CHEMICAL WEEDING OF ASPARAGUS

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THE problem of weed control in a perennial crop such as asparagus is known to all. Heavy dressings with common salt have been made for this purpose with varying success, but continued applications are likely to destroy the soil structure.

During the 1952-53 season the following herbicides were tested.

DNBP, sodium cyanate, IPC, SES (sodium 2,4-dichlorophenoxy ethyl sulphate), TCA, and MCP. The results of these trials were reported fully at last year's Conference. A fair measure of weed control was obtained with each, but it could not be claimed that any one gave excellent results. The major weakness of all these materials is their lack of long residual activity. Asparagus growers are seeking a herbicide that may be applied after the last spring cultivation (which is made just prior to the emergence of the spears) which would control weeds until the close of the cutting season, or better still, until the fern dies down.

The recent introduction of herbicides with more residual activity has enabled further testing of materials which might fit this situation.

MATERIALS AND METHODS

With a view to conducting further chemical weed control trials in asparagus 100 one-year-old plants of each of the varieties Mary Washington and Paradise were purchased and set out at the Horticultural Research Station, Department of Agriculture, Levin, in August 1952. The beds were hand weeded during the 1952-53 season.

In mid-September 1953 the beds and inter-row were rotary-hoed to a depth of 3in., and on 24 September they were hand raked to remove litter.

Plots were necessarily small to include all the treatments and permit one replication. Each plot was measured off 3ft. 9in. long by 1yd. wide), which included three asparagus crowns (crowns set 15in. apart).

The herbicides tested, and the number of days after cultivation that each was applied, are set out in Table 1. All materials, except calcium cyanamide were applied in 100 gallons of water per acre at 30 to 40lb. pressure, using a small hand sprayer. This amount of water is not considered necessary on a field scale, but permits a more even distribution on small plots. The calcium cyanamide was bulked up with sand and broadcast over the plots which had received a light spraying of water, to assimilate dew, immediately prior to application.

The soil was a silty loam. Ample moisture was present in the topsoil for weed seed germination on 30 September, when the CMU and TCA were applied. Rain interrupted operations and it was not possible to put on the other herbicides till 8 October, by which time many weeds had emerged. No weeds were in excess of $\frac{3}{8}$ in. This stage was considered ideal for the contact herbicides.

The principal weeds were redshank (*Polygonum persicaria*), 60 to 70 per cent., and spurrey (*Spergula arvensis*), 10 to 20 per cent., with fewer plants of fat-hen (*Chenopodium album*), black nightshade (*Solanum nigrum*), sow thistle (*Sonchus oleraceus*), twin cress (*Coronopus didymus*), chick weed (*Stellaria media*), winter grass (*Poa annua*), and others.

TABLE 1.—Weed Control Obtained with Herbicides Applied Pre-emergence to Newly Established Asparagus Bed, October 1953 (Plants 2 years old)						
COMMON ABBREVIATION	HERBICIDE		Rate per acre. (i.e., area treated mm)	No. of days from last cultivation to date of application.	Weed counts per 1 sq.ft. 6 weeks after treatment.	Weed control rating 0 = No control 10 = Perfect control.
		CHEMICAL				
CMU		3-para-chlorophenyl)-1, 1 dimethyl urea.	1½ lb. 2½ " 5 "	6 6 6	22 3 0	8.1 9.7 10.0
Chloro IPC		Isopropyl N-(3-chlorophenyl) carbamate.	4 " 8 "	14 14	17 4	8.5 9.6
IPC		Isopropyl-N-phenyl carbamate.	4 " 8 "	14 14	59 27	4.8 7.6
*DNABP		Dinitro amyl phenol 10% + Dinitro butyl phenol 50%.	1 qt. 2 qts.	14 14	31 21	7.3 8.2
*DNBP		4,6-dinitro ortho secondary butyl phenol (2.0lb. per gal.).	2 " 4 "	14 14	35 19	6.9 8.3
*Amine DNOC		Diethylamine salt of Dinitro ortho cresol.	4 lb. 8 "	14 14	15 12	8.7 9.0
NaCNO		Sodium cyanate.	10 " 20 "	14 14	74 43	3.5 6.2
TCA		Sodium trichloracetate.	25 " 50 "	6 6	42† 40†	6.3 6.5
CaCN ₂ (non-oiled)		Calcium cyanamide.	200 " 400 "	14 14	91 65	2.0 4.3
CaCN ₂ (oiled)		Calcium cyanamide.	200 " 400 "	14 14	68 54	4.2 5.3
Dieselene		Dieselene.	40 "	14	32	7.2
*DNABP + CIPC			1 qt. } 4 lb. }			
	Check	No treatment.		14	0	10.0
					114	0.0
* Plus dieselene—15 gallons per acre. † Plus couch (<i>Agropyron repens</i>) over half plot. Very little killed. mm—Commercially, interrow would be cultivated and thus actually less than half area treated. Acre rate would be less than half shown.						

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Weed counts were taken approximately 6 weeks after the treatments were applied. The data is summarised in Table 1.

Meteorological data relevant to the trial is shown in Table 2.

TABLE 2—Meteorological Data Relevant to Trial

Rainfall				Monthly Totals			
October—			in.				in.
1	..	..	0.79	September	..	..	5.04
2	..	..	0.65	October	..	..	5.45
3	..	..	0.05	November	..	..	4.76
4	..	..	0.00	December	..	..	5.78
5	..	..	0.00	January	..	..	2.44
6	..	..	0.01	February	..	..	3.17
7	..	..	0.21	March	..	..	3.01
8	..	..	0.21				
9	..	..	1.85				
10	..	..	0.11				
11	..	..	trace				
12	..	..	0.59	8 October, 1953			
13	..	..	0.33	Min. temp.	..	..	51.8°F.
14	..	..	0.05	Max. temp.	..	..	63.6°F.
15 to 31 ..	..	..	0.60	Humidity	..	..	76%
Total ..	..	..	<u>5.45</u>	Rainfall (started 4 p.m.) ..	..	..	0.21in.
				Earth temp. at 4in. ..	..	..	56.4°F.

RESULTS AND DISCUSSION

Weed control with CMU was outstanding. Not a single weed appeared throughout the season and right up until the beds were cultivated in August 1954 (10 months after application) on the plots treated at the 5lb. rate. Almost equal control was obtained at half this rate. In the latter case there was some invasion of creeping bent (*Agrostis stolonifera*) from outside the plots when the asparagus had reached the advanced fern stage and a few annual weed seeds germinated when the fern was cut down. The 1½lb. rate did not give adequate control, but even at this low dosage results were still superior to many other treatments.

Chloro IPC was the next most effective material. At the 8lb. per acre rate it gave weed control equal to that obtained with 2½lb. of CMU, though the effect of the latter was slightly longer lasting. The measure of weed control obtained with 4lb. of chloro IPC would perhaps have been regarded as satisfactory, commercially, but much inferior to that obtained with 8lb. per acre.

IPC at the heaviest rate completely controlled redshank, spurrey, and seedling grasses, but it was not effective against twin cress, fat-hen, and sow thistle. The 4lb. rate of IPC was insufficient to control redshank and spurrey, though the redshank was somewhat stunted.

DNBP at 1 gallon per acre and the DNA,B,P mixture at half this rate, both plus 15 gallons of dieselene per acre, gave fairly good initial control, but their residual activity was much less than other herbicides already discussed.

Applications of amine DNOC, both at the 4lb. and 8lb. rates plus 15 gallons of dieselene per acre, resulted in very good weed control only little inferior to that obtained with chloro IPC. The residual action of this DNOC was much greater than that of either of the DNBP preparations.

Dieselene alone at 40 gallons per acre gave a fair reduction in weed numbers, but its effect was short lived and plots soon became infested with weeds.

The combination spray chloro IPC 4lb., DNA,B,P 1 quart, plus 15 gallons of dieselene proved most effective. Plots so treated remained weed free until the asparagus fern was fully developed.

Weed controls with sodium cyanate, TCA, and calcium cyanamide were unsatisfactory. The weeds in the plots treated with calcium cyanamide were lush and much taller than those in the control plots. This was attributed to the high percentage (26 per cent.) of nitrogen in this herbicide. Rain fell soon after the last treatments were applied. The calcium cyanamide would have been washed into the soil before any herbicidal action could take place. It is probable that the effect of sodium cyanate was reduced for the same reason.

It should be pointed out, however, that rain is essential for the maximum benefit to be derived from those herbicides which act through the soil. Conditions, therefore, were ideal for CMU, chloro IPC, IPC, and TCA.

There was no indication of injurious effects on the asparagus from any of the treatments. Plots will be observed again this season.

CONCLUSION

Under the conditions of this experiment CMU at 2½lb. per acre was the best treatment. Further testing of CMU on a field scale under varying soil and climatic conditions is considered necessary before final recommendations can be made for all districts throughout New Zealand.

N.B.—It must be remembered that the rates of application quoted throughout this paper apply to the area treated.

DISCUSSION

Q.—At what stage was CIPC applied for weed control in carrots?

A.—As a pre-emergence treatment, that is, about a week before sowing. However, CIPC was also satisfactory as a post-emergence treatment applied when carrots were about 4in. high.

Q.—Do roots of asparagus get nearer the surface as they get older? If so, would not the application of CMU eventually be dangerous?

A.—In the United States practically the whole of CMU applied remained in the top ½in. of soil. Very few roots would reach this level. In practice asparagus was remoulded each spring.

Q.—At what stage should CIPC be applied to onions?

A.—Both pre-emergence and post-emergence treatments are satisfactory.