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Research Note

HERBICIDES FOR BUCKWHEAT

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SUMMARY

A comprehensive screening programme suggested a small number of herbicides for use in buckwheat (*Fagopyrum esculentum*, Moench = *F. sagittatum*, Gilib). The best tolerated herbicides were alachlor, chlorthal-dimethyl and ethofumesate applied before emergence and alloxym-sodium and diclofop-methyl applied after crop emergence.

INTRODUCTION

Buckwheat originated in central China and is now grown mainly in Canada, USSR and Poland (Lustenberger *et al* 1975). Japan is a major importer of the grain for noodle production and there is current New Zealand interest in supplying this market.

Occasional earlier attempts to grow the crop, mainly in Canterbury, were usually abandoned as a result of weed problems (J.H.B. Butler, pers comm). Apart from non-residual pre-emergence treatments there is scant literature on suitable herbicides. Growers' bulletins (e.g. Campbell and Gubbels 1972 in Canada) stress the value of sound cultural practices to encourage a strong weed-smothering effect.

This paper describes a glasshouse and field screening programme aimed at developing selective herbicide treatments for the crop.

METHODS AND MATERIALS

In a series of glasshouse pot experiments, buckwheat seeds were sown, five in each 7.5 or 10 cm pot, containing loam and coarse sand in a 5:2 mixture. A wide range of herbicides was applied pre- and post-emergence, each at two rates. Herbicides were sprayed at 138 kPa in 410 litres/ha using a single fan nozzle mounted on a travelling overhead carrier in a laboratory spray booth. For soil incorporated treatments, the soil was thoroughly shaken in plastic bags after spraying before re-potting and sowing. Other pre-emergence treatments were applied to the soil surface immediately after sowing and post-emergence treatments were applied at the seedling 2-3 true leaf stage.

Field trials were sown in four-row plots 6 m long with rows spaced 30 cm apart. Herbicides were applied with a modified Oxford Precision Sprayer at 200 kPa in 350 litres/ha. Pre-emergence treatments were applied immediately after sowing and post-emergence treatments applied at the 3-4 true leaf stage.

The glasshouse experiments and the early field experiments were basically screening tests. Often herbicide effects were severe and clear-cut and simply recorded as plant mortality. Otherwise, assessments of plant vigour were made using a 0 to 10 scoring system as follows:

0-4	severe damage
5-6	stunted growth
7-8	slight vigour reduction
9-10	little or no effect

In one field trial fresh weights of plants were taken at maturity.

RESULTS

Pre-sowing, soil-incorporated treatments.

All soil-incorporated herbicides, namely butylate, cycloate, dinitramine, EPTC,

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napropamide, pendimethalin and trifluralin severely affected seed germination in a pot experiment. Butylate was least damaging but none of the treatments were considered worth testing in the field.

Pre-emergence treatments, surface applied.

Although there was some inconsistency between tests, chlormethazole, chloroxuron and metribuzin could be clearly discarded. The remaining herbicide treatments, listed in Table 1 are those which usually caused only a small effect on the plants. The higher rate is included if possible as this is likely to provide better weed control. Alachlor, chorthal-dimethyl and ethofumesate can be selected as the best tolerated pre-emergence herbicides.

TABLE 1: pre-emergence herbicide screening tests. Buckwheat plant vigour scores* on promising treatments 2½ weeks after application.

Herbicide	Rate kg/ha	Glasshouse		Rate kg/ha	Field
		first test	second test		
alachlor	1.8	5.5	7.0	1.8	8.0
chlorthal-dimethyl	7.5	7.0	7.0	9.0	8.0
diphenamid	4.5	6.5	6.0	6.0	8.5
diuron	0.8	7.5	-	0.8	7.0
ethofumesate	1.8	8.5	7.0	2.1	8.5
lenacil	0.8	7.5	-	0.8	8.5
metolachlor	1.2	-	7.0	1.2	8.5
prometryn	0.8	7.0	7.0	0.8	7.5
propachlor	4.5	6.0	-	4.0	6.5

* see text.

Post-emergence treatments

When applied to the foliage, the following herbicides caused severe damage: aziprotryne, bentazone, phenmedipham/desmedipham, desmetryn, linuron, metamitron, methabenzthiazuron and metribuzin.

A few herbicide treatments, listed in Table 2, were tolerated in glasshouse tests. In the field carbetamide and chlormethazole caused severe damage. If these are discarded then those remaining are alloxydim-sodium, diclofop-methyl, 2,2-DPA and ethofumesate, although the latter two are doubtful. In a field comparison alloxydim-sodium was slightly safer than diclofop-methyl (Table 3).

DISCUSSION

This comprehensive evaluation has confirmed that buckwheat is sensitive to many herbicides. None of the soil-incorporated materials were tolerated and only two grass-killers were safe applied after emergence. Thus, general herbicide treatments can only

TABLE 2: Post-emergence herbicide screening tests. Buckwheat plant vigour scores* on promising treatments, 7-10 days after application.

Herbicide	Rate kg/ha	Glasshouse			Field
		first test	second test	third test	
alloxydim-sodium	1.2	-	-	8.0	8.5
carbetamide	2.4	5.0	6.5	6.0	severe damage
chlormethazole	0.8	6.0	6.5	5.5	severe damage
2,2-DPA	6.0	4.5	4.5	4.5	5.5
diclofop-methyl	1.2	4.5	6.0	5.5	6.0
ethofumesate	1.2	6.0	6.5	6.5	3.5

* see text.

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TABLE 3: Tolerance of buckwheat to post-emergence applications of alloxydim-sodium and diclofop-methyl

Herbicide	Rate kg/ha	Fresh weights of mature plants, g/m ²
alloxydim-sodium	1.0	877
alloxydim-sodium	1.5	962
diclofop-methyl	1.0	859
diclofop-methyl	1.5	804
untreated		992
LSD (5%)		115

be considered after sowing and before emergence of the crop. There were a few candidate herbicides in this category — alachlor, chlorthal-dimethyl and ethofumesate — and a further few which could be used if confined to low doses — diuron, lenacil, metolachlor and prometryn.

There were some differences in severity of effect between the glasshouse and field and caution is needed when applying these results to further field work. Mixtures of pre-emergence herbicides are worth trying although in our experience some potentially effective mixtures, for example alachlor plus ethofumesate, reduce crop tolerance. We have also found that treatment with ethofumesate reduces the safety of some subsequent pesticide treatments.

The usual requirement of favourable soil conditions for activation will apply if any of these herbicides are to be adopted. Similar conditions will also favour vigorous early crop growth which is probably still the most important prerequisite for weed control of this crop.

REFERENCES

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