

STUDIES ON THE CONTROL OF NUT-GRASS *CYPERUS ROTUNDUS* L. IN COCONUT GARDENS BY CHEMICAL WEEDICIDES

R. GOPINATHAN NAIR and P. CHAMI

Central Coconut Research Station, Kasaragod

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The large interspace between the coconut trees and the tall columnar stem without lateral branches provide ample space for weeds to grow and spread unchecked in coconut gardens. Grasses are the most troublesome weeds, and because of their capacity to revive very easily from the stolons left behind, they cannot be easily controlled by the usual methods of ploughing, harrowing and intercultivation. Repeated operations are necessary, and this involves considerable expenditure.

The use of growth-regulating chemicals as weed-killers has become common in progressive countries and has been found to be more economical, especially in countries where labour is costly. A number of commercial preparations of these are now available in various forms such as acids, mineral salts, organic salts or amines and esters under different names. The effects of these chemicals on different weeds have been studied by various workers all over the world. While broad-leaved dicot weeds can be effectively controlled with chemical herbicides, the nut-grass, *Cyperus rotundus* L., is very difficult to be checked on account of its aggressive spreading habit and the presence of subterranean stolons with a number of buds, which are capable of remaining dormant for long periods.

In recent years trials have been made in the use of hormonal weedicides in the control of nut-grass also. Fernoxone, a formulation of sodium salt of 2, 4-dichlorophenoxyacetic acid has been found to reduce *Cyperus rotundus* stands considerably (Krishna Rao, Warriar and Moses, 1951; Thakur and Singh, 1955; Appala Naidu and Chandra Singh, 1958). Working with nut-grass Stamper and Melville (1956) reported that Dalapon at 12 and 24 lb. per acre gave a faster top kill than any other herbicides or their combination. *Cyperus rotundus* was reported to be responsive to Dalapon by Hauser and Thompson (1956). Arakeri (1957) and Arakeri and Adhate (1957) obtained effective control of the weed by spraying amine salt of 2,4-D. Narayanan and Meenakshisundaram (1957) recommended a mixture of sodium salt of 2,4-D and MCPA at the rate of 5 lb. per acre for effective control of this weed. According to Appala Naidu and Chandra Singh (1960) the chloropropionic acid compound Dowpon was effective in killing even the mature plants. Though most of these workers could kill the aerial parts of the weed, no measure could be devised for a complete control of the weed by making ineffective the long chain of tubers responsible for the successive growth of its sprouts. The effect of the different chemicals may vary in different parts of the country at varied climatic, edaphic and farming conditions. The present series of experiments with hormonal weedicides has

been taken up to study their efficiency in controlling nut-grass under the conditions prevailing at the Central Coconut Research Station, Kasaragod, which in a way represents the conditions prevalent on the west coast of India where coconut cultivation predominates.

EXPERIMENTAL

The trials were conducted in the years 1961 and 1962. The treatments were carried out by the middle of June, when the nut-grass plants, which sprout soon after the pre-monsoon rains in May, attained a height of about quarter to half a metre. The first trial was undertaken in 1961. Three proprietary weedicides were used: (i) Bihedenol, a mixture of 2,4-dichlorophenoxy acetic acid; (ii) Tributon, a mixture of methyl ester of 2,4-dichlorophenoxyacetic acid and 2,4,5-trichlorophenoxy acetic acid; and (iii) Dowpon, a formulation containing 85 per cent of sodium salt of 2, 2-dichloropropionic acid. All the chemicals were tried simultaneously, each at five different doses, viz., 4.5 kg., 9 kg., 13.5 kg., 18 kg., and 22.5 kg. per hectare.

Two other trials were made in 1962, using (a)(i) Isopropyl-N-phenyl carbamate (IPC), (ii) Ethyl phenyl carbamate (EPC), and (iii) 2,4-dinitrophenol; and (b)(i) Ethyl-di-n-propyl thiol carbamate (EPTAM), (ii) 2,2-dichloropropionic acid sodium salt (Dalapon), and (iii) Iso-Cornox (formulation of CMPP).

In these two trials the chemicals were tried in five different doses, viz., 1 kg., 5 kg., 10 kg., 15 kg. and 20 kg. per hectare. Randomized split-plot design replicated four times was used for all the three experiments. The gross size of the plot was 1 sq. m. and the net size $\frac{1}{2}$ sq. m. Sufficient number of plants were thus left in between plots to avoid border effect, if any. The chemicals were applied in a single dose as aqueous sprays at the rate of 900 litres per hectare. The effectiveness of the different chemicals was assessed by taking weed counts in $\frac{1}{2}$ sq. m. in each plot before and after spraying.

The trials could be conducted only during the pre-monsoon days, when the *Cyperus* begins to spring up extensively. Thus the ideal condition for weed-control trials—dry weather with high temperature—was not prevalent. But as the monsoon had not commenced in full swing, the trials were practically not hindered by rains for four to five days after the spray treatment, although the weather was generally cloudy and humid.

OBSERVATIONS

In the first trial the weeds in the plots sprayed with the chemicals in concentrations of 13.5 kg. or more per hectare turned yellow within 48 hours of treatment and subsequently got scorched in another 48 hours. In the lower concentrations the process of yellowing and scorching were slow. Complete mortality of the aerial portions could be noticed within 15 to 20 days of the treatment. The results on the mortality counts after six weeks from the date of application of the herbicides are given in Table I.

The mortality counts for nut-grass are really the counts of the dead aerial portion of the plants and it is difficult to find out whether all the tubers on the subterranean rhizomes have been affected. The plots were under examination for about six months after treatments and the general performance of the grass regarding regrowth has been observed.

TABLE I. EFFECT OF WEEDICIDE ON *Cyperus rotundus* L.

Chemical	Bi-hedenol					Tributon					Dowpon				
	Plants		% mortality			Plants		% Mortality			Plants		% mortality		
	Total	Dried	L.C.L.	Actual	U.C.L.	Total	Dried	L.C.L.	Actual	U.C.L.	Total	Dried	L.C.L.	Actual	U.C.L.
4.5 kg./hectare	998	820	80	82	84	1131	902	78	80	82	930	675	70	73	76
9 kg./hectare	1055	1042	97	99	100	1211	1195	98	99	100	1175	980	81	83	85
13.5 kg./hectare	1264	1260	99	100	100	1268	1240	97	98	99	940	872	92	93	94
18 kg./hectare	912	912	100	100	100	1203	1201	98	99	100	1375	1375	99	100	100
22.5 kg./hectare	1187	1187	100	100	100	1122	1122	99	100	100	1602	1492	92	93	94

L.C.L. = Lower Confidence Limit.

U.C.L. = Upper Confidence Limit (cf. Pearson and Hartley, 1958).

All the three chemicals were found to be efficient for the control of the weed, though the efficiency attained varied depending on the chemical and the dose applied. Dowpon was slow in action and was comparatively less effective. For killing the weeds by a single spray, a high concentration of 13.5 kg. per hectare of any of these chemicals was found to be quite sufficient. In plots treated with Dowpon fresh growth was observed four months after spraying, whereas in those treated with the other two chemicals regrowth was only sparse, and the sprouts were weak, chlorotic and died soon.

None of the chemicals (IPC, EPC and Dinitrophenol) used in the second experiment were found to be effective; no mortality of the weeds could be obtained. In plots treated with high concentrations of the weedicides slight yellowing of the leaves was observed. But the subsequent leaves were not affected and the plants survived.

In the third experiment with EPTAM, Dalapon and Iso-Cornox, only Dalapon could be found effective in the control of *Cyperus*. Counting was not made in the plots treated with the other two weedicides, as no mortality of the weeds was noticed. The mortality counts of the weeds in the plots treated with Dalapon is presented in Table II. The mortality was as high as 86 per cent for the lowest concentration of 5 kg. per hectare. Complete mortality was noticed with a concentration of 20 kg. per hectare; concentrations of 10–15 kg. per hectare gave a mortality rate of 96 per cent. Mortality rate was less than 10 per cent even for the highest concentration of Iso-Cornox. The plots were kept under observation and the regrowth of the weeds was noticed. Only very sparse growth has been seen in the plots treated with Dalapon, and the sprouts were very weak and chlorotic.

TABLE II. EFFECT OF DALAPON ON *CYPERUS ROTUNDUS* L.

Dose	Number observed	Number dead	L.C.L.	% mortality	U.C.L.
Control	200	0	0	..	..
1 kg./hectare	125	0	0	..	..
5 kg./hectare	304	261	82	86	90
10 kg./hectare	211	202	92	96	99
15 kg./hectare	267	256	93	96	99
20 kg./hectare	243	243	99	100	100

CONCLUSION

Hand weeding of *Cyperus rotundus* involves heavy expenditure; there are also the chances of regrowth of the weeds from the bits of stolons left behind. But spraying of some weedicides resulted in a suppression of regrowth of the weeds. The sprouts were very slow in growth, weak, chlorotic, and died very soon. Spraying of Bi-hedenol, Tributon or Dalapon is suggested as a long-range policy for the control of nut-grass.

Where crops of some food value are interplanted with coconut, care should be taken to avoid the drifting of the spray on to the food crops.

SUMMARY

Of the three weedicides—Bi-hedenol, Tributon and Dowpon—tried in the year 1961 for the control of *Cyperus rotundus* L., the first two at concentrations of 13.5 kg. or more per hectare were found to be effective. Out of the six weedicides—IPC, EPC, 2, 4-dinitrophenol, EPTAM, Dalapon and Iso-Cornox—tried in 1962, only Dalapon was found to be effective. This chemical at the concentration of 5 kg. per hectare gave 86 per cent mortality of the weed, and at high concentration of 20 kg. per hectare it gave complete mortality.

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