Evaluation of Roundup Ready Alfalfa for Adaptability to Wyoming Conditions

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Introduction

Alfalfa (*Medicago sativa* L.) is the world's premier forage crop and the third most valuable (over $ 9.3 billion) crop in the United States. In Wyoming and surrounding states, it is the mainstay for livestock production systems which is commonly fed to dairy and beef cattle, sheep, and horses. Over the past few decades, alfalfa has been the focus of scientific research and as a result, several advances have been made to improve its genetics to develop adapted and resistant cultivars for optimum forage production. Weeds in alfalfa production systems have a negative impact of alfalfa's productivity and thus, employing an effective weed management system is necessary for an efficient and productive forage system. Glyphosate-resistant (Roundup Ready) technology has successfully been incorporated into alfalfa and they have been released in the market. Using Roundup Ready (RR) alfalfa could potentially improve the level of weed management through the elimination of crop injuries and reduction of costs while increasing forage yield, nutritive value and other corresponding benefits.

Objective

To evaluate forage yield, nutritive value, and adaptability of RR alfalfa cultivars under irrigated conditions in Wyoming.

Materials and Methods

The experiment was established at the University of Wyoming James C. Hageman Sustainable Research and Extension center (SAREC) in 2013. Treatments included 25 RR alfalfa cultivars. Each cultivar was replicated four times in a randomized complete block design. Seeds of each cultivar were planted at a seeding rate of 20 pounds pure live seed per acre. Glyphosate was uniformly applied to all plots at 3 trifoliate seedling stage to control weeds during the establishment stage. Three cuts at 30 to 45 days interval (depending on plant growth) were made in each year. Forage samples were oven dried at 140°F for 72 hours to determine forage yield on dry matter basis. Nutritive value was determined using Near Infrared Reflectance Spectroscopy.

Results and Discussion

Cultivars did not vary for forage yields. However, numerically, forage yield was higher (14.8 tons per acre) for R59Hg217, and lower (11.5 tons per acre) for WL372HQ.RR when forage yields from 2015 to 2018 were summed (Table 1). Weed free RR alfalfa plots were achieved from early application of glyphosate. The cultivars have similar ability to maintain higher or comparable forage yields whiles improving weed control in alfalfa production systems. Annual forage yield was higher in 2016 (3.7 tons per acre) and 2017 (4.4 tons per acre) than in 2015 (1.9 tons per acre) and 2018 (2.9 tons per acre) (Table 1). This could be attributed to the effect of abiotic stress on the plants due to variations in soil moisture, and temperature which is likely to have interrupted plant

growth at certain stage of development in a particular year. Nutritive value was similar among the cultivars. In general, forage nutritive value was high in all cultivars (e.g., average crude protein 28%; relative feed value 223). Overall, results from the study suggest that RR alfalfa cultivars are adaptable to conditions of Wyoming with potential of high yield and quality.

Table 1. Forage dry matter yield and nutritive value of roundup ready alfalfa cultivars at SAREC from 2015 to 2018

	Forage yield					Forage nutritive value †					
Cultivar	2015	2016	2017	2018	Total	CP	ADF	NDF	IVDMD	TDN	RFV
	Tons per acre					%					
6497R	1.9	4.1	4.2	2.9	13.1	27.5	25.5	42.3	79.2	74.0	218
6516R	1.9	3.8	4.6	3.1	13.3	27.5	25.6	42.9	79.3	73.8	216
6547R	1.9	3.4	4.1	2.7	12.1	27.9	24.8	42.7	80.4	74.7	228
Ameristand 415NT RR	1.9	3.8	4.1	2.4	12.3	27.5	25.2	42.3	80.0	74.2	223
Ameristand 433T RR	1.9	3.2	4.3	2.7	12.1	28.3	24.7	43.1	79.5	74.8	229
Ameristand 455TQ RR	1.8	3.4	4.6	2.8	12.6	27.6	25.2	45.9	76.1	74.3	222
Consistency 4.10RR	2.1	3.4	4.1	2.9	12.5	28.1	24.7	42.7	80.0	74.8	229
Denali 4.10RR	1.9	3.6	4.0	2.8	12.3	28.4	24.6	43.2	79.7	75.0	230
DKA46-16 RR	1.9	3.8	4.2	2.7	12.6	27.5	25.3	42.7	79.1	74.1	219
Integra 8444 RR	1.8	3.2	4.3	2.7	11.9	28.0	24.8	43.5	79.7	74.8	226
Mutiny	1.9	2.7	4.2	2.7	11.5	28.5	24.5	43.3	80.1	75.1	231
R312W244	1.7	3.3	4.6	2.9	12.5	27.5	25.7	42.8	79.1	73.7	218
R49W215	1.8	3.6	3.8	2.7	11.9	27.6	25.6	42.6	79.2	73.9	224
R570K217	2.0	3.4	4.5	2.8	12.7	27.5	25.5	42.4	79.1	73.9	221
R58W235	1.9	3.9	4.2	2.9	12.9	27.2	25.7	42.8	79.5	73.7	217
R59Hg217	2.0	4.6	4.6	3.5	14.8	27.2	25.9	42.6	79.1	73.5	212
RR Apha Tron	2.0	3.9	5.1	3.3	14.3	27.3	25.9	43.3	79.3	73.5	216
RR Nema Star	1.9	4.4	4.6	3.0	13.8	27.8	25.1	43.3	79.6	74.4	223
RR Presteez	1.8	3.1	5.0	3.0	12.9	28.1	24.6	43.3	79.5	74.9	225
RR Stratica	2.1	3.8	4.4	2.9	13.2	28.0	25.0	43.1	79.8	74.5	223
RR Tunnica	2.0	4.2	5.0	3.1	14.4	28.0	25.0	43.5	80.1	74.5	226
WL 355RR	1.9	3.9	4.7	3.1	13.6	28.3	24.9	44.3	80.4	74.6	225
WL 367RR/HQ	2.0	4.1	4.4	3.2	13.7	28.5	24.5	44.0	80.2	75.0	231
WL 372HQ.RR	1.8	3.1	3.9	2.7	11.5	27.9	25.4	42.6	78.8	74.1	223
WL 356HQ.RR	1.9	3.5	4.3	2.5	12.2	27.4	25.7	42.0	79.4	73.8	218
Average	**1.9**	**3.7**	**4.4**	**2.9**	**12.8**	**27.8**	**25.2**	**43.1**	**79.4**	**74.3**	**223**
LSD (0.05)	0.3	1.0	0.8	0.7	10.4	16	14	43	21	36	19

†Values are averaged over all three harvest periods in 2018 only.

CP, crude protein; ADF, acid detergent fiber; NDF, neutral detergent fiber; IVDMD, in vitro dry matter digestibility; TDN, total digestible nutrient; RFV, relative feed value.

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