2,4-DB ESTER ALTERNATIVES, SETBACK, AND DESICCATION HERBICIDES FOR ALFALFA SEED PRODUCTION

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Introduction

Weed control during alfalfa establishment is critical for the production of weed-free alfalfa seed. Losses due to weeds include both reduced yields from competition and contamination by weed seeds. The recent loss of 2,4-DB ester has limited the herbicide options available for alfalfa seed producers. Additionally, high temperatures during establishment can further restrict the herbicides that can be used without injury to the alfalfa crop. New herbicides offer potential to provide effective weed control during alfalfa establishment with minimal injury to the crop.

In addition to being used for weed control, contact herbicides like paraquat sometimes are used to delay early season plant development by burning back alfalfa plants. We term herbicides used for this purpose as "setback" herbicides. Growers intensively delay early plant development so that flowering coincides with warm weather that is conducive for alfalfa leafcutting bees to pollinate the crop. Setback herbicides are applied instead of cultivation. Reducing cultivation to delay plant development may reduce the occurrence of diseases introduced into injured alfalfa crowns and may also help to minimize stand reduction that occurs during mechanical setback. With the introduction of several new contact herbicides, it is likely that some of these herbicides may be useful for delaying crop development to synchronize the onset of bloom with the optimum time of alfalfa leafcutting bee emergence and pollination activity. The use of setback herbicide products also may provide some incidental weed control.

Methods

General Procedures

Weed control, setback, and desiccation trials were conducted on cooperators' fields, where other alfalfa seed management practices were carried out by the cooperating growers. Herbicide treatments were applied with a CO_2-pressurized backpack sprayer. Plots were 10 ft wide and 25 or 30 ft long. Alfalfa seed yields were obtained by harvesting the center 4.25 ft of each plot with a small plot combine. Data were analyzed using ANOVA, and treatment means were separated using a protected least significant difference at the 5 percent level, LSD (0.05).

Postemergence Tough Combinations

Alfalfa was planted March 14 in a Nyssa silt loam soil with a pH of 8.1 and 1.3 percent organic matter in Ridgeview, OR. Tough, 2,4-DB, and Buctril were applied alone and in combination with each other and with Basagran. Tough was applied with and without the addition of crop oil concentrate (COC). All combinations also contained COC. Non-ionic surfactant (NIS) was added to 2,4-DB amine to determine if it would increase 2,4-DB amine activity to the level of 2,4-DB ester. Herbicide treatments were applied May 1. Air temperature at the time of application was near 90°F. Treatments were arranged in a randomized complete block design with three replications. The predominant weed species present at this site were common lambsquarters, hairy nightshade, Russian thistle, and kochia. The trial was not harvested because of an uncontrolled dodder infestation.

Raptor Rates and Additives

This study was conducted at the same location as the previous study. Postemergence treatments were applied on May 1. Raptor was applied at 0.032, 0.040, and 0.048 lb ai/acre with either NIS or methylated seed oil (MSO). NIS was applied at 0.25 percent v/v and MSO was applied at 1 percent v/v. Pursuit (0.063 lb ai/acre) with NIS and Raptor (0.04 lb ai/acre) plus Buctril (0.25 lb ai/acre) and NIS were also evaluated. All treatments contained 32 percent N at 1 percent v/v. Treatments were replicated three times. This trial also was not harvested.

Alfalfa Setback

A trial was established to evaluate herbicides for potential as setback agents and to determine alfalfa seed yields with different setback techniques. The trial was located on an established alfalfa seed field in Ontario, OR. Alfalfa maturity was delayed by mowing, cultivation, and applications of paraquat, Liberty, and Blazer herbicides on April 25. Treatments were arranged in a randomized complete block design with four replications. Evaluations included alfalfa setback, height, flowering, and seed yield. The trial was harvested on September 7.

Preharvest Desiccation with F-8426

This experiment evaluated F-8426 (Aim) for potential use in preharvest alfalfa seed desiccation. The trial was run in an established alfalfa seed field growing on a Powder silt loam soil near Ontario, OR. F-8426 was applied at 0.025, 0.0375, and 0.05 lb ai/acre with NIS (0.25 percent v/v) or Silwet (8.0 oz/acre). F-8426 was also evaluated with Phase (8.0 oz/acre). F-8426 treatments were compared to Paraquat (0.47 lb ai/acre) plus NIS. Treatments were applied August 22. Desiccation was evaluated visually and by determining moisture content at 3 and 7 days after treatment. Moisture content was determined by harvesting a 1 ft^2 sample from each plot and measuring the fresh and dry weight of the sample. Unfortunately, samples were collected in the morning before the alfalfa plants had completely dried out. Desiccated plant material retained more moisture during the night resulting in small differences in moisture content among treatments even though visual ratings were drastically different.

Results

Postemergence Tough Combinations

Combinations of Basagran with Tough, 2,4-DB, or Buctril and the combination of Buctril plus Tough caused among the greatest and most persistent alfalfa injury (Table 1). The addition of COC to Tough did not significantly increase injury compared to Tough alone. While weed populations were too variable to conclude that weed control with Tough improved with the addition of the COC, the trend for increased control encourages further testing. Tough plus COC was very effective in controlling Russian thistle and moderately effective on common lambsquarters and hairy nightshade. Tough plus COC was moderately effective in controlling kochia but provided significantly greater kochia control than 2,4-DB ester and 2,4-DB amine applied alone. Combinations of Tough with Basagran or Buctril provided greater than 90 percent control of hairy nightshade, Russian thistle, and kochia, but were highly injurious.

Raptor Rates and Additives

Using MSO instead of NIS with Raptor generally improved control of hairy nightshade and Russian thistle (Table 2). At the low rate of Raptor (0.032 lb ai/acre), MSO also improved common lambsquarter control compared to the NIS. The use of MSO also increased alfalfa injury from Raptor, in most cases, compared to the same treatment applied with NIS. Lower rates of Raptor with MSO may provide acceptable weed control while reducing herbicide costs.

Alfalfa Setback

In the "setback" trial, all the herbicides examined delayed alfalfa maturity on May 3 (Table 3). Mowing provided among the greatest setback and Blazer among the least. On May 25, only mowing, cultivation, and Blazer had significant setback compared to the untreated plots. Paraquat and Liberty did not reduce alfalfa height on May 3 and alfalfa heights were not different among any treatments on May 25. On May 25 the untreated plots had slightly higher percentage of plants flowering, but this difference, like the others observed, was transient. Alfalfa seed yields were variable and yields were not different among treatments.

Preharvest Desiccation with F-8426

Alfalfa desiccation was greater with paraquat plus NIS than for carfentrazone at any rate or with either surfactant (Table 4). Paraquat was the only treatment that reduced plant moisture content seven days after treatment compared to the untreated control. If alfalfa would have been harvested in the afternoon after desiccated plants had dried out, differences between the carfentrazone and paraquat treatments would have been even greater. It does not appear that carfentrazone has potential for use in preharvest alfalfa seed desiccation.

Table 1. Alfalfa injury and weed control with postemergence herbicides, Malheur Experiment Station, Oregon State University, Ontario, OR, 2000.

		Alfalfa injury				Weed control†			
Treatment*	Rate	5-9-00	5-16-00	5-30-00	6-19-00	Common lambsquarters	Hairy nightshade	Russian thistle	Kochia
	lb ai/acre					%			
Buctril	0.25	0	3	3	0	60	83	45	47
2,4-DB ester	0.5	0	3	3	8	62	67	25	28
2,4-DB	0.5	0	0	10	10	60	58	22	15
Tough	0.94	0	7	0	0	65	65	67	57
Tough + COC	0.94 + 1.0	0	7	8	3	83	82	97	67
2,4-DB + Tough + COC	0.5 + 0.94	0	3	8	10	72	83	97	70
Basagran + Tough + COC	1.0 + 0.94	20	15	18	17	91	90	98	95
Basagran + 2,4-DB + COC	1.0 + 0.5	22	17	18	37	83	82	87	70
Basagran + Buctril + COC	1.0 + 0.25	12	17	22	22	91	92	85	80
Tough + Buctril + COC	0.94 + 0.25	18	27	27	37	84	92	95	94
2,4-DB + NIS	0.5 + 0.25 % v/v	0	3	15	18	57	53	38	8
Untreated		-	-	-	-	-	-	-	-
LSD (0.05)		8	12	14	15	34	24	31	32

*NIS was applied at 0.25 percent v/v and COC was applied at 1.0 qt/acre.
†Weed control ratings were taken on May 30.

Table 2. Alfalfa injury and weed control with Raptor rates and different adjuvants, Malheur Experiment Station, Oregon State University, Ontario, OR, 2000.

		Alfalfa injury				Weed control†			
Treatment*	Rate	5-9-00	5-16-00	5-30-00	6-19-00	Common lambsquarters	Hairy nightshade	Russian thistle	Kochia
	lb ai/acre					%			
Pursuit + NIS	0.063	7	13	8	7	53	57	37	82
Raptor + NIS	0.032	2	12	8	7	50	57	47	67
Raptor + NIS	0.04	0	10	2	5	38	65	55	70
Raptor + NIS	0.048	3	13	12	8	52	62	53	80
Raptor + MSO	0.032	10	17	13	15	78	78	73	73
Raptor + MSO	0.04	8	18	22	20	72	85	95	87
Raptor + MSO	0.048	7	15	17	12	77	82	87	83
Raptor + Buctril + NIS	0.04 + 0.25	3	18	7	7	90	88	73	73
Untreated		-	-	-	-	-	-	-	-
LSD (0.05)		9	NS	11	7	27	16	23	16

*32 percent nitrogen solution (1 percent v/v) was added to all treatments. NIS was applied at 0.25 percent v/v and MSO was applied at 1.0 percent v/v.

†Weed control ratings were taken on May 30.

Table 3. Alfalfa setback, height, flowering, and seed yield in response to mechanical and chemical setback treatments, Malheur Experiment Station, Oregon State University, Ontario, OR, 2000.

		Alfalfa setback		Alfalfa height		Alfalfa flowering		
Treatment*	Rate	5-3	5-25	5-3	5-25	5-25	7-7	Alfalfa seed yield†
	lb ai/acre	----------%----------		----------in----------		----------%----------		lb/acre
Mowing		55	15	6.6	15.1	5	100	542
Cultivation		46	19	7.9	14.3	11	100	587
Paraquat	0.47	43	10	10.3	14.6	11	100	549
Liberty	0.5	51	9	11.9	16.5	4	100	592
Blazer	0.38	35	13	9.4	14.8	8	100	508
No setback		0	0	12.3	16.4	18	100	540
LSD (0.05)		11	12	2.3	NS	4	NS	NS

*NIS (0.25 percent v/v) was added to treatments containing Paraquat or Blazer. AMS (3.0 lb/acre) was added to Liberty treatments.

†Alfalfa seed was harvested on September 7.

Table 4. Alfalfa desiccation and moisture content from herbicide treatments, Malheur Experiment Station, Oregon State University, Ontario, OR, 2000.

		Alfalfa desiccation		Moisture content†	
Treatment*	Rate	8-25	8-29	8-25	8-29
	lb ai/acre	----------%----------			
Carfentrazone + MSO	0.025 + 1 qt	30	19	60	62
Carfentrazone + Silwet	0.025 + 8 oz	24	14	57	60
Carfentrazone + MSO	0.0375 + 1 qt	41	20	55	58
Carfentrazone + Silwet	0.0375 + 8 oz	38	23	57	58
Carfentrazone + MSO	0.05 + 1 qt	38	25	55	58
Carfentrazone + Silwet	0.05 + 8 oz	34	20	59	58
Paraquat + NIS	0.47 + 0.25% v/v	83	80	53	54
Carfentrazone + Phase	0.025 + 8 oz	34	18	60	61
Untreated		--	--	60	60
LSD (0.05)		10	5	5	4

*Treatments were applied August 22.

†Moisture content was calculated by weighing alfalfa before and after drying. Samples were harvested in the morning before the dew was gone which reduced differences among treatments.