CONTROL OF INSECT PESTS OF ESTABLISHING BRASSICAS

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Summary

Insect attack has been blamed for poor establishment of brassica crops especially in areas of Canterbury and North Otago. A series of trials indicates that DDT, methyl parathion or diazinon applied at 1 lb a.i. per acre at crop emergence could give some protection to seedling brassicas against insect attack. The role of seed dressings is discussed, and some observations are made on the type of damage caused by some of the more common insects known to attack establishing brassicas.

INTRODUCTION

IN RECENT YEARS difficulty has been experienced in establishing brassica crops in the drier areas of Canterbury and North Otago. Insect damage at the germinating and seedling stage has been given as one factor responsible for poor establishment. Lowe (1958) has observed 10 species of insects which he considers capable of causing damage to brassica seedlings. In order to study chemical means of controlling insect attack at the germinating and seedling stage, a series of trials was conducted, the results of which are given and discussed in this paper.

METHOD

In Trials 1 to 8 the chemicals were mixed with one gallon of water and sprayed on 20 ft×20 ft plots using a knacksack sprayer with a twin-nozzled boom (nozzle size 56). Spraying was carried out under calm conditions only, and each plot was sprayed twice at right-angles, ensuring an even application of chemical. In each trial there were four or five replications with two times of application — *i.e.*, at crop emergence (C.E.) and 8 to 12 days after C.E. In Trials 2 and 4 some plots were sprayed twice (at C.E. and at 11 to 12 days, respectively, after C.E.). These plots thus received twice the amount of chemical applied to the other plots.

In Trial 9, ½ gal of water per 33 ft×33 ft plot was used. There were five replications. In Trial 10 the chemicals were coated on the seed which was drilled over approximately one acre at 2 lb seed per acre. Some compensation was made in drilling, to allow for increased seed size and weight caused by the chemical coating. In Trial 11 the chemical was dusted on to the seed and made to adhere to the seed coat by means of a cellulose sticker. The area drilled for each treatment was approximately one acre. There were two replications.

All trials were assessed by taking random plant counts in each plot. In Trials 1 to 8 the number of healthy plants was counted in 10 sq. ft per plot determined by the random casting of a 1 ft square wire frame. With ridged crops a foot length of row was taken closest to where the wire frame fell. In Trial 9, 5 sq. ft per plot were taken. In Trials 10 and 11, 25 sq. ft and 80 sq. ft, respectively, were taken per area.

RESULTS

Results are given in Tables 1 to 6, all rates being in a.i. per acre.

In Trials 1, 2, 3, 7 and 8, differences were not significant and details have not been tabulated. The chemicals in these trials included DDT 1 lb as a standard, plus malathion 2, 4 and 16 oz, diazinon 2, 4 and 16 oz, azinphos methyl 4 and 16 oz, methidathion 1 lb, fenthion 1 lb, trichlorfon 2 and 16 oz, lindane 1 lb, dieldrin 1 lb and methyl parathion 1 lb. Not all rates and all chemicals were included in all trials.

TABLE 1: TRIAL 4 — PALMERSTON, NORTH OTAGO
Crop: Swedes. Applied: 11/12/66 (C.E.) C.E.+11. Assessed: 6/1/67.

<i>Treatment</i>	<i>Time of Appln.</i>	<i>Mean Plant Counts per 10 sq. ft</i>
DDT 1 lb	C.E.	23 aA
DDT 1 lb	C.E.+11	17 abA
DDT 1 lb	C.E.+ (C.E.+11)	16 bA
Trichlorfon 1 lb	C.E.	15 abA
Trichlorfon 1 lb	C.E.+11	20 abA
Trichlorfon 1 lb	C.E.+ (C.E.+11)	19 abA
Malathion 1 lb	C.E.	18 abA
Malathion 1 lb	C.E.+11	16 bA
Malathion 1 lb	C.E.+ (C.E.+11)	20 abA
Dupont 1179 1 lb	C.E.	17 abA
Dupont 1179 1 lb	C.E.+11	15 bA
Control		18 abA

CV=23.4%.

TABLE 2: TRIAL 5 — WENDONSDALE, SOUTHLAND
Crop: Swedes. Applied: 13/12/66 (C.E.) C.E.+7. Assessed: 23/2/67.

<i>Treatment</i>	<i>Time of Appln.</i>	<i>Mean Plant Counts per 10 sq. ft</i>
DDT 2 oz	C.E.	15 abcdAB
DDT 2 oz	C.E.+7	20 aA
DDT 1 lb	C.E.	16 abcAB
DDT 1 lb	C.E.+7	12 cdB
Azinphos methyl 1 lb	C.E.	17 abAB
Azinphos methyl 1 lb	C.E.+7	13 bcdB
Azinphos methyl 2 oz	C.E.	14 bcdAB
Azinphos methyl 2 oz	C.E.+7	11 dB
Diazinon 1 lb	C.E.	14 bcdAB
Diazinon 1 lb	C.E.+7	13 bcdB
Control		16 abcAB

CV=18.9%.

TABLE 3: TRIAL 6.—WAIANAKARUA, NORTH OTAGO

Crop: Swedes + Choumoellier. Applied: 18/12/66 (C.E.) C.E. + 12.
Assessed: 20/1/67.

<i>Treatment</i>	<i>Time of Appln.</i>	<i>Mean Plant Counts per 10 sq. ft</i>
DDT 1 lb	C.E.	51 aA
DDT 1 lb	C.E.+12	21 bA
Methyl parathion 1 lb	C.E.	50 aA
Dieldrin 1 lb	C.E.	42 abAB
Dieldrin 1 lb	C.E.+12	38 abAB
Lindane 1 lb	C.E.	36 abAB
Lindane 1 lb	C.E.+12	33 abAB
Malathion 1 lb	C.E.	35 abAB
Malathion 1 lb	C.E.+12	27bAB
Diazinon 1 lb	C.E.	32 abAB
Diazinon 1 lb	C.E.+12	24 bAB
Control		30 bAB
CV=36.5%.		

Main Effects (all treatments):

Crop emergence=39.7aA. Crop emergence+12 days=28.9bA.

TABLE 4: TRIAL 9 — TINWALD, MID CANTERBURY

Crop: Rape. Applied: 27/10/65 (crop drilled on 26/10/65). Assessed:
22/11/65.

<i>Treatment</i>	<i>Mean Plant Counts per 25 sq. ft</i>
Malathion 4 oz	407 aA
Methyl parathion 2 oz	406 abA
Azinphos ethyl 2 oz	405 abA
Fenthion 4 oz	391 cA
Control	238 dB
CV=20%.	

TABLE 5: TRIAL 10 — TINWALD, MID CANTERBURY

Crop: Rape. Applied: 26/10/65. Assessed: 22/11/65.

<i>Treatment per 2 lb Rape Seed</i>	<i>Mean Plant Counts per 25 sq. ft</i>
Azinphos ethyl 4 oz	543
Azinphos methyl 2 oz	530
Bayer S4400 4 oz	423
Dieldrin 4 oz	325
Control	181

TABLE 6: TRIAL 11 — WENDONSDALE, SOUTHLAND
Crop: Swedes. Applied: 14/1/67. Assessed: 23/2/67.

<i>Treatment</i>	<i>Mean Plant Counts per 80 sq. ft</i>
Fenitrothion 5 g/2 lb seed	73
Chlorophenvinphos 5 g/2 lb seed	50
Kerosene 2 g/2 lb seed	39
Lindane spray 9 oz/acre	83
Control	90

DISCUSSION

A general point emerging from Trials 1 to 8 was the lack of statistically significant response to chemical application. There was some indication, unsupported statistically, that DDT, diazinon and malathion applied at 1 lb at C.E. gave some measure of plant protection. In Trial 6, however, there was a significant difference at the 5% level between DDT (1 lb) at C.E. and methyl parathion (1 lb) at C.E. and control. In Trial 9 all chemical treatments were significantly better at the 1% level than control.

No adequate explanation can be provided for the lack of response in plant numbers in Trials 1 to 8 compared with the apparently highly significant response to all chemicals in Trial 9. It was considered that relative numbers of insects present when the treatments are applied greatly influence the resultant response in plant number. Accurate assessment of insect numbers and species is essential before any attempt can be made with inter-trial comparisons.

A major difficulty with trials of the above type is the assessment of insect numbers prior to chemical treatments. The insects are small or well camouflaged and are usually quite mobile. This means that insect populations can be quite transient in a given crop. Although several different species can be seen together on a crop, there is usually one particular species present in higher numbers and causing the most damage. The type of damage done by the more common species is usually typical of that species. The following observations pertaining to the specific types of damage were used to help determine the major damaging insect present on each trial site.

(1) Springtails (Collembola spp.)

Small holes up to 2 to 3 mm in diameter are often seen in the leaves with the upper or lower epidermis remaining. Apparent lack of seedling emergence could also be due to springtails attacking the primary root and stem of the germinating seed. Trials 2, 4, 7, 9 and 10 were sited on what was considered a crop being attacked by relatively high numbers of springtails. On Trial 4 site up to 10 springtails per emerging seedling could be counted.

(2) Weevils (Curculionidae)

The weevil typically straddles the edge of a leaf or cotyledon and chews out a scallop section, in comparison with the rather smooth-edged wound caused by springtails. In a bad weevil attack, the leaves become stripped and the crop assumes a distinctly tattered appearance. Some species of weevils also attack the stem by eating away an

elongated sector of the stem. The stem is weakened, but the leaves remain intact. Provided the plant environment is optimal, the plant may survive. Trials 1, 6 and 8 were sited on what was considered a crop being attacked by weevils.

(3) Wheat Bug (*Nysius huttoni*)

Wheat bug damage can be described as stem "ring barking" at ground level. The seedling is later broken off by the first wind after damage has occurred. Little sign of wheat bug damage was seen on the trial sites.

(4) Grass-grub Adult (*Costelytra zealandica*)

Adult grass-grub damage is rather similar to weevil damage. The essential difference is the extent of damage caused by the adults over a very short time. Large areas of seedlings can be completely destroyed overnight as a result of a grass-grub flight passing through the paddock. The beetles can also nip off the cotyledons and first true leaves of the seedlings, leaving only the stem standing. It was considered that Trial 3 was sited on a crop previously attacked by grass-grub adult. However, there was little sign of the insect at the time of application, although adults were found lying dead on the ground.

The data from Trials 10 and 11 indicated both advantages and disadvantages of seed dressings. In Trial 10 there appeared to be a response to all chemical treatments. In comparison, data from Trial 11 showed an apparent severe germination depression due to the kerosene treatment. One of the disadvantages of seed dressings is the possibility of reduced germination and all chemicals used for such purposes should be carefully screened beforehand.

CONCLUSION

Owing to a high degree of variability in the crops and lack of adequate numbers of insects on some trial sites, the data from the majority of trials are inconclusive. To confirm the following tentative recommendations based on the above data more trial work will be required.

It is suggested that DDT, methyl parathion or diazinon applied at 1 lb a.i. per acre at crop emergence could reduce insect populations and consequent damage to emerging seedlings.

It is thought that seed dressings would only protect germinating seeds against apparent springtail damage, and would probably have little or no effect on surface feeders such as weevils and grass-grub adults. However, because of the low cost and almost negligible residual effects of seed dressings they are worth recommending as some insurance for all brassica crops provided germination is not affected. Further work will be carried out to evaluate various types of seed dressings.

In the opinion of the writers, insect damage to seedling brassicas is made apparently worse under dry conditions. A seedling or a germinating seed in a moist environment could withstand an insect attack which, under dry conditions, it would not survive. It is also thought that farm management practices such as adequate seedbed preparation and time of sowing could reduce or prevent insect damage.

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REFERENCE

Lowe, A. D., 1958. *Proc. 8th Lincoln Coll. Farmers Conf.*: 11.