

2003 EASTERN WASHINGTON ON FARM MALT BARLEY TRIALS

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Columbia County/WSU Extension Agent

Objective: To evaluate adaptability of selected spring malt barley varieties to eastern Washington conditions using commercial production conditions.

Grower Cooperators:

<u>Name</u>	<u>Location</u>	<u>County</u>
Broughton Land Co	Dayton	Columbia
Juris/Takemura	Dayton	Columbia
Talbott Farms	Dayton	Columbia
David Harlow	Palouse	Whitman
Jim & Jeff Pittman	Oaksdale	Whitman
Gary Houser	Pomeroy	Garfield
Kurt Carstens	Reardan	Lincoln

Great Western Malting Representative: Kevin Anderson - Vancouver

WSU Extension Coordinators:

John Burns - Whitman County (WSU Dept Crops & Soils)
Aaron Esser – Lincoln/Adams County (Ritzville)
Roland Schirman - Columbia County (Dayton)

Methods:

Seven sites were selected by WSU Cooperative Extension agents in an effort to provide a cross section of the agroclimatic zones of eastern Washington. Seed of Baroness feed barley and six potential malt varieties was provided by in quantity great enough to allow seeding of up to 1 acre at each location. Baroness, Harrington and Metcalfe were provided by Columbia County Grain Growers, while Legacy, and Manley were supplied by Great Western Malting and Radiant by Washington State Crop Improvement Association – Foundation Seed Service. Seedbeds were prepared and seeding made with standard equipment at each location. Weed and insect control was provided by the cooperating grower at a time that they deemed optimum. Harvest was made with production size combines and each plot individually weighed. Sub samples taken at harvest were evaluated for quality by Great Western Malting at their Pocatello facility.

Growing Season

The 2003 growing season in eastern Washington was again disappointing in general for spring grain production. The soil moisture recharge during the winter months was marginal although above the 2002 season at most locations. There were also below average temperatures and virtually no precipitation after May 25, which greatly reduced the yield potential. State wide an acceptable quality barley crops was recorded but lower quality than that of recent cropping history.

All sites were dryland - recrop with a reduced or direct seed system.

Precipitation records for 2002-2003 as compared to the long term average and the 2002 - 03 daily average Maximum/Minimum temperatures of selected locations are shown below. It must be recognized that these are from NOAA recording sites and were not taken at the plot site.

Selected Climatic Records for 2002 - 03 Growing Season

Month	Dayton		Pullman		Spokane		Pomeroy		Rosalia	
	02-03	20 yr	02-03	20 yr	02-03	20 yr	02-03	20 yr	02-03	20 yr
Sept	0.23	0.89	0.41	0.89	0.33	0.70	0.49	0.87	0.37	0.83
Oct	0.33	1.53	0.73	1.48	0.18	1.06	0.74	1.19	0.10	1.22
Nov	1.48	2.67	1.23	2.83	1.65	2.24	0.94	2.09	0.68	2.36
Dec	1.95	2.47	2.13	2.53	3.27	2.25	2.01	2.06	2.37	2.60
Jan	3.11	2.31	4.26	2.46	3.40	1.82	4.68	2.03	2.98	2.15
Feb	2.29	1.87	1.66	1.71	0.52	1.51	1.06	2.71	1.46	1.69
March	2.57	2.02	4.74	2.01	2.13	1.53	3.95	1.62	2.11	1.69
April	2.98	1.76	1.30	1.56	1.41	1.28	1.85	1.14	0.96	1.45
May	0.75	1.35	1.16	1.56	1.49	1.60	1.27	1.35	1.54	1.53
June	0.00	2.20	0.18	1.43	0.22	1.18	0.13	1.01	0.48	1.33
July	0.08	0.54	0.06	0.73	0.00	0.76	0.05	0.60	0.00	0.78
Aug	0.42	0.66	0.79	0.91	0.44	0.73	0.60	0.74	0.54	0.70
Total	16.19	20.27	18.65	20.10	15.04	16.66	17.77	17.41	13.59	18.33

Monthly Ave Temperature (°F)

Month	Dayton		Pullman		Spokane		Pomeroy		Rosalia	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
Sept	77.4	46.8	75.6	59.5	74.1	42.3	75.5	43.1	75.0	42.2
Oct	61.8	34.2	58.9	27.8	56.5	29.3	59.8	29.8	59.1	26.9
Nov	49.9	31.5	47.2	31.1	45.2	28.3	50.0	28.0	48.5	27.0
Dec	44.3	32.2	39.5	29.9	38.2	29.5	41.4	30.4	39.7	29.6
Jan	45.7	34.3	41.8	31.4	38.5	29.5	44.0	32.7	41.2	30.5
Feb	47.7	29.6	41.9	28.0	40.8	25.4	44.3	27.9	42.3	27.2
March	55.4	39.1	49.5	34.9	49.2	32.3	52.7	35.4	49.8	33.8
April	60.7	39.0	56.0	35.4	54.8	35.5	57.5	37.2	57.2	35.4
May	68.5	45.5	64.5	41.4	64.9	41.9	66.4	41.4	64.2	40.2
June	82.0	51.5	76.1	46.3	77.5	49.7	79.4	47.7	78.1	46.5
July	92.0	67.4	88.4	49.9	89.0	57.0	90.5	52.6	89.3	50.4
Aug	87.9	55.8	84.9	50.0	84.8	55.7	86.8	51.1	87.5	51.5

Pest and other Environmental Pressure

Broadleaf weeds were satisfactorily controlled at all locations in a timely manner. Wild oat continues to be a concern as producers move toward reduced tillage but this year herbicides gave a satisfactory level of suppression at all locations. No recordings of aphid, wire worm or Hessian fly were ever above the economic threshold level. Of continued concern is the observation of failure to have uniform seedling establishment within a seeded row. In that most growers have integrated direct seeding in their management system the potential of pathogens that are present but not considered economic in intense tillage must be evaluated. Low levels of rhizoctonia were noted in most fields but other organisms may also be involved. In fields where stand counts were made, the general conclusion was that varietal differences in their reaction to this disease did not exist.

Varieties Tested:

BARONESSE: This 2-row feed grade variety has become the industry standard for barley production in eastern Washington. Released by Western Plant Breeders in 1992 this variety was planted on 238,000 acres in 2002 which was 85% of all feed barley varieties acreage of eastern Washington (see Figure 1). Yield and quality have been outstanding over a wide range of agroclimatic zones.

HARRINGTON : Currently recognized as the PNW standard for malt varieties this two row, 1986 University of Saskatchewan release was planted on 18,200 acres in Washington in 2003 (only 55% of malt variety acreage) down from 42,700 acres in 1996 (see Figure 1). It has excellent straw strength and mid season maturity. It is adapted to dryland production, but tends to yield below the best dryland feed types. Test weight has been better than some of the other varieties

LEGACY (BT290): Legacy is a six-row variety released in 2001 by Busch Agricultural Resources that was grown with limited acreage in Idaho, Montana and the western Canadian provinces. It has reported better yield, percent plump and lower protein than comparative 6-row varieties. It shows resistance to stem rust, surface-borne smuts, moderate resistance to common root rot, and spot form of net blotch. With relatively weak straw standability under eastern Washington conditions is a concern.

MANLEY (TR490): Manley was released in 1990 by the University of Saskatchewan, Saskatoon. It is a 2-row malt barley moderately resistant to spotted form of net blotch and has good test weight and yield. Its maturity is about three days later than Harrington and it is susceptible to net form of net blotch, loose smut, scald and septoria leaf blotch. Manley is a rough awned variety and is similar in height to Stander and Harrington and shorter than Argyle with fair lodging resistance.

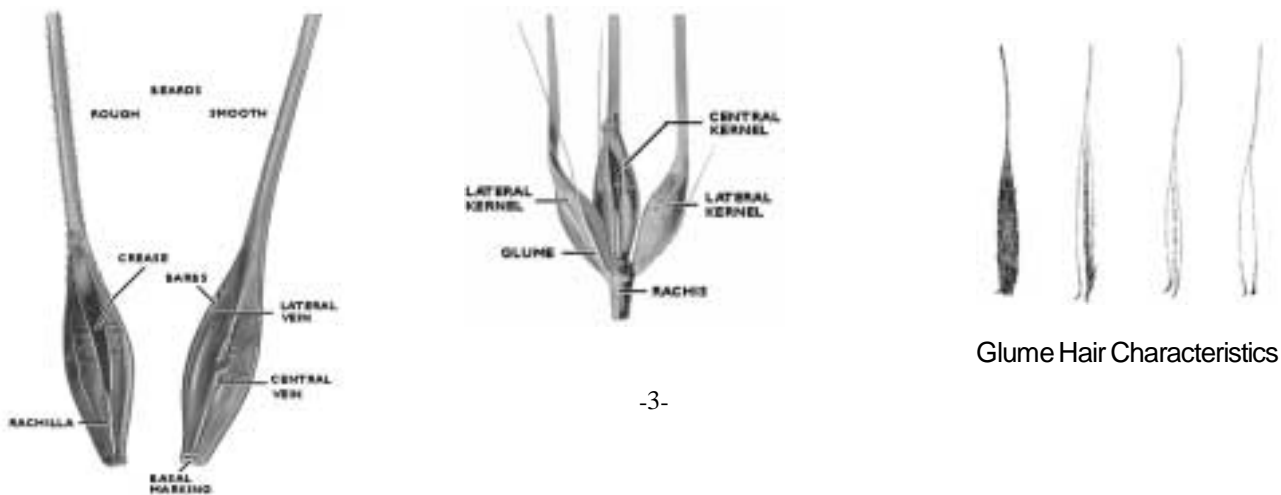
AC METCALFE (TR 232): AC Metcalfe is a high yielding, white aleurone malting variety. In western Canadian trials the yield potential has been 8.3% higher than Harrington and 2.2 % lower than Manley. It is medium early in maturity, one day later than Harrington but two - three days earlier than Manley. Metcalfe has good resistance to loose smut, is moderately resistant to the spotted form of net blotch, fusarium head blight and carries the T gene for stem rust resistance. It is susceptible to the net-form of net blotch, scald and septoria as are Manley and Harrington. Its height is equal to Manley and slightly taller than Harrington. It has shown better lodging resistance than Harrington and similar to Manley.

AC Metcalfe has shown a very high malt acceptance level of samples submitted for testing. It generally has a plumper kernel than many other varieties when grown under similar conditions.

RADIANT (WA98-NZ223): Radiant is a proanthocyanidin-free two-rowed spring malting and feed barley released in 2003 by Washington State Agricultural Research Center. This rough awned, mid-tall, relatively stiff straw, mid-season, variety is a selection from a cross of Baronesse and pant 29-667, a proanthocyanidin-free induced mutation of Harrington. Radiant has shown wide adaptation with excellent yield performance. It has shown moderate resistance to stripe rust and other diseases. In addition to the reported benefit of the proanthocymidin-free characteristic that makes the technical processes for stabilization of beer against permanent and chill haze superfluous, micro-malting data indicate that other malting quality parameters of Radiant match those obtained by Harrington. Under favorable growing conditions. Radiant achieves a higher kernel weight and a desired lower protein content (10%) than Harrington. Industry acceptance is still pending until further testing occurs.

Identification of Varieties

With the number of varieties that are being evaluated at the grower level we have attempted to develop a table of seed head characteristics to aid in identification. A visual glossary is shown below. For some characteristics the use of a hand lens is recommended.



ABBREVIATIONS **Beard:** R-rough, S-smooth, SS-semismooth; **Rachilla Hairs:** S-short, L-Long; **Basal Mark:** D-depression, C-crease, DC-depression tending to crease; **Hull:** W-wrinkled, S-smooth; **Lateral Vein Barbs:** N-none, F-few, S-several, Nu-numerous; **Glume hairs:** C-Covered, B-band, M-midline, S-short, L-long.

Variety	No Rows	Beard	Rachilla Hairs	Basal Mark	Hull	Lateral Vein Barbs	Glume Hairs	Other Characteristics
Radiant	2	R	L	C	S	N	C/L	Crease narrow, prominent veins, kernels long plump tapering at both ends, testa without proanthocyanidins.
Farmington	2	R	L	C	S-W	N	C/L	Crease narrow, prominent veins, plump kernels tapering at both ends.
Baronesse	2	R	L	D	W	N	C/L	Midlong to long kernel. Crease narrow lower half, flared at beard end. Lateral sterile florets are extremely reduced in size vs typical two-row barley.
Harrington	2	R	L	D	S-W	N	C/L	Crease narrow, shallow. Loose Hull. Diamond shaped kernel.
AC Metcalfe	2	R	L	D	S-W	F	C-B/L	Long glume hairs are mainly confined to a band but there are a few scattered over the rest of the glume.
Garnet	2	R	L	DC	W	N	C/L	Lateral veins prominent. Kernels broad at midpoint, giving kernels a diamond shape.
Manley	2	S	L		S-W	N	C/L	
Legacy	6	SS	L	DC	W	S	B/L	Crease V-shaped with crease hairs. Several barbs on moderately prominent lateral veins. Hull wrinkled with sharkskin in interveinal areas.
Lacey	6	SS	S	DC	W	F	C/S	V-shaped, narrow at base. Kernels medium large, plump, and wide at center. Veins moderately prominent.

Photos of varieties in this year trials are shown in report appendix.

Results

Data obtained from these trials has been grouped into several tables & graphs. In summary these include:

Table 1 Yield by location showing variety yield and basic information of each site.

Table 2 Summary of quality factors by variety with sub standard ratings highlighted for malt varieties.

Figure 1 Estimated Washington barley acreage for 1994 - 2003.

Figure 2 Variety yield by location expressed as percent of Baronesse.

Figure 3 Comparative protein percentage by variety at each location.

The weather factors noted under growing conditions show that the 2003 crop was under severe moisture stress during the fill period. This may not have been true for all sites but no measure was made of this factor. General grower reaction was that performance of all spring crops in eastern Washington was below the long term average given the rainfall pattern. The planting date at all sites was considered to be in the desired range.

Yield Potential

Yield of the varieties seeded at each location are shown in Table 1. Average yields of the various sites varied from 2337 lb/A at Talbott, a site NW of Dayton in a 16 inch rainfall zone, to 4357 lb/A at the Palouse (Harlow) site(20 in rainfall). This year most growers in the region were reporting yields in the 2800 to 3200 lb/A range.

To reduce the possibility of skewing yield comparisons across all sites a ranking for varieties at each location was made and then these rankings averaged. Using this approach it can be seen that Radiant was consistently in the upper yield while Manley ranked lowest under this system. Unfortunately our seed stock was not great enough to seed Radiant at the Houser site.

Of the remaining varieties there is no clear difference in yield ranking. Legacy does seem to favor high stress situations. This is the first year that Baronesse failed to be ranked highest overall.

In that Baronesse is the primary variety grown in Washington, Figure 3 has been prepared expressing yield of each varieties as a percent of Baronesse at each location. Actual Baronesse yield for the location is shown in the Label parenthesis.

Quality grade

The current minimum standards for malt barley are shown below. It has been suggested by the American Malting Barley Association that breeders raise their standard for plump to 90 % for 2 row and 80 percent when evaluating new lines to 80 percent. If this standard were also adopted for production fields it could pose a challenge for dryland areas that occasionally have late season moisture stress.

Current Malt Quality Standards

Type	2 Row	6 Row
Protein	< 13.5 %	< 13.5 %
Plump	> 80 %	> 70 %
Thins	< 5 % (5/64 screen)	< 5 % (5/64 screen)

Based on laboratory analysis, all of the malting varieties failed to meet the minimum standards plumpness at both the Carsten and Pittman locations. Radiant did not meet plump standards at any location but had significant amount on 5 ½ screen(data not shown). Manley also tended to show greater elevated levels of protein than other cultivars.

Comparative protein levels are shown in Figures 3.

Test weight essentially paralleled the percent plump.

Seed Size/Stand

Although from an academic point of view it would be desirable to seed the same number of seeds per square foot, the only practical way to establish this type of plot is to select a drill seed setting and seed all plots at that setting. With the wide variation of seed sources it appeared that the number of seed could vary significantly. One thousand kernel weight was determined from this years seed lots and the potential rate of seeds per square foot are shown below.

1000 KERNEL SEED WEIGHTS 2003 MALTING TRIALS						
VARIETY	WEIGHT IN GRAMS	Seed/lb	Seed/sq ft at seeding rate of X #/Acre			
			75	80	85	90
A.C. METCALFE	51.5	8816	15.2	16.2	17.2	18.2
BARONESSE	43.4	10461	18.0	19.2	20.4	21.6
HARRINGTON	50	9080	15.6	16.7	17.7	18.8
LEGACY	37.7	12042	20.7	22.1	23.5	24.9
MANLEY	45	10089	17.4	18.5	19.7	20.8
RADIANT	49	9265	16.0	17.0	18.1	19.1

Stand count was taken at 5 locations 3 – 4 weeks after seeding. These are summarized below. It is interesting to note that only at the Carsten site is there a parallel between predicted and actual stand number.

	Stamd Count - Plant/Square ft				
	Takemura	Talbott	BLC	Carsten	Houser
AC Metcalfe	14.3	13.6	12.5	9.9	12.8
Baroness	15.3	15.2	15.2	12.1	17.7
Harrington	13.4	14.8	15.7	9.5	16.5
Legacy	13.7	13.1	15.3	13.1	13.1
Manley	14.3	14.3	14.5	11.5	13.1
Radiant	13.7	11.6	17.8	10.8	

SUMMARY

These trials continue to confirm that available malt barley varieties have the potential to compete with feed barley for many agroclimatic zones in eastern Washington. Although Harrington continued to give acceptable yields it appears other varieties have an wider agroclimatic range of adaptability and yield potential for this area. The Canadian released two row cultivar Metcalfe and the Busch 6 row variety Legacy continue to show good quality and yield potential if the malted product meets the standards preferred by the brewing industry. Although historically lodging has been a limiting factor with six row varieties under this years conditions it was not a factor. The newly released cultivar Radiant, showed promising yield promise but the ability to have consistant quality to make it acceptable to the industry is unknown.

Future Plans

On Farm testing of potential Malt Barley varieties was continued in 2003 in response to request from extension advisory committees. An additional site had been scheduled for Asotin county but was not established due April to weather conditions. Present indication is that budget constraints will reduce the level of involvement that Great Western can provide in 2004. With the present staffing restraints in Extension, discussion with growers as to program priority will occur to determine how many trials in this area will be established during the 2004 growing season.

Special Thanks

We would like to express special thanks to the Broughton Land Company crew and Gary Houser for putting in the seedings during the time that the Extension Agent was serving on a jury trial and unavailable to be in the field.

Appendix to Report:

Included as an appendix to this report are yield results of genetic materials that were in the 2003 WSU Variety Testing program. All locations utilized small plots (4x16') with at least 3 replications. Seeding and harvesting was with standard small plot equipment.

To allow you the reader to more easily compare performance across locations Appendix Table 1 expresses the yields of 6 row type barley varieties as percent of Steptoe at that location and for the two row varieties as percent of Baronesse.

Questions on these results or requests for information on numbered lines that were also included in these trials should be directed to either Dr Steve Ulrich or John Burns at the Dept of Crop & Soil Science, Washington State Univ. Pullman, WA.

Figure 1

Estimated Washington Barley Acreage for 1994 - 2003

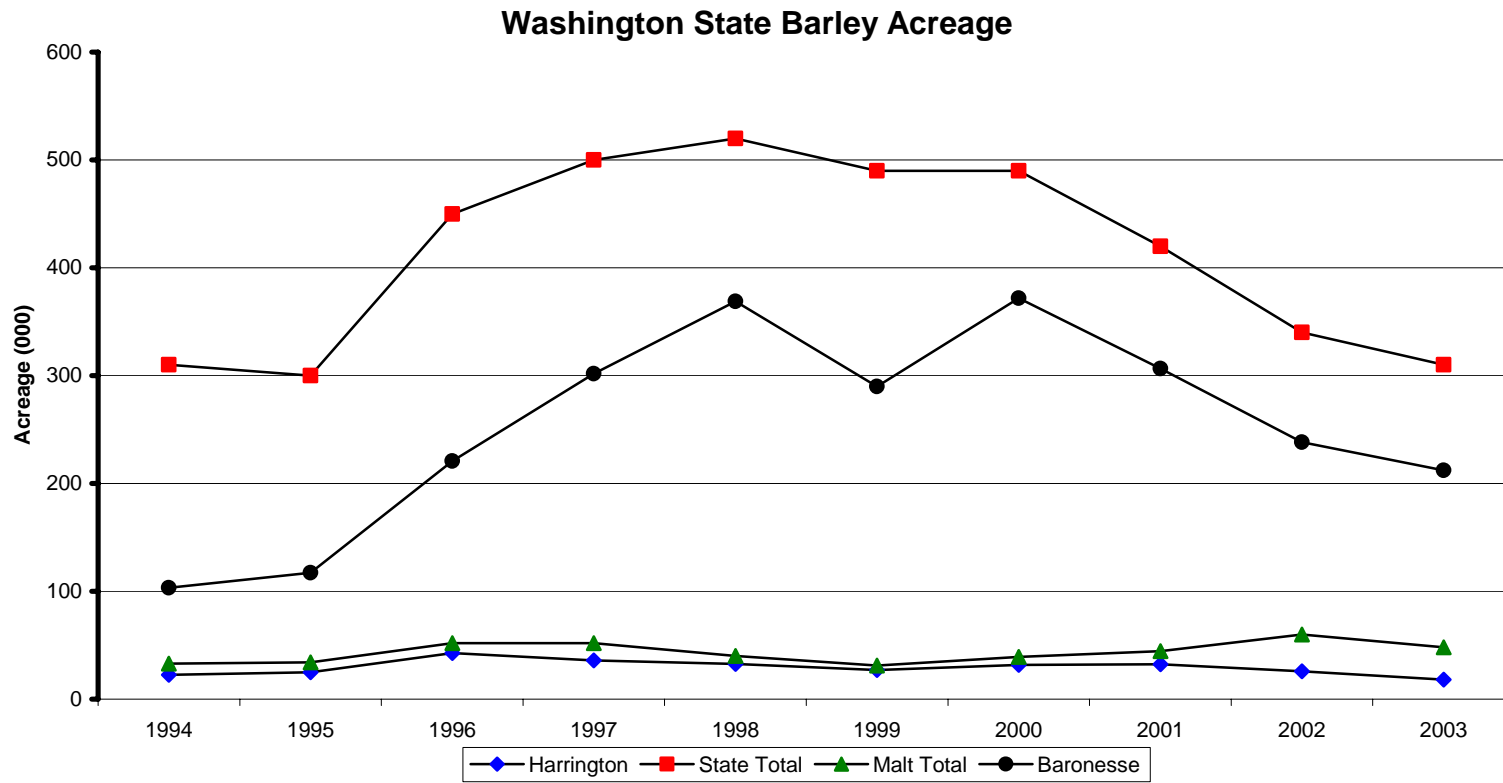


Figure 2

2003 Yield as % Baronesse

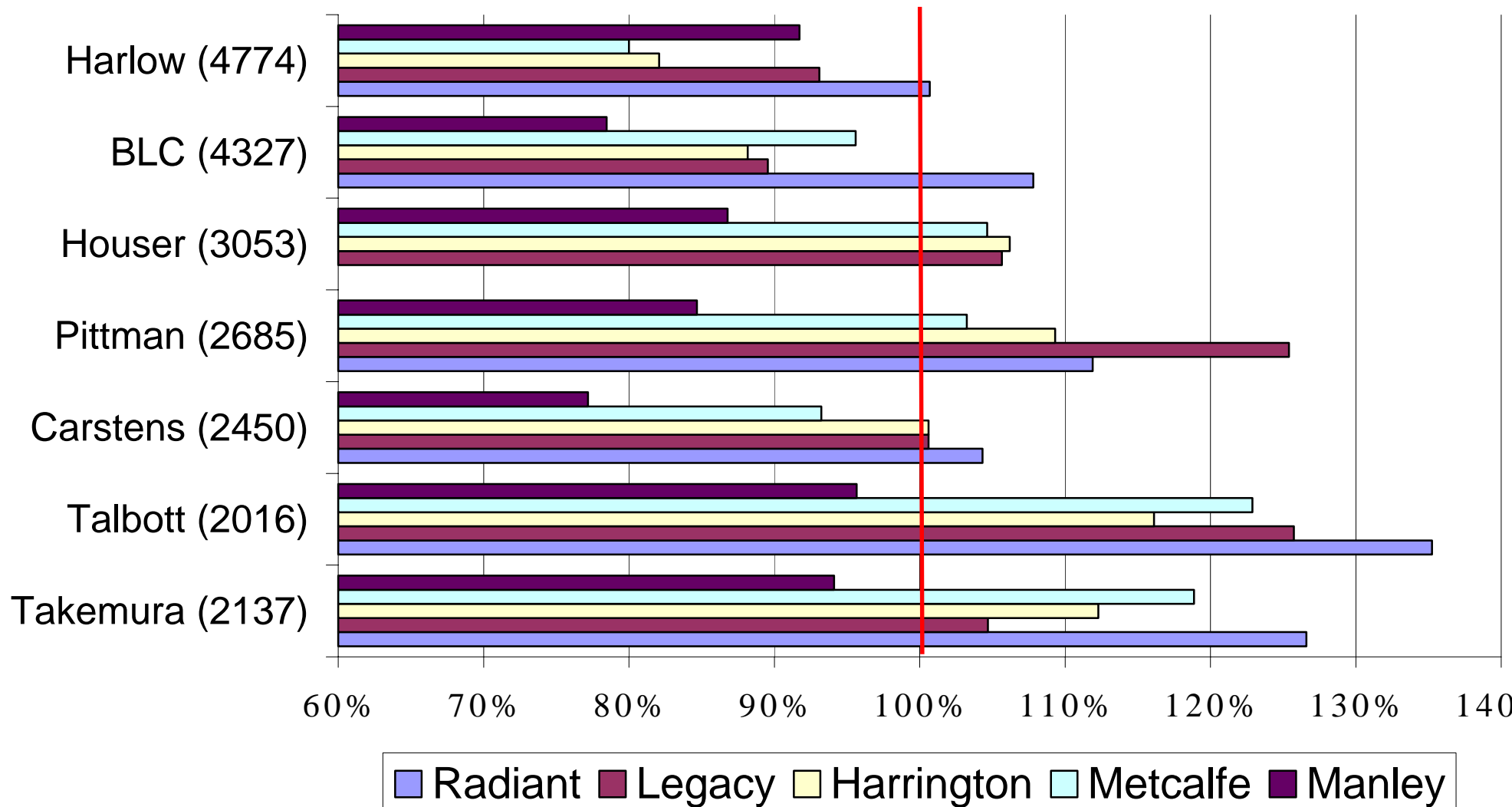


Figure 3

2003 Malt Barley Trial Protein Content

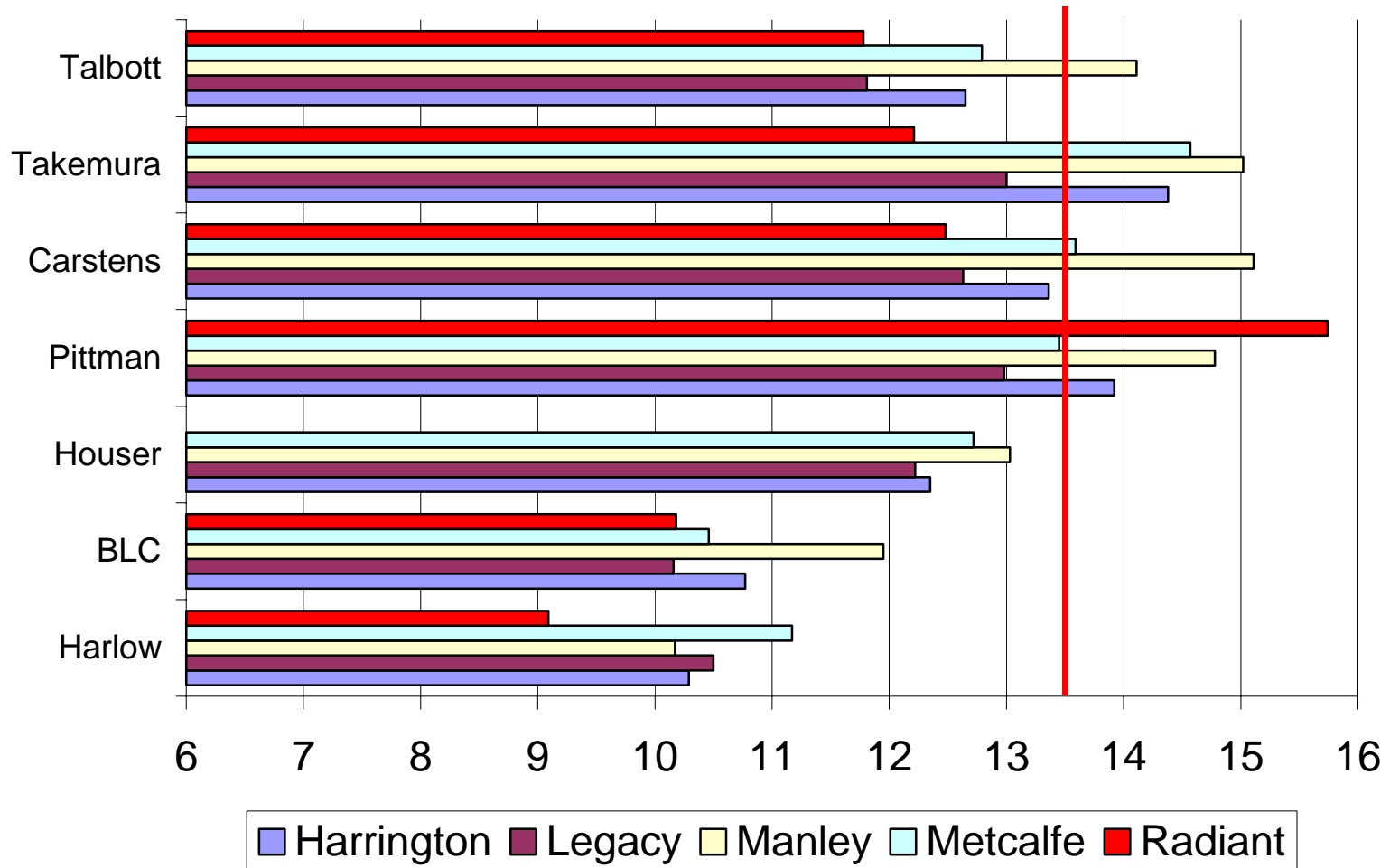


Table 1: Yield by Location in Lb/A and (Ranking) at that Location

	Takemura	Talbott	Carstens	Pittman	Houser	BLC	Harlow	Ave
Radiant	2705 (1)	2726 (1)	2556 (1)	3004 (2)		4665 (1)	4807 (1)	4093 (1.2)
Legacy	2237 (4)	2534 (2)	2465 (2)	3366 (1)	3226 (2)	3875 (4)	4445 (3)	3691 (2.6)
Harrington	2399 (3)	2340 (4)	2465 (3)	2938 (3)	3242 (1)	3815 (5)	3918 (5)	3519 (3.4)
AC Metcalfe	2540 (2)	2477 (3)	2284 (5)	2771 (4)	3194 (3)	4136 (3)	3819 (6)	3537 (3.7)
Baronesse	2137 (5)	2016 (5)	2450 (4)	2685 (5)	3053 (4)	4327 (2)	4774 (2)	3573 (3.9)
Manley	2011 (6)	1928 (6)	1891 (6)	2273 (6)	2649(5)	3395 (6)	4379 (4)	3088 (5.6)
Site Ave	2338	2337	2352	2839	3073	4036	4357	
Seeding Rate	80	80	70	75	80	80	85	
Seeding Date	4/21	4/21		5/10	4/23	4/23	4/28	
Harvest Date	8/7	8/13		8/24	8/13	8/22	8/30	

Table 2: Quality Evaluation Factors

	Harlow	BLC	Houser	Pittman	Carstens	Takemura	Talbott
Protein							
Baronesse	9.11	10.58	12.31	14.44	13.75	13.56	13.31
Harrington	10.29	10.77	12.35	13.92	13.36	14.38	12.65
Legacy	10.50	10.16	12.22	12.98	12.63	13.00	11.81
Manley	10.17	11.95	13.03	14.78	15.11	15.02	14.11
Metcalfe	11.17	10.46	12.72	13.45	13.59	14.57	12.79
Radiant	9.09	10.18		15.74	12.48	12.21	11.78
Bushel Wt							
Baronesse	50.3	47.8	48.9	43.3	43.3	44.2	47.8
Harrington	49.3	47.3	47.7	42.3	44.2	44.7	47.3
Legacy	48.9	45.6	47.8	43.0	43.7	44.4	48.0
Manley	49.0	48.7	45.1	42.8	41.5	40.6	45.6
Metcalfe	49.7	44.4	47.9	42.0	44.7	43.7	47.5
Radiant	50.2	47.3		40.5	43.7	44.7	48.1
Plump							
Baronesse	90	85	81	38	44	89	81
Harrington	96	90	78	47	58	90	78
Legacy	94	81	74	41	32	91	76
Manley	89	94	59	50	26	78	65
Metcalfe	95	73	86	18	64	92	80
Radiant	87	64		17	28	76	70
Thin							
Baronesse	1	1	2	7	6	1	2
Harrington	1	1	2	5	6	1	2
Legacy	1	1	2	7	10	1	2
Manley	1	1	4	4	12	3	3
Metcalfe	1	2	2	13	3	1	1
Radiant	1	4		13	8	2	2

WSU 2003 Small Plot Variety Trials

VARIETY	RITZVILLE	LAMONT	BICKLETON	FAIRFIELD	DUSTY	WALLA WALLA	REARDAN	ALMIRA	DAYTON	MAYVIEW	FARMINGTON	ST. JOHN	PULLMAN	MOSES LAKE	MEAN YIELD	MEAN TEST WT. (LBS/BU)
2 Row	Barnesse Yield or % of Barnesse															
BARONESSE	1744	2450	2154	2726	2702	3423	3541	3627	4196	3875	4345	4488	4886	5431	3542	48.8
AC METCALFE	93%	78%	92%	106%	111%	86%	88%	100%	92%	92%	85%	85%	94%	100%	93%	48.8
ADAGE	104%	99%	91%	133%	115%	102%	102%	95%	96%	106%	107%	100%	102%	91%	102%	48.9
BOB	98%	95%	107%	117%	120%	95%	81%	100%	93%	93%	102%	102%	91%	102%	99%	49.7
CAMAS	108%	77%	94%	91%	105%	94%	95%	92%	80%	94%	59%	92%	94%	101%	90%	50.7
CAMELOT	108%	81%	98%	97%	117%	86%	82%	90%	77%	95%	82%	90%	87%	90%	90%	49.6
CEBECO 0149	99%	88%	94%	114%	117%	90%	94%	100%	82%	100%	99%	98%	99%	101%	98%	48.6
FARMINGTON	89%	91%	90%	101%	101%	80%	99%	93%	85%	96%	104%	83%	88%	95%	92%	48.4
HARRINGTON	93%	65%	76%	101%	114%	78%	82%	85%	83%	88%	99%	87%	93%	90%	88%	47.9
MANLEY	83%	68%	78%	88%	114%	66%	71%	77%	89%	83%	65%	76%	94%	90%	82%	47.7
RADIANT	100%	85%	91%	105%	127%	93%	88%	95%	85%	80%	90%	94%	100%	104%	95%	48.6
SAMISH 23	94%	78%	95%	102%	105%	88%	102%	92%	78%	95%	87%	89%	88%	96%	92%	49.0
XENA	105%	85%	115%	82%	119%	98%	84%	96%	91%	94%	51%	98%	96%	103%	93%	49.3
2000NZ772	95%	66%	94%	107%	89%	70%	97%	98%	77%	95%	86%	84%	101%	80%	88%	48.7
98NZ015	66%	57%	81%	119%	88%	81%	76%	88%	75%	81%	92%	88%	99%	88%	86%	47.7
BZ596-117	106%	65%	106%	113%	125%	91%	108%	99%	81%	96%	98%	92%	98%	121%	100%	50.8
BZ596-189	94%	87%	81%	113%	87%	94%	94%	98%	87%	102%	103%	90%	100%	108%	97%	48.7
NZDK 00-155	94%	72%	76%	97%	103%	77%	87%	83%	79%	91%	84%	88%	96%	83%	86%	46.7
NZDK 00-170	95%	67%	77%	73%	99%	80%	84%	91%	85%	94%	95%	89%	91%	94%	88%	47.3
NZDK 55	105%	73%	82%	91%	127%	83%	86%	87%	78%	91%	95%	94%	92%	100%	91%	47.8
NZDK 7	87%	82%	80%	102%	93%	93%	61%	103%	81%	97%	86%	94%	94%	89%	89%	48.1
NZDK 91	98%	82%	84%	88%	110%	81%	88%	96%	86%	99%	93%	91%	94%	79%	90%	47.1
NZDK 94	91%	80%	80%	109%	113%	83%	81%	89%	82%	89%	70%	95%	92%	95%	89%	47.6
WA 10421-99	107%	76%	81%	109%	99%	87%	88%	92%	76%	94%	83%	88%	95%	110%	92%	48.2
WA 10451-99	100%	93%	79%	96%	92%	98%	77%	95%	88%	100%	93%	96%	102%	92%	93%	49.0
WA 10497-97	88%	67%	91%	101%	109%	93%	86%	93%	87%	93%	90%	90%	96%	96%	92%	49.6
WA 10701-99	113%	82%	97%	112%	108%	97%	95%	105%	81%	99%	83%	99%	97%	94%	96%	49.3
WA 7194-98	81%	73%	97%	81%	102%	97%	86%	98%	79%	93%	71%	94%	93%	107%	90%	49.7
WA 7617-99	93%	72%	74%	91%	109%	71%	86%	91%	85%	100%	78%	82%	89%	73%	85%	44.3
WA 8569-99	111%	93%	88%	105%	107%	99%	88%	98%	87%	97%	95%	100%	95%	94%	96%	48.8
WA 8601-97	92%	84%	72%	108%	102%	93%	89%	94%	91%	98%	84%	88%	101%	104%	94%	46.7
WA 9004-99	112%	80%	101%	105%	83%	93%	92%	96%	86%	93%	80%	92%	97%	99%	93%	49.6
WA 9701-99	108%	81%	81%	102%	123%	93%	94%	94%	84%	100%	99%	97%	97%	89%	95%	46.9
WA 9776-99	98%	75%	75%	96%	100%	70%	100%	92%	88%	100%	91%	89%	87%	100%	91%	46.6
6 - Row	Steptoe Yield or % of Steptoe															
STEPTOE	1547	1656	2300	1871	2667	3139	2912	3528	3324	3193	2950	4050	4526	4836	3036	46.0
2001NZ706	100%	95%	82%	146%	77%	78%	109%	84%	91%	108%	133%	94%	96%	124%	101%	45.6
99NZ 102	91%	84%	77%	163%	84%	80%	107%	85%	89%	97%	116%	95%	91%	134%	100%	46.5
CREEL	100%	65%	94%	130%	81%	78%	112%	97%	87%	100%	134%	104%	100%	113%	101%	47.7
LEGACY	95%	110%	97%	111%	94%	80%	111%	98%	90%	95%	149%	97%	96%	114%	102%	48.1
MOREX	110%	93%	88%	106%	97%	95%	103%	84%	72%	78%	124%	87%	86%	105%	94%	48.4



Manley



A.C.Metcalf



Radiant



Baronesse



Harrington



Legacy



**2003 Eastern
Washington
On Farm
Malt Barley
Trials**