WEED CONTROL IN ROOT CROPS GROWN IN THE WEST INDIES

— *by* —

L. Kasasian and J. Seeyave

Respectively, Herbicide Agronomist and Assistant Herbicide Agronomist, Regional Research Centre, University of the West Indies.

Chemical weed control in tropical root crops has recently been reviewed by the first author (1), and the results of experiments on dasheen, tannia, yam, sweet potato and cassava carried out in Trinidad up to early 1966 have been reported by Kasasian (2). The purpose of this paper is to report subsequent work and present the results of experiments on other root crops.

SWEET POTATO *(Ipomoea batatas* (L.) Lam.)

Several years' experiments had shown the most promising treatments to be mixtures of amiben with TCA or diphenamid applied immediately after planting slips, or paraquat, (using a spray shield to keep the spray off the crop) when the vines were turned. A screening experiment, using a logarithmic sprayer, carried out early in 1966 suggested that propazine and Glenbar were also promising treatments. Two replicated (x4) yield trials were therefore carried out later in the year and the results are presented in Table I.

Table 1. Tuber yields of sweet potato (cv. 0 49) expressed as % of weedfree controls

Experiment 1

Treatment	Yield	Weeks of weed control
Amiben 1 + TCA 5 lb/ac a. i.	98.5	6
" 1 + diphenamid 2	116.5	8
norea 2	118.3	6
" 4	118.0	8
norea 2 + TCA 5	122.2	9
propazine 2	99.7	6
" 4	96.8	7
" 2 + TCA 5	107.9	9
sindone 4	89.9	5.5
" 2 + propazine 2	117.6	5.5
amiben 1 + " 2	110.0	7
" 1 + norea 2	111.1	5.5
Glenbar 2	118.3	4.5
" 4	110.6	6.5
" 2 + amiben 1	108.1	7
Weed free control	100.0	–
L.S.D. 5%	27.1	
Coefficient of variation	17.4%	

Experiment 2

Treatment	Yield	Weeks of weed control
Amiben 1.5 + TCA 5 lb/ac	82.6	5
propazine 1	62.6	6
" 2	61.5	6
" 1 + TCA 5	63.0	7
" 1 + Amiben 1.5	63.8	9
Weedfree control	100.0	–
Unweeded "	39.2	3
L.S.D. 5%	30.4	
Coefficient of variation	30.0%	

The first trial carried out at the beginning of the wet season showed that propazine 2 + TCA 5 lb/ac, norea 2 + TCA 5 lb/ac, amiben 1 + diphenamid 2 lb/ac and norea 4 lb/ac gave the best weed control without affecting the yield. In the second trial carried out later in the season, propazine proved to be injurious to the vines, in many cases resulting in death of the plant. The difference in tolerance to propazine is thought to be due to the difference in time of application after planting: in the first trial where no damage was observed, application was made three days after planting the slips and in the second, the slips were sprayed the day following planting. This tends to be confirmed by the results of the preliminary trial in which regrowth several months old tolerated up to 8 lb/ac of propazine. It would appear therefore that spraying with propazine either alone or in mixtures should be delayed for a few days following planting.

The weed control requirements of the crop were also studied in a weed competition experiment laid down towards the end of 1966. This was arranged in an 8 x 8 latin square design using cv. 0 49. Table II shows the treatments and results.

Table II. Tuber yields of sweet potato (cv. 0 49) 3½ months after planting

Treatment	Yield	% Weed cover at harvest
Weedfree	100.0	2
One weeding at 3 weeks	81.4*	56
Two weedings at 3 & 6 weeks	86.0	26
Three " " 3, 6 & 9 "	91.5	8
One " " 4 "	82.4*	31
Two " " 4 & 8 "	85.7*	14
Three " " 4, 8 & 12 "	84.5*	3
No weeding	45.4*	99
L.S.D. 5 %	14.8	
Coefficient of variation	17.9%	

It seems therefore that weeding should not be delayed as long as three weeks; at four weeks a permanent set back has been caused. There appears to be little advantage in weeding after the first three to four weeks, hence the yield

reductions on the amiben + TCA plots seem more likely to be due to phytotoxicity than to weed competition and the better results from amiben + diphenamid are probably due more to its greater safety than to the longer period of weed control obtained.

YAMS *(Dioscorea alata* L.*)*

The tolerance of yams to herbicides applied before crop emergence had been demonstrated in several years' trials and was again confirmed in 1966/67 in Jamaica when plots treated with 3 lb/ac diuron and linuron outyielded the controls and plots treated with 3 lb/ac simazine and atrazine gave 99–100 percent of the yield of the weeded control. In Trinidad it had been found that the addition of 5 lb/ac of TCA to the urea or triazine herbicides improved weed control without significantly affecting the yield; in Jamaica, however, it was found to cause a significant reduction in yield without improving weed control. This difference is presumably due to the soil in the Jamaican experiment being much more permeable. A number of newer soil-acting herbicides were screened at the same time and promising results were given by 1 and 2 lb/ac bromacil and terbacil. Yields were unaffected by 4 lb/ac metobromuron but were reduced by fluometuron at 1 or 2 lb/ac. Four months after planting additional plots were given a basally directed spray of 5 or 10 lb/ac dalapon. The yams were not tall enough to escape foliar contamination altogether and this caused some leaf distortion but there was no effect on yield.

In Trinidad two months after an initial pre-emergence application of diuron 3 lb/ac + TCA 5 lb/ac, directed sprays of dalapon 3, 6 & 9 lb/ac and paraquat 0.5 lb/ac were applied. Injury on the lower parts of the vines was greatest with the higher rates of dalapon and least with the lowest rate and with paraquat. The latter treatment caused no loss of yield but non-significant reductions in yield occurred with all rates of dalapon. These trials suggest that paraquat and dalapon might be useful as post-emergence treatments provided the crop is grown on supports and care is taken to keep the spray off the vines as much as possible.

Table III. Root yields of yams 6½ months after planting

Treatment	Yield
Sprayed and kept weedfree	100.0
" not weeded	79.7
Not sprayed, not weeded	37.0*
Sprayed and weeded every month	105.6
" " " " 2 months	81.4
" " " " 3 "	72.6*
L.S.D. 5%	22.7
Coeffiicent of variation	23.7%
Rainfall 1st month	13.35 in.
2nd "	10.00
3rd "	7.74
4th "	6.61
5th "	3.41
6th "	6.70
7th "	2.27

Two weed competition experiments were carried out in 1966/7, one in Trinidad and one in Jamaica. In Trinidad the yams were given an initial pre-emergence spraying with 3 lb/ac diuron + 5 lb/ac TCA and this was followed two months later by the first manual weeding (by hoe). Weeding thereafter was either every month, every two months or every three months. The three controls were either: (1) sprayed and then kept weedfree; (2) sprayed but not weeded; (3) neither sprayed nor weeded — see Table III.

In Jamaica no preliminary spraying was carried out and Table IV shows the treatment and results.

Table IV. Root yields of yams harvested 8 months after planting

Treatment		Yield
Weeding (by hoe) every month		100.0
" " " " 2 months		63.4
" " " " 3 "		34.6*
" after 6 and 12 weeks, then every 3 months		97.8*
No weeding		25.8*
L.S.D. 5%		69.0
Coefficient of variation		58.8%
Rainfall	1st month	9.74 in.
	2nd "	16.17
	3rd "	5.76
	4th "	3.78
	5th "	8.57
	6th "	2.65
	7th "	1.35

It will be seen that in both experiments the complete absence of any weeding resulted in yield reductions of approximately 70%. Where a pre-emergence spraying (in Trinidad) kept the weeds in control for 8 weeks bi-monthly weeding yielded 81% as much as those kept weedfree and 3-monthly weeding 73%; where no pre-emergence herbicide was used (in Jamaica) bi-monthly weeding yielded only 63% as much as those weeded monthly and 3-monthly weeding 35%.

In Trinidad pre-emergence spraying and no weeding yielded as much as spraying and weeding bi-monthly; and in Jamaica weeding at six and twelve weeks and then every three months yielded as much as plots weeded monthly. Taken together both experiments suggest that if yams receive a pre-emergence spraying, which should control the weeds for two to three months, little subsequent weeding would be necessary.

IRISH POTATO *(Solanum tuberosum* L.*)*

In preliminary trials, promising treatments were prometryne, ametryne, linuron, diphenamid, TCA, amiben, monolinuron, pyriclor, metobromuron and norea. The addition of 5 lb/ac of TCA to 1.5 lb/ac of either linuron or prometryne markedly increased the degree of weed control and caused little injury to the crop. Table V gives the results of a replicated (x6) pre-emergence trial.

Table V. Tuber yields of Irish potato (cv. Arka) 3 months after planting

Treatment	Yield	Weeks of Weed Control
Weedfree	100.0	–
linuron 1.5 lb/ac	96.7	7
" 1.5 + TCA 5	92.7	10
prometryne 1.5	101.2	7
" + TCA 5	93.5	9
L.S.D. 5%	25.6	
Coefficient of variation	22.0%	

None of the other compounds gave as good weed control as linuron and prometryne and there appears to be no point in testing them further, except for pyriclor which appears to be fairly promising for the control of *Cyperus rotundus* and might be useful in areas where this weed is prevalent. However, in a pre-emergence trial on cv. Patrones current at the time of writing, pyriclor is having an adverse effect on crop growth whereas terbacil at 1 lb/ac is giving good control of nutgrass without crop injury. Other promising treatments in this trial are 1.5 and 3.0 lb/ac of fluometuron and Ciba 6313 [N-(4-bromo-3-chlorophenyl)-N'-methoxy-N'-methyl urea].

CARROTS (*Daucus carota* L.)

Over 20 experiments have been carried out on carrots (Danvers Half Long and 126) in Trinidad and Jamaica and these have led to the conclusion that the most promising pre-emergence treatments (i.e. those giving the best weed control without crop injury) are prometryne and linuron and the most promising post-emergence treatments are mineral oils and prometryne. In pre-emergence yield experiments prometryne caused no injury at rates up to 2 lb/ac in five trials; linuron caused injury once in the four experiments in which it was applied at 1 and 2 lb/ac (but the one case in which 4 lb/ac was used resulted in injury); amiben was safe at up to 3 lb/ac in three experiments and trifluralin at up to 8 lb/ac in one trial; diphenamid proved injurious at 2 lb/ac and prometone at even 0.5 lb/ac.

Kerosene, TVO and White Spirit have been compared as post-emergence sprays in three yield trials and little difference was found between them either with respect to weed control or crop tolerance. As kerosene is the least expensive, most of the remaining trials with oils were confined to it. In three experiments application was made at 2 or 4 hourly intervals from 06.00 – 18.00 hours — no consistent difference between times was shown and there appeared to be no correlation with relative humidity or temperature.

Post-emergence prometryne has proved non-injurious at up to 2 lb/ac and nitrofen at up to 4 lb/ac; linuron has proved damaging at even 1 lb/ac but in one experiment carrots over 3 in. were not injured wheras smaller ones were. It seems probable that repeated applications of prometryne or nitrofen to prevent weed emergence or, on older carrots, linuron, may well be the answer and this is currently under test.

Carrots have proved to be tolerant of EPTC applied before planting for

nutgrass control and in two recent experiments in Jamaica it was found that only three days need elapse between treatment and sowing.

Numerous other herbicides have been tested pre- and post-emergence in the greenhouse and in the field (see Herbicide Research Unit reports) but the only observations of special interest are the unreliable results with propazine (used commercially in carrots in some parts of the world) and the tolerance exhibited towards Ciba 6313 [N-(4-bromo-3-chlorophenyl)-N'-methoxy-N'-methyl urea] and Ciba 6989 (2, 4'-dinitro-4-trifluoromethyl-diphenylether).

GINGER *(Zingiber officinale* Rosc.*)*

A single preliminary pre-emergence experiment was carried out in 1961 and the results obtained suggested that the crop was fairly tolerant of herbicidal rates of simazine, atrazine, atraton, prometon, ametryne, prometryne, amiben, diuron, neburon, TCA and dalapon but not of fenac.

REFERENCES

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