WEED CONTROL IN TOBACCO

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Summary

As found overseas, tobacco has also proved in New Zealand studies to be a very sensitive crop to most herbicides. Tobacco has exhibited insufficient tolerance to the six triazine compounds so far tested; and the degree of weed control has been rather variable. Of the 16 herbicides field evaluated, tobacco has tolerated post-planting treatments at weed control rates of dichlobenil 2, 3, and 4 lb, diphenamid 4, 8, and 12 lb, PEBC 6 lb, and trifluralin 2 lb. Diphenamid has shown the greatest margin of crop safety but black nightshade (*Solanum nigrum*) has not been satisfactorily controlled. In contrast to dichlobenil, diphenamid appears to have an extended soil residual life, and has seriously reduced subsequent stands of rye-corn, oats and Italian ryegrass (*Lolium multiflorum*).

No differences have been noted between the wettable powder and granular formulations of dichlobenil in their weed control activity and crop safety. Soil incorporation of dichlobenil formulations has not extended its length of weed control. Dichlobenil 2, 3, and 4 lb, diphenamid/trifluralin mixtures 4 + 1 lb and PEBC 4 to 6 lb appear to be treatments worthy of further field test in post-plant applications using efficient surface incorporation devices.

INTRODUCTION

OVER the past six years, the tobacco acreage has been steadily increasing in New Zealand. In 1957-58 a total of 3,260 acres was grown in the Nelson province. This increased to 5,880 acres in the 1963-64 season. With this acreage increase, there has been a much greater labour demand and a more specialized use of machinery for controlling weed growth in the crops. Shortly after planting, rear-mounted mechanical cultivators are used for controlling small seedling weed growth in the row. When the tobacco plants become too advanced, inter-row cultivation is continued with rotary weeder, but these machines do not effectively weed between the plants in the row. Much of this weeding then reverts to the use of hand hoes, which is an expensive and time-consuming operation. Furthermore, it has been suggested that the spread of tobacco mosaic virus may be promoted by the frequent use of cultivation machinery.

The main weed problems in tobacco fall into two categories:

- (a) Annual grasses such as barnyard grass (*Echinochloa crusgalli*) and summer grass (*Digitaria sanguinalis*).
- (b) Annual broadleaf weeds such as fathen (*Chenopodium album*), black nightshade (*Solanum nigrum*), redroot (*Amaranthus hybridus*), redshank (*Polygonum persicaria*), and yellow weed (*Galinsoga parviflora*).

Weeds compete strongly with young tobacco for soil moisture and nutrients. A major loss with even minor weed growth results from a reduction in quality owing to torn leaves at picking.

EXPERIMENTAL

Initial field screening trials in October, 1961, consisted of single row 1/400th acre plots replicated twice. In the 1963-64 season, with fewer potential selective compounds available, the plot size was increased to 1/200th acre, and up to five replications were used per trial.

Treatments were applied topically to freshly transplanted tobacco. Virginia Gold has been the only tobacco variety tested.

All applications of spray materials were applied with an Oxford Precision Sprayer delivering 46 gal of water per acre through 37 solid cone nozzles at 40 lb/sq. in. Granular applications were applied by hand through a perforated shaker. All soil incorporation was carried out immediately after application of the chemicals by raking the surface to disturb the soil completely to a depth of two inches.

The following compounds (expressed in lb active ingredient per acre treated) have been compared in preliminary screening trials: trietazine 1, 2, 4; simazine ½, 1; ipazine ½, 1, 2; G34698 1, 2; simetryne 1, 2; EPTC 3, 6; R1607 3, 6; R2060 3, 6; PEBC (R2061) 3, 6; amiben 2, 3; nitrofen 2, 4; DCPA 2, 4, 8, 10; dichlobenil 2, 3, 4; diphenamid 4, 6, 8, 12; trifluralin 1, 1½, 2, 3.

Amiben and dichlobenil were compared as both granular and spray formulations. All other compounds were applied as sprays. In all trials, PEBC was soil incorporated to a depth of two inches. Soil types varied from alluvial silts to medium black loams. Moisture conditions varied widely, since many of the trials did not experience rain for two or three weeks following treatment. In Trial 3, irrigation immediately followed the application of the materials.

RESULTS AND DISCUSSION

PRE-PLANTING APPLICATIONS

With present mechanical planting methods, pre-planting treatment has not proved to be an entirely satisfactory method of applying herbicides in tobacco. The planting technique often involves the removal of a portion of the topsoil, with consequent dilution of the herbicide by transference from the crop row to the inter-row area.

POST-PLANTING TREATMENTS

Initial screening trials were made in November, 1961, to recently cultivated ground immediately after transplanting the tobacco. Light rain fell within 12 hours of applying the treatments. Assessment of weed control and crop vigour was made three weeks after treatment (Table 1). Broadleaf weeds, which developed in the untreated controls, included black nightshade, redroot, and barnyard grass.

All the high triazine treatments provided almost complete weed control after three weeks, but indicated low tobacco tolerance, especially G34698. Only trietazine provided an acceptable level of weed control without serious crop damage but appeared to have an insufficient margin of safety. DCPA and nitrofen at 4 lb failed to provide adequate weed control and resulted in reduced crop vigour. Both amiben and dichlobenil gave an acceptable control of nightshade and redshank. Amiben 3 lb and dichlobenil 1.4 lb caused a retardation in crop growth, but this was not observed with dichlobenil at the 2.8 lb rate.

TABLE 1: ASSESSMENT AT 3 WEEKS OF TRIAL 1
(November 22, 1961)

<i>Treatment</i> (lb)	<i>Weed Control*</i>	<i>Crop Vigour†</i>
Trietazine 1	6.5	8.5
Trietazine 2	8.0	5.5
G34698 1	8.5	5.0
G34698 2	10.0	2.5
Simetryne 1	5.5	6.5
Simetryne 2	8.0	5.0
Prometryne 1	5.0	6.0
Prometryne 2	9.0	4.0
Amiben 3	9.0	6.5
Nitrofen 2	2.5	8.5
Nitrofen 4	3.5	6.0
DCPA 2	0.5	9.5
DCPA 4	2.5	6.5
Dichlobenil 1.4	8.5	6.5
Dichlobenil 2.8	8.5	9.0
Control	0.5	9.5

* 0 = No control; 10 = Complete weed control.

† 0 = Completely eliminated; 10 = Healthy, no effects.

Trials in 1963 were confined to post-planting treatments of DCPA, dichlobenil, diphenamid, trifluralin and PEBEC.

Trial 2 was sited on a Motueka river silt. No rain fell for 10 days after application, but 3.0 in. fell over the following seven weeks. Broadleaf weed control and crop vigour ratings were made seven weeks after application (Table 2).

TABLE 2: ASSESSMENT AT 7 WEEKS OF TRIAL 2
(November 21, 1963)

<i>Treatment</i> (lb)	<i>Weed Control</i>	<i>Crop Vigour</i>
Dichlobenil 2	6.8	9.1
Dichlobenil 4	8.1	8.7
Dichlobenil*+ 2	6.2	8.7
DCPA 10	6.9	4.9
Trifluralin* 2	4.7	8.0
PEBC* 6	1.3	8.7
Control	2.9	9.0

* Soil incorporated immediately.

The principal weeds present at inspection were fathen, redroot, black nightshade and scented fathen (*Chenopodium* sp.). Under the trial conditions, dichlobenil at 4 lb was the most effective treatment, giving almost complete weed control without visible crop damage. No difference in weed control and crop vigour could be detected between incorporated and non-incorporated dichlobenil at 2 lb. While providing a level of weed control comparable with that of dichlobenil, DCPA at 10 lb caused a serious initial reduction in tobacco growth. The more mature basal leaves were inhibited in lamina expansion and tended to be elongated. However, 13 weeks

after application, the DCPA treatments no longer showed signs of visual damage and were similar in appearance to the plants in the controls. Both trifluralin and PEBC caused no visible effects on the tobacco, but failed to provide acceptable weed control.

Trial 3 laid in New Plymouth on an Egmont loam was designed to compare the efficiency of dichlobenil as a wettable powder and a granular formulation, with diphenamid, DCPA and trifluralin. All treatments were made to freshly transplanted tobacco on weed-free soil. Two hours after treatments were applied, the area was irrigated with 0.5 in. of water. All treatments were assessed for weed control and crop vigour five weeks after application (Table 3).

TABLE 3: ASSESSMENT AT 5 WEEKS OF TRIAL 3
(December 13, 1963)

<i>Treatment (lb)</i>	<i>Weed Control</i>	<i>Crop Vigour</i>
Dichlobenil (wetable powder) 2	9.2	9.3
Dichlobenil (wetable powder) 3	9.4	9.0
Dichlobenil (wetable powder) 4	9.8	8.4
Dichlobenil (granular) 2	9.2	8.8
Dichlobenil (granular) 3	9.7	8.3
Dichlobenil (granular) 4	9.6	8.8
DCPA 10	7.3	8.3
PEBC* 6	7.1	8.5
Trifluralin 2	7.4	9.4
Diphenamid 4	8.6	10.0
Diphenamid 8	9.0	10.0
Diphenamid 12	9.4	10.0
Control	0.8	10.0

* Soil incorporated immediately.

Summer grass and spurrey (*Spergula arvensis*) were the two main weeds present. Dichlobenil treatments effectively controlled these two weeds and no difference was detected between the granular and wettable powder formulations in weed control or tobacco vigour. A high level of weed control was attained with diphenamid without damage to the crop, even with rates up to 12 lb. DCPA, PEBC and trifluralin were not as effective in controlling summer grass or spurrey but seemed to be safe on the crop.

TABLE 4: TREATMENT OF COVER CROPS

<i>Treatment (lb)</i>	<i>Plant Numbers per sq. ft</i>			<i>Crop Vigour*</i>		
	<i>Ryegrass</i>	<i>Oats</i>	<i>Rye-corn</i>	<i>Ryegrass</i>	<i>Oats</i>	<i>Rye-corn</i>
Dichlobenil 2	594	180	126	10	10	10
Dichlobenil 3	756	198	99	10	10	10
Dichlobenil 4	486	234	117	10	10	10
Diphenamid 4	441	144	81	6	5	2
Diphenamid 8	333	108	45	3	2	½
Diphenamid 12	234	63	18	3	1	0

* 10=No effect on crop
0=Crop eliminated

The three rotation cover crops, rye-corn, oats and ryegrass, grown in Nelson following tobacco were sown into diphenamid and dichlobenil treated plots 10 weeks after application. Each plot was rotary-hoed to a depth of 8 in. and the seed sown in rows across the plots. From observations made 11 weeks after sowing (Table 4) it is apparent that dichlobenil showed no residual action toward the three cover crops. Diphenamid was clearly more persistent in the soil towards grasses, as it had severely reduced the numbers of surviving seedlings in all treatments and had restricted their subsequent growth. Ryegrass appears to be the least susceptible to diphenamid, oats intermediate and rye-corn the most susceptible.

CONCLUSIONS

Tobacco appears to be generally quite sensitive to most herbicides and there would seem to be few safe compounds which give an acceptable control of the common Nelson tobacco weeds.

PEBC and trifluralin appear to have some safety toward tobacco, but have given rather variable weed control, probably because of their critical requirements for thorough soil incorporation. Marked reduction in leaf growth has resulted from DCPA at rates required to give satisfactory broadleaf weed control in some trials.

Because of its extended soil life and subsequent effects on germinating rye-corn, which is the major rotation cover crop for Nelson tobacco, diphenamid, except in mixture, can hardly be considered for further field-scale evaluation. Like other Solanaceae weeds, black nightshade, which is a serious problem in some tobacco areas, has shown a high level of tolerance to diphenamid.

The most promising material to date for post planting applications has been dichlobenil. It has shown tobacco tolerance at 4 lb, and down to 2 lb, has given an acceptable control of the more important weeds in Nelson tobacco. No differences have been noted in the level of weed control and subsequent crop growth between granular and sprayable formulations with or without soil incorporation. Dichlobenil appears to be short-lived in the soil and has not caused any apparent reduction in stand of subsequent grass rotation cover crops.

In view of these encouraging results, further large-scale post-planting treatments seem worthy of evaluation next season, comparing granular and sprayable formulations of dichlobenil at 2 to 4 lb with and without soil incorporation. Leaf analyses are needed to determine any effects of dichlobenil treatments on smoking qualities of the tobacco.

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