

April 2006

AG/Crop Trials/2006-03

Irrigated Alfalfa Variety Performance, 2003-2005; Delta, Utah

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This report summarizes production of alfalfa varieties during three years on a cooperating farm at Delta (Millard Co.). This site is at an elevation of 4600 ft and averages 5069 growing degree days (base 40° F) per year. Cultivars were from breeding programs and seed marketers, plus Vernal as a check for comparisons with newer genotypes. Fall dormancy (FD) ratings were 2 to 6, and predominantly 4 (Table 1). Additional background on FD and pest- and disease-resistance ratings, breeding histories, release date, performance at other locations, and marketers may be found on websites of the National Alfalfa Alliance (www.alfalfa.org) and the North American Alfalfa Improvement Conference (www.naaic.org). The NAAIC Web site also lists Winter Survival Index ratings for some varieties, under alfalfa trial results from Minnesota and Wisconsin.

Varieties were drill-seeded at 18 lb bulk seed/ac into Anco silty clay loam on August 16, 2002, in a randomized complete block design with five replications. Each 3- by 20-ft plot had five rows spaced 6 in apart, with a 1-ft gap between adjacent plots. Plots were flood-irrigated once per cutting. Manure was applied to the test field in the 2 years prior to alfalfa. Initial soil test levels in the surface foot were pH 8.1, 2.1% organic matter, and 59, >400, and 33 ppm P, K, and SO₄-S, respectively. These were adequate to very high levels, and remained so throughout the trial. Initial soil test levels of Cu, Fe, Mn, and Zn were 2, 4, 3, and 1 ppm, respectively. Annual applications included 22 lb N and 104 lb of P₂O₅/ac in March,

Pursuit[®] herbicide in April, and usually Furadan[®] insecticide in May for control of alfalfa weevil.



Plots were harvested four times annually in 2003-2005, at early-bud to mid-bloom stages (average of late-bud to early-bloom), with a Carter flail harvester. Fourth harvests were taken on September 20-October 1. Fresh weight of forage above a 3-in stubble was obtained from each plot and an approximately 0.5-lb subsample was used to determine dry matter (DM) concentration by oven drying at 60° C (140° F). Plot management and harvest timing simulated commercial practices as much as possible, except that hay was not windrowed, dried, and baled on the plots. Plots, therefore, received less machinery traffic than would occur under most commercial conditions. Small-plot oven-dry alfalfa yield is perhaps 10-15% higher than air-dry weight of hay from commercial harvesting and baling of the same material. The usual DM losses from respiration during drying in the windrow, machinery traffic, and leaf shatter from mechanical handling are not encountered in small-plot trials.

Varieties in Table 1 are ranked in decreasing order of mean annual DM production over 3 years. Distribution of total DM production among harvests within a year (and range among years) averaged 36% (34-38%) in first cutting, 24% (22-27%) in second, 22% (20-25%) in third, and 18% (17-19%) in fourth. High production in 2004 was partly due to a delayed first harvest to comply with a withholding period following insecticide application.

Varieties may be compared in terms of the least significant difference (LSD). This is the minimum difference required between varieties in a column for detection of true variety effects at a given level of probability. Values of LSD are shown for 5% and 30% probabilities that observed differences are merely due to chance, rather than to variety effects. For example, in Table 1, 3-year mean yields of the top 14 varieties do not differ at the 5% probability level, because they vary by less than the LSD of 0.63 tons/ac. Production of the first- and fifteenth-ranked varieties differs at the 5% probability level, because they vary by at least the LSD. At 30% probability that yield variations are due to chance, smaller differences become significant. The coefficient of variation (CV) describes variation among replications of the same variety; values below 10% suggest good precision for detecting variety differences.

Averaged over 3 years, annual forage production differed by 1.6 tons DM/ac among varieties. It would require only a fraction of this performance improvement to offset any difference

in seed cost between varieties. Varieties with FD 4 to 6 were spread throughout the upper third of the yield rankings, indicating a wide range of performance potential within these dormancy classes. Annual yields peaked in the second harvest year, then tapered by approximately 1.3 ton DM/ac between the second and third years. Yield rankings in a particular year do not necessarily reflect those of 3-year means, confirming that selection of high-performing varieties should be based on data from multiple years.

Vernal, a public cultivar released in 1953 with some resistance to bacterial wilt, Fusarium wilt, stem nematode, and root-knot nematode, was the least productive variety in this trial. Compared to Vernal, other varieties in the trial have broader packages and higher levels of resistance to many of the previously-mentioned alfalfa pests and diseases, plus Phytophthora root rot, that are common in Utah. Stands of these varieties are therefore likely to persist longer than those of older or non-certified varieties where disease and pest resistance characteristics are lacking or unknown.

We would like to acknowledge the generous contributions of our cooperating growers, Kevin and Ray Gardner, who provided land and services for this project.

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Table 1. Alfalfa varieties ranked by 3-year mean annual dry matter (DM) production at Delta, UT. Plots were seeded at 18 lb bulk seed/ac on August 16, 2002 and harvested four times annually at early-bud to mid-bloom stages.

Cultivar	Fall dormancy rating ^a	Season-total DM production			
		2003	2004 ^b	2005	3-yr mean
-----Tons DM/ac-----					
Archer II	5	9.99	11.62	10.25	10.70
Ruccus	5	9.52	11.89	10.10	10.55
Geneva	4	9.27	11.66	10.56	10.50
WL 342	4	9.46	11.86	10.14	10.48
Recover	5	9.96	11.54	9.78	10.46
Stamina	4	9.50	11.89	9.64	10.34
DG AL355	4	8.98	11.48	9.93	10.28
Tango	6	9.34	11.95	9.65	10.28
FG3R134	4	9.10	11.50	9.84	10.19
Somerset	3	9.02	11.17	10.54	10.19
Payday	4	9.24	11.60	9.91	10.18
DKA42-15	4	9.17	11.44	10.14	10.16
GS 9723	6	9.27	11.37	9.74	10.16
XTRA-3	4	9.26	11.31	9.69	10.16
Endurance	4	9.01	11.23	9.64	10.05
GP98WR	4	9.31	11.02	9.22	9.97
Alpine II	2	9.19	11.45	9.41	9.94
Rebound 4.2	4	8.95	11.21	9.66	9.93
Select	4	9.25	11.17	9.27	9.87
Hayday	4	8.86	10.99	9.64	9.83
Plumas	4	9.24	10.92	9.29	9.82
Legendairy YPQ	3	8.54	10.93	9.63	9.73
Ameristand 403T	4	8.67	10.84	9.40	9.65
Multi 777	4	8.82	10.65	9.29	9.61
Vernal (certified)	2	8.29	10.36	8.48	9.09
Mean		9.15	11.32	9.71	10.04
Significance of F test (P)		0.06	<0.01	<0.01	<0.01
LSD (0.05)		0.83	0.79	0.72	0.63
LSD (0.30)		0.44	0.41	0.38	0.33
CV (%)		6.6	5.5	5.8	4.6

^aRegrowth height following a late summer cutting, relative to heights of standard check cultivars. Ratings range from 1 (extremely dormant; short) to 11 (extremely non-dormant; tall).

^bUnexpectedly high forage production is partly due to delayed first harvest to comply with a withholding period following insecticide application.