OBSERVATIONS ON THE EFFECT OF MCPB ON RED CLOVER SEED PRODUCTION

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SUMMARY

THE use of MCPB on red clover is limited where the crop is to be harvested for seed. Time of spraying in relation to time of flowering is an important consideration, as late spraying may affect early flower head formation and could reduce seed yields. This effect may be reduced by vigorous growth in a wet season. The sodium salt of 2,4-DB appeared to be more severe than the sodium salt of MCPB on red clover at equivalent rates and gave more prolonged leaf distortion. Spraying not later than early October for broad red clover and not later than early November for Montgomery red clover is recommended, and only later where dense weed growth would have an adverse effect on seed yields and harvesting of the crop.

INTRODUCTION

Since the introduction of MCPB into New Zealand it has been used extensively on pastures and crops under a variety of conditions. Its particular tolerance to clovers both as seedlings and mature plants has led to its use on clover seed crops as well as clover forage crops. The purpose of this paper is to show the effect of MCPB (as the sodium salt) on red clover (*Trifolium pratense*) with respect to seed production. Weed control in clover crops is not always a problem, but on heavy land infestation of Scotch thistle (*Cirsium lanceolatum*), Californian thistle (*Cirsium arvense*), nodding thistle (*Carduus nutans*) and docks (*Rumex* spp) makes spraying imperative, particularly where seed is being harvested for a second or third year. MCPB is not completely without effect on clovers and recent work (1) has shown that it is only about one-eighth as toxic to white clovers as MCPA, but about one-third as toxic to red clover; that is, both broad red and Montgomery red clovers. While white clover can be sprayed safely with MCPB, care must be taken when it is applied to red clover seed crops.

FIELD OBSERVATIONS

In the 1956/57 season several areas of red clover in Otago and South Canterbury were sprayed, MCPB being used at a standard rate of 1.5 lb. acid equivalent per acre. These included both broad red clover (cowgrass) and the late flowering Montgomery red clover.

Broad Red Clover

A crop in its second harvest year which had been sprayed in early November was inspected in mid December 1956. Growth was strong due to a wet season and individual stems reached 24 in. in length. However, approximately 30 per cent. of the foliage showed leaf distortion typical of the effect of MCPB on red clover and described by Edmond (2).

Flowering appeared to be normal, but a number of the seed heads withered up a day or two after opening. After the crop was cut for hay it was observed that the leaves showing distortion discoloured very quickly and became brittle. Regrowth after the hay cut was vigorous and there was no evidence of further leaf distortion. Flowering proceeded as normal and at harvest a very satisfactory yield was obtained with a 99 per cent. purity and 94 per cent. germination test for the seed sample.

The above crop was sprayed at 5 in. in height and another crop in the same district sprayed at 2 in. did not show the same leaf distortion as the former and only a small percentage could be found on inspection.

Montgomery Red Clover

Six crops were inspected. One paddock showing nearly 50 per cent. leaf distortion was found to have been sprayed late in December, but in the remaining areas only some distortion was evident. In the late sprayed crop initial flowering was badly checked with the early flowers withering up soon after opening. However, after a fortnight flowering became normal and was similar to untreated crops. On inspection for certification it was the opinion of officers of the Department of Agriculture that initial flowering in this crop had been delayed. The yield at harvest was satisfactory and comparable with untreated crops despite early fears of retarded flowering. That autumn was wet and harvesting was prolonged well into winter months. Purity and germination tests were of a similar order to the broad red clover sample. In the other five crops inspected yields were satisfactory and in only one case was the initial flowering thought to be retarded. All these were sprayed in October or early November.

Other areas of Montgomery red clover were inspected in Otago. In all cases growth was short at the times of spraying, which were September and October. On close inspection only some leaf distortion could be found. Bud development was normal at the start of flowering and all crops were passed as suitable for certification. Average to good yields were obtained with a high standard of purity and germination.

1957-58 season: To observe further the effect of MCPB on red clover a trial was laid down on a second harvest crop of Montgomery red clover. The treatments were:

1. Control.
2. Sodium salt of MCPB at 1 lb. acid equivalent per acre.
3. Sodium salt of MCPB at 2 lb. acid equivalent per acre.
4. Sodium salt of 2,4-DB at 1 lb. acid equivalent per acre.
5. Sodium salt of 2,4-DB 2 lb. acid equivalent per acre.

Application was on 16 December and the trial area had been grazed up to the time of spraying, the clover plants being up to 2 in. in height. The sodium salt of 2,4-DB was included to observe its effect in relation to MCPB.

After 3 weeks leaf distortion was apparent in both the MCPB and the 2,4-DB plots, but other growth was no different from control. After 6 weeks leaf distortion in the 2,4-DB plots was most evident, and is compared with other treatments as follows:

- 2,4-DB at 2 lb. acid equivalent per acre—60 per cent.
- 2,4-DB at 1 lb. acid equivalent per acre—30 per cent.
- MCPB at 2 lb. acid equivalent per acre—20 per cent.
- MCPB at 1 lb. acid equivalent per acre—*

* Very little distortion, hard to distinguish from control.

There was a growth check apparent in the high rate of 2,4-DB at this stage.

After 9 weeks leaf distortion was still very evident with the high rate of 2,4-DB, but flower head formation was normal and counts in all treatments showed no difference in density from control. The atypical leaves were still being produced, even though some of the stems measured up to 19 in. in length. Growth was very dense and becoming rank due

to very wet seasonal conditions. From then on leaf distortion disappeared from the treated plots, but could still be seen in the 2 lb. acid equivalent per acre of 2,4-DB treatment after 11 weeks. No flowering upset could be found at any stage and buds formed at the same time in all plots. This recovery may have been due to the very wet conditions which encouraged vigorous foliage growth.

During this season other crops of Montgomery red clover were inspected which had been treated with 1 lb. and 1.5 lb. acid equivalent of MCPB per acre applied in October and early November. Leaf distortion was found on some newly formed leaves, but there was no evidence of any check in initial flower head formation.

DISCUSSION

Spraying in relation to time of flowering would seem to have some importance in the effect of MCPB on red clover seed production. The comparatively late spraying of a crop of early flowering broad red clover showed leaf distortion and some upset of the early flower head formation. This was also seen in one case where a Montgomery red clover crop was sprayed late in comparison with its time of flowering. Crops sprayed earlier showed leaf distortion only, with no flower head disturbances. In the trial the time of spraying caused no flower malformations, but the conditions may have offset this. Environment may be a contributing factor. The crops in South Canterbury tend to flower and mature earlier than those in Otago, but spraying is carried out at about the same time in both districts. The late spraying of red clover seed crops is due to the time the area is closed up for seed; with no grazing, weeds grow profusely and suffer little competition from the clover crop.

Work done in England by Deakins and Ormrod (3) shows that time of spraying in relation to flowering is of importance and warrants critical work. They found that on Montgomery red clover MCPB up to 4 lb. acid equivalent per acre had no appreciable effect on numbers of flowering heads or head size, while 2,4-DB markedly reduced size and vigour, but not the number of heads formed. On broad red clover MCPB and 2,4-DB reduced the number of heads and their size by an appreciable amount. The point made was that the later flowering of the Montgomery red clover allowed it to recover, so this effect on head formation was reduced.

It would appear that by spraying MCPB early enough any serious damage to Montgomery red clover can be avoided. The effect on flower head formation with broad red clover could also be avoided by taking a hay cut and harvesting the aftermath. However, it is the author's contention that in a drought year a serious check to flower head formation and consequent seed yield could occur due to the dry conditions causing early flowering and ripening. The general effect of the drought on the clover may be made worse by the application of MCPB. Both the last two seasons have been unduly wet for red clover seed production and until a dry season is experienced it is difficult to really assess the effect MCPB has on seed production.

One point that has emerged is that the use of MCPB at advanced stages of growth has had no effect on the germination of seed harvested.

CONCLUSIONS

Red clover is a difficult crop to experiment with, harvesting being primarily dependent on the seasonal conditions affecting pollination and the weather at the harvest period. To obtain a true picture of the effect of MCPB on red clover seed production under field conditions trial work would have to be carried out over a number of seasons. From experience under New Zealand conditions and with reference to English work it

appears that MCPB should not be used on red clover seed crops unless under the following circumstances:

- (a) Spraying not later than early October on broad red clover crops and not later than early November on Montgomery red clover crops.
- (b) Later spraying to be carried out only where dense weed growth would have an adverse effect on seed yields and harvesting of the crop.

REFERENCES

- (1) K. Carpenter and C. Wilson. Proc. 3rd British Weed Control Conference. Vol. 2. P.433. 1956.
- (2) D. B. Edmond. N.Z.J. Sci. & Tech. Sec A Vol 38. P.397. 1956.
- (3) R. M. Deakins and J. F. Ormrod. Proc. 3rd British Weed Control Conference. Vol. 2. P.487. 1956.

DISCUSSION

Q.—Has the speaker had any preference for 2,4-DB or MCPB and would he qualify his preference?

A.—2,4-DB controls a wider range of weeds.

Q.—Is there any evidence that 2,4-DB and MCPB affect germination of the plants grown from the seed of crops treated with these materials?

A.—No, germination was on a par with unsprayed crops. There was doubt as to any carry-over effect in the next generation of plants.

Q.—Has the speaker any results using 2,4-DB and MCPB on docks in new pastures?

A.—MCPB and 2,4-DB give good control of seedling docks in new pastures. Root regrowths are more difficult to kill; 2,4-DB has promise in this regard. No firm recommendation can be made for mature docks.

Q.—What effect has rate of water application on clover tolerance?

A.—Normal water rate was 15 to 20 gallons to the acre. Results with 30 gallons of water per acre were not as good. Ten gallons of water per acre had no effect on tolerance, but weed control was not as good. For Californian thistle control 15 to 20 gallons per acre were preferred to 10 gallons per acre.

The effect of the sodium salt of MCPB at 2 lb. acid equivalent per acre on Montgomery red clover. Normal untreated leaf on right.

The effect of the sodium salt of 2,4-DB at 2 lb. acid equivalent per acre on Montgomery red clover. Severe distortion of newly produced leaves as compared with the normal untreated leaf.