

WEED CONTROL

HERBICIDES OR CULTIVATION?

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The recent introduction of herbicides as a supplementary method to cultivation for controlling weed growth has, from time to time, brought forth various questions concerning the relative merits of herbicides and the normal methods of hand weeding and cultivation. In order to obtain experimental evidence on some of these questions an experiment was planted in which normal weeding and cultivation methods were compared with herbicides. The opportunity was also taken to find out at which period of growth the cane crop was likely to suffer most damage from neglected weed control.

The experiment was planted, using the variety N:Co.339, on 11th December, 1952. The soil type was a heavy clay loam of doleritic origin which was comparatively free of watergrass. The fertilizer applied was 500 lbs. per acre Super-Rock 4:1 mixture. No top dressings were given. The statistical layout was a random block of four replications.

Table I shows the pre- and post-emergent treatments used, the date when any weed control measure was carried out and the rainfall.

Factors Influencing Weed Growth and Control

Prior to the application of herbicides the normal steep sides of the furrow, except in Treatment 1, were broken down, as it was thought that the

gradual crumbling of the sides would rapidly offset the effect of the herbicide.

The weather conditions play an important part in the growth of weeds. Although the annual rainfall (44.58") for 1953 was above average (36.29") it must be realised that over 10" of this rainfall fell overnight and after the experiment had been given the pre-emergent herbicidal spray. This heavy rainfall resulted in a lot of soil movement and the efficiency of the spray must have been greatly reduced. After the good rains in January and February a period of severe drought was experienced which continued until the end of August, thereafter the rainfall appears to have been fairly normal. This period of drought was sufficient to inhibit the germination and growth of the weeds. Hence, it is felt that under normal rainfall conditions more weed control measures would have had to be adopted.

Weed Populations

A survey of the weeds growing in the experiment was carried out on 4th February, 1953. Thirty-three different species of weeds were identified, only six belonging to the grass family, the remainder being broad leaf species. A density scale was adopted, and the relative density of each weed species recorded.

TABLE II

Treatment No.	1	2	3	4	5	6	7	8	9	10
Number of species	22	20	20	24	5	12	5	18	18	25
Relative density	57	51	56	69	18	26	17	77	41	86

There does not appear to be much variation in the weed populations of the various treatments except in Treatments 5 and 7 which were given a post-emergent contact spray two weeks before the count was made. This demonstrates the immediate effectiveness of the post-emergent contact spray, but later it was noticed that these plots were heavily infected with grasses. The herbicide was probably applied when the grasses were too well established.

In the plots treated with a pre-emergent spray it was found that *Digitaria sanguinale* germinated, but that the newly-formed side roots, which were short and developed rather blunt ends, were incapable of entering the soil. The majority of these weeds eventually died, some being detached from the soil by the action of the wind.

Table II shows the number of weed species and the relative density for each treatment.

In the "cultivation only" plots it was found that a number of weeds developed in the cane line, probably as a result of no hand weeding. The 2, 4-D pre-emergent application kept the weeds down for about a month but when growth took place the cultivators were unable to kill the weeds in the line which were protected by the young cane.

The plots which had no 2, 4-D pre-emergent spray and were due to be kept clean by cultivation were cultivated two weeks after planting. This destroyed all the young weeds and it remained clean for a further period of five weeks by which time the cane was well developed.

TABLE I

Treatment No.	1	2	3	4	5	6	7	8	9	10
Pre-emergent Treatment	2.9 lbs. Sodium salt 2, 4-D/ac	2.9 lbs. Sodium salt 2, 4-D/ac	2.9 lbs. Sodium salt 2, 4-D/ac	1.45 lbs. Sodium salt 2, 4-D/ac	1.45 lbs. Sodium salt 2, 4-D/ac	Nil	Nil	Nil	Nil	Nil
Post-emergent Treatment	Cultivation and weeding	Cultivation only	Herbicides	Cultivation only	Herbicides	Cultivation	Herbicides	Cultivation and weeding started 11 weeks after planting	Cultivated and weeded for 11 weeks only	Nil
11/12/52	Planted Experiment Rainfall 11th	to 18th December	3.09" spread over	5 days						
18/12/52	2.9 lbs. 2, 4-D/ac Rainfall 18th	2.9 lbs. 2, 4-D/ac to 31st December	2.9 lbs. 2, 4-D/ac 0.62" spread over	1.45 lbs. 2, 4-D/ac 8 days	1.45 lbs. 2, 4-D/ac ac	—	—	—	—	—
31/12/52	— Rainfall 1st	— January to 19th	— January, 1953, 14.11" spread over	— 9 days. Heavy rain of 10.35" in one day	—	Cultivated	—	—	Hand weeded	—
20/1/53	— Rainfall 20th	— January to 6th	— February, 1.22" spread over 7 days	—	1 lb. 2, 4-D Iso Propyl Ester + 4 gals. C.A.D.E. per acre	—	1 lb. 2, 4-D Iso Propyl Ester + 4 gals. C.A.D.E. per acre	—	—	—
6/2/53	Weeded Rainfall 6th	Cultivated to 26th February,	— 7.31" spread over	Cultivated 11 days. Heaviest fall of 2.56" on	—	Cultivated 9th February	—	—	Cultivated and weeded	—
26/2/53	Cultivated Rainfall 26th	Cultivated February to 24th	1 lb. 2, 4-D Iso Propyl Ester + 4 gals. C.A.D.E. per acre April. 2.63" spread over 17 days, usually very light rain, less than 0.1"	Cultivated per acre	1 lb. 2, 4-D Iso Propyl Ester + 4 gals. C.A.D.E. per acre	Cultivated	1 lb. 2, 4-D Iso Propyl Ester + 4 gals. C.A.D.E.	Weeded	Cultivated	—
24/4/53	Cultivated Rainfall 24th	— April, 1953, to 13th January, 1954,	— 20.52". May, June, July and August extremely dry	—	—	—	—	Cultivated	—	—
13/1/54	Weeded Rainfall 13th	— January to 5th July, 1954. 14.86"	—	—	—	—	—	—	—	—
5/7/54	Harvested at 19 months old cane Total Rainfall: 64.36"									
TOTAL TREATMENTS:										
Herbicides	1	1	2	1	3	Nil	2	Nil	Nil	Nil
Cultivations	3	2	Nil	2	Nil	3	Nil	1	2	Nil
Weeding	2	Nil	Nil	Nil	Nil	Nil	Nil	2	2	Nil

The weight of 2, 4-D used is the acid equivalent weight. All spray was applied at the rate of 25 gallons per acre

TABLE III

Treatment No.	1	9	2	6	3	8	4	5	7	10
Tons cane per acre	53.33	48.00	46.05	45.33	44.26	43.16	41.39	34.90	28.70	18.41

Table III gives the tons cane per acre harvested from each treatment.

Significance at 19 : 1 = 12.36 tons per acre

99 : 1 = 16.56 tons per acre

From these results it may be deduced that it does not matter whether the weeds are brought under

control by herbicides or cultivation methods, provided they are controlled early. There appear to be indications that after a pre-emergent spray is applied it is better to cultivate than to apply a post-emergent herbicide. The extra depth of soil over the setts apparently has the effect of encouraging tillering and keeping the setts in a moister condition.

TABLE IV

Treatment No.	1	9	4	2	6	5	3	8	7	10
Sucrose per cent. cane	14.71	14.67	14.65	14.50	14.47	14.45	14.33	14.06	13.58	13.37

Table IV gives the sucrose percentage cane for the various treatments.

Significant difference at 19 : 1 = 0.52 sucrose % cane

99 : 1 = 0.70 sucrose % cane

Here it is seen that where the weed control has been bad the sucrose has decreased. This experiment shows then that with bad weed control there is a loss not only in yield but also in sucrose.

Time of Weed Control

In considering the two treatments, "Control for 11 weeks after planting (Treatment 9)" and "Control

beginning 11 weeks after planting (Treatment 8), the following observations were made: according to Table III the yields were 48.00 tons cane per acre and 43.16 tons cane per acre respectively which shows no significant difference; but, when the number of sticks produced is taken in consideration, it will be seen that three months after planting there were twice as many shoots in the weeded plots (Treatment 9) as in the neglected ones (Treatment 8) as is shown in Table V.

TABLE V

Treatment No.	1	2	3	4	5	6	7	8	9	10
At harvest	2586	2783	2432	2063	2109	2220	1726	2386	2468	1202
Three months after planting	1905	1612	1965	1391	1463	1501	1450	983	1848	879

Table V shows the number of sticks produced three months after planting and at harvest time.

In Treatment 8 there must have been a large number of bull shoots and year-old canes produced, probably caused by more light and better growing conditions prevailing when the weeds were removed. If the cane had been harvested earlier a loss in yield could have resulted from the early neglect of weed control.

Some Observations on Weed Control

When controlling weeds either by cultivation or herbicides it is essential that the control measures should be carried out when the weeds are young,

preferably soon after germination. The drag-harrow used a few weeks after planting can save a tremendous amount of weeding later. The correct time to use the drag-harrow is when the weeds have just germinated and the cane shoots by then will probably be just below ground level so that the extra covering of soil will not prevent the shoots from coming through the ground.

The herbicides should be applied as a pre-emergent spray, i.e. after the cane is planted but before the weeds have germinated. This pre-emergent spray will control grasses as well as broad leaf weeds. If a post-emergent spray is necessary it must be used when the weeds are small.

If fields which are intended to be planted, are left fallow for any period, they should be harrowed periodically to kill any weeds before they have had time to seed. The old saying "one year's seeding, seven years weeding," should be borne in mind although not strictly applicable to the sugar industry it nevertheless makes one realise the dangers of allowing weeds to seed.

Costs

It is not intended to compare the costs of the two methods of weed control as herbicides must not be considered as a complete answer to weed problems but only as an additional method available to the farmer. Herbicides must fit into the farm programme of operations and will become more and more valuable as the labour supply becomes shorter. It is realised that a tractor can cultivate large acreages but it is not always possible nor desirable to cultivate

too often: it is here that herbicides are useful and their value can not be assessed in mere £ s. d.

Conclusions

It is apparent that weeds can be controlled either by herbicides or the usual methods of cultivation and weeding. If herbicides are used it appears desirable that the cane should be cultivated at some period, in order to increase rooting and place the cane deeper where more moisture is available. There does not appear to be any advantage in breaking down the furrow prior to spraying.

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(For discussion of this paper see page 133)

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