UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

# FIELD CROP NOTES

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## SPRING 2012

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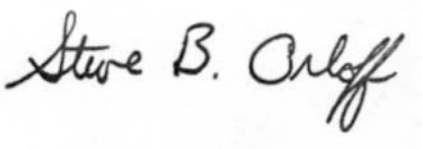

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### Effect of Nitrogen Fertilization Practices on Spring Wheat Protein Content

Grain protein content is a significant issue for wheat producers—nearly as important as yield. The price that a producer receives for hard red spring wheat is determined by the grain protein content with a discount for wheat with less than 14% for grain marketed in the Pacific Northwest. This has significant economic consequences for wheat producers. Unfortunately, yield and protein content are often inversely related and is difficult to achieve both. The primary production factors that affect protein content are variety selection and nitrogen fertility management.

With the high cost of fertilizers and their application, growers need to maximize N use-efficiency while at the same time minimize the number of fertilizer applications. Research was needed to evaluate the effect of different varieties and nitrogen fertilization program on yield, protein and bushel weight. Trials were conducted in Scott Valley and in Tulelake at the Intermountain Research and Extension Center (IREC). Four varieties were evaluated—Yecora Rojo, Hank, Fusion and Malbec. Seven nitrogen treatments/strategies were evaluated (Table 1). Urea was the nitrogen fertilizer source used for all applications.

**Table 1.** Nitrogen treatments evaluated in Scott Valley and IREC.

1. Control – **(unfertilized)**
2. 120 Pre-plant **(Total N 120 lbs)**
3. 120 Pre-plant + 30 lbs Flowering **(Total N 150 lbs)**
4. 120 Pre-plant + 50 lbs Tillering **(Total N 170 lbs)**
5. 120 Pre-plant + 50 lbs Tillering + 30 lbs Boot **(Total N 200 lbs)**
6. 120 Pre-plant + 50 lbs Tillering + 30 lbs Flowering **(Total N 200 lbs)**
7. 120 Pre-plant + 50 lbs Tillering + 30 lbs Boot + 30 lbs Flowering **(Total N 230 lbs)**

Grain yields were higher at the IREC site (Tulelake) than at the Scott Valley site. This is commonly observed due to more favorable environmental conditions (cooler summer temperatures and better soil) in Tulelake compared with Scott Valley. In

addition, 2011 was a fairly wet spring and it was difficult to find a planting window. The soil was prepared in spring and the wheat planted into moisture. Some of the seeds emerged with soil moisture and others did not emerge until there was subsequent rain. This resulted in staggered emergence which lowered the yield potential of the Scott Valley site.

Nitrogen fertilization had a significant impact on grain yield at both sites. In Scott Valley, maximum yield increased from 0.6 to 1.1 tons per acre over the untreated check depending on the variety and fertilizer treatment (Table 2). The yield increase over the unfertilized plots was far greater at the IREC site where yields were nearly doubled (almost 2 tons higher) for many of the varieties (Table 3). Additional applications after the preplant application also increased yield in most cases. At the Scott Valley site the 230 pounds N per acre application did not increase yield over the other fertilization strategies that included a topdress application. However, at IREC maximum yield for all varieties occurred at the 230 pounds per acre application rate where N was applied preplant and top dressed at tillering, boot and flowering growth stages. This is probably due to the higher yield potential at this site and this site had a slightly lower preplant soil nitrate nitrogen level (6 ppm at IREC compared with 8 ppm in Scott Valley).

Wheat variety and the nitrogen fertilizer program had a significant effect on wheat protein content. Hank had the lowest protein content of the four varieties at both sites. Protein content was much higher at the Scott Valley site than at IREC most likely due to the much higher yield at IREC and the slightly lower initial soil nitrate level. Many of the fertilizer treatments resulted in a protein content above 14 percent (the benchmark value in Pacific Northwest markets) in Scott Valley. In contrast, protein contents below 12 percent were common at IREC for the plots that received the lower N rates, and none of the treatments ever reached 14 percent average for the four replications. A preplant application alone, common grower practice, was never sufficient to reach acceptable protein levels to avoid a discount at either site. At IREC the highest fertilizer rate (230 pounds N per acre over four applications) always resulted in the numerically highest protein content. In Scott Valley, the numerically highest protein content was also achieved with this highest rate. However, differences in protein content between this rate and lower rates were small and acceptable protein levels were achieved with some of the lower rates. In Scott Valley, any treatments that had 170 pounds of N or more over the season had a protein content over 14, except for the cultivar Hank. These results emphasize the need for split applications of N, rather than relying solely on a preplant application, to achieve acceptable yield and protein content.

**Table 2.** Effect of nitrogen strategy on yield, protein and bushel weight of four hard red spring wheat varieties grown in the Scott Valley (Siskiyou County).

| Treatments | Total N lbs/A | Yield tons/A | Protein (%) | Test Wt. (bu/A) |
|---|---|---|---|---|
| **Yecora Rojo** | | | | |
| Untreated | 0 | 1.80 | 12.5 | 63.2 |
| Pre-plant | 120 | 2.47 | 13.2 | 62.0 |
| Pre-plant + Flowering | 150 | 2.59 | 14.9 | 62.1 |
| Pre-plant + Tillering | 170 | 2.71 | 15.6 | 62.1 |
| Pre-plant + Tillering + Boot | 200 | 2.84 | 14.7 | 62.2 |
| Pre-plant + Tillering + Flowering | 200 | 2.93 | 15.3 | 62.2 |
| Pre-plant + Tillering + Boot + Flowering | 230 | 2.90 | 15.4 | 62.0 |
| **Hank** | | | | |
| Untreated | 0 | 2.27 | 12.0 | 62.7 |
| Pre-plant | 120 | 2.82 | 12.7 | 61.2 |
| Pre-plant + Flowering | 150 | 2.96 | 13.2 | 61.5 |
| Pre-plant + Tillering | 170 | 2.91 | 13.2 | 62.2 |
| Pre-plant + Tillering + Boot | 200 | 2.71 | 13.5 | 60.7 |
| Pre-plant + Tillering + Flowering | 200 | 3.16 | 13.8 | 61.0 |
| Pre-plant + Tillering + Boot + Flowering | 230 | 2.88 | 13.9 | 61.2 |
| **Fuzion** | | | | |
| Untreated | 0 | 2.58 | 12.3 | 63.7 |
| Pre-plant | 120 | 2.79 | 13.4 | 63.2 |
| Pre-plant + Flowering | 150 | 3.09 | 14.0 | 62.8 |
| Pre-plant + Tillering | 170 | 3.12 | 14.9 | 62.5 |
| Pre-plant + Tillering + Boot | 200 | 3.05 | 14.6 | 62.6 |
| Pre-plant + Tillering + Flowering | 200 | 3.09 | 15.0 | 62.5 |
| Pre-plant + Tillering + Boot + Flowering | 230 | 3.16 | 14.1 | 62.8 |
| **Malbek** | | | | |
| Untreated | 0 | 2.66 | 12.7 | 63.3 |
| Pre-plant | 120 | 3.26 | 13.1 | 63.1 |
| Pre-plant + Flowering | 150 | 3.19 | 13.2 | 62.9 |
| Pre-plant + Tillering | 170 | 2.72 | 14.1 | 62.4 |
| Pre-plant + Tillering + Boot | 200 | 3.54 | 13.7 | 62.6 |
| Pre-plant + Tillering + Flowering | 200 | 3.06 | 14.0 | 62.5 |
| Pre-plant + Tillering + Boot + Flowering | 230 | 3.22 | 14.3 | 62.4 |
| LSD 0.05 | | 0.38 | 1.1 | 1.0 |

**Table 3.** Effect of nitrogen strategy on yield, protein and bushel weight of four hard red spring wheat varieties grown at the Intermountain Research and Extension Center (Siskiyou County).

| Treatments | Total N (lbs/A) | Yield (tons/A) | Protein (%) | Test Wt. (lbs/bu) |
|---|---|---|---|---|
| **Yecora Rojo** | | | | |
| Untreated | 0 | 2.78 | 9.2 | 63.6 |
| Pre-plant | 120 | 3.99 | 10.0 | 63.2 |
| Pre-plant + Flowering | 150 | 4.35 | 10.9 | 63.1 |
| Pre-plant + Tillering | 170 | 4.19 | 11.4 | 62.8 |
| Pre-plant + Tillering + Boot | 200 | 4.32 | 12.8 | 62.0 |
| Pre-plant + Tillering + Flowering | 200 | 4.25 | 12.1 | 62.8 |
| Pre-plant + Tillering + Boot + Flowering | 230 | 4.47 | 13.1 | 62.8 |
| **Hank** | | | | |
| Untreated | 0 | 2.50 | 8.5 | 62.5 |
| Pre-plant | 120 | 4.34 | 10.4 | 62.6 |
| Pre-plant + Flowering | 150 | 4.45 | 11.0 | 62.1 |
| Pre-plant + Tillering | 170 | 4.34 | 11.1 | 62.6 |
| Pre-plant + Tillering + Boot | 200 | 4.67 | 11.6 | 62.5 |
| Pre-plant + Tillering + Flowering | 200 | 4.62 | 12.0 | 62.3 |
| Pre-plant + Tillering + Boot + Flowering | 230 | 4.81 | 12.9 | 62.3 |
| **Fuzion** | | | | |
| Untreated | 0 | 2.31 | 9.2 | 63.5 |
| Pre-plant | 120 | 3.96 | 10.6 | 63.1 |
| Pre-plant + Flowering | 150 | 4.20 | 11.3 | 63.0 |
| Pre-plant + Tillering | 170 | 4.25 | 12.4 | 63.3 |
| Pre-plant + Tillering + Boot | 200 | 4.36 | 12.7 | 62.9 |
| Pre-plant + Tillering + Flowering | 200 | 4.41 | 12.3 | 63.4 |
| Pre-plant + Tillering + Boot + Flowering | 230 | 4.47 | 13.5 | 63.1 |
| **Malbek** | | | | |
| Untreated | 0 | 2.61 | 9.3 | 63.3 |
| Pre-plant | 120 | 4.03 | 10.7 | 63.3 |
| Pre-plant + Flowering | 150 | 4.31 | 11.7 | 63.3 |
| Pre-plant + Tillering | 170 | 4.23 | 12.4 | 63.3 |
| Pre-plant + Tillering + Boot | 200 | 4.33 | 12.6 | 62.8 |
| Pre-plant + Tillering + Flowering | 200 | 4.34 | 12.6 | 63.0 |
| Pre-plant + Tillering + Boot + Flowering | 230 | 4.43 | 13.3 | 63.1 |
| LSD 0.05 | | 0.27 | 0.5 | 0.5 |

## Late-Season Nitrogen Application Timing and Fertilizer Source

Another trial was conducted at IREC to evaluate the effect or different fertilizer sources and application timing (flag leaf or flowering) on grain yield and protein content (variety Yecora Rojo). All plots received 92 pounds per acre of N preplant as urea. An additional 50 pounds per acre were applied as UN-32 through the sprinkler system at tillering. Then the fertilizers listed in Table 4 were applied. NDemand and CoRoN are foliar nitrogen products marketed by Wilbur Ellis and Helena, respectively. Plots were harvested on September 19, 2011.

The late-season nitrogen applications applied at flag leaf or flowering growth stages did not affect wheat yield in this trial. The trial had already received 142 pounds of N preplant and at tillering before the late-season N treatments were applied. Wheat injury was rated after the nitrogen treatments were applied. Treatments with UN-32 resulted in significant injury, especially when applied at the 9 pound per acre N rate or higher. The injury was necrosis or burn back primarily on the flag leaf. Injury was still evident on the early-treated plots (flag leaf) at the second evaluation (after the second application timing—flowering). However, the injury was less than that of the plots that were just treated. The other treatments only caused very slight injury; note numerical injury ratings were slightly higher for the higher rate of NDemand or CoRoN. However, while the injury from foliar UN-32 was visually striking, there was not a significant impact on yield.

The late-season N applications increased protein content. The maximum increase was about 0.6 percentage points. The higher rate of NDemand, CoRoN or UN-32 (9 lbs N/acre) seemed to be needed to have much of an impact on protein content. These results are somewhat inconsistent and it is difficult to determine which treatment might be the most cost effective. Additional research, perhaps at a more deficient site, is warranted.

**Table 4.** Effect of nitrogen source on yield, protein and bushel weight of Yecora Rojo produced at the Intermountain Research and Extension Center (Siskiyou County).

| Fertilizer Source | N (lbs/A) | Injury 7/6 | Injury 7/26 | | Yield (tons/A) | | Protein (%) | |
|---|---|---|---|---|---|---|---|---|
| | | Flag | Flag | Anthesis | Flag | Anthesis | Flag | Anthesis |
| Urea | 30 | 0 | 7.0 | 5.0 | 4.30 | 4.16 | 14.0 | --* |
| Urea + Agrotain | 30 | 0 | 4.5 | 2.5 | 4.28 | 4.14 | 14.2 | 13.5 |
| Ndemand | 3 | 0 | 2.5 | 3.2 | 4.25 | 4.25 | 13.4 | -- |
| Ndemand | 9 | 0 | 5.0 | 7.9 | 4.26 | 4.16 | 13.7 | 13.6 |
| CoRoN | 3 | 0 | 1.2 | 5.2 | 4.26 | 4.14 | 13.4 | 13.4 |
| CoRoN | 9 | 0 | 1.2 | 8.9 | 4.26 | 4.15 | 13.8 | 14.0 |
| UN-32 | 3 | 10.8 | 8.0 | 21.2 | 4.20 | 4.33 | 13.7 | 13.7 |
| UN-32 | 9 | 27.5 | 16.2 | 30.0 | 4.10 | 4.22 | 14.3 | 13.9 |
| UN-32 | 30 | 32.5 | 19.8 | 31.2 | 4.28 | 4.32 | 14.2 | 13.8 |
| Check | -- | 0 | 3.2 | 4.5 | 4.20 | 4.24 | 13.4 | 13.6 |
| LSD 0.05 | | 1.5 | 5.5 | | NS | | 0.6 | |

*Questionable data values

## Alfalfa Seeding Rates

How much alfalfa seed is actually needed per acre for an adequate stand of alfalfa? This question often arises when growers look to plant a new field and see how much seed costs, especially RR alfalfa. Seeding rates vary greatly across the county. In California's Central Valley some growers plant as high as 30 to 40 pounds per acre, while many growers in the Midwest only seed 12 pounds per acre.

Mylen Bohle, an Area Extension Agronomist in Central Oregon, has done research evaluating different seeding rates and summarized his results and data from other tests in a presentation this last winter. He evaluated seeding rates from 4 to 32 pounds which equated to (3.1 to 25 pounds per acre of pure life seed accounting for hard seed and dead seed). The trial was conducted for 5 years, from 1999 through 2003. The trial was harvested using a 3-cut schedule and a 4-cut schedule. The number of stems per square foot was counted each year but I only included the first and last year results in the table below. The average yield over the 5 years for the two cutting schedules is also shown in the table. The number of stems per square foot the final year of the stand and the average yield over the 5 years did not increase when seeding rate was increased above 12 pounds per acre (9.4 lbs. pure live seed/acre).

| Seeding Rate | | 3-Cut Schedule | | | 4-Cut Schedule | | |
|---|---|---|---|---|---|---|---|
| | | 1999 Avg. | 2003 Avg. | Ave. Yield | 1999 Avg. | 2003 Avg. | Ave. Yield |
| lbs/A | lbs. PLS*/acre | Stems/ft2 | Stems/ft2 | Tons/A | Stems/ft2 | Stems/ft2 | Tons/A |
| 4 | 3.1 | 69 | 71 | 7.08 | 87 | 56 | 7.67 |
| 8 | 6.2 | 81 | 75 | 7.34 | 94 | 58 | 8.27 |
| 12 | 9.4 | 91 | 80 | 7.40 | 108 | 66 | 8.42 |
| 16 | 12.5 | 104 | 82 | 7.42 | 116 | 62 | 8.21 |
| 20 | 15.6 | 109 | 85 | 7.42 | 117 | 67 | 8.50 |
| 24 | 18.7 | 108 | 83 | 7.50 | 128 | 67 | 8.27 |
| 28 | 21.8 | 115 | 83 | 7.46 | 131 | 64 | 8.46 |
| 32 | 25 | 127 | 89 | 7.34 | 145 | 70 | 8.53 |

* PLS = pure live seed

In addition to this research, a more recent study was conducted by Forage Specialist Marvin Hall and others to evaluate seeding rates of 6, 10, 14, and 18 lb/acre of pure live seed. The trial was conducted with RR alfalfa and they evaluated Roundup, other herbicides, and an untreated check plot at 7 locations in 6 states over two years. They found no difference in yield due to seeding rate except for first cutting where the 6 lb rate averaged 223 lb/acre less. They also found no difference in forage quality due to seeding rate. There is a fair amount of "self thinning" (or plant mortality) over the first year of a new alfalfa seeding. The degree of self thinning typical depends on the seeding rate—more self thinning with higher seeding rates. In the study above, 51% of the plants were lost at the 6 lb/acre seed rate and nearly 70% were lost with the 18 lb/ac seed rate by the first fall after seeding. By the second fall, all seeding rates had the same plant density.

So, based on this research would I recommend seeding at less than 10 pounds per acre? I wouldn't for several reasons. This research was conducted in small plots with probably ideal seedbed conditions. Most producers want a stand life of a minimum of 5 to 6 years, and 7 to 8 or more would be preferable. The cost of a few more pounds of seed amortized over the life of the stand is minimal. A little higher seeding rate to ensure an adequate stand is relatively cheap insurance. These results, however, do suggest that we could use slightly lower seeding rates than those traditionally used provided the seedbed is in good condition. A firm well prepared seedbed is oftentimes more important than the seeding rate.

**Alfalfa Variety Selection**

Selecting the best alfalfa variety for your farm is not an easy decision. There are an incredible number of varieties from which to choose. In fact, for just the fall dormancy classes we produce there are 135 alfalfa varieties according to the National Alfalfa and Forage Alliance (Winter Survival, Fall Dormancy & Pest Resistance Ratings for Alfalfa Varieties 2012 Edition). http://www.alfalfa.org/pdf/2012%20NAFA%20Variety%20Leaflet.pdf. There are actually 18 alfalfa varieties in the fall dormancy 3 class, 94 fall dormancy 4 varieties and 23 fall dormancy 5 varieties. And, these are just the certified varieties and do not include non-certified varieties or blends. I personally would not plant non certified varieties or blends so it does make the decision a little bit easier.

Variety choice is an important decision and one you must live with for a minimum of five to seven years (could actually be less if you select the wrong variety). Varieties differ in their yield potential, resistance to insects, diseases and nematodes, forage quality, and stand persistence. These factors should be the primary consideration when selecting a variety rather than the price of the seed. The resistance ratings for certified varieties can be found in the website listed above. Whether or not a variety is resistant to Roundup (RR alfalfa) is now another factor to consider. This decision depends to a large degree on the weed pressure in your field and your ability to control them with your current weed control program and lastly where you market your alfalfa.

To help growers know which varieties are likely to perform best on their farm, University of California Cooperative Extension regularly conducts alfalfa variety trials. These are led by UC Davis Alfalfa Specialist Dan Putnam. There were two variety trials conducted at the Intermountain Research and Extension Center (IREC) in Tulelake. One trial was established in 2007 and harvested for 4 full years (2008, 2009, 2010 and 2011). Not surprisingly, Vernal was the lowest yielding variety in the trial. Other varieties yielded an average of up to a full 30 percent more, which equates to 2 tons per acre higher yield per year. With alfalfa prices last year between $200 and $250 or more per ton, that is a huge difference in potential profits. Another trial was just planted in 2010 and harvested for the first year this past year (2011). The following pages show the results for both trials. I caution growers not to use a single year's worth of data to choose a variety. The ranking can change significantly and first year results alone can be misleading, especially if a variety does not persist.

Yield is only one factor (albeit likely the most important factor) when selecting a variety. Growers commonly inquire about the forage quality of different alfalfa varieties. However, analyzing all the varieties in a trial is costly and is therefore rarely done. We had the opportunity this last year to analyze the forage quality of varieties in the new trial on first and third cutting. The results are presented in the table for the new trial. There was a significant difference in TDN between varieties for both cuttings. TDN on first cutting varied from 53.1 to 55.6. These results together with the yield data can help growers make a more informed variety decision.

## 2011 YIELDS, TULELAKE ALFALFA CULTIVAR TRIAL. TRIAL PLANTED 8/17/10

Note: Single year data should not be used to evaluate alfalfa varieties or choose alfalfa cultivars

| | | YEAR TOTAL | | | | | | | | | | | | | | | % of VERNAL | Cut 1 CP | Cut 3 CP | Cut 1 ADF | Cut 3 ADF | Cut 1 TDN* | Cut 3 TDN* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FD | | | | | | | | | | | | | | | | % | | | | | | |
| **MS Sunstra 803** | **4** | 8.8 | ( 1) | A | | | | | | | | | | | | | 114.5 | 22.3 | 23.4 | 29.4 | 23.2 | 54.3 | 58.5 |
| **R57M129 FG** | **5** | 8.3 | ( 2) | | B | | | | | | | | | | | | 108.7 | 21.8 | 22.1 | 28.0 | 23.0 | 55.2 | 58.6 |
| **HybriForce 2400** | **4** | 8.3 | ( 3) | | B | C | | | | | | | | | | | 108.6 | 21.7 | 21.1 | 27.9 | 25.1 | 55.3 | 57.2 |
| **R57M130 FG** | **5** | 8.3 | ( 4) | | B | C | | | | | | | | | | | 108.1 | 21.8 | 22.4 | 28.7 | 22.2 | 54.7 | 59.1 |
| **DG4210** | **4** | 8.2 | ( 5) | | B | C | D | | | | | | | | | | 108.0 | 23.6 | 22.4 | 27.8 | 21.7 | 55.3 | 59.5 |
| **GrandStand** | **4** | 8.2 | ( 6) | | B | C | D | | | | | | | | | | 107.9 | 20.7 | 22.0 | 29.8 | 23.1 | 54.0 | 58.5 |
| **WL 357 HQ** | **4** | 8.2 | ( 7) | | B | C | D | E | | | | | | | | | 107.8 | 22.6 | 22.6 | 29.1 | 22.9 | 54.5 | 58.6 |
| **Integra 8400** | **4** | 8.2 | ( 8) | | B | C | D | E | | | | | | | | | 107.5 | 21.7 | 21.8 | 29.4 | 24.3 | 54.2 | 57.7 |
| **PGI 459** | **4** | 8.2 | ( 9) | | B | C | D | E | | | | | | | | | 107.4 | 20.7 | 22.2 | 30.9 | 23.9 | 53.3 | 58.0 |
| **WL 363 HQ** | **5** | 8.2 | ( 10) | | B | C | D | E | F | | | | | | | | 106.7 | 21.7 | 23.0 | 29.2 | 22.4 | 54.4 | 59.0 |
| **Dura 512** | **5** | 8.1 | ( 11) | | B | C | D | E | F | G | | | | | | | 106.1 | 22.0 | 21.5 | 30.7 | 24.3 | 53.4 | 57.7 |
| **AmeriStand407TQ** | **4** | 8.1 | ( 12) | | B | C | D | E | F | G | H | | | | | | 105.7 | 22.0 | 22.4 | 28.8 | 23.1 | 54.7 | 58.5 |
| **R46Bx162** | **4** | 8.0 | ( 13) | | B | C | D | E | F | G | H | | | | | | 105.1 | 22.7 | 23.4 | 28.0 | 21.5 | 55.2 | 59.6 |
| **Archer III** | **5** | 8.0 | ( 14) | | B | C | D | E | F | G | H | I | | | | | 104.7 | 23.1 | 22.9 | 28.1 | 22.6 | 55.2 | 58.8 |
| **R47M312 FG** | **4** | 8.0 | ( 15) | | B | C | D | E | F | G | H | I | | | | | 104.6 | 21.9 | 22.1 | 29.8 | 23.3 | 54.0 | 58.4 |
| **Mountaneer II** | **5** | 8.0 | ( 16) | | B | C | D | E | F | G | H | I | J | | | | 104.3 | 23.1 | 21.9 | 29.4 | 23.8 | 54.3 | 58.1 |
| **Syngenta 6422Q** | **4** | 8.0 | ( 17) | | | C | D | E | F | G | H | I | J | | | | 104.2 | 23.8 | 22.5 | 27.5 | 21.7 | 55.6 | 59.5 |
| **R56Bx212** | **5** | 7.9 | ( 18) | | | | D | E | F | G | H | I | J | K | | | 103.5 | 22.9 | 21.6 | 28.1 | 23.5 | 55.1 | 58.2 |
| **Rebound 6.0** | **4** | 7.9 | ( 19) | | | | | E | F | G | H | I | J | K | | | 103.4 | 22.5 | 21.8 | 28.7 | 22.5 | 54.7 | 58.9 |
| **R46Bx163** | **4** | 7.9 | ( 20) | | | | | E | F | G | H | I | J | K | | | 103.4 | 21.5 | 22.6 | 29.8 | 22.2 | 54.0 | 59.2 |
| **MasterPiece II** | **4** | 7.9 | ( 21) | | | | | E | F | G | H | I | J | K | | | 103.3 | 22.6 | 20.6 | 28.4 | 24.1 | 54.9 | 57.8 |
| **Integra 8300** | **3** | 7.8 | ( 22) | | | | | | F | G | H | I | J | K | | | 102.5 | 23.0 | 22.2 | 28.0 | 21.9 | 55.2 | 59.3 |
| **Syngenta 6422Q-EMD** | **4** | 7.8 | ( 23) | | | | | | F | G | H | I | J | K | | | 102.2 | 23.3 | 21.9 | 27.5 | 21.8 | 55.6 | 59.4 |
| **R47M120 FG** | **4** | 7.8 | ( 24) | | | | | | | G | H | I | J | K | | | 102.0 | 22.4 | 20.5 | 29.9 | 24.5 | 53.9 | 57.6 |
| **Lightening IV** | **4** | 7.7 | ( 25) | | | | | | | | H | I | J | K | L | | 101.3 | 22.1 | 22.4 | 28.8 | 23.0 | 54.7 | 58.6 |
| **Xtra-3** | **4** | 7.7 | ( 26) | | | | | | | | H | I | J | K | L | | 101.3 | 23.2 | 22.5 | 28.4 | 23.3 | 55.0 | 58.4 |
| **R48W224 FG** | **4** | 7.7 | ( 27) | | | | | | | | | I | J | K | L | M | 100.6 | 22.5 | 22.5 | 28.2 | 22.2 | 55.1 | 59.1 |
| **Vernal** | **2** | 7.6 | ( 28) | | | | | | | | | | J | K | L | M | 100.0 | 21.2 | 23.7 | 29.3 | 21.4 | 54.3 | 59.7 |
| **R48M153 FG** | **4** | 7.6 | ( 29) | | | | | | | | | | | K | L | M | 99.3 | 20.6 | 22.5 | 28.7 | 20.9 | 54.8 | 60.0 |
| **R65BD278** | **6** | 7.4 | ( 30) | | | | | | | | | | | | L | M | 96.9 | 23.5 | 21.5 | 30.7 | 27.1 | 53.4 | 55.8 |
| **Minerva** | **5** | 7.4 | ( 31) | | | | | | | | | | | | | M | 96.5 | 21.0 | 21.6 | 31.2 | 24.6 | 53.1 | 57.5 |
| **Rugged** | **3** | 7.4 | ( 32) | | | | | | | | | | | | | M | 96.4 | 23.0 | 23.4 | 28.7 | 22.6 | 54.7 | 58.9 |
| **MEAN** | | 7.96 | | | | | | | | | | | | | | | | 22.3 | 22.2 | 29.0 | 23.1 | 54.6 | 58.6 |
| **LSD (0.1)** | | 0.34 | | | | | | | | | | | | | | | | | | | | | |
| **LSD (0.05)** | | | | | | | | | | | | | | | | | | NS | NS | 0.7 | 0.9 | 0.5 | 0.6 |
| **P value** | | | | | | | | | | | | | | | | | | 0.059 | 0.0616 | 0.011 | 0.001 | 0.011 | 0.001 |

Trial seeded at 25 lb/acre viable seed at Intermountain Research and Extension Center, Tulelake, CA.

Entries followed by the same letter are not significantly different at the 10% probability level according to Fisher's (protected) LSD.

FD = Fall Dormancy reported by seed companies.

*TDN calculated from ADF using the California Equation

## 2008-2011 YIELDS, TULELAKE ALFALFA CULTIVAR TRIAL. TRIAL PLANTED 07/27/07

| | | 2008 Yield | | 2009 Yield | | 2010 Yield | | 2011 Yield | | Average | | | % of VERNAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FD | Dry t/a | | | | | | | | | | | % |
| **Released Varieties** | | | | | | | | | | | | | |
| Archer III | 5 | 8.6 | ( 1) | 8.3 | ( 2) | 7.5 | ( 3) | 9.8 | ( 1) | 8.5 | ( 1) | A | 131.0 |
| PGI 459 | 4 | 8.5 | ( 2) | 8.3 | ( 4) | 7.8 | ( 1) | 9.3 | ( 9) | 8.5 | ( 2) | A B | 129.6 |
| DKA50-18 | 5 | 8.3 | ( 11) | 8.5 | ( 1) | 7.6 | ( 2) | 9.3 | ( 10) | 8.4 | ( 3) | A B C | 129.0 |
| WL 357HQ | 5 | 8.3 | ( 12) | 8.1 | ( 6) | 7.2 | ( 8) | 9.2 | ( 12) | 8.2 | ( 4) | B C D | 125.8 |
| GrandStand | 4 | 8.2 | ( 20) | 8.0 | ( 10) | 7.3 | ( 6) | 9.3 | ( 5) | 8.2 | ( 5) | B C D E | 125.7 |
| Integra 8400 | 4 | 8.0 | ( 34) | 8.3 | ( 3) | 7.5 | ( 4) | 8.9 | ( 22) | 8.2 | ( 6) | B C D E F | 125.3 |
| Integra 8300 | 3 | 8.3 | ( 15) | 8.1 | ( 7) | 7.2 | ( 9) | 9.1 | ( 14) | 8.2 | ( 7) | B C D E F | 125.2 |
| AmeriStand407TQ | 4 | 8.1 | ( 30) | 8.0 | ( 9) | 7.2 | ( 12) | 9.3 | ( 8) | 8.2 | ( 8) | B C D E F G | 125.1 |
| AmeriStand444NT | 4 | 8.4 | ( 4) | 7.7 | ( 31) | 7.2 | ( 14) | 9.2 | ( 11) | 8.1 | ( 9) | B C D E F G H | 124.7 |
| Genoa | 4 | 8.4 | ( 6) | 7.7 | ( 27) | 7.3 | ( 5) | 9.1 | ( 16) | 8.1 | ( 11) | B C D E F G H | 124.6 |
| Legendairy | 3 | 8.0 | ( 33) | 8.1 | ( 5) | 7.2 | ( 11) | 9.1 | ( 13) | 8.1 | ( 13) | C D E F G H I | 124.4 |
| MilkMaker ML | 5 | 8.4 | ( 3) | 7.6 | ( 37) | 6.9 | ( 31) | 9.4 | ( 4) | 8.1 | ( 15) | C D E F G H I J | 123.8 |
| PGI 424 | 4 | 8.3 | ( 10) | 7.9 | ( 13) | 7.0 | ( 24) | 8.9 | ( 20) | 8.0 | ( 17) | D E F G H I J K | 123.0 |
| CW 500 | 5 | 8.2 | ( 18) | 7.9 | ( 14) | 6.8 | ( 38) | 9.1 | ( 15) | 8.0 | ( 20) | D E F G H I J K L | 122.8 |
| FSG 528SF | 5 | 8.4 | ( 7) | 7.7 | ( 26) | 6.9 | ( 35) | 8.9 | ( 21) | 8.0 | ( 21) | D E F G H I J K L M | 122.3 |
| Rebound 5 | 4 | 7.9 | ( 38) | 8.0 | ( 8) | 7.2 | ( 13) | 8.6 | ( 33) | 7.9 | ( 24) | D E F G H I J K L M N O | 121.7 |
| FSG 505 | 5 | 7.8 | ( 46) | 7.7 | ( 25) | 7.2 | ( 7) | 8.7 | ( 29) | 7.9 | ( 28) | E F G H I J K L M N O P Q | 120.5 |
| Xtra-3 | 4 | 8.4 | ( 5) | 7.5 | ( 45) | 6.8 | ( 41) | 8.6 | ( 31) | 7.8 | ( 31) | G H I J K L M N O P Q R | 120.0 |
| Magnum VI | 4 | 7.8 | ( 47) | 7.8 | ( 18) | 6.8 | ( 44) | 8.7 | ( 30) | 7.8 | ( 36) | J K L M N O P Q R S T U | 118.9 |
| WL 343HQ | 4 | 7.6 | ( 52) | 7.7 | ( 34) | 6.9 | ( 29) | 8.6 | ( 34) | 7.7 | ( 38) | K L M N O P Q R S T U | 118.3 |
| Dura 512 | 5 | 8.1 | ( 24) | 7.8 | ( 21) | 6.6 | ( 48) | 8.2 | ( 49) | 7.7 | ( 40) | L M N O P Q R S T U | 117.7 |
| 54V09 | 4 | 8.1 | ( 29) | 7.6 | ( 39) | 6.7 | ( 46) | 8.2 | ( 45) | 7.6 | ( 43) | M N O P Q R S T U | 117.3 |
| WL 325 HQ | 4 | 7.8 | ( 48) | 7.7 | ( 32) | 6.8 | ( 42) | 8.1 | ( 52) | 7.6 | ( 47) | P Q R S T U | 116.4 |
| Mountaineer 2 | 5 | 7.9 | ( 39) | 7.3 | ( 50) | 6.6 | ( 51) | 8.3 | ( 44) | 7.5 | ( 49) | Q R S T U | 115.6 |
| Everlast II | 4 | 7.7 | ( 51) | 7.5 | ( 43) | 6.8 | ( 43) | 8.2 | ( 50) | 7.5 | ( 50) | Q R S T U | 115.5 |
| MasterPiece | 4 | 8.0 | ( 37) | 7.4 | ( 49) | 6.7 | ( 45) | 7.9 | ( 55) | 7.5 | ( 51) | R S T U | 115.0 |
| Whitney | 4 | 7.9 | ( 41) | 6.9 | ( 54) | 6.3 | ( 53) | 8.8 | ( 26) | 7.5 | ( 52) | S T U | 114.5 |
| Prosementi | ND | 8.1 | ( 28) | 7.2 | ( 53) | 6.3 | ( 54) | 8.2 | ( 48) | 7.4 | ( 53) | T U | 114.0 |
| FSG 408DP | 4 | 7.6 | ( 53) | 7.3 | ( 52) | 6.8 | ( 40) | 8.0 | ( 53) | 7.4 | ( 54) | U | 113.7 |
| Vernal | 2 | 6.7 | ( 56) | 6.5 | ( 56) | 5.6 | ( 56) | 7.3 | ( 56) | 6.5 | ( 56) | | 100.0 |
| | | | | | | | | | | | | | |
| **Experimental Varieties** | | | | | | | | | | | | | |
| R46Bx164 | 6 | 8.1 | ( 26) | 8.0 | ( 11) | 7.0 | ( 23) | 9.4 | ( 3) | 8.1 | ( 10) | B C D E F G H | 124.6 |
| R56Bx214 | 4 | 8.3 | ( 9) | 7.6 | ( 38) | 7.1 | ( 19) | 9.5 | ( 2) | 8.1 | ( 12) | C D E F G H | 124.4 |
| R56BD191 | ND | 8.3 | ( 13) | 7.8 | ( 16) | 7.1 | ( 17) | 9.1 | ( 17) | 8.1 | ( 14) | C D E F G H I J | 123.8 |
| R46Bx197 | 8 | 8.3 | ( 8) | 7.8 | ( 17) | 7.2 | ( 16) | 8.9 | ( 24) | 8.1 | ( 16) | D E F G H I J K | 123.5 |
| R46Bx218 | 6 | 8.1 | ( 31) | 7.8 | ( 15) | 6.8 | ( 39) | 9.3 | ( 6) | 8.0 | ( 18) | D E F G H I J K | 123.0 |
| R56BD190 | ND | 8.2 | ( 19) | 7.8 | ( 24) | 7.2 | ( 15) | 8.9 | ( 23) | 8.0 | ( 19) | D E F G H I J K L | 122.8 |
| R56BD188 | ND | 8.2 | ( 22) | 8.0 | ( 12) | 7.2 | ( 10) | 8.5 | ( 36) | 8.0 | ( 22) | D E F G H I J K L M | 122.3 |
| R46Bx160 | 5 | 7.9 | ( 40) | 7.8 | ( 22) | 7.1 | ( 20) | 9.0 | ( 18) | 8.0 | ( 23) | D E F G H I J K L M N | 122.0 |
| R46Bx165 | 8.5 | 8.0 | ( 36) | 7.8 | ( 20) | 6.9 | ( 32) | 9.0 | ( 19) | 7.9 | ( 25) | D E F G H I J K L M N O P | 121.4 |
| R46BD201 | ND | 8.2 | ( 17) | 7.8 | ( 19) | 7.0 | ( 22) | 8.5 | ( 38) | 7.9 | ( 26) | D E F G H I J K L M N O P | 121.1 |
| R46Bx211 | 4.1 | 7.9 | ( 44) | 7.3 | ( 51) | 7.0 | ( 25) | 9.3 | ( 7) | 7.9 | ( 27) | D E F G H I J K L M N O P Q | 120.6 |
| R46Bx167 | 4 | 8.2 | ( 23) | 7.7 | ( 29) | 7.0 | ( 27) | 8.5 | ( 37) | 7.8 | ( 29) | F G H I J K L M N O P Q | 120.3 |
| R46Bx162 | 8 | 8.2 | ( 16) | 7.7 | ( 28) | 7.0 | ( 28) | 8.4 | ( 40) | 7.8 | ( 30) | F G H I J K L M N O P Q | 120.3 |
| R46Bx777 | ND | 8.1 | ( 32) | 7.8 | ( 23) | 7.1 | ( 18) | 8.4 | ( 42) | 7.8 | ( 32) | G H I J K L M N O P Q R | 119.9 |
| R46Bx163 | 4 | 8.1 | ( 25) | 7.4 | ( 48) | 6.9 | ( 30) | 8.8 | ( 25) | 7.8 | ( 33) | G H I J K L M N O P Q R | 119.9 |
| R46BD203 | ND | 8.3 | ( 14) | 7.4 | ( 47) | 6.9 | ( 33) | 8.6 | ( 32) | 7.8 | ( 34) | H I J K L M N O P Q R S | 119.6 |
| R46Bx778 | ND | 8.2 | ( 21) | 7.5 | ( 41) | 6.6 | ( 50) | 8.7 | ( 27) | 7.8 | ( 35) | I J K L M N O P Q R S T | 119.2 |
| R46Bx775 | ND | 8.1 | ( 27) | 7.7 | ( 30) | 7.0 | ( 21) | 8.1 | ( 51) | 7.7 | ( 37) | J K L M N O P Q R S T U | 118.8 |
| R56Bx212 | 6 | 7.9 | ( 42) | 7.5 | ( 42) | 6.8 | ( 37) | 8.6 | ( 35) | 7.7 | ( 39) | K L M N O P Q R S T U | 118.3 |
| R56BD202 | ND | 7.8 | ( 45) | 7.6 | ( 35) | 6.5 | ( 52) | 8.7 | ( 28) | 7.7 | ( 41) | L M N O P Q R S T U | 117.7 |
| TS 4028 | 4 | 7.9 | ( 43) | 7.5 | ( 40) | 7.0 | ( 26) | 8.2 | ( 47) | 7.7 | ( 42) | M N O P Q R S T U | 117.4 |
| R46Bx173 | 5 | 7.7 | ( 50) | 7.5 | ( 44) | 6.9 | ( 36) | 8.5 | ( 39) | 7.6 | ( 44) | M N O P Q R S T U | 117.1 |
| R46Bx161 | 6 | 7.5 | ( 55) | 7.7 | ( 33) | 6.9 | ( 34) | 8.4 | ( 41) | 7.6 | ( 45) | N O P Q R S T U | 117.0 |
| R46Bx217 | 8 | 8.0 | ( 35) | 7.4 | ( 46) | 6.6 | ( 47) | 8.3 | ( 43) | 7.6 | ( 46) | O P Q R S T U | 116.6 |
| R46Bx776 | ND | 7.7 | ( 49) | 7.6 | ( 36) | 6.6 | ( 49) | 8.2 | ( 46) | 7.5 | ( 48) | Q R S T U | 115.8 |
| R66BD108 | ND | 7.6 | ( 54) | 6.8 | ( 55) | 5.9 | ( 55) | 7.9 | ( 54) | 7.0 | ( 55) | V | 108.1 |
| | | | | | | | | | | | | | |
| MEAN | | 8.05 | | 7.69 | | 6.93 | | 8.71 | | 7.84 | | | |
| CV | | 5.8 | | 4.5 | | 4.5 | | 8.7 | | 4.1 | | | |
| LSD (0.1) | | 0.49 | | 0.37 | | 0.33 | | 0.81 | | 0.34 | | | |

Trial seeded at 25 lb/acre viable seed at Intermountain Research and Extension Center, Tulelake, CA.

Entries followed by the same letter are not significantly different at the 10% probability level according to Fisher's (protected) LSD.

FD = Fall Dormancy reported by seed companies.

# FIELD CROP NOTES

## DATED MATERIAL

*Cooperative Extension*
*University of California*
*1655 South Main Street*
*Yreka, CA 96097*

**NON-PROFIT**
**STANDARD MAIL**
**PERMIT #3**
**YREKA, CA**

**CURRENT RESIDENT**
**OR**