BRASSICA WEED CONTROL

By S. N. DAWES, Department of Agriculture, Wellington

SUMMARY

In brassicas weed control is not very successful. The most effective weedkillers are pre-emergence chemicals. Of these TCA and oktone are the most reliable. TCA at rates up to 30lb. per acre in swedes and 20lb. in other brassicas under the correct moisture conditions gives reasonable results without adverse effect on germination. Oktone in quick-establishing crops (rape and chou moellier) in a suitable carrier is a valuable weedkiller if applied to weeds that have already germinated. As for all pre-emergence chemicals these materials must be regarded as stop-gap treatments until more suitable chemicals are available. One other method of weed control, direct drilling of crops into chemically killed turf, has given promising results.

Between 700,000 and 800,000 acres of brassicas are grown as fodder crops in New Zealand each year. Their importance to both dairy and sheep farming is well known. Control of weeds is one important problem in the growing of these crops. If more effective weed control was possible, it might well stimulate the growing of an increased acreage of brassicas. Chemicals offer a possible means of achieving this.

CHEMICAL WEED CONTROL

No post-emergence weedkillers so far tested have proved sufficiently selective for general use in weed control in brassicas. Most hormone weedkillers, for instance, are too severe on them. It is therefore necessary to resort to pre-emergence weed control.

PRE-EMERGENCE WEED CONTROL

I propose to review the trials carried out by the Extension Division, Department of Agriculture, with pre-emergence chemicals on brassicas. Unfortunately yield data are not available from this year's trials, but the effectiveness of treatments has been judged. Trials have been conducted on the following crops: swedes, turnips, rape, and chou moellier. I will consider the results obtained on each crop separately.

1. SWEDES

(a) TCA

Eighteen trials have been conducted with TCA; 15 replicated trials and 3 observational. Of the 15 replicated trials there are yield data available from 7. In one of these 7 trials with TCA at 10lb. and 20lb. per acre both treatments gave yields significantly greater than the hand-weeded control. The main weed was redroot (*Amaranthus retroflexus*). Two other trials with rates of 10lb. and 30lb. and 10lb. and 20lb. respectively gave yields significantly higher than the control (not hand weeded) for all treatments. Rates of 5lb., 10lb., and 20lb. in another trial gave yields higher though not significantly so than the control. In these 3 trials the main weeds were spurrey (*Spergula arvensis*) and fat-hen (*Chenopodium album*).

The weeds in the other 3 trials for which yield data are available were so scattered that there was no difference between the control and the hand-weeded control.

In 6 of the remaining trials (where yield data are not yet available) with rates of 10lb. and 20lb. of TCA per acre, spurrey and fat-hen, the main weeds, were suppressed, especially at the 20lb. rate. Lack of rain following the application of the TCA probably caused the failure of 4 trials.

These results show that TCA may be used at rates up to 30lb. per acre with probably no adverse effect on swedes. Low rates of 10lb. to 20lb. are effective for the control of most *Polygonum* and *Amaranthus* species. Rates over 20lb. per acre are probably necessary for the effective control of spurrey and fat-hen, especially on colloidal soil types. In fact, wherever spurrey and fat-hen form part of the weed population high rates of TCA are necessary or these species will become dominant when the other weeds are killed off.

(b) Propham

Nine trials have been conducted; 8 replicated and 1 observational. Of the 8 replicated trials yield data are available from 4. In one of these trials with rates of 1lb., 2lb., and 4lb. of propham per acre all treatments gave no significant difference in yield from the control. Conditions were very dry after the application of these treatments and much of the propham was no doubt volatilised.

In the 3 other trials rates of 2lb. and 4lb. per acre gave yields significantly lower than the controls.

In the five remaining trials with rates of 1lb., 2lb., and 4lb. the high rates (especially 4lb.) gave good control of spurrey and fat-hen, but in all cases germination of swedes was reduced and severely so in the 2lb. and 4lb. rates of propham.

From these trials it is evident that only rates of up to 1lb. per acre of propham can be used on swedes under cool soil conditions, though probably still with some reduction in germination. At these rates spurrey and fat-hen are only checked.

(c) CIPC

Eight trials have been carried out; 4 replicated and 4 observational. Yield data are available from one trial. The yield in this trial with one rate of 1lb. was not significantly different from the control, but was significantly lower than the hand-weeded control.

In 3 of the remaining trials with rates of $\frac{1}{2}$ lb. to 4lb. CIPC per acre germination of the swedes was reduced at all rates, though spurrey and fat-hen were controlled, especially at the higher rates.

Two other trials with rates of 1lb. showed no reduction in germination and excellent control of spurrey.

The remaining trial contained only one weed, Californian thistle (*Cirsium arvense*) and this was not affected by CIPC. Under cool soil conditions CIPC at rates up to 1lb. per acre can give good control of weeds without effecting germination of swedes. More work is required, however, to determine when it is safe to use CIPC.

(d) Oktone

Ten trials have been conducted; 8 replicated and 2 observational. Six of the replicated trials have yield data available.

In one of these trials at rates of 2lb. and 4lb. per acre both treatments gave significantly greater yields than the hand-weeded control. The main weed was redroot.

Two other trials with rates of 2lb. and 4lb. gave yields significantly greater than the control but significantly less than the hand-weeded control.

In the 3 other trials from which yield data are available very few weeds were present and there was no significant difference between the control and the hand-weeded control.

The four remaining trials also had rates of 2lb. and 4lb. of oktone, which initially checked spurrey and fat-hen, but they finally recovered and competed with the crop.

Oktone has no residual life and is therefore of little value in weed control in swedes.

2. TURNIPS

(a) TCA

Six trials have been conducted; 5 were observational trials. Yield data are available from the other trial, which had treatments of 10lb. and 20lb. per acre of TCA. There was no significant difference in yields from the control. Initial weed control was good, but the crop established very slowly and fat-hen dominated the crop.

The rates of TCA in the other 5 trials were also 10lb. and 20lb. per acre. In one trial there was good control of redroot, especially at the 20lb. rate, and in 2 other trials there was initially good control of weeds. The crops, however, were poor and patchy and once the residual life of the TCA wore off, in one case redroot and in the other spurrey competed strongly with the crop.

Weed control in the other 2 trials failed due to lack of rain after application of the TCA.

TCA did not affect germination of the turnips in any of the trials. Turnips will tolerate 20lb. of TCA. This will control redroot, but only check spurrey and fat-hen.

(b) Propham

Two observational trials have been carried out with propham. In one trial with rates of 1lb. and 4lb. per acre of propham under very dry conditions the strike of the crop was not affected and weed control was poor. No doubt much of the propham was lost by volatilisation. Similarly, in the other trial with rates of 2lb. and 4lb. conditions were very dry and control of weeds was poor, but the crop also appeared to be retarded, especially at the 4lb. rate.

(c) CIPC

Two observational trials have been conducted. In one using 1lb. and 3lb. per acre of CIPC, under very dry conditions, there appeared to be no germination injury, but poor weed control also.

The second trial with rates of 2lb. and 4lb. gave reasonable control of weeds, but the crop was virtually destroyed.

(d) Oktone

Three trials have been carried out; 2 observational and 1 trial from which yield data are available. The treatment in this trial was 4lb. per acre of oktone, and there was no significant difference in yield from the control. The initial control of weeds was good, but the crop established very slowly and fat-hen and twin cress (*Coronopus didymus*) competed with the crop.

In the 2 other trials rates of 2lb. and 4lb. of oktone again gave initially good weed control, but the weeds later smothered the crop.

Oktone is of little value in turnips.

3. RAPE

(a) TCA

Six trials, 3 observational and 3 replicated, have been carried out. Yield data are available from 2 of the latter trials.

One of these trials with rates of 5lb., 10lb., and 20lb. per acre of TCA gave yields which were not significantly different from the control. The 20lb. rate, however, did suppress spurrey the main weed present. In the

other trial with rates of 20lb. and 40lb. the 40lb. treatment was significantly less than the hand-weeded control, and the 20lb. rate showed no significant difference. The weather was very dry after the application and because of this weed control at the 20lb. rate was poor.

There was poor control of weeds in 3 of the remaining trials with rates of TCA from 5lb. to 20lb. due to lack of rain following the applications.

In the other trial with rates of 20lb. and 30lb. good control of fat-hen was obtained, especially at the 30lb. rate, but the 30lb. rate apparently damaged the rape.

Rape will tolerate up to 20lb. per acre of TCA and under the correct moisture conditions weed control is satisfactory.

(b) **Propham**

Four replicated trials have been conducted with propham.

In the one trial from which yield data are available, the yields of treatments with propham at rates of 1lb., 2lb., and 4lb. per acre were not significantly different from the control. However, conditions were very dry after propham was applied.

Two trials with rates from $\frac{1}{2}$ lb. to 4lb. gave good control of spurrey at the higher rates, and germination of the rape did not appear to be affected, but conditions were again very dry.

The remaining trial had rates of 2lb. and 4lb., which achieved good control of spurrey, but germination of the rape was affected.

(c) **CIPC**

Two observational trials only have been laid down with CIPC on rape. In one trial with rates of 2lb. and 4lb. of CIPC per acre germination of the rape was reduced, especially at the 4lb. rate. Weed control was poor, as the weeds germinated and established before the crop.

Very little control of weeds was achieved in the other trial with rates of 1lb. and 2lb. The rape did not appear to be affected, but the weather following the treatments was very dry.

(d) **Oktone**

Three replicated trials have been carried out. One trial was harvested for yields. It had treatments of 4lb. and 8lb. per acre of oktone and there was no significant difference in yield of these treatments from the control.

In the other 2 trials, using rates of 2lb. to 8lb. of oktone, good control of *Polygonum* species, fat-hen, and spurrey was achieved. There was evidence of a check to the rape in one trial, but this appeared to be due to the use of dieselene as a carrier under cool soil conditions. Oktone in the correct carrier is a good weedkiller in rape.

4. **CHOU MOELLIER**

(a) **TCA**

Five trials have been laid down, and yield data are available from one. This trial had treatments of 10lb. and 20lb. per acre of TCA, and good control of fat-hen was achieved, especially at the 20lb. rate. There was no significant difference in yield from the control, but the crop was badly affected by aphid and white butterfly.

In 3 other trials with rates of 10lb. and 20lb. of TCA fat-hen was considerably reduced, especially at the 20lb. rate.

The remaining trial had 10lb., 20lb., and 40lb. rates of TCA, which gave poor weed control, as there was no rain following the applications. The 40lb. rate, however, caused germination injury of the chou moellier.

At no other rate in any trial was germination affected, and TCA will give satisfactory weed control in chou moellier if rain follows its application.

(b) **Oktone**

Three trials were laid down, from one of which yield data are to hand.

In this trial there was no significant difference in yield from the control, 8lb. per acre of oktone being used. Initial weed control was effected, but the crop was attacked by aphid and white butterfly and did not benefit from the reduced weed competition.

The two remaining trials had treatments of 4lb. of oktone. Control of weeds was good in one, but in the other trial inkweed (*Phytolacca octandra*) was the main weed present, and it was not affected by the oktone.

To evaluate all these results brassicas are best divided into 2 groups.

1. Slow-establishing crops that give only partial ground cover: Turnips and swedes come under this heading and pre-emergence weed control is not very satisfactory. A chemical with a reasonable residual life is required. TCA is the only safe and effective chemical available, but will give good control of weeds only under the correct moisture conditions. It must be applied immediately the crop is sown, and the crop should be sown immediately after cultivation.

Propham and CIPC, which are less dependent on rain and have longer residual lives in the soil, are generally not safe enough to use, as they may considerably reduce germination of the brassica crop even at low rates.

Oktone has no residual life and is therefore of little use in these crops.

2. Quick-establishing crops that give good ground cover: Rape, chou moellier, and kale come in this group. Here, provided the crop grows well, weed control is less of a problem. The task is to suppress weed growth for a period sufficient to enable the crop to shade the soil and prevent the germination of further weeds. For these crops pre-emergence weed control is reasonably satisfactory. TCA or oktone may be used under the correct moisture conditions. Oktone has the advantage that it is not affected by dry weather following its application. It is highly volatile and has little or no residual life and is not selective on most germinating weeds, including weeds that are resistant to TCA. It should be employed in a suitable aromatic carrier such as diesel fuel oil under high soil temperatures, and kerosene or benzene under cool soil temperatures. In all cases it should be applied to weeds that have already germinated. The best method is to allow the weeds to strike ($\frac{1}{4}$ in. to $\frac{1}{2}$ in. high), drill in the seed, and apply the oktone 3 to 4 days later. Another method is to sow straight after the seed-bed is prepared and apply the oktone a day or so before crop emergence. The first method is more suitable under dry soil conditions.

CONCLUSION

It can be seen that up to the present chemical weed control in brassicas is not wholly satisfactory. Until more suitable chemicals are available reliance must be placed on pre-emergence methods of weed control which have never proved very useful.

There is, however, one other method of weed control to consider. This is the direct drilling of crops into chemically killed turf. In this

method run-out pasture or pasture damaged by grass-grub, etc., is sprayed with dalapon or dalapon and amizol to kill the existing turf and the crop is drilled directly into the dead turf. Preliminary trials on this method have been carried out with considerable success. The crop establishes relatively weed free and weeds are prevented from establishing for some time by the litter of dead turf. Also the cost and loss of production caused by cultivation are eliminated and soil moisture and nitrogen conserved. The moisture and the nitrogen made available from decaying plant roots and surface dung and urine enable quick establishment of crops. This method is, I consider, a sound way of attacking the problem and will, I think, become widely used, particularly in the North Island once its possibilities are realised.

DISCUSSION

Q.—Would deeper sowings give better results with application of CIPC?

A.—All trials were sown at normal depths, as it would be too risky to sow at greater depth because of poor crop germination.

Q.—Does soil type affect the response from TCA?

A.—Heavy soils require higher rates and big variation has been found on the different soil types with TCA.

Q.—Has the stale seed-bed technique been used in trials and in conjunction with the sodium salt of PCP?

A.—It has been successful with rape and chou moellier crops; not so with swedes and turnips.