



# AGRONOMY PROGRESS REPORT

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## 2002 REGIONAL BARLEY, COMMON AND DURUM WHEAT, TRITICALE, AND OAT PERFORMANCE TESTS IN CALIFORNIA<sup>1</sup>

L. F. Jackson<sup>2</sup>, J. Dubcovsky<sup>3</sup>, L.W. Gallagher<sup>3</sup>, O. Chicaiza<sup>4</sup>, D. Stewart<sup>4</sup>, H. Vogt<sup>4</sup>, L. K. Gibbs<sup>4</sup>, D. Prato-Mayo<sup>5</sup>, D. Kirby<sup>6</sup>, K. Brittan<sup>7</sup>, H. Carlson<sup>7</sup>, S. Garcia<sup>7</sup>, B. Marsh<sup>7</sup>, D. Munier<sup>7</sup>, C. Mutters<sup>7</sup>, S. Orloff<sup>7</sup>, B. Roberts<sup>7</sup>, R. Vargas<sup>7</sup>, and S. Wright<sup>7</sup>

University of California Cooperative Extension 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 2002. Entries in the tests included standard cultivars, new and soon-to-be released cultivars, and advanced breeding lines from both public and private breeding programs. Fall-sown winter barley (8 entries) was evaluated at one location; fall-sown spring barley (25 entries), at 6 locations; and spring-sown spring barley (40 entries), at two locations. Fall-sown winter wheat (18 entries) was evaluated at one location; fall-sown spring wheat (59 entries total), at 10 locations (not all entries were evaluated at all locations); and spring-sown spring wheat (24 entries), at two locations. Durum wheat (35 entries) was evaluated at 6 locations. Fall-sown winter triticale (10 entries) was evaluated at one location; fall-sown spring triticale (6 entries), at 3 locations. Fall-sown spring oat (19 entries) was evaluated at 2 locations.

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 and at 1.0 million seeds per acre for rainfed wheat and all barley, oat and triticale tests. Randomized complete block designs with four replications were used. Each plot was nine drill rows wide (5 to 6-inch row spacing) and 20 feet long, except at the UC Desert Research and Extension Center (Imperial) where plots were 16 feet long. 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

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<sup>1</sup>These 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.

<sup>2</sup>Extension Agronomist, <sup>3</sup>Agronomist, <sup>4</sup>Staff Research Associates, Department of Agronomy and Range Science, UC Davis, <sup>5</sup>Lab Assistant, Department of Agronomy and Range Science, UC Davis <sup>6</sup>Staff Research Associate, UC IREC, Tulelake, and <sup>7</sup>UC Cooperative Extension Farm Advisors in Yolo, Modoc, San Benito, Kern, Glenn, Butte, Siskiyou, Kings, Madera, and Tulare counties, respectively.

maturity, lodging, shattering, disease reaction, and grain quality were determined as indicated in the tables. Information regarding each site is given in Table 1.

The small grain crop for the 2002 season in California, according to the California Agricultural Statistics Service, included 625,000 acres of wheat (including 95,000 acres of durum), 110,000 acres of barley, and 320,000 acres of oat (primarily for hay). Triticale acreage wasn't estimated but about 51,000 acres were grown for forage, including spring types sown in the San Joaquin Valley for dairy, winter types sown in northern and northeastern California for cattle grazing and hay, and about 4,000 acres grown as cover crop. Leading wheat cultivars (non-durum) by acreage were Yecora Rojo (128,500 acres), Bonus (77,000 acres), and Express (73,800 acres). Yecora Rojo and Bonus predominated in the San Joaquin Valley while Express predominated in the Sacramento Valley. Kronos was the leading durum cultivar with 61,000 acres, accounting for two-thirds of the durum total. Between 150,000 and 200,000 acres of wheat and triticale were harvested as green-chop forage for dairies in California's Central Valley. Many rainfed wheat and barley fields in the foothills surrounding the San Joaquin Valley also were harvested as forage in 2002 because of drought; rainfall totals in the region were about a third of average for the year. Conditions were favorable for irrigated grain production throughout most of the state, but severe frost injury occurred on early sown fields in the southern San Joaquin Valley. Because of very mild late-fall to early winter temperatures, wheat and triticale that had been planted for forage for dairies in November was in the jointing stage by mid-January when weather turned very cold for the rest of the month and into the 1<sup>st</sup> week of February. High tiller and/or plant mortality occurred. Later, damage was reported on earlier sown or earlier maturing cultivars in the Sacramento Valley, where more typical freeze injury symptoms of partial spike sterility were visible. Stripe rusts of wheat and barley were the most important diseases in 2002. Several new races of each pathogen appeared and the previously resistant wheat cultivar Bonus became susceptible. Moderate to severe wheat stripe rust (up to 70% severity) occurred in commercial fields of Bonus in the Sacramento/San Joaquin Delta and other areas of the Sacramento Valley in mid-to-late April. Wheat stripe rust also occurred throughout the San Joaquin Valley where, despite the warmer, drier climate, it ranged to 80% severity and 20% incidence by the 4<sup>th</sup> week of May in commercial fields as far south as Kern County (southern end of the San Joaquin Valley) where the most common cultivars are Yecora Rojo and Brooks. Severe barley stripe rust occurred on susceptible lines and cultivars in both the Sacramento and the San Joaquin Valleys by the 3<sup>rd</sup> week of May. Wheat leaf rust also occurred; leaf rust levels in the southern San Joaquin Valley ranged to 40% severity, 40% incidence.

## BARLEY

**Fall-sown winter barley.** The fall-sown winter barley test contained 8 cultivars. Entries in the test, type of barley, their backgrounds, and seed sources are shown in Table 2. Yield and agronomic performance data are given in Tables 3-4. Very severe moisture stress (irrigation cut-off too soon) at the anthesis-watery ripe stage reduced grain yield and bushel wt. Grain yield ranged from 3420 to 5840 lb/acre. Steptoe (spring barley check that survived the winter) and Eight-Twelve were the highest yielding. In the three-year period 2000-2002, Eight-Twelve was the highest yielding (Table 4).

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**Fall-sown spring barley.** The fall-sown spring barley test contained 25 entries, including 10 cultivars and 15 advanced lines. Entries in the test, type of barley, their backgrounds, and seed sources are shown in Table 5. Yield and agronomic performance data are given in Tables 6-13. Scald was severe at Butte by the watery ripe stage. UC 476, Max, Patti, Meltan, Legacy, Commander, 6B95-2482, 6B95-2482#1, and 6B95-2482#2 were severely affected. Stripe rust was severe on several entries (UC 476, Max, Legacy, Commander, UCD PYT99 A-13, UCD PYT99 C-3, 6B95-2482, 6B95-2482#1, and 6B95-2482#2) at UC Davis and/or Kings. The UC Davis test was sown very late (1/25/02) due to very wet conditions at the normal sowing time (late November to early December). As a result, very severe BYD developed on many entries (Meltan, Legacy, UCD 97-4286, 6B95-2482, 6B95-2482#1, 6B95-2482#2, UCD 99-320 and UCD PYT01 C6). Severe bird damage/shatter occurred at Butte, Kings, and Madera, severely reducing grain yields of Legacy, 6B95-2482, 6B95-2482#1, and 6B95-2482#2. Average yields ranged from 1980 lb/acre at the rainfed Tulare site (severe drought stress) to 5090 lb/acre at the Madera site where the top-yielding entry (Max) yielded 7120 lb/acre. Entries 23IBYT 7, UC 933, and UCD PYT99-A13 were highest yielding in the Sacramento Valley; entry UCD PYT99 A-13, in the San Joaquin Valley; and entries UCD 97-4286 and UCD 99-3230, at rainfed sites. In the three-year period 2000-2002, entry UCD PYT99-A13 was the highest yielding in the Sacramento Valley and the San Joaquin Valley; and entry UCD 97-4286, at rainfed sites (Table 13).

**Spring-sown spring barley.** The intermountain spring barley test contained 40 entries, including 21 cultivars and 19 advanced lines. Entries in the test, type of barley, their backgrounds, and seed sources are shown in Table 14. Yield and agronomic performance data are given in Tables 15-17. Early season frost damage reduced stands and late-season drought stress reduced yields and bushel weights at the Siskiyou site. Average yields ranged from 3900 lb/acre at the Siskiyou site to 7450 lb/acre at the Tulelake site where the top-yielding entry (93Ab688) yielded 9640 lb/acre. In the three-year period 2000-2002, Brigham, Statehood and Xena were highest yielding region-wide and at Tulelake (Table 17).

## WHEAT

**Fall-sown winter wheat.** The fall-sown winter wheat test contained 18 cultivars. Entries in the test, type of wheat, their backgrounds, and seed sources are shown in Table 18. Yield and agronomic performance data are given in Tables 19-20. Very severe moisture stress (irrigation cut-off too soon) at the anthesis-watery ripe stage reduced grain yield and bushel wt. Grain yield ranged from 1960 to 3860 lb/acre. Promontory, Lambert, Temple, and Rohde were the highest yielding. In the three-year period 2000-2002, Lambert was the highest yielding (Table 20).

**Fall-sown spring wheat.** The fall-sown spring wheat test contained 59 entries (not all entries were evaluated at all locations), including 20 cultivars and 39 advanced lines. Entries in the test, type of wheat, their backgrounds, and seed sources are shown in Table 21. Yield, agronomic performance, and quality data are given in Tables 22-35. The Sacramento/San Joaquin Delta site was sown very late (2/6) due to wet conditions at the planned sowing time; many plots had poor stands and both stripe rust and BYD became very severe. Severe moisture stress reduced yields at the Tulare rainfed site. Strong late May winds induced severe shatter at the UC Davis site, particularly on Express and Plata. Stripe rust was severe on several entries (Yecora Rojo, Klasic, Cavalier, Brooks, Cuyama, Bonus, WWW BR 2238R, BZ 998-181, YU 995-231W, RSI 99WY50417, and APB W98-275) at one or more of the following sites: UC Davis, Sacramento-San Joaquin Delta, Madera, Kings and Kern (Table 32). Leaf rust was severe

on several entries (Yecora Rojo, Klasic, Cavalier, Brooks, Bonus, and YU 995-231W) at one or more of the following sites: Butte, UC Davis, Madera, Kings and Kern (Table 32). Grain protein content of samples from three sites in the Sacramento Valley, three sites in the San Joaquin Valley and one site in the Imperial Valley was measured (Table 33). Mean grain protein content ranged from 11.1% to 14.5% for samples from the Sacramento Valley, from 11.2% to 14.0% for samples from the San Joaquin Valley, and from 11.2% to 15.4% for samples from the Imperial Valley. Among entries tested at all sites, Yecora Rojo, Express, Brooks, Eldon, Blanca Grande, WWW BR 2238R, WWW BR 3677, and APB W990D-877 all had average grain protein content of 13% or higher. Quality evaluations conducted by the California Wheat Commission laboratory on samples from the 2002 Kings site (Table 34) showed that the highest loaf volumes and overall bread scores were produced by Klasic, Eldon, and UCD 990370078; 17 additional entries were rated fully satisfactory. Average grain yields ranged from 1510 lb/acre at the rainfed Tulare site to 7750 lb/acre at the Kings site where the top-yielding entry (Cuyama) yielded 8720 lb/acre. Entry RSI 96WY51419C-2 was the highest yielding in the Sacramento Valley; entries RSI 99WY51462 and Cuyama, in the San Joaquin Valley; and Klasic, in the Imperial Valley and at rainfed sites. In the three-year period 2000-2002, Summit was the highest yielding in the Sacramento Valley; Cuyama, in the San Joaquin Valley; and Klasic, in the Imperial Valley and at rainfed sites (Table 35).

**Spring-sown spring wheat.** The intermountain spring wheat test contained 24 entries, including 18 cultivars and 6 advanced lines. Entries in the test, type of wheat, their backgrounds, and seed sources are shown in Table 36. Yield and agronomic performance data are given in Tables 37-39. Late-season drought stress reduced yields and bushel weights at the Siskiyou site. Average yields ranged from 2870 lb/acre at the Siskiyou site to 7740 lb/acre at the Tulelake site where the top-yielding entry (Alpowa) yielded 8480 lb/acre. In the three-year period 2000-2002, Alpowa was the highest yielding region-wide and at Tulelake (Table 39).

**Durum wheat.** The durum wheat test contained 35 entries, including 13 cultivars and 22 advanced lines. Entries in the test, their backgrounds, and seed sources are shown in Table 40. Yield, agronomic performance, and quality data are given in Tables 41-51. Two tests were conducted at Imperial, one with normal irrigation (5 flood irrigations, 30" total) and one with low irrigation (3 flood irrigations, 12" total) (Table 1). Entries in the low irrigation test were about 4 days advanced in maturity compared to the normal irrigation trial. A portion of the low irrigation test showed severe stress (premature senescence) and evidence of root rot. One plot of each of the following entries was severely affected: APB D990D-210, Orita, RSI 99WV30413, UCD 992050023, Mohawk, Crown, APB BK-5, and WWW D3121. Low levels of stripe rust occurred on some entries at UC Davis, Madera, and Kings. Low to moderate levels of black point occurred on some entries at UC Davis, Kings, Kern, and Imperial (low irrigation test); Tacna and APB D990D-82 had relatively high average black point severity (Table 47). Lodging was severe to moderately severe at all sites except Madera; entries with good lodging resistance included Topper, Orita, RSI 98WV13823, UCD 992050023, and Tacna (Table 47). Grain protein content of samples from one site in the Sacramento Valley, three sites in the San Joaquin Valley and one site in the Imperial Valley was measured (Table 48). Mean grain protein content ranged from 11.2% to 14.8% for samples from the Sacramento Valley, from 10.1% to 15.8% for samples from the San Joaquin Valley, and from 11.9% to 15.3% for samples from the Imperial Valley. Tacna and WWW D8267 had grain protein content of 14% or higher averaged over all locations; 14 additional entries (Kofa, Kronos, Ria, Deluxe, Crown, Matt, Orita, YU 895-130, WWW D6575, WWW D1183, YU 897-98, YU 897-60, APB D990D-213, and APB BK-5) had average grain protein content of 13% or higher. Quality evaluations (conducted by the California Wheat Commission laboratory) on samples from the Kings (Table 49) and Imperial (Table 50) sites showed that samples of 13 entries from the Kings site and eight entries from the Imperial site had the highest possible pasta color scores. Average grain yields ranged from 4790 lb/acre at the Madera site to 7670 lb/acre at the Kings site where the top-yielding entry (UCD 992050023) yielded 8740 lb/acre. Platinum, Duraking, YU 897-44, Mohawk, UCD 992030003, UCD 992050023 and UC D201-04 were the highest yielding in the San Joaquin Valley; and UC D201-35, Duraking, Topper, Deluxe and Orita, in the Imperial Valley. In the three-year period 2000-2002, Duraking and Platinum were the highest yielding in the San Joaquin Valley; and Duraking, Orita, and Topper, in the Imperial Valley (Table 51).

## TRITICALE

**Fall-sown winter triticale.** The fall-sown winter triticale test contained 10 entries, including 5 cultivars and 5 advanced lines. Entries in the test and seed sources are shown in Table 52. Yield and agronomic performance data for the Siskiyou site are given in Table 53. The nursery did not show the degree of moisture stress from early cut-off of irrigation at the anthesis-watery ripe stage that was shown by the adjacent winter wheat and winter barley nurseries. Grain

yield ranged from 3280 to 5060 lb/acre. Entries 1029E, Trical 336, and Decor were the highest yielding. The wheat cultivar Stephens yielded about 65% of the top-yielding triticale.

**Fall-sown spring triticale.** The triticale test contained 6 entries, including 4 cultivars, 1 advanced line, and a wheat check (Yolo). Entries in the test, their backgrounds, and seed sources are shown in Table 54. Yield and agronomic performance data are given in Tables 55-58. One entry, Trical 96, showed moderate levels of leaf rust at UC Davis and Kings. Low levels of BYDV were detected at all sites. Average grain yields ranged from 5980 lb/acre at the UC Davis site to 7100 lb/acre at the Kings site where the top-yielding entry (UC 103) yielded 8510 lb/acre. In the two-year period 2001-2002, Trical 96 was highest yielding in the Sacramento Valley; UC 103, in the San Joaquin Valley; and Juan, in the Imperial Valley (Table 58). In the same period the wheat cultivar Yolo yielded about 55% of the top-yielding triticale in the Sacramento Valley; about 87%, in the San Joaquin Valley; and about 96%, in the Imperial Valley.

## OAT

**Fall-sown spring oat.** The oat test contained 19 entries, including 9 cultivars and 10 advanced lines. Entries in the test, their backgrounds, and seed sources are shown in Table 59. Yield and agronomic performance data are given in Tables 60-63. The UC Davis site was very late-sown (1/25/02) due to very wet conditions at the planned sowing time, and developed poor stands and very severe BYD. BYD also occurred at the UC BAREC site. Overall, entries least affected by BYD (moderately resistant) included Harrison, UCD 94-408, UCD 96-406, and LA 604 (Table 62). Powdery mildew was severe on several entries (Sierra, Montezuma, Kanota, Swan, Pert, UC 113, UC 125 and UCD96-412) at the UC BAREC site. Lodging was severe on Curt, Montezuma, Cal Red, and Kanota at the UC BAREC site. Average grain yields ranged from 2370 lb/acre at the UC Davis site to 3150 lb/acre at the UC BAREC site where the top-yielding entry (UCD 94-409) yielded 5440 lb/acre. In the two-year period 2001-2002, Entry UCD 94-408 was highest yielding overall.