SECOND YEAR RESULTS OF THE 1999 TO 2003 ALFALFA FORAGE VARIETY TRIAL

Eric P. Eldredge, Clinton C. Shock, and Lamont D. Saunders
Malheur Experiment Station
Oregon State University
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Introduction

With increasing dairy herds in Oregon and Idaho, a marketing opportunity exists for premium-quality dairy hay. Cutting alfalfa early, when buds are fully formed but before the first flowers open, produces higher quality hay, but the total yield will be reduced. Repeated early cutting saps the vitality of alfalfa plants by reducing stored carbohydrate in the roots and crowns, and can result in thinning stands or a shorter life of the stand. Alfalfa stressed by an early cutting regime is more susceptible to pests or diseases that may be present in the field. In this trial, 12 proprietary varieties are compared with 2 public check varieties for production of dairy quality hay, over a projected 5-year life of stand. The purpose of this trial is to identify alfalfa cultivars that can stay productive when cut early for high-quality hay, grown on marginal soil with sprinkler irrigation.

Methods

The trial was established in September 1998, on Nyssa silt loam that had not been deep plowed. The soil is marginally productive, typical of bench ground fields where alfalfa hay is often produced in the Treasure Valley. Plots were 20 ft long by 5 ft wide, separated by 3-ft alleys, with each variety replicated five times in a randomized complete block design. Preplant fertilizer was applied according to the results of a soil test, and preplant incorporated herbicide was applied for weed control. In September of 1999, sulfur was applied at three ton/acre, and a single shank was pulled between plots at 34-inches depth in an attempt to improve water infiltration into the soil. Further details of this trial's establishment were given in last year's annual report (Eldredge, et al. 2000). Fall regrowth was cut with a flail mower on November 29, 1999, and December 19, 2000, to reduce rodent cover and to improve herbicide spray penetration and effectiveness. A tank mix of Gramoxone at 0.5 lb ai/acre plus Sencor at 0.5 lb ai/acre was applied on March 25, 2000 to control winter annual weeds and to provide a residual soil active herbicide.

The alfalfa plants in all of the plots came through the winter in very good condition. Plots were harvested on May 18, June 16, July 18, and August 22, 2000. The first cutting was slightly late, as some plants were in bloom. The second, third, and fourth cuttings were made at bud stage. At each cutting date, a 3-ft by 20-ft swath was cut from the center of each plot using a flail mower, and the alfalfa was weighed. Ten random samples of alfalfa were collected before each cutting, dried in a forage dryer at

140°F with forced air, and reweighed to determine the alfalfa moisture content at each cutting.

Forage quality samples of approximately 20 stems per plot were taken at second cutting. The second cutting forage quality samples were dried, ground to pass a one-mm screen, subsampled, and sent to the Oregon State University Forage Quality Lab at Klamath Falls, OR, where they were reground to pass a 0.5-mm screen. Near infrared spectroscopy (NIRS) was used to analyze percent crude protein, percent acid detergent fiber (ADF), and percent neutral detergent fiber (NDF). Relative feed value (RFV) was calculated by the formula:

$$RFV = \{[88.9 - (ADF * 0.779)] * (120/NDF)\}/1.29$$

Quality standards based on RFV are Prime, RFV higher than 151; No. 1, RFV 151 to 125; No. 2, RFV 124 to 103; No. 3, RFV 102 to 87; No. 4, RFV 86 to 75; and No. 5, RFV less than 75 (Undersander et al. 1991). A higher RFV means less grain or feed concentrate is required to formulate the dairy ration.

Results and Discussion

In the second production year of the trial, five cuttings could not be taken as planned, because there was too little regrowth in September to allow for a fifth cutting. The average total hay yield was 7.39 ton/acre (Table 1). The total yields of 'Wrangler', 6.86 ton/acre, and 'Lahontan', 6.17 ton/acre, were significantly lower than the total for 'G9722', 7.82 ton/acre. There were no significant differences between varieties in the crude protein, which averaged 25.9 percent in the second cutting. Crude protein ranged from 27.4 percent for 'Wrangler' to 25.1 percent for 'Plumas'. Acid detergent fiber, ADF, ranged from 29.8 percent for 'Plumas', to 27.1 percent for 'Gold Plus', with an average of 28.5 percent. Neutral detergent fiber, NDF, ranged from 41.4 percent for 'Plumas' and 'Emperor', to 39.7 percent for 'Gold Plus', with an average of 40.7 percent. All varieties except 'Plumas', 'ZX9453', and 'Emperor' produced hay with relative feed value 151 or higher in the second cutting. 'Gold Plus' had a relative feed value (RFV) of 160, which was significantly higher than 'Plumas', with RFV of 148, or 'Emperor', with RFV of 149.

The 2 year total hay yield averaged 11.58 ton/acre, with a range from 12.18 ton/acre for 'G9722', to 10.38 ton/acre for 'Lahontan' (Table 2). Information on the disease, nematode, and insect resistance of the varieties in this trial was provided by the participating seed companies and/or the North American Alfalfa Improvement Council (Table 3). Most of the varieties have some resistance to diseases and pests that could limit hay production in our area. Growers should choose varieties that have stronger resistance ratings for disease or pest problems known to be present in their fields, in addition to demonstrated potential for high yield.

Diseased plants were first noticed in the northern end of the trial in September 2000, and samples were sent to the Plant Disease Clinic at Oregon State University in Corvallis. The diagnosis was a crown rot disease complex caused by the fungi *Colletotrichum trifolii* (anthracnose) and *Fusarium* species. Anthracnose is typically a problem where animals' hooves damage the alfalfa crowns, and in this trial some cattle got loose during the Fourth of July weekend and trampled the plots, especially in the first replicate on the north end of the trial. Before fall dormancy, plots throughout the trial showed the "shepherd's crook" symptom on stems, indicating that the anthracnose infection was spreading. The flail mower used to harvest the alfalfa could have easily spread the fungal crown rot disease complex from plot to plot. The soil depth to an impervious layer is shallowest in the first replicate, where the anthracnose was first seen, and poor drainage and low water infiltration rate also contribute to the development of crown rot diseases in alfalfa. Most of the varieties in this trial are rated highly resistant to anthracnose. In the third through fifth years of this trial, the degree of resistance to crown rot may determine which varieties remain productive.

Literature Cited

Eldredge, E.P., C.C. Shock, and L.D. Saunders. 2000. First year yield of the 1999-2003 alfalfa forage variety trial. Malheur Experiment Station Annual Report, Oregon State University Special Report 1015, pp 12-15.

Undersander, D., N. Martin, D. Cosgrove, K. Kelling, M. Schmitt, R. Becker, C. Grau, and J. Doll. 1991. Alfalfa management guide. ASA-CSSA-SSSA, Madison, WI.

Table 1. Alfalfa variety hay yields and second cutting crude protein*, ADF*, NDF*, and relative feed value for 2000. Malheur Experiment Station, Oregon State University, Ontario, OR.

Variety	Cutting date 5/18	6/16	7/18	8/22	2000 total	Crude protein	ADF ‡	NDF§	Relative feed value
	---------- ton/acre†				----------	------- % of DW¶		--------	RFV
G9722	2.44	1.99	1.73	1.66	7.82	25.8	28.8	41.0	151
Plumas	2.51	1.71	1.75	1.74	7.71	25.1	29.8	41.4	148
Tango	2.31	1.93	1.67	1.77	7.68	25.8	28.4	40.5	154
ZX9453	2.28	1.90	1.70	1.73	7.61	26.2	28.6	41.3	150
Emperor	2.34	1.83	1.71	1.72	7.60	25.2	29.0	41.4	149
Archer II	2.27	1.86	1.67	1.74	7.55	25.8	28.9	40.9	151
Multi-5301	2.53	1.73	1.68	1.58	7.52	26.2	27.8	39.8	157
Rambo	2.25	1.89	1.77	1.62	7.52	25.8	29.0	40.8	151
W-L 325HQ	2.23	1.91	1.63	1.66	7.43	26.5	27.6	40.2	156
Surpass	2.25	1.83	1.68	1.65	7.40	25.3	28.9	41.1	151
DK 142	2.20	1.93	1.55	1.65	7.32	26.0	28.3	40.2	155
Gold Plus	2.30	1.77	1.61	1.59	7.29	26.7	27.1	39.7	160
Wrangler	2.28	1.64	1.51	1.43	6.86	27.4	27.2	40.2	157
Lahontan	1.58	1.60	1.47	1.53	6.17	25.3	29.0	41.0	151
Mean	2.27	1.82	1.65	1.65	7.39	25.9	28.5	40.7	153
LSD (0.05)	0.33	NS††	NS	0.19	0.67	NS	2.2	1.5	10

*Based on % of dry weight.
†Yield at 88% dry matter.
‡ ADF: acid detergent fiber.
§NDF: neutral detergent fiber.
¶DW: dry weight.
††NS: not significant.

Table 2. Forage yield of alfalfa varieties in the first and second production years. Malheur Experiment Station, Oregon State University, Ontario, OR, 2000.

Variety	1999	2000	Two year total	Two year average
	ton/acre			
G9722	4.36	7.82	12.18	6.09
Emperor	4.55	7.60	12.14	6.07
Rambo	4.62	7.52	12.14	6.07
Archer II	4.57	7.54	12.12	6.06
ZX9453	4.42	7.61	12.03	6.01
Surpass	4.22	7.41	11.63	5.81
DK 142	4.25	7.32	11.57	5.79
Tango	3.83	7.68	11.51	5.76
Multi-5301	3.99	7.52	11.50	5.75
Plumas	3.75	7.71	11.46	5.73
Wrangler	4.37	6.86	11.23	5.62
Gold Plus	3.85	7.29	11.13	5.57
W-L 325 HQ	3.68	7.43	11.12	5.56
Lahontan	4.20	6.17	10.38	5.19
Mean	4.19	7.39	11.58	5.79
LSD (0.05)	NS	0.67	NS	NS

Table 3. Variety source, year of release, fall dormancy, and level of resistance to pests and diseases for 14 varieties in the 1999-2003 alfalfa forage variety trial. Malheur Experiment Station, Oregon State University, Ontario, OR, 2000.

		Release		Resistance rating†									
Variety	Source	year	FD*	BW	F	VW	PR	AN	SA	PA	SN	AP	RK
Lahontan	public	1954	6‡	MR	LR	-	LR	-	MR	LR	R	-	-
Wrangler	public	1984	2	R	R	LR	HR	LR	HR	HR	-	-	-
Surpass	Andrews Seed	1985	3	HR	HR	R	R	MR	-	R	-	-	-
Rambo	ABI Alfalfa	1995	3	HR	HR	R	HR	HR	MR	R	R	R	-
DK 142	DeKalb	1996	4	HR	HR	R	HR	R	R	HR	R	HR	-
Tango	Forage Genetics	1997	6	MR	HR	HR	HR	HR	HR	HR	MR	-	R
WL 325 HQ	W-L Research	1997	3	HR	HR	R	HR	HR	R	R	R	R	-
Archer II	ABI Alfalfa	1998	5	R	HR	HR	R	HR	R	MR	R	LR	R
Emperor	ABI Alfalfa	1998	4	HR	HR	HR	HR	HR	MR	R	-	HR	-
Gold Plus	MBS Inc.	1998	4	HR	HR	R	HR	HR	HR	HR	HR	R	-
Multi-5301	Geertson Seed	1998	4	R	HR	R	MR	HR	-	R	-	R	-
Plumas	Forage Genetics	1998	4	R	HR	R	HR	HR	HR	R	HR	R	MR
ZX9453	ABI Alfalfa	-	5	-	HR	R	R	MR	R	R	HR	-	MR
G9722	Geertson Seed	-	6	R	R	-	R	-	R	HR	-	-	-

*FD: fall dormancy, BW: bacterial wilt, FW: Fusarium wilt, VW: Verticillium wilt, PRR: Phytophthora root rot, AN: Anthracnose, SAA: spotted alfalfa aphid, PA: pea aphid, SN: stem nematode, AP: Aphanomyces, RKN: root knot nematode (Northern).

†Pest Resistance Rating: >50 percent = HR (high resistance), 31-50 percent = R (resistant), 15-30 percent = MR (moderate resistance), 6-14 percent = LR (low resistance).

‡Fall Dormancy: 1 = Norseman, 2 = Vernal, 3 = Ranger, 4 = Saranac, 5 = DuPuits, 6 = Lahontan, 7 = Mesilla, 8 = Moapa 69, 9 = CUF 101.