APHIDS IN CEREALS IN NEW ZEALAND

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Summary

The aphids known from grasses and cereals in New Zealand are listed, and an outline of current knowledge of two of these is given. These are the grain aphid (*Macrosiphum miscanthi* (Tak.)) and the cereal aphid (*Rhopalosiphum padi* (L.)) the two known pests of cereals in New Zealand. Current recommendations for control are included.

IN GENERAL, the aphids causing economic problems in crops in New Zealand are those whose life-cycle is relatively simple in that they are able to continue their existence throughout the year with little change of form. There is no egg stage, the young being born alive (viviparity) in an all-female population. There are upwards of twenty generations annually, varying in length from five to seven days in summer to about 60 days in winter.

Variation within the population is mainly confined to the production of winged forms (alates) in spring and autumn. These fly to fresh crops and establish new colonies (see Fig. 1).

FIG. 1: Generalized flight pattern of crop aphids in New Zealand, derived from three main species flying, and applicable to all crop species. Shaded area shows overall range of numbers flying, and black line mean of three species over 21 sets of data.

TABLE 1: APHIDS RECORDED FROM GRASSES AND CEREALS IN NEW ZEALAND

<i>Aphid</i>	<i>Recorded Host-plants in New Zealand</i>		<i>Life-cycle</i>
<i>Aploneura lentisci</i> (Pass.)	...	Roots of grasses and giant buttercup (<i>Ranunculus acris</i> L.)	Unknown
<i>Geioica lucifuga</i> (Zehn.)	...	Roots of <i>Danthonia</i> sp.	Unknown
* <i>Macrosiphum miscanthi</i> (Tak.) (Grain aphid)	...	All grasses and cereals, occasionally on other plants.	Continuous cycle on Gramineaceous plants, occasionally colonizes other plants.
<i>Pemphigus bursarius</i> (L.)	...	Galls on petioles of poplar, roots of grasses and some other plants (e.g., <i>Rumex</i> spp.)	Summer on poplar, and winter on roots.
<i>Rhopalosiphum maidis</i> (Fitch) (Overseas common name, corn-leaf aphid)	...	Barley, maize, oats.	Continuous cycle on cereals.
* <i>Rhopalosiphum padi</i> (L.) (Cereal aphid)	...	All grasses and cereals.	Continuous cycle on grasses and cereals.
<i>Rhopalosiphum rufiabdominalis</i> (Sasaki) (Overseas common name: rice-root aphid)	...	Several grasses.	Unknown, thought to be on Gramineae only, including roots.

*Known to be important pests in New Zealand.

A number of aphids have been recorded on grasses and cereals in New Zealand, and these are listed in Table 1. Only two of these, however, have proved to be of economic consequence, although one other (*R. maidis*) is a well-known corn pest in U.S.A. ("corn-leaf aphid") and has been found in recent years on some barley stands here. These three aphids all successfully colonize both grasses and cereals, and so have no difficulty in carrying on their life-cycle in New Zealand since some of these plants are available in quantity throughout the year. But it is the grain aphid (*M. miscanthi*) and the cereal aphid (*R. padi*) which are capable of causing a widespread drop in wheat yields. They differ in appearance and behaviour, and in the measures taken for their control. These are the only aphids known at present as pests of cereals in New Zealand.

CEREAL APHID

Though feeding by this aphid must cause deterioration in the plant, it is its effectiveness as a vector of barley yellow dwarf virus (BYDV) that makes it necessary to apply control measures. In most circumstances, biological control of this pest is at the moment ineffective. It is a small bottle-green aphid which flies regularly each season in April-May, even into early June, and again from late September to the end of November. The alates land on young cereal plants, depositing young, and, as colonies build up, the feeding of the aphids spreads the virus throughout the crop. This spread within the crop after the alates arrive is known as secondary spread, and it has been shown that this is the major means by which virus reaches most of the plants, thus causing a drop in yield.

FIG. 2: Composite graph of the end of autumn flights of cereal aphid, grouped according to years. This is the information used to determine a "safe sowing date" for autumn-sown wheat.

Measures for control depend on whether the crop is autumn or spring sown. Recommendations for autumn-sown cereals are two-fold: (1) If sowing is delayed so that plants emerge after mid-June, the problem of autumn infestation is by-passed (see Fig. 2). (2) Where, for any reason at all, a grower prefers to sow during April or May, chemical control measures will be required during some seasons. There are two possibilities for control. Some work has been done on sowing wheat with insecticide granules with good results, but as a routine measure this is relatively expensive, and may not be necessary in some seasons. Those who do not use this method will require to have an attitude of vigilance in all seasons. Crops will need to be inspected for the presence of aphids, and some time between mid-June and mid-September control measures applied if aphids are present.

There is little evidence that this aphid brings fresh infestations in the spring flights to crops that were sown in autumn. The plants appear to have reached an unacceptable stage in most seasons by the time flights begin. The aphid can, however, severely infest crops of wheat or barley sown in spring. In these the fresh young plants face a continuous series of flights (see Fig. 1) while in a very susceptible and attractive stage. Continuous spraying is out of the question, and the greatest degree of success in trials has come from sowing the crop with insecticidal granules, and using an aphicidal spray at a later stage if this becomes necessary. The effect of these control measures on yield is not at present as clear-cut as is desirable and this precludes any emphatic statement on the economics of this procedure. The beneficial effect on barley crops is at present thought to be one of quality rather than yield.

Fortunately, all cereal lines grown in New Zealand commercially show some tolerance to both aphids and BYD virus, so that control measures are a matter of improving yields and hence profits rather than saving crops from eradication by these pests.

GRAIN APHID

This aphid has shown itself to be very important in wheat crops throughout New Zealand since 1967, but evidence is gradually being accumulated that it was known here as a pest late last century, and has occurred occasionally in pest numbers since that time. Only time will tell whether it will be found regularly on the increased acreages of wheat.

It is a large, apple-green aphid which flies to emerging wheat-heads in October-November and persists there, feeding on the grain until the ripening stages begin, usually about mid-December, or later in the south. During the rest of the year, numbers appear to be low except in hill-country areas, and autumn flights do not appear at present to lead to serious infestations in autumn-sown wheat. In any case, control measures for cereal aphid in those crops would effectively deal with this aphid also.

The problem, therefore, is what measures to take if infestation does occur in the spring. Work done at the Plant Diseases Division, DSIR, Lincoln, has shown that feeding by the excessive numbers (100 to 350 per head) found on wheat-heads in the field causes serious grain shrinkage and consequent loss of yield. There are no preventive measures that can be taken, and vigilance is required amongst growers so that systemic sprays can be applied when infestation does occur. The economics of spraying as a cure for this aphid are not at all clear, since repeat applications could be necessary. In Canterbury, however, it has been found in practice that a single, well-timed spray almost always gives the desired

TABLE 2: CHARACTERISTICS OF CEREAL AND GRAIN APHIDS

	<i>Cereal Aphid</i>		<i>Grain Aphid</i>	
	<i>Winged Form</i>	<i>Wingless Form</i>	<i>Winged Form</i>	<i>Wingless Form</i>
Body length (mm)	1.8	1.8	2.9	2.9
Antennal length (mm)	1.3	1.3	3.3	3.2
*Cornicle length (mm)	0.27	0.21	0.63	0.75
Colour (adults)	Bottle green-reddish at hind end of abdomen.		Apple green	
Site on plant	On leaves including undersides. In winter pale nymphs around "collar" of plant at soil surface.		On heads in November on stem when crowded, occasionally on leaves.	

*Cornicles are elongate appendages on both sides of the hind end of the abdomen.

measure of control. Where 30% of heads are carrying aphids, yield increases from a single spray will more than offset the cost of about \$4.50 per acre.

Table 2 sets out the characteristics of these two aphids to assist in their recognition in the field.