WEED CONTROL IN FIELD BRASSICAS

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Summary

Yields of turnips, swedes and choumoellier were not reduced by early and late post-emergence applications of nitrofen but turnips suffered a considerable reduction and swedes a slight reduction from picloram treatment at the same times. Combinations of the two materials were slightly less severe than picloram alone. Weed control by a combination of nitrofen and picloram was generally superior to either material separately.

IN CONTRIBUTIONS to the *Proceedings* of the 1964 N.Z. Weed and Pest Control Conference, Mason, A. Thompson and F. B. Thompson described further work with nitrofen and gave results of preliminary testing of the new herbicide, picloram, for weed control in brassica crops. Mason gave trial results which indicated significant advantages in combining low rates of the two materials, particularly in maintaining broad spectrum efficiency against more advanced weed growth. This report gives results of a trial conducted at the Department of Agriculture's Experimental Area, Marton, to compare the two materials separately and in combination at two stages of crop and weed growth. Because the area in which the brassica crops were to be sown was expected to produce only a minor weed infestation, an adjacent area known to be fairly heavily infested with a good variety of weeds was cultivated and prepared in conjunction with the crop sowing and the resulting weed growth treated at the same times as the nearby trial crops.

EXPERIMENTAL

The treatments shown in Tables 1 and 2 were applied as indicated across parallel sowings of turnips (N.Z. Green Globe), swedes (Doon Major) and choumoellier (Medium Stem) drilled on November 3, 1964, and to weeds which came away after a final cultivation on that date. Treatments were applied at two stages of crop and weed growth, designated for convenience of reference as "early" and "late". Early treatments were applied on November 24, 1964, to crops which had 1 to 4 leaves and weeds mainly in the early seedling 1- to 2-leaf stage. Late treatments were applied on December 3, 1964, to crops with 3 to 6 leaves and weeds with 3 to 6 leaves and up to 6 in. high. The area occupied by the brassica crops had a light weed infestation mainly of spurrey (*Spergula arvensis*) with some nightshade (*Solanum nigrum*), redshank (*Polygonum persicaria*) and dock (*Rumex obtusifolius*), while the weed block had a mixture of redshank, redroot (*Amaranthus hybridus*), nightshade, dock, fathen (*Chenopodium album*), hawksbeard (*Crepis capillaris*), spurrey, shepherd's purse (*Capsella bursa-pastoris*), twincress (*Coronopus didymus*) and groundsel (*Senecio vulgare*). Adequate rain in the week after sowing ensured excellent germination and early growth of crops and weeds but conditions became dry with only 0.25 in. rain in the two weeks before early spraying and a

further 0.11 in. between this and the application of late treatments. No effective rain fell in the 24 hours after either application.

Treatments, which are quoted throughout in pounds or ounces active ingredient per acre, were applied in 30 gal of water per acre, in randomized blocks replicated four times.

RESULTS

All crops were sampled during April, 1965, and plant numbers, bulb and leaf weights recorded. Because of limited space, total green yield data only are given in Table 1. No treatment had any appreciable effect on plant numbers and these are not given. The yields reflect the sensitivity of the slower growing choumoellier to the relatively slight competition, mainly in the early stages, from spurrey where it was not adequately controlled. Turnips and swedes, because of their more vigorous and spreading growth, were able to dominate the weed and suffered little from competition. The effect of treatments on weed growth was assessed 6 to 7 weeks after treatment and results are given in Table 2.

TABLE 1: RELATIVE GREEN YIELD OF TURNIP, SWEDE AND CHOUMOELLIER

Treatment	*Turnips*		*Swede*		*Choumoellier*	
	Early	*Late*	*Early*	*Late*	*Early*	*Late*
Nitrofen 1 lb	103	—	108	—	107	—
Nitrofen 2 lb	104	101	104	115	111	112
Nitrofen 3 lb	—	102	—	115	—	130
Nitrofen 1 lb/Picloram ¾ oz	77	87	98	100	117	115
Nitrofen 1 lb/Picloram 1½ oz	74	81	100	100	127	121
Nitrofen 2 lb/Picloram ¾ oz	79	87	104	104	119	123
Nitrofen 2 lb/Picloram 1½ oz	73	90	100	104	128	131
Nitrofen 3 lb/Picloram ¾ oz	—	92	—	107	—	129
Picloram ¾ oz	70	74	95	94	107	111
Picloram 1½ oz	67	66	93	93	118	113
Picloram 2½ oz	—	66	—	82	—	117
Control	100		100		100	
Control yields (tons/ac)	38.1		36.9		26.4	

Nitrofen 3 lb, nitrofen 3 lb/picloram ¾ oz, and picloram 2½ oz were not applied at the early stage, and nitrofen 1 lb was not applied at the late stage.

Crop Tolerance

The high degree of crop tolerance to nitrofen was confirmed. Even at 3 lb there was little apparent effect on the crops apart from the short-lived initial distortion and scorching of the foliage. The visual effects of picloram were slight and mainly confined to the characteristic cupping of turnip and swede foliage at the higher rates. Turnip bulbs were deformed, particularly by the early treatments, and bulb size reduced by all rates. Swedes were fairly free from deformity but bulb size was reduced. There was little apparent effect on choumoellier. Most treatments, picloram more than nitrofen, but particularly mixtures of the two, caused an increase in leaf yield at the expense of bulb production. Turnip and swede yield data indicate that these crops were more severely affected by picloram applied alone than in combination with nitro-

TABLE 2: WEED CONTROL ASSESSMENTS — PER CENT. REDUCTION

Treatment (per acre)	Early application — November 24, 1964							Late application — December 3, 1964						
	Red-shank	*Spurrey*	*Night-shade*	*Hawks-beard*	*Red-root*	*Dock*	*Fathen*	*Red-shank*	*Spurrey*	*Night-shade*	*Hawks-beard*	*Red-root*	*Dock*	*Fathen*
Nitrofen 1 lb	90	10	90	0	70	90	90	—	—	—	—	—	—	—
Nitrofen 2 lb	95	30	100	0	90	95	95	40	10	60	0	50	95	50
Nitrofen 3 lb	—	—	—	—	—	—	—	50	40	80	0	60	100	70
Nitrofen 1 lb/Picloram ¾ oz	80	40	100	90	70	95	100	50	30	100	90	60	90	100
Nitrofen 1 lb/Picloram 1½ oz	90	70	100	95	90	100	100	80	60	100	95	80	100	100
Nitrofen 2 lb/Picloram ¾ oz	95	40	100	90	75	100	100	70	30	100	90	60	100	100
Nitrofen 2 lb/Picloram 1½ oz	100	70	100	95	90	100	100	90	60	100	95	90	100	100
Nitrofen 3 lb/Picloram ¾ oz	—	—	—	—	—	—	—	90	50	100	90	90	100	100
Picloram ¾ oz	20	20	95	90	60	80	100	10	20	95	90	50	75	100
Picloram 1½ oz	30	60	100	95	80	95	100	30	50	100	95	70	90	100
Picloram 2½ oz	—	—	—	—	—	—	—	80	80	100	100	90	100	100
Control	0	0	0	0	0	0	0	0	0	0	0	0	0	0

fen, and that the adverse effect of the picloram was diminished by increasing the amount of nitrofen in the mixture. This suggests that the physiological changes in the brassica leaf which are brought about by nitrofen, and which persist for 3 to 4 weeks after treatment, have the effect of reducing absorption of picloram.

Weed Control

No treatment gave any control of shepherd's nurse, twincress or groundsel but these are not usually serious competitors with brassica crops.

Nitrofen was generally ineffective against spurrey and hawksbeard, so that early treatments of this material on the non-cropped section became infested with these and the other resistant species mentioned above, which, by smothering, probably contributed to the generally good control of nitrofen-sensitive weeds. By the time of the late treatment, most weeds had developed considerable resistance to nitrofen and even at 3 lb only dock and nightshade were adequately controlled.

Picloram applied alone at the lower rates initially retarded redshank, but in the absence of crop competition was unable to control it. Most other weeds, except spurrey and the resistant species mentioned above, were adequately controlled at both times of treatment and would have given little trouble in the presence of a vigorous crop. At 2½ oz picloram control of all the more highly competitive weeds was good to excellent.

The principal benefit from adding picloram to nitrofen at the early treatment stage was an improvement in spurrey control and near elimination of hawksbeard. For most other species, the improvement over nitrofen alone at this time was negligible. At the late treatment stage, when most species had become resistant to nitrofen, the advantages of adding picloram were more apparent, with control of redshank, and to a less extent spurrey and redroot, superior to that achieved by either material alone.

DISCUSSION

Although nitrofen is a comparatively recent introduction to New Zealand, a great deal of information on its use in brassica crops has been accumulated. It is recognized as a material which is very well tolerated by all the common field brassicas and which, if correctly used at 1½ to 2 lb, will give adequate control of most of the important annual weeds of these crops. Its major weakness is the rapidity with which weeds become resistant, creating a need for fairly precise timing if application within the economical 1½ to 2 lb range is to be successful. This point is clearly illustrated by results from this trial where 1 lb applied at the correct stage gave better weed control than 3 lb applied 9 days later.

Because less experimental evidence is available, the position with picloram is not so clear, but it now seems a rather less complete answer to the outstanding brassica weed problems than it did a year ago. At the low rates of 1 to 1½ oz, which the fear of undesirable soil residues, and the limited tolerance of the root brassicas, particularly turnips, seems to dictate, failure to control redshank, spurrey and, at the late stage, redroot renders low rates of picloram alone of limited value where these weeds are dominant. However, where quantities of 2 oz or more can be used, very good weed control results.

The combination of nitrofen and picloram increased the range of weed control beyond that achieved by either material separately

with no evidence of increased effect on the crops, but the main advantage of the combination was obtained when weeds had advanced beyond the stage for effective control by nitrofen alone.

ACKNOWLEDGEMENTS

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REFERENCES

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