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Irrigated Alfalfa Variety Performance, 1999-2002; Kaysville, Utah

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This report summarizes alfalfa yields from 4 harvest years of an irrigated trial at the Utah Agricultural Experiment Station research farm at Kaysville, Davis Co. This site is at an elevation of 4340 ft and averages 5365 growing degree days (base 40° F) per year. Alfalfa cultivars were solicited from national and regional breeding programs and seed marketers. Deseret and Ranger were included as check varieties for comparisons with newer genotypes. Fall dormancy (FD) ratings ranged from 2 to 5 among entries (Table 1). Additional background on FD and pest- and disease-resistance ratings, cultivar breeding history, 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).

Entries were drill-seeded into a Kidman fine sandy loam at 20 lb bulk seed/ac on September 16, 1998. Experimental design was a randomized complete block with five replications. Eptam® (EPTC) was soil-incorporated as a pre-plant herbicide. Plots were 3 wide by 20 ft long with five rows at 6-in spacing and a 1-ft gap between outside rows of adjacent plots. Plots were sprinkle-irrigated at approximately 10-day intervals as needed according to soil water content and evaporative demand. Periodic applications of P, K, and S resulted in levels in the surface foot of soil that ranged between 15-14 ppm P, 178-92 ppm K, and 3-6 ppm S at the beginning and end of the trial, respectively. Very few weeds and insect pests were present and post-planting herbicides and insecticides were not used.

Plots were harvested four times per growing season at late-bud to mid-bloom stages (average of



early bloom) with a Carter flail harvester. A fifth cutting was harvested after killing frost in late fall of 2000 and 2001. 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 55° C (131° 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 due to respiration during drying in the windrow, machinery traffic, and leaf shatter from mechanical handling are not encountered in small-plot trials.

Variety means in Table 1 are ranked in decreasing order of mean annual production for the

4 years of the trial. Distribution of total season production averaged across years (and range among years) was 36% (27-42%) in first cutting, 27% (20-32%) in second, 21% (20-24%) in third, and 17% (16-18%) in fourth. In 2000 and 2001, when a fifth cutting was obtained, average distribution of total season DM production was 34, 23, 18, 15, and 10%, respectively, for first through fifth cuttings.

Varieties may be compared in terms of the least significant difference (LSD), the minimum numerical difference required between any two entries in a column in order for those entries to be statistically different. Conservative and liberal values of LSD are calculated at 5 and 30% probabilities that observed differences among entries are merely due to chance rather than to real variety effects. For example, in the column for 4-year means, none of the top six varieties differ statistically from each other at the 5% probability level, because the differences are all less than the LSD of 0.54 tons/ac. The seventh-ranked variety in this column is statistically different from the first variety at the 5% probability level, however, because they differ by at least the LSD. The coefficient of variation (CV) expresses the level of inherent variability among replications of the same variety, and values below 10% are evidence of good precision for detecting differences among entries.

When averaged over 4 years, annual forage production differed by 2.2 tons/ac between top and bottom entries. The six top-performing entries included all of the least-dormant (FD 5) varieties. The bottom three entries were all more dormant (FD 3), although a variety with FD 2 performed close to the mean of all varieties. Varieties with FD 3-4 were spread throughout 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 ton/ac in each of the remaining 2 years.

Yield rankings in a particular year do not necessarily reflect the rankings of 4-year means, showing that selection of high-performing varieties should be based on data from multiple years. The public cultivar Deseret, released in 1975 with some resistance to bacterial wilt and stem nematode, ranked near the top of the trial. The public cultivar Ranger, released in 1940 with resistance only to bacterial wilt, was at the bottom of the trial. Compared to Deseret and Ranger, other varieties in the trial have broader packages of resistance to many of the alfalfa pests and diseases 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.

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Table 1. Alfalfa cultivars ranked by 4-year mean annual dry matter (DM) production at Kaysville, UT. Plots were cut four times each growing season at late-bud to mid-bloom stages.

Entry (cultivar)	Fall dormancy ^a	Season-total DM production				4-year mean
		1999	2000	2001	2002	
		-----Tons DM/ac-----				
Archer II	5	6.10	11.02	10.92	9.91	9.71
ZX 9451	5	5.90	11.88	10.74	9.29	9.61
Deseret	5	5.47	11.65	10.47	9.51	9.43
Magnum V	4	5.73	11.65	10.26	9.25	9.42
54Q53	4	5.64	11.34	10.24	9.28	9.33
WL 325HQ	3	5.94	10.92	10.44	9.39	9.23
DK 133	4	6.06	11.27	9.95	8.60	9.10
DK 142	4	5.26	11.43	10.58	8.82	9.05
Enhancer	4	5.35	11.39	10.48	8.85	8.98
Cimarron 3i	4	5.78	11.51	9.69	8.37	8.97
Spur	4	5.32	10.98	10.39	8.55	8.95
Gold Plus	4	5.88	10.82	9.80	8.19	8.92
WL 324	3	4.86	11.21	10.22	9.06	8.90
Affinity+Z	4	5.78	10.76	10.28	8.99	8.87
Imperial	3	5.30	11.11	9.90	9.28	8.85
Stamina	4	5.80	11.72	9.76	8.16	8.80
Alpine II	2	5.70	10.54	9.98	8.63	8.76
Mountaineer	4	5.84	11.07	9.18	8.15	8.64
Emperor	4	5.12	10.54	9.46	8.85	8.54
Endurance	4	5.04	11.06	9.54	8.20	8.53
DK 134	3	5.03	10.62	9.59	8.32	8.53
MultiQueen	4	4.98	11.06	9.70	8.13	8.51
Excalibur II	4	5.09	11.30	9.78	7.86	8.51
Plumas	4	5.22	10.55	9.81	8.12	8.42
Reno	4	4.65	11.33	9.73	7.93	8.37
Ripin	4	4.54	10.06	9.56	8.64	8.28
TMF Multiplier II	3	4.39	9.97	9.58	8.08	8.17
Rambo	3	4.74	10.03	9.08	7.95	8.05
Ranger	3	4.55	9.57	8.63	7.61	7.48
Mean		5.34	10.98	9.92	8.61	8.79
LSD (0.05)		1.00	0.86	0.64	0.70	0.54
LSD (0.30)		0.52	0.45	0.34	0.37	0.29
CV (%)		16	6	6	6	4

^aFall dormancy ratings relate fall regrowth height following a late summer cutting to heights of known check cultivars, and range from 1 (extremely FD) to 11 (extremely non-dormant).