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WEED CONTROL IN STRAWBERRY NURSERY[1]

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Abstract. **Three herbicides applied either alone or in combination and a fumigant were evaluated for weed control, plant injury, and plant production with two cultivars in a strawberry** (Fragaria ananassa, **Duch.) nursery. Weed control was best with a combination of DCPA (dimethyl tetrachlorophthalate) and chloroxuron (3- p-chlorophenoxy)phenyl-1,1-dimethylurea) at 16 and 8 lbs a.i./acre, respectively, and was only slightly less effective at one-half these rates. DCPA alone, diphenamid (N,N-dimethyl-2,2-diphenylacetamide), and the fumigant MC-33 (67% methyl bromide and 33% chloropicrin) gave inadequate weed control. Daughter plant production by 'Florida Belle' was not apparently affected by treatments. DCPA and DCPA-chloroxuron combination treatments produced fewer large plants of 'Dover' than the hoed check. Number of 'Dover' small plants produced was not affected by treatments. Phytotoxic symptoms were noted with all herbicides. On a scale of 1 to 10 with a 10 rated as non-phytotoxic, the phytotoxicity of the herbicides were: diphenamid 9.3, DCPA (low rate) 7.8 and (high rate) 6.1, and the DCPA-chloroxuron (low rate) 7.4 and (high rate) 5.5, respectively.**

Weed control in the strawberry nursery is difficult since new plantings grow slowly and are not competitive with weeds. Florida growers generally use a broad spectrum fumigant for weed control and supplement this with hand-weeding in areas of the bed where daughter plants are present and use tractor cultivation elsewhere, thereby avoiding phytotoxicity. Previous work has shown that chloroxuron, DCPA, and diphenamid can give fair to good weed control with little plant damage (1, 2, 3). Since that time, new strawberry cultivars have been introduced in Florida, and these chemicals have not been tested on them. The purpose of this study was to determine the effect of herbicides on two recent strawberry cultivar releases with respect to plant damage, plant production, and weed control in a nursery.

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Materials and Methods

An experiment was conducted in the summer of 1978 at ARC Dover on Scranton (adjunct) fine sand. Except where MC-33 was applied, the experimental area was treated with a nematicide (a mixture of 1,3-dichloropropene and 1,2-dichloropropane) and beds prepared. 'Dover' and 'Florida Belle' strawberry cultivars were transplanted on May 25 in a randomized block design replicated four times. The treatments were: 1. unhoed check, 2. hoed check, 3. MC-33 at 400 lbs/acre applied preplant, 4. DCPA at either 8 (DCPA L) or 5. 16 (DCPA H) lbs a.i./acre, 6. a combination of DCPA and chloroxuron at 8 and 4 lbs a.i./acre (DCPA-chl L) and 7. 16 and 8 lbs a.i./acre (DCPA-chl H), respectively, of DCPA and chloroxuron, and 8. diphenamid at 4 lbs a.i./acre. Before each herbicide application, all plots were weeded except unhoed check which was weeded only before the first herbicide application. All herbicides except chloroxuron were applied preemergence on June 15, July 28, and September 7. Chloroxuron was applied post emergence on June 21 and August 1. All beds were irrigated prior to and after application of all herbicides except chloroxuron. Visual foliage injury ratings were made periodically. Weed control ratings were made prior to making beds weed free for the next herbicide application, and counts of plant production were made at harvest. Irrigation and fertilization were applied as needed.

Results and Discussion

Foliage injury was evident with the use of all herbicides (Table 1). Injury was greatest with the first herbicide application. Diphenamid, DCPA-H and DCPA-chl-H interfered with the rooting of daughter plants after the first application. The problem ended after about two weeks. Diphenamid also caused a mild leaf chlorosis after the first application. DCPA application resulted in the usual leaf crinkling which was more severe with the higher rate. In addition, chlorosis was evident on the youngest leaves. With the application of chloroxuron the chlorosis became more widespread. All three herbicides appeared to cause the daughter plants to cease growth for 10 to 14 days after the first application.

The major weeds present in the nursery were annual sedge (*Cyperus compressus* L.), crabgrass (*Digitaria ciliaris* Henr.), beggarweed (*Desmodium tortuosum* (SW) DC.), and goosegrass (*Eleusine indica* (L.) Gaertn.) (Table 2).

Table 1. Influence of treatments on strawberry foliage injury.

Treatments	Phytotoxicity ratings[z] on three dates					
	6-29-78		7-11-78		8-10-78	
	FB[y]	Dover	FB	Dover	FB	Dover
Check unhoed	10 a[x]	10 a	10 a	10 a	10 a	10 a
Check hoed	10 a	10 a	10 a	10 a	10 a	10 a
MC-33	10 a	10 a	10 a	10 a	10 a	10 a
DCPA L[w]	6.0bc	7.0b	8.0b	9.3b	8.0b	9.5ab
DCPA H[w]	5.5c	5.5bc	5.5c	5.5d	7.5bc	8.5b
DCPA-chl L[w]	7.5b	5.5bc	8.8b	7.8c	8.0b	7.0bc
DCPA-chl H[w]	4.8c	4.0c	6.0c	5.8d	7.0c	6.0c
Diphenamid	9.0ab	8.5ab	9.8a	9.8a	10 a	10 a

[z]1 = All foliage of daughter plants chlorotic and distorted, 10 = no injury.
[y]FB = Florida Belle.
[x]Mean separation in columns by Duncan's multiple range test, 1% level.
[w]L and H = low and high rates respectively, Chl = Chloroxuron.

Table 2. Effect of treatments on weed control.

Treatments	Percent of bed covered with each weed species on three dates														
	7/24/78					9/1/78					10/14/78				
	AS[z]	CR	FB	GO	T	AS	CR	FB	GO	T	AS	CR	FB	GO	T
Check unhoed	18	14	9	15	97.5a[y]	19	15	10	16	100.0a	10	16	3	30	100.0a
Check hoed	0	0	0	0	0.0e	0	0	0	0	0.0d	0	0	0	0	0.0e
MC-33	25	13	9	5	83.8b	20	11	3	6	65.0b	4	6	1	6	37.5b
DCPA L[x]	31	2	9	2	63.8c	23	3	3	6	60.0b	8	2	0	2	22.0c
DCPA H[x]	9	0	9	1	43.3d	18	2	1	4	50.0c	4	0	1	3	14.5d
DCPA-chl L[x]	4	0	1	3	13.8e	2	0	0	3	12.5d	3	2	2	6	21.3c[w]
DCPA-chl H[x]	1	0	0	0	3.5e	0	1	0	1	5.0d	5	5	1	4	22.0c[w]
Diphenamid	15	3	11	2	70.0c	19	9	1	5	68.8b	8	2	2	11	37.5b

[z]AS = Annual sedge, CR = crabgrass, FB = Florida beggarweed, GO = goosegrass, T = total area of bed covered by all weeds.
[y]Mean separation in columns by Duncan multiple range test, 5% level.
[y]L and H = low and high rates. respectively; chl = chloroxuron.
[w]Sprayed only twice with chloroxuron.

Table 3. Influence of treatments on daughter plant production as of October 14, 1978.

Treatments	No. daughter plants/mother plant					
	Dover			Florida Belle		
	Large[z]	Small	Very small	Large	Small	Very small
Check unhoed	2.2d[y]	0	0	5.0b	0	0
Check hoed	50.0a	16.8a	31.8a	29.7a	4.6a	22.5a
MC-33	44.5ab	24.3a	23.5a	15.1ab	5.7a	18.3a
DCPA L[x]	31.2b	14.0a	21.0a	15.6ab	2.6a	18.3a
DCPA H[x]	33.0ab	18.0a	20.8a	22.3a	9.2a	21.8a
DCPA-chl L[x]	15.7bc	12.8a	17.3a	28.0a	12.2a	17.1a
DCPA-chl H[x]	24.8b	9.9a	15.7a	26.4a	12.8a	19.9a
Diphenamid	32.0ab	22.4a	23.0a	15.3ab	5.3a	17.5a

[z]Refers to plant size. Large are those acceptable for transplanting, Very small are those just rooted, and all others are rated as small.
[y]Mean separation in columns by Duncan's multiple range test, 5% level.
[x]L and H = low and high rates, respectively; chl = chloroxuron.

Weed control was acceptable only with the DCPA-chl combinations. The somewhat poorer weed control of this treatment at harvest was probably the result of not applying chloroxuron the third time. Only chloroxuron controlled annual sedge. Weed size (except in the unhoed check) prior to each herbicide application was largest in the diphenamid and MC-33 treatments and smallest with the DCPA-chl combination treatments. Except for the first rating period, there were no differences in weed control between MC-33 and diphenamid. Since this study was conducted, tests at ARC-Dover have shown that a fumigant with 98% methyl bromide provides weed control which is much superior to MC-33. However, some legumes with an impervious seed coat were not controlled with the 98% methyl bromide fumigant.

Treatments, except for the unhoed check, had little effect on daughter plant production by harvest date (Table 3). With the 'Dover' cultivar, the number of large daughter plants was less than the hoed check with all herbicides, but only the DCPA-L and the DCPA-chl combination treatments produced significantly less large plants. There were no other significant differences because of herbicide treatments.

Diphenamid is easily leached from sandy soils under high rainfall or irrigation rates as was present in this study (4). This may have accounted for its poor performance. DCPA and chloroxuron are not easily leached even under high rates of rainfall or irrigation (4). Thus, these materials are probably more suitable than diphenamid for strawberry summer nurseries in Florida.

All of the materials used in this study probably would not be acceptable to growers in preference to their present method of weed control. Because of herbicide injury to the foliage of young seedlings, most growers would not apply DCPA and chloroxuron at rates used in this study even though plant production at harvest may not be curtailed. Reduced plant production can be a problem though with some cultivars as noted in this study. The use of these herbicides later in the season probably would be more acceptable because of less plant injury. Since most of the bed is covered with plants late in the season and tractor cultivation is not practical, the use of a herbicide at that time may be preferable to hand weeding.

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