

Economic and Efficacy Evaluation of Roundup Ready® and Conventional Alfalfa at Scottsbluff, Nebraska during the 2007 Growing Season.

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A field study was initiated near Scottsbluff, Nebraska to compare the effectiveness of various herbicides applied postemergence for selective weed control in Roundup Ready and conventional alfalfa. The experimental design was a randomized complete block with four replications. Plots were 11 feet wide by 50 feet long and were located on a sandy loam soil with a pH of 8.0 and organic matter content of 1.3%. The plot area was rototilled and packed in late March and alfalfa was seeded at a rate of 8 lbs of seed/acre on March 30, 2007. Roundup Ready alfalfa, 'RR04BD-2411', was seeded in plots treated with Roundup and a similar conventional alfalfa variety, 'Rebound 4.2', was seeded in plots treated with non-Roundup herbicide treatments. Herbicides were applied postemergence either on May 15, May 21, May 31, June 11, or June 18 (Table 1). On May 15, alfalfa was in the unifoliate growth stage and common lambsquarters and hairy nightshade heights were 0.75 and 1.25 inch, respectively. Herbicides were applied with a tractor-mounted sprayer calibrated to deliver 20 gallons of water per acre at 32-psi pressure with Spraying Systems 11002 VS nozzles. Environmental conditions and weed growth stages at each of the herbicide application timings are given in Table 1.

Visual alfalfa injury from herbicides was evaluated on June 3 and June 11 (Table 2). Roundup WeatherMax did not cause injury to Roundup Ready alfalfa. Raptor and Pursuit applied to conventional alfalfa when the crop was in the second trifoliate growth stage caused 14 and 9% early season alfalfa injury respectively. The addition of 2,4-DB to Raptor increased alfalfa injury over that observed with Raptor alone. Roundup Ready and conventional alfalfa density was not affected by herbicide treatments. First cutting forage was composed of alfalfa and weeds and forage yield was greatest in nontreated plots in both Roundup Ready and conventional alfalfa because of the abundance of weeds. Weed density averaged 42, 23, 7, 3, 3, and 2 plants per sq yd for common lambsquarters, hairy nightshade, redroot pigweed, stinkgrass, green foxtail, and yellow foxtail respectively. Common lambsquarters was the

dominant weed competing with alfalfa.

Non Roundup treatments providing the greatest control of common lambsquarters and 87% or greater average weed control were Raptor plus Buctril, Raptor plus 2,4-DB, and Pursuit plus Buctril. Total forage yields in these plots ranged from 3.8 to 4.2 tons/acre at 12% moisture with RFV's that ranged from 192 to 206. Pursuit alone only controlled 37% of the common lambsquarters and therefore total forage yield increased to 5.6 tons/acre due to the inclusion of lambsquarters while RFV dropped to 175. In order to suppress common lambsquarters, it was necessary to combine Raptor with Buctril or 2,4-DB and Pursuit with Buctril. The combination of Raptor plus 2,4-DB did however cause more early season alfalfa injury than Raptor plus Buctril which was reflected in reduced first cutting forage yield.

Roundup UltraMax II applied at the unifoliate growth stage of alfalfa when common lambsquarters was approximately 0.7 inch tall or twice, once at the unifoliate and again 3 weeks later provided excellent lambsquarters control (Table 2). Increasing the Roundup UltraMax II rate to 1.12 lb/acre and applying two applications, one when alfalfa was at the 2 trifoliate growth stage and again 3 weeks later also provided excellent weed control. Two applications of Roundup WeatherMax II at 0.75 lb/acre starting at the unifoliate stage or at 1.12 lb/acre starting at the 2 trifoliate alfalfa growth stage provided total forage yields of 4.3 to 4.4 tons/acre with RFV's of 188 to 206. Waiting until alfalfa was in the 4 trifoliate growth stage resulted in good weed control but there was a trend for forage yields to decline.

Alfalfa with a RFV of 185 or greater (Supreme) was selling for \$140/ton, a RFV of 170 to 185 (Premium) for \$125/ton, and an RFV of 150 to 170 (Good) for \$112/ton in southeastern Wyoming during the fall of 2007. The value of three cuttings of forage harvested from the untreated conventional alfalfa was \$728/acre. Three cuttings of forage harvested from areas treated with Pursuit plus Buctril was valued at \$588/acre. The cost of the Pursuit plus Buctril treatment was approximately \$31/acre. Three cuttings of forage harvested from Roundup Ready alfalfa treated with Roundup WeatherMax at 1.12 lb/acre at the 2 trifoliate growth stage and again in 3 wk was valued at \$616/acre. The cost of the Roundup herbicide program was estimated at \$40/acre plus the additional cost for the Roundup Ready alfalfa seed was \$20/acre (\$2.40 per pound additional

cost for Roundup Ready seed at an 8 pound per acre seeding rate equals approximately \$20/acre) for a total cost of \$60/acre.

The value of forage from the nontreated area was \$728/acre, from the Pursuit plus Buctril treated area was \$557 (\$588 - \$31 = \$557), and from the Roundup treated area was \$556 (\$616 - \$40 - \$20 = \$556). The results from the 2007 growing season suggest the conventional and Roundup Ready weed control systems provided a similar economic return. However, the greatest economic return was obtained when no weed control program was utilized.

Table 1. Environmental Conditions at the Time of Herbicide Application.

Date	Air temperature (F)	Humidity (%)	Wind speed & direction (mph)	Time of day	Crop growth stage	Weed heights ^a (inches)					
						Kocz	Colq	Rrpw	Stgr	Grft	Yeft
May 15	54	53	7 NW	10:00 am	unifoliate	0.75	1.25	1	—	1	1
May 21	77	30	4 SE	11:00 am	2 trifoliate	1.75	1.5	1.5	—	1.5	1
May 31	49	82	0	8:30 am	4 trifoliate	2	2	2	—	2	2
June 11	76	50	6 E	8:30 am	8 trifoliate	6	5	5.5	1	5	5
June 18	60	51	5 NW	9:00 am	12 inches	8	6	6.5	2	6	6

^a A dash (—) indicates no weed growth.

Rainfall before and following herbicide application:

Date	Amount - (inches) -	Date	Amount - (inches) -	Date	Amount - (inches) -
April 2	0.23	May 5	0.29	June 7	0.08
April 5	0.14	May 8	0.50	June 12	0.83
April 23	0.10	May 18	0.50	June 15	0.75
April 24	0.30	May 21	0.23	June 25	0.85
May 1	0.75	May 29	0.23		
May 3	0.26	June 5	0.75		

Table 2. Economic and Efficacy Evaluation of Roundup-Resistant and Conventional Alfalfa.

Alfalfa variety	Herbicide treatment ¹	Rate	Crop growth stage	Alfalfa										Percent weed control 6/11 ³							
				Visual injury ²		Stand 6/6	Forage yield at 12% moisture														
				6/3	6/11		Cut 1 7/9	RFV	Cut 2 7/30	RFV	Cut 3 9/7	RFV	Total	RFV Avg.	Colq	Hans	Rrpw	Stgr	Grft	AVG	
(lb/acre)	-- (%) --	(plants/sq yd)	(tons/A)	(tons/A)	(tons/A)	(tons/A)	(tons/A)	(tons/A)	(tons/A)	(tons/A)	(tons/A)	(tons/A)	(tons/A)	----- (%) -----							
R 0 4 B D - 2 4 1 1	Untreated	—	—	0	0	64	2.6	198	2.3	178	1.6	171	6.5	182	0	0	0	0	0	0	
	Roundup WeatherMax II + AMS	0.75	Unifoliate	0	0	71	1.3	217	1.5	180	1.2	214	4.1	203	96	91	99	74	83	89	
	Roundup WeatherMax II + AMS	0.75	Unifoliate																		
	Roundup WeatherMax II + AMS	0.75	3 wks later	0	0	66	1.1	206	1.6	188	1.5	171	4.3	188	99	87	74	99	74	94	
	Roundup WeatherMax II + AMS	1.12	2 trifoliate	0	0	65	1.3	217	1.7	203	1.4	182	4.5	200	61	67	92	74	74	74	
	Roundup WeatherMax II + AMS	1.12	2 trifoliate																		
	Roundup WeatherMax II + AMS	1.12	3 wks later	0	0	71	1.3	206	1.6	214	1.4	199	4.4	206	93	96	99	99	99	97	
	Roundup WeatherMax II + AMS	1.5	4 trifoliate	0	0	58	1.0	231	1.5	193	1.4	184	3.9	202	90	97	99	91	99	95	
Roundup WeatherMax II + AMS	1.5	4 trifoliate																			
Roundup WeatherMax II + AMS	1.5	3 wks later	0	0	63	0.7	218	1.6	214	1.3	197	3.7	209	91	79	89	74	99	86		
R e b o u n d 4.2	Untreated	—	—	0	0	50	3.0	182	1.5	179	2.0	137	6.5	165	0	0	0	0	0	0	
	Raptor + X77 + UAN	0.032	2 trifoliate	14	10	55	0.9	235	1.8	186	1.8	151	4.5	190	37	95	99	25	99	71	
	Raptor + Buctril + X77 + UAN	0.032 + 0.25	2 trifoliate	11	7	56	1.0	215	1.6	177	1.4	186	4.0	192	99	99	99	50	99	89	
	Raptor + 2,4-DB + X77 + UAN	0.032 + 0.5	2 trifoliate	25	18	58	0.8	252	1.6	194	1.4	174	3.8	206	91	98	99	50	99	87	
	Pursuit + X77 + UAN	0.047	2 trifoliate	9	11	47	1.4	194	2.2	176	2.0	155	5.6	175	37	85	92	41	99	71	
	Pursuit +Buctril + X77 + UAN	0.047 + 0.25	2 trifoliate	10	6	54	1.0	232	1.6	183	1.5	172	4.2	195	99	99	99	41	99	87	
	Pursuit + 2,4-DB + X77 + UAN	0.047 + 0.5	2 trifoliate	11	10	53	1.0	225	1.6	200	1.5	170	4.1	198	59	89	96	41	99	77	
LSD at 0.05	—	—	3	8	14	0.3	48	0.8	39	0.4	43	1.2	25	39	25	21	60	29	25		

¹ Spray additives were added to herbicides at the following concentrations: ammonium sulfate (AMS) at 17 lb/100 gal, surfactant (X77) at 0.25%, and liquid nitrogen (UAN) at 1% per volume of carrier.
² Visual alfalfa injury was evaluated on a scale from 0 to 100 with 0 equal to no injury and 100 equal to death of the plant.
³ Weed control was determined by taking weed counts in the center of each plot and then comparing weed counts in herbicide treated areas to plots that were not treated. Weed abbreviations: common lambsquarters (Colq), hairy nightshade (Hans), redroot pigweed (Rrpw), stinkgrass (Stgr), and green foxtail (Grft).