WEED CONTROL IN LINSEED

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Summary

Since MCPA became the accepted treatment for weeds in linseed, problems which remained have been spurrey (*Spergula arvensis*) and, to a growing extent, members of the Polygonaceae family.

Crop tolerance appears to be greatest in the early stage of growth and 2,4-DB applied then gave reasonable weed control. Linuron and an unnamed triazine gave excellent spurrey control and satisfactory control of polygonaceous species, while appearing to exhibit reasonable crop tolerance.

Dicamba and picloram in mixtures with MCPA gave good control of polygonaceous species but crop tolerance and soil residue need further investigation.

INTRODUCTION

MANY YEARS have passed since a paper on weed control in linseed was presented at a Conference of this organization. The reason could hardly be that no problem existed, for uncontrolled spurrey (*Spergula arvensis*) has constantly plagued linseed growers. The situation has, in fact, been that for 15 of the past 20 years no control could be offered for spurrey, and the other major weeds of linseed were reasonably well controlled by the use of MCPA.

Over recent years, however, weeds resistant to MCPA have increased to the stage, on heavy land at least, where it no longer gave acceptable weed control.

In 1962, therefore, a series of trials was begun in search of alternative treatments to meet the problem which had developed. Throughout the paper, rates of herbicides are expressed in terms of lb active ingredient per acre, and the yields in cwt per acre. The linseed variety was Redwood, and the volume of water used in spraying was 20 gal per acre unless otherwise stated.

WEED PROBLEM

Spurrey, of course, remained as the major weed of linseed in the cool humid regions. On heavy soils, members of the Polygonaceae had become the main problem. These included redshank (*Polygonum persicaria*), cornbind (*P. convolvulus*) and wireweed (*P. aviculare*). Spurrey had generally increased and the other species which were becoming more prominent were field pansy (*Viola arvensis*) and scarlet pimpernel (*Anagallis arvensis*). The last of these is not yet a major weed but its resistance to conventional treatments suggests that it could grow in importance.

Fathen (*Chenopodium album*) and wild turnip (*Brassica campestris*) of course remain as weeds which must still be controlled.

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EXPERIMENTAL WORK

1962

Treatments set out in Table 1 were applied on November 13, 1962, to a crop 8 in. tall and heavily infested with cornbind up to 4 in. tall. Other weeds present were redshank and wireweed. Here the volume of water used was 14 gal per acre except for monochloroacetic acid and the two dinoseb treatments which were applied in 40 gal per acre.

Assessment of weed control was made on a 0 to 10 scale and represents the general level of weed control attained, bearing in mind the relative importance of each species present. A score of less than 6 on the weed control scale indicates a level of weed control which would not be acceptable in practice. This is true of all weed control assessments given throughout the paper.

TABLE 1: TREATMENTS, 1962

Treatment (lb)	Yield (cwt/acre)	Weed Control (0-10)
Control	13.4 abA	—
2,4-D (amine) 1.0	15.2 aA	8
MCPA 0.75/2,3,6-TBA 0.225	7.6 cB	7½
2,4-D (amine) 0.5	13.2 abA	6½
2,4-DB 1.5	13.6 abA	6½
MCPA 1.25	13.5 abA	6
2,4-DB 1.0	13.7 abA	6
Monochloroacetic acid 10.2	11.2 bAB	6
MCPA 0.75	13.1 abA	5
Dinoseb (amine) 1.4	11.8 bA	3
Dinoseb (ammonium) 1.0	11.3 bAB	2

1963

Trial A—Stages of Growth

Treatments set out in Table 4 were applied at three stages of growth. This was principally a crop-tolerance trial but sufficient weeds were present to allow assessment of weed control to be made as well.

The crop was drilled on October 15 and applications were made 21, 59 and 67 days later. In Table 2 are listed the stage of growth of the crop and weed species at each time of treatment.

TABLE 2: STAGE OF GROWTH WHEN TREATED, TRIAL A, 1963

Species	21 days	59 days	67 days
Linseed	1 in. tall	early bud	10% flowering
Cornbind	one true leaf	4 to 6 in. tall	6 to 8 in. tall
Redshank	cotyledon	8 to 10 in. tall	8 to 10 in. flowering
Wireweed	cotyledon	up to 10 in. diam.	up to 12 in. diam.
Fathen	cotyledon	9 in. tall	10 in. tall
Spurrey	½ in. tall	7 to 10 in. tall	8 to 10 in. bud
Field Pansy	cotyledon	3 to 4 in. tall	3 to 6 in. bud

Trial A—Yields

Treatment at the three stages of growth gave yields which appear in Table 3. Comparison at each stage of growth must be made with its own untreated control and not between one stage of growth and another.

TABLE 3: YIELDS, TRIAL A, 1963

Treatment (lb)	21 days	Yields (cwt/acre)	
		59 days	67 days
Control	18.8 abA	14.7 aA	15.4 aA
2,4-D (amine) 1.0	18.8 abA	11.9 bcAB	9.2 cC
2,4-D (amine) 0.5	18.3 abA	11.9 bcAB	11.5 bcBC
2,4-DB 1.5	15.1 bA	11.8 bcAB	12.6 bABC
MCPA 1.5	20.8 aA	10.7 cB	11.4 bcBC
2,4-DB 0.75	16.5 abA	13.5 abAB	14.0 abAB
MCPA 0.75	17.3 abA	11.0 cB	12.3 bABC

Trial A—Weed Control

Figures listed in Table 4 indicate the general level of weed control attained by each treatment at each stage of growth.

Cornbind and redshank were the principal weeds so scores were determined largely by results on these species. Had wireweed been the predominant weed no treatment would have given an acceptable result.

TABLE 4: LEVELS OF WEED CONTROL, TRIAL A, 1963

Treatment (lb)	21 days	59 days	67 days
2,4-D (amine) 1.0	8	7	7
2,4-D (amine) 0.5	7	5	4½
2,4-DB 1.5	6	6	6
MCPA 1.5	5½	6	5½
2,4-DB 0.75	5	4	5
MCPA 0.75	4	4½	4

Trial B

A range of newer materials was tested at rates set out in Table 5. The triazines (prometryne and the 2-chloro compound G 34,698) were applied 21 days, and the other treatments 59 days, after drilling. The weed species and their stage of growth when treated correspond to the stages set out in Table 2.

TABLE 5: TREATMENTS, TRIAL B, 1963

Treatment (lb)	Yields (cwt/acre)	Weed Control (0-10)
Control	14.0 abcAB	—
G 34,698 1.6	16.4 aA	9
G 34,698 0.8	15.9 aAB	8
Prometryne 1.6	14.4 abcAB	8
Prometryne 0.8	13.8 abcAB	6
Dicamba 0.125	11.6 bcB	5½
Prometryne 0.4	15.1 aAB	5
G 34,698 0.4	14.8 abAB	5
Dicamba 0.25	14.1 abcAB	4
Mecoprop 1.5	7.1 dC	3
Mecoprop 0.75	11.3 cB	2

Trial C

The remaining drilled plots on this area were used 59 days after drilling to apply the treatments set out in Table 6.

TABLE 6: TREATMENTS, TRIAL C, 1963

Treatment (lb)	Yields (cwt/acre)	Weed Control (0-10)
Control	13.7 abA	—
G 34,698 0.8	13.6 abA	8
Linuron 0.5	13.6 abA	5½
Prometryne 1.0	12.9 abA	5½
MB8882 2.0	13.6 abA	5
Prometryne 0.5	12.1 bA	4½
MB8882 1.0	15.1 aA	4
Linuron 0.25	12.4 abA	4
MB9057 1.0	13.2 abA	0

Trial D

On an area near Mayfield where spurrey is the predominant weed of linseed, the treatments set out in Table 7 were applied. All were pre-emergence treatments except prometryne 0.75 lb which was applied 27 days after drilling when the crop was 2 to 2½ in. tall and the spurrey ½ to ¾ in. tall.

Yields were taken but as the crop had suffered bird damage and yield figures varied only slightly they are not quoted.

TABLE 7: TREATMENTS, TRIAL D, 1963

Treatment (lb)	Spurrey Control
Prometryne 0.75 (post-em)	10
Chloroprotham 1.5	9
Prometryne 1.0 (pre-em)	7½
Chloroprotham 1.0	5½
Chloroprotham 0.5	2

1964

Trial A

Plots drilled on September 29, 1964, were treated with the materials set out in Table 8, the triazines and linuron being applied 28 days after drilling, and the remainder 16 days later. Stages of growth set out in Table 2 are a guide to the stage of weeds and crop at these times.

The weed population suffered strong competition from a vigorous crop, the main species in descending order of density being red-shank, scarlet pimpernel, and fathen.

TABLE 8: TREATMENTS, TRIAL A, 1964

<i>Treatment (lb)</i>	<i>Yields (cwt/acre)</i>	<i>General Weed Control</i>
Control	29.0 aABC	—
MCPA 0.75/Dicamba 0.1	28.2 abcABC	9
Linuron 1.0	29.6 aAB	9
MCPA 0.75/Picloram 0.1	25.3 cdCD	9
2,4-D (amine) 1.0	23.5 dDE	8
2,4-DB 2.0	28.6 abABC	8
2,4-D (amine) 0.5	25.6 bcdBCD	7½
Picloram 0.1	23.6 dD	7½
Linuron 0.5	28.4 abABC	7
Dicamba 0.1	29.8 aAB	5½
MCPA 0.75	29.8 aAB	5½
2,4-DB 1.0	30.0 aA	5½
Prometryne 0.5	28.9 aABC	4
G 34,698 1.0	28.7 abABC	3
G 34,698 0.5	29.7 aAB	2
Prometryne 1.0	19.8 eE	1

Trial B

On November 23, 1964, treatments listed in Table 9 were applied to a linseed crop 1½ to 2 in. tall, heavily infested with spurrey ½ to 1 in. tall. There was also enough redshank and cornbind present to assess control of these species too.

TABLE 9: TREATMENTS, TRIAL B, 1964

<i>Treatment (lb)</i>	<i>Yields (cwt/acre)</i>	<i>Weed Control</i>
Control	15.1 bAB	—
Linuron 1.0	19.2 aA	10
Linuron 0.5	18.7 abA	8
Prometryne 0.5	17.7 abA	7
Linuron 0.25	16.7 abA	5
Prometryne 0.25	18.2 abA	5
Prometryne 1.0	11.4 cB	3

DISCUSSION

In presenting results, treatments are tabulated in order of efficiency in weed control. If proof were needed that MCPA at 0.75 lb per acre was no longer satisfactory, it is found in the lowly position occupied by this treatment in the tables.

Data from the 1962 trial suggested 2,4-D amine and 2,4-DB as worthy of further trial. Both rates of 2,4-D caused severe initial distortion but yields, surprisingly, were not reduced. The two dinoseb compounds were at a disadvantage with respect to weed control, being applied at a relatively late stage of growth. Their yields, however, were lower than control, though not significantly so. Monochloroacetic acid gave reasonable weed control in the absence of fathen and a yield similar to dinoseb.

In 1963, MCPA, 2,4-D and 2,4-DB were applied at three stages of growth. Except at the earliest stage of growth, all treatments

which gave satisfactory control of the polygonaceous weeds also caused a reduction in yield. Although no direct comparison was made between stages of growth, crop tolerance to phenoxyacetic compounds at least is greater at the young stage of growth.

Among the newer materials tested in 1963, the triazines prometryne and G 34,698 stood out while linuron (applied rather late) and dicamba at low rates looked promising. A feature of the year's results was excellent spurrey control. This was also achieved with chlorpropham pre-emergence but a treatment more versatile regarding weed spectrum and condition governing herbicide activity would be preferred.

After exhibiting satisfactory crop tolerance in 1963, prometryne, owing possibly to a changed formulation, caused severe crop damage in 1964. G 34,698 retained the crop tolerance shown in 1963, but, because of its failure to control fathen at rates used, scored poorly on weed control.

While giving good weed control, 2,4-D amine confirmed a hint from the previous year that a weakening of the stem could lead to collapse of the crop. Yields from 2,4-D amine were also significantly lower than untreated control. At 2 lb, 2,4-DB gave good weed control and no yield reduction. Redshank seems more susceptible to 2,4-DB than cornbind, the opposite being the case with MCPA.

Linuron, applied early, gave excellent weed control without loss of yield. Spurrey is particularly susceptible. The 1964 trials marked the first appearance in the series of picloram and of dicamba mixed with MCPA. Mixed with MCPA, both gave excellent weed control, dicamba in particular being improved by the addition of MCPA. Dicamba alone and as the mixture caused no yield reduction, but the reverse was true of picloram.

The "break" in stem fibre associated with the use of "hormone" type herbicides has presented a problem in linen flax production. The absence of the characteristic stem distortion where linuron and the triazines were used suggests that fibre "break" might be avoided by their use.

The question of costs must arise when a change in weed control practice is envisaged. Any change is likely to mean an increase over MCPA; in fact, the use of linuron or a triazine would probably treble the cost of herbicide. Against this, of course, must be set the facts that MCPA is no longer effective and that some compensating increase in yield could be forthcoming.

CONCLUSION

Some alternative to MCPA is needed for most linseed-growing districts. If the new treatment would control spurrey, this would be a great advantage.

Except for control of wireweed, 2,4-DB at 1.5 to 2 lb gave reasonable results where spurrey was no problem and where application was made when the crop was 1 to 2 in. tall. This could be a useful treatment where pasture species were undersown.

Where no undersowing is involved, linuron appears most promising. Its effectiveness against spurrey at quite low rates could make its use on the moderately-yielding crops of the spurrey districts quite economical. The place of the triazines, prometryne and G 34,698 is uncertain, but the latter at least is worthy of further testing on linseed.

Mixtures of dicamba and picloram with phenoxyacetic compounds require further testing. Where herbicides have a long residual life in the soil, this aspect of crop tolerance must also be given attention.

In the case of picloram at least, this is the subject of a separate study.

The cost structure of the linseed-growing and processing industry might leave little room for increased cost of production. However, any increase might be partially off-set by greater purity of seed and some increase in yield.

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