COMPATABILITY OF WEEDICIDES AND INSECTICIDES IN CONTROL OF THE CEREAL APHID

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Summary

The increase in wheat acreage in New Zealand has made the occurrence of Barley Yellow Dwarf Virus, spread by the cereal aphid, a matter of importance. The aphid infests the crop in both autumn and spring and trials show that high incidence of the disease causes marked decreases in yield. In the absence of highly resistant varieties, present control measures are limited to planting to escape flight dates, or the use of sprays to control the aphid. A trial is described in which three aphicides, when used in combination with three weedicides, were found to give good control of the aphid without apparently affecting the efficiency of the weedicides.

THE SPRING of 1960 saw a marked increase in the amount of wheat sown in New Zealand. For many farmers, however, the resultant harvest was marred by the knowledge that a virus had reduced their yields. This disease, now known as Barley Yellow Dwarf Virus, is of world-wide occurrence. It was first recorded officially in New Zealand in 1955 but has probably been here for many years. This disease is conveyed by winged forms of an aphid (*Rhopalosiphum padi* L.) and, once inoculated by these insects into a few plants, may then spread from plant to plant by the same means, or by wingless forms.

APHID FLIGHTS

A long-term study of aphid flights is being carried on by the Entomology Division of the Department of Scientific and Industrial Research at Lincoln. This shows that the cereal aphid flies consistently at two periods of the year—from February to the end of May, and again from September to mid-December.

VIRUS HOSTS

Host plants of the virus are all the cereals and many species of grasses, some of which carry the disease without any visual symptoms. This means that aphids coming from grasses on to cereals are almost certain to carry the virus. They first do this during the autumn flight period, landing on new plantings, feeding and multiplying. During feeding they inoculate the plant with virus, causing severe stunting, and consequent losses in growth and yield. The plants show yellowing in varying degrees, and even low rates of aphid infestation cause clearly visible yellow patches in the crop in spring.

A further opportunity to infest new crops occurs when the aphid flies again in the spring. Where autumn infestations have not already been controlled with sprays, such flights also spread the virus within the crop.

EFFECT ON YIELD

Little is known about the actual level of loss in ultimate harvest, but results from plots sown to study the biology of the pest at Lincoln showed outstanding differences. Plots infested with aphids

and virus in May gave two-thirds the yields of plots which received regular sprayings to exclude such infestations. These results were taken from plots replicated four times and were shown to be highly significantly different when statistically analysed.

Such regular spraying is, however, not within the bounds of possibility for a farmer, so such treatments were paralleled by other plots in which the available aphicides were tried against the insect. Many farmers spray wheat in early spring for weed control, so these materials were tested in all possible combinations with the standard weedicides as well as by themselves. Both weeds and aphids were at a relatively low level in this experiment, and control of these did not affect yield markedly, but the treatments showed that all insecticides used gave nearly 100% control of aphids. In addition, there were no adverse effects that could be observed on effective properties of the weedicides by their being mixed with the insecticides.

All materials were mixed in the tank of a low-volume sprayer and applied immediately in 14 gal of water per acre. The method of application was by tractor fitted with a boom-sprayer, so that the experiment was strictly comparable with normal farm procedure.

The materials and dosages used are shown in Table 1.

TABLE 1: INSECTICIDE TRIAL AGAINST CEREAL APHID

<i>Insecticide</i>	<i>Commercial</i>	<i>Per Acre Active</i>	<i>Dosage Control</i>
Thiometon	20 oz — 20%	4 oz	All materials 100% at dosages used.
Demeton S-methyl	12 oz — 25%	3 oz	
Dimethoate	20 oz — 40%	8 oz	

Weedicides: All the above materials were compatible with the amine salt of 2,4-D, and MCPA as mixed or potassium salts at 1 lb. a.i. per acre under the conditions of the experiment.

Application: Materials were mixed in the tractor tank and applied immediately in 14 gal water per acre.

MANAGEMENT

It will be seen that planting dates may be delayed to mid-May, so that autumn-sown crops emerging from early June on will not be subject to autumn infestation. Such departure from proven practice may not always be acceptable to farmers, many of whom feel that early planting has been proved over the years to be sound. Others will feel that delayed sowing plans will lead to trouble in that paddocks may be unworkable at this late stage of the season. In these circumstances it is recommended that farmers adhere to established practice in planting dates, and rely on spraying to rid their crops of aphids. It should be noted, however, that this will entail keeping a sharp lookout for aphids as soon as plants emerge. This can be done only by visiting the crop at regular intervals and examining the plants in detail.

ARE SPRAYS WORTHWHILE?

This question can be answered only by examining evidence gained from experimental work now in progress.

- (1) There is no doubt that the use of sprays to kill aphids and thus stop feeding reduces the drain on the plant caused by aphid-feeding.

- (2) While feeding, the aphid inoculates the plant with virus, and there is good evidence that autumn spraying of infested areas heavily reduces the spread of virus in the crop and gives increases in yield which far exceed the cost of treatment.
- (3) There is evidence also to show that spring spraying reduces the amount of virus evident at harvest. It is suspected that the amount of virus present is related to aphid numbers, and their elimination stops the progress of the virus. Whatever be the explanation of this, it is sufficient at this stage to assure growers that experimental areas sprayed in spring show an increase in yields which is a paying proposition. Cost of such treatment is confined to materials only if these are applied with the normal weed-spray in late August.

OTHER MATERIALS AND DOSAGES

The materials tested were tried only at the dosages stated, which at the time of the trial were the maximum rates allowable by regulation under the Agricultural Chemicals Act.

Under farm conditions, other insecticides or lower dosages may be offered for control of this aphid. It seems likely that such recommendations are quite sound, since trials suggest this aphid is relatively easy to kill. No information is available, however, on compatibility of other aphicides with the weedicides commonly used on cereals.

COSTS

Where the materials are applied by the farmer himself, the cost of insecticides alone varies from 17s. 9d. to 29s. 6d. per acre, according to material and dosage.

PERMITS

At present no permit is required for the materials listed when used for control of this aphid. Where areas are to be grazed, a grazing interval of seven days for dimethoate and fourteen days for thiometon and demeton-s-methyl must be observed. If it is desired to use other materials, advice should be sought on dosages and permits from local advisory officers of the Department of Agriculture.