

WEED CONTROL *in* *direct-seeded* *under semi-arid*

TABLE 1. SELECTIVITY OF PRE-EMERGENCE HERBICIDES TO SEEDLING ASPARAGUS

Chemical	Rate	*Initial stand % of control	Vigor	
			4/9/68	6/25/68
Alanap-3	4	67	3.8	7.0
	8	72	3.8	6.0
	12	62	2.5	5.5
Balan	1/2	87	5.5	8.8
	1	85	4.8	7.9
Bensulide	2	83	4.5	5.8
	6	94	4.2	7.5
	9	49	3.5	6.0
Brominal	12	54	4.5	6.5
	2/8	85	6.0	8.0
	3/8	62	4.2	6.8
CIPC	4/8	99	6.5	8.8
	2	59	2.5	5.5
	4	51	1.2	2.2
Diuron	6	24	3.2	2.2
	2	96	5.5	5.2
	4	116	5.8	4.8
Monuron	6	91	4.5	3.2
	2	67	6.0	7.5
	4	87	4.5	4.8
Tenoran	6	109	4.0	5.8
	2	107	5.0	6.8
	4	84	3.5	3.0
VCS-438	8	114	5.5	3.0
	1	85	5.0	7.0
	2	109	5.8	5.5
Vegiben	4	98	5.0	5.2
	2	94	6.2	8.5
	4	79	5.2	7.5
Check	8	80	6.2	7.5
			10.0	10.0

* No statistical differences at the 5% level.

† Vigor scores: 1 = all plants dead; 10 = control plants.

Chemical weed control is possible in direct seeded asparagus, according to these tests. However, a successful program may require a pre-emergent chemical that will give complete control for at least 4 to 6 weeks after crop emergence, and then a layby treatment for the rest of the season. Additional tests are needed before recommendations can be made. The University of California has no recommendations at present for herbicides in direct seeded asparagus planting. Federal registrations are available only for Vegiben and Paraquat when used pre-emergent to the asparagus.

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ABOUT 200 B.C., Cato described a method of growing asparagus which is similar to that in use today. This classic method of establishing commercial asparagus plantations with transplanted crowns is costly in time and labor. Direct seeding in the field to high density plant populations offers a quicker and less expensive potential for establishment of an asparagus plantation. Weed control is a serious obstacle to direct seeding of asparagus in the first season. The only chemicals registered for pre-emergence use on direct seeded asparagus are Vegiben, a product of relatively short life span in the soil (6-to-8 weeks) and Paraquat, a nonselective contact herbicide.

Since asparagus is grown in such widely diverse environments as the Salinas Valley, the Delta area, and the desert areas of Southern California, it is improbable that any one chemical would be adequate for the weed problems in all areas. These studies were initiated to find additional chemicals that would give selective weed control in direct seeded asparagus.

Experiments were conducted in 1967 on a Ramona sandy loam soil at Riverside and at the University of California Field Station at Moreno on a Greenfield soil in 1968 and 1969. In each experiment the soil was prepared and weed seed was broadcast over the entire area. A bed shaper was used to incorporate the weed seed. The asparagus was planted at 1-inch depth.

Pre-emerge to asparagus

Data taken included plant counts, plant weights and visual scoring for plant vigor. Data showing selectivity of various pre-emergence herbicides to seedling asparagus can be found in table 1. In these trials, chemicals which killed or severely damaged the asparagus include Monuron, Diuron, Simazine, Sinbar, Sin-

TABLE 2. TOXICITY OF PRE-EMERGENCE HERBICIDES TO WEED SEEDLINGS

Chemical	Rate	Trial 1		Trial 2		Trial 3		Trial 4		Trial 5	
		Broad-leaf	Grass	Broad-leaf	Grass	Broad-leaf	Grass	Broad-leaf	Grass	Broad-leaf	Grass
Alanap	lb/A	Percent reduction from control									
	4	86	86	100	100	100	100	63	51	100	78
	8	91	65	100	100	100	100	80	82	99	96
	12							86	87	100	84
Balan	16									100	67
	1.0							86	99		
	1.5	91	100	100	100	100	100				
	2.0	95	100	100	100	100	100	89	99		
Bensulide	4.0							58	100		
	3									90	68
	6							72	99	82	52
	9							99	99	100	64
Monuron	12							99	97	99	67
	2	100	88	100	100	100	100				
	4	100	100	100	100	100	100				
	Simazine	2	100	95	100	100	100	100			
Sinbar	4	100	98	100	100	100	100				
	2	84	86	100	100	100	100				
Sindone-B	4	100	100	100	100	100	100				
	1							37	71		
	2							55	88	53	13
	4							77	90	29	29
	6									87	42
	8									95	51
Treflan	1	86	100	100	100	100	100				
	2	94	100	100	100	100	100				
Vegiben	2							76	82	0	0
	3							82	53		
	4							97	92	85	54
	6									100	70
8									100	69	

ASPARAGUS

conditions

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done-B, Treflan, Tenoran, and CIPC. Vegiben was marginal on the basis of these studies. Emergence of asparagus seedlings with Vegiben showed little serious effect but the plant vigor scoring indicates that considerable stunting occurred. Emergence data for Alanap showed some reduction in stand and considerable stunting was encountered in part of the test. Balan was included in 12 tests, four of which significantly reduced (at the 5% level) crop emergence and three treatments which seriously reduced plant vigor, as shown by visual scoring. Bensulide was included in ten tests, one of which significantly reduced crop stand. Six tests were scored for vigor with five showing serious reductions compared with the controls. Brominal was tested in only one trial and the data indicate that further work is warranted since stand was not reduced and stunted plants recovered. VCS-438 caused some stunting in these trials but unpublished data from other workers indicating good results suggests further work might be profitable.

Pre-emergence to weeds

Data showing toxicity of various pre-emergence herbicides to weed seedlings can be found in table 2. All chemicals tested in these trials have, in other circumstances, exhibited selective weed control. Sindone-B gave little control in these trials with five of seven treatments showing less than 80% control of broadleaf weeds. Alanap controlled broadleaf weeds with only one treatment of 13 showing less than 80% and grass control at near 100% in all treatments tested. Monuron, Simazine, and Treflan gave good weed control with all treatments tested showing between 84% and 100% control. Pre-emergence weed control data were not obtained for Brominal, CIPC, Diuron, Tenoran, and VCS-438. Of the herbicides tested in these trials for pre-emergence

weed control in direct-seeded asparagus Balan, Bensulide, and Brominal appear to offer the most promising results.

Post-emerge to asparagus

Herbicides are necessary to protect the asparagus seedlings during emergence, and during the first growing season for a period of more than nine months. Protecting the plants from late season weeds becomes a problem when residual activity of the pre-emergence herbicide is limited. Herbicides suitable for post-emergence use on seedling asparagus were investigated at Riverside and Moreno in 1968 and 1969. The data for this trial included asparagus stand count and vigor scorings. No weed data were taken. Chemicals tested were Alanap, Balan, Bensulide, Brominal, CIPC, Diuron, Monuron, Tenoran, Vegiben, and VCS-438.

These tests indicated that Diuron and Monuron seriously injure the plants when sprayed directly over seedling asparagus. VCS-438 caused severe stunting up to 10 weeks. CIPC or Brominal might be a possibility for use eight weeks after emergence but data were erratic. Balan, Bensulide, Tenoran and Vegiben appeared safe for use at about four weeks after emergence, with Alanap showing some selectivity at two weeks after emergence. Some stunting occurred in all treatments tested in these trials and Bensulide caused some twisting of the plants. However, with Alanap, Balan, Bensulide, CIPC, Tenoran and Vegiben, the data show that the plants generally recovered. VCS-438 was a possibility for use at the

two-pound rate but the data reflect considerable damage at the higher rates.

Post-emerge to weeds

Two trials were established at Moreno to study post-emergent weed control with the more promising chemicals chosen from the previous test. Beds were formed and asparagus was planted in rows, with weed seed broadcast over the entire area. Sprinkler irrigation was used throughout these trials. Chemicals were applied to the one trial when the weeds reached 5 inches in height and to the other when the weeds were 14 inches high. Irrigation was continued for several weeks following chemical application. Weeds in a 3-foot section of row were then cut at ground level and fresh weights recorded. The data from these tests show that VCS-438 gave excellent contact control of established weeds at both the 5-inch and 14-inch height (see table 3). Brominal showed some contact action on weeds in the 5-inch range at all rates tested but had no effect on larger weeds. Alanap displayed some contact action on the smaller weeds at the higher rates tested but had no effect on larger weeds. The data indicate that the effects of Brominal and Alanap were statistically significant at the 5% level but more tests need to be conducted to establish the practicality of these treatments.

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TABLE 3. TOXICITY OF HERBICIDES SPRAYED POST-EMERGENCE ON WEEDS 5 INCHES HIGH AND 14 INCHES HIGH

Chemical	Rate	Weeds 5" high		Weeds 14" high	
		lbs/3 ft of row	% reduction from control	lbs/3 ft of row	% reduction from control
Alanap	4	5.5	7	7.3	11
	8	2.9	51*	6.3	23
	12	4.5	24*	7.0	14
	16	3.9	43*	6.5	20
Balan	1/2	5.6	4	8.8	0
	1	6.6	0	8.3	0
	2	6.1	0	8.3	0
Bensulide	4	3.8	36*	6.9	15
	6	3.6	38*	6.3	23
	9	6.1	0	7.4	9
	12	4.3	28	5.1	37*
Brominal	15	4.4	26	6.1	25
	2/8	4.0	32*	7.1	12
	3/8	3.3	45*	5.5	32
	4/8	3.6	38*	4.1	49*
VCS-438	5/8	2.9	51*	5.5	32
	1	2.0	66*	3.4	59*
	2	0	100*	1.8	79*
	4	0	100*	0	100*
Check	8	0	100*	0	100*
		5.9		8.1	

* Differ statistically from the controls at the 5% level.