

## **FOURTH-YEAR RESULTS OF THE 2006-2011 FURROW-IRRIGATED ALFALFA FORAGE VARIETY TRIAL**

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### **Introduction**

The purpose of this trial is to compare the productivity and hay quality of alfalfa varieties in the Treasure Valley area of Malheur County. The trial also provides information about the adaptation of alfalfa varieties to furrow irrigation for hay production. In this five-year trial, seven proprietary varieties and one seed treatment are being compared to two public check varieties.

### **Methods**

The trial was established on Owyhee silt loam where winter wheat was the previous crop and alfalfa had not been grown for more than 10 years. Details of crop establishment are available at <http://www.cropinfo.net/AnnualReports/2006/06AlfAnnReport.html>. Seed of each proprietary entry was supplied by the company, and certified seed of the two public check varieties was obtained locally. The entry 'FC2055' was the same variety as 'FC1055' except FC2055 included a proprietary seed treatment. This trial was established and grown with furrow irrigation from gated pipe, with furrows spaced 30 inches apart.

In 2009, the first cutting was taken on May 27. A 32-inch by 20-ft swath was cut from the center of each plot with a flail mower, and the alfalfa was weighed. The alfalfa was harvested three more times, on July 9, August 12 and October 1. Ten samples of alfalfa were cut by hand from the edges of plots over the entire field at random on the same day just before each harvest. The samples were quickly weighed wet, then dried at 140°F for 48 hours, and reweighed to determine the average alfalfa moisture content at each cutting. Yield was reported as tons per acre of alfalfa hay at 88 percent dry matter.

Samples of alfalfa to measure forage quality were taken mid-morning before the third cutting from approximately 1 ft of row per plot. The forage quality samples were dried at 140°F for 48 hours, ground in a Wiley mill (Thomas Scientific, Swedesboro, NJ) to pass through a 1-mm screen, and sent to the Oregon State University Forage Quality Lab at Klamath Falls, Oregon, where they were reground in a UDY mill (UDY Corp., Ft. Collins, CO) to pass through a 0.5-mm screen. Near infrared spectroscopy (NIRS) was used to

estimate percent dry matter, percent crude protein, percent acid detergent fiber (ADF), percent neutral detergent fiber (NDF), percent fat, and percent ash.

Relationships for estimated ruminant dry matter intake (DMI) for alfalfa hay, total digestible nutrients (TDNL) for alfalfa hay, and relative forage quality (RFQ) were calculated using empirical formulas.

Ruminant DMI was estimated by the equation

$$\text{DMI} = \left( \left( \left( 0.120 * 1350 \right) / \left( \text{NDF} / 100 \right) \right) + \left( \text{NDFD} - 45 \right) * 0.374 \right) / 1350 * 100,$$
where NDFD = dNDF48 / NDF \* 100 and dNDF48 is the Digestible NDF as a percentage of dry matter, as determined by a 48-hour in vitro digestion test.

The TDNL for alfalfa hay was estimated by the equation

$$\text{TDNL} = (\text{NFC} * 0.98) + (\text{Protein} * 0.93) + (\text{Fat} * 0.97 * 2.25) + ((\text{NDF} - 2) * (\text{NDFD} / 100))$$
where NFC = 100 - ((NDF - 2) + Protein + 2.5 + Ash).

Relative forage quality was calculated by the formula:

$$\text{RFQ} = (\text{DMI} * \text{TDNL}) / 1.23$$

where 1.23 is used as the denominator to adjust the scale to match the RFV scale at 100 = full bloom alfalfa.

Quality standards for alfalfa hay based on RFQ are: Supreme, RFQ higher than 185; Premium, RFQ 170-184; Good, RFQ 150-169; Fair, RFQ 130-149, and Low, RFQ below 129. Relative forage quality is an estimate of voluntary energy intake when alfalfa hay is the only source of energy and protein for ruminants. The higher the RFQ, the less grain or feed concentrate supplements are required to formulate dairy rations.

## Results and Discussion

Most of the varieties were in the late bud to early bloom stage when the first cutting was taken. The second cutting was taken July 9 at mid-bud stage. Third cutting was on August 12, at late bud stage, and the forage quality samples were taken at this time. Fourth cutting was on October 1 at early bloom stage.

The average fourth-year total hay yield was 8.10 ton/acre. The first cutting average yield was 1.8 ton/ac. In the second cutting the average yield was 3.02 ton/ac. In the third cutting, the average yield was 1.69 ton/ac. In the fourth cutting the average yield was 1.65 ton/ac.

Crude protein averaged 23.5 percent in the third cutting, and ranged from 24.2 percent for 'DKA-42-15' to 22.2 percent for 'Lahontan' (Table 1). Acid detergent fiber averaged 32.1 percent and ranged from 33.2 percent for Lahontan to 30.4 percent for DKA-42-15. Neutral detergent fiber averaged 36.7 percent and ranged from 38.2 percent for 'FC 1045' to 34.8 percent for 'WL 319 HQ'. Relative forage quality averaged 191, in the "Supreme" quality category, and ranged from RFQ = 203, ("Supreme") for DKA-42-15 to

RFQ=178, (“Good”) for Lahontan. After 4 years, 'FC 2055', 'Masterpiece', and 'Rustler II' were among those with the highest yields (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 alfalfa varieties have some resistance to the diseases and pests that could limit hay production. Growers should choose varieties with strong resistance ratings for disease or pest problems known to be present in their fields. The yield potential of a variety should be evaluated based on performance in replicated trials at multiple sites over multiple years.

Table 1. Alfalfa variety hay yield and third-cutting crude protein, ADF, NDF, and RFQ for 2009. Oregon State University, Malheur Experiment Station, Ontario, OR.

Variety	Cutting date				2009 total	Crude protein	ADF <sup>a</sup>	NDF <sup>b</sup>	RFQ <sup>c</sup>
	5/27	7/09	8/12	10/01					
	-----ton/acre <sup>d</sup> -----				-----% of DW <sup>e</sup> -----				
FC 2055	1.89	3.25	1.81	1.81	8.76	23.6	32.8	37.2	187.4
Masterpiece	1.87	3.25	1.69	1.84	8.65	23.8	31.6	36.2	196.8
Rustler II	1.87	3.14	1.84	1.73	8.58	23.6	32.2	36.4	192.2
FC 1055	1.82	2.95	1.8	1.81	8.38	23.2	32.8	37.2	189.6
Lahontan	1.72	3.05	1.64	1.61	8.02	22.2	33.2	38	177.8
DKA-42-15	1.9	2.56	1.79	1.73	7.98	24.2	30.4	35	202.6
FC 1045	1.78	3.04	1.57	1.57	7.96	23.4	33	38.2	182.2
WL 357 HQ	1.84	2.85	1.65	1.48	7.82	23.4	32.4	37.4	185
WL 319 HQ	1.65	3.03	1.57	1.42	7.67	24	30.8	34.8	202
Wrangler	1.66	2.58	1.42	1.5	7.16	23.6	32.2	36.4	194.8
Mean	1.80	3.02	1.69	1.65	8.10	23.5	32.1	36.7	191.0
LSD (0.05)	0.24	0.14	0.11	0.13	0.36	NS <sup>f</sup>	1.44	1.64	13.39

<sup>a</sup>ADF: acid detergent fiber. <sup>b</sup>NDF: neutral detergent fiber. <sup>c</sup>RFQ: relative forage quality.

<sup>d</sup>Yield at 88 percent dry matter. <sup>e</sup>DW: dry weight. <sup>f</sup>NS: Not Significant at the alpha = 0.05 level.

Table 2. Alfalfa variety hay yield in each of the first 4 years, and cumulative total yield in the 2006-2011 furrow irrigated forage variety trial. Oregon State University, Malheur Experiment Station, Ontario, OR, 2009.

Variety	2006 total	2007 total	2008 total	2009 total	Cumulative total
	----- ton/acre <sup>a</sup> -----				
FC 2055	6.9	7.9	6.7	8.76	30.26
Masterpiece	7	8	6.54	8.65	30.19
Rustler II	7.1	7.6	6.53	8.58	29.81
DKA-42-15	7.1	7.8	6.61	7.98	29.49
WL 357 HQ	6.9	8.3	6.41	7.82	29.43
FC 1055	6.7	7.6	6.45	8.38	29.13
WL 319 HQ	7	8	6.3	7.67	28.97
FC 1045	6.9	7.6	6.26	7.96	28.72
Lahontan	6.8	7.1	6.13	8.02	28.05
Wrangler	6.5	7.3	6.27	7.16	27.23
Mean	6.9	7.7	6.42	8.10	29.13
LSD (0.05)	NS <sup>b</sup>	0.36	NS	0.36	0.60

<sup>a</sup>Yield at 88 percent dry matter. <sup>b</sup>NS: Not significant at the alpha = 0.05 level.

Table 3. Variety source, year of release, fall dormancy, and level of resistance to pests and diseases for alfalfa varieties in the 2006-2011 furrow-irrigated forage variety trial. Oregon State University, Malheur Experiment Station, Ontario, OR, 2009.

Variety	Source	Release year	FD <sup>a</sup>	Pest resistance rating <sup>b</sup>									
				BW	FW	VW	PRR	AN	SAA	PA	SN	AP	RKN
Lahontan	public	1954	6 <sup>c</sup>	MR	LR	-	LR	-	MR	LR	R	-	-
Wrangler	public	1984	2	MR	R	LR	HR	LR	HR	HR	LR	LR	LR
Rustler II	Andrews Seed	1995	4	HR	HR	HR	HR	HR	R	HR	MR	R	-
Masterpiece	Simplot	2000	4	HR	HR	R	HR	HR	R	-	HR	R	R
DKA-42-15	Monsanto	2001	4	HR	HR	HR	HR	HR	R	HR	R	HR	-
WL 319 HQ	W-L Research	2002	3	HR	HR	HR	HR	HR	R	HR	MR	HR	LR
WL 357 HQ	W-L Research	2003	5	HR	HR	HR	HR	HR	R	R	MR	HR	LR
FC 1045	Andrews Seed	2005	4	HR	HR	HR	HR	HR	MR	R	R	R	MR
FC 1055	Andrews Seed	2006	5	HR	HR	HR	HR	R	R	R	HR	R	HR
FC 2055	Andrews Seed	2006	5	HR	HR	HR	HR	R	R	R	HR	R	HR

<sup>a</sup>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: Northern root knot nematode.

<sup>b</sup>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.