8/31/92	1834	9.35	8.0	4.8	62	0.23	22	45	0.43	69	0.98	0.00	38.4	6.2	15.2	22.0	3.55	1272
9041-104		014:83	B	8/31/92	1621	8.10	6.6	2.5	72	0.27	22	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1276
9041-106		014:85	B	8/31/92	1109	8.30	6.0	4.1	60	0.26	20	39	0.37	80	0.56	0.00	37.5	4.9	19.4	18.2	3.75	1301
9041-108		014:87	B	8/31/92	1195	7.10	4.3	3.4	56	0.24	20	38	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1529
9041-110		014:89	B	8/29/92	2005	7.85	6.1	2.4	72	0.26	23	46	0.00	0	0.52	0.00	49.5	7.7	0.3	26.3	3.42	1531
9042-002		014:92	B	8/31/92	597	10.70	7.3	2.8	73	0.30	22	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1552
9042-003		014:93	B	8/31/92	1237	8.85	6.3	3.1	67	0.28	21	42	0.44	74	0.94	0.57	22.8	7.4	22.8	26.9	3.64	1545
9042-004		014:94	B	8/31/92	853	7.85	5.4	3.4	61	0.27	18	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1298
9042-005		014:95	B	9/03/92	1706	10.20	5.4	2.6	68	0.28	27	47	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1370
9042-006		015:72	C	9/02/92	800	112	4.5	3.5	56	0.37	17	38	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1187
9042-008		015:74	B	8/31/92	1493	9.45	7.6	2.4	76	0.27	19	38	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1555
9042-009		015:75	B	8/28/92	1109	11.05	7.3	4.5	62	0.24	22	44	0.00	0	0.95	0.00	55.5	4.8	10.4	16.5	3.47	1491
9042-010		015:76	B	8/31/92	1578	9.90	6.9	3.9	64	0.25	18	39	0.45	64	0.69	0.41	29.9	6.3	19.9	23.5	3.75	1549
9042-012		015:78	B	8/31/92	2133	8.25	6.8	3.6	66	0.25	21	44	0.41	80	1.02	0.53	40.2	4.8	13.4	17.8	3.74	1537
9042-013		015:79	B	8/31/92	2218	10.45	6.7	3.8	63	0.27	24	44	0.00	0	0.88	0.00	35.0	8.6	2.0	31.7	3.70	1550

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	TYP	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coß	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
9042-014		015:80	B	9/03/92	2048	9.00	5.4	4.1	57	0.25	38	61	0.00	0	0.71	0.00	53.3	3.6	9.9	10.8	2.97	1389
9042-015		015:81	B	8/31/92	1450	9.40	5.1	3.7	58	0.26	25	47	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1297
9042-017		015:83	B	9/03/92	1536	9.95	6.7	3.4	66	0.26	19	40	0.40	78	0.65	0.44	38.9	5.2	15.7	19.2	3.70	1369
9042-019		015:85	B	8/31/92	2005	7.45	7.2	2.7	73	0.28	20	41	0.42	76	0.88	0.00	38.5	6.1	16.1	22.5	3.68	1539
9042-020		015:86	B	8/31/92	1621	8.35	5.0	3.9	57	0.28	21	40	0.00	0	0.65	0.00	25.0	10.5	0.4	38.7	3.67	1551
9042-021		015:87	C	9/02/92	800	365	4.8	1.7	74	0.35	21	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1186
9042-022		015:88	B	8/31/92	1408	8.10	7.4	3.4	69	0.27	19	40	0.39	84	0.64	0.00	48.8	3.9	9.4	15.6	3.98	1294
9042-023		015:89	B	9/03/92	1578	9.20	6.6	3.9	63	0.25	30	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1386
9042-024		015:90	B	8/31/92	1493	9.05	5.3	3.7	59	0.26	19	36	0.42	81	0.82	0.05	33.6	5.8	16.6	21.4	3.72	1533
9042-025		015:91	B	8/31/92	2730	9.30	6.5	2.7	70	0.28	21	43	0.00	0	0.83	0.00	33.6	9.4	1.5	34.5	3.69	1300
9042-029		015:95	B	8/31/92	1920	8.80	6.9	3.1	69	0.27	24	45	0.00	0	0.68	0.00	20.8	11.1	1.6	40.9	3.68	1293
9042-031		016:73	C	9/02/92	800	313	5.8	2.8	68	0.27	20	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1199
9042-032		016:74	C	9/02/92	1000	254	5.5	3.9	59	0.27	24	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1194
9042-033		016:75	B	8/31/92	896	10.35	7.0	3.0	70	0.27	21	40	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1540
9042-034		016:76	B	8/31/92	1365	11.20	6.0	2.5	71	0.29	22	42	0.43	75	0.73	0.00	36.0	6.1	14.1	22.7	3.72	1554
9043-001		016:77	B	8/31/92	1578	9.90	8.3	3.6	70	0.27	23	44	0.44	72	0.97	0.00	50.2	3.4	14.8	13.8	4.12	1548
9043-002		016:78	B	9/03/92	1706	9.05	7.2	3.2	70	0.27	25	48	0.00	0	0.84	0.00	57.8	6.4	2.5	21.2	3.32	1367
9043-004		016:80	B	8/31/92	2048	9.35	7.5	3.2	70	0.27	31	52	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1535
9043-005		016:81	B	8/31/92	1493	9.75	8.1	3.5	70	0.27	22	46	0.00	0	1.19	0.00	45.4	6.7	1.3	24.7	3.69	1295
9043-007		016:83	C	9/02/92	600	303	4.0	2.1	66	0.36	23	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1183
9043-009		016:85	B	8/31/92	1195	11.10	7.6	3.3	70	0.27	21	44	0.00	0	1.40	0.00	61.7	4.6	3.0	16.7	3.65	1547
9043-014		016:90	B	8/31/92	2005	8.30	7.7	3.0	72	0.27	25	48	0.00	0	1.10	0.00	51.3	4.7	4.0	17.5	3.73	1538
9043-015		016:91	C	9/02/92	1000	311	4.5	2.2	67	0.33	19	36	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1198
9043-016		016:92	C	9/02/92	700	383	4.3	1.5	74	0.44	18	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1195
9043-017		016:93	C	9/02/92	1200	184	6.4	2.3	73	0.42	21	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1192
9043-018		016:94	C	9/02/92	700	397	8.6	2.8	75	0.33	19	38	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1201
9043-023		017:75	B	8/31/92	1920	9.30	7.6	2.7	73	0.30	17	36	0.37	85	0.81	0.00	41.2	3.3	14.0	13.9	4.19	1557
9043-024		017:76	B	8/31/92	1280	8.70	8.5	3.4	72	0.29	25	48	0.00	0	1.01	0.00	48.0	6.0	4.2	22.6	3.79	1556
9043-026		017:78	B	8/31/92	1920	7.90	5.0	2.5	67	0.28	24	47	0.00	0	0.88	0.00	34.7	7.8	2.8	29.1	3.73	1544
9043-030		017:82	B	8/31/92	1450	8.45	9.9	3.7	73	0.27	24	45	0.49	68	1.02	0.00	47.8	3.5	12.2	14.1	4.01	1559
9043-031		017:83	B	8/31/92	2048	7.70	9.7	3.5	73	0.27	28	51	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1542
9043-032		017:84	B	8/31/92	1237	7.35	10.3	3.9	73	0.25	28	50	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1536
9043-036		017:88	B	8/31/92	1493	8.05	8.7	3.3	73	0.27	25	47	0.00	0	0.73	0.00	51.5	4.9	4.3	19.3	3.97	1534
9043-037		017:89	B	8/31/92	2773	9.10	7.1	3.1	70	0.26	24	48	0.00	0	1.07	0.00	44.7	6.5	2.0	23.9	3.69	1299
9043-038		017:90	B	8/31/92	2176	9.30	9.1	3.9	70	0.26	25	47	0.00	0	1.04	0.00	54.1	4.2	5.5	16.3	3.90	1546
9043-039		017:91	B	8/31/92	2133	9.95	8.3	3.8	69	0.27	24	46	0.46	75	1.38	0.00	56.0	2.8	11.9	10.5	3.74	1543
9043-044		018:72	B	8/31/92	725	8.55	7.7	2.8	73	0.25	23	48	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1296
9043-046		018:74	C	9/02/92	1000	224	6.4	2.2	74	0.32	22	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1189
9043-049		018:77	B	8/31/92	1706	8.50	10.9	2.9	79	0.26	20	43	0.00	0	0.83	0.00	55.1	3.1	9.7	12.8	4.11	1598
9043-052		018:80	B	8/31/92	3242	9.20	10.1	3.5	74	0.26	24	47	0.39	84	1.08	0.00	41.1	5.7	14.6	22.0	3.85	1541
9043-053		018:81	C	9/02/92	800	363	8.1	3.2	71	0.30	22	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1255
9043-054		018:82	B	8/31/92	1237	10.45	9.6	4.6	68	0.26	22	44	0.00	0	1.03	0.00	62.2	2.5	9.6	8.9	3.52	1553
9043-055		018:83	B	8/31/92	2133	7.30	8.6	3.5	71	0.28	27	48	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1558
9043-056		018:84	B	9/01/92	1109	8.35	8.5	2.7	76	0.26	19	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1579
9044-001		018:86	B	9/01/92	1237	8.40	5.3	2.4	69	0.28	24	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1592
9044-003		018:88	C	9/02/92	1600	308	4.5	1.9	71	0.58	32	55	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1247
9044-004		018:89	B	9/01/92	1578	6.65	6.5	2.5	72	0.26	21	43	0.00	0	0.65	0.00	36.8	8.9	7.4	26.2	2.95	1582
9044-005		018:90	B	9/01/92	1365	8.10	5.1	3.1	63	0.27	27	51	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1574

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	T Y P	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coβ	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
9044-006		018:91	B	9/01/92	896	9.20	6.4	2.6	71	0.29	22	42	0.00	0	0.88	0.00	44.1	6.2	12.1	17.3	2.80	1561
9044-008		018:93	B	9/01/92	1365	9.50	4.3	2.1	67	0.30	35	59	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1575
9044-013		019:74	C	9/02/92	900	388	4.7	3.9	55	0.31	13	38	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1172
9044-014		019:75	B	9/01/92	896	9.75	7.7	3.2	71	0.26	20	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1587
9044-015		019:76	B	9/01/92	1066	9.30	6.1	7.1	46	0.25	18	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1589
9044-016		019:77	B	9/01/92	811	8.95	7.6	2.8	73	0.26	22	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1594
9044-017		019:78	B	9/01/92	1066	8.10	4.9	1.6	76	0.31	22	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1562
9044-018		019:79	C	9/02/92	1600	193	4.3	1.9	70	0.30	23	53	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1171
9044-020		019:81	B	9/01/92	853	8.55	6.5	5.3	55	0.25	21	43	0.00	0	0.97	0.00	49.0	5.9	8.9	15.8	2.69	1578
9044-021		019:82	C	9/02/92	1600	222	5.3	2.2	71	0.28	20	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1170
9044-022		019:83	B	9/01/92	1024	8.35	4.7	5.3	47	0.24	22	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1565
9044-023		019:84	B	9/01/92	427	9.40	3.4	3.0	53	0.27	20	39	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1591
9044-025		019:86	B	9/01/92	1706	6.60	5.3	5.2	51	0.25	34	55	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1570
9044-026		019:87	C	9/02/92	1200	186	2.0	3.3	37	0.38	28	56	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1176
9044-027		019:88	B	9/01/92	2346	7.70	5.3	4.0	57	0.24	35	61	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1596
9044-029		019:90	B	9/01/92	2389	8.80	5.1	4.4	54	0.25	28	49	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1580
9044-031		019:92	B	8/31/92	938	9.00	5.1	6.3	45	0.25	23	39	0.00	0	0.64	0.00	56.1	4.8	11.0	12.4	2.57	1560
9044-032		019:93	B	9/01/92	1280	8.35	4.6	3.5	57	0.28	21	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1567
9044-034		019:95	B	9/01/92	1280	8.05	7.5	3.6	68	0.26	24	42	0.00	0	1.03	0.00	49.9	5.0	13.2	13.9	2.79	1584
9044-036		020:64	B	9/01/92	469	8.75	5.4	4.3	56	0.26	34	60	0.00	0	0.68	0.00	48.0	3.8	10.1	10.6	2.76	1577
9044-037		020:65	C	9/02/92	1000	224	5.4	2.3	70	0.26	14	41	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1180
9044-038		020:66	C	9/02/92	1000	322	6.1	2.4	72	0.29	23	44	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1182
9044-039		020:67	B	9/01/92	1280	8.00	5.0	2.8	64	0.27	21	44	0.44	75	0.34	0.00	19.9	9.5	12.1	29.8	3.14	1564
9044-047		020:75	B	9/01/92	853	9.20	7.1	2.6	73	0.27	22	42	0.00	0	0.63	0.00	49.8	4.5	10.3	15.8	3.47	1581
9044-048		020:76	B	9/01/92	512	10.10	6.4	2.0	76	0.27	23	45	0.00	0	0.81	0.00	51.4	4.6	10.0	13.3	2.90	1597
9044-049		020:77	C	9/02/92	1000	357	4.4	4.7	49	0.30	19	49	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1175
9044-051		020:79	B	9/01/92	3327	9.50	6.2	2.9	68	0.29	37	66	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1586
9044-052		020:80	B	9/01/92	427	9.60	5.1	3.4	60	0.27	24	52	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1588
9044-053		020:81	B	9/01/92	939	7.80	4.9	2.1	70	0.30	24	47	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1571
9044-054		020:82	C	9/02/92	1000	266	3.3	2.3	59	0.27	31	59	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1177
9044-055		020:83	B	9/01/92	1152	9.10	7.6	4.4	64	0.25	36	61	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1566
9044-056		020:84	B	9/01/92	853	9.25	5.6	4.9	53	0.25	19	40	0.00	0	0.66	0.00	50.4	6.0	4.5	15.7	2.62	1569
9045-001		020:86	C	9/02/92	1200	266	2.6	6.0	30	0.26	25	49	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1178
9045-009		020:94	C	9/02/92	1200	170	4.2	1.6	73	0.30	24	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1173
9045-010		020:95	C	9/02/92	900	192	4.0	2.1	65	0.41	22	54	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1174
9045-012		021:64	B	9/01/92	640	8.35	4.3	2.0	68	0.30	27	47	0.00	0	0.65	0.00	34.4	6.1	10.9	21.0	3.43	1563
9045-013		021:65	B	9/01/92	683	9.30	5.8	2.4	70	0.30	22	45	0.00	0	0.38	0.00	49.8	12.7	9.2	11.9	0.94	1576
9045-015		021:67	B	9/01/92	981	6.70	5.1	5.1	50	0.24	31	60	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1572
9045-019		021:71	B	9/01/92	640	8.90	5.9	2.4	71	0.27	21	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1585
9045-022		021:74	C	9/02/92	1000	149	5.1	2.1	71	0.33	18	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1179
9045-030		021:82	B	9/01/92	2218	8.25	5.5	5.0	52	0.25	22	44	0.00	0	1.17	0.00	49.0	6.1	10.4	17.3	2.84	1593
9045-033		021:85	B	9/01/92	1152	8.40	5.3	2.1	71	0.27	25	45	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1583
9045-036		021:88	B	9/01/92	1280	7.90	7.6	4.2	65	0.25	33	55	0.00	0	0.97	0.00	41.6	4.8	12.0	12.5	2.59	1590
9045-038		021:90	B	9/01/92	2005	7.45	5.5	2.7	67	0.28	37	59	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1595
9045-041		021:93	B	9/02/92	597	8.85	4.4	1.9	70	0.29	19	36	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1323
9045-052		022:71	B	9/02/92	597	10.50	7.8	4.3	64	0.28	38	59	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1322
9045-056		022:75	C	9/02/92	600	349	4.6	2.0	70	0.31	20	48	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1181
9045-062		022:81	B	9/02/92	938	10.30	7.7	2.8	74	0.26	36	65	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1321

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	T Y P	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coβ	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
9045-065		022:84	B	9/02/92	768	8.65	8.2	3.3	71	0.29	33	55	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1328
9045-067		022:86	B	9/04/92	811	7.40	4.5	4.4	51	0.25	35	67	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1622
9045-069		022:88	B	9/04/92	768	8.35	6.7	2.4	73	0.29	31	55	0.00	0	0.64	0.00	53.4	3.5	10.9	12.8	3.61	1627
9045-070		022:89	B	9/04/92	640	8.70	4.0	2.6	61	0.29	31	46	0.00	0	0.72	0.00	33.4	9.8	0.8	34.1	3.47	1625
9045-073		022:92	B	9/04/92	640	8.55	3.5	1.6	69	0.36	27	50	0.00	0	0.52	0.00	32.6	5.6	14.9	20.6	3.70	1623
9045-074		022:93	B	9/04/92	1195	8.05	3.4	3.8	48	0.29	42	68	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1679
9045-077		023:63	B	9/04/92	811	8.05	8.5	2.5	78	0.23	19	52	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1680
9045-079		023:65	B	9/04/92	597	8.45	7.9	2.9	73	0.26	19	38	0.00	0	1.00	0.00	28.1	13.2	15.1	13.7	1.03	1619
9045-080		023:66	B	9/04/92	1109	8.95	8.0	3.0	73	0.26	32	53	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1677
9045-083		023:69	B	9/04/92	811	7.95	2.4	6.4	28	0.27	28	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1628
9045-088		023:74	B	9/04/92	725	8.40	5.8	3.7	61	0.26	22	47	0.00	0	1.12	0.00	30.4	8.7	12.3	30.3	3.49	1673
9045-089		023:75	B	9/04/92	1322	9.00	7.1	4.0	64	0.26	37	54	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1630
9045-091		023:77	B	9/04/92	640	8.60	5.5	2.6	68	0.30	32	55	0.00	0	0.60	0.00	44.8	8.7	11.2	11.3	1.29	1620
9045-093		023:79	B	9/04/92	1792	8.25	5.3	2.9	64	0.30	38	59	0.00	0	0.58	0.00	52.4	3.3	10.6	11.6	3.53	1624
9045-096		023:82	C	9/02/92	700	171	6.1	2.6	70	0.33	34	60	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1260
9045-098		023:84	B	9/04/92	1066	9.30	5.4	2.1	72	0.28	23	52	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1634
9045-099		023:85	B	9/04/92	1066	8.00	6.4	3.6	64	0.27	39	69	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1621
9045-100		023:86	C	9/02/92	800	361	4.9	3.5	58	0.34	30	50	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1261
9045-101		023:87	B	9/04/92	640	8.90	3.0	3.5	46	0.31	36	60	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1626
9045-104		023:90	B	9/04/92	1408	8.60	5.0	5.0	50	0.26	25	44	0.00	0	1.53	0.00	43.5	2.9	18.2	9.3	3.26	1610
9045-105		023:91	B	9/04/92	1536	8.95	6.9	2.4	74	0.29	26	43	0.00	0	1.23	0.00	52.8	5.5	10.1	15.3	2.79	1640
9046-001		024:64	C	9/02/92	600	111	5.0	4.8	52	0.32	20	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1257
9046-009		024:72	B	9/04/92	1066	8.85	9.0	3.7	71	0.29	28	57	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1613
9046-011		024:74	B	9/04/92	1834	9.20	5.6	2.3	71	0.31	37	61	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1612
9046-012		024:75	B	9/04/92	768	9.95	6.1	2.5	71	0.28	29	52	0.00	0	0.87	0.00	54.7	5.5	3.4	19.6	3.55	1609
9046-014		024:77	B	9/04/92	1152	8.60	4.9	8.1	38	0.24	34	59	0.00	0	1.47	0.00	49.2	6.5	0.1	22.6	3.50	1633
9046-015		024:78	B	9/04/92	853	8.40	4.3	2.1	68	0.30	28	58	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1611
9046-017		024:80	B	9/04/92	640	8.20	7.4	3.0	71	0.34	27	48	0.00	0	0.96	0.00	31.7	11.8	0.4	29.6	2.52	1638
9046-018		024:81	B	9/04/92	768	9.45	4.7	4.0	54	0.28	32	75	0.00	0	1.61	0.00	37.8	7.1	14.8	24.1	3.38	1631
9046-020		024:83	B	9/04/92	1066	9.70	6.9	4.3	61	0.26	17	45	0.00	0	1.63	0.00	61.2	4.5	0.3	16.9	3.77	1636
9046-025		024:88	B	9/04/92	811	8.80	6.1	3.8	62	0.29	22	44	0.00	0	0.96	0.00	46.1	9.2	0.3	24.7	2.68	1618
9046-027		024:90	B	9/04/92	768	8.65	4.2	4.2	50	0.30	34	62	0.00	0	0.63	0.00	43.3	10.1	0.5	22.0	2.18	1676
9046-028		024:91	B	9/04/92	2389	8.25	5.6	2.7	67	0.27	38	59	0.00	0	0.69	0.00	40.5	5.4	14.1	15.4	2.86	1615
9046-029		024:92	B	9/04/92	2176	8.60	8.5	5.9	59	0.25	41	65	0.00	0	1.05	0.00	58.4	2.0	8.6	5.1	2.59	1632
9046-030		024:93	B	9/04/92	683	10.50	7.0	5.8	55	0.26	24	41	0.00	0	2.02	0.00	34.5	10.1	0.2	35.8	3.55	1635
9046-033		025:63	B	9/04/92	1066	8.95	5.3	2.7	66	0.32	24	50	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1616
9046-034		025:64	B	9/04/92	1365	8.65	5.8	4.1	59	0.28	25	45	0.00	0	1.53	0.00	29.6	9.9	0.8	35.5	3.59	1629
9046-035		025:65	C	9/02/92	600	155	2.8	0.9	75	0.48	14	33	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1262
9046-036		025:66	B	9/04/92	1024	9.25	7.2	6.4	53	0.24	24	47	0.00	0	1.42	0.00	41.6	8.7	0.1	31.5	3.64	1637
9046-037		025:67	B	9/04/92	1237	8.60	5.9	2.1	74	0.31	26	49	0.00	0	0.81	0.00	38.1	5.1	11.1	18.7	3.69	1639
9046-040		025:70	B	9/04/92	341	8.90	6.3	2.9	69	0.28	23	45	0.00	0	1.44	0.00	72.3	2.5	0.1	2.6	1.04	1614
9046-041		025:71	B	9/04/92	597	8.45	7.5	2.7	73	0.29	20	43	0.00	0	0.60	0.00	41.1	8.4	10.5	21.5	2.56	1675
9046-044		025:74	C	9/02/92	800	183	6.5	2.7	70	0.31	29	48	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1263
9046-045		025:75	B	9/04/92	683	8.55	5.5	1.8	76	0.31	28	54	0.00	0	0.83	0.00	48.0	6.2	12.1	15.0	2.43	1672
9046-048		025:78	B	9/04/92	896	9.25	5.5	4.7	54	0.24	23	49	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1654
9046-049		025:79	C	9/02/92	800	142	4.3	3.0	59	0.37	22	42	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1259
9046-051		025:81	C	9/02/92	1800	197	6.4	2.8	69	0.38	22	46	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1264
9046-053		025:83	B	9/04/92	1237	9.00	6.0	3.9	60	0.23	21	43	0.00	0	1.12	0.00	26.4	6.7	23.8	23.2	3.45	1660

1992 Bale (at 8% mc) and 5-Cone (as is basis) Analyses

Sorted by Accession or Nursery Number (November 23, 1993)

Accession or Nursery Number	Identification	Location	T Y P	Harvest Date	Yield Lb/Ac	MC or ConeWt	% α	% β	Alpha Ratio	HSI	Coα	Coβ	6 Mo HSI	% Left	mL oil/100g Fresh	mL oil/100g Stor.	Area % Oil Composition Myr	Cary	Farn	Hum	H/C	LabNo
9046-054		025:84	B	9/04/92	1536	9.80	9.0	7.1	56	0.23	28	45	0.00	0	1.85	0.00	54.6	3.9	8.8	14.6	3.70	1685
9046-059		025:89	B	9/04/92	2560	9.30	4.4	3.8	54	0.27	34	60	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1678
9046-062		025:92	B	9/04/92	555	10.10	4.7	2.1	69	0.31	26	49	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1674
9046-063		025:93	B	9/04/92	384	8.95	4.5	1.8	72	0.31	29	50	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1671
9046-065		025:95	B	9/04/92	1109	8.90	7.4	5.6	57	0.25	22	38	0.00	0	1.49	0.00	45.1	4.6	9.3	16.7	3.65	1681
9046-069		026:66	B	9/04/92	1066	9.15	3.5	5.3	40	0.26	23	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1653
9046-070		026:67	B	9/04/92	384	9.05	5.1	2.4	68	0.31	25	46	0.00	0	0.99	0.00	19.7	9.0	9.9	33.1	3.69	1666
9046-076		026:73	B	9/04/92	640	9.15	6.8	4.2	62	0.33	47	71	0.00	0	0.91	0.00	47.4	6.5	0.1	22.1	3.41	1649
9046-078		026:75	B	9/04/92	469	10.05	5.1	7.6	40	0.26	22	45	0.00	0	1.85	0.00	38.5	7.4	11.2	25.6	3.44	1647
9046-082		026:79	B	9/04/92	1024	10.10	7.8	3.9	67	0.26	27	55	0.00	0	1.74	0.00	36.7	11.5	14.4	12.5	1.09	1655
9046-085		026:82	B	9/04/92	1152	9.30	7.6	5.2	59	0.25	22	38	0.00	0	1.53	0.00	42.2	7.8	0.0	28.4	3.65	1657
9046-086		026:83	B	9/04/92	1152	9.90	5.5	4.6	54	0.26	22	42	0.00	0	1.16	0.00	40.8	5.4	12.5	15.4	2.86	1642
9046-087		026:84	B	9/04/92	1066	9.40	9.3	3.2	74	0.24	37	66	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1663
9046-088		026:85	B	9/04/92	3413	9.90	6.2	2.7	70	0.28	28	47	0.00	0	0.55	0.00	44.4	8.1	11.0	12.1	1.49	1684
9046-092		026:89	B	9/04/92	1493	10.60	9.1	6.3	59	0.24	22	37	0.00	0	1.31	0.00	55.0	3.7	11.3	13.0	3.51	1617
9046-093		026:90	B	9/04/92	1664	9.75	5.3	2.7	66	0.29	34	56	0.00	0	0.53	0.00	57.2	6.3	0.0	21.1	3.36	1668
9046-094		026:91	B	9/04/92	1408	9.95	4.7	3.1	60	0.28	27	47	0.00	0	1.00	0.00	50.8	5.0	11.8	14.9	2.96	1686
9046-096		026:93	B	9/04/92	1536	9.85	6.2	3.4	65	0.26	22	39	0.00	0	1.39	0.00	40.5	9.0	0.4	31.8	3.55	1644
9046-097		026:94	B	9/04/92	1536	8.80	5.2	5.8	47	0.24	33	57	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1650
9046-100		027:64	B	9/04/92	1834	8.70	9.2	5.0	65	0.25	33	54	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1645
9046-102		027:66	B	9/04/92	1450	5.95	7.8	5.6	58	0.26	20	34	0.62	56	2.12	0.80	53.1	4.9	8.2	18.3	3.73	1643
9046-103		027:67	B	9/04/92	938	9.70	7.7	4.4	64	0.25	21	48	0.00	0	1.74	0.00	50.6	6.1	0.0	22.7	3.71	1651
9046-104		027:68	B	9/04/92	1493	10.55	8.7	5.1	63	0.25	25	43	0.00	0	1.54	0.00	46.3	7.1	0.2	25.8	3.66	1641
9046-106		027:70	B	9/04/92	896	9.80	8.0	5.2	60	0.23	22	45	0.00	0	1.47	0.00	46.1	6.5	7.8	23.2	3.59	1646
9046-107		027:71	B	9/04/92	2133	9.35	8.0	3.2	71	0.28	26	45	0.00	0	1.32	0.00	34.8	12.2	0.2	32.6	2.67	1683
9048-008		027:79	B	9/04/92	1109	10.75	6.0	5.7	51	0.26	35	58	0.00	0	1.59	0.00	46.8	7.6	0.0	26.7	3.51	1667
9048-020		027:91	B	9/04/92	1066	10.75	7.2	4.0	64	0.25	31	61	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1656
9048-023		027:94	B	9/04/92	1280	9.70	6.0	4.5	57	0.24	26	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1659
9048-037		028:75	B	9/04/92	1066	11.80	6.6	4.3	61	0.24	27	51	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1682
9048-039		028:77	B	9/04/92	1109	11.05	4.7	3.2	60	0.28	38	56	0.00	0	1.13	0.00	41.1	7.4	0.0	27.3	3.67	1664
9048-042		028:80	C	9/02/92	1200	197	6.4	2.8	69	0.35	26	43	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1258
9048-046		028:84	B	9/04/92	811	10.70	7.0	4.3	62	0.24	25	53	0.00	0	1.56	0.00	44.6	7.6	0.2	26.3	3.45	1669
9048-054		028:92	B	9/04/92	1066	11.40	7.0	3.4	68	0.24	29	54	0.00	0	1.81	0.00	39.8	5.9	14.7	21.1	3.56	1658
9048-070		029:67	B	9/04/92	640	10.75	5.7	3.9	60	0.27	28	46	0.00	0	1.76	0.00	36.5	11.3	0.2	32.4	2.86	1670
9048-083		029:88	C	9/02/92	1000	266	6.0	3.7	62	0.29	39	56	0.00	0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	1253
9048-109		030:81	B	9/04/92	1066	10.00	9.8	4.7	68	0.25	26	55	0.00	0	1.48	0.00	69.9	3.9	0.1	11.9	3.08	1652
9048-113		030:85	B	9/04/92	768	11.10	5.4	3.2	63	0.28	31	50	0.00	0	1.47	0.00	48.2	8.3	0.1	28.6	3.43	1661

Lupulin Analyses

1992 Lupulin Analyses

Sorted by Acc/Nursery (October 20, 1993)

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Accession or Nursery Number	Identification	Location	Harvest Date	% α-acids	% ß-acids	Alpha Ratio	Sum α+ß	HSI	Coα	Coß	Crush (3 hr)	SPO (hrs)	Permea-bility	Calc. % Remain	Hum/ Cary	Laboratory Serial No.
19005M	LC x OP	001:53-54	7/13/92	5.1	69.1	7	74.2	0.186	24	44	1.895	0.0	0.00	0	0.00	2290
19009M	Fu x Fu-S	005:53-54	7/13/92	18.0	54.0	25	71.9	0.219	28	48	0.505	0.0	0.00	0	0.00	2285
19046M	LC-S x Fu-S	014:53-54	7/07/92	5.2	48.5	10	53.7	0.236	27	46	1.430	0.4	0.00	0	0.00	2226
19047M	Elsasser x Fu-S	015:53-54	7/13/92	37.0	40.4	48	77.4	0.217	40	59	0.560	0.0	0.00	0	0.00	2293
19058M	Ea Gr x OP	018:53-54	7/13/92	17.1	62.2	22	79.3	0.193	20	43	2.132	0.0	0.00	0	0.00	2291
19085M	Land x(GcxFu-S)	022:53-54	7/13/92	21.2	44.2	32	65.4	0.215	30	52	0.860	0.0	0.00	0	0.00	2289
19172M	CatsTailx19009M	024:53-54	7/07/92	27.8	38.0	42	65.8	0.254	20	34	1.783	0.0	0.00	0	0.00	2243
19173M	Striessx73-28	025:53-54	7/07/92	25.1	39.5	39	64.6	0.218	24	47	1.731	0.0	0.00	0	0.00	2234
21017M	6220-009M	029:53-54	7/07/92	42.8	30.5	58	73.3	0.248	38	58	0.547	0.0	0.00	0	0.00	2238
21058M	6305-008M	011:57-58	7/14/92	24.5	52.3	32	76.7	0.209	29	53	1.248	0.0	0.00	0	0.00	2320
21059M	6321-010M	012:57-58	7/08/92	11.6	61.5	16	73.1	0.192	18	40	1.864	2.2	0.74	0	0.00	2248
21064M	6611-002M	023:57-58	7/14/92	15.2	51.9	23	67.1	0.222	27	52	1.419	0.0	0.00	0	0.00	2305
21072M	6620-028M	049:57-58	7/14/92	38.5	31.1	55	69.6	0.287	41	61	0.539	0.0	0.00	0	0.00	2302
21076M	6806-115M	020:57-58	7/14/92	44.0	27.6	61	71.6	0.265	35	59	1.348	0.0	0.00	0	0.00	2311
21087M	Yugo 3/3	015:57-58	7/08/92	35.9	22.1	62	58.0	0.310	21	40	0.513	0.0	0.00	0	0.00	2276
21088M	Yugo 5/9	016:57-58	7/14/92	35.3	30.3	54	65.6	0.249	15	46	1.770	0.0	0.00	0	0.00	2299
21089M	Yugo 5/10	017:57-58	7/08/92	30.3	24.7	55	55.0	0.261	13	46	0.602	0.0	0.00	0	0.00	2256
21110M	7007-018M	010:55-56	7/07/92	44.3	29.5	60	73.9	0.250	22	39	0.430	0.0	0.00	0	0.00	2241
21117M	Native Wis	014:41-44	7/13/92	31.7	40.0	44	71.7	0.235	31	59	0.445	0.0	0.00	0	0.00	2286
21130M	6903-021M	030:57-58	7/08/92	13.5	59.6	19	73.1	0.199	26	32	1.912	0.0	0.00	0	0.00	2254
21131M	6903-023M	031:57-58	7/14/92	29.0	49.1	37	78.1	0.208	16	31	1.948	0.0	0.00	0	0.00	2309
21135M	7006-430M	039:57-58	7/08/92	41.0	31.0	57	72.0	0.249	19	37	0.444	0.0	0.00	0	0.00	2251
21136M	7006-323M	041:57-58	7/14/92	34.5	37.4	48	71.9	0.249	19	37	0.694	4.6	0.68	0	0.00	2316
21137M	7006-340M	043:57-58	7/08/92	26.4	41.0	39	67.4	0.243	18	33	2.029	0.0	0.00	0	0.00	2273
21184M	Male Comet?	016:55-56	7/07/92	45.7	28.7	61	74.4	0.263	33	56	0.496	0.0	0.00	0	0.00	2228
21234M	S. Afr. NP2/55	026:57-58	7/08/92	20.8	24.1	46	44.8	0.305	15	35	1.092	0.0	0.00	0	0.00	2281
21267M	7303-138M	033:55-56	7/13/92	48.7	20.4	70	69.2	0.287	31	52	0.479	0.0	0.00	0	0.00	2297
21272M	7308-037M	002:59-60	7/08/92	49.1	25.1	66	74.2	0.242	25	43	0.422	0.0	0.00	0	0.00	2260
21274M	7311-141M	015:59-60	7/14/92	52.9	24.8	68	77.7	0.255	35	60	0.475	0.0	0.00	0	0.00	2322
21275M	7313-047M	028:59-60	7/14/92	40.7	18.4	69	59.1	0.271	31	54	0.395	0.0	0.00	0	0.00	2312
21313M	7302-036M	034:53-54	7/07/92	48.3	16.4	75	64.7	0.279	27	42	1.244	3.0	0.28	0	0.00	2230
21315M	7302-125M	040:53-54	7/07/92	44.5	23.2	66	67.7	0.271	27	50	1.214	0.0	0.00	0	0.00	2236
21317M	7302-153M	043:53-54	7/13/92	57.8	23.0	72	80.8	0.242	31	53	0.000	0.0	0.00	0	0.00	2292
21318M	7302-155M	044:53-54	7/07/92	48.5	17.3	74	65.9	0.289	29	49	0.486	0.0	0.00	0	0.00	2239
21319M	7302-166m	045:53-54	7/07/92	50.7	16.3	76	67.1	0.294	29	50	0.838	0.0	0.00	0	0.00	2232
21326M	7303-149M	034:55-56	7/13/92	51.5	19.6	72	71.2	0.274	24	43	0.564	0.0	0.00	0	0.00	2287
21327M	7303-169M	036:55-56	7/07/92	43.3	18.3	70	61.6	0.312	30	49	0.904	0.0	0.00	0	0.00	2242
21328M	7303-165M	037:55-56	7/07/92	44.9	19.6	70	64.5	0.272	35	51	0.714	0.0	0.00	0	0.00	2233
21329M	7304-085M	038:55-56	7/07/92	41.4	17.5	70	58.9	0.317	19	35	2.234	0.0	0.00	0	0.00	2229
21330M	7304-105M	040:55-56	7/07/92	51.0	25.0	67	76.0	0.246	30	45	0.407	0.0	0.00	0	0.00	2225
21332M	7304-148M	042:55-56	7/13/92	50.2	19.4	72	69.6	0.262	27	48	0.651	0.0	0.00	0	0.00	2288
21333M	7304-197M	046:55-56	7/07/92	39.0	17.2	69	56.2	0.293	28	45	1.101	0.0	0.00	0	0.00	2240
21336M	7309-004M	003:59-60	7/08/92	39.0	30.2	56	69.2	0.241	22	37	0.817	0.0	0.00	0	0.00	2262
21337M	7309-034M	004:59-60	7/08/92	39.8	20.7	66	60.5	0.288	18	32	0.774	0.0	0.00	0	0.00	2247
21338M	7309-045M	005:59-60	7/08/92	44.4	20.5	68	64.9	0.262	20	38	0.544	0.0	0.00	0	0.00	2261
21339M	7311-012M	008:59-60	7/08/92	33.3	18.3	64	51.6	0.278	30	46	0.660	0.0	0.00	0	0.00	2263
21340M	7311-020M	009:59-60	7/14/92	64.5	15.5	81	80.0	0.249	35	58	0.481	0.0	0.00	0	0.00	2304
21341M	7311-046M	010:59-60	7/08/92	38.5	13.4	74	51.9	0.285	25	48	0.728	0.0	0.00	0	0.00	2244

1992 Lupulin Analyses

Sorted by Acc/Nursery (October 20, 1993)

Accession or Nursery Number	Identification	Location	Harvest Date	% α-acids	% ß-acids	Alpha Ratio	Sum α+ß	HSI	Coα	Coß	Crush (3 hr)	SPO (hrs)	Permea-bility	Calc. % Remain	Hum/ Cary	Laboratory Serial No.
21342M	7311-114M	012:59-60	7/08/92	40.1	21.1	65	61.2	0.298	27	45	0.569	0.0	0.00	0	0.00	2267
21343M	7311-135M	014:59-60	7/14/92	48.2	20.3	70	68.5	0.282	39	61	0.483	0.0	0.00	0	0.00	2314
21344M	7311-142M	016:59-60	7/08/92	49.6	20.4	71	70.0	0.297	26	45	0.536	0.0	0.00	0	0.00	2246
21345M	7312-017M	017:59-60	7/14/92	55.1	20.3	73	75.4	0.270	25	44	0.479	5.1	0.45	0	0.00	2306
21346M	7312-028M	018:59-60	7/14/92	53.4	25.6	68	79.0	0.252	35	53	0.501	0.0	0.00	0	0.00	2308
21347M	7312-033M	020:59-60	7/08/92	42.0	24.4	63	66.4	0.273	28	43	0.501	0.0	0.00	0	0.00	2264
21350M	7312-088M	023:59-60	7/08/92	53.6	18.7	74	72.3	0.267	21	35	0.413	0.0	0.00	0	0.00	2259
21351M	7313-015M	026:59-60	7/14/92	51.5	21.5	71	73.0	0.303	29	50	0.524	0.0	0.00	0	0.00	2303
21352M	7314-004M	030:59-60	7/14/92	49.8	24.5	67	74.2	0.265	29	11	0.715	0.0	0.00	0	0.00	2315
21353M	7314-019M	031:59-60	7/14/92	51.4	23.6	69	75.0	0.274	31	53	0.457	0.0	0.00	0	0.00	2321
21354M	7314-023M	032:59-60	7/08/92	44.6	21.0	68	65.6	0.268	27	46	0.488	0.0	0.00	0	0.00	2266
21356M	7314-086M	034:59-60	7/08/92	42.3	22.5	65	64.8	0.264	36	56	0.537	0.0	0.00	0	0.00	2269
21357M	7314-109M	036:59-60	7/08/92	36.3	22.6	62	58.9	0.394	34	52	1.106	0.0	0.00	0	0.00	2270
21358M	7315-031M	037:59-60	7/08/92	43.9	17.9	71	61.8	0.312	28	49	0.455	0.0	0.00	0	0.00	2258
21359M	7315-051M	038:59-60	7/08/92	55.3	23.8	70	79.1	0.258	28	53	0.412	0.0	0.00	0	0.00	2253
21360M	7506-085M	044:59-60	7/08/92	45.7	29.7	61	75.4	0.230	16	34	0.450	0.0	0.00	0	0.00	2268
21361M	7506-207M	050:59-60	7/08/92	39.3	24.4	62	63.7	0.263	14	31	1.717	0.0	0.00	0	0.00	2271
21362M	7596-235M	051:59-60	7/08/92	40.7	38.2	52	78.9	0.224	27	42	1.902	0.0	0.00	0	0.00	2265
21363M	7507-107M	052:59-60	7/08/92	31.1	26.4	54	57.5	0.249	23	45	0.621	0.0	0.00	0	0.00	2272
21364M	7507-117M	053:59-60	7/14/92	34.7	47.9	42	82.6	0.210	22	42	0.623	0.0	0.00	0	0.00	2300
21375M	7504-040m	050:57-58	7/08/92	29.7	39.1	43	68.8	0.229	18	42	1.666	2.3	0.86	0	0.00	2245
21377M	7504-124M	053:57-58	7/08/92	10.8	17.2	39	28.0	0.303	19	42	1.833	0.0	0.00	0	0.00	2257
21378M	7506-014M	055:57-58	7/14/92	54.7	23.4	70	78.1	0.234	30	53	0.408	0.0	0.00	0	0.00	2310
21379M	7506-057M	041:59-60	7/14/92	39.6	39.2	50	78.8	0.226	25	47	0.436	0.0	0.00	0	0.00	2313
21380M	7506-100M	046:59-60	7/08/92	44.1	28.2	61	72.3	0.244	17	31	0.411	3.4	0.61	0	0.00	2255
21381M	7506-182M	049:59-60	7/08/92	23.9	52.3	31	76.2	0.213	13	25	2.127	0.0	0.00	0	0.00	2252
21399M	Yugo 07P14	025:57-58	7/14/92	57.3	19.7	74	76.9	0.247	16	40	0.423	0.0	0.00	0	0.00	2301
21400M	Yugo 20P09	035:57-58	7/08/92	18.0	23.1	44	41.1	0.438	13	50	0.747	0.0	0.00	0	0.00	2275
21444M	7302-016m	033:53-54	7/07/92	42.0	25.8	62	67.8	0.263	29	50	0.806	0.0	0.00	0	0.00	2237
21447M	7313-098M	029:59-60	7/08/92	44.0	19.6	69	63.6	0.288	28	47	0.650	0.0	0.00	0	0.00	2249
21448M	7506-081M	043:59-60	7/08/92	40.8	35.6	53	76.3	0.215	24	44	0.824	0.0	0.00	0	0.00	2278
21449M	7506-096M	045:59-60	7/08/92	33.0	29.3	53	62.3	0.242	31	50	0.552	0.0	0.00	0	0.00	2282
21466M	7302-052M	035:53-54	7/13/92	57.2	24.3	70	81.4	0.237	23	49	0.415	0.0	0.00	0	0.00	2296
21468M	7302-028M	053:53-54	7/07/92	46.7	23.1	67	69.7	0.273	26	46	0.724	0.0	0.00	0	0.00	2231
21488M	7506-161M	047:59-60	7/08/92	43.0	37.1	54	80.0	0.219	16	32	0.848	0.0	0.00	0	0.00	2250
21489M	7611-108M	054:59-60	7/14/92	47.9	23.8	67	71.8	0.251	23	41	0.476	0.0	0.00	0	0.00	2318
21550M	W Am Hum 490	005:39-40	6/25/92	28.4	36.7	44	65.0	0.268	49	73	0.860	0.0	0.00	0	0.00	2004
21555M	W Am Hum 496	008:39-40	7/27/92	9.6	16.9	36	26.5	0.267	46	76	1.712	0.0	0.00	0	0.00	2507
21561M	W Am Hum 503	011:39-40	7/27/92	14.0	52.0	21	65.9	0.203	50	81	1.488	0.0	0.00	0	0.00	2508
21569M	W Am Hum 514	015:39-40	7/06/92	29.8	43.2	41	73.0	0.229	44	65	0.495	0.0	0.00	0	0.00	2223
21570M	W Am Hum 515	016:39-40	6/25/92	28.6	43.6	40	72.1	0.249	47	71	0.492	0.0	0.00	0	0.00	2005
21571M	W Am Hum 516	031:41-44	7/06/92	29.3	44.4	40	73.6	0.235	44	66	0.676	0.0	0.00	0	0.00	2222
21572M	W Am Hum 517	017:39-40	6/25/92	29.0	36.3	44	65.3	0.259	44	59	0.568	0.0	0.00	0	0.00	2006
21573M	W Am Hum 518	018:39-40	7/06/92	36.5	37.4	49	73.9	0.239	37	61	0.409	0.0	0.00	0	0.00	2220
21574M	W Am Hum 520	032:41-44	6/25/92	28.9	36.4	44	65.3	0.282	47	70	0.569	0.0	0.00	0	0.00	2003
21575M	W Am Hum 522	019:39-40	7/06/92	30.3	35.3	46	65.6	0.277	43	67	1.041	0.0	0.00	0	0.00	2218
21577M	Hum 524 Mont 5	020:39-40	7/06/92	14.8	44.6	25	59.4	0.239	34	74	1.592	0.0	0.00	0	0.00	2217
21588M	W Am Hum 543	039:41-44	7/06/92	20.9	44.2	32	65.1	0.226	40	67	1.655	0.0	0.00	0	0.00	2221

1992 Lupulin Analyses

Sorted by Acc/Nursery (October 20, 1993)

Accession or Nursery Number	Identification	Location	Harvest Date	% α-acids	% ß-acids	Alpha Ratio	Sum α+ß	HSI	Coα	Coß	Crush (3 hr)	SPO (hrs)	Permea-bility	Calc. % Remain	Hum/ Cary	Laboratory Serial No.
21589M	W Am Hum 544	040:41-44	6/25/92	14.9	53.9	22	68.8	0.210	65	70	1.527	0.0	0.00	0	0.00	2007
21595M	W Am Hum 550	001:39-40	6/25/92	19.1	45.3	30	64.5	0.248	57	72	0.990	0.0	0.00	0	0.00	2008
21597M	W Am Hum 553	028:39-40	6/25/92	12.7	42.0	23	54.7	0.223	43	67	1.611	0.0	0.00	0	0.00	2009
21601M	W Am Hum 569	029:39-40	7/13/92	21.1	48.8	30	69.9	0.255	41	72	0.537	0.0	0.00	0	0.00	2294
21615M	7303-052M	055:53-54	7/07/92	47.3	22.0	68	69.4	0.249	30	46	0.715	0.0	0.00	0	0.00	2235
21616M	8305-021M	103:03-04	7/17/92	18.5	28.4	39	46.9	0.260	23	41	1.446	0.0	0.00	0	0.00	2506
21617M	8309-026M	105:03-04	7/13/92	27.4	38.6	41	66.0	0.233	20	40	0.557	0.0	0.00	0	0.00	2283
21617M	8309-026M	105:03-04	7/17/92	26.5	28.9	48	55.4	0.235	21	38	2.178	0.0	0.00	0	0.00	2505
51060M	219-5	002:55-56	7/13/92	8.8	58.6	13	67.5	0.224	25	48	0.941	0.0	0.00	0	0.00	2284
51114M	221-1	005:55-56	7/13/92	13.9	50.7	21	64.6	0.235	24	47	1.341	0.0	0.00	0	0.00	2295
52047M	19127 X 19173M	011:55-56	7/13/92	31.5	38.8	45	70.2	0.252	30	58	0.547	0.0	0.00	0	0.00	2298
60013M	Ariz 1-2	002:41-44	7/06/92	34.5	28.2	55	62.8	0.289	62	76	1.629	0.0	0.00	0	0.00	2219
60023M	Colo 1-1	005:41-44	7/27/92	35.4	28.6	55	64.0	0.271	45	64	2.013	0.0	0.00	0	0.00	2509
60026M	Colo 2-1	007:41-44	6/25/92	36.4	35.4	51	71.9	0.257	59	77	2.094	0.0	0.00	0	0.00	2002
60028M	Colo 2-3	009:41-44	6/25/92	45.4	29.1	61	74.6	0.225	53	70	0.626	0.0	0.00	0	0.00	2001
63013M	BG x 58015M	024:55-56	7/07/92	41.0	29.7	58	70.6	0.257	43	62	0.468	0.0	0.00	0	0.00	2227
63014M	BG x 58015M	025:55-56	7/07/92	43.3	31.8	58	75.1	0.250	42	62	0.617	0.0	0.00	0	0.00	2224
63015M	BG(BG x 19062M)	026:55-56	7/27/92	45.5	18.9	71	64.3	0.243	21	43	0.375	10.0	0.00	0	0.00	2510
64031M	BG(BG x 19062M)	037:57-58	7/14/92	34.8	39.8	47	74.6	0.258	31	53	0.568	0.0	0.00	0	0.00	2319
64035M	Zattler 7K4910P	002:57-58	7/14/92	46.0	31.4	59	77.4	0.232	18	96	0.000	0.0	0.00	0	0.00	2307
64037M	Zattler 7K4910P	004:57-58	7/08/92	18.8	46.8	29	65.6	0.202	17	33	1.972	0.0	0.00	0	0.00	2277
64102M	Wye #321	006:57-58	7/08/92	32.2	35.0	48	67.1	0.239	41	66	0.612	0.0	0.00	0	0.00	2280
64103M	Wye OB 79	007:57-58	7/08/92	32.9	37.8	47	70.7	0.216	40	60	1.211	0.0	0.00	0	0.00	2279
64105M	Wye 15/56/148	009:57-58	7/14/92	30.5	38.3	44	68.8	0.248	51	72	0.000	0.0	0.00	0	0.00	2317
65034M	Ha(Ha x 19040M)	038:57-58	7/08/92	5.6	27.1	17	32.7	0.451	16	39	1.883	0.0	0.00	0	0.00	2274
8901-001M		147:01	7/15/92	38.7	32.4	54	71.2	0.259	45	69	0.372	0.0	0.00	0	0.00	2323
8901-003M		147:03	6/25/92	30.1	35.8	46	65.9	0.275	50	70	0.510	0.0	0.00	0	0.00	2026
8901-010M		147:10	6/25/92	30.2	36.0	46	66.2	0.259	42	69	0.885	0.0	0.00	0	0.00	2028
8901-013M		147:13	6/25/92	25.9	47.5	35	73.4	0.245	49	67	1.449	0.0	0.00	0	0.00	2029
8901-028M		147:28	7/15/92	41.5	32.3	56	73.7	0.280	41	65	0.437	0.0	0.00	0	0.00	2324
8901-034M		147:34	6/25/92	33.2	40.7	45	73.9	0.251	44	67	0.585	0.0	0.00	0	0.00	2022
8901-049M		147:49	6/25/92	28.0	32.3	46	60.3	0.278	55	75	0.500	0.0	0.00	0	0.00	2017
8901-051M		147:51	6/25/92	27.8	40.3	41	68.2	0.249	44	66	0.889	0.0	0.00	0	0.00	2030
8901-053M		148:02	6/25/92	31.3	28.9	52	60.2	0.261	54	75	0.773	0.0	0.00	0	0.00	2010
8901-059M		148:08	6/25/92	33.8	36.9	48	70.7	0.255	47	62	0.560	0.0	0.00	0	0.00	2024
8901-060M		148:09	6/25/92	20.4	37.9	35	58.3	0.280	46	65	0.000	0.0	0.00	0	0.00	2018
8901-064M		148:13	7/15/92	37.7	39.5	49	77.2	0.236	39	62	0.461	0.0	0.00	0	0.00	2329
8901-068M		148:17	6/25/92	30.1	39.7	43	69.8	0.231	39	61	0.564	0.0	0.00	0	0.00	2019
8901-070M		148:19	7/15/92	40.8	39.0	51	79.8	0.234	47	68	0.669	0.0	0.00	0	0.00	2326
8901-073M		148:22	7/15/92	39.3	37.9	51	77.2	0.252	47	67	0.362	0.0	0.00	0	0.00	2325
8901-074M		148:23	6/25/92	28.6	33.7	46	62.3	0.271	51	70	0.757	0.0	0.00	0	0.00	2020
8901-078M		148:27	6/25/92	28.3	35.9	44	64.2	0.263	45	65	0.459	0.0	0.00	0	0.00	2021
8901-081M		148:30	6/25/92	24.7	29.4	46	54.1	0.266	44	65	1.902	0.0	0.00	0	0.00	2025
8917-013M		149:08	6/25/92	23.9	40.6	37	64.5	0.273	44	65	1.815	0.0	0.00	0	0.00	2014
8917-015M		149:10	6/25/92	26.0	41.6	38	67.6	0.254	51	69	0.486	0.0	0.00	0	0.00	2011
8918-006M		149:18	6/25/92	11.4	44.8	20	56.1	0.250	53	58	1.597	0.0	0.00	0	0.00	2015
8918-007M		149:19	6/25/92	16.0	42.5	27	58.5	0.256	51	72	1.869	0.0	0.00	0	0.00	2016
8918-024M		149:36	6/25/92	18.2	52.7	26	70.9	0.232	53	64	0.588	0.0	0.00	0	0.00	2012

1992 Lupulin Analyses

Sorted by Acc/Nursery (October 20, 1993)

Accession or Nursery Number	Identification	Location	Harvest Date	% α-acids	% ß-acids	Alpha Ratio	Sum α+ß	HSI	Coα	Coß	Crush (3 hr)	SPO (hrs)	Permea-bility	Calc. % Remain	Hum/ Cary	Laboratory Serial No.
8918-026M		149:38	6/25/92	25.9	45.5	36	71.4	0.254	47	67	0.567	0.0	0.00	0	0.00	2027
8918-030M		149:42	6/25/92	16.8	49.3	25	66.1	0.244	45	67	1.120	0.0	0.00	0	0.00	2023
8918-032M		149:44	6/25/92	17.1	52.1	25	69.1	0.243	49	63	1.546	0.0	0.00	0	0.00	2013
8918-034M		149:46	6/26/92	23.9	34.2	41	58.1	0.285	37	59	0.822	0.0	0.00	0	0.00	2053
8918-039M		149:51	6/26/92	27.0	39.7	41	66.7	0.279	45	63	0.519	0.0	0.00	0	0.00	2054
8918-042M		150:03	6/26/92	18.1	44.0	29	62.1	0.265	46	65	0.511	0.0	0.00	0	0.00	2052
8921-001M		150:08	6/26/92	29.4	39.4	43	68.9	0.248	48	69	0.360	0.0	0.00	0	0.00	2044
8923-005M		150:15	6/26/92	39.5	31.6	56	71.1	0.261	47	70	0.397	0.0	0.00	0	0.00	2043
8924-002M		150:28	6/26/92	31.0	36.2	46	67.3	0.244	47	67	0.445	0.0	0.00	0	0.00	2047
8924-008M		150:34	7/15/92	25.5	42.4	38	67.9	0.238	44	66	0.498	0.0	0.00	0	0.00	2332
8924-009M		150:35	6/26/92	36.4	35.2	51	71.6	0.249	42	61	0.433	0.0	0.00	0	0.00	2046
8936-002M		150:38	6/26/92	35.5	36.4	49	71.8	0.241	65	80	0.410	0.0	0.00	0	0.00	2048
8936-005M		150:41	6/26/92	33.9	36.9	48	70.8	0.270	54	74	0.372	0.0	0.00	0	0.00	2057
8936-007M		150:43	6/26/92	22.0	30.7	42	52.7	0.279	48	68	1.471	0.0	0.00	0	0.00	2055
8936-008M		150:44	6/26/92	25.3	44.5	36	69.8	0.269	53	73	0.438	0.0	0.00	0	0.00	2049
8936-012M		150:48	6/26/92	23.7	44.3	35	68.0	0.260	61	77	1.982	0.0	0.00	0	0.00	2050
8936-014M		150:50	6/26/92	27.5	38.5	42	66.0	0.261	56	73	0.347	0.0	0.00	0	0.00	2056
8936-016M		151:01	7/15/92	36.9	35.5	51	72.4	0.268	53	79	0.431	0.0	0.00	0	0.00	2330
8936-017M		151:02	6/26/92	29.3	44.2	40	73.5	0.235	54	74	0.519	0.0	0.00	0	0.00	2041
8936-018M		151:03	6/26/92	25.9	35.8	42	61.6	0.251	54	75	0.450	0.0	0.00	0	0.00	2042
8936-019M		151:04	6/26/92	29.7	35.2	46	64.8	0.248	54	74	1.518	0.0	0.00	0	0.00	2045
8936-021M		151:06	7/15/92	26.3	53.1	33	79.4	0.207	48	76	1.773	0.0	0.00	0	0.00	2327
8936-023M		151:08	6/26/92	32.7	39.5	45	72.2	0.233	63	80	0.596	0.0	0.00	0	0.00	2037
8936-026M		151:11	6/26/92	13.7	27.5	33	41.2	0.311	51	71	1.825	0.0	0.00	0	0.00	2051
8939-002M		151:17	6/26/92	26.2	40.4	39	66.5	0.255	58	73	0.450	0.0	0.00	0	0.00	2061
8940-003M		151:20	6/26/92	20.7	40.9	34	61.6	0.231	48	63	1.843	0.0	0.00	0	0.00	2039
8940-007M		151:24	6/26/92	17.8	33.0	35	50.8	0.259	48	64	1.820	0.0	0.00	0	0.00	2040
8940-012M		151:29	6/26/92	19.8	41.3	32	61.1	0.248	47	60	0.888	0.0	0.00	0	0.00	2038
8940-015M		151:32	6/26/92	24.4	49.9	33	74.3	0.223	46	63	0.629	0.0	0.00	0	0.00	2036
8941-001M		151:34	6/26/92	25.9	34.8	43	60.6	0.254	45	61	0.446	0.0	0.00	0	0.00	2034
8941-005M		151:38	6/26/92	24.3	40.9	37	65.1	0.233	45	62	0.625	0.0	0.00	0	0.00	2033
8941-006M		151:39	6/26/92	18.3	50.2	27	68.4	0.225	45	63	1.498	0.0	0.00	0	0.00	2035
8941-007M		151:40	6/26/92	19.7	53.3	27	73.0	0.206	40	60	1.643	0.0	0.00	0	0.00	2032
8942-010M		151:50	7/15/92	30.3	43.0	41	73.3	0.239	35	64	0.385	0.0	0.00	0	0.00	2331
8943-002M		152:02	6/26/92	13.7	57.6	19	71.3	0.190	42	68	1.830	0.0	0.00	0	0.00	2063
8943-009M		152:09	7/15/92	27.5	45.8	38	73.3	0.250	32	62	0.438	0.0	0.00	0	0.00	2334
8944-001M		152:11	6/26/92	11.8	38.8	23	50.6	0.254	43	63	1.067	0.0	0.00	0	0.00	2065
8945-014M		152:26	6/26/92	27.9	38.1	42	66.0	0.280	59	75	0.487	0.0	0.00	0	0.00	2058
8945-018M		152:30	7/15/92	18.2	54.4	25	72.6	0.237	45	74	1.452	0.0	0.00	0	0.00	2333
8945-022M		152:34	6/26/92	19.6	24.7	44	44.3	0.306	49	71	0.552	0.0	0.00	0	0.00	2060
8946-001M		152:39	6/26/92	29.5	41.9	41	71.3	0.257	54	71	0.386	0.0	0.00	0	0.00	2066
8946-005M		152:43	6/26/92	31.9	43.6	42	75.5	0.230	54	77	0.612	0.0	0.00	0	0.00	2031
8946-007M		152:45	6/26/92	33.7	38.0	47	71.8	0.247	54	71	0.340	0.0	0.00	0	0.00	2062
8946-009M		152:47	6/26/92	27.8	38.6	42	66.4	0.278	51	68	0.394	0.0	0.00	0	0.00	2064
8950-002M		153:14	6/26/92	24.3	37.4	39	61.7	0.252	62	79	0.456	0.0	0.00	0	0.00	2067
8951-004M		153:21	7/15/92	41.8	33.3	56	75.1	0.257	61	80	0.545	0.0	0.00	0	0.00	2328
8951-007M		153:24	6/26/92	23.7	41.4	36	65.1	0.261	49	64	0.554	0.0	0.00	0	0.00	2059
9001-002M		154:02	6/30/92	23.6	42.1	36	65.6	0.275	57	71	0.905	0.0	0.00	0	0.00	2068

1992 Lupulin Analyses

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9001-006M		154:06	6/30/92	24.1	31.6	43	55.7	0.274	50	63	0.676	0.0	0.00	0	0.00	2070
9001-007M		154:07	7/15/92	33.2	40.4	45	73.5	0.263	49	69	0.461	0.0	0.00	0	0.00	2400
9001-008M		154:08	7/15/92	30.2	40.4	43	70.5	0.258	56	77	0.616	0.0	0.00	0	0.00	2392
9001-015M		154:15	6/30/92	20.4	38.5	35	58.9	0.296	61	72	1.095	0.0	0.00	0	0.00	2073
9001-028M		154:28	7/15/92	37.6	36.4	51	74.0	0.253	51	73	1.912	0.0	0.00	0	0.00	2391
9001-029M		154:29	6/30/92	23.8	34.8	41	58.5	0.254	56	72	1.987	0.0	0.00	0	0.00	2071
9001-035M		154:35	7/15/92	29.1	40.8	42	69.9	0.266	43	66	0.422	0.0	0.00	0	0.00	2387
9001-054M		155:02	7/15/92	36.6	38.2	49	74.8	0.247	63	80	0.578	0.0	0.00	0	0.00	2395
9001-056M		155:04	6/30/92	25.6	40.1	39	65.6	0.250	66	79	0.669	0.0	0.00	0	0.00	2072
9002-001M		155:29	7/15/92	38.1	35.1	52	73.1	0.288	48	69	0.443	0.0	0.00	0	0.00	2389
9002-008M		155:36	6/30/92	26.5	45.8	37	72.3	0.250	47	67	0.353	0.0	0.00	0	0.00	2069
9002-012M		155:40	6/30/92	28.6	38.7	42	67.3	0.255	48	68	0.411	0.0	0.00	0	0.00	2074
9002-019M		155:47	7/15/92	31.8	40.5	44	72.3	0.251	45	69	0.419	0.0	0.00	0	0.00	2399
9002-031M		156:07	7/15/92	33.7	40.9	45	74.6	0.261	39	63	0.407	0.0	0.00	0	0.00	2394
9002-040M		156:16	7/15/92	24.2	51.5	32	75.7	0.236	45	72	0.551	0.0	0.00	0	0.00	2396
9002-041M		156:17	7/15/92	42.0	35.4	54	77.4	0.271	61	80	0.498	0.0	0.00	0	0.00	2383
9002-049M		156:25	6/30/92	15.7	57.4	22	73.2	0.220	44	59	1.427	0.0	0.00	0	0.00	2075
9002-063M		156:39	6/30/92	25.1	35.3	42	60.4	0.286	47	66	0.643	0.0	0.00	0	0.00	2076
9002-064M		156:40	6/30/92	17.9	42.6	30	60.5	0.253	39	56	0.467	0.0	0.00	0	0.00	2077
9002-073M		156:49	7/15/92	52.8	42.8	55	95.6	0.267	59	80	0.364	0.0	0.00	0	0.00	2379
9002-075M		156:51	7/15/92	36.7	38.2	49	74.8	0.253	38	61	0.858	0.0	0.00	0	0.00	2401
9002-080M		157:04	7/15/92	38.3	33.0	54	71.3	0.274	49	71	0.477	0.0	0.00	0	0.00	2397
9003-003M		157:07	6/30/92	28.2	46.4	38	74.6	0.276	66	80	0.848	0.0	0.00	0	0.00	2090
9003-007M		157:11	7/15/92	40.1	37.1	52	77.3	0.254	56	76	0.387	0.0	0.00	0	0.00	2386
9003-015M		157:19	6/30/92	25.0	40.4	38	65.4	0.265	45	66	0.399	0.0	0.00	0	0.00	2092
9003-027M		157:31	6/30/92	31.2	44.0	41	75.2	0.240	49	69	0.439	0.0	0.00	0	0.00	2106
9003-031M		157:35	6/30/92	20.5	44.0	32	64.4	0.245	55	81	0.645	0.0	0.00	0	0.00	2102
9003-048M		157:52	7/15/92	38.6	36.5	51	75.0	0.259	67	82	0.463	0.0	0.00	0	0.00	2393
9003-059M		158:11	7/15/92	37.9	40.2	49	78.1	0.270	57	76	0.427	0.0	0.00	0	0.00	2380
9003-071M		158:23	6/30/92	24.2	32.8	42	57.0	0.265	61	81	0.424	0.0	0.00	0	0.00	2093
9003-075M		158:27	7/15/92	18.5	16.2	53	34.7	0.269	58	79	0.421	0.0	0.00	0	0.00	2373
9004-002M		158:34	7/15/92	31.0	38.1	45	69.0	0.279	39	64	0.552	0.0	0.00	0	0.00	2369
9004-016M		158:48	7/15/92	40.5	31.5	56	72.1	0.271	48	73	0.453	0.0	0.00	0	0.00	2398
9004-022M		159:02	6/30/92	18.3	48.6	27	66.8	0.233	38	63	1.298	0.0	0.00	0	0.00	2100
9004-025M		159:05	7/15/92	36.8	26.9	58	63.7	0.273	47	71	0.394	0.0	0.00	0	0.00	2382
9004-030M		159:10	6/30/92	24.2	35.7	40	59.9	0.267	42	66	0.446	0.0	0.00	0	0.00	2101
9004-032M		159:12	7/15/92	38.6	35.4	52	74.1	0.266	46	69	0.428	0.0	0.00	0	0.00	2388
9004-042M		159:22	7/15/92	34.3	39.7	46	74.0	0.266	43	67	1.360	0.0	0.00	0	0.00	2390
9004-048M		159:28	6/30/92	28.3	42.3	40	70.6	0.250	40	65	0.427	0.0	0.00	0	0.00	2105
9004-055M		159:35	7/15/92	36.4	26.1	58	62.6	0.295	56	75	0.501	0.0	0.00	0	0.00	2370
9004-057M		159:37	7/15/92	45.4	33.2	58	78.6	0.279	44	65	0.412	0.0	0.00	0	0.00	2384
9004-061M		159:41	6/30/92	31.9	32.5	50	64.4	0.267	44	66	0.521	0.0	0.00	0	0.00	2103
9004-065M		159:45	6/30/92	24.7	31.6	44	56.4	0.286	61	67	0.520	0.0	0.00	0	0.00	2091
9004-067M		159:47	7/15/92	38.6	36.1	52	74.8	0.264	46	74	0.393	0.0	0.00	0	0.00	2378
9004-070M		159:50	7/15/92	37.3	38.2	49	75.6	0.243	46	71	0.536	0.0	0.00	0	0.00	2366
9005-001M		160:09	6/30/92	24.3	49.5	33	73.8	0.234	58	78	0.408	0.0	0.00	0	0.00	2083
9005-012M		160:20	6/30/92	28.0	44.1	39	72.1	0.240	45	65	0.553	0.0	0.00	0	0.00	2084
9005-015M		160:23	7/15/92	32.4	34.4	49	66.9	0.258	44	73	0.348	0.0	0.00	0	0.00	2376

1992 Lupulin Analyses

Sorted by Acc/Nursery (October 20, 1993)

Accession or Nursery Number	Identification	Location	Harvest Date	% α-acids	% ß-acids	Alpha Ratio	Sum α+ß	HSI	Coα	Coß	Crush (3 hr)	SPO (hrs)	Permea-bility	Calc. % Remain	Hum/ Cary	Laboratory Serial No.
9005-016M		160:24	7/15/92	41.7	35.2	54	76.9	0.256	53	75	0.390	0.0	0.00	0	0.00	2365
9005-023M		160:31	6/30/92	26.2	44.6	37	70.8	0.259	57	74	0.456	0.0	0.00	0	0.00	2079
9005-029M		160:37	7/15/92	29.3	46.5	39	75.8	0.231	51	78	0.364	0.0	0.00	0	0.00	2372
9005-038M		160:46	7/15/92	40.1	38.8	51	78.9	0.270	48	71	0.360	0.0	0.00	0	0.00	2374
9005-051M		161:07	6/30/92	28.9	39.8	42	68.7	0.252	64	75	0.441	0.0	0.00	0	0.00	2085
9005-059M		161:15	7/15/92	31.5	45.2	41	76.8	0.240	44	68	0.452	0.0	0.00	0	0.00	2385
9005-063M		161:19	6/30/92	27.2	44.2	38	71.4	0.245	62	77	0.431	0.0	0.00	0	0.00	2080
9006-025M		162:09	6/30/92	25.4	37.3	41	62.7	0.261	60	64	0.407	0.0	0.00	0	0.00	2087
9006-033M		162:17	7/15/92	28.3	30.5	48	58.8	0.306	42	69	0.512	0.0	0.00	0	0.00	2375
9006-034M		162:18	7/15/92	34.6	37.5	48	72.1	0.262	49	69	0.481	0.0	0.00	0	0.00	2402
9006-035M		162:19	6/30/92	27.6	47.3	37	74.9	0.255	40	59	0.342	0.0	0.00	0	0.00	2078
9006-038M		162:22	6/30/92	25.9	42.0	38	67.9	0.264	45	66	0.400	0.0	0.00	0	0.00	2081
9006-052M		162:36	6/30/92	21.4	44.1	33	65.4	0.247	61	68	0.383	0.0	0.00	0	0.00	2094
9006-054M		162:38	6/30/92	24.0	38.9	38	63.0	0.275	44	64	0.431	0.0	0.00	0	0.00	2082
9007-010M		163:05	6/30/92	26.1	46.8	36	72.9	0.242	67	65	0.396	0.0	0.00	0	0.00	2096
9007-029M		163:29	6/30/92	28.4	40.4	41	68.8	0.270	60	67	0.378	0.0	0.00	0	0.00	2088
9007-030M		163:31	6/30/92	24.3	35.7	41	60.0	0.288	64	69	0.390	0.0	0.00	0	0.00	2095
9007-066M		164:09	6/30/92	24.1	48.2	33	72.4	0.229	63	67	0.368	0.0	0.00	0	0.00	2089
9007-076M		164:17	6/30/92	24.4	44.9	35	69.4	0.235	42	63	0.369	0.0	0.00	0	0.00	2099
9008-018M		164:41	7/15/92	34.9	40.2	46	75.1	0.246	55	79	0.465	0.0	0.00	0	0.00	2368
9008-027M		164:50	6/30/92	30.7	42.9	42	73.6	0.241	40	62	0.369	0.0	0.00	0	0.00	2097
9008-028M		164:51	6/30/92	32.6	27.3	54	59.9	0.260	42	63	0.420	0.0	0.00	0	0.00	2098
9008-029M		164:52	6/30/92	27.3	49.6	36	77.0	0.230	50	76	0.449	0.0	0.00	0	0.00	2104
9008-033M		165:04	7/15/92	35.8	42.3	46	78.1	0.244	45	71	0.507	0.0	0.00	0	0.00	2362
9008-036M		165:07	7/15/92	41.3	31.2	57	72.5	0.263	42	66	0.681	0.0	0.00	0	0.00	2361
9008-051M		165:22	6/30/92	25.8	44.0	37	69.7	0.261	58	68	0.530	0.0	0.00	0	0.00	2086
9008-058M		165:29	6/30/92	16.9	56.6	23	73.5	0.226	37	63	0.425	0.0	0.00	0	0.00	2107
9009-007M		167:02	7/15/92	40.6	34.6	54	75.2	0.265	50	72	0.432	0.0	0.00	0	0.00	2360
9009-011M		165:47	7/15/92	32.6	31.6	51	64.1	0.259	50	76	0.648	0.0	0.00	0	0.00	2363
9009-014M		165:50	7/15/92	35.9	27.8	56	63.7	0.307	46	67	0.547	0.0	0.00	0	0.00	2371
9009-021M		166:05	7/01/92	27.6	29.2	49	56.8	0.286	54	73	0.628	0.0	0.00	0	0.00	2151
9009-022M		166:06	7/01/92	25.1	37.2	40	62.4	0.269	41	63	0.533	0.0	0.00	0	0.00	2147
9009-023M		166:07	7/01/92	30.2	41.1	42	71.3	0.249	54	75	0.953	0.0	0.00	0	0.00	2155
9009-025M		166:09	7/15/92	32.4	44.4	42	76.8	0.245	57	80	0.539	0.0	0.00	0	0.00	2359
9009-027M		166:11	7/15/92	38.9	31.7	55	70.6	0.267	45	72	0.491	0.0	0.00	0	0.00	2348
9009-029M		166:13	7/01/92	26.1	33.7	44	59.8	0.260	45	66	1.163	0.0	0.00	0	0.00	2148
9009-033M		166:17	7/01/92	21.3	28.7	43	50.0	0.264	53	68	0.482	0.0	0.00	0	0.00	2144
9009-035M		166:19	7/15/92	36.1	39.1	48	75.2	0.250	47	71	0.462	0.0	0.00	0	0.00	2354
9009-041M		166:25	7/15/92	42.0	36.3	54	78.3	0.257	48	69	0.444	0.0	0.00	0	0.00	2358
9009-043M		166:27	7/15/92	40.2	34.0	54	74.2	0.259	58	76	0.453	0.0	0.00	0	0.00	2355
9009-046M		166:30	7/15/92	42.5	30.2	58	72.7	0.280	54	74	0.643	0.0	0.00	0	0.00	2349
9009-048M		166:32	7/15/92	33.5	43.3	44	76.8	0.251	48	76	0.416	0.0	0.00	0	0.00	2342
9009-051M		166:35	7/15/92	43.7	30.5	59	74.1	0.280	42	70	0.616	0.0	0.00	0	0.00	2345
9009-059M		166:43	7/15/92	48.2	29.7	62	78.0	0.262	62	79	0.474	0.0	0.00	0	0.00	2352
9010-001M		167:04	7/15/92	30.0	50.3	37	80.4	0.229	57	82	0.309	0.0	0.00	0	0.00	2357
9010-003M		167:06	7/15/92	26.1	44.6	37	70.8	0.254	52	75	0.797	0.0	0.00	0	0.00	2351
9010-006M		167:09	7/15/92	27.8	47.5	37	75.3	0.249	47	75	0.399	0.0	0.00	0	0.00	2356
9010-010M		167:13	7/01/92	18.5	48.4	28	66.8	0.253	47	73	0.673	0.0	0.00	0	0.00	2152

1992 Lupulin Analyses

Sorted by Acc/Nursery (October 20, 1993)

Accession or Nursery Number	Identification	Location	Harvest Date	% α-acids	% ß-acids	Alpha Ratio	Sum α+ß	HSI	Coα	Coß	Crush (3 hr)	SPO (hrs)	Permea-bility	Calc. % Remain	Hum/ Cary	Laboratory Serial No.
9010-012M		167:15	7/01/92	21.5	41.7	34	63.2	0.259	48	77	0.410	0.0	0.00	0	0.00	2143
9010-019M		167:22	7/01/92	22.6	50.4	31	72.9	0.226	44	74	0.378	0.0	0.00	0	0.00	2146
9010-024M		167:27	7/01/92	20.4	43.9	32	64.3	0.247	57	70	0.406	0.0	0.00	0	0.00	2141
9010-027M		167:30	7/01/92	40.4	58.3	41	98.6	0.237	62	75	0.539	0.0	0.00	0	0.00	2142
9010-029M		167:32	7/15/92	26.0	48.6	35	74.6	0.238	46	73	0.442	0.0	0.00	0	0.00	2347
9010-032M		167:35	7/15/92	26.5	48.9	35	75.4	0.250	44	72	0.484	0.0	0.00	0	0.00	2350
9010-036M		167:39	7/15/92	27.2	45.5	37	72.7	0.251	44	72	0.718	0.0	0.00	0	0.00	2346
9010-050M		168:01	7/15/92	21.3	51.1	29	72.3	0.230	40	68	0.723	0.0	0.00	0	0.00	2367
9010-055M		168:06	7/15/92	23.4	44.4	34	67.8	0.241	44	74	0.529	0.0	0.00	0	0.00	2337
9010-057M		168:08	7/15/92	31.6	41.6	43	73.2	0.251	47	73	0.591	0.0	0.00	0	0.00	2335
9011-002M		168:27	7/15/92	33.5	38.2	47	71.7	0.258	55	79	0.511	0.0	0.00	0	0.00	2336
9011-006M		168:31	7/15/92	29.3	46.9	38	76.2	0.252	57	82	0.477	0.0	0.00	0	0.00	2353
9011-010M		168:35	7/01/92	30.5	25.3	55	55.8	0.258	63	78	0.404	0.0	0.00	0	0.00	2135
9011-015M		168:40	7/15/92	44.4	30.8	59	75.2	0.247	58	79	0.533	0.0	0.00	0	0.00	2338
9011-024M		168:49	7/15/92	47.8	33.3	59	81.1	0.244	49	68	0.406	0.0	0.00	0	0.00	2364
9011-026M		168:51	7/15/92	39.8	33.1	55	72.9	0.267	42	72	0.665	0.0	0.00	0	0.00	2343
9011-027M		168:52	7/15/92	27.8	43.6	39	71.4	0.251	49	76	0.463	0.0	0.00	0	0.00	2341
9011-038M		169:11	7/01/92	27.3	39.4	41	66.7	0.264	59	81	1.213	0.0	0.00	0	0.00	2131
9011-039M		167:42	7/15/92	32.1	38.0	46	70.1	0.269	40	70	0.487	0.0	0.00	0	0.00	2344
9011-041M		169:14	7/01/92	32.8	28.2	54	61.0	0.286	51	71	0.454	0.0	0.00	0	0.00	2134
9011-049M		169:22	7/01/92	26.1	42.0	38	68.2	0.262	49	71	0.445	0.0	0.00	0	0.00	2136
9011-050M		169:23	7/01/92	28.8	44.8	39	73.6	0.225	57	78	0.532	0.0	0.00	0	0.00	2138
9011-055M		169:28	7/15/92	31.9	39.7	45	71.6	0.261	52	80	0.616	0.0	0.00	0	0.00	2339
9011-060M		169:33	7/15/92	36.6	37.8	49	74.4	0.259	50	76	0.609	0.0	0.00	0	0.00	2340
9011-068M		169:41	7/01/92	23.9	42.8	36	66.8	0.254	57	77	0.852	0.0	0.00	0	0.00	2133
9011-074M		169:47	7/15/92	19.8	32.6	38	52.3	0.246	61	76	0.531	0.0	0.00	0	0.00	2377
9012-002M		170:02	7/16/92	29.0	36.7	44	65.7	0.269	49	73	0.716	0.0	0.00	0	0.00	2458
9012-006M		170:07	7/16/92	29.8	23.2	56	53.0	0.275	42	65	0.456	0.0	0.00	0	0.00	2428
9012-008M		170:09	7/16/92	39.8	28.5	58	68.3	0.259	54	74	0.417	0.0	0.00	0	0.00	2431
9012-011M		170:12	7/16/92	30.1	32.0	48	62.2	0.264	40	67	0.474	0.0	0.00	0	0.00	2434
9012-018M		170:19	7/16/92	28.2	44.8	39	73.0	0.244	37	62	0.377	0.0	0.00	0	0.00	2436
9012-025M		170:26	7/01/92	26.4	35.1	43	61.6	0.247	58	76	0.354	0.0	0.00	0	0.00	2145
9012-030M		170:31	7/01/92	29.1	39.6	42	68.7	0.250	47	68	0.388	0.0	0.00	0	0.00	2153
9012-040M		170:41	7/16/92	41.9	34.0	55	75.9	0.270	49	72	0.447	0.0	0.00	0	0.00	2438
9012-043M		170:44	7/01/92	24.4	34.9	41	59.3	0.270	54	77	0.400	0.0	0.00	0	0.00	2114
9012-045M		170:46	7/01/92	27.7	33.0	46	60.8	0.296	47	69	0.505	0.0	0.00	0	0.00	2123
9012-046M		170:47	7/01/92	22.4	40.8	35	63.2	0.281	44	70	0.641	0.0	0.00	0	0.00	2126
9012-048M		170:49	7/16/92	33.7	33.0	50	66.7	0.250	47	69	0.437	0.0	0.00	0	0.00	2409
9012-055M		171:04	7/16/92	31.6	37.0	46	68.7	0.253	45	72	0.545	0.0	0.00	0	0.00	2435
9012-058M		171:07	7/16/92	22.1	42.9	34	65.0	0.241	44	72	0.434	0.0	0.00	0	0.00	2421
9013-002M		171:21	7/16/92	23.6	45.0	34	68.6	0.249	39	74	0.759	0.0	0.00	0	0.00	2441
9013-004M		171:23	7/16/92	31.5	30.2	51	61.7	0.263	55	76	0.439	0.0	0.00	0	0.00	2410
9013-006M		171:25	7/16/92	32.3	36.6	47	68.8	0.274	46	69	0.434	0.0	0.00	0	0.00	2432
9013-008M		171:27	7/16/92	26.1	34.2	43	60.2	0.262	36	64	0.503	0.0	0.00	0	0.00	2433
9013-013M		171:32	7/01/92	23.6	40.8	37	64.4	0.273	46	69	0.523	0.0	0.00	0	0.00	2140
9013-019M		171:38	7/01/92	20.6	39.3	34	59.9	0.273	43	67	0.464	0.0	0.00	0	0.00	2112
9013-024M		171:43	7/16/92	37.4	36.1	51	73.4	0.253	51	73	0.547	0.0	0.00	0	0.00	2407
9013-024M		171:43	7/01/92	31.0	35.2	47	66.2	0.271	49	72	0.616	0.0	0.00	0	0.00	2125

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Sorted by Acc/Nursery (October 20, 1993)

Accession or Nursery Number	Identification	Location	Harvest Date	% α-acids	% ß-acids	Alpha Ratio	Sum α+ß	HSI	Coα	Coß	Crush (3 hr)	SPO (hrs)	Permea-bility	Calc. % Remain	Hum/ Cary	Laboratory Serial No.
9013-027M		171:46	7/16/92	23.0	51.1	31	74.1	0.233	36	67	0.751	0.0	0.00	0	0.00	2437
9013-032M		171:51	7/01/92	29.7	36.9	45	66.6	0.282	43	68	0.470	0.0	0.00	0	0.00	2149
9013-036M		172:03	7/16/92	29.6	42.2	41	71.7	0.234	40	63	0.423	0.0	0.00	0	0.00	2423
9013-040M		172:07	7/16/92	29.1	44.1	40	73.2	0.239	48	77	0.422	0.0	0.00	0	0.00	2442
9013-049M		172:16	7/16/92	32.3	37.2	46	69.4	0.267	56	79	0.713	0.0	0.00	0	0.00	2403
9013-054M		172:21	7/16/92	40.7	29.2	58	69.9	0.270	44	67	0.458	0.0	0.00	0	0.00	2422
9013-060M		172:27	7/16/92	34.3	39.9	46	74.2	0.244	46	71	0.377	0.0	0.00	0	0.00	2455
9013-062M		172:29	7/16/92	24.6	37.9	39	62.5	0.255	41	68	0.404	0.0	0.00	0	0.00	2424
9013-064M		172:31	7/16/92	19.6	47.1	29	66.7	0.236	38	71	0.697	0.0	0.00	0	0.00	2440
9014-009M		172:41	7/01/92	25.3	45.4	36	70.7	0.250	46	67	0.934	0.0	0.00	0	0.00	2156
9014-013M		172:45	7/16/92	19.1	44.2	30	63.3	0.226	47	79	0.899	0.0	0.00	0	0.00	2462
9014-027M		173:07	7/16/92	20.7	48.1	30	68.8	0.213	39	70	1.387	0.0	0.00	0	0.00	2425
9014-034M		173:14	7/16/92	27.6	42.4	39	70.0	0.246	42	69	0.526	0.0	0.00	0	0.00	2439
9014-043M		173:23	7/01/92	29.7	39.4	43	69.1	0.246	60	80	0.415	0.0	0.00	0	0.00	2137
9014-044M		173:24	7/01/92	23.6	47.0	33	70.6	0.269	54	81	0.706	0.0	0.00	0	0.00	2124
9014-052M		173:32	7/01/92	18.7	49.8	27	68.5	0.241	44	73	0.666	0.0	0.00	0	0.00	2139
9014-054M		173:34	7/01/92	24.4	41.3	37	65.7	0.261	49	74	0.447	0.0	0.00	0	0.00	2150
9014-056M		173:36	7/16/92	35.4	37.9	48	73.3	0.249	47	70	0.415	0.0	0.00	0	0.00	2461
9016-026M		174:22	7/01/92	30.2	46.2	40	76.3	0.225	47	72	0.458	0.0	0.00	0	0.00	2129
9016-029M		174:25	7/01/92	28.4	47.3	37	75.6	0.280	45	65	0.479	0.0	0.00	0	0.00	2154
9016-030M		174:26	7/16/92	28.3	41.3	41	69.6	0.231	42	66	0.488	0.0	0.00	0	0.00	2419
9016-045M		174:41	7/16/92	29.1	43.8	40	72.9	0.218	51	71	0.409	0.0	0.00	0	0.00	2427
9016-046M		174:42	7/01/92	26.7	52.2	34	78.9	0.221	48	70	0.472	0.0	0.00	0	0.00	2130
9016-052M		174:48	7/01/92	24.0	46.6	34	70.6	0.233	50	72	0.645	0.0	0.00	0	0.00	2119
9016-053M		174:49	7/01/92	18.4	55.7	25	74.2	0.219	40	67	1.633	0.0	0.00	0	0.00	2109
9016-061M		175:05	7/16/92	34.3	33.1	51	67.4	0.256	49	73	0.520	0.0	0.00	0	0.00	2469
9016-069M		175:13	7/16/92	45.1	20.2	69	65.3	0.260	44	66	0.435	0.0	0.00	0	0.00	2405
9017-012M		175:26	7/16/92	40.9	34.8	54	75.7	0.253	41	65	0.434	0.0	0.00	0	0.00	2430
9017-028M		175:42	7/01/92	23.4	38.5	38	61.9	0.270	48	72	0.474	0.0	0.00	0	0.00	2110
9018-004M		176:25	7/01/92	32.9	38.6	46	71.5	0.246	45	69	0.489	0.0	0.00	0	0.00	2108
9018-013M		176:34	7/01/92	38.6	32.7	54	71.3	0.258	48	72	0.382	0.0	0.00	0	0.00	2117
9018-015M		176:36	7/01/92	34.3	35.2	49	69.5	0.244	49	68	0.390	0.0	0.00	0	0.00	2122
9019-007M		177:17	7/16/92	36.8	36.5	50	73.3	0.251	52	78	0.436	0.0	0.00	0	0.00	2426
9019-008M		177:18	7/01/92	29.7	38.8	43	68.4	0.275	50	75	0.642	0.0	0.00	0	0.00	2132
9019-009M		177:19	7/01/92	34.4	33.3	51	67.7	0.270	54	77	0.471	0.0	0.00	0	0.00	2127
9019-012M		177:22	7/01/92	28.8	32.2	47	61.0	0.283	59	79	0.522	0.0	0.00	0	0.00	2120
9019-015M		177:25	7/16/92	34.6	35.9	49	70.5	0.238	46	74	0.409	0.0	0.00	0	0.00	2468
9019-030M		177:40	7/01/92	25.1	41.2	38	66.3	0.263	55	81	0.471	0.0	0.00	0	0.00	2115
9019-048M		178:06	7/01/92	29.6	39.1	43	68.7	0.280	43	67	1.150	0.0	0.00	0	0.00	2128
9019-053M		178:11	7/16/92	29.3	43.7	40	73.0	0.231	52	77	0.649	0.0	0.00	0	0.00	2412
9019-059M		178:17	7/16/92	41.1	29.9	58	71.1	0.266	56	81	0.538	0.0	0.00	0	0.00	2477
9019-066M		178:24	7/16/92	44.8	30.7	59	75.5	0.252	66	85	0.489	0.0	0.00	0	0.00	2414
9020-005M		179:50	7/01/92	28.2	38.7	42	66.9	0.264	54	75	0.419	0.0	0.00	0	0.00	2161
9020-006M		178:36	7/01/92	31.9	30.1	51	62.0	0.304	55	73	0.455	0.0	0.00	0	0.00	2116
9020-008M		178:38	7/16/92	37.8	35.3	52	73.1	0.256	56	76	0.439	0.0	0.00	0	0.00	2404
9020-011M		178:41	7/01/92	26.9	43.7	38	70.6	0.244	53	72	0.514	0.0	0.00	0	0.00	2118
9020-029M		179:07	7/16/92	30.2	38.0	44	68.2	0.223	58	79	0.558	0.0	0.00	0	0.00	2418
9020-039M		179:17	7/01/92	25.7	35.2	42	60.9	0.279	45	67	0.464	0.0	0.00	0	0.00	2111

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Accession or Nursery Number	Identification	Location	Harvest Date	% α-acids	% ß-acids	Alpha Ratio	Sum α+ß	HSI	Coα	Coß	Crush (3 hr)	SPO (hrs)	Permea-bility	Calc. % Remain	Hum/ Cary	Laboratory Serial No.
9020-046M		179:24	7/01/92	32.7	40.9	44	73.7	0.283	43	66	0.468	0.0	0.00	0	0.00	2121
9020-049M		179:27	7/01/92	26.1	30.0	46	56.1	0.299	53	72	0.515	0.0	0.00	0	0.00	2113
9020-060M		179:38	7/16/92	35.2	26.2	57	61.4	0.251	64	80	0.402	0.0	0.00	0	0.00	2415
9021-023M		180:16	7/01/92	29.6	34.8	46	64.4	0.272	44	68	0.498	0.0	0.00	0	0.00	2159
9021-024M		180:17	7/16/92	36.1	29.6	55	65.7	0.294	51	68	0.483	0.0	0.00	0	0.00	2406
9021-032M		180:25	7/01/92	15.4	16.7	48	32.1	0.302	47	69	1.595	0.0	0.00	0	0.00	2162
9021-041M		180:34	7/16/92	33.9	38.5	47	72.3	0.232	59	79	0.532	0.0	0.00	0	0.00	2416
9021-043M		180:36	7/01/92	23.4	27.0	46	50.3	0.289	48	71	0.548	0.0	0.00	0	0.00	2160
9021-048M		180:41	7/16/92	36.2	29.6	55	65.8	0.260	46	68	0.491	0.0	0.00	0	0.00	2413
9021-049M		180:42	7/01/92	26.6	46.2	37	72.8	0.249	54	76	0.395	0.0	0.00	0	0.00	2166
9022-013M		181:24	7/16/92	24.6	45.8	35	70.3	0.237	44	72	0.739	0.0	0.00	0	0.00	2408
9022-019M		181:30	7/16/92	24.5	37.8	39	62.3	0.243	46	73	0.497	0.0	0.00	0	0.00	2411
9022-025M		181:36	7/01/92	14.8	30.0	33	44.8	0.273	36	63	0.595	0.0	0.00	0	0.00	2163
9022-027M		181:38	7/16/92	28.8	39.2	42	68.0	0.240	49	76	0.467	0.0	0.00	0	0.00	2420
9022-029M		181:40	7/16/92	26.1	39.7	40	65.8	0.246	43	72	0.499	0.0	0.00	0	0.00	2429
9022-031M		181:42	7/01/92	20.8	41.6	33	62.5	0.253	36	64	0.674	0.0	0.00	0	0.00	2164
9022-032M		181:43	7/01/92	14.6	33.8	30	48.4	0.269	34	64	1.473	0.0	0.00	0	0.00	2158
9022-034M		181:45	7/01/92	19.8	39.5	33	59.3	0.280	37	64	0.574	0.0	0.00	0	0.00	2169
9022-038M		181:49	7/01/92	21.5	47.6	31	69.1	0.267	37	69	0.479	0.0	0.00	0	0.00	2175
9022-039M		181:50	7/16/92	23.9	35.8	40	59.6	0.234	47	72	0.664	0.0	0.00	0	0.00	2417
9022-042M		182:01	7/16/92	35.8	35.2	50	71.0	0.296	52	79	0.594	0.0	0.00	0	0.00	2482
9022-064M		181:23	7/16/92	31.1	38.3	45	69.4	0.256	38	67	0.385	0.0	0.00	0	0.00	2478
9022-066M		182:25	7/01/92	17.0	38.4	31	55.4	0.251	41	71	1.503	0.0	0.00	0	0.00	2157
9023-003M		182:31	7/01/92	36.9	40.2	48	77.0	0.241	58	80	0.455	0.0	0.00	0	0.00	2167
9023-003M		182:42	7/01/92	14.7	54.6	21	69.3	0.215	34	66	1.530	0.0	0.00	0	0.00	2176
9023-005M		182:33	7/01/92	24.5	44.5	35	69.0	0.247	58	80	0.516	0.0	0.00	0	0.00	2170
9023-006M		182:34	7/01/92	27.5	38.4	42	65.8	0.242	48	72	0.585	0.0	0.00	0	0.00	2168
9023-010M		182:38	7/16/92	27.6	48.1	36	75.7	0.231	42	73	0.738	0.0	0.00	0	0.00	2481
9023-010M		182:38	7/01/92	20.4	51.2	29	71.7	0.238	39	73	0.570	0.0	0.00	0	0.00	2165
9023-014M		182:42	7/16/92	22.3	52.6	30	74.8	0.210	34	68	0.834	0.0	0.00	0	0.00	2472
9024-014M		183:04	7/16/92	31.0	40.2	44	71.1	0.242	49	76	0.443	0.0	0.00	0	0.00	2476
9024-021M		183:11	7/16/92	19.8	57.6	26	77.4	0.215	38	74	1.095	0.0	0.00	0	0.00	2447
9024-033M		183:23	7/01/92	19.3	38.6	33	57.9	0.270	46	75	0.607	0.0	0.00	0	0.00	2171
9024-033M		183:23	7/16/92	27.0	43.5	38	70.4	0.232	48	80	0.405	0.0	0.00	0	0.00	2452
9024-034M		183:24	7/01/92	25.2	46.3	35	71.6	0.249	41	67	1.212	0.0	0.00	0	0.00	2177
9024-036M		183:26	7/01/92	15.9	27.0	37	43.0	0.308	45	71	0.739	0.0	0.00	0	0.00	2172
9024-039M		183:29	7/01/92	24.7	42.9	37	67.6	0.243	45	74	1.486	0.0	0.00	0	0.00	2173
9024-041M		183:31	7/01/92	30.7	42.5	42	73.3	0.248	45	67	0.506	0.0	0.00	0	0.00	2174
9024-052M		183:42	7/01/92	19.1	49.0	28	68.1	0.272	42	75	1.200	0.0	0.00	0	0.00	2178
9024-052M		183:42	7/16/92	26.2	45.6	36	71.8	0.225	48	79	0.424	0.0	0.00	0	0.00	2445
9025-009M		184:20	7/02/92	19.5	44.4	30	63.9	0.257	40	70	1.173	0.0	0.00	0	0.00	2179
9025-013M		184:24	7/02/92	16.6	31.2	35	47.8	0.268	58	69	0.000	0.0	0.00	0	0.00	2208
9025-014M		184:25	7/16/92	24.1	45.5	35	69.5	0.254	38	74	0.454	0.0	0.00	0	0.00	2443
9025-015M		184:26	7/02/92	20.5	44.6	31	65.0	0.258	33	61	1.255	0.0	0.00	0	0.00	2198
9026-001M		184:29	7/02/92	16.3	29.8	35	46.1	0.272	40	65	1.449	0.0	0.00	0	0.00	2207
9026-003M		184:31	7/02/92	27.8	37.2	43	64.9	0.257	35	62	1.077	0.0	0.00	0	0.00	2212
9026-006M		184:34	7/02/92	20.0	54.5	27	74.5	0.242	34	67	1.633	0.0	0.00	0	0.00	2186
9027-006M		184:40	7/16/92	34.8	23.0	60	57.7	0.276	52	74	0.689	0.0	0.00	0	0.00	2449

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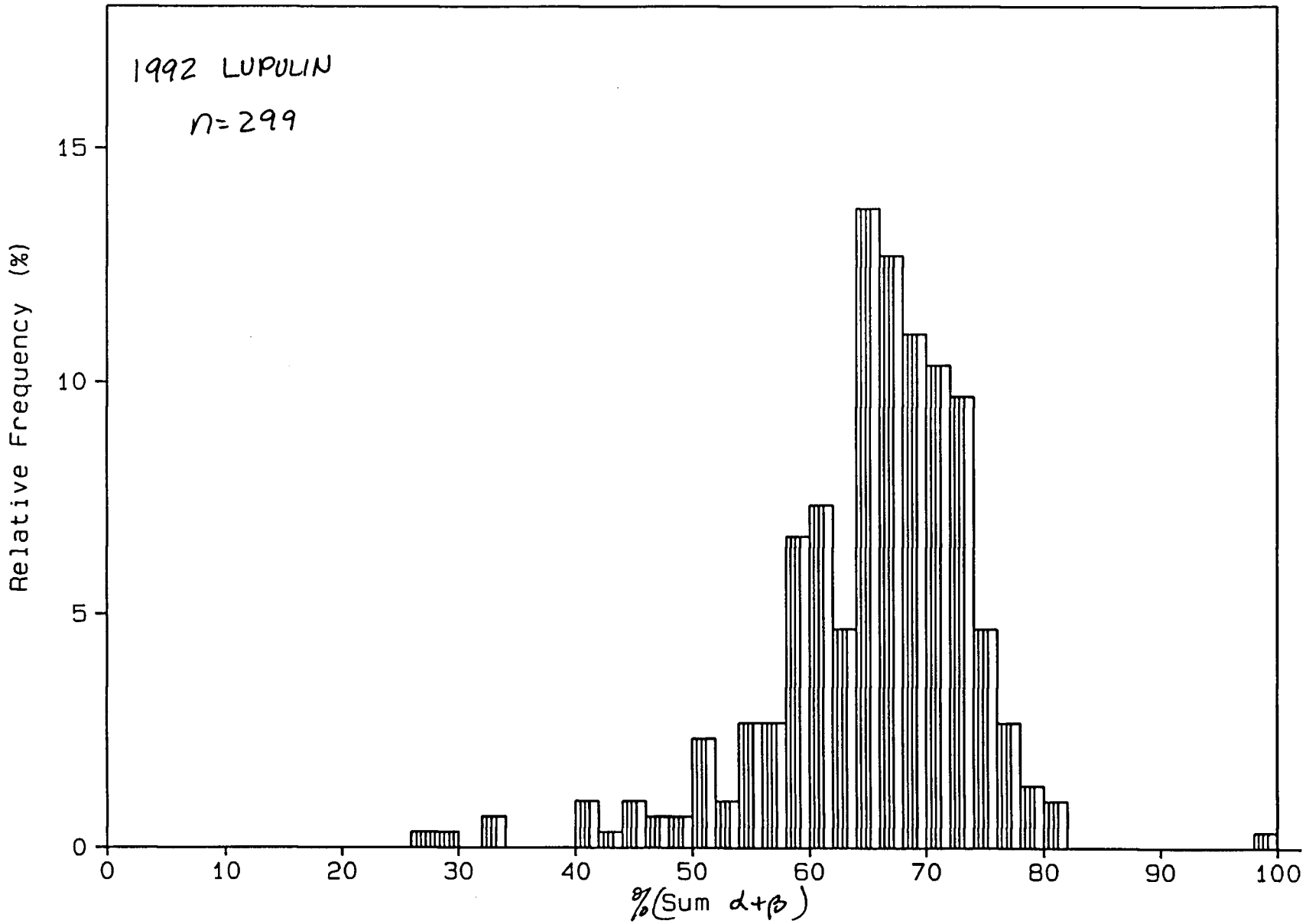
Accession or Nursery Number	Identification	Location	Harvest Date	% α-acids	% ß-acids	Alpha Ratio	Sum α+ß	HSI	Coα	Coß	Crush (3 hr)	SPO (hrs)	Permea-bility	Calc. % Remain	Hum/ Cary	Laboratory Serial No.
9027-026M		185:08	7/16/92	43.1	32.8	57	75.9	0.261	44	67	0.469	0.0	0.00	0	0.00	2444
9027-041M		185:23	7/16/92	42.0	32.6	56	74.6	0.251	53	75	0.389	0.0	0.00	0	0.00	2448
9027-045M		185:27	7/02/92	23.7	35.3	40	59.0	0.251	51	73	1.175	0.0	0.00	0	0.00	2215
9027-047M		185:29	7/02/92	32.0	37.4	46	69.4	0.248	48	65	1.040	0.0	0.00	0	0.00	2214
9027-070M		185:52	7/02/92	33.1	34.3	49	67.4	0.274	55	78	0.697	0.0	0.00	0	0.00	2202
9028-003M		186:03	7/02/92	32.1	34.8	48	66.9	0.247	54	69	0.797	0.0	0.00	0	0.00	2206
9028-024M		186:24	7/16/92	37.5	42.4	47	79.9	0.236	46	72	0.550	0.0	0.00	0	0.00	2485
9028-024M		186:24	7/16/92	37.9	33.6	53	71.5	0.271	40	63	0.869	0.0	0.00	0	0.00	2484
9028-025M		186:25	7/02/92	31.6	38.6	45	70.2	0.273	42	64	0.582	0.0	0.00	0	0.00	2187
9028-026M		186:26	7/02/92	31.1	30.4	51	61.5	0.282	67	78	0.854	0.0	0.00	0	0.00	2204
9028-032M		186:32	7/02/92	26.6	28.6	48	55.2	0.291	52	71	0.831	0.0	0.00	0	0.00	2200
9028-039M		186:39	7/02/92	36.6	37.0	50	73.6	0.242	54	71	0.497	0.0	0.00	0	0.00	2205
9028-042M		186:42	7/02/92	28.3	32.4	47	60.7	0.295	56	69	0.890	0.0	0.00	0	0.00	2213
9029-001M		187:17	7/16/92	17.5	50.1	26	67.6	0.231	39	67	1.703	0.0	0.00	0	0.00	2460
9029-006M		187:22	7/02/92	28.2	39.4	42	67.5	0.236	59	78	0.550	0.0	0.00	0	0.00	2210
9029-008M		187:24	7/02/92	25.5	33.9	43	59.4	0.264	55	77	0.896	0.0	0.00	0	0.00	2188
9030-002M		187:28	7/16/92	18.6	42.6	30	61.2	0.241	46	75	1.015	0.0	0.00	0	0.00	2451
9030-007M		187:33	7/02/92	19.6	48.4	29	68.0	0.229	49	75	1.548	0.0	0.00	0	0.00	2209
9030-008M		187:34	7/16/92	20.3	51.4	28	71.7	0.214	50	78	1.044	0.0	0.00	0	0.00	2453
9030-012M		187:38	7/16/92	17.7	43.5	29	61.2	0.226	35	68	0.664	0.0	0.00	0	0.00	2450
9030-013M		187:39	7/02/92	10.0	56.0	15	66.0	0.216	35	71	1.644	0.0	0.00	0	0.00	2180
9030-013M		187:39	7/16/92	11.2	66.4	14	77.6	0.183	31	71	1.592	0.0	0.00	0	0.00	2465
9030-014M		187:40	7/02/92	17.2	37.2	32	54.4	0.294	46	73	1.521	0.0	0.00	0	0.00	2181
9030-015M		187:41	7/16/92	22.5	49.2	31	71.7	0.226	42	72	0.641	0.0	0.00	0	0.00	2456
9030-021M		187:47	7/16/92	16.0	49.0	25	65.0	0.238	24	72	1.236	0.0	0.00	0	0.00	2480
9030-032M		188:06	7/16/92	27.9	34.8	45	62.7	0.252	54	78	1.379	0.0	0.00	0	0.00	2479
9030-033M		188:07	7/16/92	27.3	44.4	38	71.7	0.247	55	78	0.552	0.0	0.00	0	0.00	2464
9030-036M		188:10	7/16/92	15.3	50.1	23	65.4	0.227	26	76	1.374	0.0	0.00	0	0.00	2474
9030-040M		188:14	7/16/92	31.2	39.3	44	70.5	0.239	52	78	0.602	0.0	0.00	0	0.00	2457
9030-043M		188:17	7/16/92	41.0	27.9	60	68.9	0.258	55	76	0.373	0.0	0.00	0	0.00	2466
9030-046M		188:20	7/16/92	35.6	35.5	50	71.2	0.256	51	72	0.453	0.0	0.00	0	0.00	2471
9030-049M		188:23	7/02/92	24.4	41.0	37	65.5	0.271	41	69	1.428	0.0	0.00	0	0.00	2182
9030-050M		188:24	7/16/92	38.4	37.5	51	75.9	0.238	57	78	0.441	0.0	0.00	0	0.00	2470
9030-054M		188:28	7/16/92	33.3	40.2	45	73.6	0.233	52	72	0.456	0.0	0.00	0	0.00	2454
9030-057M		188:31	7/16/92	27.9	48.3	37	76.2	0.216	56	79	0.543	0.0	0.00	0	0.00	2473
9031-002M		188:35	7/16/92	37.8	36.1	51	73.9	0.249	58	78	0.498	0.0	0.00	0	0.00	2446
9031-006M		188:36	7/16/92	15.1	56.3	21	71.4	0.196	25	71	1.374	0.0	0.00	0	0.00	2483
9031-006M		188:39	7/16/92	20.1	49.7	29	69.8	0.227	37	70	1.364	0.0	0.00	0	0.00	2467
9031-026M		189:07	7/16/92	18.2	40.4	31	58.6	0.237	45	71	1.147	0.0	0.00	0	0.00	2475
9031-027M		189:08	7/02/92	26.4	41.4	39	67.7	0.279	67	81	0.988	0.0	0.00	0	0.00	2183
9031-031M		189:12	7/16/92	21.1	39.9	35	60.9	0.261	53	79	0.521	0.0	0.00	0	0.00	2463
9032-006M		189:18	7/02/92	15.6	13.7	53	29.3	0.331	58	73	0.938	0.0	0.00	0	0.00	2216
9032-010M		189:22	7/02/92	22.2	37.0	38	59.3	0.292	36	62	0.619	0.0	0.00	0	0.00	2211
9032-011M		189:23	7/16/92	32.2	38.2	46	70.3	0.243	42	69	0.451	0.0	0.00	0	0.00	2459
9032-053M		190:13	7/16/92	27.5	40.1	41	67.7	0.228	39	68	0.876	0.0	0.00	0	0.00	2497
9032-054M		190:14	7/16/92	18.4	46.3	28	64.7	0.212	36	70	1.675	0.0	0.00	0	0.00	2504
9033-006M		190:31	7/16/92	40.9	31.2	57	72.1	0.252	53	78	0.000	0.0	0.00	0	0.00	2493
9033-019M		190:44	7/16/92	38.3	30.8	55	69.1	0.245	44	72	0.536	0.0	0.00	0	0.00	2499

1992 Lupulin Analyses

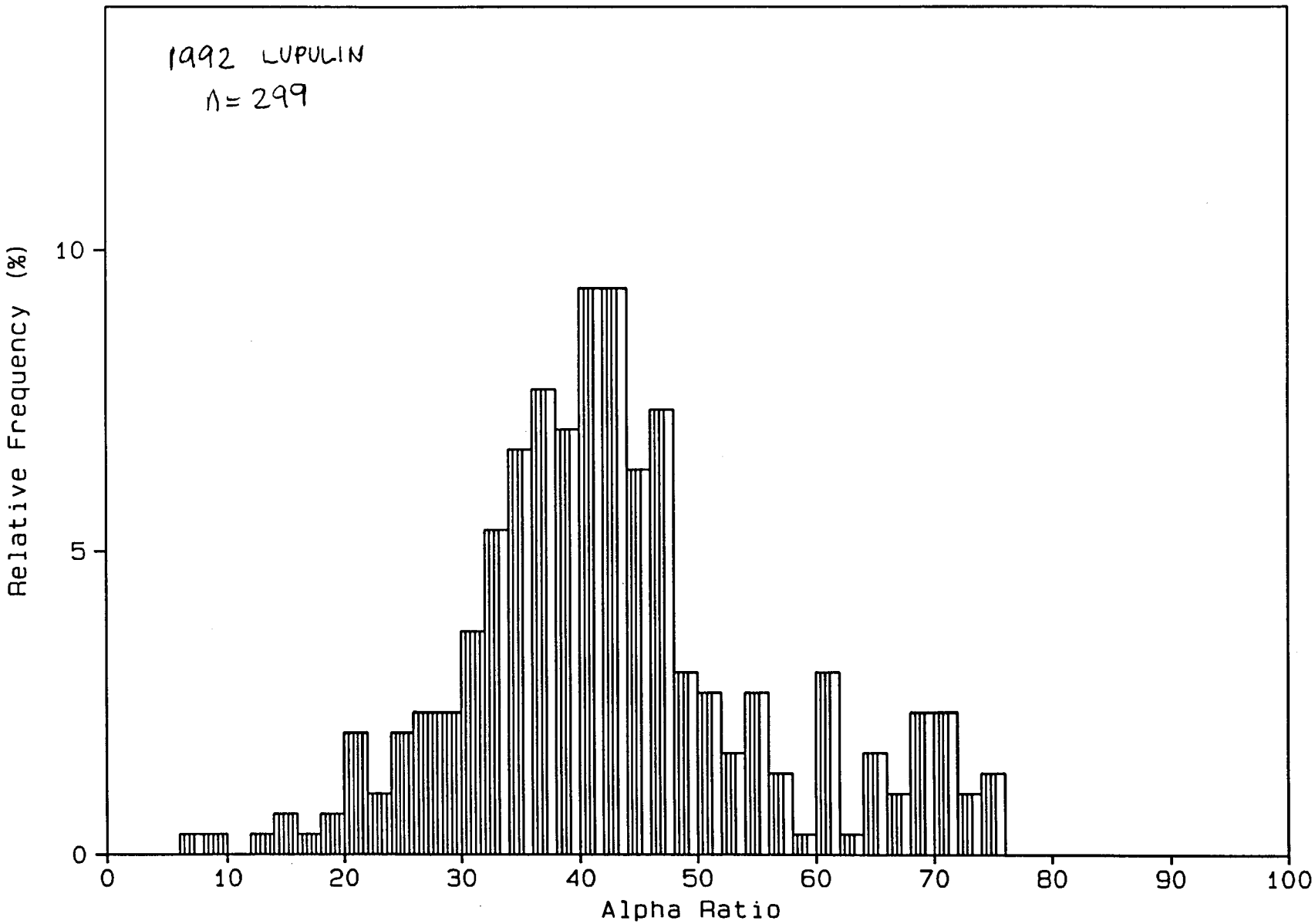
Sorted by Acc/Nursery (October 20, 1993)

Accession or Nursery Number	Identification	Location	Harvest Date	% α-acids	% ß-acids	Alpha Ratio	Sum α+ß	HSI	Coα	Coß	Crush (3 hr)	SPO (hrs)	Permea-bility	Calc. % Remain	Hum/ Cary	Laboratory Serial No.
9033-028M		191:07	7/16/92	27.0	43.7	38	70.7	0.232	51	78	0.443	0.0	0.00	0	0.00	2496
9033-034M		191:07	7/02/92	24.5	45.5	35	70.0	0.255	55	77	0.633	0.0	0.00	0	0.00	2184
9033-035M		191:08	7/16/92	41.7	32.2	56	73.9	0.257	53	77	0.495	0.0	0.00	0	0.00	2494
9033-045M		191:18	7/16/92	32.0	33.8	49	65.8	0.251	49	71	1.634	0.0	0.00	0	0.00	2501
9033-047M		191:20	7/02/92	29.2	37.5	44	66.7	0.269	60	75	1.670	0.0	0.00	0	0.00	2201
9033-059M		191:32	7/02/92	27.6	40.2	41	67.7	0.258	53	76	0.760	0.0	0.00	0	0.00	2199
9033-061M		191:34	7/02/92	21.0	31.9	40	52.9	0.308	44	69	1.473	0.0	0.00	0	0.00	2185
9033-071M		191:44	7/02/92	27.4	37.7	42	65.1	0.279	70	81	0.472	0.0	0.00	0	0.00	2196
9034-002M		192:02	7/16/92	38.9	28.7	58	67.6	0.262	44	69	0.549	0.0	0.00	0	0.00	2488
9034-005M		192:05	7/02/92	22.6	19.1	54	41.8	0.341	46	65	1.289	0.0	0.00	0	0.00	2192
9034-006M		192:06	7/02/92	29.1	37.0	44	66.2	0.277	54	70	0.940	0.0	0.00	0	0.00	2203
9034-012M		192:12	7/02/92	24.0	24.4	50	48.5	0.324	51	70	0.783	0.0	0.00	0	0.00	2195
9034-018M		192:18	7/02/92	18.4	31.8	37	50.2	0.312	50	64	1.553	0.0	0.00	0	0.00	2190
9034-026M		192:26	7/16/92	33.6	29.9	53	63.5	0.257	44	70	0.652	0.0	0.00	0	0.00	2503
9034-033M		192:33	7/16/92	29.6	27.1	52	56.7	0.313	43	65	0.552	0.0	0.00	0	0.00	2487
9034-038M		192:38	7/02/92	31.6	35.8	47	67.4	0.268	47	68	1.067	0.0	0.00	0	0.00	2189
9034-043M		192:43	7/16/92	31.1	39.4	44	70.5	0.249	41	67	0.531	0.0	0.00	0	0.00	2492
9034-051M		192:51	7/16/92	38.3	30.6	56	68.8	0.260	46	72	0.546	0.0	0.00	0	0.00	2502
9034-054M		193:03	7/16/92	43.3	30.3	59	73.7	0.259	49	72	0.562	0.0	0.00	0	0.00	2489
9034-067M		193:15	7/02/92	31.8	35.1	47	66.9	0.259	39	62	0.507	0.0	0.00	0	0.00	2191
9035-013M		193:35	7/16/92	37.0	34.3	52	71.4	0.269	57	33	0.564	0.0	0.00	0	0.00	2490
9035-033M		194:03	7/16/92	37.0	33.6	52	70.6	0.261	46	70	0.526	0.0	0.00	0	0.00	2495
9035-048M		194:18	7/16/92	38.1	27.2	58	65.4	0.282	55	81	0.558	0.0	0.00	0	0.00	2498
9035-049M		194:19	7/02/92	26.4	44.8	37	71.2	0.282	49	69	0.894	0.0	0.00	0	0.00	2197
9035-057M		194:27	7/02/92	22.6	35.6	39	58.2	0.287	44	71	1.303	0.0	0.00	0	0.00	2194
9035-058M		194:28	7/16/92	35.8	37.8	49	73.6	0.240	41	65	0.439	0.0	0.00	0	0.00	2491
9035-059M		194:29	7/16/92	36.5	31.3	54	67.8	0.264	51	75	0.699	0.0	0.00	0	0.00	2500
9035-064M		194:34	7/02/92	20.6	42.7	33	63.3	0.274	53	72	1.435	0.0	0.00	0	0.00	2193
9035-075M		194:45	7/16/92	29.5	40.3	42	69.7	0.277	43	69	0.461	0.0	0.00	0	0.00	2486

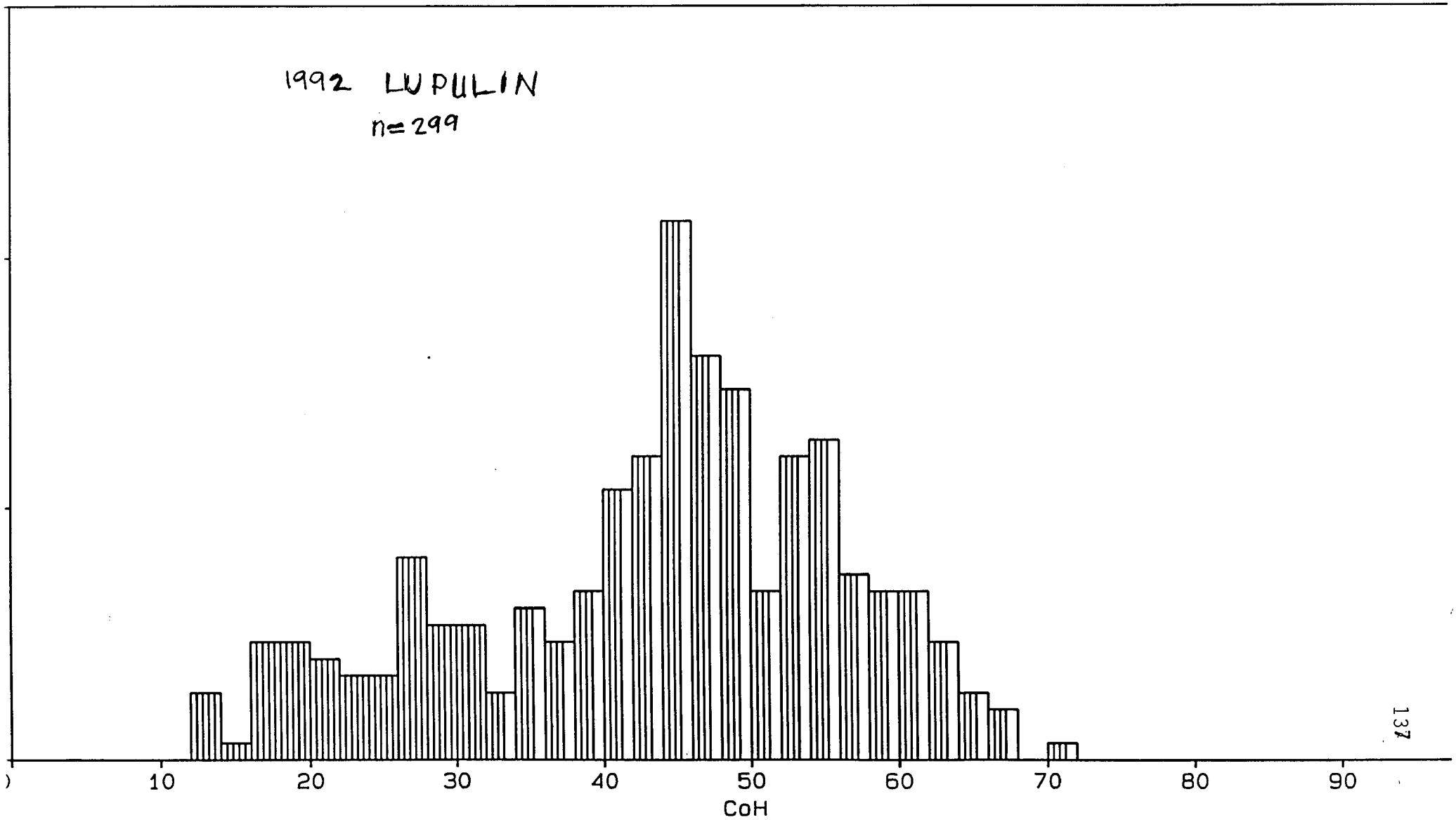
1992 crop: Analysis of male hops (lupulin basis): Sum of alpha and beta



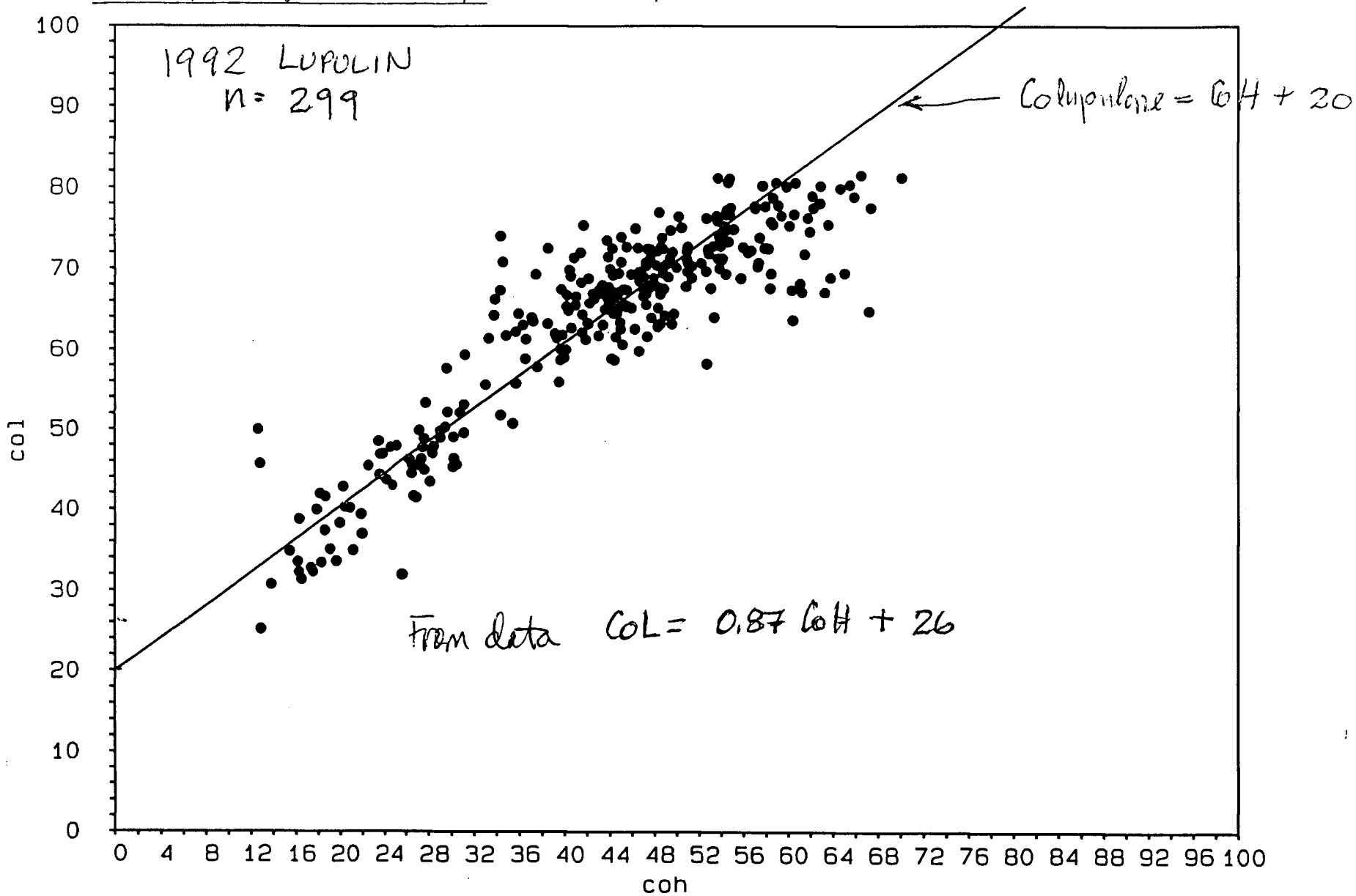
1992 crop: Analysis of male hops (lupulin basis): Alpha Ratio



1992 crop: Analysis of male hops: Cohumulone content.



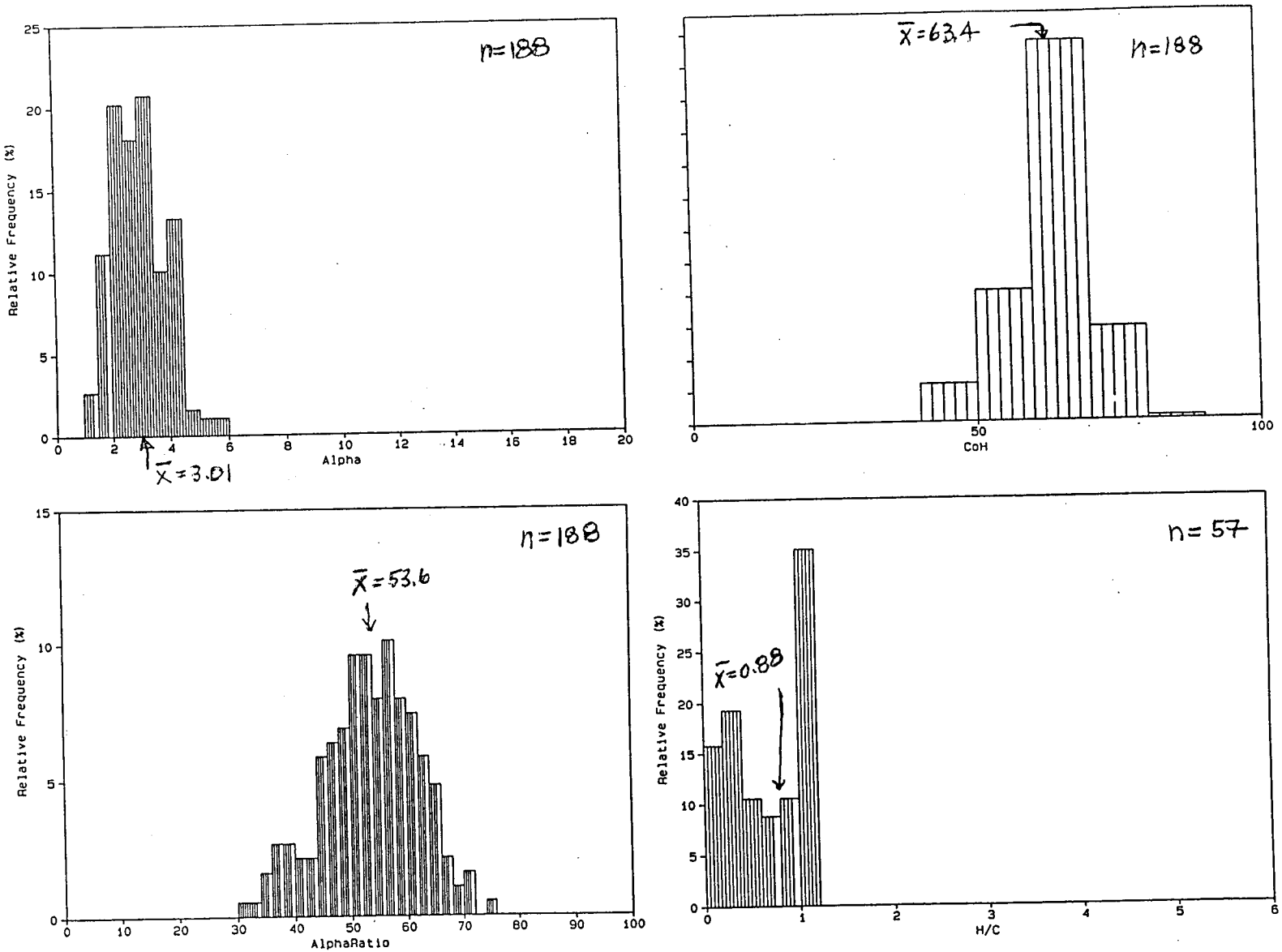
1992 crop: Analysis of male hops: Relationship between Coh and CoL



Native American Progeny Crosses 9001 - 9035, 1992 crop

Category	n	Mean	Max	Min	St Dev	%cv
Alpha	188	3.01	5.97	1.24	0.913	329.8
Beta	188	2.59	6.18	0.70	0.791	327.8
Sum	188	5.61	10.11	2.27	1.395	402.0
AlphaRatio	188	53.61	75.13	31.22	8.389	639.0
HSI	188	0.33	0.53	0.26	0.041	803.1
HSI 6mo	0	0.00	0.00	10000.00	0.000	0.0
Remain	0	0.00	0.00	10000.00	0.000	0.0
Yield	185	536.76	1900.00	128.00	263.972	203.3
Cone Weight	0	0.00	0.00	10000.00	0.000	0.0
CoH	188	63.44	83.12	41.48	7.164	885.6
CoL	188	82.94	92.98	63.25	5.461	1518.9
Fresh Oil	70	0.53	1.21	0.11	0.231	231.3
Myrcene	57	64.16	82.64	24.74	12.229	524.7
Caryophyllene	57	4.08	22.40	0.77	3.604	113.3
Humulene	57	2.60	32.91	0.21	4.273	60.8
Farnesene	57	0.08	0.44	0.01	0.088	87.7
H/C	57	0.88	3.51	0.03	0.744	117.8
H/F	57	47.89	132.00	1.38	33.239	144.1
C/F	57	84.56	293.58	5.40	67.660	125.0
Storage Oil	0	0.00	0.00	10000.00	0.000	0.0

Native American Hops: 1992 crop. crosses Nr. 9001 to 9035 (main yard, Corvallis)
bale samples: Alpha, alpha ratio, CoH, and C/H ratio



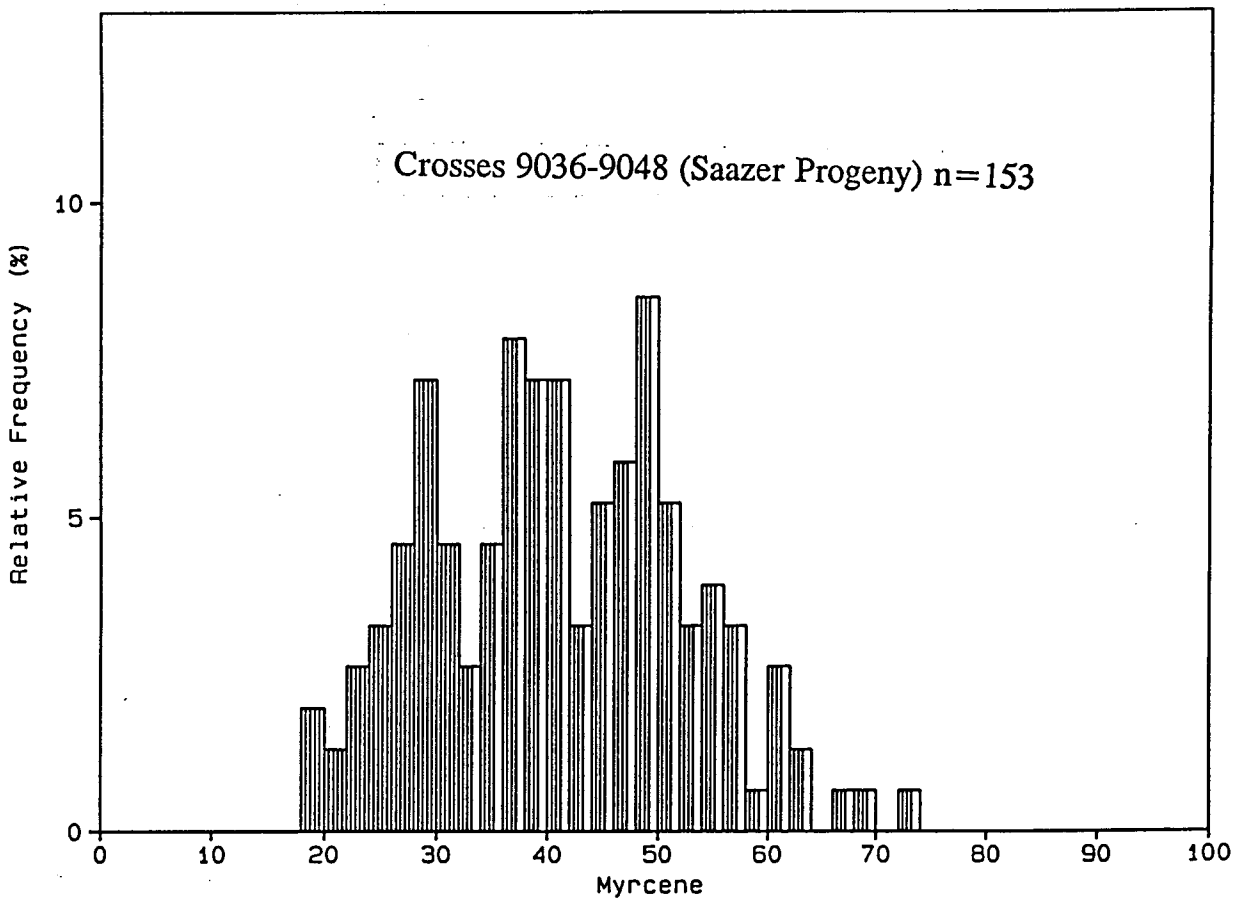
Comparison of European (Saazer) seedlings and Wild American seedlings grown in 1992.

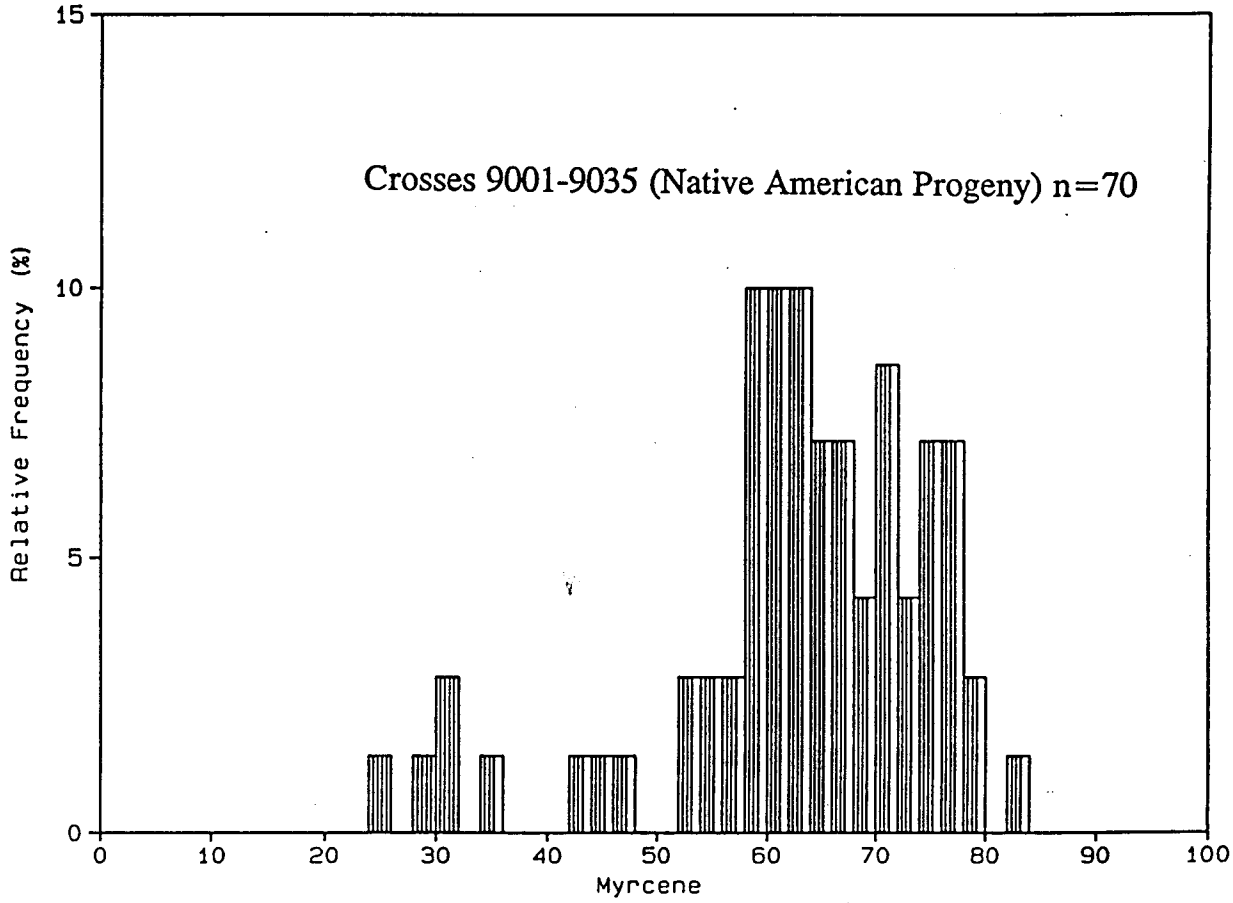
Crosses 9036-9048 (Saazer)

Category	n	Mean	Max	Min	St Dev	%cv
Alpha	364	5.67	10.89	0.00	1.674	338.9
Beta	364	3.41	8.12	0.93	1.103	309.0
Sum	364	9.08	16.15	1.95	2.119	428.6
AlphaRatio	364	62.06	78.70	0.00	10.043	618.0
HSI	364	0.29	0.67	0.22	0.053	538.1
HSI 6mo	0	0.00	0.00	10000.00	0.000	0.0
Remain	0	0.00	0.00	10000.00	0.000	0.0
Yield	363	1079.58	3413.00	80.00	564.206	191.3
Cone Weight	82	213.86	397.00	75.40	74.272	287.9
CoH	364	23.98	46.69	13.40	5.240	457.6
CoL	364	45.40	75.10	0.01	7.317	620.5
Fresh Oil	159	0.98	2.12	0.34	0.352	278.8
Myrcene	153	41.18	72.25	18.44	11.407	361.0
Caryophyllene	153	6.97	22.32	1.96	2.830	246.1
Humulene	153	22.59	41.60	2.63	8.447	267.5
Farnesene	153	9.01	26.31	0.01	6.820	132.1
H/C	153	3.32	4.19	0.94	0.601	553.0
H/F	153	80.06	3189.48	0.51	324.004	24.7
C/F	153	23.61	909.61	0.16	92.090	25.6
Storage Oil	0	0.00	0.00	10000.00	0.000	0.0

Crosses 9001-9035 (Native American Progeny)

Category	n	Mean	Max	Min	St Dev	%cv
Alpha	250	3.00	5.97	1.22	0.911	329.4
Beta	250	2.53	6.18	0.70	0.786	321.8
Sum	250	5.53	10.11	2.01	1.386	399.0
AlphaRatio	250	54.19	75.13	25.84	8.461	640.4
HSI	250	0.33	0.53	0.26	0.042	798.4
HSI 6mo	0	0.00	0.00	10000.00	0.000	0.0
Remain	0	0.00	0.00	10000.00	0.000	0.0
Yield	247	525.68	1900.00	100.00	244.836	214.7
Cone Weight	33	507.87	776.40	280.60	146.649	346.3
CoH	250	63.35	83.12	41.48	7.302	867.6
CoL	250	82.68	92.98	63.25	5.409	1528.4
Fresh Oil	75	0.52	1.21	0.09	0.238	217.4
Myrcene	70	62.99	82.64	24.74	12.344	510.3
Caryophyllene	70	4.49	22.40	0.77	3.872	116.1
Humulene	70	2.60	32.91	0.21	3.890	66.9
Farnesene	70	0.09	0.44	0.01	0.092	95.7
H/C	70	0.84	3.51	0.03	0.698	120.1
H/F	70	45.52	132.00	1.38	32.417	140.4
C/F	70	79.07	293.58	5.40	63.240	125.0
Storage Oil	0	0.00	0.00	10000.00	0.000	0.0


Crosses 9036-9048 (Saazer Progeny) n=153
Relative Frequency (%)
0
5
10
0
10
20
30
40
50
60
70
80
90
100
Myrcene


Crosses 9001-9035 (Native American Progeny) n=70
Relative Frequency (%)
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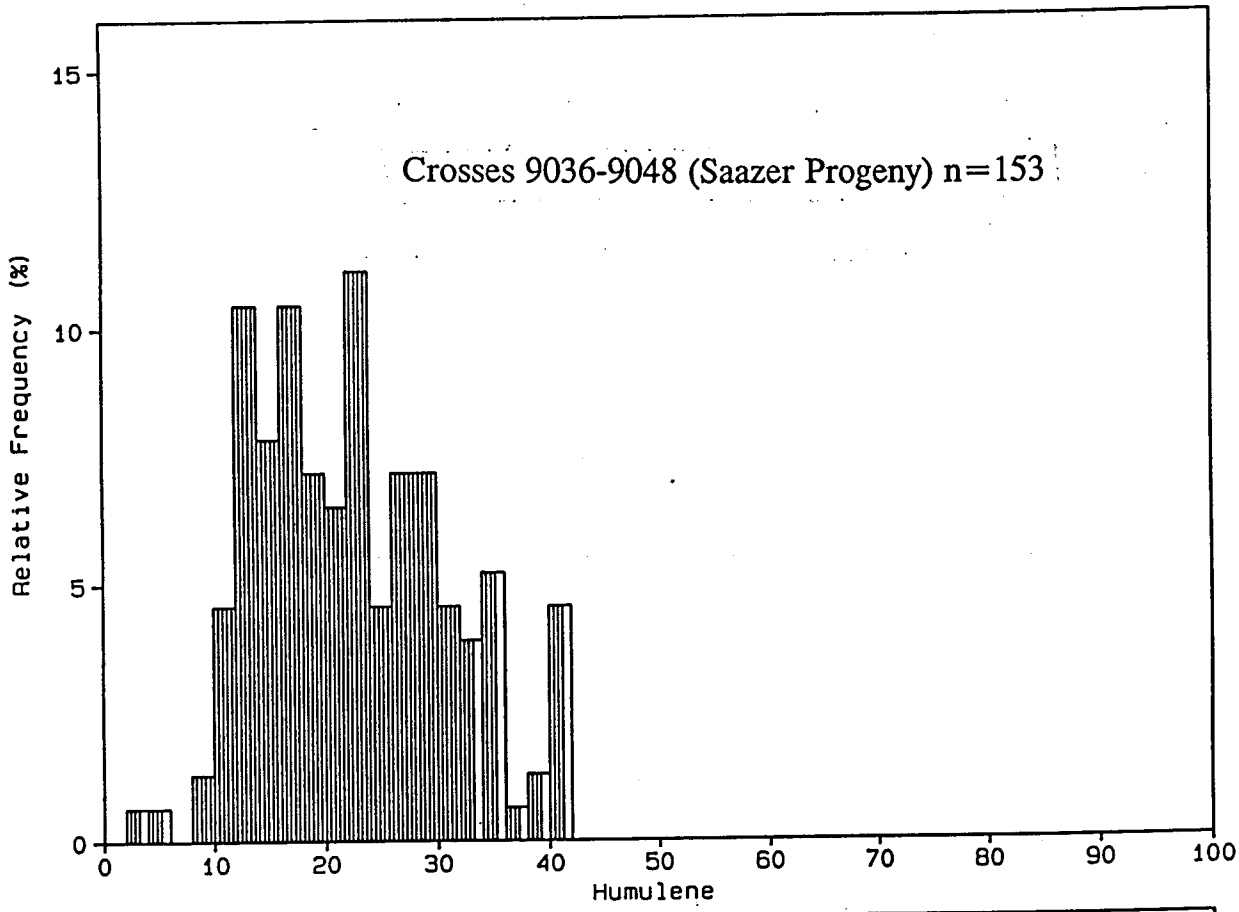
0
10
20
30
40
50
60
70
80
90
100
Myrcene


Crosses 9036-9048 (Saazer Progeny) n=153
Relative Frequency (%)
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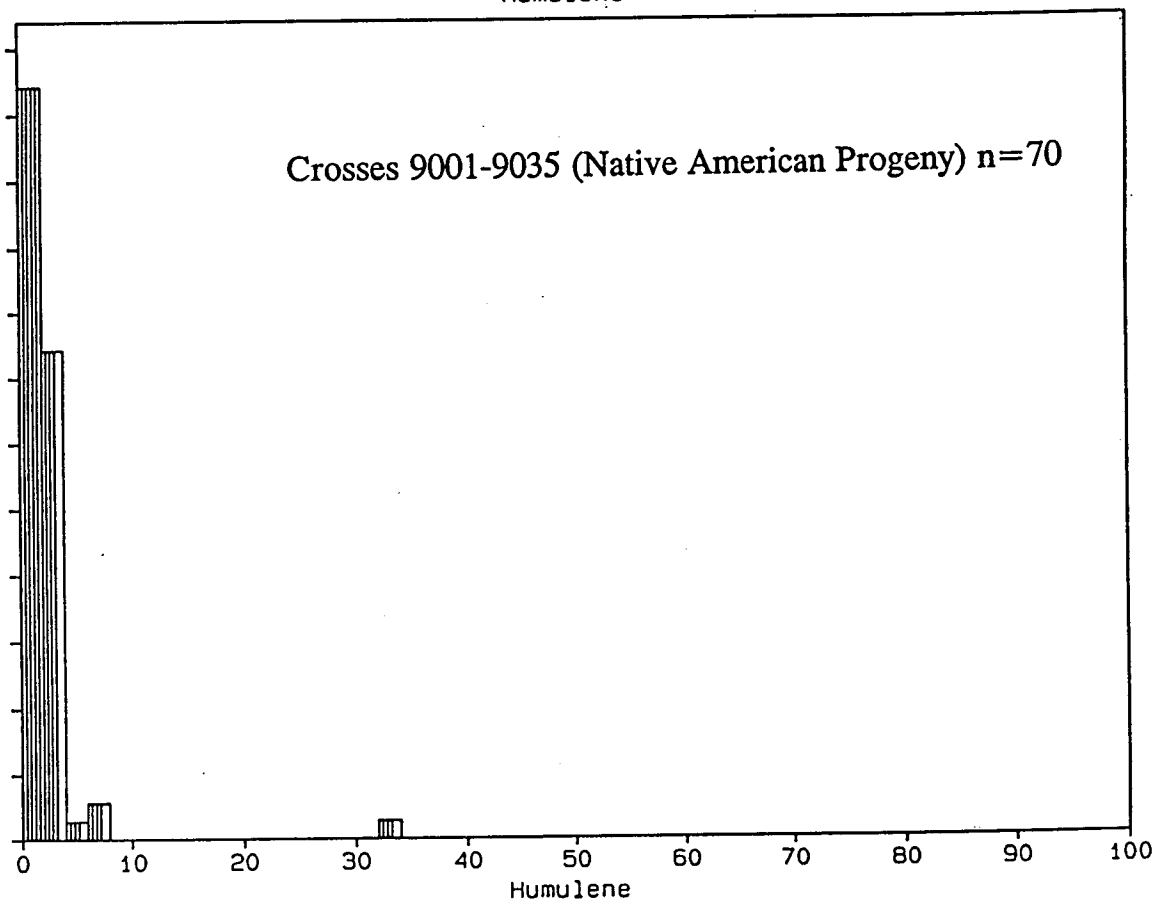
10
5
0
0
10
20
30
40
50
60
70
80
90
100
Humulene


Crosses 9001-9035 (Native American Progeny) n=70
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10
20
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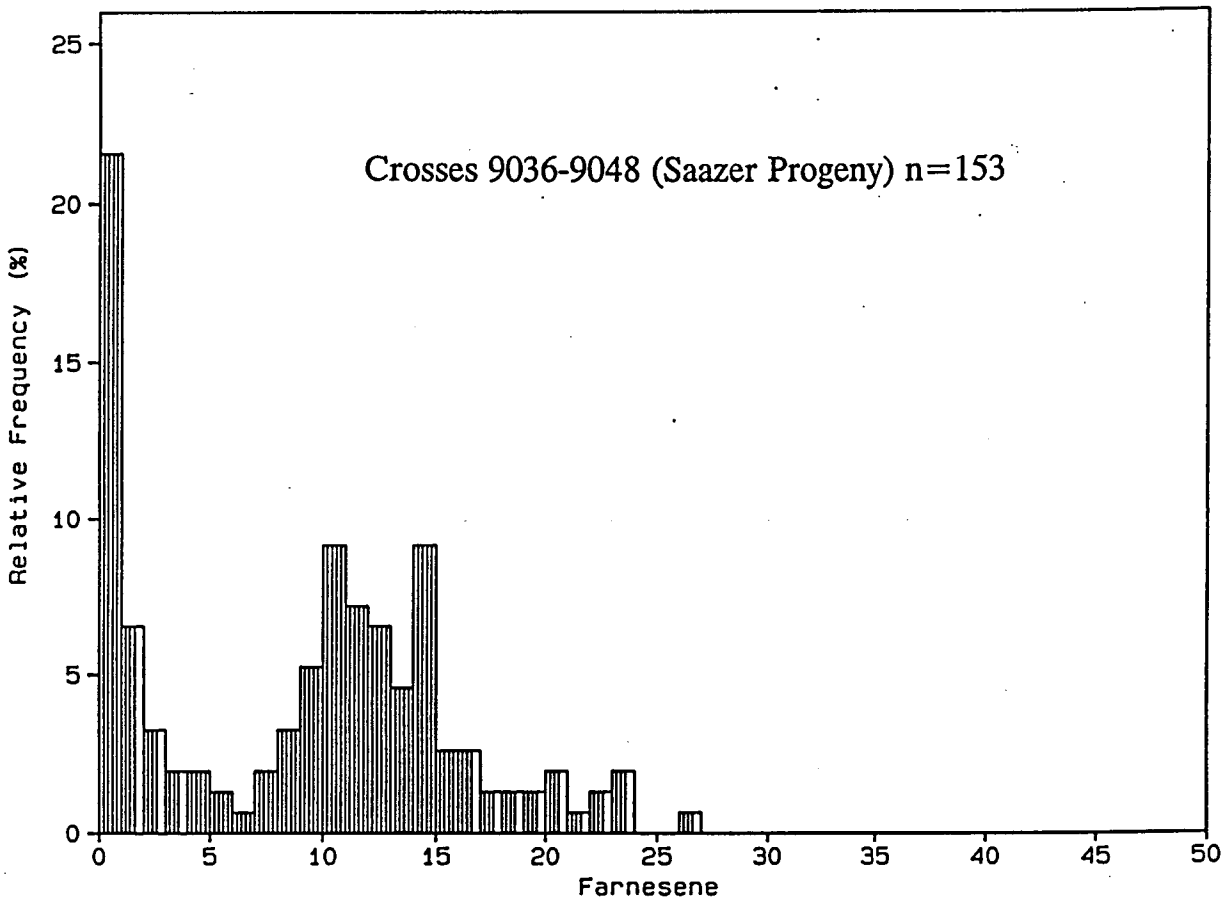
40
50
60
70
80
90
100
Humulene


Crosses 9036-9048 (Saazer Progeny) n=153
Relative Frequency (%)
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10
15
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5
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20
25
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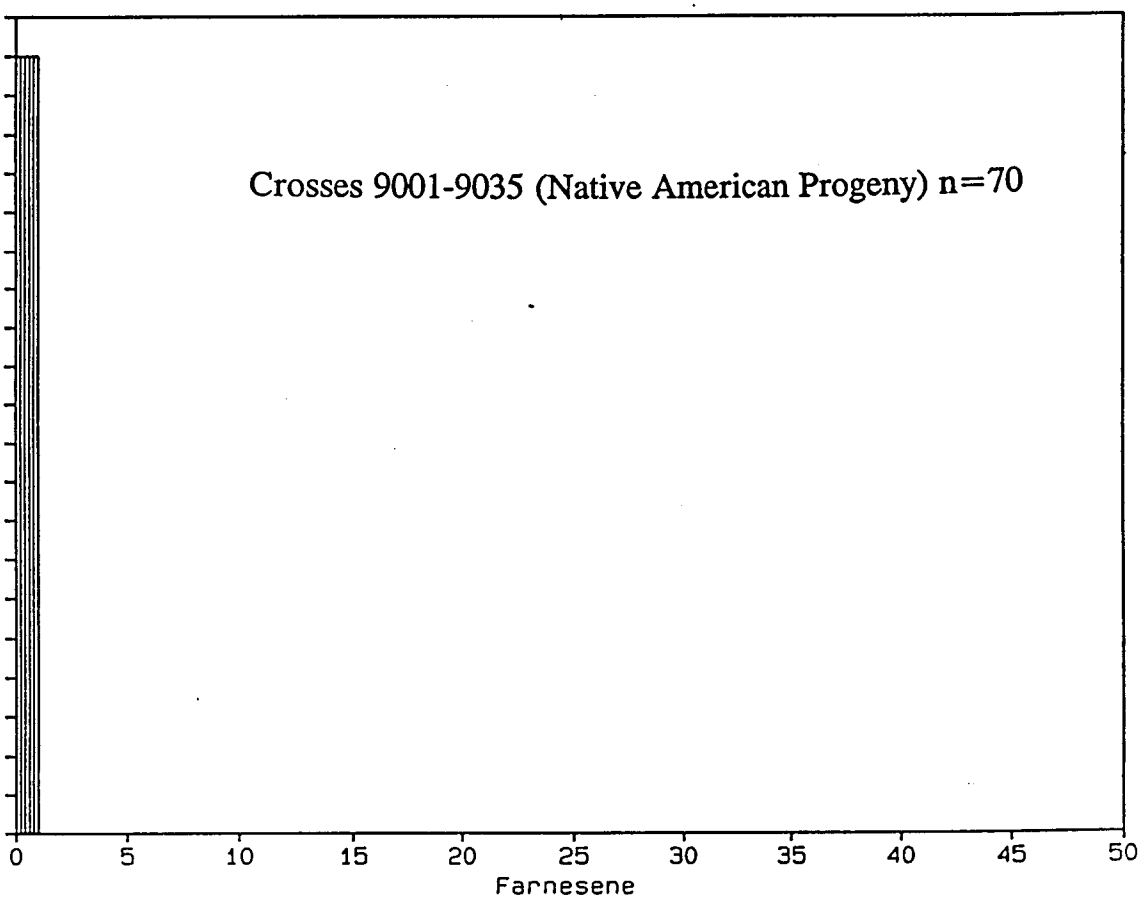
35
40
45
50
Farnesene


Crosses 9001-9035 (Native American Progeny) n=70
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10
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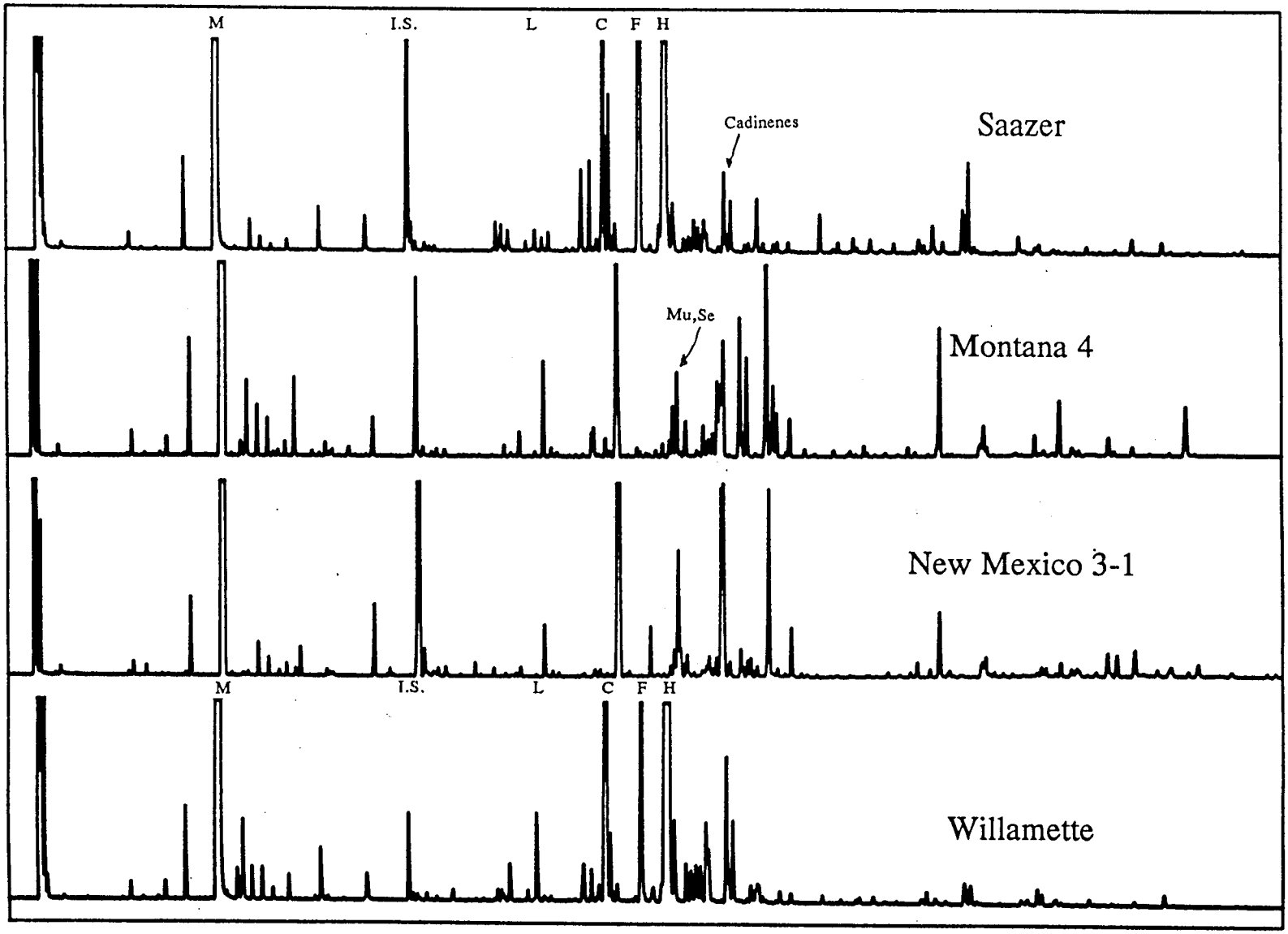
20
25
30
35
40
45
50
Farnesene



Chromatograms of native American hop oil samples from Montana and New Mexico compared with Saazer and Willamette. Of the 79 GLC analyses of native American progeny in Crosses 9001-9035 only 3 had H/C ratios higher than 2.5.

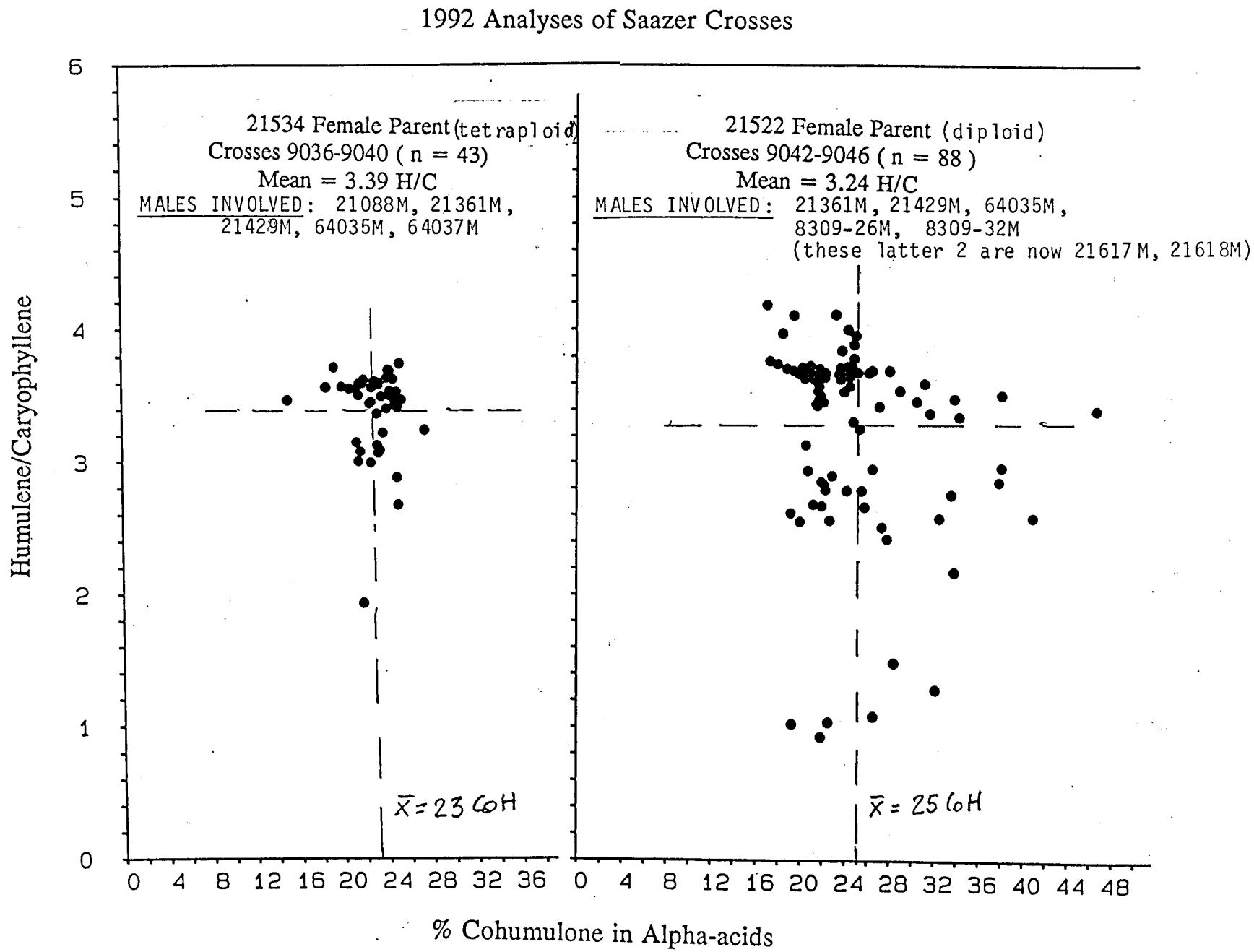
1992 Analyses of Saazer Crosses
Averages of miniature bales

Cross	total/ oil	% Alpha-acids	% Beta-acids	Alpha Ratio	CoH	H/C	C/F	Yield
N.Amer	217/74	3.00	2.54	54	64	0.80	81.52	540
Saazer (Cones)	7/0	3.35	3.31	50	19			128
9036	23/16	4.00	3.19	55	22	3.13	16.29	1290
9037	7/5	6.14	2.92	67	24	3.41	0.65	905
9038	2/0	5.90	5.04	54	30			1290
9039	16/10	7.02	3.53	67	23	3.72	0.82	2432
9040	31/12	4.85	4.08	70	23	3.56	2.64	881
9041	47/20	5.94	4.80	75	20	3.52	13.66	1146
9042	21/14	6.42	3.34	66	22	3.65	3.31	1570
9043	22/16	8.46	3.35	72	24	3.81	1.35	1754
9044	27/10	5.73	3.59	62	25	2.87	0.66	1197
9045	30/13	5.75	3.25	64	30	2.77	1.47	1003
9046	47/36	6.43	4.10	62	27	3.10	45.11	1206
9048	10/7	6.55	4.11	61	30	3.37	200.47	998

Note: crosses Nr. 9036 to 9040: tetraploid x diploid
(males involved: 21088M, 21361M, 21429M 64035M, 64037M)

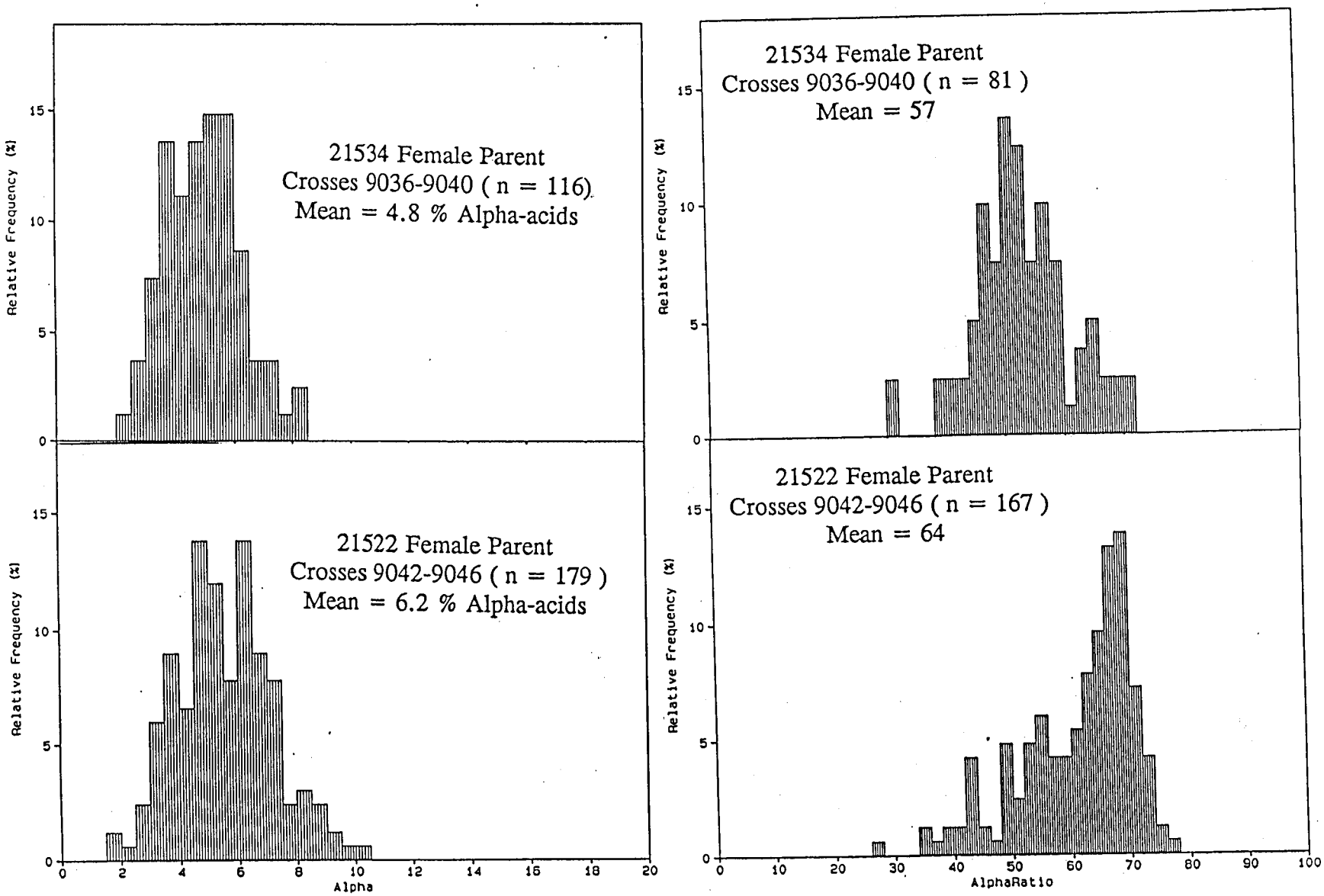
crosses Nr. 9042 to 9044: diploid x diploid
(males involved: 21361M, 21429M, 64035M)

crosses Nr. 9045, 9046: diploid x tetraploid
(males involved: 21617M, 21618M)



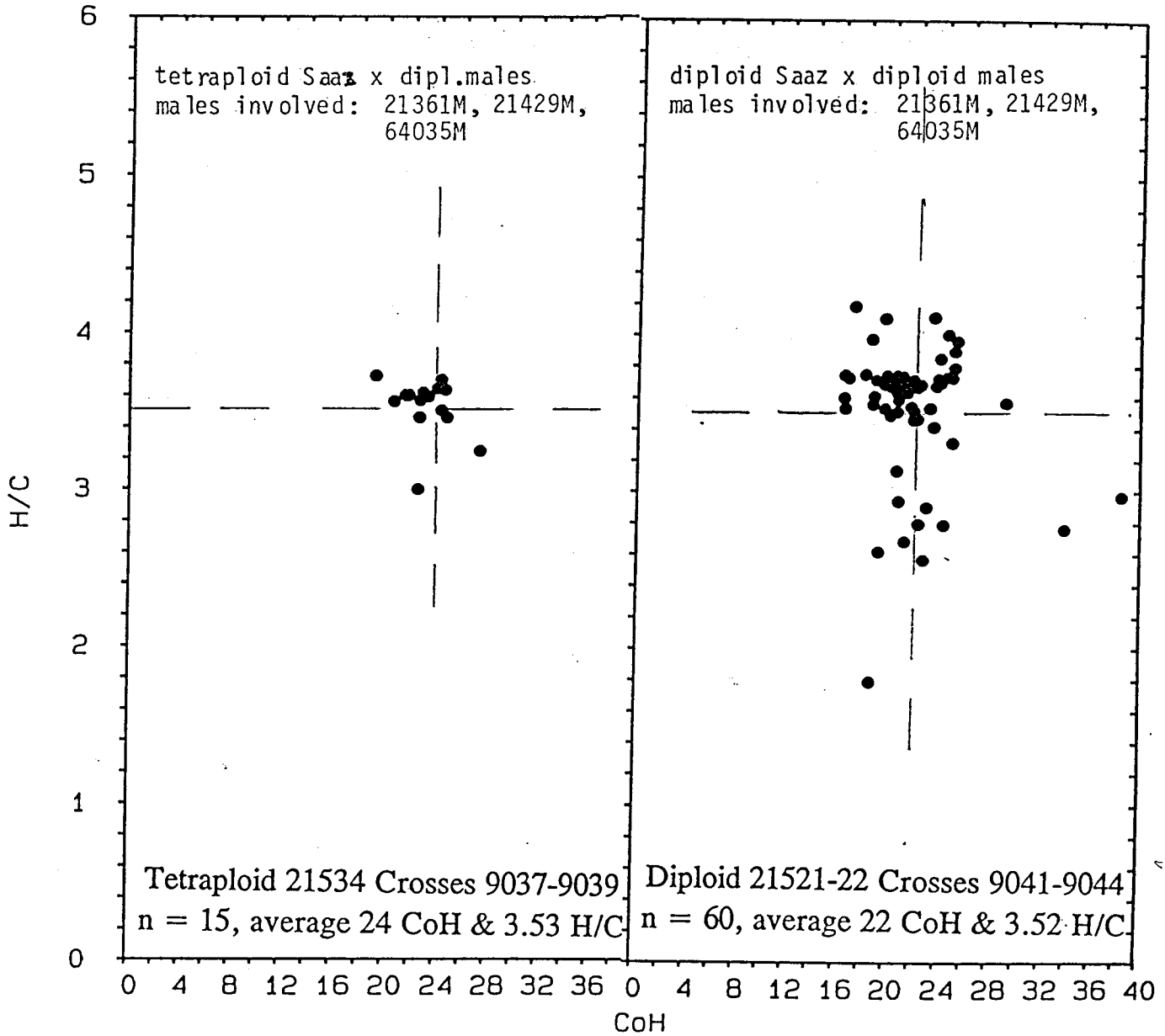
Scatter diagrams for triploid progeny vs diploid progeny humulene/caryophyllene ratios vs cohumulone in alpha-acids. The range of values is much smaller for the triploid progeny. (Note: Some of the spread may be due to different males).

1992 Analyses of Saazer Crosses

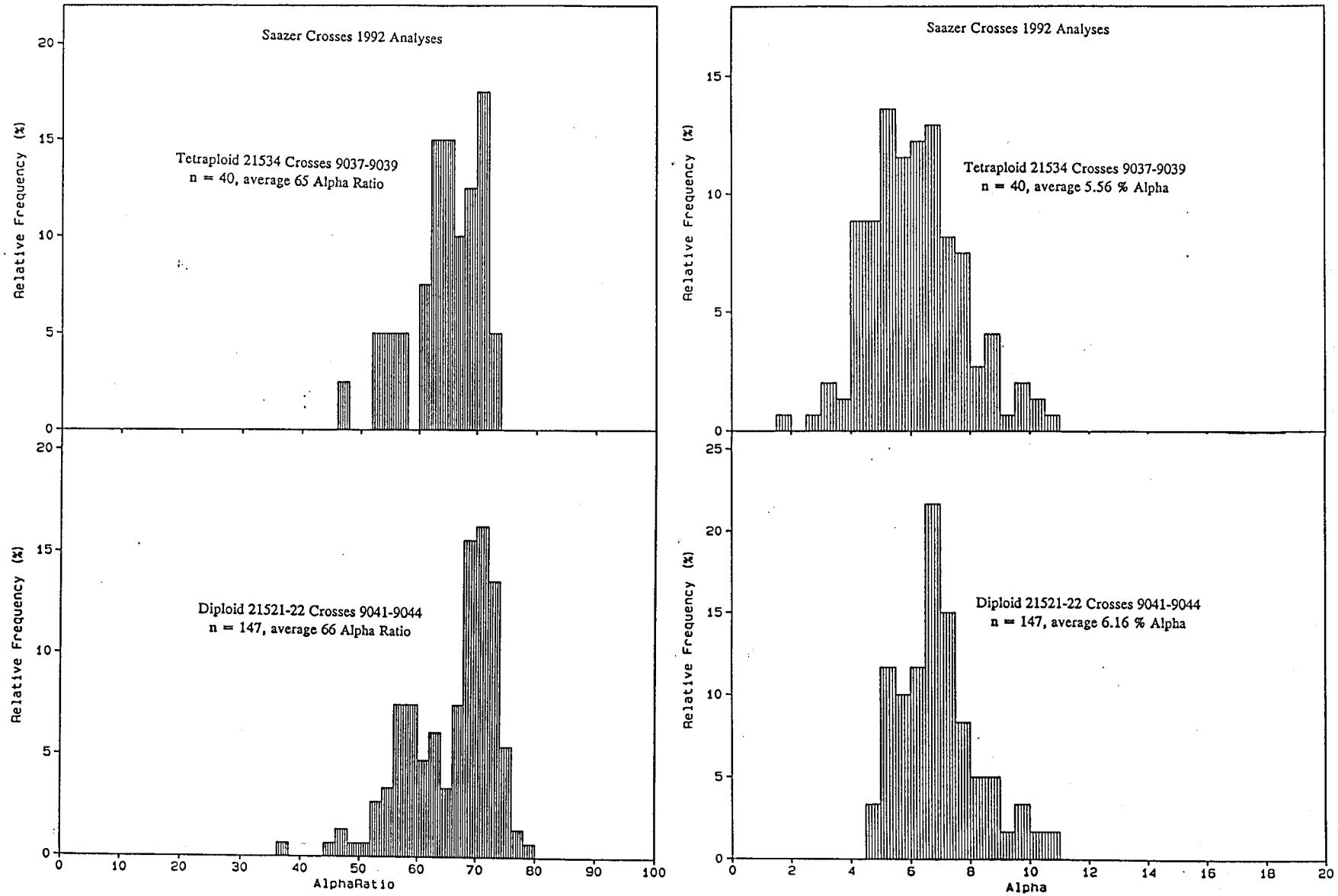


Histograms of % alpha-acids and alpha ratios in Saazer crosses. Triploid female parent 21534 and diploid female parent 21522. The same male parents were used in these crosses. The triploid progeny had lower % alpha-acids and lower alpha ratio than the diploid progeny.

Saazer Crosses 1992 Analyses



Scatter diagrams for triploid progeny vs diploid progeny humulene/caryophyllene ratios vs cohumulone in alpha-acids. The range of values is much smaller for the triploid progeny. The same 3 males are involved in both sets of crosses.



Histograms of % alpha-acids and alpha ratios in Saazer crosses. Triploid female parent 21534 and diploid female parent 21522. The same male parents were used in these crosses. The triploid progeny had lower % alpha-acids and lower alpha ratio than the diploid progeny.

Agricultural Chemistry Department
Bioanalytical Services/Hop Chemistry

OREGON STATE UNIVERSITY
Agricultural & Life Sciences II Room 1007
Corvallis, Oregon 97331-7301
(503) 737-1807 FAX (503) 737-0497

March 10, 1993

Mr. Albert Jaenike
Fromm Mayer Bass Inc.
P.O. Box 2889
Yakima, Washington 98907

Here is the formula for estimating the initial alpha-acid content from the HSI and the % alpha-acid content when analyzed.

$$HSI = \frac{A_{275}}{A_{325}}$$

$$\%\alpha - \text{acid Remaining} = 100 - 110 * \log\left(\frac{HSI}{0.25}\right)$$

For example, we just analyzed a Centennial sample with 7.8 % alpha and 0.433 HSI.

$$\%\alpha - \text{acid Remaining} = 100 - 110 * \log\left(\frac{0.433}{0.25}\right)$$

$$\%\alpha - \text{acid Remaining} = 100 - 110 * 0.239 = 73.76 = 73.8\%$$

Then we can say that 7.8 % alpha = 73.8% of the initial alpha-acids

$$\text{Initial alpha} - \text{acids} = \frac{7.8}{0.738} = (10.6)$$

* multiply by...

STROH

THE STROH BREWERY COMPANY
100 RIVER PLACE
DETROIT, MICHIGAN 48207-4291
(313) 446-2053

JOSEPH D. HERTRICH
VICE PRESIDENT
BREWING

February 12, 1992

Dr. Al Haunold
Oregon State University
Crop Science Department
Corvallis, Oregon 97331

Dear Dr. Haunold:

It was a pleasure to meet you during the recent HRC meeting in Portland and I look forward to our future association.

I am writing to confirm my comments to you on several ongoing projects.

1) Our primary interest is in aroma hops. We would like to see U.S. bred and grown aroma hops that represent all of the classical hop lines in the world. Obviously, this has been the thrust of your Hallertauer, Tettnanger and Saazer projects. We would like to see some Fuggle/Golding types worked on in the future since we have positive brewing experience with the Styrian variety, and we believe a more disease resistant alternative to Willamette will eventually be needed.

2) We do not believe that a high alpha aroma hop or a mid-range alpha aroma hop is a viable approach. We feel that when making lightly hopped American lagers, alpha levels become too restrictive a factor for hop application, and limit the other flavor characteristics of the hops. I believe this is the reason Perle is not widely accepted. As brewers, Stroh will not use Perle because the alpha levels are simply too high to apply it as a flavor hop. This comment must be considered in the context of lightly hopped American beers. It may not be a factor for micro or boutique brewers, or European brewers making an entirely different product.

3) We are interested in experimenting with some zero alpha hop material for a possible approach to light stable products. If the premise is valid, we would hop in the brew kettle with zero alpha hops to recover all hop flavor characteristics except bitterness, then add light stable reduced iso-alpha acids later in the process. I would like to test this premise in our pilot brewing unit if you have some material available. I would like to test two or three zero alpha varieties if you could provide 200 grams of each variety. If you could select and provide material, I would like to know what hop variety represents the most similar characteristics to the zero alpha variety. We would use this variety for the control brews. Since we are significant users of Cascades and consider them our primary aroma hop, my preference would always be for zero alpha hops with Cascade-like characteristics.

I look forward to hearing from you. Please contact me with any questions.

Sincerely,

JDH/ts

CC: M. C. Meilgaard

United States Department of Agriculture
Agricultural Research Service
Pacific West Area
Forage Seed & Cereal Res. Unit
Dept. Crop and Soil Science
Crop Science Building 451B
Oregon State University
Corvallis, Oregon 97331-3002
FAX: 503 737-1589

March 3, 1992.

Mr. Joseph D. Hertrich
Vice President, Brewing
The Stroh Brewery Co.
100 River Place
Detroit, MI 48207-4291

Dear Mr. Hertrich,

I was happy to finally meet you in person during last month's HRC meeting in Portland. Unfortunately, I came down with a bad ear infection right during our evening dinner. Thanks to antibiotics I am better now, but my hearing on the left ear still is not back to normal.

I was happy to hear that Stroh values aroma hops and particularly those grown in the US. I will try to address the specific points in your Feb. 12 letter in detail here.

1. Fuggle/Golding types. These are two different types of hops. Unfortunately, in Yugoslavia the term Styrian Goldings got established, but the Styrian hops are actually true Fuggles. We have finally cleaned up the old Fuggle from all viruses (assistance from Dr. Bob Klein, Prosser) and one of the Oregon growers will put a nursery into the ground this spring. If virus-free Fuggle indeed has a somewhat higher yield potential than the old Fuggle, there will be some commercial planting in the near future.

At this time I am not working on Goldings at all--there simply has not been any commercial interest in this type of hops. I have a number of Goldings in my collection--the first step would have to be virus cleanup.

2. I agree with your statement that a combination high alpha/aroma is not a viable approach. Perle is a nice aromatic hop but as you stated, the alpha level is simply too high. I have made contacts with Germany and hopefully I will get their newest releases Hallertauer Tradition, Spalter Select and Hallertauer Magnum for testing under our condions.

3. In addition to the zero alpha hop USDA 21120 I have other selections in my program which have even higher beta acids content and better cone types. I will get you small bale samples from the 1992 harvest (about 500 g each) for laboratory evaluation this fall. If the Cascade-type aroma is of value to you, I could make some crosses with a zero-alpha male and Cascade this summer. Please let me know.

It was a pleasure hearing from you and specifically I value your suggestions. If you have additional comments, please let me know.

Sincerely,

Al Haunold
Research Geneticist

HORTICULTURE RESEARCH INTERNATIONAL

WYE

Dr.Al Haunold
United States Department of Agriculture
Agricultural Research Service
Department of Crop Science
Oregon State University
Corvallis
Or 97331

4th. March 1992

Dear Al,

Last year, as part of my work on identifying hop varieties, I received samples of oil from hops of the 1990 crop grown in the U.S.A. Included were samples from Tettnang grown in Oregon and Washington and a sample from Fuggle grown in Oregon. I believe that you were involved in the selection of Tettnang for growing in America and therefore would be interested in the results of the glc analyses of these samples

I enclose copies of the chromatograms from three oil samples, which were composite samples from a number of growths. The three chromatograms were so similar that I concluded that they were all of the same variety.

Since then I have obtained samples of the 1991 crop Tettnang from America and Germany. We have Fuggle growing here which I have also used for comparison. All the chromatograms of U.S.A. Tettang (a total of 15 samples) are similar to chromatograms of Fuggle and not like those of German-grown Tettnang.

Both Fuggle and Tettnang have high farnesene contents. However the F/C ratio of Tettnang is usually much higher than that of Fuggle. Also Tettnang has a higher H/C ratio than Fuggle.

Tettnang grown in America has F/C and H/C ratios similar to Fuggle and not to Tettnang from Germany. Also, we have analysed for alpha- and beta-acids and the alpha:beta ratio is typical of Fuggle and not of Tettnang.

I enclose copies of the analytical data and would be very interested in any comments you may have.

With kind regards and best wishes,

Dr. C.P. Green (chemist)

United States Department of Agriculture
Agricultural Research Service
Pacific West Area
Forage Seed & Cereal Res. Unit
Dept. Crop and Soil Science
Crop Science Building 451B
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FAX: 503 737-1589

March 10, 1992.

Dr. C. P. Green
Chemist
Horticulture Research International
Dep. Hop Research Wye College,
Wye Ashford, Kent England TN 25 5 AH

Dear Colin,

I just received your letter and with a smile on my face I hasten to answer it right away.

First of all, you are mistaken in your belief that I had something to do with the selection of the socalled "US Tettnanger" now grown on fairly large acreage in both Oregon and Washington. We have also known for a long time that the US Tettnanger is similar if not identical to Fuggle and we have pointed that out repeatedly to the Hop Research Council at various meetings since at least 1988.

Let me give you some background: We have had a Tettnanger here since the early 1960's which originally came from the small hop growing area in Switzerland just across Lake Constance and we called it "Swiss Tettnanger" and gave it the USDA Accession Number 61021.It is identical in all respects to some other Tettnanger selections that I have in my germplasm collection and also identical in both soft resin composition, alpha/beta ratio and oil composition to Tettnanger from Germany.

When Chuck Zimmermann, our former USDA hop physiologist moved to Prosser, WA at his own request in 1970 he took a substantial amount of USDA hop germplasm with him to test under Washington conditions and also to start a hop cultivar evaluation and breeding program there. Among the genotypes was USDA 61021, the Swiss Tettnanger. At that time Cal Skotland (plant pathologist) was still using indicator plants for virus testing. 61021 was found to be infected with various viruses and Cal cleaned it up. The "virus-free" plants were then propagated and a 1-acre test plot was established at a commercial farm in the Yakima Valley (Martin Puterbaugh) about 1973. Yields were not exciting and after a few years the plot was removed.

Sometime in the late 1970's there was renewed interest in growing aroma hops in the Yakima Valley. Presumabley USDA 61021 was tested again for viruses (ELISA method) and cleaned up again. A new plot was established in the Yakima Valley. Several Oregon growers got starts from this plot and among them was Stauffer Farms new Hubbard Oregon. I saw the Oregon planting (about 5 acres) the first time in late 1979 (it was planted in 1978 and had produced the first crop in 1979). Plants looked very strong, large crowns--I couldn't believe that Tettnanger had made such good growth. Therefore I randomly sampled from 10 different (but obviously very strong) hills and grew these out in my seedless testing yard near Corvallis.

Dr. Green, page 2.

In order to avoid confusion we gave these selections a different USDA Accession number, namely 21197.

The following year, 1980, when we got the first cone samples it was immediately clear that we were not dealing with a Tettnanger. All indications pointed to a Fuggle, both the soft resins and the oil.

After a few more years we pointed that discrepancy out to the Hop Research Council. There was some discussion but the outcome was some admonishments to us (Gail Nickerson and myself)..."why do you care, if they buy it as a Tettnanger and like it... it shouldn't be any concern of yours". Of course you know that the buyer is Anheuser Busch and in 1991 a total of 2831 acres (577 in Oregon and 2254 in Washington, none in Idaho) was grown with a total production of 3,460100 lbs of baled hops.

Nobody knows whether all of these hops came from the same source and if there was a mixup, where it occurred. I rather suspect that some commercial fields may indeed be the real Tettnanger. In a commercial test that we ran for 4 years in Oregon and Washington, comparing 21197 with Tettnanger B (which I had received from Germany in 1987 and given the Accession number 21497) agronomic differences were also apparent since the two plots (about 3 acres of Tettnanger B) were growing side by side: reddish coloration on Tettnanger B stems versus green stems for 21197, differences in leaf color, lower yield potential of Tettnanger B (about 1½ bales/acre), some differences in cone type and of course the well known quality differences. There was no difference in maturity. Tettnanger B has since been removed since its yield was unsatisfactory.

I hope this background information is of value to you. I will be sending a copy of this and your letters to Gail Nickerson and will ask her to make additional comments. She may have specific comments on the oil chromatograms. If you would like oil samples from the 1991 crop please contact Gail directly.

BEst regards and good wishes for your work,

A. Haunold
Research Geneticist

Agricultural Chemistry Department
Bioanalytical Services/Hop Chemistry

Oregon State University
Weniger 339
Corvallis, Oregon 97331-6502
(503) 737-1807 FAX (503) 737-0497

March 12, 1992

Dr. Colin Green
Chemist
Horticulture Research International
Hop Research Department
Wye College
Near Ashford, Kent
ENGLAND TN 25 5 AH

Dear Colin,

As Dr Haunold wrote to you, we were aware that what was being sold as "US Tettnanger" is virtually identical to Fuggle. And what is worse, there is some 'Hallertau' that is being sold which also is indistinguishable from Fuggle. Al gave you his version of how the varieties could have become confused. I have another theory. In the 1970's we analyzed some imported varieties for Dr Romanko that were being grown in northern Idaho. The Tettnangers had the right H/F ratios, cohumulone and alpha/beta ratios. And the Hallertauer did not have farnesene! Anyway I think that in propagating and moving to different hop yards the most vigorous plants were increased without too much attention to where they came from. Unfortunately, nobody checked the chemical characteristics after the virus indexing and before propagation.

In 1984 I included a list of varieties with farnesene in the Hop Research Council annual report and again in 1988 I prepared a table of the varieties with farnesene ranked by the H/F ratio for the HRC report. There are two groups: one group has farnesene higher than caryophyllene and the other has caryophyllene higher than farnesene. Willamette, the triploid derived from Fuggle, has a slightly lower H/F ratio than Fuggle. Oregon Cascade usually has higher farnesene than caryophyllene, but the Washington Cascade is the opposite.

This past year we analyzed some Tettnang Tettnangers for a microbrewery and the results were interesting in that there were some samples that did not have the 'Tettnang' characteristics!

Sincerely,

Gail

Gail Nickerson
Chemist

also sent copies of
1984 HRC Report
pp. 108, 109, 119, 120

enc

Commercial Hop Genotypes with Farnesene

Ranked by Humulene/Farnesene Ratio

1975-1989 Averages of Analyses From USDA-OSU Germ Plasm Collection Except As Noted

Farnesene>Caryophyllene

Variety	% Alpha	% Beta	Alpha Ratio	CoH	% Myrcene	H/C	H/F	C/F
Tettnanger B (21497)	5.6	5.3	52	24	58.4	3.13	1.34	0.43
Tettnanger A (21496)	6.5	4.8	55	25	56.3	3.34	1.35	0.40
Spalter (21186)	5.4	4.4	53	23	46.4	3.35	1.42	0.42
Tettnanger (61021)	4.7	4.5	51	22	45.0	3.27	1.47	0.45
Tettnanger (21015)	4.5	3.7	55	24	39.0	3.37	1.68	0.50
Saazer (21077)	4.3	3.6	54	24	33.0	3.32	1.87	0.56
Cascade (56013)	6.2	5.0	55	36	67.5	2.75	1.98	0.72
Cascade (21092)	6.2	5.5	53	37	67.9	2.62	2.41	0.92

Caryophyllene>Farnesene

Variety	% Alpha	% Beta	Alpha Ratio	CoH	% Myrcene	H/C	H/F	C/F
Cascade* (1989 Wa Comm)	5.2	7.4	41	35	59.5	2.58	2.74	1.06
Willamette (21041)	6.2	3.7	63	34	45.6	3.00	4.67	1.56
Fuggle T4 (21003)	5.3	2.7	66	27	43.4	3.02	5.01	1.66
Tettnanger** (21197)	5.7	2.9	66	27	51.3	3.09	5.39	1.74
Fuggle N (21016)	5.8	3.1	65	26	43.4	2.99	5.84	1.95
Golding (61019)	5.5	2.9	65	26	43.4	2.96	5.96	2.01
Fuggle H (48209)	5.4	2.8	66	26	42.2	2.94	6.07	2.06
Fuggle (19209)	5.0	2.6	66	27	43.4	2.94	6.25	2.13
Golding (61020)	5.4	2.6	67	27	49.8	2.87	6.53	2.27

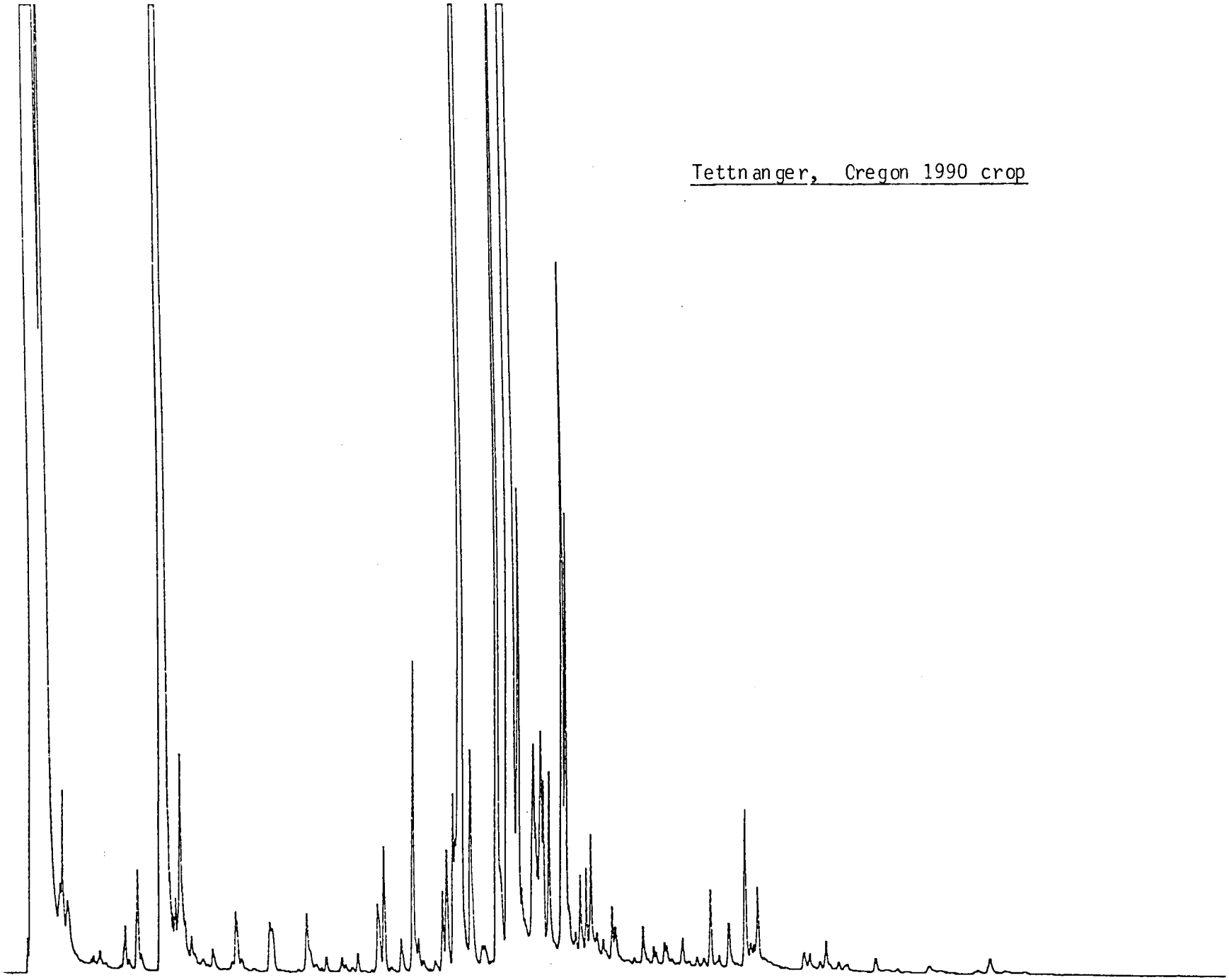
* Washington commercial hop yard

** Clone selected from Oregon commercial hop yard

1991Tettnang Tettnanger

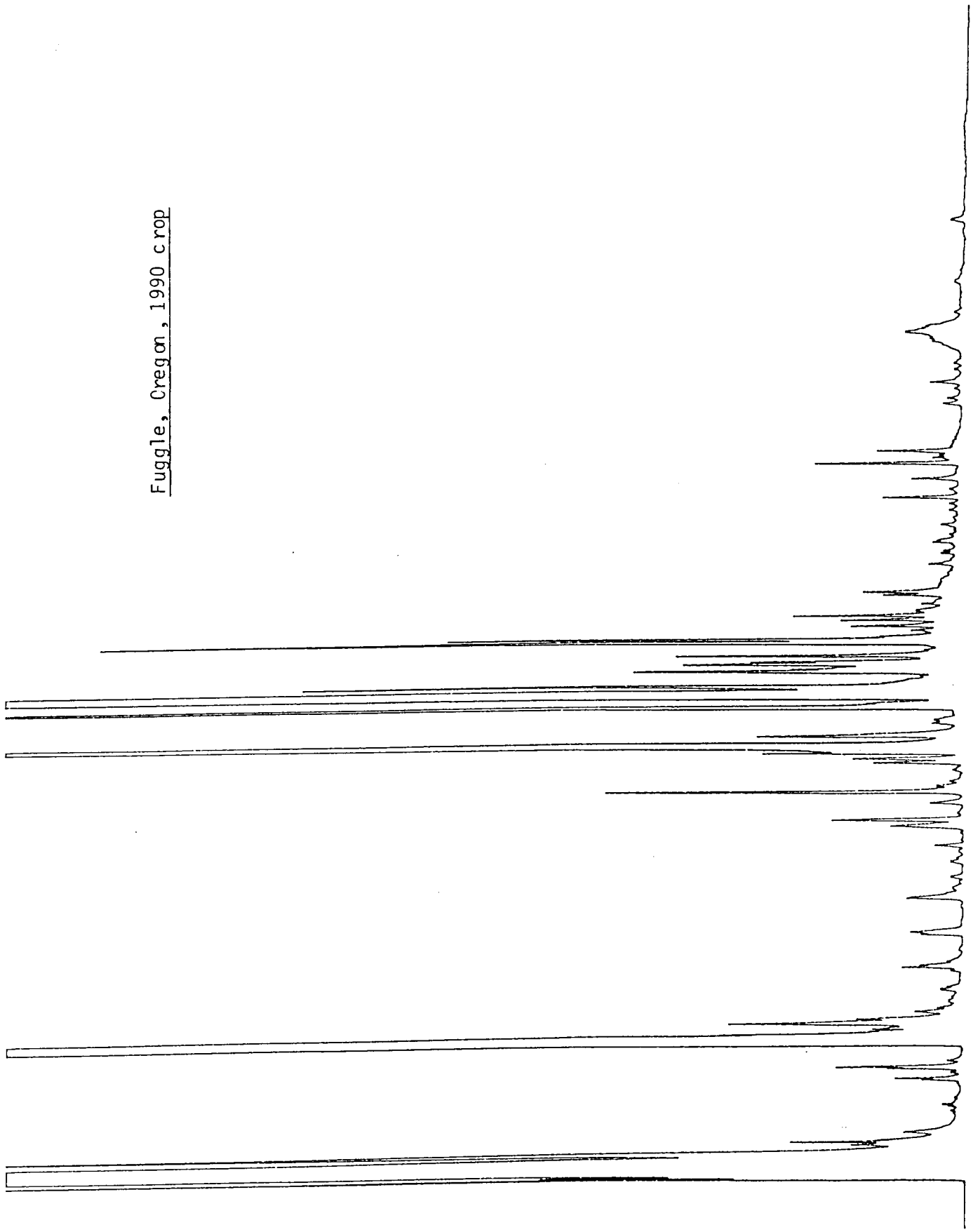
Spectrophotometric Analysis (Results on As Is Basis)

Lot Number	% Alpha	% Beta	Alpha Ratio a*100/a+b	Hop Storage Index	CoHumulone	Humulene / Caryophyllene	Humulene / Farnesene	Caryophyllene / Farnesene
1006	4.56	4.99	52	0.329	31	3.64	1.54	0.42
1008	3.68	4.62	44	0.310	30	3.66	1.27	0.35
1009	4.45	4.26	51	0.317	29	3.60	1.63	0.45
1010	5.87	4.59	56	0.297	28	3,59	1.68	0.47
2401	5.12	5.01	51	0.339	28	3.58	1.30	0.36
2402	5.60	4.66	56	0.341	28	3.06	6.78	2.22
2403	6.78	5.24	54	0.321	24	3.32	146.80	44.24
2405	5.36	4.62	56	0.307	27	3.44	1.82	0.53
2406	6.16	4.80	56	0.288	29	3.47	2.18	0.63
2407	5.57	4.41	56	0.287	28	3.56	1.38	0.39
2408	6.69	5.37	55	0.311	28	3.56	2.00	0.56
2409	4.54	4.74	49	0.344	25	3.30	25.12	7.60



08 TETTNANGER OREGON 1990

DATA SAVED TO BIN # 9



Fuggle, Oregon, 1990 crop

Alpha-acid and Beta-acid Analyses of USA Tettnanger, German Tettnanger, and English Fuggle

		LCV	alpha--acid (spectrophotometric)	beta--acid (spectrophotometric)	alpha :beta (spectrophotometric)	D.I.
Tettnang	Yakima 643	3.68	3.96	2.28	1.74	0.33
Tettnang	Yakima 641	3.97	4.21	2.53	1.66	0.32
Tettnang	Yakima 640	4.07	4.58	2.51	1.83	0.30
Tettnang	Yakima 644	3.65	3.88	2.06	1.89	0.35
Tettnang	Yakima 646	4.07	4.42	2.54	1.74	0.33
Tettnang	Yakima 645	3.81	4.16	2.30	1.81	0.31
Tettnang	USA	4.15	4.87	2.75	1.78	0.32
Tettnang	Hallertau 1	4.71	5.32	4.85	1.10	0.31
Tettnang	Hallertau 2	4.73	5.34	4.15	1.29	0.31
Tettnang	Hallertau 3	4.84	5.45	4.40	1.24	0.31
Tettnang	Tettnang 1	5.26	6.27	4.61	1.36	0.25
Tettnang	Tettnang 2	5.07	5.94	4.44	1.34	0.28
Tettnang	Tettnang 3	5.52	6.49	4.79	1.36	0.28
Tettnang	Tettnang	4.31	5.07	3.97	1.28	0.31
Fuggle N triangle 90		3.91	4.51	2.59	1.74	0.31
Fuggle N ng 90		4.29	5.12	2.42	2.12	0.29
Fuggle Nott 90		4.42	5.14	2.81	1.83	0.29
Fuggle 27/8/91		4.82	5.80	3.09	1.88	0.23
Fuggle 3/9/91		6.21	6.74	3.22	2.09	0.24
Fuggle 9/9/91		5.88	6.71	3.20	2.09	0.24
Fuggle 17/9/91		5.88	6.92	3.02	2.29	0.24
Fuggle 23/9/91		6.02	6.66	3.42	1.95	0.25
Fuggle ra25-7 91		6.74	7.88	3.47	2.27	0.26
Fuggle r12 h25-6		7.19	7.48	4.09	1.83	0.28

	M%	C%	F%	H%	S%
142 Tettnang Tettnanger	36.2	4.9	16.6	17.3	1.0
143 Tettnang Tettanger	38.2	4.9	16.1	17.5	1.0
144 Tettnang Tettnanger	35.4	6.5	12.2	22.7	0.8
169 Tettnang Tettanger	26.8	6.3	15.6	23.3	1.2
145 Hallertau Tettnanger	23.9	4.4	8.5	13.8	1.5
146 Hallertau Tettnanger	32.7	8.1	4.4	28.5	1.1
147 Hallertau Tettnanger	22.6	9.2	7.4	32.2	1.3
150 260 Wa Tettnanger	36.4	11.4	5.9	28.8	0.9
151 254 Wa Tettnanger	37.6	10.6	6.4	28.3	0.9
152 0250 Wa Tettnanger	41.5	10.3	7.5	26.4	1.1
153 257 Wa Tettnanger	42.3	10.2	5.5	25.7	0.8
154 677 Or Tettnanger	35.4	10.8	6.1	28.5	1.0
155 676 Or Tettnanger	34.5	10.5	6.7	28.7	1.0
388 Tettnang Or 90	24.5	12.6	6.4	34.2	2.8
395 Tettnang Wa 90	38.3	10.5	5.9	26.2	1.4
161 Tettnang Yakima 640	40.0	8.6	5.2	23.6	1.0
162 Tettnang Yakima 641	41.9	9.0	5.6	25.4	0.9
163 Tettnang Yakima 643	36.3	9.6	5.9	26.1	1.0
164 Tettnang Yakima 644	32.7	11.3	5.2	27.8	1.0
165 Tettnang Yakima 645	35.8	8.9	4.8	21.3	1.0
166 Tettnang Yakima 646	38.9	9.6	6.2	25.3	1.1
167 Tettnang usa	38.7	9.5	5.6	25.8	1.0
389 Fuggle Or 90	29.3	12.2	5.3	30.9	1.3
325 Fuggle N ra25-7 90	18.9	12.2	6.2	36.3	1.4
346 Fuggle Nott ra28-30 90	29.5	12.0	4.8	32.6	1.3
3 Fuggle 27 aug 91	10.3	11.7	10.2	38.9	1.3
11 Fuggle 3 sep 91	34.9	8.3	8.7	26.4	1.0
23 Fuggle 9 sep 91	39.4	7.8	7.1	29.1	0.7
38 Fuggle 17 sep 91	43.3	6.9	6.7	21.1	0.9
44 Fuggle 23 sep 91	44.1	6.4	7.3	20.0	0.6
31 Fuggle ra25-7 91	23.0	11.3	7.5	35.0	1.3

American hops (1992 crop) analyzed by the Czech Hop Research Institute at Zatec at the request of Hop Growers of America Inc. (raw hops).

procedure and instrumentation: Analytica EBC- 4th ed. 1987, Nr. 7.4.1 (HPLC method)
hop oil by steam distillation. Analysis by capillary gas chromatography with mass spectr. detection GC-MS, Varian 3400 + ITD 800 Finnigan (fused silica capillary column) stationary phase DB-5, 30 m length, i.d. 0.25 (Note from Gail B.N. DB-5 is a pesticide column, OK for MS, not so good for hops.

	Hop Variety (Crop 1992)							
	Aquila	Chinook	Cluster	Galena	Nugget	Willamette	Saaz	SAAZ
Growing Area	Yakima	Yakima	Yakima	Yakima	Yakima	Yakima	Saaz	SAAZ
Country	USA	USA	USA	USA	USA	USA	Czech Rep.	CZECH
Co-Humulone (%)	48.3	30.9	41.4	39.1	25.1	31.7	24.6	25.6
Co-Lupulone (%)	68.2	52.2	65.6	65.3	46.9	53	40.3	40.5
Total Oil (%)	1.02	1.13	0.42	0.96	0.97	0.74	0.51	0.51
Myrcene (%)	54.4	33.1	42.6	40.2	45.4	32.5	32.9	32.9
Caryophyllene (%)	5.9	12.1	9.8	6.8	10.1	14.7	7.3	7.3
Humulene (%)	0.7	19.8	21.5	14.4	23.4	29.6	25.9	25.9
Farnesene (%)	0.3	0	0	0	0.1	8.8	16.4	16.4
Beta-Selinene (%)	3.9	1.3	0.6	0.5	0.7	0.4	0.2	0.2
Alpha-Selinene (%)	4.8	1.9	0.9	0.7	0.8	0.5	0.3	0.3
Gamma-Cadinene (%)	0.2	2.8	0.5	3.1	0.6	1.2	0.9	0.9
Delta-Cadinene (%)	0.4	4.1	0.8	0.9	0.7	1.5	1.0	1.0
Selina-4,7-diene (%)	2.9	1.4	0	0	0	0.1	0	0
Selina-3,7-diene (%)	2.9	0.5	0	0	0.1	0.1	0	0

	Hop Variety (Crop 1992)							
	Cascade	Eroica	Mt.Hood	Tettnanger	Cluster	Liberty	Willamette	Saaz (Czechoslovakia)
Growing Area					Idaho	Oregon	Oregon	
Country	USA	USA	USA	USA	USA	USA	USA	
Co-Humulone (%)	32.5	41.6	22.4	28.5	41.5	24.9	32.1	25.6
Co-Lupulone (%)	47.8	66.3	40.7	46.6	64.8	40.3	51.9	40.5
Total Oil (%)	0.48	0.71	0.59	0.61	0.34	0.55	0.51	0.51
Myrcene (%)	52.2	45.3	35.1	35.3	41.1	23.1	35.1	32.9
Caryophyllene (%)	6.4	20.2	13.7	15	9	15.2	9.9	7.3
Humulene (%)	20.8	0.9	33.4	31.9	22.1	33.7	35	25.9
Farnesene (%)	5.7	0	0	5.3	0.1	0.3	3.9	16.4
Beta-Selinene (%)	0.8	3	0.2	0.2	0.5	0.5	0.3	0.2
Alpha-Selinene (%)	0.8	3.1	0.6	0.5	0.7	0.8	0.5	0.3
Gamma-Cadinene (%)	0.6	0.4	1.2	1.1	0.5	1.3	0.7	0.9
Delta-Cadinene (%)	0.8	0.2	1.8	1.5	0.8	2	1.1	1.0
Selina-4,7-diene (%)	0	0	0	0	0	0	0	0
Selina-3,7-diene (%)	0	0	0.2	0.1	0	0.2	0.1	0

1992: USDA Hop Research Reports and Plans.

Form AD-416 *****OFFICIAL PROJECT*****
Document Printed: 04/03/92 Date Modified: 07/26/91

1. Accession: 0144299 2-4. Agency ID: ARS 5358-05-00 5. Project Number: 5358-21000-008-00D 6. Status: A=ACTIVE
7. Title: HOP GENETICS, PRODUCTION, AND UTILIZATION; GERMPLASM IMPROVEMENT, EVALUATION, AND MAINTENANCE
8. Performing Organization: 0000 1185 AGRICULTURAL RESEARCH SERVICE CORVALLIS OREGON 97331 01

12. SY Time/Investigator(s) SY Total: 1.00
SY Time/Name SY Time/Name CORVALLIS, OR. SY Time/Name
1.00 HAUNOLD A

16. Research Location on Campus: YES Total Net to Loc: $210,630
17-1. Project Type: D=Appropriated 17-2. = FY: 92
21. Facilities: A = FEDERALLY OWNED Agreement No.:
22. Regional Project Number: A: - - B: - -
24. OBJECTIVES:
Develop high-yielding Tettnanger and Saazer-type aroma hops. Evaluate existing three-acre commercial Hallertauer-type aroma selections with eventual public release of one or more new cultivars. Release hop germplasm for public use. Use novel approach for hop beta acid utilization. Identify and characterize valuable hop aroma components.
25. APPROACH:
Use conventional and polyploidy breeding techniques, GC/MS spectrophotometric, and HPLC techniques. Grow and harvest hops commercially, obtain yield, quality, brewing and taste panel evaluation, increase planting stock for public release. Maintain USDA hop germplasm collection, obtain quality samples, provide planting stock to interested parties. Serve as curator for USDA hop germplasm. Use unique USDA germplasm developed in early 1970's, evaluate with cooperation from a commercial brewer, make chemically modified extracts, test in commercial brewing process. Use HPLC and GC/MS techniques, flavor panel, and sniff-port evaluation.
REPLACED: 5358-22000-001-00D (Accession # 0141065) which was renumbered to 5358-22000-002.
27. KEYWORDS:
HUMULUS LUPULUS QUALITY AROMA FLAVOR YIELD POLYPLOIDY BREWING HOP GERMPLASM

Recommended			Approved		Concurred	
Signature	A/D	Date	Signature		A/D	Date
RL: LLOYD F ELLIOTT	A	05/21/91	NPL1:	J. C. Theurer	A	07/24/91
LD:		00/00/00	NPL2:			00/00/00
AD: W. Ralph Nave	A	07/22/91	NPL3:			00/00/00
PAO: Larry Rolle	A	07/22/91	BPMS:			00/00/00
			ADA:	Howard J. Brooks	A	07/26/91

28. Award Date: 00/00/00 29. Start Date: 05/08/91 30. Termination Date: 04/30/96 Duration: (months) 060

Form AD-417 Document Printed 04/03/92 *****OFFICIAL PROJECT*****

1. Accession:	2-4. Mode Code:	5. Project Number:	Date Last Modified:
0144299	ARS 5358-05-00	5358-21000-008-00D	07/26/91

				Net to Location
STP(s)	2.1.2.4	Plant Gene Expression	50%	105,315
	2.1.2.5	Plant Germplasm Evaluation	50%	105,315
		Total Net to Location:		$210,630

32.	Basic Research:	20%	42,126
33.	Applied Research:	80%	168,504
34.	Development Effort:	0%	0
		Total Net to Location:	$210,630

	Prime Commodity	Codes Activity	Research Problem Area Code	Field of Science Code	Prime %	Net to Location
36.	2800	4500	207	0512	10	21,063
37.	2800	4600	208	0512	30	63,189
38.	2800	5000	307	0512	50	105,315
39.	2800	5100	405	0512	10	21,063
				Total Net to Location:		$210,630

SubClass.	Codes	Description	%	Net to Location
Commodity	2831	HOPS	100	210,630
			Total Net to Location:	$210,630
Activity	4584	HOST-PLANT INTERACTIONS	10	21,063
Activity	4612	NON-GENETIC DISEASE CNTRL	10	21,063
Activity	4615	BREED DISEASE RESIST PLNT	20	42,126
Activity	5011	IMPR BREEDS & VARIET	50	105,315
Activity	5100	CONSUMER ACCEPT PRODUCTS	10	21,063
			Total Net to Location:	$210,630
Special	PST2	NONPESTICIDAL CONTROL	20	42,126
Special	SAGP	GERMPLASM	20	42,126

* Note: Rounding may cause minor differences in calculated value compared to the actual Net to Location.

Agricultural Research Service
Research Management Information System
ARS Project System
04/03/92

Executive Summary Sheet

For ARS Project No. 5358-21000-008-00D
Accession Number 0144299
Mode Code 5358-05-00

NPL Team:
Leader: Howard J. Brooks

Appropriated

HOP GENETICS, PRODUCTION, AND UTILIZATION;
GERMPLASM IMPROVEMENT, EVALUATION, AND MAINTENANCE

PACIFIC WEST AREA
CORVALLIS, OREGON
FORAGE SEED AND CEREAL RESEARCH

Project Status: ACTIVE Start: 05/08/91 Term: 04/30/96

Current Official Funding Levels:

Net to Location:	Permanent	Temporary
FY 91	$ 204,448	$ -76,304
FY 92	$ 210,630	$ 0

****** Official Strategic Plan Codes ******

2.1.2.4	50%
2.1.2.5	50%

Reason Project was Initiated: Normal Progression

Remarks:
Request EOT; approved project statement on file in the Area office, peer review requirements have been met.

APPROVED:

Area Director: on 07/22/91 by W. Ralph Nave
Assoc Depty Admin: on 07/26/91 by Howard J. Brooks

Created: on 03/26/91 By J91
Last Modified: on 07/26/91 By MBG

U.S. DEPARTMENT OF AGRICULTURE
RESEARCH WORK UNIT/PROJECT DESCRIPTION - RESEARCH RESUME
U.S. DEPT. OF AGRICULTURE, STATE AGRICULTURAL EXPERIMENT STATIONS AND OTHER INSTITUTIONS

DATE (Day, Month, Year): 01 JUL 92

AMENDMENT: ☐

1. ACCESSION NO.: 0025152

AGENCY IDENTIFICATION NO.: 2. CSRS 3. CR 4. 0000

5. WORK UNIT/PROJECT NO.: CR00036

6. STATUS: New A ☐ Extended B ☐ Revised C ☒ Terminated E ☐ Pending F ☐

7. TITLE

BREEDING, GENETICS, PATHOLOGY, CHEMISTRY, AND CULTURE OF HOPS

8. PERFORMING ORGANIZATION

AGRIC. EXPERIMENT STATION
OREGON STATE UNIVERSITY

CITY	STATE/COUNTRY	ZIP CODE	CONG. DISTRICT
CORVALLIS	OR USA	97331	5

13. RESPONSIBLE ORGANIZATION

OREGON AGRICULTURAL EXPERIMENT STATION
OREGON STATE UNIVERSITY

CITY	14. STATE	ZIP CODE
CORVALLIS	OR	97331-3002

12. INVESTIGATOR NAME(S) (Last name & initials)

1 Haunold, A.
2 Nickerson, G.B.
3
4
5
6

15. RESPONSIBLE INDIVIDUAL (Last name & initials): T. R. DUTSON

16. RESEARCH LOCATION ON CAMPUS? A ☒ Yes B ☐ No

PROJECT TYPE

17-1. FOR USDA USE: A ☐ Contract B ☐ Grant C ☐ Coop. Agmt. D ☐ In-house

17-2. FOR USDA USE: Contr./Gr./Agmt. with SAES A ☐ Other B ☐

18-1. FOR STATE USE: 1890/T T ☐ SP GR G ☐ RD V R ☐ CRGO C ☐ Alcohol Ind I ☐ SBRG B ☐ Hatch H ☒ M-S M ☐ State S ☐ AH A ☐ Native Latex L ☐

CONTRACTS, GRANTS & COOPERATIVE AGREEMENTS

18-4. CONTR./GR./AGMT./NO.

19-1. FACE AMOUNT

18-5. FOR STATE USE: ARS A ☐ ERS B ☐ FS C ☐ ACS D ☐ SRS E ☐

19-2. TOTAL SYS.

20. FY

21. FACILITIES: A ☐ Federally-owned B ☐ Federally-leased C ☐ Combined D ☒ State E ☐ Other

22.-23. REGIONAL PROJECT NO.

24. OBJECTIVES 25. APPROACH (Use space needed for "24. OBJECTIVES", then indicate "25. APPROACH".)

24. Develop high-yielding Tettnanger and Saazer-type aroma hops. Evaluate existing three-acre commercial Hallertauer-type selections with eventual public release of an additional cultivar to supplement recently released Mt. Hood and Liberty. Release hop germplasm and triploid male pollinators for public use. Use novel approach for hop beta acid utilization. Provide certified hop analyses on behalf of the State of Oregon. Identify and characterize valuable hop aroma components.

25. Use conventional and polyploidy breeding techniques, GC/MS spectrometry and HPLC. Grow and harvest hops commercially, obtain yield, quality, brewing and taste panel evaluation, increase planting stock for public release. Maintain USDA hop germplasm collection, provide planting stock to interested parties. Serve as curator of USDA hop germplasm. Evaluate native North American hops for insect resistance. Evaluate, increase, and distribute sterile triploid male pollinators to Oregon growers to replace diploid males. Maintain well equipped and staffed hop chemistry laboratory.

27. KEYWORDS

HUMULUS, LUPULUS, QUALITY, AROMA, FLAVOR, YIELD, POLYPLOID, BREWING, INSECT RESISTANCE, TRIPLOID, MALE, BREEDING, WEED CONTROL

RECOMMENDED			APPROVED — Check applicable one — CONCURRED		
SIGNATURE	TITLE	DATE	SIGNATURE	TITLE	DATE
	Professor (cont)	6/12-92			

28. AWARD DATE (Day, Mo., Yr.)

29. START DATE (Day, Mo., Yr.)

30. TERMINATION (Day, Mo., Yr.)

DURATION (Months)

FOR USDA USE

☐ Project referred and cleared by all interested agencies for entry into CRIS.

SIGNATURE

DATE

FORM AD-416 (5/83)

U.S. DEPARTMENT OF AGRICULTURE

RESEARCH WORK UNIT/PROJECT DESCRIPTION-CLASSIFICATION OF RESEARCH

U.S. DEPT. OF AGRICULTURE, STATE AGRICULTURAL EXPERIMENT STATION AND OTHER INSTITUTIONS

DATE (Day, Month, Year): 01 JUL 92

169a

1. ACCESSION NO.	AGENCY IDENTIFICATION NO.	5. WORK UNIT/PROJECT NO.	31. HATCH MARKETING
0025152	2. CSRS 3. OR 4. HATCH	ORE00036	☐ Yes ☐ No %

32. BASIC RESEARCH	33. APPLIED RESEARCH	34. DEVELOPMENT EFFORT	35. FORESTRY
50 %	50 %	%	%

CLASSIFICATION BY ACTIVITY, COMMODITY, SCIENCE, AND RESEARCH PROBLEM AREA

	ACTIVITY		COMMODITY		SCIENCE		RESEARCH PROBLEM AREA	PRODUCT OF (2) X (4) X (6)
	CODE (1)	% (2)	CODE (3)	% (4)	CODE (5)	% (6)	CODE (7)	% (8)
36.	4500	10	2830	100	0412	100	207	10
37.	4600	30	2830	100	1112	40	208	12
38.	4600	30	2830	100	0512	60	208	18
39.	5000	50	2830	100	0512	100	307	50
40.	5100	10	2830	100	1524	100	405	10
41.								
42.								
43.								
44.								
45.								
46.								
47.								

SPECIAL CLASSIFICATION

Fields 48-77 are used to identify special areas of research such as Pollution, Health and Medical, Tobacco-Health, Weather, Nuclear Radiation, Poverty, Natural Beauty, Sub-Commodities, Pesticide Targets, Water Resources, Energy, Home Economics, Sub-Activities (SEA/AR) and Special Research Programs (SEA/AR). Refer to your agency manual for specific codes and instructions.

CODE	%	CODE	%	CODE	%	CODE	%	CODE	%
48. C2830	100	54.		60.		66.		72.	
49. PST2	20	55.		61.		67.		73.	
50.		56.		62.		68.		74.	
51.		57.		63.		69.		75.	
52.		58.		64.		70.		76.	
53.		59.		65.		71.		77.	

79. COOPERATORS

A ☒ USDA B ☐ Other Federal Agencies C ☒ Industry and other D ☐ State

COOPERATING DEPARTMENTS WITHIN STATE PERFORMING INSTITUTION

80.

81.

82.

83. REPORTING DEPARTMENT WITHIN STATE PERFORMING INSTITUTION

Agricultural Experiment Station
Department of Crop and Soil Science

AD FORM 417

USDA CRIS Report (Hops, Corvallis)-- 1992

Haunold

PAGE: 2 12/17/92

ANNUAL RESEARCH PROGRESS REPORT
Report of Progress (AD-421)

Accession: 0144299 Year: 92 Project Number: 5358-21000-008-00 D
Mode Code: 5358-05-00 STP Codes: 2.1.2.4 50% 2.1.2.5 50%

Title: HOP GENETICS, PRODUCTION, AND UTILIZATION;
GERMPLASM IMPROVEMENT, EVALUATION, AND MAINTENANCE

Period Covered From: 01/92 To: 12/92

Progress Report

Seven promising Tettnanger-type female triploid selections (USDA 21660 to 21666) were increased for potential off-station tests in 1993. USDA 21484 (sponsored by the Hop Research Council) and USDA 21459 and 21490 (outside sponsorship) were harvested from 3-acre, off-station plots for expanded brewing trials. The special aroma hop USDA 21120 was harvested from two Oregon off-station plots for specialized processing and brewing trials. USDA 21491 was discarded. About 3000 propagules of 47 early flowering triploid male genotypes were distributed to growers as yield stimulators. Native North American hops were evaluated and a manuscript was prepared. About 500 Saazer-derived female aroma hops were evaluated as single nursery plants. About 1000 female and 400 male genotypes were evaluated for chemical quality characteristics. Off-station plots were monitored for plant development and optimum harvest dates. A new 4-acre hop yard was established for hop germplasm evaluation, maintenance, and distribution. Blue Northern Brewer, an attractive ornamental hop, was released to the public.

Publications:

01. 01. HAUNOLD, A., NICKERSON, G.B., GAMPERT, U. and WHITNEY, P.A. 1992. Registration of Liberty hop. Crop Sci. 32:1071.

Approved: LLOYD F ELLIOTT Date: 12/92
Title: RESEARCH LEADER

UNOFFICIAL

Oregon State University, CRIS Report, Corvallis, 1992 (hops)

U.S. DEPARTMENT OF AGRICULTURE, STATE AGRICULTURAL EXPERIMENT STATIONS & OTHER INSTITUTIONS
***** PROGRESS REPORT ***** FACSIMILE AD-421 ***** DATE (day, mo, yr): 30 OCT 92

1. ACCESSION NO: 0025152 2. ID NO: CSRS TYPE GRANT NO: HATCH
3. STATION CODE: ORE 4. ID NO: 0000 REGIONAL RESEARCH NO:
5. PROJECT NO: ORE00036
7. TITLE: BREEDING, GENETICS, PATHOLOGY, CHEMISTRY, AND CULTURE OF HOPS

8. PERFORMING ORGANIZATION
CROP & SOIL SCIENCE
AGRICULTURAL EXPER. STATION
OREGON STATE UNIV
CORVALLIS
OREGON 97331

12. INVESTIGATOR NAME(S):
HAUNOLD A
NICKERSON G B

6. ☐ CHECK IF TERMINATION REPORT
30. ESTIMATED TERMINATION DATE: 30 JUN 97
84. PERIOD COVERED (mo, yr);
85. PROGRESS:
At the January 1992 meeting of the Hop Research Council, 7 triploid selections (USDA Nrs. 21660 to 21666) were identified for potential offstation tests in 1993. The selections were increased in field nursery rows during the 1992 season. The triploid aroma selections USDA 21484, 21459, and 21490 were harvested from 3-acre offstation plots and 21491 was discarded. The special aroma hop USDA 21120 of interest to Miller Brewing Co., harvested from 2 Oregon offstation plots, produced 52 bales (9118 lbs total). About 3,000 propagules of early to medium early flowering triploid males were distributed to Oregon growers for use as yield stimulators. A nursery to produce additional planting stock of triploid males was established. Native North American hops were evaluated and a manuscript was prepared. About 500 Saazer-derived female aroma hops were evaluated as single nursery plants. About 1000 female and 400 male genotypes were evaluated for chemical quality traits. Off-station plots were monitored for plant development and optimum harvest dates. A new 4-acre hop yard was established for hop germplasm evaluation, maintenance, and distribution. Blue Northern Brewer, an attractive ornamental hop, was released to the public.

DISCLOSURE OF PATENTS/INVENTIONS
PATENT/APPLICATION NO: none ISSUE FILING DATE:

87. PUBLICATIONS

Haunold, A. Nickerson, G.B., Gampert, U. and Whitney, P.A. 1992. Registration of Liberty hop. Crop Science 32: 1071.

WORK UNIT/PROJECT NO. OR00036
RESEARCH PROJECT OUTLINE
OREGON AGRICULTURAL EXPERIMENT STATION

Title: Breeding, Genetics, Pathology, Chemistry, and Culture of Hops.

Personnel and Departments:
Project Leader: Alfred Haunold, Department of Crop and Soil Science and USDA/ARS.
Cooperators:
Gail B. Nickerson, Agricultural Chemistry
Max L. Deinzer, Agricultural Chemistry
Ian J. Tinsley, Agricultural Chemistry
Stephen T. Kenny, WSU Prosser, WA, Agronomy, Physiology
Robert E. Klein, WSU Prosser, Plant Pathology
Keith W. Dorschner, University of Idaho, Parma, Entomology
David A. Anderson, Western Biochemical Consulting, Beaverton, Oregon, Weed and Pest Control

Date: Revised July 1, 1992

Duration: 5 years

Introduction

Significant changes have occurred in the Oregon and U.S. hop industry since the last revision of this project in 1987. The Hop Marketing Order, which had at least indirectly controlled production and acreage during the past 20 years, was canceled at the end of 1986. Thus, any grower was free to plant and sell any hops he wanted beginning with the 1987 crop year. The effect on acreage expansion in Oregon and other hop producing states was minimal, since hops are sold on future contracts and brewers had purchased everything they needed at least for two or more years in advance.

The shift of hop varieties, particularly to higher alpha types, which was initiated in the early 1980's, continued unabated. Today the new superalpha hops, primarily Galena and Nugget, account for over one third of all hops grown in the United States.

The expansion of superalpha hops, and particularly Nugget, in Oregon was less dramatic, but significant nevertheless. Of the nearly 7200 acres grown in the state in 1991, 1695 acres or nearly one third were Nugget and 99 acres were Galena. Eroica, the

third significant superalpha hop, was discontinued following a similar decline in the other two U.S. hop producing states.

In the aroma sector, the expansion of Willamette continued the trend of the previous five years. In 1991, 3590 acres of Willamette, representing 50% of the total Oregon hop acreage, were grown in the state. Despite its early maturity and attractive brewing characteristics, Fuggle continued its decline and represented only slightly less than 7% (487 acres) of the total 1991 Oregon hop acreage. However, a Tettnanger type (in quality similar to Fuggle and also early in maturity) has now taken up much of the lost Fuggle acreage (577 acres in 1991). This hop originated from a 1961 USDA introduction of Tettnanger (USDA 61021, called Swiss Tettnanger), which was cleaned from viruses and originally expanded in Washington in the late 1970's. During the past decade it expanded into Oregon and has shown a yield potential similar to or somewhat higher than that of Fuggle.

Despite the attractiveness of superalpha hops to certain brewers and particularly to hop processors, several successful large brewers use only aroma hops. Willamette and the previously mentioned US-grown Tettnanger have now captured a significant portion of the US aroma hop market, which heretofore was almost exclusively the domain of European imports (Germany, Czechoslovakia, Yugoslavia).

Cascade, the first US-developed aroma hop (released in 1971) unfortunately did not fulfill the optimistic expectations of earlier years. Acreage expanded dramatically at first and reached a high of 6349 acres (15% of US hop acreage) in 1981. Aroma users have now largely replaced Cascade with Willamette in their hopping blends. No Cascade was grown in Oregon in 1991, but 1240 acres were produced in Washington, largely for specialty users and exports.

The USDA-ARS Hop Research project is regional in nature, serving the entire US hop industry including the states of Washington and Idaho in addition to Oregon. Since this project is a State project, some of the wording is deliberately targeted to "Oregon growers". This should not be construed to mean Washington or Idaho are excluded. Quite the contrary, most of the new cultivars developed during the past 25 years under projects preceding the present one are now grown in larger acreages outside of Oregon and particularly in the Yakima Valley of Washington.

Major Accomplishments During the Past Five Years

The Hallertauer mittelfrüh aroma breeding program initiated in 1983 culminated with the successful release of Mt. Hood (1989) and Liberty (1991). Mt. Hood is now grown on nearly 1000 acres, largely in Washington. The 47 acres of Mt. Hood grown in Oregon in 1991 averaged over 1,500 lbs/acre, significantly higher than Fuggle or Tettnanger and slightly higher than Willamette. Liberty is still in semi-experimental field trials, but acreage expansion is expected to occur in the near future.

Perle, a German higher-alpha aroma hop introduced by USDA/ARS in 1980 began a slow but steady acreage expansion in the mid-1980's. It is now grown on about 1000 acres. It is a diploid, and some concern has been expressed about the seed content of Oregon-grown Perle, despite the above average alpha acids content and attractive aroma.

A pollinator composite of 10 early flowering triploid males as yield stimulators was released to Oregon growers in 1990. Triploid males (3-6 per acre) are now being used in diploid yards such as Perle, Fuggle, and Tettnanger to produce higher yields without undesirably high seed content. Additional triploid males from the Hallertauer polyploid breeding program have now been identified and released to Oregon growers.

Aliette, a systemic fungicide for downy mildew control was evaluated in commercial Oregon hop yards through the cooperation of Western Biochemical Resources Inc. Efficacy and residue data have been obtained and a section 18 exemption for use in commercial Oregon hop yards has been obtained for the past two years.

The hop chemist (33% USDA funding) continues to provide official certified hop quality analyses to the State of Oregon. The chemistry laboratory is also frequently requested to provide official analyses of hop quality for public and commercial clients in the United States and abroad on a contract basis. No other facility like it exists anywhere in the State of Oregon.

Publications

During the previous project cycle (1987-92) the project produced 20 publications. They included 14 journal articles, 4 abstracts, and 2 book chapters.

Future Goals

The brewing industry is extremely conservative. For well over 100 years many brewers have become accustomed to European aroma types such as Fuggle, Hallertauer mittelfrüh, Tettnanger, and Saazer. Willamette has now largely replaced Fuggle with satisfactory results. Mt. Hood will at least partially satisfy the demands for additional Hallertauer mittelfrüh aroma types. However, no Saazer or Tettnanger replacements are available. Therefore, a second aroma breeding program, initially involving Tettnanger types, was initiated in 1986, followed by a Saazer-type program in 1990. Work during the next five-year project cycle will largely concentrate on Tettnanger- and Saazer-type aroma hops. The hop chemistry laboratory will continue to provide official certified hop quality analyses to Oregon growers. (The Washington State Hop Laboratory in Yakima provides this service to Washington and Idaho growers.)

Background Information for Project Objectives During 1992-96

a) USDA Funding for Hop Research:

For the past 20 years there has essentially been no funding increase for USDA hop research. Furthermore, some funds initially budgeted for Oregon were shifted to Prosser, WA under a USDA-WSU cooperative agreement, with the hop research geneticist at Corvallis serving as ADODR (authorized departmental officer's designated representative). A hop germplasm backup nursery is now being maintained at Prosser. The Prosser cooperative funds probably came in part from elimination of the USDA hop chemistry position and reduction of hop breeding/genetics support at Oregon State University. The state chemist position (OSU Ag Chemistry), however, was strengthened somewhat by increased USDA funding of one third of the chemist's salary obligation.

The USDA geneticist at Corvallis was appointed curator of hop germplasm and charged with maintenance, exchange,evaluation, and distribution, following establishment of the USDA Northwest Clonal Germplasm Repository at Corvallis. There was, however, no increase in funding. USDA hop breeding and genetics research at Corvallis continued uninterrupted. A large portion of current operating funds and all support personnel costs are now covered by industry grants.

b) Cooperative Research

An excellent working relationship has been established between the USDA hop geneticist and the state hop pathologist at Prosser, WA. Hop pesticide and herbicide research is now being conducted on a contract basis between the Oregon Hop Commission and Western Biochemical Consulting of Beaverton, Oregon, with USDA acting as a project coordinator.

Hop pesticide residue research has been expanded both at Oregon State and Washington State, largely with industry funds. The OSU/USDA hop research project at Corvallis actively cooperates with all phases of pesticide residue research as various needs arise. This relationship has been expanded during the past few years for the mutual benefit of the US hop industry as well as the hop growing industry in the State of Oregon.

A cooperative research effort with the hop entomologist at Parma, ID has been initiated to identify genetic sources of insect resistance in native North American hops.

c) European Noble Aroma Hops:

Hallertauer mittelfrüh types

Following the release of the two triploids Mt. Hood (1989) and Liberty (1991) from the Hallertauer mittelfrüh aroma breeding research during the past five-year project cycle, the US hop industry, and Oregon growers particularly, now have two alternatives for growing aroma hops that can compete well with imports. For various reasons, partially because of previous forward contracting with existing varieties, Oregon growers have not participated in the acreage expansion of Mt. Hood. Liberty is now entering expanded brewing trials, and future acreage expansion is likely.

An additional Hallertauer-type aroma hop, USDA 21484, is now in preliminary field trials in the three hop-producing states. Initial feedback from brewers has been positive. If this trend continues, a third Hallertauer-mittelfrüh-type aroma hop may be released during the next project cycle.

Tettnanger-type aroma hops

Crosses between diploid Tettnanger (Swiss Tettnanger, USDA 61021) and selected tetraploid aroma males made in 1988 produced a significant number of triploid offspring. During the past three years sixteen selections were identified as having

commercial potential. Seven of these are now scheduled for preliminary increase with possible field trials starting in 1993. These selections have an aroma/quality profile similar to German Tettnanger, with higher yield potential under Oregon conditions. They are triploids and, therefore, naturally seedless.

Saazer-type aroma hops

Saazer-type hops (grown primarily in Czechoslovakia) are perceived to be significantly different in brewing performance from other aroma hops being used worldwide. Due to their low yields, Saazer hops have been relatively scarce on world hop markets, resulting in relatively high prices and customers concerned about future supplies.

Crosses between tetraploid Saazer and selected diploid aroma-type males, diploid Saazer and selected tetraploid aroma males, and diploid Saazer and diploid aroma males produced nearly 1000 seedlings in 1991, which will produce the first crop in 1992. A large number of tetraploid x diploid seedlings checked cytologically thus far are triploids. Cone samples obtained from about 80 triploids in their seedling year confirmed the desired Saazer-type aroma and quality profile. Substantial efforts during the next five-year project cycle will be devoted to Saazer-type aroma hops.

d) Virusfree Fuggle

Through the cooperation of Dr. Robert Klein, plant pathologist at WSU, Prosser, Washington, a virusfree Fuggle was obtained in August 1991. Plants were increased in the greenhouse during the summer, and a field nursery is planned for 1992 to provide Oregon growers with virusfree Fuggle planting stock. Based on previous experience, virusfree hops have higher yield and quality potential as compared to virus infected planting stock.

e) Triploid Male Hops for Yield Stimulation

Oregon is the only significant hop producing area in the world where seeded hops are produced. The brewing industry as well as the hop trade and the processing industry dislike seeded hops for various reasons. In recent years, Oregon growers have occasionally been forced to accept price discounts due to excessively high seed content in diploid hops such as Fuggle, Tettnanger, and Perle. In future sale contracts with Oregon growers, acceptable seed content has been reduced significantly.

Triploid hops, such as Willamette, Mt. Hood, or Liberty, are naturally seedless and pose no problem. Diploid hops often produce in excess of 10% seeds by weight, even when only a few fertile diploid males are planted in the yards. Hop growers like to use males for yield stimulation from pollination which can sometimes increase yields by 25% or more.

It was found some years ago that triploid nearly sterile males can give a similar stimulation to cone size and cone weight without producing unwanted seeds. Although the yield increase is less than that produced by diploid males, due to the absence of seeds, several Oregon growers have successfully experimented with triploid males provided by the USDA hop research project during the past decade.

A concerted effort, spearheaded by the Oregon Hop Commission, has now been implemented to assist Oregon growers in replacing diploid males with triploids for yield stimulation. Nearly 3000 rhizomes of various triploid males were distributed to Oregon growers in the spring of 1992 for field planting. A triploid male root nursery has now been planted at the OSU/USDA experimental farm for production of additional triploid males for the 1993 season.

f) Wild American Hops

Native North American hops are found in various parts of the United States and Canada, particularly in the upper Midwest and the Rocky Mountain region. These hops are fully cross-compatible with European-type hops but have a different aroma and quality profile. The high-alpha genes, successfully introduced from wild Canadian hops to European hops in the 1920's are largely responsible for the success of the superalpha hops Galena, Nugget, and Eroica in the United States, Magnum in Germany, as well as Bullion and Brewer's Gold, the progenitors of superalpha hops.

There are indications that native North American hops carry genetic traits for aphid- and/or mite resistance. A program to evaluate native North American hops for agronomic, disease, and quality characteristics as well as pest resistance was started about three years ago, largely funded by industry grants. This work, now in its fourth year, will require at least two additional years for completion.

Two large nurseries (700 and 3000 plants each) from seed collections in the native habitat are now established at the OSU East Farm. Other native North American hops collected in 1959 and 1960 are now established in four-hill plots at the OSU East Farm.

g) Special Aroma Hops With Low Alpha/High Beta Acids Content

A cross made in 1970 produced interesting offspring with relatively high beta- but virtually no alpha acids content. With the cooperation of Miller Brewing Corp., this novel hop has now advanced to semi-commercial use for special aroma blends involving chemical modification of the beta acids content. One selection, USDA 21120 is now grown on about 10 acres in Oregon, but it has not yet been released for general production.

Crosses between selected low alpha/high beta parents made in 1988 yielded additional low-alpha special aroma selections which may be agronomically superior to USDA 21120. These selections are scheduled for expanded field evaluation during the next project cycle.

Proposed Research Program 1992-96

1. Continue evaluation of off-station test plot USDA 21484 (Hallertauer mittelfrüh quality profile).
2. Develop Tettnanger- and Saazer-type triploid aroma hops from material currently established at the OSU East Farm in nursery and preliminary yield plots.
3. Evaluate, increase, and distribute sterile triploid male pollinators to Oregon growers to replace diploid males in order to produce a seedless crop in future years.
4. Cooperate with interested brewers to develop high-beta special aroma hops.
5. Cooperate with the Department of Agricultural Chemistry, OSU, and Dr. Dorschner at Parma, Idaho, in evaluating native North American hops for aphid and/or mite resistance.
6. Continue as curator of hop germplasm under the USDA National Plant Germplasm System. Upgrade the USDA Hop Germplasm Collection, complete the detailed hop genotype description for the national GRIN (Germplasm Resources

Information Network) system, and maintain contacts and germplasm exchange activities with hop breeders, geneticists, and research workers worldwide.

7. Cooperate with the Oregon Hop Commission, Western Biochemical Consulting, and the Department of Agricultural Chemistry to develop, evaluate, and monitor new and established herbicides and pesticides for the benefits of the Oregon hop industry. (State scientists in Washington and Idaho provide a similar service to their growers.)
8. Continue to provide official Certified Hop Quality Analyses to Oregon growers and industry clients worldwide.

Procedure

1. Continue to monitor the performance of Mt. Hood and Liberty in Oregon commercial plantings as well as the experimental 3-acre plot of USDA 21484 in cooperation with the Hop Research Council.
2. Establish selected Tettnanger-types in commercial plots in Oregon in cooperation with the Hop Research Council. Evaluate promising triploid Saazer-type selections from the current nursery and work toward establishing one or more field trials during the next project cycle.
3. Increase planting stock of triploid male yield stimulators in cooperation with the Oregon Hop Commission.
4. Monitor the performance of USDA 21120 in two large Oregon off-station plots. Develop additional zero alpha/high beta hops as a backup to USDA 21120.
5. Monitor quality performance of the USDA male and female hop germplasm collection and establish a sound data base covering several years. Evaluate experimental hops for soft resin and aroma constituents, including storage stability and performance in pilot brewing tests.
6. Monitor the virus status of hop germplasm, experimental genotypes, existing cultivars, and new hops obtained through germplasm exchange from abroad.
7. Continue as hop germplasm curator for the U.S. Department of Agriculture, distribute limited quantities of hop germplasm to members of the public or arrange contacts for obtaining hop planting stock when required. Upgrade the USDA Hop Germplasm Collection by adding new genotypes selected from

segregating breeding populations. Continue detailed genotype description and enter data into the National GRIN network.

8. Maintain a well equipped hop chemistry laboratory at Oregon State University in cooperation with the Department of Agricultural Chemistry, provide certified hop quality analyses to Oregon growers on behalf of the Oregon Department of Agriculture, and serve as advisor on hop quality matters to government and industry clients at home and abroad.

Present Outlook

Two new triploid aroma hop cultivars have now been released. At least one or possibly two or more additional aroma types with Tettnanger and/or Saazer-type quality profile will likely result from work currently underway. Diligent replacement of fertile diploid males by triploid males will likely assure that most Oregon hops produced in the future will be largely seedless without growers having to absorb large yield losses by completely eliminating all males. If the early promises of aphid or mite resistance in native North American hops hold true, these genetic sources will be integrated into the hop breeding program.

Budget

Sources of funds are as follows:

1. USDA/ARS budgeted appropriation
2. Hop Research Council
3. Oregon Hop Commission
4. Miller Brewing Company
5. Official Hop Quality Analyses

United States Department of Agriculture
Agricultural Research Service
Pacific West Area
Forage Seed & Cereal Res. Unit
Dept. Crop and Soil Science
Crop Science Building 451B
Oregon State University
Corvallis, Oregon 97331-3002
FAX: 503 737-1589

August 31, 1992.

To: Dr. L loyd Elliott
Research Leader, USDA-ARS
Corvallis, OR. 97331

From: Dr. Al Haunold
Research Geneticist
Hop Research, Corvallis, OR. 97331

Subject: Technology transfer during FY 1992 (Oct. 1, 1991 to Sep.30, 1992).

1. Completed public release of the new aroma hop cultivar Liberty, USDA Accession Number 21457.

2. Prepared release notice for Blue Northern Brewer (USDA Accession Nr. 21079), an ornamental hop. This is the first time a hop cultivar has been publicly released primarily as an ornamental.

3. Distributed about 3000 rhizomes of nearly sterile triploid hop pollinators to Oregon growers through the Oregon hop commission. These male pollinators were planted in commercial Oregon hop yards during spring 1992 to pollinate commercial hop cultivars and produce higher yields without unwanted seeds. Conservative estimates place the increased yields at 10 to 20% above those without male stimulation.

4. Obtained a virusfree Fuggle hop (USDA Accession Nr. 21650) through the cooperation of Dr. Bob Klein, plant pathologist at WSU Prosser, WA. This hop was indreased in late fall 1991 and distributed to Oregon growers in the following spring. Virusfree Fuggle is expected to give yield increases of 10 to 20% above the yield of virus-infected Fuggle plants.

5. Expanded the zero-alpha/high beta specialty hop for Miller Brewing Co to 6 acres. This novel hops has virtually no alpha acids (all beta) and is used by Miller to produce tetra-hydro-alpha acids for special aroma and foam properties on a pilotplant scale

6. Formal Technology transfer meetings in FY 1992:

   a) Hop Research Council meeting , followed by US Hop Grower meeting Feb. 6-7, Portland Oregon.

   b) Miller Brewing Co. Research Meeting, Feb. 5, 1992, Portland, OR.

November 16, 1992

To: Dr. Lloyd Elliott, USDA-ARS Research Leader
Corvallis, OR 97330

From: Alfred Haunold, USDA-ARS Research Geneticist
Hop Research and Germplasm Preservation
Corvallis, OR 97331-3002

Subject: Tangible Benefits to ARS from Extramural Research at Prosser, WA, 1989, 1990, 1991, part of 1992.
C/A No 58-91H2-H-136.

1. The entire USDA Hop Germplasm Collection and the USDA World Hop Cultivar Collection are now established at Prosser, Washington. Some genotypes, particularly a significant number of males, were lost and should be replanted as soon as possible. It is nice to have a backup collection of USDA hop germplasm. However, since the project at Corvallis was established over 60 years ago without backup facilities until recently, no valuable hop germplasm had been lost.

2. Agronomic and quality data of hops grown in the World Cultivar and Germplasm collections at Prosser were obtained (see attached). Many Corvallis selections performed well under Prosser conditions, documenting that hop breeding and selection can indeed be done at Corvallis for the Yakima Valley despite climatic differences between the two locations.

3. USDA hop aroma selections first identified at Corvallis were established and tested at large (3-acre) Washington off-station plots in cooperation with the Hop Research Council, an industry association of hop growers, dealers, and brewers. Due to space limitations, the increase at Prosser had to be contracted out to a commercial propagator. The Hop Research Council coordinated the off-station tests in the Yakima Valley. Supervision of similar tests at Corvallis has remained with the USDA hop research project.

   The following selections were tested (see attached):
   - 1989: 21456, 21457, 21459, 21490, 21491, 21496, 21497
   - 1990: 21457, 21459, 21484, 21490, 21491, 21496, 21497
   - 1991: 21459, 21484, 21490, 21491, 21496, 21497
   - 1992: only the first two quarterly reports (see attached) have been received to date. One report included hop storage analysis of the 1991 season. No information was provided to date on off-station trials in the Yakima Valley.

In addition two Washington selections (8254-167 and 8254-244) which are of interest to one major brewer were established outside the USDA-WSU cooperative framework.

4. The new hop cultivar Centennial (USDA 21507) was released in 1990. Centennial was selected by former USDA plant physiologist Z.E. Zimmermann in the late 1970's. Centennial is attractive to micro- and home-brewers, but has never been tested by large commercial brewers.

   Five downy mildew susceptible germplasm lines were released in 1991. They are judged to be valuable for maintaining downy mildew cultures in field locations without the danger of crown dieout. They have never been tested under Oregon conditions.

5. Physiological studies on hops, which to my knowledge are not done anywhere else, have been initiated at Prosser as follows:

   a. Host plant resistance to two spotted spider mites (see 1989 CRIS report) and second quarterly [4/1 to 6/30/1989] report) (attached).
   b. Work on aphid resistance was initiated (see 1990 CRIS report and third quarterly [7/1 to 9/30/1990] report) (attached).
   c. Restriction Fragment Length Polymorphism (RFLP) work was started (see 1990 CRIS report).
   d. Hop leaf molecular genetic investigations were initiated (see third and fourth quarterly reports, 7/1 to 29/30 and 1/10 to 12/31/1991) (attached).

   Note: First quarterly report dated 1/1 to 3/31, 1992 defines previously mentioned "molecular genetic research" as chloroplast DNA screening for nuclear marker (see attached).

   Publications, as reported in CRIS writeups.

1989: Kenny, S.T., and Rohrbach, J.F. 1989. Photosynthesis measurement in hop. Agron. Abstr. 1989. Amer. Soc. of Agron., Madison, WI, p. 114. (Abstract)

1990: Kenny, S.T., 1990. Identification of U.S. grown hop cultivars by hop acid and essential oil analyses. J. Amer. Soc. Brew. Chem. 48:3-8.
Kenny, S.T., Furter, R., Whelen, S., and Hall, B.D. 1990. Restriction fragment length polymorphisms (RFLPSs) in hop. Agron. Abstr. Amer. Soc. Agron. Madison, WI, p., 199. (Abstract)

1991: Kenny, S.T., and Zimmermann, C.E. 1991. Registration of Centennial hop. Crop Sci. 31:1092.

Kenny, S.T. 1991. Registration of five hop germplasms for hop downy mildew research. Crop Sci. 31:1391-1392.

Comments by ADODR

1. Although ARS hop breeding and germplasm development work can benefit from testing in a different environment, much of this work at Prosser has been a duplication of Corvallis activities.

2. Commercial off-station testing in cooperation with the Hop Research Council is being coordinated by the Hop Research Council and the Washington Hop Commission. The Prosser cooperator seems to be only marginally involved.

3. Recent physiological studies seem to be groping for leads. Much has been initiated, or at least mentioned in the reports, but a clear direction has yet to emerge. Hostplant resistance, mentioned in 1989 and 1990 reports, is not mentioned in subsequent years. RFLP and DNA work seems to be at the "probing" stage at the moment.

   The most significant benefit to the public over the 12 years of this cooperative work was the release of the hop cultivar Chinook in 1986. (1991 production: 4.4 mill. lbs; estimated farmgate value $7-8 mill.). However, Chinook was bred in 1974 and selected in 1979 by C.E. Zimmermann, USDA hop physiologist at the time.

National Forage Seed Production
Research Center
Oregon State University
3450 S.W. Campus Way
Corvallis, Oregon 97331-7102
503 750-8722 (Comm & FTS)
FAX: 503 750-8750 (Comm & FTS)

November 20, 1992

SUBJECT: Benefits from and dollars to hop research at Prosser, Washington C/A No. 58-91H2-H-136

TO: Robert J. Reginato
Director, USDA ARS, Pacific West Area
800 Buchanan Street
Albany, California 94710

FROM: Lloyd F. Elliott, Research Leader

Transfer of funds to the Irrigated Agriculture Research and Extension Center were:

FY 1988	$71,345	
FY 1989	70,632	There is a question if the
FY 1990	69,643	agreement can be funded for
FY 1991	66,889	FY 1993 without a new CRIS
FY 1992	69,643	because it has already been
(FY 1993	69,643)?	funded 60 months as per the C/A.

In his letter to me, enclosed, Al outlined the benefits from this specific C/A. He feels that in the last two years we have been getting much better value. He thinks the physiological studies, page 2, No. 5 could prove of value. Regarding his comments page 3, No. 1 even though the Prosser work may be duplicative, I think it is absolutely essential that the hops be tested at both locations. Certainly we would like to see less program duplication. I question that the RFLP and DNA work will lead them very far.

My personal feeling is that if the Hop Commissions are able to keep this work going, much closer cooperation is essential. If the two projects continue, eventually more joint planning is needed.

United States Department of Agriculture
Agricultural Research Service
Pacific West Area
800 Buchanan Street
Albany, California
94710

July 7, 1992

Mr. J. J. Wills, Director
Washington State University
Office of Grant and Research Development
Pullman, WA 99164-3140

Dear Mr. Wills:

Enclosed for your files are two fully executed copies of the amendment listed below.

Agreement No.:	58-5358-8-007 Amendment No. Four
Title:	Development and Culture of High Quality Hops
Principal Investigator:	Stephen T. Kenny

If you should have any questions regarding this amendment, contact me at 510/559-6018.

Sincerely,

KEN EASON
Contract Specialist

Enclosure

cc:
A. Haunold, ADODR, Corvallis, OR
B. Messenger, Corvallis, OR
P. Inouye, Albany, CA
L. Rolle, Albany, CA
Information Staff, Albany, CA

t1

UNITED STATES DEPARTMENT OF AGRICULTURE
RESEARCH AGREEMENT

TYPE OF RESEARCH AGREEMENT
SPECIFIC COOPERATIVE AGREEMENT

11D 5319-2416
S. Kenney

AGENCY (Name and address)
AGRICULTURAL RESEARCH SERVICE
PACIFIC WEST AREA
800 BUCHANAN STREET
ALBANY, CA 94710

AGREEMENT NO.
58-5358-8-007

TYPE OF ACTION
Amendment No. Four

PERIOD OF AGREEMENT
May 1, 1988 thru April 30, 1993

FEDERAL OBLIGATION
$ 348,152.00

CHANGE IN FEDERAL OBLIGATION
$ 69,643.00

PERFORMING ORGANIZATION (Name and address)
Washington State University
Agricultural Experiment Station
Pullman, WA 99164

CRIS NO.
5358-21000-008-01S

AUTHORITY
7 USC 3318

OBLIGATION DISTRIBUTION

Accounting Code	Amount
2015358050	$ 69,643.00

PRINCIPAL INVESTIGATOR (Name and address)
Stephen T. Kenney
Irrigated Agriculture Research and
Extension Center
P. O. Box 30
Prosser, WA 99350

FINANCE OFFICE (Complete mailing address)
USDA, AGRICULTURAL RESEARCH SERVICE
PACIFIC WEST AREA BUDGET AND FISCAL OFFICE
800 BUCHANAN STREET
ALBANY, CA 94710

TITLE OF PROJECT
Development and Culture of high quality hops

AUTHORIZED DEPARTMENTAL OFFICER'S DESIGNATED REPRESENTATIVE (Name and address)
Alfred Haunold
USDA, ARS, Forage Seed and Cereal Research Unit
3320 N. W. Orchard Avenue
Corvallis, OR 97330

BASIS FOR AWARD

This Agreement includes the following:
- ☐ Statement of Work; or
- ☐ Project Summary; or
- ☐ Proposal; and
- ☐ General Provisions
  - ☐ 7CFR 3015, Subpart U (by reference)
  - ☐ FORM ARS-452
- ☐ Special Provisions
- ☐ Submit -
  - ☐ Technical Reports,
  - ☐ Fiscal Reports, to: Authorized Departmental Officer's Designated Representative
- ☒ Other (Specify)

PRIOR AMOUNT: $278,509.00
ADDED AMOUNT: 69,643.00
TOTAL AMOUNT: $348,152.00

1. Funding is added in the amount of $69,643.00.
2. Except as provided above, all other terms and conditions shall remain the same.

FOR THE UNITED STATES DEPARTMENT OF AGRICULTURE

AUTHORIZED DEPARTMENTAL OFFICER	TYPED NAME	DATE
	JACK C. NELSON	JUL 07 1992

FOR THE PERFORMING ORGANIZATION
(Signature of person authorized by the governing body of the performing organization to incur contractual obligations.)

SIGNATURE	TYPED NAME AND TITLE	DATE
	for VINCENT HUTNAK FINANCE OFFICER / SPONSORED PROGRAMS	JUN 12 1992
SIGNATURE	TYPED NAME AND TITLE	DATE

Agricultural Research Service
Research Management Information System
ARS Project System
04/03/92

Executive Summary Sheet

For ARS Project No. 5358-21000-008-01S
Accession Number 0142752
Mode Code 5358-05-00

NPL Team:
Leader: Howard J. Brooks

Specific C/A 58-5358-8-007 Award Date: 09/20/91

DEVELOPMENT AND CULTURE OF HIGH QUALITY HOPS (Prosser)

IRRIGATED AGR RES & EXT CENTER
WASHINGTON STATE UNIVERSITY
PROSSER WASHINGTON

Project Status: ACTIVE Start: 05/01/88 Term: 04/30/93

Current Official Funding Levels:

Net to Location:	FY	88($-	71,345)
		89($-	70,632)
		90($-	69,643)
		91($-	66,889)
		92($-	0)
Total All FY's:		($-	278,509)

for 1993
$69,643.00
(FY 5/01-93 to 4/30-94)

****** Official Strategic Plan Codes ******

2.1.2.5 100%

Reason Project was Initiated: Extramural

Remarks:
FY-91 funds added in the amount of $66,889, C/A No. 58-91H2-8-136 has been changed, and LOC payment method changed to HHS-PMS.

APPROVED:

Area Director: on 11/14/91 by W. Ralph Nave
Assoc Depty Admin: on by

Created: on 04/25/88 By SRR
Last Modified: on 11/14/91 By J01

Form AD-416 *****OFFICIAL PROJECT*****
Document Printed: 04/03/92 Date Modified: 11/14/91

1. Accession: 0142752 2-4. Agency ID: ARS 5358-05-00 5. Project Number: 5358-21000-008-01S 6. Status: A=ACTIVE

7. Title: DEVELOPMENT AND CULTURE OF HIGH QUALITY HOPS

8. Performing Organization: 8537 1107 WASHINGTON STATE UNIVERSITY
IRRIGATED AGR RES & EXT CENTER PROSSER
WASHINGTON 99350 04

12. SY Time/Investigator(s) SY Total: .00
SY Time/Name SY Time/Name SY Time/Name
HAUNOLD A KENNY S T

16. Research Location on Campus: NO Total Net to Loc: (- $0)
17-1. Project Type: S=Specific C/A 17-2. A=SAES FY: 92
21. Facilities: C = COMBINED Agreement No.: 58-5358-8-007
22. Regional Project Number: A: - - B: - -

24. OBJECTIVES:
Develop improved hop lines, develop improved production practices, and test hop varieties and selections for adaption to irrigated hop-producing areas.

25. APPROACH:
Identify, select, and develop new hop experimental lines for segregating progenies with improved genetic and agronomic characteristics. Identify heredity characters, resistance to diseases and insects in cooperation with a geneticist, plant pathologist, and entomologist. Evaluate commercial potential of domestic and foreign varieties and advanced selections for agronomic and cultural adaptability and production in the irrigated Pacific Northwest.
NOTE: This is a continuation of research conducted under Specific C/A No. 58-9AHZ-3-742, Accession #0048427.
FORMERLY: 5358-22000-001-02S.

27. KEYWORDS:
CULTURAL PRACTICES PLANT GROWTH HOP GENOTYPES PLANT INTRODUCTIONS PRODUCTION PRACTICES CROP YIELDS STORAGE STABILITY RESIN CONTENT CROP QUALITY DISEASE INSECT RESISTANCE AROMA PROPERTIES VARIETIES

Recommended			Approved	Concurred	
Signature	A/D	Date	Signature	A/D	Date
RL:		00/00/00	NPL1:		00/00/00
LD:		00/00/00	NPL2:		00/00/00
AD: W. Ralph Nave	A	11/14/91	NPL3:		00/00/00
PAO: Jack C. Nelson	A	11/14/91	BPMS:		00/00/00
			ADA:		00/00/00

28. Award Date:	29. Start Date:	30. Termination Date:	Duration: (months)
09/20/91	05/01/88	04/30/93	060

Form AD-417 Document Printed 04/03/92 *****OFFICIAL PROJECT*****

1. Accession:	2-4. Mode Code:	5. Project Number:	Date Last Modified:
0142752	ARS 5358-05-00	5358-21000-008-01S	11/14/91

			Net to Location
STP(s) 2.1.2.5	Plant Germplasm Evaluation	100%	(-)
		Total Net to Location:	(- $0)

32.	Basic Research:	20%	(- 0)
33.	Applied Research:	80%	(- 0)
34.	Development Effort:	0%	(- 0)
		Total Net to Location:	(- $0)

	Prime Commodity	Codes Activity	Research Problem Area Code	Field of Science Code	Prime %	Net to Location
36.	2800	4500	207	0212	10	(-)
37.	2800	4600	208	0212	10	(-)
38.	2800	5000	307	0212	40	(-)
39.	2800	4900	405	0212	40	(-)
				Total Net to Location:		(- $0)

SubClass.	Codes	Description	%	Net to Location
Commodity	2831	HOPS	100	(- 0)
			Total Net to Location:	(- $0)
Activity	4584	HOST-PLANT INTERACTIONS	10	(- 0)
Activity	4615	BREED DISEASE RESIST PLNT	10	(- 0)
Activity	4910	GERMPLSM,COL,MAINT,DIST	20	(- 0)
Activity	4940	REPROD,GROWTH,DEVELOPMENT	20	(- 0)
Activity	5011	IMPR BREEDS & VARIET	40	(- 0)
			Total Net to Location:	(- $0)
Special	PST2	NONPESTICIDAL CONTROL	20	(- 0)

Naumann

PAGE: 3 12/17/92

ANNUAL RESEARCH PROGRESS REPORT
Report of Progress (AD-421)

Accession: 0142752 Year: 92 Project Number: 5358-21000-008-01 S
Mode Code: 5358-05-00 STP Codes: 2.1.2.5 100% %

Title: DEVELOPMENT AND CULTURE OF HIGH QUALITY HOPS (Prosser, WA)

Period Covered From: 01/92 To: 12/92

Progress Report

USDA selection 21484 and WSU selections 8254-167 and 8254-244 were tested in two large trials, each in Washington. Yield and alpha acid content were 2040 kg/ha and 2.2 percent, 2320 and 2.0, 1820 and 5.7, 1960 and 6.7, 1470 and 3.5, and 1440 and 4.4, respectively. Brewers evaluated 12 experimental hop samples and expressed interest in a repeat sampling of one selection. In a study to test whether hop resistance to hop aphid is heritable, the family from parents previously identified as resistant to aphid had the lowest number of aphids on the release leaf (227). Other families in the study representing several combinations of resistance/susceptible types ranged between 391 and 632 aphids per release leaf. The aphids weighed less on the plants from resistant parents. Restriction fragment patterns of the chloroplast DNA (cpDNA) of Humulus lupulus and H. japonicus with four endonucleases (KpnI, PstI, PvuII, SalI) were used to construct a physical map of the cpDNA of these two species. The physical maps showed identical restriction sites for KpnI, PvuII and SalI. One large PstI fragment of japonicus was replaced with two fragments in lupulus. The evidence suggests that the two species evolved recently from a common ancestor.

Publications:

01. 01. DORSCHNER, K.W. and KENNY, S.T. 1992. Occurrence of hop aphid phagostimulants in the honeydew of aphids. Entomol. Exp. Appl. 65:49-55.

02. 02. PILLAY, M. and KENNY, S.T. 1992. Chloroplast DNA physical maps of Humulus lupulus and H. japonicus. West Soc. of Crop Sci. Agron. Abstr. Amer. Soc. of Agron., Madison, WI, Appendix 3, p. 4.

03. 03. PILLAY, M. and KENNY, S.T. 1992. RFLP studies in hop (Humulus lupulus L) and the related species H. japonicus Siebold & Zucc. West Soc. of Crop Sci. Agron. Abstr. Amer. Soc. of Agron., Madison, WI, Appendix 3, p. 4.

Approved: LLOYD F ELLIOTT Date: 12/92
Title: RESEARCH LEADER

UNOFFICIAL

Washington State University

Irrigated Agriculture Research and Extension Center

Rt. 2, Box 2953-A
Prosser, WA 99350-9687
509-786-2226
FAX 509-786-4635

MEMORANDUM

DATE: May 1, 1992

TO: A. Haunold

FROM: S. T. Kenny

SUBJECT: QUARTERLY PROGRESS REPORT FOR 1/1/92 TO 3/31/92 FOR COOPERATIVE AGREEMENT No. 58-91H2-8-136

Several breweries requested additional information and samples of some advanced selections (January 14, 1992 quarterly progress report). No brewery evaluation results are available.

Hop molecular genetic research is in two areas. The first is examining the hop chloroplast DNA genome and the second is screening for nuclear DNA markers. Results from the chloroplast DNA study show that the chloroplast genome of European landrace varieties, bred cultivars, and native U.S. hops have few if any differences. The chloroplast genomes of *Humulus lupulus* and *H. japonicus* show differences. Twenty-five hop DNA clones were hybridized to nylon membranes containing DNA from parental plants used in crosses to determine the inheritance of hop resistance to hop aphid. None were useful in identifying any RFLPs. We identified one clone as a chloroplast DNA fragment. We continue to test different hybridization protocols specifically used to identify single copy genes.

Washington State University

Irrigated Agriculture Research and Extension Center

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MEMORANDUM

DATE: July 10, 1992

TO: Al Haunold

FROM: Stephen Kenny

SUBJECT: QUARTERLY PROGRESS REPORT FOR THE PERIOD 4/1/92 TO 6/30/92 FOR COOPERATIVE AGREEMENT No. 58-5358-8-007

During this period, the experimental hop yards were pruned, strung, trained, and sprayed for two-spotted spider mite and aphid control. The early season was unusually warm. The variety collection , germplasm collection and the advanced selection nursery location began flowering about two weeks earlier than average. The seedling nursery is not flowering as early likely due to training delays. The male germplasm collection plants were managed to delay flowering until the second week of July and this appears to have been successful this season.

Six month storage analysis for some of the hop samples harvested in 1991 were completed. The complete set of analytical data for the 1991 crop year are attached.

About 50 hop DNA clones have been examined for their ability to detect polymorphisms between the parents used in crossing studies. One of these clones showed a polymorphism. Testing of the other clones is in progress. We began evaluation of the random amplified polymorphic DNA (RAPD) technique to find out if RAPD markers could be used as genetic markers in hop. At present we are having difficulty obtaining sharp DNA bands on the gel.

Male Hop Yard Map page 1 07/10/92

Hill	Row 308		Row 307		Row 306		Row 305		Row 304		Row 303		Row 302		Southwest Row 301		Hill
40			21446M		21381M		21335M		21272M		21118M		64102M		19062M	NP	40
39			+		+		+		+		+	NP	+		+	NP	39
38			21445M	NP	21380M		21334M		21271M		21117M	NP	64101M		19061M	WP	38
37			+		+		+	NP	+		+	NP	+	NP	+		37
36			21444M		21379M		21333M		21270M		21111M	NP	64037M	NP	19060M	NP	36
35			+		+		+		+		+	WP	+	NP	+	NP	35
34			21438M	NP	21378M		21332M		21269M		21110M		64036M		19058M	WP	34
33			+		+		+		+		+		+	WP	+	WP	33
32			21437M		21377M		21331M		21268M		21109M		64035M		19048M	NP	32
31			+	NP	+		+		+		+		+	WP	+	NP	31
30			21436M		21376M		21330M		21267M		21108M		64034M	NP	19047M	NP	30
29			+	NP	+	NP	+		+		+		+		+	NP	29
28			21435M		21375M		21329M		21266M		21107M		64033M	NP	19046M	NP	28
27			+		+		+		+		+		+	NP	+	NP	27
26			21434M		21374M		21328M		21265M		21106M		64032M	NP	19044M	NP	26
25			+		+		+		+		+		+	NP	+	NP	25
24			21433M		21367M	NP	21327M		21264M	NP	21105M	NP	64031M		19043M	NP	24
23			+		+	NP	+		+	NP	+		+		+	NP	23
22			21432M		21364M		21326M		21263M		21104M	NP	64028M		19041M	NP	22
21			+		+		+		+		+	NP	+	NP	+	NP	21
20			21431M		21363M		21325M		21262M		21103M		64027M	WP	19040M	NP	20
19			+		+		+		+		+		+	NP	+	NP	19
18			21430M	NP	21362M		21324M		21237M		21102M		63017M	NP	19039M	NP	18
17			+		+	NP	+		+		+		+	NP	+	NP	17
16	21604M	NP	21429M		21361M		21323M		21236M	NP	21101M		63016M		19037M	NP	16
15	+	NP	+		+		+		+	NP	+		+	NP	+	WP	15
14	21603M		21428M		21360M		21322M		21235M		21100M		63015M		19036M	NP	14
13	+		+		+		+		+		+		+		+	NP	13
12	21548M	NP	21427M	NP	21359M		21321M		21234M	WP	21090M		63014M		19010M	NP	12
11	+		+		+		+		+	NP	+		+	NP	+	NP	11
10	21547M		21426M		21358M		21320M		21192M		21089M		63013M		19009M		10
9	+		+	NP	+		+		+	NP	+		+		+		9
8	21546M		21425M	NP	21357M		21319M		21191M		21088M		63012M		19008M	WP	8
7	+	NP	+		+		+		+		+		+		+	WP	7
6	21545M		21424M		21356M		21318M		21190M		21087M		63011M	NP	19007M	NP	6
5	+		+		+		+		+		+		+	NP	+	NP	5
4	21544M		21423M	NP	21355M		21317M		21189M		21076M		60031M	NP	19006M		4
3	+	NP	+		+		+		+		+		+		+		3
2	21543M		21422M		21354M		21316M		21184M		21072M	NP	60028M		19005M		2
1	+	NP	+	NP	+		+		+		+		+	NP	+		1
	Row 308		Row 307		Row 306		Row 305		Row 304		Row 303		Row 302		Row 301		

NP (no plant) and WP (weak plant) desgination is on the right side of the plant name.

Male Hop Yard Map page 2 07/10/92

Hill	Row 308	Row 307	Row 306	Row 305	Row 304	Row 303	Row 302	Southwest Row 301	Hill
76	8696-019M	21542M NP	21421M	21353M	21315M	21178M	21071M	60026M	76
75	8693-045M	+ NP	+	+	+ NP	+	+	+	75
74	8693-043M	21541M NP	21420M	21352M	21314M	21177M	21070M	60023M NP	74
73	8693-040M	+ NP	+	+	+ NP	+	+	+	73
72	8693-025M	21540M	21419M	21351M	21313M	21176M	21069M NP	60013M	72
71	8686-011M	+ NP	+	+	+	+	+	+	71
70	8686-007M	21539M WP	21418M	21350M	21311M NP	21175M	21067M	58111M NP	70
69	8685-063M	+	+	+	+ NP	+	+	+	69
68	8685-041M WP	21489M	21417M	21349M	21310M	21174M	21065M	52047M NP	68
67	8685-014M WP	+ NP	+	+	+ NP	+	+ NP	+	67
66	8662-004M	21488M	21416M	21348M	21309M NP	21153M	21064M	52045M	66
65	8659-045M	+	+	+	+	+	+	+	65
64	8659-023M	21487M	21415M	21347M	21308M	21142M	21061M	52042M WP	64
63	8658-039M	+	+	+	+	+	+ NP	+	63
62	8658-036M	21468M	21414M	21346M	21307M	21141M	21060M NP	52040M NP	62
61	8658-013M	+ NP	+ NP	+	+ NP	+ NP	+ NP	+	61
60	8657-017M	21467M NP	21413M	21345M	21306M	21137M	21059M	51114M	60
59	8657-002M	+	+ NP	+	+	+	+	+	59
58	8553-311M	21466M WP	21410M NP	21344M	21305M	21136M	21058M NP	51101M NP	58
57	8553-106M	+	+	+	+	+	+ NP	+ NP	57
56	8552-226M	21465M	21402M	21343M NP	21304M NP	21135M	21018M	51061M	56
55	8552-217M	+ NP	+	+	+	+	+	+	55
54		21464M	21401M NP	21342M	21303M	21134M NP	21017M	51060M NP	54
53	8552-096M	+	+	+	+	+ NP	+	+ NP	53
52	8552-093M	21463M	21400M NP	21341M	21302M NP	21133M	21009M NP	19183M NP	52
51	8552-059M	+	+ NP	+ NP	+	+	+ NP	+ WP	51
50	8552-053M	21462M	21399M NP	21340M	21301M	21132M	65037M NP	19182M WP	50
49	8551-099M	+	+	+ NP	+	+	+ NP	+	49
48	8551-076M	21461M	21398M	21339M	21300M	21131M WP	65034M NP	19173M NP	48
47	8411-036M	+	+	+	+	+ NP	+ NP	+ NP	47
46	8411-017M	21449M	21392M	21338M	21275M	21130M	64105M NP	19172M NP	46
45	8312-038M	+	+	+	+	+	+ NP	+ NP	45
44		21448M NP	21388M NP	21337M	21274M NP	21129M	64104M NP	19170M NP	44
43		+	+ WP	+	+	+	+ NP	+ NP	43
42		21447M	21385M	21336M	21273M WP	21119M NP	64103M NP	19085M WP	42
41		+ NP	+	+	+	+ NP	+ WP	+ WP	41
	Row 308	Row 307	Row 306	Row 305	Row 304	Row 303	Row 302	Row 301	

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USDA Female Germplasm at Prosser, WA

Record#	NAME	LOCATION
1	19001 B G	038/39-40
2	19027	044/07-08
3	19028	036/09-10
4	19105	044/11-12
5	19110	038/07-08
6	19120	036/15-16
7	19137	036/25-26
8	19137	037/03-04
9	19151	037/30
10	19185	039/19-20
11	19209	037/31-32
12	21003	038/05-06
13	21003	038/47-48
14	21007	039/21-22
15	21011 L16	009/03-04
16	21014 NP	006/21-23
17	21014 HAL	013/03
18	21014 HAL	013/04
19	21014 HAL	013/07
20	21014 HAL	013/11
21	21014 HAL	013/18
22	21015 TET	005/34-35
23	21016 FUN	011/24-26
24	21039 G S	009/42-44
25	21040 COL	012/24-26
26	21041 WIL	012/21-23
27	21041 WIL	016/09-11
28	21042	038/13-14
29	21043 CHA	008/21-23
30	21044 NOD	008/18-20
31	21045 SER	006/18-20
32	21047 NP	006/15-17
33	21049 STY	011/27-29
34	21050 AHI	009/30-32
35	21051 APO	010/30-32
36	21052 ATL	010/27-29
37	21053 AUR	007/33-35
38	21054	050/09-10
39	21055 PAC	012/03-05
40	21056	038/19-20
41	21057	038/15-16
42	21062	038/41-42
43	21077 SAA	011/36-38
44	21078 REC	007/36-38
45	21079 BNB	005/03-04
46	21079 BNB	038/21-22
47	21080 BAC	009/34-35
48	21081 DUN	008/33-35
49	21082 NEO	008/30-32
50	21083 VOJ	008/27-29
51	21084	039/45-46
52	21085	038/33-34
53	21086	038/25-26
54	21092 CAS	012/18-20
55	21092 CAS	017/39-40
56	21093 N B	008/24-26
57	21093 N B	017/03-04
58	21094	038/23-24
59	21095	038/31-32
60	21097 H B	007/21-23
61	21098	039/05-06
62	21112 TAR	008/15-17
63	21113 LUB	010/39-41
64	21114 NAD	011/39-41
65	21115 P T	011/03-05
66	21116 B G	010/24-26
67	21116 B G	016/45-47
68	21120	016/42-44
69	21120	048/37-38
70	21122	037/42
71	21123	036/23-24
72	21125	047/35-36
73	21128	040/11-12
74	21138	039/11-12
75	21139	038/17-18
76	21143	039/15-16
77	21144	039/17-18
78	21145	037/34
79	21149	050/13-14
80	21150	039/03-04
81	21151	050/29-30
82	21156	039/13-14
83	21158	039/07-08
84	21159	040/15-16
85	21160	040/05-06
86	21161	039/27-28
87	21162	040/13-14
88	21163	050/33-34
89	21164	039/31-32
90	21167 HY2	006/03-05
91	21168 P B	006/39-41
92	21169 T B	007/39-41
93	21170 ELS	006/36-38
94	21172 LAN	006/24-26
95	21173 STR	006/27-29
96	21179 HEE	006/30-32
97	21180	036/41-42
98	21181	039/23-24
99	21182 GAL	011/18-20
100	21182 GAL	018/30-32
101	21183 ERO	048/27-28
102	21185 HER	005/30-32
103	21185 HER	016/12-14
104	21186 SPA	005/27-28
105	21186 SPA	016/21-23
106	21187 S B	012/27-29

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USDA Female Germplasm at Prosser, WA

Record#	NAME	LOCATION
107	21188 NP2	012/30-32
108	21193 NUG	011/12-14
109	21193 NUG	018/33-35
110	21194	036/07-08
111	21195	039/25-26
112	21196 B6A	009/22-23
113	21196 B6A	036/29-30
114	21197	037/26
115	21199	046/19-20
116	21200	040/45-46
117	21201	036/03-04
118	21202	039/33-34
119	21203	040/25-26
120	21204	042/23-24
121	21205	046/05-06
122	21206	042/21-22
123	21207	050/03-04
124	21208	042/09-10
125	21210	050/39-40
126	21211	042/13-14
127	21212	042/07-08
128	21213 ARO	010/36-38
129	21214 SIR	010/33-35
130	21215 NOR	008/36-38
131	21216 GRB	009/36-38
132	21217 STA	008/39-41
133	21219	046/29-30
134	21220 ERO	011/15-17
135	21220 ERO	019/30-32
136	21222 AQU	042/37-38
137	21224	050/47-48
138	21225 OLY	011/09-11
139	21225 OLY	019/33-35
140	21225 OLY	042/29-30
141	21226 CHI	012/15-17
142	21226 CHI	019/39-41
143	21226 CHI	042/33-34
144	21227 PER	007/24-26
145	21227 PER	016/24-26
146	21231	042/31-32
147	21232	048/11-12
148	21233	042/27-28
149	21238 BLI	009/27-28
150	21239 BOB	007/30-32
151	21240 BUK	007/27-29
152	21241	042/25-26
153	21242	043/35-36
154	21243	043/41-42
155	21244	036/31-32
156	21245	040/17-18
157	21246	037/15-16
158	21247	043/07-08
159	21248	036/17-18
160	21249	036/19-20
161	21250	036/21-22
162	21251	037/18
163	21252	037/19-20
164	21253	037/22
165	21254	036/33-34
166	21255	036/35-36
167	21256	043/09-10
168	21257	015/39-41
169	21257	037/23-24
170	21258	043/03-04
171	21259	036/27-28
172	21260	039/09-10
173	21261	042/45-46
174	21276 EPL	009/18-20
175	21277 EPM	009/15-16
176	21278 KEA	009/12-14
177	21279 KMI	009/10-11
178	21280 POK	010/18-20
179	21281 SUN	006/09-11
180	21282 SAX	007/18-20
181	21283 VIK	007/15-17
182	21284 BRA	008/09-11
183	21285 BOR	042/05-06
184	21286 KIR	010/42-44
185	21287 BAN	036/37-38
186	21288	043/47-48
187	21289	042/47-48
188	21290	042/39-40
189	21291	042/41-42
190	21292	042/43-44
191	21293	044/43-44
192	21294	044/03-04
193	21295	044/17-18
194	21296	043/21-22
195	21297	043/25-26
196	21298	043/23-24
197	21299	043/19-20
198	21368	036/39-40
199	21369	037/39-40
200	21370	039/37-38
201	21371	043/17-18
202	21372	043/45-46
203	21373	043/15-16
204	21383	044/47-48
205	21384	042/03-04
206	21386	044/25-26
207	21387	044/39-40
208	21389	044/41-42
209	21390	044/23-24
210	21391	051/23-24
211	21393	044/33-34
212	21394	051/25-26

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USDA Female Germplasm at Prosser, WA

Record#	NAME	LOCATION
213	21395	043/27-28
214	21396 TOL	005/18-20
215	21397 H4X	005/22-23
216	21397 H4X	018/06-08
217	21403 STK	005/39-40
218	21404 GBU	005/46-47
219	21405 SAL	005/42-44
220	21406 ALP	006/42-44
221	21407	039/39-40
222	21408	039/41-42
223	21412	038/43-44
224	21441	051/31-32
225	21443	037/43-44
226	21450	037/47-48
227	21451	036/43-44
228	21452	036/45-46
229	21453	036/47-48
230	21454	040/43-44
231	21455 MHO	008/06-08
232	21455 MHO	017/42-44
233	21456	043/33-34
234	21457 LIB	005/06-08
235	21457 LIB	019/12-14
236	21459	019/18-20
237	21460	042/11-12
238	21470	051/39-40
239	21471	051/41-42
240	21472	051/43-44
241	21473	051/45-46
242	21475	051/47-48
243	21481	034/13-14
244	21484	017/34-35
245	21484	018/09-11
246	21484	034/17-18
247	21485	040/41-42
248	21486	040/39-40
249	21491	017/46-47
250	21492	040/37-38
251	21493	040/35-36
252	21496 TEA	007/03-05
253	21497 TEB	007/06-08
254	21498 YEO	005/15-16
255	21499 ZEN	005/12-14
256	21500	043/11-12
257	21503	040/23-24
258	21505	042/19-20
259	21507 CEN	012/12-14
260	21507 CEN	019/36-38
261	21507 CEN	042/15-16
262	21511	040/03-04
263	21512	050/11-12
264	21513	043/05-06
265	21514 HE6	013/35
266	21515 HE8	013/38
267	21516 HE9	013/39
268	21517 HERS	013/43
269	21518 HEA	013/44-46
270	21520	044/13-14
271	21521 S36	012/33-35
272	21521 S36	018/21-23
273	21522 S38	012/36-38
274	21522 S38	019/21-23
275	21523 LVF	015/06-08
276	21524 NVF	015/15-17
277	21525 72Y	015/45-47
278	21525 72Y	046/17-18
279	21526 O126	011/42-44
280	21527 BLA	009/39-40
281	21527 BLA	034/19-20
282	21528 LUC	011/45-47
283	21528 LUC	034/23-24
284	21529 O31	012/45-47
285	21529 O31	034/25-26
286	21530 O114	012/42-44
287	21530 O114	034/29-30
288	21531 UNIV	012/39-41
289	21531 UNIV	034/31-32
290	21532 72C	010/45-47
291	21535 72YVF	016/33-35
292	21535 72YVF	034/33-34
293	21535 72YVF	048/15-16
294	21535 72YVF	048/17-18
295	21535 72YVF	048/19-20
296	21536	043/31-32
297	21538 72CVF	016/36-38
298	21538 72CVF	034/35-36
299	21538 72CVF	047/19-20
300	21538 72CVF	047/21-22
301	21538 72CVF	047/23-24
302	21609 PAG	007/42-44
303	21610 NZH	005/10-11
304	48209 FUH	011/21-23
305	48209 FUH	018/03-05
306	50024	051/29-30
307	50040	047/31-32
308	50075	040/29-30
309	52013	051/27-28
310	54003	051/33-34
311	56001 HAL	005/36-38
312	56002 BAC	010/21-23
313	56008	051/37-38
314	56012	051/35-36
315	56013 CAS	016/39-41
316	58016	018/36-38
317	58016	046/27-28
318	58016	047/45-46

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USDA Female Germplasm at Prosser, WA

Record#	NAME	LOCATION
319	58016	048/13-14
320	58112	047/15-16
321	59008	046/11-12
322	60020	047/25-26
323	60024	046/09-10
324	60025	047/07-08
325	60029	047/43-44
326	60032	047/05-06
327	60033	046/07-08
328	60035	046/15-16
329	60037	043/43-44
330	60037	046/21-22
331	60038	015/27-29
332	60038	017/36-38
333	60038	046/25
334	60039	046/03-04
335	60040	047/03-04
336	60042 SHI	008/42-44
337	61008	046/33-34
338	61011	046/41-42
339	61017	048/09-10
340	61019 YUG	011/33-35
341	61020 SAV	011/30-32
342	61021 STE	006/33-35
343	62013 COM	006/06-08
344	62051 JAN	010/15-17
345	62052 DEN	010/12-14
346	62053 DEF	010/09-11
347	63006	047/09-10
348	63008	046/35-36
349	63018	046/37-38
350	63020	051/19-20
351	63021	048/25-26
352	63027	047/11-12
353	63032	040/27-28
354	64003	047/17-18
355	64007	048/21-22
356	64008	051/21-22
357	64009	047/39-40
358	64010	047/33-34
359	64020	048/41-42
360	64026	048/39-40
361	64100 BUL	009/24-26
362	64106	048/43-44
363	64107 N B	005/24-26
364	64107 N B	048/05-06
365	65009	015/36-38
366	65009	051/17-18
367	65101 TAL	011/06-08
368	65102 L1	009/06-08
369	65102 L1	018/18-20
370	65103 E2	008/03-05
371	65103 E2	017/18-20
372	65104 L8	010/06-08
373	65104 L8	019/24-26
374	66050 ALC	007/12-14
375	66051 PRO	008/12-14
376	66052 PRI	006/45-47
377	66054 CAL	007/45-47
378	66055 F C	008/45-47
379	66056 SMO	009/46-47
380	68051 B C	007/09-11
381	68052 P G	006/12-14

Washington State University

Irrigated Agriculture Research and Extension Center

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MEMORANDUM

DATE: November 12, 1992

TO: A. Haunold

FROM: S. T. Kenny

SUBJECT: QUARTERLY PROGRESS REPORT FOR 7/1/92 TO 9/30/92 FOR COOPERATIVE AGREEMENT No. 58-5358-8-007

Off-station trials at two locations each of USDA 21484 and Washington Selections 8254-176 and 8254-244 were commercially harvested. At the Toppenish location, 21484 had a hops yield of 2300 kg ha^{-1} and an α-acid level of 2.6% and a β-acid level of 3.2%. At the Prosser location, 21484 yielded 2040 kg ha^{-1} with 2.3% α-acid and 3.3% β-acid. At the Toppenish location, 8254-167 had a hops yield of 1960 kg ha^{-1} and an α-acid level of 6.9% and a β-acid level of 6.6%. At the Moxee location, 8254-167 had a hops yield of 1800 kg ha^{-1} and an α-acid level of 5.9% and a β-acid level of 5.9%. At the Toppenish location, 8254-244 had a hops yield of 1450 kg ha^{-1} and an α-acid level of 4.8% and a β-acid level of 5.9%. At the Moxee location, 8254-167 had a hops yield of 1450 kg ha^{-1} and an α-acid level of 4.3% and a β-acid level of 5.3%. Growth at all locations appeared normal throughout the growing season.

Cone samples from about 1200 seedling hops were harvested for laboratory analysis. Small bale (ca. 500 g) samples were obtained from about 140 plots. These included commercial cultivars and advanced selections. Analytical results of both sample types should be reported in the next quarterly report.

In molecular biology, were are continuing to screen hop DNA clones for polymorphisms in the parental hop genotypes used in the hop resistance to aphid study. We have tested 120 clones. The level of polymorphisms detected by these clones is very low. We are also screening the parental genotypes using 10 base primers to detect RAPD markers. Thus far, very little differences have been observed. We have evaluated ribosomal DNA clones for their ability to detect differences between hop genotypes. We have found that groups of genotypes had identical rDNA fragment patterns. This work may be useful in identification of hop genotypes.

1991 Bale Sample Analysis Summary

#	Name	Location	Date	Yield (lb/A)	% Alpha @8%	% Beta @8%	HSI	% CoH	% CoL	Alpha +Beta	A/B Ratio	Ave. Cone Wt.	Fresh Oil Data ml/ 100g	% MYR	% MBE	H/C Ratio	% HUM	% FARN	6 Mo. Storage Data % Alp. Rem.	HSI	ml/ 100g	H/C Ratio	% HME II	% Beta Rem.	% Acids Rem.	Year
268	21011 L16	009/03-04	9/18/91	3089	5.79	4.34	0.247	41	61	10.1	1.33	199	0.63	55.1	3.45	2.38	15.05	0.00								91
109	21014 HA?	013/22	9/05/91	445	7.87	5.20	0.238	29	49	13.1	1.51		1.13	54.5	0.46	3.46	24.32	0.00								91
215	21014 HAL	013/07	9/05/91	920	4.46	4.68	0.235	21	39	9.1	0.95	150	1.11	53.5	0.46	3.43	24.80	0.00	69.3	0.488	0.40	3.55	8.3	70.1	69.7	91
265	21015 TET	005/34-35	9/05/91	366	2.21	3.36	0.277	27	41	5.6	0.66	136	0.35	50.1	0.00	3.59	13.28	16.94	67.7	0.532	0.15	2.84	7.5	66.3	66.8	91
239	21016 FUN	011/24-26	9/00/91	288	4.39	2.34	0.269	33	51	6.7	1.88	131	0.93	54.0	0.60	2.63	20.06	4.87	73.5	0.419	0.33	2.90	5.6	88.8	78.8	91
152	21040 COL	012/24-26	9/00/91	359	6.27	3.94	0.243	38	61	10.2	1.59	163	1.14	51.4	0.83	1.95	18.49	4.82								91
206	21041 WIL	012/21-23	9/09/91	1565	4.18	3.53	0.264	35	54	7.7	1.18	186	1.27	55.5	0.74	2.71	18.81	7.10	73.2	0.442	0.43	3.06	5.4	81.5	77.0	91
255	21041 WIL	016/09-11	9/09/91	1556	4.46	3.82	0.278	35	55	8.3	1.17	199	1.42	54.8	0.70	2.69	19.02	7.06	71.5	0.432	0.42	3.14	5.1	80.5	75.6	91
252	21077 SAA	011/36&38	9/05/91	133	3.09	2.81	0.306	30	40	5.9	1.10		0.28	34.1	0.00	3.62	18.11	18.90								91
122	21092 CAS	017/39-40	9/10/91	1663	4.49	4.99	0.236	34	49	9.5	0.90	259	1.26	69.1	0.94	2.41	9.38	5.01	52.6	0.540	0.28	2.72	5.9	62.2	57.6	91
131	21092 CAS	012/18-20	9/10/91	1764	3.43	4.77	0.244	31	48	8.2	0.72	280	1.10	68.5	0.83	2.50	10.07	5.17								91
225	21093 N B	008/24-26	9/00/91	407	7.82	4.28	0.278	29	49	12.1	1.83	231	1.31	55.4	0.72	2.35	21.64	0.00	85.4	0.386	0.74	2.51	1.9	91.0	87.4	91
219	21113 LUB	010/39-41	9/00/91	324	2.65	3.29	0.273	33	46	5.9	0.81	142	0.19	29.6	0.18	3.08	21.40	17.71								91
243	21114 NAD	011/39-41	9/05/91	426	2.51	3.76	0.271	28	40	6.3	0.67	130	0.54	44.2	0.00	3.46	18.74	17.42								91
134	21116 B G	010/24-26	9/18/91	3256	6.23	4.07	0.257	38	62	10.3	1.53	236	2.13	69.1	1.68	1.64	10.33	0.00	56.0	0.612	0.55	2.01	6.4	60.5	57.8	91
226	21116 B G	016/45-47	9/18/91	2730	6.56	3.94	0.239	34	62	10.5	1.67	232	1.35	71.0	1.58	1.59	9.34	0.00								91
114	21120	041/46	9/18/91	928	1.99	6.05	0.211	41	46	8.0	0.33	227	0.91	58.5	0.76	0.86	2.82	0.00	0.7	0.952	0.31	1.67	2.5	38.4	29.1	91
187	21120	016/42-44	9/18/91	919	0.79	5.77	0.239	34	42	6.6	0.14	139	0.48	59.3	0.75	1.07	4.13	0.00								91
264	21170 ELS	006/36-38	9/05/91	1231	1.98	3.44	0.263	30	40	5.4	0.58	121	0.24	35.6	0.00	3.46	33.52	0.24	77.5	0.390	0.18	3.35	8.1	81.4	80.0	91
247	21172 LAN	006/24&26	9/05/91	104	2.07	2.25	0.294	27	42	4.3	0.92		0.32	53.3	0.00	3.43	11.32	14.97								91
250	21179 HEE	006/30-32	9/05/91	508	1.82	3.48	0.301	28	37	5.3	0.52	145	0.19	27.3	0.14	3.42	35.40	0.64								91
204	21181	039/23-24	9/18/91	1260	7.45	5.72	0.229	39	64	13.2	1.30	226	1.50	63.6	1.82	1.63	12.83	0.00								91
123	21182 GAL	018/30-32	9/16/91	3030	9.34	5.88	0.236	38	63	15.2	1.59	316	1.49	55.2	4.57	2.30	10.60	0.00	85.2	0.323	0.61	2.43	1.1	97.6	90.0	91
223	21182 GAL	011/18-20	9/16/91	3291	8.80	5.43	0.233	38	64	14.2	1.62	327	1.05	51.0	4.44	2.19	12.15	0.00	83.9	0.337	0.49	2.33	1.7	92.5	87.2	91
188	21185 HER	005/30-32	9/09/91	789	2.03	3.82	0.230	28	39	5.8	0.53	137	0.43	44.8	0.07	3.42	29.35	0.32								91
203	21185 HER	016/12&14	9/09/91	1426	2.19	5.22	0.226	28	38	7.4	0.42	174	0.79	50.8	0.20	3.35	26.52	0.00	61.7	0.406	0.31	3.76	8.1	79.7	74.4	91
221	21186 SPA	005/27-28	9/05/91	610	3.23	3.52	0.252	32	43	6.7	0.92	134	0.51	60.4	0.00	3.66	9.08	14.02	49.7	0.596	0.17	2.98	6.5	55.9	52.9	91
104	21193 NUG	011/12-14	9/18/91	1853	13.55	4.35	0.245	24	50	17.9	3.11	281	2.61	60.7	2.42	2.45	15.39	0.00	88.5	0.340	0.93	2.57	1.0	86.2	87.9	91
229	21193 NUG	018/33-35	9/18/91	1423	13.51	3.84	0.231	23	48	17.3	3.52	321	2.65	60.4	2.43	2.37	15.06	0.00	88.2	0.342	1.08	2.54	1.0	90.6	88.8	91
111	21220 ERO	019/31-32	9/19/91	3351	10.85	3.93	0.241	42	65	14.8	2.76	204	1.53	61.8	0.91	0.03	0.35	0.00	75.9	0.448	0.58	0.21	0.3	77.7	76.4	91
244	21220 ERO	001/03-47	9/20/91		10.40	3.85	0.253	43	67	14.2	2.71	275	1.57	61.3	0.90	0.03	0.44	0.00	83.8	0.373	0.59	0.16	0.2	78.5	82.4	91
263	21220 ERO	011/15-17	9/19/91	1941	5.41	2.87	0.264	47	70	8.3	1.88	166	0.57	59.3	2.63	1.27	5.26	0.00								91
157	21225 OLY	033/06-47	9/13/91	800	9.14	4.18	0.229	27	53	13.3	2.19	188	2.04	71.3	1.84	1.10	6.99	0.00								91
227	21225 OLY	011/09-11	9/16/91	2122	7.45	3.93	0.236	29	54	11.4	1.90	229	0.90	63.4	1.58	1.08	9.15	0.00								91
234	21225 OLY	019/33-35	9/16/91	5273	9.88	4.42	0.237	32	56	14.3	2.24	223	2.37	61.5	2.01	1.56	13.61	0.00	55.6	0.641	0.66	1.84	4.8	50.2	53.9	91
164	21226	042/33-34	9/18/91	2077	11.56	3.21	0.243	31	54	14.8	3.60	262	2.32	49.5	3.35	2.19	13.72	0.00								91
143	21226 CHI	019/39-41	9/16/91	3033	11.69	3.26	0.244	30	51	15.0	3.59	240	1.88	48.1	3.31	2.26	14.55	0.00	73.0	0.466	0.72	2.54	2.3	64.1	71.1	91
240	21226 CHI	012/15-17	9/16/91	3528	12.61	3.49	0.242	31	54	16.1	3.61	296	2.54	49.1	3.16	2.24	14.80	0.00	72.2	0.477	0.87	2.61	3.8	65.1	70.7	91
183	21227 PER	004/26-47	9/10/91	421	5.77	3.64	0.283	31	53	9.4	1.59	166	1.29	41.5	0.43	2.52	31.40	0.16	71.0	0.387	0.66	2.71	2.8	83.5	75.8	91
199	21227 PER	016/24-26	9/00/91	295	6.26	3.80	0.254	32	49	10.1	1.65	163	1.31	40.1	0.61	2.62	32.15	0.06	87.9	0.387	0.64	2.89	4.1	82.0	85.7	91
249	21227 PER	007/24-26	9/00/91	407	7.12	3.80	0.285	33	54	10.9	1.87	180	1.25	43.4	0.55	2.48	29.43	0.12								91
231	21238 BLI	009/27-28	9/10/91	1713	7.97	3.67	0.236	33	58	11.6	2.17	235	3.01	61.2	0.77	2.24	7.26	18.79	40.3	0.771	0.51	2.65	6.4	42.3	40.9	91
266	21257	037/33-34	9/18/91	1821	13.23	6.75	0.262	35	59	20.0	1.96	310	3.50	64.1	2.89	1.50	8.80	0.00								91
179	21285 BOR	016/03-05	9/00/91	1589	1.65	2.63	0.275	11	25	4.3	0.63	127	0.57	26.5	0.72	3.38	43.84	0.23								91
198	21369	037/40	9/12/91	1482	6.95	4.27	0.247	30	60	11.2	1.63	181	2.51	68.0	0.86	2.27	6.82	11.70								91

1991 Bale Sample Analysis Summary

#	Name	Location	Date	Yield (lb/A)	% Alpha @8%	% Beta @8%	HSI	% CoH	% CoL	Alpha +Beta	A/B Ratio	Ave. Cone Wt.	Fresh Oil Data ml/ 100g	% MYR	% MBE	H/C Ratio	% HUM	% FARN	6 Mo. Storage Data % Alp. Rem.	HSI	ml/ 100g	H/C Ratio	% HME II	% Beta Rem.	% Acids Rem.	Year
174	21370	039/37-38	9/12/91	1922	8.72	3.65	0.235	29	56	12.4	2.39	181	2.78	66.3	1.26	2.68	6.37	12.94								91
154	21383	044/47-48	9/12/91	1523	8.48	2.68	0.251	39	63	11.2	3.16	174	1.20	64.3	0.00	0.00	0.00	0.00	77.6	0.387	0.39	2.20	3.0	83.8	79.1	91
135	21386	045/47-48	9/12/91	333	4.13	3.29	0.231	33	52	7.4	1.26	279	1.14	62.3	2.15	1.35	4.47	2.32								91
121	21387	044/39-40	9/12/91	1234	6.38	4.16	0.221	46	68	10.5	1.53	335	1.65	71.7	2.36	0.00	0.00	0.00								91
201	21389	044/41-42	9/12/91	1844	3.64	3.07	0.234	40	58	6.7	1.19	363	1.11	66.8	1.58	2.24	9.12	0.00								91
195	21390	044/23-24	9/12/91	1221	5.17	3.79	0.244	38	61	9.0	1.36	418	1.57	74.4	3.13	1.96	3.49	0.00								91
160	21394	045/03-04	9/12/91	499	4.80	3.34	0.251	31	56	8.1	1.44	405	1.09	71.8	2.99	2.67	5.93	0.00								91
163	21395	045/39-40	9/12/91	387	4.46	3.06	0.241	39	62	7.5	1.46	319	1.60	68.8	3.74	1.81	6.34	0.00								91
148	21397 H4X	018/06&08	9/05/91	67	2.84	3.39	0.223	23	41	6.2	0.84		1.04	33.6	0.24	3.32	39.41	0.00								91
126	21403 STK	005/39-40	9/19/91	2676	7.53	3.72	0.257	41	67	11.2	2.03	265	1.70	67.2	1.27	2.16	8.21	4.53	75.5	0.401	0.54	2.30	1.5	89.7	80.2	91
224	21404 GBU	005/46-47	9/19/91	245	7.86	3.62	0.255	40	64	11.5	2.18	249	0.88	53.2	1.30	2.91	23.33	0.00	80.1	0.394	0.38	3.24	5.4	82.0	80.7	91
232	21405 SAL	005/42-44	9/19/91	945	8.82	4.27	0.230	41	65	13.1	2.07	278	1.88	68.3	2.47	3.46	13.52	0.00	80.3	0.372	0.56	3.66	2.9	90.0	83.4	91
241	21406 ALP	006/42-44	9/19/91	2509	7.26	2.73	0.271	25	49	10.0	2.66	231	1.31	62.1	1.83	3.38	15.08	4.46	76.7	0.417	0.48	3.53	3.4	74.2	76.0	91
180	21407	039/39-40	9/12/91	2651	8.75	3.69	0.236	39	64	12.4	2.37	211	1.76	58.1	2.01	1.81	7.06	4.44								91
245	21408	039/41-42	9/18/91	3429	11.36	5.48	0.237	49	70	16.8	2.07	356	3.34	70.2	2.54	1.44	6.06	0.00								91
209	21412	038/44	9/12/91	637	3.19	3.83	0.236	26	39	7.0	0.83	260	1.10	55.5	1.88	1.79	7.77	3.34								91
116	21439	038/45	9/12/91	1769	6.15	3.94	0.208	30	42	10.1	1.56	205	1.25	66.1	0.65	0.00	0.00	8.35								91
246	21440	038/37-38	9/12/91	1471	6.42	3.06	0.260	37	49	9.5	2.10	259	0.90	74.1	0.93	3.31	6.05	8.40								91
145	21441	051/31-32	9/12/91	2140	2.84	3.84	0.233	34	50	6.7	0.74	245	0.61	57.1	0.16	2.16	18.00	0.00								91
149	21443	037/43-44	9/12/91	454	4.36	2.57	0.247	24	44	6.9	1.70	185	0.93	55.3	0.71	2.79	21.49	0.00								91
146	21450	037/47-48	9/18/91	394	6.99	2.70	0.256	27	52	9.7	2.59	333	2.14	53.9	0.99	0.60	8.90	0.00								91
167	21451	036/43-44	9/12/91	1007	6.93	3.16	0.256	29	52	10.1	2.19	187	1.34	58.1	0.54	1.54	15.93	0.32								91
153	21452	036/45-46	9/12/91	722	12.65	4.72	0.255	34	56	17.4	2.68	272	2.15	63.5	0.26	0.46	1.76	0.00								91
128	21453	036/47-48	9/00/91	2387	7.62	4.03	0.267	32	57	11.7	1.89	170	1.19	58.6	2.72	2.09	18.38	0.00								91
112	21454	040/43-44	9/12/91	1751	9.52	5.48	0.253	38	62	15.0	1.74	308	2.51	73.3	0.87	2.12	6.63	3.41								91
137	21455 MHO	019/06-07	9/09/91	719	4.45	5.55	0.237	25	42	10.0	0.80	235	1.73	54.8	0.57	2.13	21.63	0.13	23.3	1.100	0.48	2.67	11.0	26.7	25.2	91
139	21455 MHO	017/42-44	9/09/91	1078	4.94	5.65	0.219	21	41	10.6	0.87	186	1.61	49.8	0.42	2.19	24.88	0.00								91
253	21455 MHO	008/06-08	9/09/91	524	4.58	5.50	0.259	31	47	10.1	0.83	179	1.33	55.8	1.02	2.34	21.31	0.00	63.4	0.472	0.49	2.70	4.9	68.0	65.9	91
169	21457 LIB	018/45-47	9/09/91	772	3.76	3.15	0.231	24	41	6.9	1.19	165	0.93	41.5	0.31	3.36	32.40	0.08	66.1	0.427	0.38	3.63	8.1	82.5	73.6	91
258	21457 LIB	019/12-14	9/09/91	448	3.95	3.12	0.256	29	43	7.1	1.27	161	1.18	46.5	0.41	3.36	29.00	0.11	68.9	0.488	0.47	3.72	8.3	68.2	68.6	91
115	21459	019/18-20	9/16/91	964	3.61	2.63	0.233	28	47	6.2	1.37	183	0.95	60.2	0.55	3.26	14.32	5.15	63.0	0.537	0.26	3.14	7.6	80.5	70.3	91
211	21484	017/34-35	9/00/91	1186	3.05	4.05	0.220	25	38	7.1	0.75	198	1.03	27.1	0.11	3.33	44.19	0.06								91
235	21484	018/09-11	9/16/91	1639	3.26	4.07	0.234	28	40	7.3	0.80	225	1.28	40.9	0.37	3.29	33.90	0.04								91
270	21484	TOPPENISH		984	2.74	3.92	0.254	23	37	6.7	0.70		0.91	15.9	0.12	3.41	49.35	0.00	77.3	0.490	0.57	3.82	7.6	72.8	74.7	91
276	21484				4.23	6.17	0.247	20	39	10.4	0.69		0.97	20.7	0.34	3.45	43.66	3.58	75.0	0.485	0.56	3.88	7.9	67.3	70.4	91
161	21485	040/41-42	9/12/91	1900	9.89	4.37	0.230	16	39	14.3	2.26	214	1.51	52.8	1.18	1.84	14.19	0.00								91
141	21486	040/39	9/12/91	3798	9.71	5.33	0.225	28	48	15.0	1.82	182	2.48	67.9	1.80	0.18	0.43	8.79								91
269	21490	HARRA		912	1.89	3.20	0.534	21	32	5.1	0.59		0.52	21.5	0.28	3.50	34.41	0.00								91
133	21491	017/06-08	9/12/91	921	3.48	3.99	0.232	23	39	7.5	0.87	226	1.59	55.2	0.60	2.29	21.85	0.00								91
271	21491	HARRA		1075	1.34	2.08	0.527	26	38	3.4	0.65		0.56	20.9	0.31	2.60	38.53	0.00								91
182	21492	040/37-38	9/18/91	1378	4.03	5.44	0.238	25	43	9.5	0.74	158	2.09	57.4	0.40	3.47	21.33	1.60								91
107	21493	040/35-36	9/18/91	998	5.00	4.51	0.240	24	42	9.5	1.11	192	1.84	61.1	0.67	3.33	17.76	1.64								91
144	21494	040/33-34	9/18/91	1947	7.58	5.65	0.224	21	41	13.2	1.34	175	2.52	53.9	1.21	2.07	16.99	2.42								91
189	21495	040/32	9/12/91	894	6.21	5.89	0.240	31	49	12.1	1.05	227	1.61	58.3	0.75	2.16	15.11	5.78								91
168	21496 TEA	007/03-05	9/05/91	880	1.92	4.54	0.234	28	41	6.5	0.42	168	0.97	56.2	0.00	3.47	11.28	17.88	38.4	0.856	0.21	3.16	12.4	39.8	39.4	91

1991 Bale Sample Analysis Summary

#	Name	Location	Date	Yield (lb/A)	% Alpha @8%	% Beta @8%	HSI	% CoH	% CoL	Alpha +Beta	A/B Ratio	Ave. Cone Wt.	Fresh Oil Data ml/ 100g	% MYR	% MBE	H/C Ratio	% HUM	% FARN	6 Mo. Storage Data % Alp. Rem.	HSI	ml/ 100g	H/C Ratio	% HME II	% Beta Rem.	% Acids Rem.	Year
172	21496 TEA	016/06-08	9/00/91	472	1.82	3.13	0.260	29	43	5.0	0.58	146	0.63	56.2	0.00	3.44	11.34	16.26								91
273	21496 TEA			627	2.73	5.16	0.267	20	38	7.9	0.53		0.69	35.4	0.00	3.43	21.51	22.03	71.8	0.550	0.23	3.68	6.7	54.7	60.6	91
205	21497 TEB	018/12-14	9/09/91	557	2.64	4.73	0.240	28	40	7.4	0.56	180	0.77	58.8	0.00	3.53	10.35	16.15								91
257	21497 TEB	007/06-08	9/06/91	594	2.16	3.35	0.304	29	42	5.5	0.64	153	0.39	55.9	0.13	3.41	9.82	14.75	62.9	0.682	0.17	2.88	6.7	44.6	51.8	91
274	21497 TEB			480	3.49	5.27	0.262	24	38	8.8	0.66		0.57	39.6	0.00	3.45	18.45	20.55	70.9	0.472	0.27	3.64	5.0	68.3	69.3	91
217	21498 YEO	005/15-16	9/13/91	984	10.63	3.82	0.267	27	49	14.5	2.78	188	2.14	51.4	3.13	2.75	19.15	0.00								91
259	21499 ZEN	005/12	9/13/91	1432	9.37	3.19	0.270	27	52	12.6	2.93	182	2.15	56.7	0.48	3.33	15.90	0.00								91
136	21500	043/11-12	9/18/91	1299	10.65	5.27	0.230	25	43	15.9	2.02	232	2.35	69.4	2.40	2.27	5.68	5.09								91
124	21501	043/13-14	9/18/91	1128	8.85	5.76	0.222	19	39	14.6	1.54	181	1.52	55.7	1.34	2.31	14.76	0.29								91
193	21502	038/12	9/18/91	1540	2.67	4.66	0.279	27	38	7.3	0.57	200	1.90	67.8	0.84	1.55	9.93	0.00								91
117	21503	040/23-24	9/12/91	2434	5.28	7.03	0.190	30	47	12.3	0.75	299	1.98	69.9	0.97	1.98	9.01	3.41								91
170	21504	040/21	9/12/91	969	3.95	1.97	0.272	24	47	5.9	2.00	156	0.96	57.9	0.35	3.54	16.61	0.09								91
171	21505	042/19-20	9/12/91	2317	4.67	1.75	0.249	31	51	6.4	2.67	121	0.89	62.3	0.64	3.42	13.02	0.00								91
190	21506	042/17-18	9/18/91	1148	9.38	6.50	0.228	36	63	15.9	1.44	228	2.79	71.8	1.95	1.50	7.58	0.00								91
156	21507	042/15-16	9/17/91	1801	9.02	3.49	0.249	27	53	12.5	2.58	290	3.15	77.4	1.36	2.25	6.84	0.00								91
158	21507 CEN	019/36-38	9/10/91	855	9.00	3.40	0.254	25	50	12.4	2.65	290	2.83	78.2	1.51	1.80	5.07	0.00	72.0	0.517	0.53	0.76	0.5	64.9	70.1	91
238	21507 CEN	012/12-14	9/10/91	1654	10.11	3.80	0.242	27	52	13.9	2.66	274	3.19	77.9	1.52	2.15	5.70	0.00	50.6	0.653	0.58	2.46	3.8	48.6	50.1	91
155	21508	041/15-16	9/12/91	941	4.37	2.44	0.246	31	54	6.8	1.80	95	0.85	60.2	0.52	2.69	16.66	0.00								91
138	21509	040/09	9/00/91	330	3.93	3.27	0.238	37	58	7.2	1.20	155	0.75	62.0	3.47	2.44	13.06	0.00								91
113	21510	040/07	9/17/91	1185	4.27	2.33	0.267	31	55	6.6	1.83	87	0.96	57.5	0.68	3.28	20.40	0.00								91
151	21511	040/03-04	9/12/91	1926	10.57	3.57	0.271	29	50	14.1	2.96	226	1.32	57.3	1.98	1.71	14.36	4.71								91
166	21512	041/03-04	9/12/91	997	4.43	1.58	0.306	30	47	6.0	2.80	129	0.67	34.8	0.88	2.18	29.88	2.02								91
177	21514 HE6	013/35	9/09/91	1346	2.03	4.17	0.216	17	31	6.2	0.49	167	0.95	50.5	0.21	2.20	13.77	0.00	68.1	0.373	0.34	2.47	3.3	83.3	78.3	91
262	21516 HE9	013/39	9/09/91	2362	2.77	4.60	0.219	18	31	7.4	0.60	162	0.89	46.0	0.00	2.36	15.47	0.00	67.2	0.401	0.42	2.46	3.5	83.2	77.2	91
140	21517 HERS	013/43	9/09/91	1016	3.64	4.50	0.211	20	33	8.1	0.81	196	0.86	49.0	0.16	2.28	13.62	0.00	68.7	0.330	0.35	2.49	2.5	91.1	81.1	91
207	21518 HEA	013/44-46	9/09/91	1180	2.86	4.39	0.215	17	30	7.2	0.65	175	0.88	45.9	0.07	2.15	14.01	0.00	81.1	0.348	0.39	2.42	3.1	89.3	86.1	91
125	21520	044/13-14	9/17/91	1583	6.02	3.86	0.240	32	57	9.9	1.56	212	1.00	50.1	3.33	0.00	0.00	27.30	66.0	0.436	0.27	0.92	1.1	77.6	70.5	91
119	21521 S36	012/33-35	9/05/91	294	1.98	2.04	0.290	27	43	4.0	0.97	133	0.30	54.6	0.39	3.56	10.86	12.93								91
142	21522 S38	019/21-23	9/05/91	179	3.45	3.58	0.251	25	41	7.0	0.96	189	0.61	60.1	0.00	3.54	9.80	14.27	48.5	0.653	0.18	2.91	7.5	59.3	54.0	91
237	21523 LVF	015/06-07	9/00/91	702	3.15	3.61	0.261	28	41	6.8	0.87	167	0.66	58.8	0.00	3.54	9.65	15.95								91
127	21524 NVF	015/17	9/09/91	663	7.41	4.08	0.233	26	44	11.5	1.81	197	1.06	53.7	0.00	3.54	12.28	15.61	75.2	0.406	0.39	3.44	6.5	80.4	77.0	91
130	21525 72Y	046/17	9/09/91	178	1.86	1.54	0.267	27	45	3.4	1.20		0.18	46.2	0.00	3.49	11.34	17.43								91
216	21526 O126	011/43	9/05/91	1090	3.13	2.51	0.271	34	51	5.6	1.25	192	1.16	57.8	0.38	2.56	18.90	4.45	72.2	0.445	0.38	2.77	5.2	85.0	77.9	91
233	21529 O31	012/45-47	9/05/91	89	2.91	3.31	0.250	27	39	6.2	0.88		0.59	47.9	0.00	3.53	15.90	17.82								91
186	21530 O114	012/42-44	9/05/91	30	1.64	0.94	0.293	40	56	2.6	1.75		0.10	5.8	0.35	3.56	21.77	4.69								91
192	21531 UNIV	012/39-41	9/05/91	323	9.15	6.93	0.230	36	57	16.1	1.32	138	0.70	40.0	0.00	3.39	23.54	16.04	17.1	0.528	0.27	3.46	7.8	44.2	28.8	91
230	21532 72C	010/45-47	9/05/91	89	2.70	2.84	0.263	33	42	5.5	0.95		0.52	49.7	0.00	3.53	14.27	16.49								91
159	21535 72YV	048/15-17	9/09/91	218	2.43	2.48	0.280	27	42	4.9	0.98	171	0.37	57.3	0.00	3.53	9.85	14.72	70.7	0.536	0.14	3.15	6.1	61.8	66.2	91
162	21536	043/31	9/18/91	2368	9.97	6.58	0.229	39	69	16.6	1.52	213	2.61	59.5	2.91	0.10	0.39	0.00								91
165	21538 72CV	016/36-38	9/09/91	285	4.83	4.31	0.229	22	43	9.1	1.12	203	0.84	57.2	0.49	2.12	8.85	3.26	41.4	0.725	0.27	2.45	5.0	43.1	42.2	91
191	401-001	020/19	9/18/91	1975	9.25	7.11	0.218	38	58	16.4	1.30	153	2.49	78.3	0.93	0.09	0.40	0.00								91
210	48209 FUH	018/03-05	9/09/91	811	4.23	2.29	0.263	32	51	6.5	1.85	152	0.30	36.1	0.27	2.57	28.80	7.20	73.5	0.415	0.40	2.83	3.9	83.0	76.9	91
267	48209 FUH	011/21-23	9/09/91	203	3.49	2.27	0.277	33	50	5.8	1.54	120	0.79	48.3	0.61	2.64	23.05	5.51								91
248	56001 HAL	005/38	9/05/91	693	3.62	4.25	0.270	25	40	7.9	0.85	132	0.97	51.2	0.34	3.38	26.70	0.00	68.3	0.512	0.43	3.62	11.2	64.6	66.3	91
120	56013 CAS	014/03-35	9/11/91	987	5.06	5.92	0.224	32	48	11.0	0.86	227	1.51	70.5	0.92	2.49	8.86	4.08	45.1	0.750	0.36	2.64	7.1	48.7	47.0	91

1991 Bale Sample Analysis Summary

#	Name	Location	Date	Yield (lb/A)	% Alpha @8%	% Beta @8%	HSI	% CoH	% CoL	Alpha +Beta	A/B Ratio	Ave. Cone Wt.	Fresh Oil Data ml/ 100g	% MYR	% MBE	H/C Ratio	% HUM	% FARN	6 Mo. Storage Data % Alp. Rem.	HSI	ml/ 100g	H/C Ratio	% HME II	% Beta Rem.	% Acids Rem.	Year
132	56013 CAS	016/39-41	9/10/91	2782	4.14	5.08	0.225	34	49	9.2	0.81	224	1.34	68.1	0.86	2.48	10.06	5.28								91
202	58016	018/36-38	9/00/91	711	3.12	2.03	0.243	30	46	5.2	1.54	137	0.67	46.7	1.06	2.05	25.05	0.69								91
214	60038	015/27	9/12/91	390	2.17	3.30	0.250	52	72	5.5	0.66	287	0.60	73.8	0.28	0.43	4.01	0.00								91
222	61021 STE	006/33-34	9/05/91	859	3.18	3.96	0.234	27	42	7.1	0.80	137	0.98	54.3	0.00	3.48	12.81	16.56	58.1	0.528	0.22	3.43	8.0	67.1	63.1	91
220	62013 COM	006/06-08	9/18/91	1827	7.67	3.46	0.247	40	61	11.1	2.22	213	0.86	41.2	0.39	0.09	1.30	0.00	60.8	0.533	0.70	0.41	0.7	67.9	63.0	91
251	64100 BUL	009/26	9/13/91	1642	8.02	4.84	0.240	34	58	12.9	1.66	178	2.02	67.1	1.67	1.74	10.53	0.00								91
236	64107 N B	005/24-26	9/00/91	189	8.69	4.17	0.272	24	49	12.9	2.08	210	1.57	55.1	0.79	2.44	21.81	0.00								91
108	65009	049/03-04	9/18/91	2672	10.18	6.46	0.243	30	56	16.6	1.58	268	4.18	65.6	2.24	1.34	10.35	0.00	50.6	0.664	1.07	1.75	4.3	46.4	49.0	91
194	65009	015/36-38	9/18/91	2200	5.91	8.41	0.212	31	51	14.3	0.70	272	3.40	67.0	2.16	1.35	9.77	0.00								91
176	65102 L1	018/18-20	9/10/91	1920	5.39	3.07	0.226	40	65	8.5	1.76	178	0.44	60.7	2.66	2.79	13.19	0.00	82.9	0.326	0.18	2.79	3.3	96.8	88.0	91
196	65102 L1	009/06-08	9/10/91	2453	5.98	3.83	0.240	42	65	9.8	1.56	157	0.50	55.8	3.10	2.69	14.45	0.00	82.9	0.342	0.25	2.50	2.5	89.3	85.4	91
106	65103 E2	017/18-20	9/00/91	2094	4.79	3.04	0.260	40	64	7.8	1.58	123	0.21	45.7	2.04	2.58	20.81	0.00	80.5	0.345	0.18	2.39	4.2	83.6	81.7	91
173	65103 E2	008/03-05	9/15/91	1079	6.08	3.61	0.226	37	63	9.7	1.69	146	0.34	48.7	2.55	2.89	18.76	1.23								91
105	65104 L8	019/24-26	9/19/91	2545	5.23	3.13	0.257	40	66	8.4	1.67	186	0.60	61.1	3.19	2.62	12.84	0.00	87.3	0.322	0.25	2.49	2.8	91.6	88.9	91
150	65104 L8	010/06-08	9/00/91	2435	4.61	3.10	0.235	41	65	7.7	1.49	170	0.41	55.7	4.08	2.88	15.42	0.00								91
260	65104 L8	002/03-47	9/19/91	697	4.85	3.07	0.259	43	65	7.9	1.58	146	0.54	56.9	3.42	2.63	15.12	0.00								91
261	66052 PRI	006/45-47	9/19/91	874	5.54	5.14	0.258	32	50	10.7	1.08	153	0.95	46.7	0.34	0.22	1.95	0.00	57.1	0.610	0.42	0.93	1.2	52.9	55.1	91
200	66055 F C	008/45-47	9/12/91	866	4.93	4.77	0.248	38	61	9.7	1.03	169	1.08	68.2	0.19	0.00	0.00	8.95	73.5	0.358	0.34	1.61	0.4	97.6	85.3	91
110	8254-167	050/07-08	9/12/91	888	4.89	4.81	0.233	21	38	9.7	1.02	257	1.08	47.2	0.63	3.15	23.07	0.00								91
175	8254-167	019/27-29	9/10/91	1270	5.85	5.69	0.218	14	33	11.5	1.03	226	1.15	40.6	0.79	3.44	30.85	0.09	75.3	0.361	0.65	3.68	5.7	84.2	79.7	91
275	8254-167			1749	6.74	7.36	0.234	15	33	14.1	0.92		1.12	19.5	0.32	3.48	44.09	0.21	88.5	0.331	0.69	3.88	3.0	87.9	88.2	91
129	8254-244	018/27-29	9/10/91	911	4.69	5.40	0.229	22	40	10.1	0.87	198	1.25	42.7	0.63	3.40	30.08	2.99	57.4	0.536	0.49	3.68	8.4	68.8	63.5	91
185	8254-244	050/25-26	9/12/91	835	3.95	5.32	0.226	18	38	9.3	0.74	242	1.08	38.6	0.50	3.40	32.77	3.10								91
256	8254-244	017/12-14	9/10/91	260	4.77	5.31	0.252	30	43	10.1	0.90	186	1.14	39.5	0.66	3.41	32.14	3.21	49.8	0.578	0.38	3.80	11.1	58.2	54.2	91
21	8311-014	069/03-04	9/06/91	1855	4.04	3.95	0.298	17	37	8.0	1.02	135	0.44	16.7	0.32	2.20	36.81	0.00								91
69	8311-095	069/11	9/17/91	812	4.03	7.56	0.227	32	53	11.6	0.53	223	1.38	54.8	0.00	1.70	18.08	0.00								91
74	8311-130	072/03-04	9/17/91	2712	4.93	7.11	0.217	24	43	12.0	0.69	238	2.15	73.6	0.00	1.54	8.95	0.00								91
43	8312-046	072/05	9/10/91	2417	6.85	3.40	0.245	22	42	10.3	2.01	232	1.61	45.0	0.87	3.38	29.62	0.00								91
1	8412-050	072/07-08	9/10/91	2832	6.87	3.73	0.263	24	46	10.6	1.84	167	1.33	57.0	1.44	2.73	16.04	1.56								91
54	8412-060	069/15	9/09/91	1332	3.12	3.36	0.246	40	61	6.5	0.93	167	0.45	69.4	0.97	2.27	6.90	2.76								91
64	8551-080	072/11	9/17/91	3324	9.87	5.23	0.241	46	70	15.1	1.89	232	3.23	68.8	0.98	1.38	9.19	0.00								91
4	8552-077	072/15-16	9/11/91	2205	6.44	3.82	0.240	30	56	10.3	1.69	280	1.07	63.7	2.16	1.47	7.88	6.19								91
19	8552-222	068/03-04	9/09/91	1686	2.04	5.23	0.259	16	31	7.3	0.39	176	0.97	55.8	0.57	1.61	17.94	0.00								91
39	8553-010	072/27-28	9/11/91	3537	8.59	3.53	0.232	20	45	12.1	2.43	199	1.49	50.5	0.60	1.69	20.81	0.00								91
63	8553-065	072/21-22	9/11/91	2031	5.01	3.69	0.236	16	44	8.7	1.36	191	0.98	60.4	1.35	3.44	18.80	0.00								91
35	8553-067	068/07	9/09/91	2217	2.20	4.14	0.224	30	56	6.3	0.53	151	0.93	62.3	0.29	2.45	16.24	0.00								91
28	8553-095	072/25-26	9/10/91	2208	6.11	2.98	0.213	23	41	9.1	2.05	195	1.08	45.6	0.25	3.35	28.02	2.41								91
100	8553-281	072/23	9/18/91	2979	4.65	5.98	0.244	36	63	10.6	0.78	162	0.85	43.0	1.25	3.02	27.04	0.00								91
85	8553-287	072/19-20	9/16/91	2976	3.13	5.36	0.227	39	61	8.5	0.58	265	1.23	62.9	0.62	2.84	15.04	0.00								91
62	8553-310	068/11-12	9/09/91	1515	5.51	5.59	0.226	18	39	11.1	0.98	248	1.41	35.6	0.76	3.35	36.02	0.00	65.0	0.538	0.64	3.77	7.9	48.7	56.8	91
34	8656-002	072/39-40	9/10/91	2344	9.53	3.11	0.244	37	61	12.6	3.06	186	0.63	34.9	1.84	2.12	28.06	0.00								91
11	8656-003	072/37-38	9/11/91	1525	4.14	4.53	0.256	30	50	8.7	0.91	309	1.15	54.2	0.89	2.25	22.14	0.00								91
55	8656-021	072/41-42	9/10/91	1404	8.06	4.02	0.270	22	46	12.1	2.00	279	2.20	51.2	0.80	1.53	19.11	0.00								91
71	8657-001	072/43-44	9/11/91	2054	2.80	4.29	0.256	23	38	7.1	0.65	161	0.36	52.0	0.19	3.20	19.00	0.45								91
101	8657-003	069/19-20	9/09/91	2499	7.36	3.31	0.240	25	49	10.7	2.22	143	1.12	47.2	0.70	3.52	27.57	0.00								

1991 Bale Sample Analysis Summary

#	Name	Location	Date	Yield (lb/A)	% Alpha @8%	% Beta @8%	HSI	% CoH	% CoL	Alpha +Beta	A/B Ratio	Ave. Cone Wt.	Fresh Oil Data ml/ 100g	% MYR	% MBE	H/C Ratio	% HUM	% FARN	6 Mo. Storage Data % Alp. Rem.	HSI	ml/ 100g	H/C Ratio	% HME II	% Beta Rem.	% Acids Rem.	Year
78	8657-013	069/24	9/09/91	2043	2.06	4.73	0.233	29	43	6.8	0.44	164	0.40	50.5	0.22	3.23	19.07	0.36								91
6	8657-018	069/27	9/09/91	1760	4.16	3.97	0.230	26	43	8.1	1.05	251	0.69	44.7	1.11	3.41	28.08	0.00								91
58	8657-019	069/31	9/06/91		1.53	3.51	0.284	32	42	5.0	0.44	149	0.34	42.8	0.32	2.99	29.90	0.00								91
97	8657-027	069/35-36	9/06/91	1514	4.65	4.23	0.236	19	40	8.9	1.10	219	0.62	45.3	0.54	3.26	28.28	0.00	85.7	0.350	0.24	3.37	5.9	87.1	86.4	91
94	8657-029	069/39-40	9/06/91	1266	5.20	5.52	0.220	23	46	10.7	0.94	199	0.54	47.4	0.30	3.33	14.48	0.00	79.8	0.372	0.27	3.27	2.7	77.5	78.6	91
59	8657-035	068/39-40	9/06/91	1812	4.87	4.75	0.247	21	39	9.6	1.02	163	0.62	34.7	0.08	3.22	19.78	0.00	68.5	0.442	0.26	3.31	4.0	69.2	68.8	91
22	8657-038	068/41-42	9/06/91	1113	3.54	4.20	0.230	25	45	7.7	0.84	179	0.50	35.5	0.68	3.08	32.93	0.06								91
15	8657-042	068/43	9/06/91	2113	4.22	5.29	0.241	20	42	9.5	0.80	148	0.67	47.2	0.20	2.97	26.06	0.00	81.1	0.367	0.28	3.07	5.1	78.2	79.5	91
61	8657-043	069/43	9/06/91	1109	2.08	4.73	0.273	19	36	6.8	0.44	181	0.51	57.8	0.35	3.17	13.25	0.00								91
86	8658-005	071/47-48	9/17/91	1540	2.05	5.30	0.214	22	37	7.4	0.39	134	0.77	63.9	0.29	1.47	5.02	0.00								91
67	8658-008	072/45-46	9/17/91	1385	4.63	3.99	0.246	19	43	8.6	1.16	129	0.90	65.4	0.51	1.86	9.11	0.00								91
40	8658-009	068/33-34	9/06/91	1154	2.24	3.79	0.236	23	41	6.0	0.59	182	0.72	40.4	0.22	1.87	18.30	0.00								91
53	8658-030	068/35-36	9/06/91	1067	3.13	3.30	0.241	22	40	6.4	0.95	139	0.95	44.1	0.17	2.13	14.45	0.00								91
56	8658-043	071/45-46	9/10/91	2095	5.61	4.05	0.229	27	44	9.7	1.39	203	1.04	47.4	1.07	1.69	8.26	0.00								91
48	8658-044	072/47-48	9/10/91	1771	4.95	3.09	0.251	20	36	8.0	1.60	131	0.81	34.8	0.80	3.36	34.63	0.00	82.1	0.315	0.38	3.52	4.2	84.5	83.0	91
50	8659-028	068/37-38	9/12/91	2590	1.92	4.76	0.215	24	36	6.7	0.40	193	0.47	38.1	0.12	2.53	32.00	0.00								91
31	8665-018	068/31-32	9/06/91	826	1.97	5.73	0.241	20	39	7.7	0.34	169	0.64	65.4	1.59	2.75	3.01	0.00								91
82	8667-019	072/29-30	9/19/91	1191	5.40	5.61	0.237	24	55	11.0	0.96	188	1.39	49.2	1.46	2.07	21.57	0.12								91
7	8667-032	072/31-32	9/19/91	1518	6.93	3.22	0.228	28	52	10.1	2.15	149	1.33	52.3	0.86	2.53	21.47	0.00								91
96	8667-035	072/35-36	9/10/91	1888	5.29	4.23	0.222	19	39	9.5	1.25	231	1.48	46.8	0.86	2.73	26.10	0.00								91
42	8667-036	072/33	9/19/91	2416	7.31	2.67	0.246	24	47	10.0	2.73	208	1.48	49.0	0.79	2.81	26.68	0.00								91
70	8669-026	071/29-30	9/18/91	648	3.21	4.12	0.250	47	60	7.3	0.78	132	1.10	54.0	0.59	2.13	21.05	0.00								91
68	8669-030	071/37-38	9/11/91	2296	7.71	4.73	0.238	19	43	12.4	1.63	320	1.77	63.5	0.84	1.95	12.31	0.00								91
44	8669-033	071/39-40	9/10/91	1376	6.23	4.37	0.239	20	38	10.6	1.42	225	1.12	49.8	0.78	3.14	25.81	1.64	86.6	0.305	0.47	3.31	2.5	92.1	88.8	91
83	8669-042	071/41-42	9/11/91	2487	7.92	3.52	0.246	39	67	11.4	2.25	296	0.77	54.3	4.29	2.15	14.49	0.00								91
49	8669-048	071/31-32	9/19/91	1308	7.56	4.22	0.262	37	59	11.8	1.79	201	1.83	61.6	0.69	1.39	12.78	0.00								91
16	8669-050	071/35-36	9/10/91		8.52	3.08	0.244	19	40	11.6	2.77	215	1.47	47.2	0.38	2.19	23.34	0.00								91
77	8669-052	071/44	9/17/91	2458	8.31	3.75	0.249	43	67	12.1	2.22	314	1.88	66.5	2.13	3.43	15.15	0.00								91
25	8669-055	071/33	9/10/91	5208	13.50	5.63	0.230	36	58	19.1	2.40	326	2.81	62.5	0.71	2.18	16.08	0.00	50.3	0.655	0.78	2.54	4.8	40.8	47.5	91
33	8673-016	071/13-14	9/16/91	4591	10.35	4.87	0.231	33	56	15.2	2.13	214	2.59	61.5	1.03	1.72	14.70	0.00	73.1	0.413	0.90	1.92	3.3	70.8	72.4	91
23	8673-021	071/15-16	9/17/91	3060	8.69	4.64	0.228	21	45	13.3	1.87	246	1.98	62.3	1.20	1.58	14.20	0.00								91
20	8674-001	071/28	9/10/91	1589	4.75	4.71	0.245	18	39	9.5	1.01	260	1.71	41.1	0.93	2.42	30.67	0.00								91
9	8676-021	071/20	9/11/91	2721	6.53	4.33	0.252	32	51	10.9	1.51	362	2.02	62.5	1.88	1.89	11.17	0.00								91
75	8677-005	071/21-22	9/10/91	2156	8.10	3.15	0.277	23	50	11.3	2.57	280	0.92	26.7	0.93	2.01	23.82	0.00								91
51	8677-030	071/24	9/11/91	2518	4.79	1.95	0.267	26	41	6.7	2.46	126	0.59	36.8	0.19	2.32	22.94	0.00								91
73	8679-011	071/26	9/10/91	3100	11.42	5.46	0.229	21	39	16.9	2.09	28	2.50	48.3	0.77	2.27	18.11	0.00	77.3	0.354	1.06	2.51	1.9	77.8	77.5	91
79	8681-043	070/05	9/17/91	852	3.95	3.73	0.241	33	65	7.7	1.06	94	0.83	59.5	1.11	2.81	18.54	0.00								91
24	8681-045	070/03-04	9/06/91	2367	4.75	2.92	0.236	24	49	7.7	1.62	88	0.65	41.1	0.40	2.30	29.48	0.00								91
65	8683-008	071/05-06	9/10/91	1267	3.76	6.04	0.240	21	35	9.8	0.62	267	2.02	61.7	0.75	2.29	18.93	0.00								91
81	8683-020	071/10	9/10/91	3829	8.79	3.51	0.233	20	47	12.3	2.50	294	1.90	63.2	1.83	2.01	14.34	0.00								91
29	8683-028	071/07-08	9/10/91	2458	6.24	5.01	0.220	34	57	11.2	1.24	263	3.00	62.5	1.96	2.09	15.56	0.00								91
45	8684-010	070/07-08	9/09/91	2653	8.60	4.52	0.254	29	52	13.1	1.90	252	1.39	62.5	1.85	1.43	8.77	0.00								91
60	8685-011	068/23	9/16/91	3816	7.24	3.43	0.246	25	55	10.7	2.11	166	0.89	50.8	0.26	2.04	14.94	0.00								91
90	8685-018	070/21	9/09/91	2876	2.38	3.35	0.220	36	68	5.7	0.71	113	0.53	64.7	1.19	2.83	14.78	0.09								91
99	8685-022	068/25-26	9/19/91	1556	3.81	5.87	0.224	23	44	9.7	0.65	187	1.37	55.7	1.25	1.65	11.26	0.00								91

1991 Bale Sample Analysis Summary

#	Name	Location	Date	Yield (lb/A)	% Alpha @8%	% Beta @8%	HSI	% CoH	% CoL	Alpha +Beta	A/B Ratio	Ave. Cone Wt.	Fresh Oil Data ml/ 100g	% MYR	% MBE	H/C Ratio	% HUM	% FARN	6 Mo. Storage Data % Alp. Rem.	HSI	ml/ 100g	H/C Ratio	% HME II	% Beta Rem.	% Acids Rem.	Year
80	8685-023	070/11	9/12/91	3636	4.58	5.13	0.223	34	67	9.7	0.89	202	1.17	68.1	0.05	2.12	10.69	0.00								91
12	8685-047	068/27-28	9/06/91	2708	3.92	3.89	0.273	23	54	7.8	1.01	156	0.40	46.8	0.00	3.37	17.97	0.08								91
38	8685-059	070/09-10	9/17/91	3738	5.97	5.51	0.230	41	64	11.5	1.08	156	1.33	62.7	1.64	1.59	11.91	0.00								91
8	8685-061	070/17-18	9/16/91	3686	3.57	4.85	0.246	34	68	8.4	0.74	171	1.52	70.7	1.97	2.51	11.11	0.00								91
52	8685-068	070/15-16	9/11/91	1848	5.94	9.27	0.208	30	55	15.2	0.64	238	1.78	67.6	1.28	1.89	10.92	0.00	35.8	0.697	0.35	2.28	7.7	49.9	44.4	91
89	8686-002	070/25-26	9/09/91	2020	4.69	2.74	0.243	40	65	7.4	1.71	131	0.78	77.7	0.87	0.42	0.51	5.19								91
18	8686-009	070/23-24	9/16/91	2650	9.40	4.62	0.254	34	61	14.0	2.03	225	2.76	68.7	3.72	1.65	0.68	6.72								91
3	8686-010	070/29-30	9/11/91	1465	7.46	5.10	0.246	31	55	12.6	1.46	320	2.28	72.2	0.33	3.24	9.80	0.00								91
32	8686-018	068/21-22	9/09/91	2969	4.54	5.15	0.235	28	46	9.7	0.88	219	0.79	68.6	0.60	2.86	14.40	0.00	85.3	0.341	0.22	2.86	5.0	81.4	83.2	91
47	8686-019	070/27-28	9/19/91	3078	7.00	5.39	0.243	31	54	12.4	1.30	266	1.76	27.7	0.61	1.94	31.82	0.40								91
84	8692-001	070/31-32	9/19/91	1801	6.20	6.84	0.214	22	41	13.0	0.91	215	1.19	60.4	1.89	2.65	14.91	3.14	78.5	0.360	0.40	2.77	2.9	82.6	80.7	91
36	8692-026	070/39-40	9/12/91	1230	8.74	5.48	0.206	28	45	14.2	1.59	207	0.81	49.3	0.50	1.94	19.08	0.32	83.1	0.341	0.54	2.18	2.4	80.6	82.1	91
93	8692-027	070/37-38	9/12/91	2222	12.12	4.15	0.227	36	61	16.3	2.92	253	2.37	66.1	0.98	1.40	10.87	0.12	79.4	0.348	0.87	1.58	1.3	82.6	80.2	91
76	8692-031	070/35-36	9/18/91	952	4.69	8.62	0.218	34	58	13.3	0.54	267	1.52	74.5	0.91	1.61	7.76	0.00	61.3	0.642	0.38	1.98	4.0	45.0	50.8	91
87	8692-034	070/33-34	9/19/91	1747	9.51	3.07	0.228	24	43	12.6	3.10	146	1.42	59.4	0.81	1.99	15.31	1.47	91.4	0.318	0.54	2.23	1.5	89.1	90.8	91
95	8693-016	069/47-48	9/06/91	1052	8.08	6.95	0.238	20	40	15.0	1.16	204	1.46	61.2	0.61	2.20	13.40	0.82	63.4	0.597	0.40	2.67	5.1	47.9	56.2	91
72	8693-035	070/41-42	9/17/91	2721	9.13	5.63	0.225	38	59	14.8	1.62	230	1.39	73.5	1.12	2.12	4.80	0.57	72.6	0.426	0.39	2.57	1.9	74.3	73.2	91
2	8693-037	070/45-46	9/12/91	1087	8.94	4.75	0.234	32	52	13.7	1.88	316	1.59	49.9	1.39	1.50	19.56	0.00	87.6	0.328	0.68	1.72	1.7	88.4	88.0	91
26	8694-002	060/21	9/06/91	2255	5.48	2.69	0.245	16	42	8.2	2.04	205	0.13	5.4	0.00	1.66	34.93	2.77								91
5	8695-003	068/18	9/09/91	4160	5.70	5.22	0.232	15	32	10.9	1.09	192	0.87	41.1	0.61	1.91	25.26	0.00	55.0	0.590	0.40	2.12	6.2	50.4	52.8	91
66	8695-022	068/47	9/17/91	2829	4.22	4.13	0.252	27	47	8.4	1.02	175	0.82	47.6	1.30	1.69	20.95	0.00	70.1	0.440	0.36	1.96	5.8	70.7	70.4	91
46	8695-023	068/45-46	9/12/91	4097	5.40	8.45	0.225	21	37	13.8	0.64	226	1.02	52.5	1.87	2.50	20.01	0.06	46.3	0.604	0.42	2.82	7.3	55.2	51.8	91
37	8696-003	060/13-14	9/06/91	1592	7.42	3.53	0.238	14	34	11.0	2.10	236	0.43	9.8	0.49	1.89	40.25	0.05								91
30	8696-011	060/35-36	9/06/91	1082	4.03	2.28	0.235	25	50	6.3	1.77	250	0.45	36.8	1.92	1.47	20.22	2.83								91
17	8696-012	060/09-10	9/06/91	1649	5.44	6.00	0.228	31	57	11.4	0.91	216	1.07	70.4	2.06	1.73	6.32	0.00								91
102	8696-013	060/05-06	9/12/91	1204	6.84	6.77	0.229	22	42	13.6	1.01	309	1.31	49.2	0.26	1.86	15.32	4.31								91
27	8696-016	068/15-16	9/11/91	2198	3.96	6.04	0.204	23	41	10.0	0.65	214	0.22	1.5	0.00	1.85	41.40	0.15								91
92	8696-028	060/03-04	9/06/91	1230	7.65	3.50	0.234	21	42	11.1	2.19	217	0.64	44.5	0.77	2.00	24.02	0.06								91
98	8697-004	060/20	9/06/91	1826	5.25	3.08	0.258	20	38	8.3	1.70	379	1.06	43.5	0.93	1.99	22.83	3.67								91
41	8697-024	060/15-16	9/12/91	1997	2.37	3.88	0.242	34	56	6.3	0.61	216	0.23	71.5	1.18	1.33	9.45	0.00								91
13	8699-005	060/25-26	9/06/91	1508	8.76	4.15	0.236	29	50	12.9	2.11	247	0.81	44.9	0.41	0.65	4.71	0.00								91
10	8699-016	060/23	9/06/91	2398	5.68	6.25	0.232	25	43	11.9	0.91	201	1.23	49.4	0.33	0.31	3.81	0.00	66.6	0.483	0.52	0.57	1.0	61.0	63.7	91
57	8699-021A	060/33	9/06/91	1114	4.47	2.86	0.274	40	62	7.3	1.56	328	0.72	51.7	1.74	2.11	17.82	0.14								91
14	8699-021B	060/34	9/06/91	2287	4.82	3.23	0.240	41	64	8.1	1.49	220	0.45	54.3	3.36	2.47	15.65	0.15								91
88	8699-028	060/31-32	9/06/91	1489	2.88	6.75	0.262	32	47	9.6	0.43	192	0.68	34.1	0.76	1.79	24.49	0.00	62.4	0.652	0.35	2.04	5.5	49.9	53.7	91
91	8699-036	060/29-30	9/06/91	701	8.55	4.18	0.229	28	46	12.7	2.04	204	0.48	51.8	0.94	2.17	11.83	6.22								91
181	CALF CLUST	010/03&05	9/18/91	2003	6.55	4.58	0.231	42	63	11.1	1.43	174	0.81	57.4	3.24	2.39	15.01	0.00	83.8	0.336	0.33	2.45	3.8	91.6	87.0	91
218	CALF CLUST	036/05	9/18/91	2066	5.32	3.96	0.218	43	63	9.3	1.34	176	0.54	49.1	3.20	2.33	17.75	0.00								91
118	I33-06AQU	012/09-10	9/16/91	3434	5.91	3.86	0.241	45	67	9.8	1.53	229	1.54	62.5	0.54	0.29	1.19	0.00								91
197	I33-06AQU	020/15-16	9/16/91	3932	5.64	3.12	0.264	48	72	8.8	1.80	345	1.05	62.9	0.55	0.35	1.36	0.00	65.2	0.546	0.59	0.62	0.6	73.1	68.0	91
103	I43-11BAN	018/15-17	9/16/91	4174	9.91	5.48	0.253	31	55	15.4	1.81	203	2.68	65.3	1.55	2.42	13.26	0.00								91
178	I43-11BAN	012/06-08	9/16/91	3702	9.36	5.12	0.229	28	56	14.5	1.83	213	2.73	64.1	1.46	2.44	14.36	0.00	66.1	0.541	0.76	2.86	5.1	61.2	64.3	91
147	PETH GOLD	047/27-28	9/12/91	223	6.66	2.32	0.244	26	48	9.0	2.87	221	1.11	59.0	1.50	2.23	15.65	0.00								91
272	SAAZ	PELLET			2.91	3.31	0.296	25	43	6.2	0.88		0.19	13.3	0.16	3.35	26.18	22.67								91

Washington State University

Irrigated Agriculture Research and Extension Center

Rt. 2, Box 2953-A
Prosser, WA 99350-9687
509-786-2226
FAX 509-786-4635

MEMORANDUM

DATE: January 19, 1993

TO: A. Haunold

FROM: S. T. Kenny

SUBJECT: QUARTERLY PROGRESS REPORT FOR 10/1/92 TO 12/31/92 FOR COOPERATIVE AGREEMENT No. 58-5358-8-007

Brewing quality analyses of the approximately 1,200 cone samples and 140 bale samples collected in the 1992 crop-year were in progress during this period. A summary of the analytical results is not available, since the analyses are not yet completed.

In molecular biology, we continued to screen hop DNA clones for polymorphisms in the parental hop genotypes used in the hop resistance to aphid study. The DNA was digested with the enzymes EcoRI, EcoRV, BamHI, HindIII, DraI, XhoI, BglI, PaeR7I and KpnI. Since the last report, we tested an additional 50 hop DNA clones for their ability to detect RFLPs. We did observe RFLPs in two genotypes with two clones. The results to date have not been encouraging. We used some ribosomal DNA (rDNA is the unit of DNA sequences that directs the synthesis of ribosomal DNA) probes to look for RFLPs among the hop genotypes. Some genotypes could be uniquely identified by their rDNA fragment patterns. We continued to work with 10-mer random oligonucleotide primers to detect RAPD markers in hop. Thus far, we have found some level of polymorphism with four of the twenty primers tested.

Washington State University
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July 10, 1992

Dr. Al Haunold
Department of Crop and Soil Science
Oregon State University
Corvallis, OR 97331-3002

Dear Al:

Enclosed is a quarterly report for the second quarter of 1992.

In May, you asked about the condition of the USDA germplasm collection here. The females are located at the Roza unit of the IAREC. I have most of the female germplasm up to accession number 21538 (see attached list for the accessions actually here). The varieties are maintained in three-hill plots and the other germplasm in two-hill plots. I usually discard the materials you report as discarded each year. This year, some of the discards were saved since they might be included in our DNA analysis research. If they don't fit in, then I will discard them.

The males are located at the Headquarters unit of the IAREC. I have most of the male germplasm up to 21548M plus 21603M. Most of the plants between 19007M and 65037M are weak or missing (see attached list for the accessions actually here.) Some of the difficulty in keeping the male plants alive is the constant problem of irrigating the male yard. It is the last field on a line that doesn't have sufficient water pressure. There is no prospect of changing this situation unless a significant investment of money is made. Since we have trouble maintaining the plants in rows 301 and 302, I thought about moving these plants into a new row 309 and 310. What do you think? If it is OK with you, I thought I could collect the recent accession numbers next spring for establishment here.

You can visit the fields anytime. Instead of a special trip, I thought you could drive up on Wednesday, August 12 and see the fields in late afternoon before going on to Yakima for the HRC meeting the next morning. As currently planned, the HRC tour will not reach the Prosser area. I will be in Seattle on the 14th.

Sincerely,

Stephen T. Kenny
Assistant Agronomist

Updated 8/10/92
U.S. Hop Industry Plant Protection Committee
For informational purposes only.

US Hop Pesticide Tolerances: domestic use and import purposes.

TYPE	COMMON NAME	TRADE NAME	EPA TOLERANCE GREEN (ppm)	EPA TOLERANCE DRY (ppm)
Registered for domestic use:				
Acaricide	Propargite	Omite	15.00	30.00
Acaricide	Dicofol	Kelthane	30.00	30.00
Insecticide	Diazinon		0.75	0.75
Insecticide	Ethyl Parathion (thiophos)		1.00	1.00
Insecticide	Methyl Parathion (metafos)		1.00	1.00
Insecticide	Malathion		1.00	1.00
Insecticide	Phorate	Rampart	0.50	0.50
Insecticide (worms)	Naled	Dibrom	0.50	0.50
Microbial Insecticide (worm larvicide)	Bacillus thuringiensus var. kurstaki	Dipel	exempt	exempt
Pheromone (mite)	Trimethyl dodecatriene	Stirrup M	exempt	exempt
Fungicide	copper hydroxide, oxychloride	various	exempt	exempt
Fungicide	Metalaxyl	Ridomil	0.50	20.00
Fungicide/ Insecticide	Sulfur		exempt	exempt
Herbicide	Norflurazon	Solicam	1.00	3.00
Herbicide/ Dessicant	Paraquat	Gramoxone	0.10	0.20 (0.50 vines)
Herbicide	Trifluralin	Treflan	0.05(N)	0.05(N) (negligible)
Dessicant/ Defoliant	Endothall	Des-I-Cate		0.10
Growth Regulator	Gibberillic Acid	Gibrel Pro-Gibb Pro-Gibb Plus		0.15 N (negligible)
			GREEN (ppm)	DRY (ppm)
Allowable negligible residues resulting from irrigation water containing residues from applications on or around aquatic sites:				
Herbicide	2,4-D			0.10
Herbicide	Dalapon	Dowpon		0.20
Herbicide	Diquat	Reglone		0.02
Herbicide	Glyphosate	Roundup		0.10
Import purposes only or no domestic registration:				
Fungicide	Triforine	Saprol		60.00
Insecticide	Cyfluthrin	Baythroid	4.00	20.00
Insecticide	Demeton	Systox	0.50	1.25
Insecticide	Chlorpyrifos	Lorsban		15.00
Insecticide	Disulfoton	Disyston		0.50
Insecticide	Lambda cyhalothrin	Karate		10.00
Insecticide	Methomyl	Lannate		12.00
Acaricide	Cyhexatin	Plictran	30.00	90.00
Acaricide	Tetradifon	Tedion	30.00	120.00
Herbicide	Dinoseb			0.10

RHÔNE-POULENC

RHÔNE-POULENC AG COMPANY
PO BOX 12014, 2 T.W. ALEXANDER DRIVE
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709
(919) 549-2000
TELEX NUMBER 4999378-ANSWERBACK APC RTP

PRODUCT BULLETIN

ALIETTE® Brand Fungicide
Use On Hops For Downy
Mildew Control in Oregon
EPA Reg. No. 264-467
March 20, 1992

FOR USE AND DISTRIBUTION IN THE STATE OF OREGON
(MARION, CLACKAMAS AND POLK COUNTIES ONLY)

ALIETTE® brand fungicide has been approved for Section 18 use in 1992 on hops in Oregon for a total maximum of 8,000 acres. The following information is provided to highlight key aspects of the approved emergency registration.

APPROVAL PERIOD - 3/20/92 - 9/15/92

Crop/Site:	Hops
State:	Oregon (Marion, Clackamas and Polk counties only)
Target Pest:	Downy mildew
Rate:	2.5 lbs. product per acre per application
Dilution:	Applications should be applied in sufficient water to obtain thorough coverage.
Method of Application:	Ground equipment only. Do not apply directly to water, to areas where surface water is present or to intertidal areas below the main high water mark. Do not contaminate water when disposing of waste or equipment washwater.
Frequency of Application:	ALIETTE® fungicide should be used as a preventative spray for best performance. Up to 4 applications may be applied per season.
Preharvest Interval:	Do not apply ALIETTE® within 24 days of harvest.
Worker Re-entry:	Do not enter into treated areas for 24 hours after application. During early re-entry into treated areas to perform hand labor tasks, wear long pants (or coveralls) long sleeved shirt, shoes, socks, chemical/water resistant gloves and goggles or face shield.
Notice to Users:	All applicable directions, restrictions and precautions on the EPA approved label must be followed. This labeling must be in the possession of the user at the time of pesticide application. Neither the department nor the manufacturer makes any warranty of merchantability, fitness of purpose, or otherwise, expressed or implied, concerning the use of a pesticide in accordance with these provisions. The user and/or grower acknowledges the preceding disclaimer and accepts liability for any possible damage or nonperformance resulting from this use.

ALIETTE® is a registered trademark of Rhône-Poulenc.

My Turn (1992)

by C. Everett Koop (former US surgeon general)

Back in my former incarnation as a surgeon, I was distressed when cyclamates were taken out of soft drinks. I had found Fresca very much to my liking. The reason these substances were banned was because of experiments on rodents. The scientists found that high doses of cyclamates cause cancer in rats.

Translating those scientific studies to someone my size, I would have had to drink four bathtubs full of Fresca daily for about eight years to have an equivalent dosage.

Those who read murder mysteries know that with poison, it is the dose that counts. With coffee, it takes 96 cups to deliver toxic dose of caffeine, and with turkey, 3.8 tons to deliver a toxic dose of malonaldehyde.

In the days of my early surgical career, the state of the art in detecting the concentration of toxins was beginning to approach a sensitivity of one part per million. Anything below that was considered to be zero residue.

In 1965, we were able to test for parts per billion; by 1975, parts per trillion. And now, we are approaching the time when we will be able to test for parts per quadrillion.

Even parts per million is a minuscule measurement. Converted to time, it is one second per two years. Parts per billion converts to one second every 32 years. And parts per trillion comes out in time to a sensitivity of one second every 32,000 years.

Americans are concerned because they are confused. They are confused because no one sorts out for them various components of what has become the food safety issue.

The public does not have a very good grasp of the relationship between the dose of a toxic substance and its risk in human beings. Their information comes from those who revel in using scare tactics instead of science to warn the public about dangers in the food supply.

These scare tactics lead us down the wrong path. We end up creating concern where it isn't necessary and ignoring concerns that are real.

For instance, some people think that all manmade substances, such as pesticides, should be removed from our food supply, and that everything occurring in nature is beneficial.

To sell nothing except foods untreated by pesticides would not only leave storekeepers with rotting food, but would also fail to protect the consumer against molds that in high enough concentration can be lethal.

People who are so worried about pesticides fail to realize that the cancer rates have dropped over the past 20 years. Stomach cancer has dropped more than 75 percent, while rectal cancer has dropped more than 65 percent.

In the food supply -- as in all other public health questions -- we need better understanding of the difference between risk and hypothetical risk.

There is risk in almost everything we do, so we need to concentrate on the differences. The chances of your being killed in a motor vehicle (1 in 60,000) are much more real than are threats from pesticides. Yet that doesn't keep us off the road, either as passengers or as pedestrians.

There is another concern I have. By focusing on a hypothetical risk, like that from pesticides, not only do people find their anxiety levels elevated, but by focusing on a straw man, they also feel that they are doing something to improve their health.

In so doing, they often neglect all the other things that they could be doing more readily, more legitimately, and with greater effect, such as paying attention to smoking, alcohol, exercise, balanced diet, and so on.

Our food is not only the safest but also the most abundant in the world. Science and good sense will eventually prevail, but not until the pesticide terrorists have had another lick or two.

Experimental Herbicide Trial in Hops with MON 13200 and BAS 514
for the
Oregon Hop Commission

field bindweed

Purpose: To evaluate two experimental herbicides, BAS 514 and MON 13200, for the control of morning glory in established hop yards and for potential phytotoxic effects on mature hops.

Procedure: Trial sites were established in mature hop yards of several hop varieties. A site in Nugget variety (fld#1), Willamette var. (fld#6), and Cascade var. (fld#7) at Riverside Hop Farms was established for MON 13200 treatments. A site in Nugget var. (fld#1) and in Cascade var. (fld#7) at Riverside also, were established for the BAS 514 treatments. At Fobert Farms, a site was established in a mature field of Fuggle var. hops for MON 13200 treatments and a site in Willamette var. hops for BAS 514 treatments.

The suggested timing of application for these herbicides is preemergence to the morning glory. However, the test products were not available in time to make applications immediately after crowning, in the case of the Fuggles and Nuggets, or preemergence to the morning glory in the noncrowned Willamette var. Thus, all treatments were applied after morning glory had significant top growth at all treatment sites. To simulate preemergence conditions, treatments were applied after "hilling", a process in which dirt is thrown up around the base of the hop vine to sufficiently cover all existing weeds and hop runners. In the test sites, this top growth was covered with dirt from the conventional "hilling" operation or was done by hand. Immediately after application, one to two gallons of water was applied to each hop hill to "activate" the herbicides. Please see the attached Application Data Sheets for more information about application conditions. Observations and evaluations were made periodically during the growing season.

Results: All results are from visual observations only.

1) No effect on either morning glory growth or hop growth was noted from the application of the BAS 514

2) Suppression of morning glory growth was seen at the 1 , 1.5 , and 2.0 lb aia rate of application of MON 13200. This growth suppression was seen as: a) later emergence of morning glory regrowth in the treated plots than in the untreated plots after hilling, b) smaller leaves and shorter runners on morning glory regrowth in the treated plots vs the untreatd plots, c) less morning glory plant mass in the treated plots vs untreated plots.

3) No phytotoxic effect, such as color change or growth suppression, was noted on Fuggle, Cascade, Willamette or Nugget variety hops in at any time after the trial application, even in plots treated at the 2 lb aia rate with MON 13200.

Discussion: Data from Monsanto (manufacturer of MON 13200) indicate much greater activity on morning glory from fall or early spring applications and from split applications made both in the fall or early spring and again late spring.

Hills treated in this trial will be flagged after harvest to determine if there might be suppression of morning glory growth in the spring of 1993 from any potential residual MON 13200 existing from the 1992 application.

Suggestions for further testing are to make fall 1992 and/or early spring (February 1993) applications to determine both morning glory control and effect on hop growth. These applications would be truly preemergence to both 1993 morning glory and hop growth. Some of these plots could be treated again in the late spring 1993 with a lower rate of Mon 13200 to try to achieve maximum morning glory control.

Conclusion: Results of this trial indicate no effect from applications of BAS 514 on morning glory control or hop growth. Results do however, indicate some activity in controlling morning glory with a post-hilling treatment of MON 13200 at the 1.0, 1.5, and 2.0 lb aia rate, with no negative effect on growth of Fuggle, Cascade, Willamette or Nugget variety hops.

Confidential

1992 Oregon Hop Trials with NTN 33893

See 1992 IHG paper (Bayer AG)

Purpose: To obtain hop aphid control data from soil drench applications of NTN 33893.

Procedure: Two trial sites were established in the Hubbard, OR area. Site 1 was in a yard of mature, Nugget variety hops, Site 2 was in a yard of mature Galena variety hops. Two application timing regimes were used. Both applications were made directly to the hop hill. The first application was made at both sites on March 31, shortly after crowning. The second, was made on June 2 at Site 1 and June 12 at Site 2. Pretreatment counts were essentially zero at Site 1 on June 2 and 4.8 aphids/leaf at Site 2 on June 12. There was no untreated check maintained at either site. All treatments were compared to the grower standard for that field. Please see the attached Application Data sheet for more application information. Observations for aphid control at Site 1, were made on July 10 and August 27. Site 2 was accidently oversprayed in mid June, so no formal evaluations were made there. Site 1 was treated with Agri-Mek on 7/14 for mite control only. The rest of the yard was treated with a Lorsban/Agri-Mek combination the same day.

Results: Expressed as average aphids per leaf (an average of 25 leaves).

I) Site 1

Treatment	Average aphids per leaf 7/10/92	8/27/92
A) Early Application - 3/31/92		
1) Standard	18.36	0.64
2) 0.1 gms ai/hill	0.72	0
3) 0.3 gms ai/hill	0	0
4) 0.5 gms ai/hill	0	0
B) Late Application - 6/2/92		
1) Standard	18.20	0.63
2) 0.1 gms/hill	8.4	0
3) 0.3 gms/hill	0.32	0
4) 0.5 gms/hill	0.04	0

Discussion: Applications of 0.3 and 0.5 gms ai/hill, made soon after crowning, prevented any aphid population development by the time of the first evaluation on July10. An average of less than one aphid per leaf was found July 10 in the area treated at .1 gm ai/hill applied shortly after crowning.

Results also indicate that a late application (June 2) of NTN, may result in the development of an aphid population. This population was at an average of less than 1 aphid per leaf at the 0.3 and 0.5 gm ai/hill treatment level approximately one month after application. The .1 gm ai/hill treatment had an average of 8.4 aphids/leaf a month after application.

Although results of the trial indicate complete control of aphids at the time of harvest, from all rates of application and from both the early and the late soil drench applications, other factors may have contributed to this degree of control for the .1 gm ai/hill treatment. Unusually hot and dry weather may have diminished aphid population pressure. Also, Agri-Mek has some aphid control activity and the mite control application with Agri-Mek on July 14, may possibly have helped to contribute to the zero aphid population just prior to harvest.

Conclusion: Results of this trial indicate that the experimental aphicide NTN 33893, applied to hops at .3 gm ai/hill and at .5 gm ai/hill respectively, as a soil drench at crowning, provided complete hop aphid control through the entire growing season.

Results of the trial also indicate that when these rates are applied in early June as a soil drench treatment, a small aphid population may develop. This population however, is controlled within a month after application, and complete control is maintained through the balance of the growing season.

Finally, the results suggest that the 0.1 lb ai/hill rate, applied as a soil drench, applied either at crowning or in early June, may be inadequate to provide season long aphid control under conditions which are highly favorable to aphid development.

Application Data

Title: NTN 33893/Hops
Location: Hubbard, OR Site 2
Crop (cultivar): Nugget Var.
Planting date:
Plot size; row spacing: 7 x 7
Soil series and type:
Experimental design: Single Block
Target organism: Hops Aphid

Date:	3/31/92	6/2/92	
Treatment no:	1	2	
Dry bulb temp.:	70°F	68	
Wet bulb temp.:	51°F	50	
% Relative humidity:	23%	24%	
% Cloud cover:	5%	25%	
Wind speed	~4 mph	1-2 mph	
Wind direction:	N to S	N to S	
Dew present?	No	No	
Time of day:	3 PM	11:00 AM	
Soil moisture:	Moderate	Moderate	
Soil surface:	—	—	
Soil Temp.	65°F	—	
Method of applic.	Soil Drench	→ Same	
Type of sprayer:	CO_2 backpack	→ Same	
Carrier and volume:	H_2O @ 24gpa	→ Same	
Nozzle size:	8003	→ Same	
Nozzle type:	Flat Fan	→ Same	
Pressure:	30 psi	→ Same	

Notes:
1st applic - Hops approx. 12"-18"; Stringing
2nd applic - Hops almost to wire + blooming

Application Data

Title: NTN 33893 / Hops
Location: Hubbard, OR Site 2
Crop (cultivar): Hops - Galena var
Planting date: —
Plot size; row spacing: 7x7
Soil series and type: —
Experimental design: Single block
Target organism: Hop aphids

Date:	3/31/92	6/12/91	
Treatment no:	1	2	
Dry bulb temp.:	71°F	64°F	
Wet bulb temp.:	66°F	56°F	
% Relative humidity:	53%	61%	
% Cloud cover:	10%	60%	
Wind speed	3 mph.	4 mph	
Wind direction:	W & E	W to E	
Dew present?	No	No	
Time of day:	1:PM	10:30 AM	
Soil moisture:	Moderate	Moderate	
Soil surface:	—	—	
Soil Temp.	70°F	65°F	
Method of applic.	Soil Drench	→ Same	
Type of sprayer:	CO_2 Back Pack	→ Same	
Carrier and volume:	H_2O @ 24 gpa	→ Same	
Nozzle size:	8003	→ Same	
Nozzle type:	Flat Fan	→ Same	
Pressure:	30 Psi	→ Same	

Notes:
1st Applic - Hops recently trained - No regrowth yet
2nd applic - Hops 16-18'

1992 Oregon Hop Trial with RH 7988 Aphicide

Purpose: To obtain hop aphid control efficacy data from a single application of RH 7988.

Procedure: A trial site was established in a commercial field of mature Galena variety hops. Applications were made with a Solo backpack sprayer immediately after taking pretreatment aphid counts. Three rates were applied; 4, 6, and 8 oz. of product/100 gallons of water, respectively. Treatments were applied at rate of 80 gallons of water per acre. Please see the attached Application Data Sheet for more application information. Evaluations were made on August 4, and August 24. Evaluations consisted counting all aphids on 25 leaves per treatment. The field was harvested later in the day on August 24.

Results: Average number of aphids/leaf.

Treatment	Date Evaluated		
	7/14/92	8/4/92	8/24/92 (harvest)
1) Untreated Check	2.84	6.86	7.16
2) 4 oz/100 gal	2.91	0	0
3) 6 oz/100 gal	2.78	0	0
4) 8 oz/100 gal	2.70	0	0

Discussion: The trial site has historically had heavy aphid pressure and the total number of aphids per leaf was expected to be much greater by the end of the season than the actual number. However, unusually hot and dry weather may have contributed to fewer aphids in the untreated check than expected. Aphids were in the hop cones in the untreated check plot on 8/24.

Conclusion: Results of this trial indicate that a single application of RH 7988 at a concentration 6 oz of product/100 gal of water and 8 oz of product/100 respectively, applied at the rate of 80 gal of mix/acre on July 14, provided complete aphid control through harvest on August 24, 1992.

Western Biochemical Consulting, Inc.
9/28/92

Application Data

Title: RH 7988 / Hops
Location: Hubbard, OR
Crop (cultivar): Galena
Planting date: —
Plot size; row spacing: —
Soil series and type: —
Experimental design: Single Block
Target organism: Hop Aphid

Date:	7/14/92		
Treatment no:	—		
Dry bulb temp.:	78°F		
Wet bulb temp.:	—		
% Relative humidity:	—		
% Cloud cover:	Clear		
Wind speed	2 mph		
Wind direction:	NE to SW		
Dew present?	Dry		
Time of day:	1:30 PM		
Soil moisture:	Dry		
Soil surface:	—		
Soil Temp.	70°		
Method of applic.	Foliar		
Type of sprayer:	Solo Mist Blower		
Carrier and volume:	H2O @ 80gpa		
Nozzle size:	—		
Nozzle type:	—		
Pressure:	—		

Notes: Aphids present - whole fld

United States Department of Agriculture

Agricultural Research Service

Pacific West Area

Forage Seed & Cereal Res. Unit
Dept. Crop and Soil Science
Crop Science Building 451B
Oregon State University
Corvallis, Oregon 97331-3002
FAX: 503 737-1589

October 21, 1992.

To: Hop Growers of America Inc.
Hop Commissions of Washington, Oregon, Idaho
Hop Research Council (S.T. Likens, Exec. Secretary)
Dr. Horst-Gevert Bellmer, Brauerei Beck
Dr. Didier Zimmermann BSN Groupe
Dr. Manfred Moll, CERVAC EST

From: Dr. Alfred Haunold,
Research Geneticist
Hop Breeding, Genetics, and Germplasm Preservation

Subject: Nitrate levels in American hops, 1992 crop

During this year's visit of European brewery representatives to US hop growing areas under the sponsorship of Hop Growers of America, questions were raised concerning the nitrate levels of commercially grown American hops.

I enclose a table of nitrate analyses performed by Dr. Neil Christensen's laboratory (Crop and Soils Department) at Oregon State University. All are from commercially grown hops, 1992 season, Oregon. Some are experimental hops grown under sponsorship of the Hop Research Council in 1.5 to 3 ha plots. The commercial samples represent relatively large bale lots. (The Cluster pellet and WA Hallertau are from Washington).

I hope this information is of value to you.

Enclosure

Dr. Neil Christensen, Central Analytical Laboratory
Departement of Crop and Soil Science, Oregon State University
Corvallis, Oregon 97331. USA

October 1992

ANALYSIS of HOPS for NO3-N CONCENTRATION

Sample	Grower I.D.	Variety	NO3-N mg N/kg (oven dry wt.)
92092	2Y-205	U.S. Tett. ? (Fu type)	3645
92099	2Y-230	Fuggle	3107
92103	2S-246-B	U.S. Tett. (Fu type)	3041
92104	2M-252-W	Galena	2473
92106	2T-254-B	U.S. Tett. (Fu type)	2995
92112	2S-214-F	U.S. Tett. (Fu type)	3234
92116	2S-241-B	U.S. Tett. (Fu type)	3852
92117	2S-254-E	Willamette	2744
92135	2L-252-S	Nugget	1478
92140	2V-214-M	Experimental Ha trip	2542
92173	2L-252-T	Nugget	1820
92177		USDA 21490	2360
92178		USDA 21484	2195
92179		Perle	2256
92180		WA Hallertau	2924
92186		Cluster Pellet	2004
92190	2S-214-KK	Experimental	2838
92198	2E-270-I	Experimental Ha trip	2326
		mean	2657
		min	1478
		max	3852

Gail and Al:

Here are the NO3-N concentrations for selected hop samples. As you can see, they ranged from 1.5 to 3.8 g NO3-N/kg with an average of 2.6 g NO3-N/kg. This is on the low end of concentrations reported in Europe (2 to 18 ~~mg~~ g NO3-N/kg).

Neil

OREGON HOP COMMISSION:

BACKGROUND PAPER ON SEEDED HOPS IN OREGON

The Oregon hop industry is in a situation where we must reduce the seed content of hops grown in this state. Although discussed regularly at Commission meetings, all growers may not be aware of the seriousness of this issue. It is important that each grower understand the problem and the steps that must be taken to alleviate it.

Seeds in hops are a problem for several reasons. The enclosed article entitled, Effect of Hop Seeds on Processed Hop Products, discusses some of the reasons why seeded hops are undesirable.

In addtion to the reasons cited in the paper, Hop dealers and handlers do not like seeds as they have to pay for the added weight. Paying for seeds, something that they do not want or need, does not make sense, especially since breweries do not want the seeds as explained in the article. Seeded hops are less desirable and therefore, less marketable.

Oregon is the last area in the world where seeded hops are still grown. Unless Oregon growers lower the seed count in their hops, our product will become increasingly less valuable. Some growers have already felt the sting of high seed contents. The next three to five years are critical in this effort, however, we must get started right away.

Several months ago, the Commission formed a Seed Content Subcommittee which begin looking into the situation to see if we had a problem and if we did, how serious was it and what can be done about it. The subcommittee is chaired by Greg Weathers, its members are: Frank Fobert, Pete Vandeneynde, Jeff Butsch, and Steve Coleman. After discussion with knowledgeable experts in the hop industry the following points were uncovered:

☞ Unquestionably Oregon seed counts are too high! The high counts have affected the quality of our product, our reputation and have hurt sales.

☞ If Oregon is going to compete with other growing regions in the world, our seed content must be lowered.

☞ Growers can expect to see stricter seed content clauses written into new contracts.

☞ Replacing diploid males with triploid males is a first step for growers and should be started as soon possible.

☞ Because pollen may drift up to 25 miles from its origin, the Oregon Hop Commission may consider a policy requiring all growers to reduce or eliminate diploid males from their hop yards and to assist with eliminating wild hops in fence rows and brush lines.

☞ The Commission should work with Dr. Al Haunold and growers who already have triploid males in their fields to ensure an adequate supply of triploid male roots ~~are~~ avialable ~~to~~ for growers.

☞ It is probable and likely that growers who produce lower seed counts will be given preference for future hop contracts.

JOHN I. HAAS, Oregon Farms, has released data to the Oregon Hop Commission on their program to reduce seed content in hops. Any grower interested in this report, which was made available at the January Commission meeting, please call the Commission office and request a copy.

The competitive nature of the world-wide hop industry dictates that Oregon growers commit to reducing the seed content in their hops. It would be nice if we could return to the old days and old ways when it was much simpler to grow hops. However, such is not the case. The Hop Commission has led the way in squarely confronting this issue and is working to find solutions for the benefit of all growers.

The bottom line is simple. If Oregon growers do not lower the seed content of their hops, we may not have a market for them, or may have to sell them at a reduced price just to get rid of them! This problem is not going to "go away" by itself. It requires hard work, patience, research, and grower commitment to fix, but it is a "fixable". Just as they have in the past, all Oregon growers will have to work together and we can solve this problem.

EFFECT OF HOP SEEDS ON PROCESSED HOP PRODUCTS

(from Dr. Lloyd Rigby, J.I. Haas Inc. Yakima, WA

1. When hops are used in the brewery as normal leaf hops, the presence of seeds has a minor, if any, effect on beer quality. The hop seed has a hard impermeable coat which is not broken by boiling in the brew kettle. Consequently, hop seeds pass through the brewing process with little or nothing extracted from the seeds. The only negative quality is that seeds dilute the alpha acids content of the hops, and a brewer gets less alpha acid per dollar cost when using seeded hops as compared with seedless hops. Therefore the brewer is paying for seed weight that has no value to the brewing process.

2. In the production of hop pellets, the hop seeds are broken and crushed during the milling and pelletizing process. Hop seeds contain about 30% seed fat and part of this seed fat is solubilized in the boiling process. Some brewers contend that this is prone to produce a detectable rancid flavor in the beer.

3. The presence of seeds is most serious when the hops are extracted with a solvent, either organic solvent such as hexane, or carbon dioxide. An example of a worst case would be a seeded hop with 24% seeds. This hop when extracted, yields 7.2% of seed fat, and approximately 18% resins, depending upon the variety and richness of the hop. Therefore, the extract contains about 28% seed fat. This drastically alters the appearance of the extract, and makes the extract entirely unsuitable for modification into isomerized extracts. Also it makes it impossible to meet specifications called for by some brewers for alpha acid content in the extract. Still another problem with extract is the seed fat is lighter in weight than the resins, and depending upon the fat content, it may make it impossible to get 1kg of extract in the normal 1kg can. Similar problems may be encountered with the 2, 3 or 4kg cans. All of the cans which are used are of standard sizes used for other food products, and obtaining a special can to accommodate this problem would be totally out of the question from a cost standpoint.

Oregon
HOP
COMMISSION

TO: Growers

FROM: Allen J. Wineland, Administrator

DATE: August 10, 1992

SUBJECT: Stencils for 1992 Crop

The Seed Content Subcommittee is working with the Oregon State Inspection lab to develop a method of tracking the seed content and the leaf and stem content by *variety.*

This system will continue to ensure the confidentiality of each growers hop reports and give the Commission and growers a means to compare individual grower leaf and seed counts with the state average.

It is important that growers properly stencil each hop bale as a variety designation is now part of the stencil. The new stenciling scheme is identical to the old one except that the letter "G" that used to follow the 2 in the stencil and stood for "grower", now refers to the variety (see FIG 1. below). The alphabetic letter assigned to a variety was randomly chosen and in no case does the letter assigned to a variety correspond to the first letter of a variety. For instance, the letter C will not stand for either Cascade, Chinook or Cluster. FIG 2. shows examples of Nugget and Willamette stencils.

Two sheets are enclosed that list varieties and the corresponding letter assigned to that variety. Please post one or both of them in the baling area as a reference for yourself and the baling crew.

Your dealer will provide the stencils for you. As the grower, you must ensure your baling crew correctly stencils the bales so varieties are not mixed up. If you have questions, please call Pete Vandeneydne (393-4347), Brad Clack (393-7847) or Greg Weathers (393-6623).

FIG 1.

2G - 200 - A

FIG 2.

2L - 200 - A (Nugget)
2S - 200 - A (Willamette)

152 Chemawa Road N
Salem, OR 97303-5356
(503) 393-0368
FAX (503) 393-0677

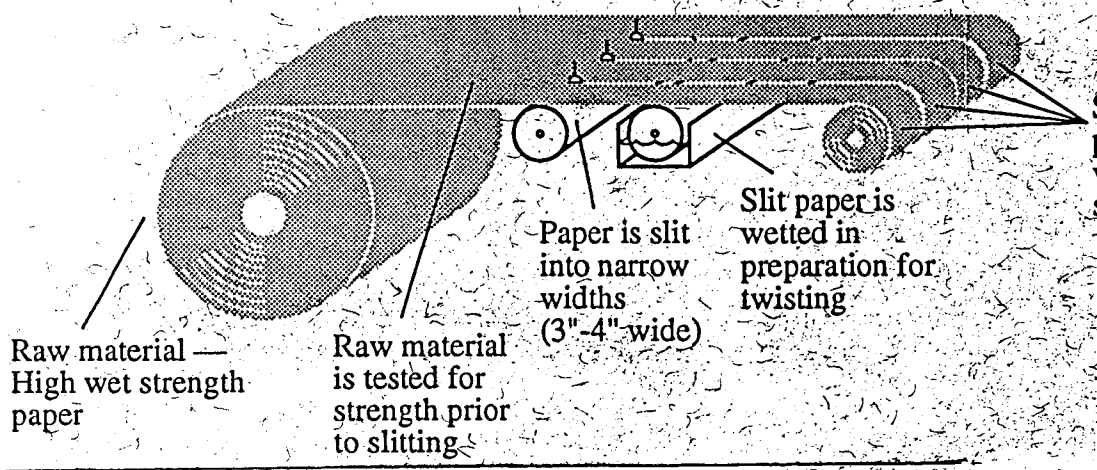
Oregon 1992 Varietal Designations

Z - Cascade
Y - Fuggle
X - Hersbrucker
W- Hallertauer
V - Mt. Hood
U - Perle
T - Tettnanger
S - Willamette
R - Aquila
Q - Banner
P - Chinook
O - Erocia
N - Cluster
M- Galena
L - Nugget
K - Olympic
J - Liberty
E - Experimental

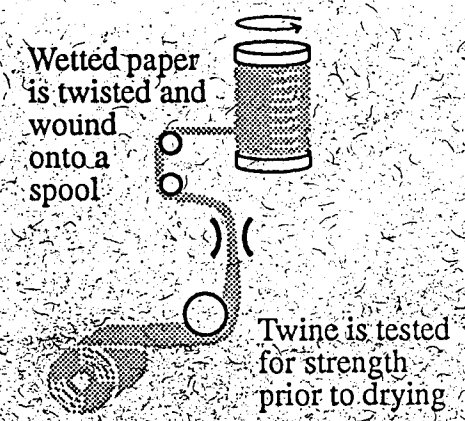
Portco Corporation Paper Hop Twine Manufacturing Process

1993 Hop Convention: Portland, OR. Marriott Hotel Jan. 26-29, 1993.

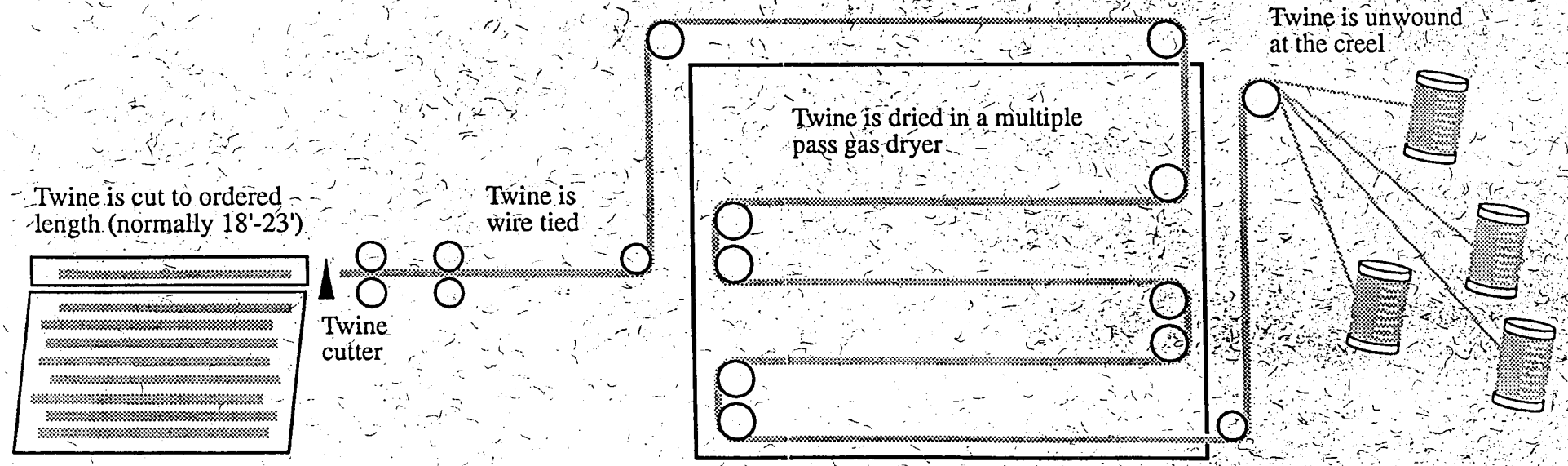
Slitting & Wetting



Twisting



Drying & Cutting



1992 USA HOP TOUR ATTRACTS SOME OF EUROPE'S BIGGEST BREWERS

This year's USA Hop Tour, sponsored by Hop Growers of America, involved officials from some of Europe's largest breweries. Tour participants included officials from Bass PLC, Carlsberg, Kronenbourg (Group BSN), Interbrew, Beck and the trade publication Brewing & Distilling International (BDI).

The event was instrumental in establishing solid brewer relationships and increasing the awareness of USA hops throughout Europe. All of our guests were impressed with the quality of the U.S. hop industry and stated they would "recommend the tour to their colleagues in Europe". The editor from BDI is currently finishing an article about the tour that will be published in the magazine's next edition.

EUROPE'S TOP 10 BREWERS IN 1990 AND 1991

1991 Ranking	Company	European Base	Volume (million hectoliters)		1991 Share
			1990	1991	
1	Heineken N.V.	Netherlands	28.9	27.9	8.8%
2	Group BSN	France	23.4	22.9	7.2%
3	Carlsberg	Denmark	16.2	16.3	5.1%
4	Foster's	United Kingdom	12.7	14.2	4.5%
5	Guinness	United Kingdom	13.3	14.2	4.5%
6	Bass PLC	United Kingdom	14.5	13.9	4.4%
7	Interbrew	Belgium	11.1	11.6	3.7%
8	Allied	United Kingdom	11.0	10.8	3.4%
9	Whitbread	United Kingdom	7.9	8.0	2.5%
10	Scottish & Newcastle	United Kingdom	7.3	7.2	2.3%

Dr. Alfred Haunold
Dept. Crop & Soil Science
Crop Science Bldg. 451B - O.S.U.

NEWS

COPY FOR YOUR INFORMATION

Oregon State University, Administrative Services A 416, Corvallis, OR 97331-2124
Agricultural Communications • News & Communication Services • Sea Grant Communications
737-3311 737-4611 737-2716

10-26-92 ORNAMENTAL HOP VARIETY REDISCOVERED AND RELEASED
By August Baunach 737-3380 SOURCE: Al Haunold, 737-5841

CORVALLIS - Blue Northern Brewer, a hop variety brought to the United States from Belgium 20 years ago by a U.S. Department of Agriculture research geneticist stationed at Oregon State University (OSU), is being officially released this year as an ornamental.

Though hop varieties brought to this country are initially quarantined, geneticist Al Haunold said the ornamental had been left to grow in his experimental hop fields outside Corvallis for 20 years because the plant was an interesting mutant.

"This combination of dark red stems, dark green leaves and golden cones is unique for a hop," Haunold said. "The nursery people have a market for it because it will cover a trellis very nicely and complement other backyard flowers."

Haunold said he spotted the hop when visiting a Belgian colleague.

"This plant showed up in a commercial field in the early seventies and was different enough that they noticed it, propagated it and kept it in a little demonstration plot," Haunold said. "I'm not sure if they ever did anything with it there or not."

According to Haunold, Blue Northern Brewer is virtually virus free but not robust nor productive enough to be grown commercially - although its golden hop cones are sufficiently aromatic and bitter enough to make good beer.

(more)

"I haven't done much with this variety except keep it alive," Haunold said, "But when nursery growers came banging on the doors with their requests I said, 'Of course.' Two years ago I had mentioned this ornamental to a gathering of representatives from several botanical gardens; they wanted to include this unique hop in their collections. After that, word traveled pretty quickly."

As the only U.S. government employee involved in hop research, Haunold not only encounters local brewers and growers, but also receives visitors from Japan, Europe, Australia, New Zealand and many other countries. During the last 30 years, he's established his reputation by producing hop varieties known as Cascade, Willamette, Mt. Hood and Liberty, which are now produced by commercial growers in the Northwest and rival the flavor and aroma of imported European hops traditionally used to make premium beers. Haunold's work is partially supported by grants from brewers and hop grower organizations.

"When we release a new variety," Haunold said, "we avoid undercutting any resulting commercial activity by giving it away - to hop growers, to nursery people, or to private citizens. People can write to us at the Crop Science department at OSU and get starter plants free of charge."

Haunold said he expects to distribute Blue Northern Brewer plants in early 1993. The variety should be available from nurseries in the spring of 1993 or 1994.

-30-

AGRICULTURE Idaho Statesman : Aug. 1992

Brewer Anheuser-Busch grows in Idaho's Panhandle

The climate is just about perfect for growing Saaz hops.

Mention Saaz hops to any brewer, and listen to their voice change, says hops entomologist Keith Dorschner. "If you're there with them, watch their eyes turn kind of teary."

According to Dorschner, the classic Teutonic aroma hops had been grown successfully only in Czechoslovakia's Bohemia until Anheuser-Busch planted them on its Elk Mountain Farms in Idaho's Panhandle.

The Saaz hops need long, temperate days with moderate rainfall, said Dorschner, of the University of Idaho's Parma center.

Marlene Fritz

"It's essentially just about perfect up there."

Paul Hoskins, director of agronomy research for Busch Agricultural Resources Inc., said the firm has also evaluated Saaz hops in Washington's Yakima Valley and Oregon's Willamette Valley.

But the crop's positive response to longer daylight and other factors persuaded Anheuser-Busch that the Bonners Ferry area is a preferable location and "in our view the most successful of the three."

All the firm's northern Idaho Saaz hops are being used in the production of its beers, Hoskins said.

Alfred Haunold, a research geneticist for the USDA Agricultural Research Service in Corvallis, believes the Saaz hops grown in northern Idaho outyield those produced in their native Czechoslovakia by 20 percent. Haunold wants to develop a similar variety for Oregon's lower latitude. While he's not there yet, he seems to be on the right track with crosses he's made so far.

At the Tablerock Brewery in Boise, brewmaster Terry Dennis said the delicately flavored Saaz hops are "not one that stands up and socks you in the teeth."

They are used in light and golden lagers and full-bodied malts, he said, and "a lot of beer purists would say that a beer can't even be called a classic Pilsner unless it contains that particular hop."

But Dennis is not using Saaz hops right now. Not only are they very expensive, but imported hops are unusually vulnerable to quality loss during shipping, he said.

"When they are coming in from Europe as loose-leaf hops," he said, "they are out of your hands and out of your control for sometimes a pretty lengthy period of time, and you have some concern about how good they are when you get them."

Sean McGree, executive director of the Hop Growers of America in Yakima, called the Saaz a "pretty tough hop to grow" and said if Anheuser-Busch is successful, "that's a first for this industry."

Saaz hops have much lower yield and are not too desirable as far as managing, cultivating and growing, McGree said. "But growers would be interested, because there's such a high demand."

"Even though it's a difficult variety to work with, there's a strong loyalty to it," McGree said.

Marlene Fritz is a communications specialist for the University of Idaho College of Agriculture and is based at the university's Boise Center.

Note: The Saazer hops mentioned in this article were brought to the US in 1988 (Osvald clones 72 Y, USDA Accession Number 21525; and Osvald clone 72 C, USDA Accession Nr. 21532). Both were meristem tip cultured at Prosser WA and released for commercial production under USDA Accession numbers 21535 and 21538, respectively. See also Trip Report dated July 27, 1991 (Busch Agric. Resources Inc) to Bonners Ferry, ID (bound copy together with HRC, OR. Hop Com, and Miller Reports). page 194.

OSU releases new hop type

By AMADO VELASQUEZ Fri;10/30/92

of the Daily Barometer

An OSU researcher has rediscovered a hop variety first brought to the United States from Belgium 20 years ago by a USDA agriculture research geneticist stationed at OSU.

Al Haunold, courtesy professor at OSU crop science and a USDA employee, will officially release the "Blue Northern Brewer" hop as an ornamental variety.

While the Blue Northern Brewer is aromatic and sufficiently bitter, it is not productive enough to be sold as a commercial variety for flavoring beers, he said.

Al Haunold

This ornamental variety can serve another purpose, however.

"They look attractive, therefore people want to use them for showing purposes in their urban gardens," he said.

This variety is different from other hops because of its dark reddish-colored stems and dark green leaves, which compared to the light green color in all the other hops, make the Blue Northern Brewer special, he said.

Two years ago, Haunold mentioned this ornamental to a gathering of representatives from several botanical gardens, he said in a release.

"After that, word traveled pretty quickly."

"The nursery people have a market for it because it will cover a trellis very nicely and complement other backyard flowers," he said.

During the last 30 years, Haunold has established his reputation by producing several hop varieties, such as: Cascade, Willamette, Mt. Hood and Liberty.

These varieties are now produced by commercial growers in the Northwest and rival the flavor and aroma of imported European hops traditionally used to make premium beers.

"No other hop research programs are found in other universities," he said. But some hop research is done by chemists in places like Prosser, Washington and Parma, Idaho.

"The state of Oregon benefits by producing Blue Northern Brewer, a crop that only a few other states produce," he said.

Haunold said the hop-growing profession is expanding rapidly and is one of Oregon's fastest-growing production fields. The main goal of the hop research by Haunold and his colleagues is to develop new varieties for Oregon farmers, he said.

Most projects of this type, such as research into the Blue Northern Brewer, receive funding from both government and industry, he said.

Haunold said he expects to distribute Blue Northern Brewer plants in early 1993. The variety should be available from nurseries in the spring of 1993 or 1994.

OSU News Service

Al Haunold eyes an experimental variety of hops at the OSU Hop Yard near campus.

Hop variety rediscovered

By AUGUST BAUNACH
OSU News Service

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● *Dr Alfred Haunold of Oregon State University shows the European Brewers Study Group around one of his hop breeding greenhouses.*

Researching the US hop

The Hop Research Council is a non-profit-making organisation which provides funding for scientific research into the production and quality of US hops. Members include: the three growers associations for Washington, Oregon and Idaho; three US brewers, Anheuser-Busch, Coors and Stroh; two Canadian brewers, Labatt and Molson; Heineken of the Netherlands and Suntory of Japan; plus 11 hop dealers/handlers.

In its first 12 years, to 1991, the HRC distributed $2.46m in research grants and in 1992 has approved an expenditure of $324,379. The main areas of research are: varietal development (especially aroma and high-alpha hops) to suit the climate in the Pacific North-west; flavour research; and plant protection.

Ann George is the administrator of the plant protection committee which oversees plant protection research. It currently has 16 projects underway with major work on protection from spider mites and aphids plus (for Oregon) downy mildew. Mrs George said the committee's long-term aims include: having three good compounds registered for each of the main problems, allowing growers to rotate their treatments; registering products for secondary pests; and providing biocontrol options that maximising pest predictor concentrations. The committee is also taking part in work to harmonise registered pesticides/herbicides with other hop-producing countries to better facilitate export/imports.

Research is carried out largely by University-run agricultural stations which have a hops specialisation.activities. There is: the Washington State University Irrigated Agriculture Research and Extension Centre at Prosser where agronomist Steve Kenny works full time on hop breeding and (with two part-timers) on plant protection; the University of Idaho Experiment Station in Parma, where Dr Keith Dorschner carries out plant protection work (mostly for red spider and aphids) on behalf of Idaho hop growers; and Oregon State University's Department of Crop and Soil Science in Corvallis where the well-known hop breeding authority Dr Alfred Haunold has successfully developed several new varieties in recent years, such as Liberty and Mount Hood.

The European Brewers' Study Tour visited all three centres to see some of the work currently underway. For example, at Prosser there is a drip-feed irrigation study in progress which could lead to growers requiring less water to grow their hops. Last season one of the Idaho growers, Norm Batt, had applied drip irrigation to 40 acres of hops using a system of hoses on the surface of the ground. Water usage was cut by between a quarter and a third of normal requirements, although there are high investment costs to bear.

At the Idaho research station a large study of hop aphid resistance has been completed that may be useful in future breeding programmes for resistant varieties. Work also continued on biological control of red spider mites, Idaho's worst pest. One idea being considered is to grow plants that are particularly attractive to the mite's predators, between the rows of hops, so that they arrive early enough in the season to be effective.

Washington State Department of Agriculture
Plant Services Division
Seed Branch-Plant Certification
2015 South First Street
Yakima, Washington 98903
(509) 575-2750

RULES RELATING TO HOP DISEASE QUARANTINE

I, C. Alan Pettibone, director of the department of agriculture of the state of Washington, by hearing held in Yakima, Washington on March 12, 1991, pursuant to Chapter 34.05 RCW and Chapter 17.24 RCW, do hereby promulgate the following rules:

WAC 16-497-001, 16-497-005, and 16-497-020 through 16-497-060 (Order 2077, Effective April 27, 1991)

WAC 16-497-001 ESTABLISHING QUARANTINE. The introduction of dangerous diseases of hops into the state of Washington would entail great losses to the horticultural interests of the state, and the most rigid examinations cannot determine the presence of disease on dormant hop plants or parts of plants; therefore this quarantine is established by the director of agriculture, pursuant to the authority provided in Chapter 17.24 RCW, setting forth the rules for the importation of hop plants into the state of Washington. (Order 2077, Effective April 27, 1991)

WAC 16-497-005 HOP DISEASE QUARANTINE--DEFINITIONS. (1) "Director" means the director of the Washington state department of agriculture or the director's authorized representative.

(2) "Department" means the Washington state department of agriculture.

(3) "Ilar viruses" means a grouping of viruses, including Apple Mosaic Virus and Prunus Necrotic Ringspot, which share common characteristics including spherical in shape, with genetic material in three different particles and commonly inducing ring spots in hosts.

(4) "Verticillium wilt" means the disease caused by Verticillium albo-atrum Reinke & Berth, or hop strains of this organism. (Order 2077, Effective April 27, 1991)

WAC 16-497-010 QUARANTINE AREA. All areas outside of the territorial borders of the state of Washington. (Order 1663, Effective June 1, 1980)

WAC 16-497-020 REGULATED ARTICLES. Plants and all parts thereof (except the kiln dried cone) of hops (Humulus Lupulus L.). (Order 2077, Effective April 27, 1991)

WAC 16-497-030 REGULATIONS--CONDITIONS GOVERNING THE MOVEMENT OF REGULATED ARTICLES. Hop plants and all parts thereof will be admitted into the state of Washington: PROVIDED, That the following provisions are complied with.

(1) The hop plant or parts thereof have been certified in accordance with the regulations of an official state agency, which certification program requires at least two field inspections during the growing season, and requires that certification tolerances shall not exceed: Verticillium wilt, (albo-atrum (dm)) and Ilar viruses, zero percent: AND PROVIDED FURTHER, That all shipments of such hop planting stock shall be apparently free of insect pests and shall be accompanied by a certificate issued by an official agency of the state of origin certifying that the hop planting stock was produced under official certification regulations and meets official standards.

(2) All shipments of hop planting stock shall be plainly marked with the contents on the outside of the package or container.

(3) Persons shipping or transporting regulated articles into this state from areas under quarantine shall notify the department's plant certification branch of the nature and quantity of each shipment, the expected date of arrival at destination, the name of the intended receiver and the destination. The person to whom the articles are shipped shall hold the same until they are inspected and/or released by the department. (Order 2077, Effective April 27, 1991)

WAC 16-497-040 DISPOSITION OF MATERIAL SHIPPED IN VIOLATION OF THIS QUARANTINE. All regulated articles arriving in the state of Washington in violation of this quarantine shall be immediately sent out of the state or destroyed at the option and expense of the owner or owners, or their responsible agents. (Order 2077, Effective April 27, 1991)

WAC 16-497-050 EXEMPTION. The restrictions on the movement of regulated articles set forth in this chapter shall not apply to hop plants or parts of plants imported for experimental or trial purposes by the United States Department of Agriculture or the state experiment stations in the state of Washington. (Order 2077, Effective April 27, 1991)

WAC 16-497-060 VIOLATION AND PENALTY. Violations of this quarantine shall be punishable by the criminal and/or civil penalties provided by law in addition to any other inspection costs that may be assessed. (Order 2077, Effective April 27, 1991)

Signed in Olympia, WA
March 27, 1991

C. Alan Pettibone
Director

United States Department of Agriculture
Agricultural Research Service
Pacific West Area
Forage Seed & Cereal Res. Unit
Dept. Crop and Soil Science
Crop Science Building 451B
Oregon State University
Corvallis, Oregon 97331-3002
FAX: 503 737-1589

Oct. 19, 1992.

Bob Bero
7576 Canfield-Columbiana Rd
Canfield, OH 44406

Dear Bob,

Here are the analyses of the hops you sent me this summer:

Variety	moisture %	alpha as is	alpha dry wt	beta as is	beta dry wt.	HSI	CoH
Cascade	6.25	4.8	5.1	4.6	4.9	0.295	38.9
Can. RedVine	6.2	5.5	5.8	6.4	6.9	0.245	47.9
Nugget	7.6	13.4	14.5	4.9	5.3	0.268	29.5
Brew.Gold	11.1	5.4	6.1	3.5	3.9	0.386	41.3

All in all, the samples are OK. The moisture of Brew.Gold is a bit high, the HSI also a bit high (you lost some alpha that way).
the Can. RedVine is probably a RedVine, but would need a lot of GC work to finally nail it sown.
There is no charge for these analyses (the standard fee would be $ 27.50)

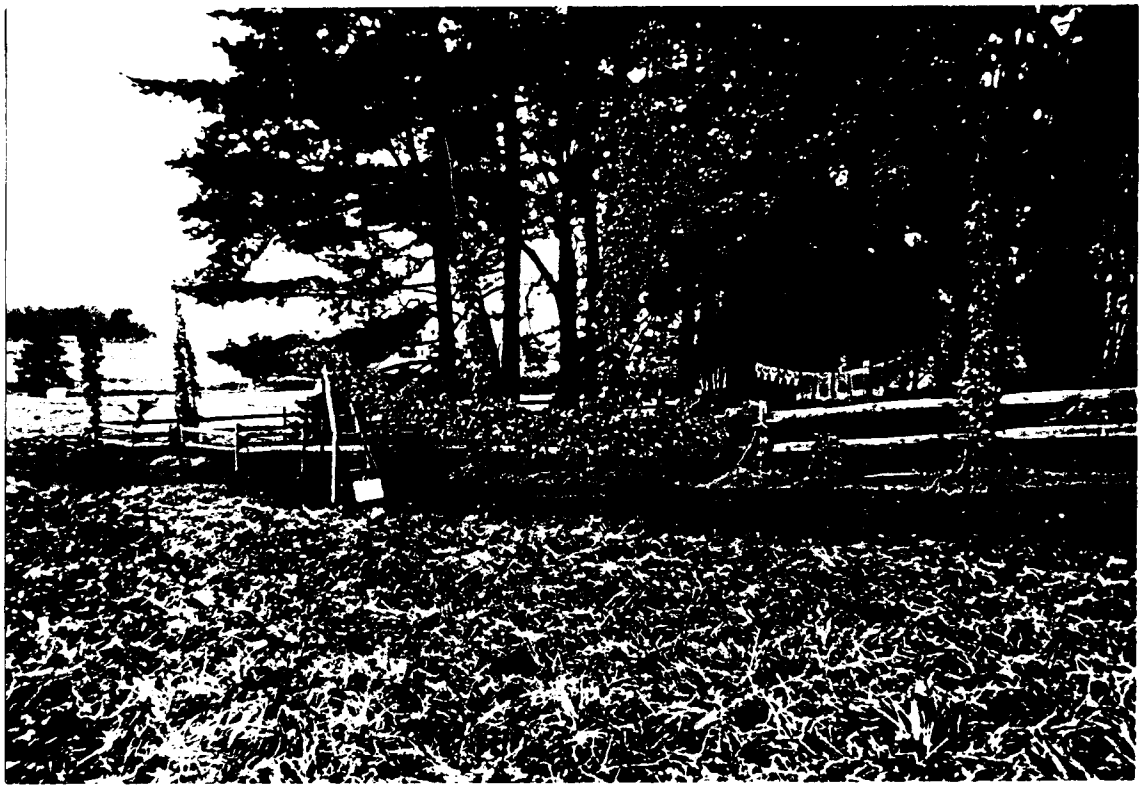
Sincerely,

Al Haunold
Res. Geneticist.

PS: I haven't tried your beverage yet, but will do so shortly.

1992 season:

Hops grown by Bob Bero, Canfield Ohio, to study adaptation and provide small samples for a local microbrewer.
Hops on poles, near clothesline: Clusters
hop far back (on poles); Zlatan, originally obtained from Czechoslovakia
hop plant horizontally, ready for hand picking: Canadian RedVine



Researchers Mind the Mint

From juleps to grasshopper pie, toothpaste to antacids—mint sparkles the flavor of our foods and our pharmacy items.

Mint's distinct, refreshing taste comes from volatile oils produced in tiny sacs in the leaves and stems of various *Mentha* species—*Mentha piperita,* or peppermint, being one of the most common.

Surprisingly, there are close to 500 different accessions—including chocolate mint, pineapple mint, eau de cologne mint, to name a few—at the National Clonal Germplasm Repository's collection of *Mentha* and *Pycnanthemum* (mountain mint).

Located in the heart of mint-growing country—Oregon's verdant Willamette Valley—the fragrant assemblage of mints is the largest in this country, and one of the most diverse worldwide, says Henrietta L. Chambers, who oversees the collection.

The mints are one of many different crops, including pears, most berries, hazelnuts, and hops, housed at the Corvallis, Oregon, repository.

The repository is one in a network of 30 ARS-managed gene banks that preserve economically important crops and their wild relatives.

These gene banks assure plant geneticists a ready source of material for breeding new crops to resist environmental stresses, such as insect pests or unfavorable weather. Another important function is to save rare species related to cultivated plants that might otherwise be lost due to livestock grazing and construction.

In the case of mint, however, several unusual applications of the collection have cropped up.

For instance, last year the National Cancer Institute in Bethesda, Maryland, requested samples of several *Pycnanthemum* species to screen them for anti-cancer or anti-AIDS properties. Recently, however, word came back that the findings were negative. "We were a bit disappointed, but we were glad to have used the collection in such a way," says Chambers.

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Horticulturist Henrietta Chambers plots the distribution of New Zealand *mentha*. (K-4424-5)

Yet *Pycnanthemum* species may offer hope for other, less serious but still troublesome problems, according to James Duke, a botanist with the ARS Germplasm Resources Laboratory in Beltsville, Maryland. Mountain mint, pennyroyals and *Hedeoma pulegioides*, and corn mint, all contain high levels of pulegone, a compound that repels fleas, ticks, and mosquitoes. Certain ticks carry organisms responsible for Lyme disease and Rocky Mountain spotted fever, Duke points out.

Other compounds in *Pycnanthemum* and *Mentha,* namely menthol and menthone, may help alleviate decompression syndrome and altitude sickness, problems that plague scuba divers and mountain climbers. A 1986 study showed that the compounds help prevent the cause of both ailments—the aggregation of blood components called platelets.

Mints might help solve economic as well as medical problems. Because it's a relatively high-value crop (the oil is worth between $15 and $25 a pound), ARS scientists consider mint a possible alternative crop for Bolivian peasants who farm coca in the Andean foothills.

In 1990, Chambers sent six mint accessions to a scientist at an agriculture development program affiliated with San Simon University in Cochabamba, Bolivia. Included was a genotype grown in Brazil that could feasibly also thrive in Bolivia. For now, however, it's still too early to comment on mint's success, says George A. White of ARS' National Germplasm Resources Laboratory, who supervises international germplasm distribution.

No matter where it's grown, mint shows up in cuisines throughout the world. A fresh mint sprig makes an attractive garnish on any plate. The fragrant herb also appears often in Indian, Thai, and other Middle Eastern dishes, either sautéed with meats or minced fresh in salads.

Mint oils, however, are much more widely used, particularly in America and European countries. Probably the most familiar uses of mint flavorings are in chewing gum and toothpaste. But it's found throughout the medicine chest—in mouthwash, antacids, even shaving cream. Cough drops sometimes contain one of mint's chief volatile oils, menthol.

Many noncaffeinated or herbal tea blends include dried peppermint or spearmint leaves. And the Oregon Mint Snuff Co. sells dried mint leaves as a substitute for chewing tobacco. The all-mint chew is billed as a nonharmful alternative to smokeless tobacco, the use of which has been linked with oral cancer.

Mints may have a place in your garden as well as in your home—some are attractive ornamentals. For example, the low-growing Corsican mint,

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An assortment from the mint collection: (top to bottom) solid-green orange mint, variegated pineapple mint, fine-leafed Corsican mint, and peppermint. (K-4424-4) (K-4424-2)

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native to that Mediterranean island and others, makes a soft, mosslike carpet that will spread to fill in cracks between a rock path.

"When you walk on it, you'll notice a nice, fresh mint aroma," says Chambers. While the plants may die back over the winter in colder climates, they revive in spring and aren't bothered by foot traffic.

Pineapple mint, sporting light green leaves with white edges, also makes a nice ornamental, as does a variegated (green and white) peppermint. And there is the round-leafed *Mentha sauveolens,* or apple mint, which, according to Chambers, really does have an apple fragrance.

For a citruslike scent, there's an orange mint. And chocolate mint is a nursery favorite, according to Bob Hornback, manager of the Ya-Ka-Ama Nursery in Forestville, California, which retails over 15 to 20 different mint varieties.

Hornback admits that the chocolate smell is "more in the imagination of the beholder," adding that he thinks of chocolate peppermint patties.

The plant's stems are a deep chocolate brown color, rather than the reddish brown of most other peppermints, says Chambers, who herself conjures up visions of chocolate mint Girl Scout cookies.

What about the eau de cologne mint? "It has a smell reminiscent of lavender," says Chambers.

Each variety, along with many other accessions, grows in 6-inch pots in a screenhouse. The screenhouse excludes insects like whiteflies that may transmit viruses or bees that may pollinate the mint flowers.

While most of the accessions originated in Europe, others come from elsewhere around the globe—Japan, Morocco, Pakistan, and Russia. Chambers hopes to visit New Zealand and Australia to collect mints native to those countries.

"There are wild mints growing in Australian grasslands we'd especially like to have—there's heavy livestock grazing in those areas that could wipe out certain species," she says.

The *Mentha* genus, Chambers points out, is just one among 180 different genera in the broader mint family, Labiatae. Other well-known mint family members include many culinary herbs such as basil, marjoram, and oregano, as well as catnip and lavender.

A pound of mint oil can flavor 45,000 sticks of gum.

Salient features that identify mint, notes Chambers, are plants with a distinctive (not always pleasant) scent, and leaves that grow in pairs opposite each other on a square stem.

Most mints display spikes of white or pale lavender flowers with tiny purple spots. Chambers uses these flowers in the further evaluation of the collection—counting the chromosomes in cells that develop into pollen.

She first pickles, or preserves, the tiny mint flower buds in a mixture of chloroform, alcohol, and acetic acid. The solution pulls water from the plant's cells but leaves them otherwise intact.

Next she squashes the flower's anthers—where pollen formation takes place—and stains them for viewing under the microscope. She can then observe meiosis, the cell division that gives rise to the pollen, the plant's male sex cells. Because they will later fuse with the female sex cell, or egg, the pollen grains (like the egg) contain only half the chromosome set and are thus easier to count than other cells, which contain the double set. Mints have between 18 and 144 chromosomes, says Chambers.

Some mints have three, rather than two sets of chromosomes. These triploid plants are sterile, because the third chromosome set can't pair properly. Mint farmers require sterile plants, because mints, like all clonally propagated plants, produce seeds that are genetically different from the original plant. Farmers can't have these other mints contaminating their stands, since mint processors demand pure oil from a single genotype.

Peppermint, Chambers points out, is actually a hybrid species—an ancient cross between spearmint *(M. spicata)* and *M. aquatica,* a broadleafed mint that doesn't have an especially good fragrance.

The most popular northwestern cultivars are Mitcham peppermints, named after a town near London, where they were first collected. Native spearmint and Scotch spearmint are also grown.

Mint harvesting begins in mid to late summer, when the plants are 2-3 feet tall. Farmers cut plants close to the ground, leaving them in windrows—heaps of hay left in the field to dry for a few days. Afterwards, the mint is steam-distilled to extract the oil.

Oregon leads the nation in mint oil production, followed by Washington and Idaho. Smaller amounts grow in Montana, Michigan, Indiana, South Dakota, and Wisconsin.

Growers sell the oil by the barrel to various companies, such as Wrigley's and Palmolive, whose scientists then blend different batches of oil to achieve a desired flavor or scent. According to the Oregon Mint Commission, a pound of mint oil can flavor 45,000 sticks of gum.—By **Julie Corliss,** ARS.

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