

**1999 REGIONAL BARLEY, COMMON AND DURUM WHEAT, TRITICALE,
AND OAT PERFORMANCE TESTS IN CALIFORNIA¹**

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University of California Cooperative Extension regional cereal evaluation tests were conducted in the intermountain valleys of northeastern California; the Sacramento, San Joaquin, and Imperial Valleys; and in the south central coastal region in 1999. Entries in the tests included standard cultivars, new and soon-to-be released cultivars, and advanced breeding lines from both public and private cereal breeding programs. Winter barley (8 entries) was evaluated at one location; fall-sown spring barley (33 entries), at 6 locations; and spring-sown spring barley (30 entries), at 3 locations. Winter wheat (14 entries) was evaluated at one location; fall-sown hard red and hard white spring wheat (38 entries), at 12 locations; durum wheat (40 entries), at 5 locations; and spring-sown spring wheat (20 entries), at 3 locations. Triticale (10 entries) was evaluated at 3 locations; and oat (11 entries), at one location. A cereal hay/forage test (23 entries) was evaluated at one location.

Tests were conducted at University of California Field Stations or in fields of cooperating growers. Tests were sown at seeding rates of 1.2 million seeds per acre for common and durum wheat tests if irrigation was planned (requiring from 74 to 147 lb/acre for common wheat and from 113 to 173 lb/acre for durum wheat, depending on the entry) and at 1.0 million seeds per acre for rainfed wheat and all barley, triticale and oat tests (requiring from 62 to 122 lb/acre for common wheat, 58 to 125 lb/acre for barley, 93 to 135 lb/acre for triticale, and 49 to 96 lb/acre for oat, depending on the entry). Randomized complete block designs with four replications were used. Each plot was six drill rows wide (6-inch row spacing) and 25 feet long, except at the UC Desert Research and Extension Center (Imperial) where plots were 16 feet long and at the UC Intermountain Research and Extension Center (Tulelake) where plots were nine drill rows (5 feet) wide. Grain was harvested with a Wintersteiger Seedmaster Universal 150 plot combine. Foliar diseases were assessed at the soft-to-medium dough stage of growth by estimating the percentages of areas of penultimate leaves (flag-1 leaf) affected. BYD assessments, however, were based on the percentage of plants showing symptoms. Black point was assessed on grain samples of durum wheat after harvest. Yield, test weight, kernel weight, plant height, days to heading and maturity, lodging, shattering, disease reaction, and grain quality were determined as indicated in the tables. Information regarding each site is given in Table 1.

Small grain sowings in California for the 1999 season included nearly 569,000 acres of wheat (including 89,000 acres of durum wheat), 170,000 acres of barley, and 310,000 acres of oat. Leading wheat cultivars (non-durum) by acreage were Yecora Rojo (113,280 acres), RSI 5 (109,081 acres), Brooks (90,000 acres), and Express (58,911 acres).

Those four cultivars accounted for over 77% of non-durum acreage. Yecora Rojo, Brooks, and RSI 5 predominated in the San Joaquin Valley while Express and RSI 5 predominated in the Sacramento Valley. Kronos was the leading durum wheat cultivar and accounted for 70% of the durum wheat acreage. The acreage of Kronos (and total durum wheat) was split nearly evenly between the San Joaquin Valley and southern California (Imperial Valley). Crop performance was much better in 1999 than in 1998 when excessive rainfall resulted in high disease and weed pressure, severe lodging, and substantial yield losses. The 1999 season's crop looked excellent well into April. Temperatures were cooler than normal through early spring, with about 1000 fewer growing degree-days than normal accumulated in major growing regions.

¹These tests were conducted by the UC Davis Department of Agronomy and Range Science and Cooperative Extension. Land for the tests, the grain produced and other facilities were contributed by cooperating growers identified in Table 1. Quality evaluations were provided by the California Wheat Commission (CWC) quality laboratory. The assistance of growers and the CWC quality laboratory is acknowledged with appreciation. The regional testing program is supported in part by funds provided by the California Crop Improvement Association and the California Wheat Commission.

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Rainfall amounts were average to substantially less than average in key areas of the state. Freezing temperatures during the Easter weekend caused frost injury (resulting in moderate to complete sterility) in fields of wheat and barley in the Central Valley that were flowering or beginning to flower at that time. Some damaged fields were harvested for forage. Late sown fields were not in a vulnerable stage so escaped damage. Disease levels were lower than in 1998, although several diseases reached severe levels in some regions of the state. Barley scald (caused by *Rhynchosporium secalis*) was severe on barley in nurseries in the Sacramento Valley. Disease severity reached 100% on the most susceptible entries. The new cultivar UC 937 showed excellent resistance, as did UC 603 and Nebula. Barley stripe rust (caused by *Puccinia striiformis*) reached disease severity of 50-100% on susceptible lines in both the Sacramento and the San Joaquin Valley. UC 937 showed excellent resistance. UC 603 also had very low stripe rust severity. Severe wheat stripe rust occurred in the Sacramento Valley. It was first observed in mid-April on the cultivar Express in Colusa and Sutter counties. Temperatures remained relatively cool and stripe rust continued to develop. By early May, commercial fields of the main cultivars of the region, Express and RSI 5, were affected, with RSI 5 apparently supporting more profuse sporulation than Express. Fields in growth stages from early fill to soft dough in Sutter, Colusa, and Yolo counties had disease levels ranging from 1% incidence/1% severity to 100% incidence/80% severity in early May. Fields that were sown later than most fields in the area were most severely affected. Septoria tritici blotch, although less severe than in 1998, was severe on early sown wheat in the Sacramento Valley, even on previously resistant cultivars and breeding lines. It reached disease severity of 50-100% on susceptible lines in the Sacramento Valley nurseries. Black-tip (black point), which was severe on durum wheat last season because of late-season rainfall and lodging was virtually absent this season.

BARLEY

Winter barley. The intermountain winter barley test contained 8 entries, all 6-row winter feed barleys except for one spring barley (Steptoe). Yield and agronomic performance data are given in Table 2. Steptoe did not survive. Yields of the remaining entries were very high. There was no disease pressure. Average yields ranged from 5170 to 8570 lb/acre. Scio, Kold and Strider were the highest yielding entries. Kold and Strider were the highest yielding from 1998-99 while Strider, Scio, Kold and Westbred Sprinter were the highest yielding in the three-year period 1997-99 (Table 3).

Fall-sown spring barley. The fall-sown spring barley test contained 33 entries, including 7 cultivars and 26 advanced lines from six breeding programs (University of California, Western Plant Breeders, Arizona Plant Breeders, Busch Ag Resources, Inc., CIMMYT, and World Wide Wheat). Most entries were 6-row spring feed barley, but there also were one 2-row feed barley (23 IBON 5), two 2-row malting barley (2B94-5337 and 2B96-5052) and two 6-row malting barley (6B94-7378 and 6B94-8253) entries. Yield and agronomic performance data for individual sites are given in Tables 4-11. Spring frosts were noted at most of the locations (Butte: 3/5, 3/11, 3/30, 4/1, 4/9; Madera: 4/4, 4/5, 4/9, 4/10; UC Davis: 3/6, 4/9, 4/11) and may have caused some sterility to entries that were nearing anthesis on those dates.

Stripe rust was particularly severe at Butte, UC Davis, Madera, and Kings. Cultivars UC 603 and UC 937 and advanced lines UCD 92-10585, 2B96-5052, UCD 95-3804, UCD 97-4286, UCD 97-4420, 20 IBYT 9, and 23 IBON 5 had very low disease scores (resistant). Scald was particularly severe at Butte and UC Davis. Cultivars UC 603, UC 937, and Nebula and advanced lines UCD 92-10588, UCD 92-10585, UCD 95-2407, APB A-5, APB A-27, UCD 95-3917, UCD 97-4420, and IBYT 9 had very low disease scores (resistant). Lodging was particularly severe at Butte, UCD and Kings.

A few entries (6B94-7378, 6B94-8253, 20 IBYT 9) had severe shatter at Butte, UC Davis, and Kings. Average yields ranged from 2980 lb/acre at the rainfed San Luis Obispo site to 6800 lb/acre at the Butte site. Entries UCD 92-10585, UC 937, APB A-7, APB A-20, UCD 97-4286, and UCD 92-10588 were highest yielding in the Sacramento Valley; entries UCD 97-4286, APB A-20, UC 937, APB A-7, and UCD 95-2407, in the San Joaquin Valley. In the three-year period 1997-99, entries UCD 92-10585, UCD 92-10588, and UC 937 were the highest yielding in the Sacramento Valley, entries UCD 92-10585, UCD 95-2407, and UC 937 were the highest yielding in the San Joaquin Valley, and entries UCD 92-10588, UCD 92-10585, and Arivat were the highest yielding in rainfed areas (Table 12).

Spring-sown spring barley. The intermountain spring barley test contained 30 entries (2-row and 6-row feed and malting barleys), including 18 cultivars and 12 advanced lines from ten breeding programs (University of California, Oregon State University, Busch Ag Resources, Coors, Utah State University, Washington State University, University of Saskatchewan, Western Plant Breeders, Arizona Plant Breeders, and World Wide Wheat). Yield and agronomic performance data for individual sites are given in Tables 13-15. There was severe moisture stress at the Lassen site due to irrigation system breakdown which resulted in stunted plants and very low yields. BYD was moderately severe at the Siskiyou site, but no stripe rust occurred at any of the sites. Several entries suffered moderate frost damage at the Siskiyou site. There was moderate to severe lodging at Tulelake where yields were very high. Average yields ranged from 660 lb/acre at the Lassen site to 8280 lb/acre at the Tulelake site. Seven entries (Statehood, Brigham, Steptoe, UT 004603, Xena, C32, and Moravian 14) yielded over 9000 lb/acre at the Tulelake site. Over the three locations, Xena, Statehood, Steptoe, Brigham, Moravian 14 and C32 were highest yielding in 1999. In the three-year period 1997-99, UCD 92-10591 and UC 960 were highest yielding at Tulelake; Steptoe and Baroness, at Siskiyou; and UCD 92-10657, UC 960, Steptoe

and UCD 92-10591, region wide (Table 16).

WHEAT

Winter wheat. The intermountain winter wheat test contained 14 entries (soft white, club, and hard red wheat) including 11 cultivars and 3 advanced lines from six breeding programs (Oregon State University, University of Idaho, Utah State University, Washington State University, Columbia Basin Seed and Sunderman Breeding Co.). Yield and agronomic performance data are given in Table 17. There was moderate-severe BYD, but no other disease. Yields were very high, ranging from 6230 to 8050 lb/acre. Lambert (soft white), Stephens (soft white), and Malcolm (soft white) were the highest yielding. In the three-year period 1997-99, Lambert has been the highest yielding (Table 20).

Fall-sown spring wheat. The fall-sown spring wheat test contained 38 entries (30 hard red spring, 2 hard red winter, 6 hard white spring), including 15 cultivars and 23 advanced lines from six breeding programs (University of California, Western Plant Breeders, Resource Seeds, Inc., Arizona Plant Breeders, Sunderman Breeding Co. and World Wide Wheat). Yield, agronomic performance, and grain quality data for individual sites are given in Tables 21-38. Spring frosts were noted at most of the locations (Butte: 3/5, 3/11, 3/30, 4/1, 4/9; Colusa: 3/5, 3/12, 3/30, 3/31, 4/1, 4/9; Imperial: 2/11; Kern: 4/10; Madera: 4/4, 4/5, 4/9, 4/10; Sac/SJ Delta: 3/10, 3/12; Sutter: 4/9; UC Davis: 3/6, 4/9, 4/11; Yolo: 4/9) and may have caused some sterility to entries that were nearing anthesis on those dates. Early season stress for moisture and nitrogen occurred at Madera. Septoria tritici blotch was particularly severe at Colusa and UCD (entries APB W96-646, APB W04-48, YU 994-199, Brooks, Yecora Rojo, and WWW 8631B were highly susceptible) while stripe rust was particularly severe at Sutter and UC Davis (entries YU 995-241, RSI 5, YU 993-68, Brooks, Topic, UC 1209, DA 993-191, RSI 96WV51505, and RSI 96WV53620 were highly susceptible). Leaf rust was severe on several entries (WWW 8631B, APB W96-646, Klasic, Yecora Rojo, Cavalier, UCD 94-157R) at Madera. Several entries (Topic, RSI 96WV51505, UC 1161, RSI 95W10510, UC 1209) had severe shatter at the Imperial site. Grain protein content of samples from eight of the sites was measured by the California Wheat Commission laboratory (Table 36). Average grain protein content (12% moisture basis) ranged from 10.6% at the Sutter and Sac/SJ Delta sites to 14.3% at the Madera site. Fourteen entries had grain protein contents of 13% or greater averaged over the eight sites. Entries Yecora Rojo and UCD 94-157R had grain protein contents of 14% or greater averaged over the eight sites. Quality evaluations conducted by the California Wheat Commission laboratory on samples from the 1999 UC Davis (Table 37) and Kings (Table 38) sites showed the highest loaf volumes and overall bread scores were produced by cultivars Kern, Stander, Cavalier and advanced lines UC 1160, YU 994-199, DA 993-191, and RSI 96WV51505 from the UC Davis site and by cultivars Sunstar King and Serra and advanced lines YU 993-68, YU 994-206, YU 995-241, UC 1160, and RSI 96WV53620 from the Kings site. Many entries from the Kings site (a total of 6 cultivars and 15 advanced lines) had overall bread scores that were rated excellent. Average grain yields ranged from 2710 lb/acre at the rainfed Yolo site to 7910 lb/acre at the Butte site. Entries RSI 96WV52305, Yolo, UCD 95-111R and RSI 96W51402 were the highest yielding in the Sacramento Valley; entries UC 1162, Yolo, YU 995-241, and RSI 96W51402, in the San Joaquin Valley; entries Klasic, RSI 96WV53620, Bonus, Brooks, and Cavalier, in the Imperial Valley; and entries APB W04-48, UC 96-129W, RSI 96W51402, and WWW 8631B, in rainfed areas. In the three-year period 1997-99, UCD 95-111R, RSI 5, Bonus, and Stander were the highest yielding in the Sacramento Valley; UC 96-129W, UCD 95-111R, and RSI 5, in the San Joaquin Valley; Klasic, Brooks, Yolo, and Bonus, in the Imperial Valley; and Serra, UC 96-129W, UCD 95-111R, Kern, and Express, in rainfed areas (Table 39).

Spring-sown spring wheat. The intermountain spring wheat test contained 20 entries (14 soft white, five hard red, and one hard white) including 14 cultivars and six advanced lines from five breeding programs (USDA/University of Idaho, Oregon State University, Sunderman Breeding Co., USDA/Washington State University, and Western Plant Breeders). Yield and agronomic performance data for individual sites are given in Tables 40-42. There was severe moisture stress at the Lassen site due to irrigation system breakdown, resulting in stunted plants and very low yields. There was moderately severe BYD at the Siskiyou site, but no other disease at any of the sites. Average yields ranged from 900 lb/acre at the Lassen site to 8810 lb/acre at the Tulelake site. ID 0506, Twin, SDM 50030, and Pomerelle were the highest yielding overall. In the three-year period 1997-99, SDM 50030 was the highest yielding region-wide, while SDM 50030, Twin, Alpowa, Pomerelle, and Vanna were the highest yielding at Siskiyou and SDM 50030, Pomerelle, Vanna, and Centennial were the highest yielding at Tulelake (Table 43).

Durum wheat. The durum wheat test contained 40 entries including 18 cultivars and 22 advanced lines from five breeding programs (University of California, Western Plant Breeders, Arizona Plant Breeders, World Wide Wheat, and Trigen Seed Services). Yield, agronomic performance, and grain quality data for individual sites are given in Tables 44-53. Spring frosts were noted at most of the locations (Imperial: 2/11; Kern: 4/10; Madera: 4/4, 4/5, 4/9, 4/10; UC Davis: 3/6, 4/9, 4/11) and may have caused some sterility to entries that were nearing anthesis on those dates. Early season stress for moisture and nitrogen occurred at the Madera site. Stripe rust affected several entries (most severe on Westbred 881, WPB 8015, UC D93-202, and Kofa) at the UC Davis, Kings and Kern sites. Lodging was particularly severe at UC

Davis. Black point incidence was low at all sites except for UC Davis, where a few entries (APB D95-403, APB D95-217, and APB D95-434) had relatively high black point severity. Grain protein content of samples from four of the sites was measured by the California Wheat Commission laboratory (Table 50). Average grain protein content (12% moisture basis) ranged from 13.4% at the Kern site to 14.2% at the Madera site. Only seven entries had grain protein contents of less than 13% averaged over the four sites. Seventeen entries had average grain protein contents of 14% or greater. Tacna had the highest average grain protein content. Quality evaluations were conducted by the California Wheat Commission laboratory on samples from the 1998 Imperial (Table 51), 1999 Imperial (Table 52) and 1999 Kings (Table 53) sites. Samples of entries Mohawk, YU 895-13, APB D95-412, and APB D95-434 from the Imperial site (1998), Westbred 881, Kofa, Mohawk, Crown, WPB 8015, APB D95-434, APB D95-403, and UC 1223 from the Imperial site (1999), and Kofa, Kronos, Mohawk, Crown, WPB 8015, UC 1172, and APB D96-652 from the Kings site (1999) had the highest pasta color scores. Average grain yields ranged from 4530 lb/acre at the Madera site to 8110 lb/acre at the Imperial site. UC 1172, UC 1171, UC 1224, UC 1173, and Westbred Turbo were the highest yielding in the San Joaquin Valley; and UC 1171, UC 1172, and UC D95-213, in the Imperial Valley. In the three-year period 1997-99, UC D95-211, Westbred Turbo, and UC D95-213 were the highest yielding in the San Joaquin Valley; and UC D95-213, UC D95-211, Westbred Turbo, Mohawk and Kronos, in the Imperial Valley (Table 54).

TRITICALE

The triticale test contained 10 entries, including two cultivars, 7 advanced lines, and one wheat cultivar (Yolo) from three breeding programs (University of California, Resource Seeds, Inc., and CIMMYT). Yield and agronomic performance data for individual sites are given in Tables 55-58. Spring frosts were noted at Imperial (2/11) and UC Davis (3/6, 4/9, 4/11) and may have caused some sterility to entries that were nearing anthesis on those dates. Low to moderate levels of BYD occurred at each site. Average grain yields ranged from 7580 lb/acre at the UC Davis site to 8350 lb/acre at the Imperial site. RSI 94TV20635, Trical 105, and RSI 97TY37812 were the highest yielding in the Sacramento Valley; UC 103, Juan, RSI 96TV11211, RSI 97TY37812, and RSI 97TY37710, in the San Joaquin Valley; and RSI 96TY10612 and RSI 97TY37812 in the Imperial Valley. In the three year period 1997-99, RSI 94TV20635 was the highest yielding in the Sacramento Valley (yielding 152% of the wheat cultivar Yolo); UC 103, in the San Joaquin Valley (yielding 129% of the wheat cultivar Yolo); and RSI 94TV20635, in the Imperial Valley (yielding 106% of the wheat cultivar Yolo) (Table 59).

OAT GRAIN AND CEREAL HAY

The oat grain test contained 11 entries including seven cultivars and four advanced lines. Yield and agronomic performance data are given in Table 60. Spring frosts were noted at UC Davis (3/6, 4/9, 4/11) and may have caused some sterility to entries that were nearing anthesis on those dates. Low levels of BYD, powdery mildew, and leaf blotch occurred. Lodging was severe on Montezuma and Kanota. Average grain yields ranged from 2440 to 7020 lb/acre. UC 125, Pert, and UC 113 were the highest yielding. In the three-year period 1997-99, entries UC 113, UC 125 and Pert were the highest yielding (Table 61). Yield and agronomic performance data for the cereal forage test at the Stanislaus site are given in Table 62. While lodging was severe (greater than 50%) on many entries, Dirkwin (wheat), UCD 94-403 (oat), Palenup (oat), and Gene (wheat) had very low lodging scores. Forage yields (at 70% moisture) ranged from 12.50 to 19.42 tons/acre. UCD 96-412 (oat), harvested at the ½ headed growth stage, was the highest yielding.