Evaluation Of Clopyralid For Weed Control In California Sugar Beet Fields

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Significant progress has been made in the control of unwanted competing vegetation in sugar beet production. With the use of preplant incorporated or preemergence applied herbicides, most beet growers are able to prevent the weeds from competing with the beets and eliminate the need for costly hand weeding. Growers are able also to use herbicides to selectively control weeds postemergence and maintain the field relatively free of competing vegetation throughout the growing season. The harvest of sugar beets can be accomplished more efficiently without the interference of grasses and broadleaved weeds.

With the intelligent use of herbicides and following good agronomic practices, coupled with one or two timely cultivations, many beet growers have been able to control all the unwanted vegetation without hand weeding. However, a shift is occurring in the weed population. More and more species of weeds are being observed in beet fields that are not readily controlled with the use of presently labeled herbicides in California. Weeds such as cocklebur (Xanthium canadense), common sunflower (Helianthus annuus), sweetclovers (Melilotus spp), burr clover (Medicago hispida), swamp smartweed (Polygonum coccineum), and velvetleaf (Abutilon theopasti), are becoming more numerous.

Clopyralid (Stinger®), an auxin-type herbicide that controls some of the above listed weeds, is labeled for use in other sugar beet-growing areas, but not in California. Two trials were conducted to investigate the effectiveness of clopyralid, applied alone and in combination with other herbicides, to control broadleaved weeds in sugar beets

Procedures

Herbicides were applied with a CO_2 constant pressure sprayer on sugar beet cultivar SS-NB3. In one trial the beets had one pair of true leaves at the time of treatment. In the second trial, the beets had two pair of true leaves. All treatments were replicated four times in a randomized block design. The herbicides were applied in 275 ml of water per 9.25 m^2 plots. The rates of herbicide applications are given in the tables that contain a summary of the evaluations. A paraffin-based adjuvant (Surfel®) was used, where indicated, at 2.34 liters per hectare.

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Weed control and sugar beet injury evaluations were made several times. Control ratings are expressed as a percentage of the untreated. Beet injury evaluations are based on a 0 to 10 scale where 0 equals no injury and 10 denotes severe injury or death. The trial was terminated June 14.

Results and Observations

Clopyralid (Stinger) provided more effective control of cocklebur and clovers than was obtained with phenmedipham-desmedipham (Betamix®), as shown in Table 1. However, more effective control of these and other broadleaved weeds was obtained when clopyralid was applied in combination with phenmedipham-desmedipham, or as sequential treatments as shown in Table 2:

Table 1 - Effect of Postemergence Applied Herbicides on Weed Control and Sugar Beet Injury

Soil Type: Merced clay
Variety: SS-NB3
Treated: 5/25

Planted: 5/11/90
Evaluated: 5/31/90

		Percent Control and Beet Injury, Average of 4 Replications					
Herbicide	kgai/ ha	Cocklebur	Clover	Smart Weed	Velvet Leaf	Overall Control	Beet Injury
clopyralid	0.28	55	66	30	0	57	2.2
clopyralid	0.56	57	76	13	10	62	2.7
phen-desm*	0.56	30	24	30	10	37	1.5
phen-desm clopyralid	0.56 0.14	80	85	73	30	81	3.0
phen-desm clopyralid	0.56 0.28	70	60	60	0	70	2.0
Untreated	---	0	0	0	0	0	0

*phen-desm = phenmedipham + desmedipham

Table 2 - The Effect of Postemergence Applied Herbicides on Weed Control and Sugar Beet Injury

Soil Type: Merced clay | Irrigation: Furrow | Treated: 5/25,5/31/90
Variety: SS-NB3 | Planted: 5/11/90 | Evaluated: 6/14/90

			Percent Control and Beet Injury, Average of 4 Replications					
Herbicide	kgai/ ha	When Applied	Cocklebur	Clover	Smart Weed	Velvet Leaf	Overall Control	Beet Injury
clopyralid	0.28	5/25						
phen-desm*	1.12	5/31	99	100	94	76	85	1.8
clopyralid	0.56	5/25						
phen-desm	1.34	5/31	100	100	98	85	93	3.0
phen-desm	0.56	5/25						
phen-desm	0.56	5/31	78	100	86	65	76	0
phen-desm	0.56	5/25						
clopyralid	0.14	5/25	99	100	91	89	92	0.3
phen-desm	0.56	5/31						
clopyralid	0.14	5/31						
phen-desm	0.56	5/25						
clopyralid	0.28	5/25	100	100	99	77	93	0.5
phen-desm	0.56	5/31						
clopyralid	0.28	5/31						
Untreated	---	---	0	0	0	0	0	0

*phen-desm = phenmedipham + desmedipham

Effective smartweed control was not obtained with either clopyralid or phenmedipham-desmedipham. However, when these herbicides were applied in combination or sequentially, good control was obtained.

Velvetleaf control was not consistent. With the combination of clopyralid plus phenmedipham-desmedipham, velvetleaf in the cotyledon stage of growth was controlled, but plants having true leaves survived. The most effective control of velvetleaf was obtained in the second trial in which a three-way combination of clopyralid, phenmedipham-desmedipham, and ethofumesate was applied, see Table 3.

Table 3 - Effect of Postemergence Applied Herbicides on Weed Control and Sugar Beet Injury

Soil Type: Merced clay
Variety: SS-NB3
Treated: 5/31/90
Planted: 5/11/90
Evaluated: 6/14/90

		Percent Control and Beet Injury, Average of 4 Replications					
Herbicide	kgai/ ha	Cocklebur	Clover	Smart Weed	Velvet Leaf	Overall Control	Beet Injury
clopyralid	0.07						
adjuvant	2.34	93	90	0	42	57	0
clopyralid	0.14						
adjuvant	2.34	92	97	0	78	78	0
clopyralid	0.28						
adjuvant	2.34	98	95	25	17	65	0
phen-desm	0.56						
clopyralid	0.07	91	100	75	33	60	0
phen-desm	0.56						
clopyralid	0.14	98	100	59	17	70	0.3
phen-desm	0.56						
clopyralid	0.28	100	100	68	0	77	0.3
phen-desm*	0.56						
ethofumesate	1.12	99	100	88	73	91	1.5
clopyralid	0.14						
phen-desm	0.56						
ethofumesate	2.24	99	100	89	90	96	1.0
clopyralid	0.14						
Untreated	---	0	0	0	0	0	0

*phen-desm = phenmedipham + desmedipham

Grass infestation was sparse in the trial area; only a few barnyardgrass (Echinochloa crusgali) plants were present. However, sethoxydim (Poast) was included in combination with clopyralid and phenmedipham-desmedipham to observe their selectivity on young beets. This is summarized in Table 4.

Table 4 - Effect of Postemergence Applied Herbicides on Weed Control and Sugar Beet Injury

Soil Type: Merced clay
Variety: SS-NB3
Treated: 5/25, 5/31/90

Planted: 5/11/90
Evaluated: 6/7, 6/14/90

			Percent Control and Beet Injury, Average of 4 Replications											
			Cocklebur		Clover		Smart Weed		Velvet Leaf		Overall Control		Beet Injury	
Herbicide	kgai/ ha	Date Applied	6/7	6/14	6/7	6/14	6/7	6/14	6/7	6/14	6/7	6/14	6/7	6/14
phen-desm*	0.56													
clopyralid	0.14	5/25	97	99	97	100	85	73	0	75	90	88	3.0	0.5
sethoxydim	0.28													
adjuvant	2.34													
phen-desm	0.84													
clopyralid	0.14	5/25	96	98	96	100	86	75	0	37	88	87	4.0	1.7
adjuvant	2.34													
sethoxydim	0.28	5/31												
Untreated	---	---	0	0	0	0	0	0	0	0	0	0	0	0

*phen-desm = phenmedipham + desmedipham

Sugar Beet Injury

In central California, temporary symptoms of phytotoxicity are always observed on sugar beets when treated with phenmedipham-desmedipham. The symptoms are generally short lived. The beets recover within two to three weeks and the early symptroms do not adversely affect beet yield or sucrose percentage.

Symptoms of phytotoxicity were observed on the leaves of beets in all plots treated with herbicides. The most pronounced symptoms were observed on beets treated with phenmedipham-desmedipham. As the rate per acre applied increased, the symptoms were more severe. The symptom expression was chlorotic and necrotic blotches on the leaf blades, the margin of the leaf was cupped upward, and the development of new leaves was delayed. Approximately two weeks following treatment, no symptoms were evident on the newly developed leaves.

Conclusion

The effectiveness of clopyralid in combination with phenmedipham-desmedipham to control weeds that are not controlled with presently labeled herbicides in California was clearly demonstrated. The control of velvetleaf, with the combination of clopyralid, phenmedipham-desmedipham, and ethofumesate, looks sufficiently promising to warrant further evaluation.

The registration of clopyralid in California would greatly benefit sugar beet growers. Its use in combination with other herbicides could significantly reduce the total amount of herbicides used in sugar beets, provide more effective weed control, reduce the need for hand weeding, and increase the profitability of sugar beet production.