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# 2008 REGIONAL BARLEY, COMMON WHEAT AND TRITICALE, AND DURUM WHEAT PERFORMANCE TESTS IN CALIFORNIA[1]

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University of California Cooperative Extension cereal evaluation tests were conducted in the intermountain valleys of northern California; the Sacramento, San Joaquin, and Imperial Valleys; and in the south central coastal region in 2008. 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 spring barley (23 entries) was evaluated at 6 sites and spring-sown spring barley (26 entries) was evaluated at three sites. Fall-sown winter wheat (40 entries) was evaluated at two sites; fall-sown spring wheat and triticale (50 entries total), at nine sites (not all entries were evaluated at all sites); and spring-sown spring wheat (30 entries), at three sites. Durum wheat (35 entries – 31 entries at Imperial and 26 entries at the other sites) was evaluated at 5 sites.

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 (equivalent to 88 to 139 lbs/acre for common wheat, and from 113 to 180 lbs/acre for durum wheat, depending on the entry) if irrigation was planned and at 1.0 million seeds per acre for rainfed wheat and all barley (equivalent to 69 to 126 lbs/acre) and triticale (equivalent to 78 to 107 lbs/acre) tests. Randomized complete block designs with four replications were used for all tests except the fall-sown winter wheat and spring-sown spring wheat tests for which three 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 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 California small grain crop in 2008 consisted of 808,000 acres of wheat (including 174,000 acres of durum), 130,000 acres of barley, and 260,000 of oat (California Agricultural Statistics Service). Triticale acreage, mostly for green-chop for dairies in the San Joaquin Valley, was estimated at 100,000 acres. Wheat for green-chop forage for dairies accounts for about 200,000 acres in the Central Valley (mostly in the San Joaquin Valley). California's wheat cultivar survey showed that the stripe rust resistant cultivars Joaquin, PR 1404 (forage wheat), and Cal Rojo had the highest acreages statewide. For durum wheat, the leading cultivars were Orita and Kronos.

The growing season for 2008 was mixed, weather-wise. Most areas had above average rainfall through the end of February, but little if any rainfall for the rest of the season; rainfed production area suffered from drought stress. Freezing temperatures, though low duration, occurred throughout the Central Valley and surrounding areas in early-mid April, coinciding with the most vulnerable stage of small grain growth to frost damage – flowering.

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[1]These tests were conducted by the UC Davis Department of Plant Sciences 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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Spring temperatures remained cool for longer than usual in 2008, extending the normal grain-fill period and providing high yield conditions for irrigated acreage. The cool conditions, on the negative side, allowed the build-up and maintenance of high aphid populations for a longer duration than usual and extended the time for stripe rust to develop and increase in the wheat crop, particularly in the Sacramento Valley. I detected stripe rust infections early this season in the Sacramento Valley (in late February), and later (early April) in the San Joaquin Valley. Cool conditions were favorable for continued development of wheat stripe rust in California's Central Valley and surrounding areas through the middle of May. With few exceptions, fungicides were applied to commercial fields of known susceptible cultivars in the Sacramento Valley, so yield losses were minimal (estimated statewide yield loss was 2%). Five consecutive days of extremely hot weather (high 90's and 100's) beginning on May 15 terminated the epidemic and hastened the Central Valley's crop toward maturity. Preliminary results identified eleven races of the stripe rust pathogen from a relatively small number of collections made from wheat in California in 2008: PST 98 (5 collections), PST 100 (5 collections), PST 101 (11 collections), PST 102 (2 collections), PST 111 (5 collections), PST 113 (3 collections), PST 115 (4 collections), PST 122 (2 collections), PST 123 (1 collection), PST 127 (1 collection), and PST 129 (10 collections).

## BARLEY

**Fall-sown spring barley**. The fall-sown spring barley test contained 23 entries (11 cultivars and 12 advanced lines). 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 3-9. Very little rainfall occurred after the end of February throughout California, so the rainfed tests (Tehama, Glenn, San Luis Obispo, and Tulare) suffered drought stress and had low yields. The winter barley entries were most affected by drought stress and exhibited poor spike emergence at some locations. No data are available for the Tulare site: Drought stress was extreme and plants were very short with few tillers; just prior to harvest, sheep grazed the plots to the ground. Extremely windy weather in June resulted in severe shatter for several entries (UC 969, Hoody, Solar, T/S//E 11-18, T/S 25, and K/H Special Blend). Stripe rust was severe on Solar and moderately severe on Max at the UC Davis site. Average yields ranged from 920 lb/acre at the rainfed San Luis Obispo site to 5400 lb/acre at the UC Davis site. UCD C135 and UC 933 were the highest yielding in the Sacramento Valley; Max and UCD C135, in the San Joaquin Valley; and Meltan, UCD C140, UC 603, and UC 969, at rainfed sites. In the three year period 2006-2008, UCD C147, UCD C135, and UC 933 were highest yielding in the Sacramento Valley; UCD C135 and UCD C109, in the San Joaquin Valley; and UCD C147, at rainfed sites.

**Spring-sown spring barley.** The intermountain spring barley test contained 21 entries (12 cultivars and 9 advanced lines). Entries in the test, type of barley, their backgrounds, and seed sources are shown in Table 10. Yield and agronomic performance data are given in Tables 11-14. Saturated soil conditions through early summer resulted in severe root rot and very low grain yields at the Lassen site. Two or more plots of the following entries were most severely affected: UC 960, Millenium, UCD-TL20, UCD YP03-8/2, UCD-TLB52, TLB 68, TLB 148, and TLB 150. Birds caused severe head shatter at the Siskiyou site; shatter was severe on one or more plots of Steptoe, Baronesse, Xena, Legacy, 95Ab11469, Tetonia, AC Metcalfe, Champion, and BZ502-265, and contributed to the high yield variability at that site. There also were scattered foci of BYD, root rot (probably Fusarium), and bacterial streak (*Xanthomonas translucens*) at the Siskiyou site, and although there was no entry-specificity regarding disease incidence/severity, the disease foci contributed to high yield variability (grain yields of one plot each of UC 960 and TLB 150 that had severe root rot were less than half that of unaffected plots). Several entries (Baronesse, Xena, Creel, Legacy, T/S//E 11-18, and Champion) had moderately severe lodging at the Tulelake site. Stripe rust was moderately severe on Steptoe and Creel at Tulelake. Average yields ranged from 590 lb/acre at the Lassen site to 6900 lb/acre at the Tulelake site. UC 960 and TLB 148 were highest yielding. In the three year period 2006-2008, UC 960, UCD-TLB52, and Millenium were highest yielding.

## WHEAT

**Fall-sown winter wheat**. The fall-sown winter wheat test that was evaluated, the Oregon Winter Elite Yield Trial, was provided by Mike Flowers, Extension Specialist, Oregon State University. The test contained 40 entries (19 cultivars and 21 advanced lines), and was evaluated at two sites, Montague (Siskiyou county) and Tulelake (Modoc county) (Tables 15-18). Irrigation was cut-off too early at the Siskiyou site, resulting in very low tests weights and low grain yields for many entries. Masami showed moderately severe leaf blotching/chlorosis at the Tulelake site. One or more plots of several entries (Stephens, Tubbs 06, Bitterroot, ID9364901A, Masami, Xerpha, BU6W00-523, 99X 1009-19, ORI2042037, Idaho 587, ID99-435, OSUPOP-35-2-CL, Coda, Cara,

OR9901619, OR2050293S, and OR2050301S) lodged severely at Tulelake, where grain yields were extremely high. Several entries (Salute, AP700CL, OR2040726S, OR2040728S and OR2050299S) yielded at least 10,000 lb/acre at Tulelake. Average yields ranged from 3360 lb/acre at the Siskiyou site to 8700 lb/acre at the Tulelake site. ID9364901A was highest yielding at the Siskiyou site, while OR2040728S was highest yielding at the Tulelake site. OR2050299S, OR2040728S, and OR2040726S were highest yielding overall.

**Fall-sown spring wheat and triticale**. The fall-sown spring wheat and triticale test contained 50 entries (24 wheat cultivars, 21 advanced wheat lines, 3 triticale cultivars and 2 advanced triticale lines). Entries in the test, type, background, and seed sources are shown in Table 19. Yield, agronomic performance, and quality data are given in Tables 20-32. Very little rainfall occurred after the end of February throughout California, so the rainfed tests (Glenn and Tulare sites) suffered drought stress. No data are available for the Tulare site: Drought stress was extreme and plants were very short with few tillers; just prior to harvest, sheep grazed the plots to the ground. Triticale entries at the Kings site had very poor stands and low grain yields, possibly because the plots were planted following a summer crop of sorghum-sudan. Uneven irrigation contributed to non-uniformity of yield at the Kings site. Late season moisture stress (early irrigation-cut-off) reduced the yields of later-maturing entries at the Kern site. Stripe rust was severe on several entries at 4 sites (Table 28). Entries showing severe stripe rust reactions at one or more sites included Anza, Yecora Rojo, Express, Summit, Blanca Grande, Clear White, Solano, Joaquin, APB W02AZ-365 and WB YU903-283; Entries showing moderately severe stripe rust reactions included Dash 12 and WWW BR5874E. Entries showing low (highly resistant) stripe rust reactions at all sites included Patwin, Lassik, Expresso, Redwing, Blanca Royale, Blanca Fuerte, Lariat, Ultra, WB DA 904-32W, RSI 01W20153, UCD 07013/24, UCD 07013/30, UCD 0715/9, UCD 07103/57, and Trical Brand 105 triticale. Extremely windy conditions just prior to harvest caused grain shatter at 5 sites. Entries showing moderately severe to severe grain shatter at one or more sites included Mika, Dash 12, Expresso, UCD 06010/5, APB W02AZ-365, RSI 00WB80722, UCD 07013/24, WB BZ904-331WP, WWW CNBR9330, APB W05AZ-137, APB W05AZ-149, and APB W05AZ-176 (Table 29). Grain protein content of samples from three sites in the Sacramento Valley and three sites in the San Joaquin Valley was measured (Table 30). Average grain protein content ranged from 11.20% to 15.02% for samples from the Sacramento Valley and from 10.29% to 13.58% for samples from the San Joaquin Valley. APB W05AZ-137 had the highest grain protein content overall. Quality evaluations (conducted by the California Wheat Commission laboratory) of samples from the Kings site (Table 31) showed that Blanca Grande, Mika, Solano, Patwin, Otis, Expresso, Redwing, and APB W05AZ-137 produced high loaf volume and satisfactory overall bread score. Average grain yields ranged from 2370 lb/acre at the Glenn Rainfed site to 6720 lb/acre at the Kern site. RSI 01T40207 triticale was the highest yielding in the Sacramento Valley (Blanca Fuerte and Ultra were the highest yielding wheat entries); RSI 01W20153, in the San Joaquin Valley; RSI 01T40207 and WB ACS 55304 triticale entries, in the Imperial Valley (Ultra, Lassik, Blanca Fuerte, and Summit were the highest yielding wheat entries); and Joaquin, at rainfed sites. In the three-year period 2006-08, Trical Brand 118 triticale was the highest yielding in the Sacramento Valley (Blanca Fuerte was the highest yielding wheat); Redwing, Blanca Grande, Joaquin, and Blanca Fuerte, in the San Joaquin Valley; Summit, in the Imperial Valley; and Cal Rojo, at rainfed sites.

**Spring-sown spring wheat.** The spring-sown spring wheat test that was evaluated, the Oregon Spring Wheat Elite Yield Trial, was provided by Mike Flowers, Extension Specialist, Oregon State University. The test contained 30 entries (14 cultivars and 16 advanced lines), and was evaluated at three sites (Tables 33-37). Saturated soil conditions through early summer resulted in severe root rot and very low grain yields in portions of the test at the Lassen site. Affected plots were non-uniformly distributed, so yield variability was very high. Two or more plots of the following entries were in the most severely affected portion of the nursery: Cabernet, OR4031111, Clear White, and Blanca Grande. There were scattered foci of BYD, root rot (probably Fusarium), and bacterial streak (*Xanthomonas translucens*) at the Siskiyou site. There was no entry-specificity regarding disease incidence/severity. High yield variability at the Siskiyou site is partially due to non-uniform sprinkler irrigation; a portion of plots in the 1st rep received poor coverage, resulting in low yields (the following entries yield about half as much in the 1st rep as they did in the other two reps: BZ901-717, OR4031111, Patwin, RSI10348W, 37C-3, UI Caltaldo, Nick, and Alpowa). Several entries (ID 0377S, BZ903-445-WP, OR4041451, Nick, Louise, WA008039, and Alpowa) at the Tulelake site had severe lodging at harvest. Average grain yields ranged from 2100 lb/acre at the Lassen site to 7860 lb/acre at the Tulelake site. BZ604-002 was the highest yielding at the Lassen and Siskiyou sites; and UI Cataldo, at the Tulelake site. BZ604-002 and Hank were highest yielding overall.

**Durum wheat**. The durum wheat test contained 35 entries (15 cultivars and 20 advanced lines). Entries in the test, their backgrounds, and seed sources are shown in Table 38. Yield, agronomic performance, and quality data are given in Tables 39-48. A few plots at the Kings site had poor stands and low grain yields, possibly because the site was planted following a summer crop of sorghum-sudan. Uneven irrigation contributed to non-uniformity of yield at the Kings site. Late season moisture stress (early irrigation-cut-off) reduced the yields of later-maturing

entries at the Kern site. Stripe rust was moderately severe to severe on several entries (UCD 06222/53, RSI 06WV141, RSI 06WV164, UCD 06222/52, and WWW CHD1126B) at the UC Davis site. Lodging was moderately severe to severe for several entries (Kronos, Westmore, Maestrale, WB YU 803-52, UCD 06222/53, APB D257-11/2, and APB D257-11/3) at the UC Davis and/or Imperial sites. Grain protein content of samples from four sites in the Central Valley and the Imperial site was measured (Table 45). Average grain protein content ranged from 11.67% to 13.83% for samples from the Central Valley, and from 13.46% to 15.84% for samples from the Imperial site. Quality evaluations (conducted by the California Wheat Commission laboratory) of samples from the Kings (Table 46) and Imperial (Table 47) sites showed that samples of 15 entries from the Kings site and 19 entries from the Imperial site had the highest possible pasta color scores. Of entries that were grown at all locations, eleven (Kronos, Fortissimo, Volante, Westmore, Levante, WB YU803-11, UCD 06222/30, UCD 06222/53, UCD 06222/52, APB D04AZ-335, and APB D257-11/2) had the maximum pasta color score at both sites. Average grain yields ranged from 5170 lb/acre at the Kings site to 7250 lb/acre at the UC Davis site. Sargolla was the highest yielding in the San Joaquin Valley while WB DA804-24 was highest yielding in the Imperial Valley. In the three-year period 2006-08, Platinum was the highest yielding in the San Joaquin Valley; and RSI 59 and Desert King, in the Imperial Valley.