VIRUS DISEASES OF CEREALS AND POPULATIONS OF VECTORS IN THE CANADIAN PRAIRIES IN 1967[1]

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These observations are based on weekly surveys during the growing season in south-central Manitoba, and on a survey trip through Saskatchewan and Alberta in the second week of August.

Aster yellows

Although the worst recorded outbreak of aster yellows virus (AYV) on barley was in 1966, the incidence of the disease in 1967 was very low. Only a trace of AYV was observed in two of 40 fields of barley examined in Manitoba, Saskatchewan and Alberta. Both fields were in Saskatchewan, one near Swift Current, the other near Bolney. There was a high incidence of AYV on stinkweed near Bolney, indicating that the virus had overwintered on these plants.

The absence of the disease reflected the very low population of the vector, the six-spotted leafhopper, Macrosteles fascifrons (Stål). The spring migration of this leafhopper into Manitoba occurred late in May, but it was smaller, and about two weeks later, than usual. Nymphal collections on rye and grasses in the spring indicated that there was virtually no survival of overwintered leafhopper eggs. Thus, there were few leafhoppers on cereals during June and July, the period during which leafhoppers are usually abundant and when AYV infection occurs.

Barley stripe mosaic

Barley stripe mosaic virus (BSMV) infections were found in four of 12 barley fields near Lethbridge, Alberta. The incidence of the disease in the four fields was: trace, 1, 20 and 50%. Elsewhere, BSMV was seen in only two of 30 barley fields examined. Both fields were about 25 miles south of Winnipeg, and the incidence of the disease was 10 and 15%.

In all cases the BSMV infections occurred on a two-row variety of barley. Two-row barley was the predominant type grown around Lethbridge, and it is possible that this type is more susceptible to BSMV than the six-row varieties such as 'Parkland', which are grown more extensively in other areas. BSMV was isolated from all samples collected in fields with BSMV infection, even when symptoms were so slight as to be questionable. It is thus possible that the incidence of the disease may have been higher than indicated.

Barley yellow dwarf

The incidence of barley yellow dwarf virus (BYDV) was low in Manitoba and southern Alberta and negligible in other areas. Ratings for BYDV in commercial fields were as follows: oats, nil in 20, trace in 11, 1% in two, 5% in two, 10% in two, 12% in one and 24% in one out of 39 fields; wheat, nil in 12, trace in 11, 1% in four, 5% in two, and 10% in one out of 30 fields; barley, nil in 25, trace in 11, 1% in one, 2% in one, 5% in two and 10% in one out of 41 fields; durum, nil in one, and trace in one out of two fields.

In Manitoba, BYDV was isolated from samples of cereals and from aphids collected in the field. Many of these isolates appeared to be relatively weak and were transmitted by the greenbug Schizaphis graminum (Rondani) or the corn leaf aphid, Rhopalosiphum maidis (Fitch), or both, but not by the English grain aphid, Macrosiphum avenae (Fabricius), the rose grass aphid, Acyrthosiphon dirhodum (Walker), or the cherry oat aphid, Rhopalosiphum padi (L.). Moderately virulent isolates with a different pattern of transmission by these five species of aphids were also found.

The proportions of field-collected aphids that transmitted BYDV when allowed to feed on oat seedlings were as follows: English grain aphid, 1/452; corn leaf aphid, 1/202; greenbug, 0/199; rose grass aphid, 0/46; cherry oat aphid, 0/21; and the [illegible] grass aphid, Sipha kurdjumovi Mordvilko (= S. pyrella Hille Ris Lambers), 0/17.

Oat blue dwarf

Oat blue dwarf virus (OBDV) was not observed in commercial fields of cereals in 1967, although a single plant of wild oats with typical OBDV symptoms was noted. However, when individuals of the vector, the six-spotted leafhopper, collected in the fall from commercial fields of oats and carrots near Portage la Prairie, were allowed to feed on indicator plants in the greenhouse, 4.3% from oats and 2.6% from carrots transmitted OBDV. Similarly 11.2% of migrant leafhoppers collected in the spring transmitted the virus.

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Host-range studies showed that symptoms of OBDV on many of the susceptible plant species, including the cereals, were mild or absent. This finding may account for the apparent low incidence of diseased plants in the field, despite the high percentage of viruliferous vectors.

Wheat streak mosaic

Wheat streak mosaic virus (WSMV) was found in volunteer winter wheat on the experimental farm at Swift Current, Saskatchewan. This virus was previously reported near Shaunavon, Saskatchewan in 1954 (1).

WSMV was also present on spring cereals in the region around Lethbridge, Alberta. Ratings for the disease in this area were as follows: wheat, nil in three, trace in one, 1% in two, 5% in one, 15% in one and 75% in three out of 11 fields; oats, nil in four and trace in three out of seven fields; barley, nil in nine, and trace in one out of 10 fields; durum, trace in the only field examined.

Other Diseases

A trace of oat necrotic mottle virus was found in one field of oats, about 10 miles west of Winnipeg.

No cereals infected with wheat striate mosaic virus were found this year.

Populations of cereal-infesting aphids

In southern Manitoba, sweeping for aphids on cereals began on 11 May. The first aphids (5 in 400 sweeps) were found on 18 May on winter rye, and all were winged forms of the English grain aphid. Populations were slow to increase in number, probably because May and early June were colder than normal. Thus, on 27 June, only six aphids (all English grain aphids) were collected in 50 sweeps on rye.

The first of the other species of aphids was found on the following dates: corn leaf aphid (one in 100 sweeps) on rye on 14 June; greenbug and cherry oat aphid (eight and one, respectively, in 200 sweeps) on wheat on 27 June; quackgrass aphid (one in 100 sweeps) on wheat on 13 July; and rose grass aphid (23 in 100 sweeps) on oats on 18 July.

During the third week in July there was a sudden marked increase inthe numbers of aphids. From 150 to 700 aphids in 50 sweeps were then collected on spring cereals. The size of the populations remained about the same until mid-August, when they began to decline as the crops ripened.

During the last week in July and the first two weeks of August, an estimation of the distribution of aphid populations on cereals across the prairies was made. A total of 59 fields of wheat, oats and barley was swept by net in this period. Sweeping was often supplemented by visual observation. The crops sampled for aphids were between the shot blade and green headed stage.

Populations of the cereal-infesting aphids were largest in south-central Manitoba (Fig. 1). Six species could be found in many fields in this region, but the greenbug and English grain aphid were clearly the most numerous. In southwestern Manitoba and across most of Saskatchewan, aphid numbers were very low but they were slightly higher in Alberta, particularly around Lethbridge and Edmonton.

The English grain aphid was the most widespread species and was often the dominant, and sometimes the only, aphid. The greenbug was found only in the southern and eastern parts of the prairies. This aphid was most numerous in southern Manitoba, where it was often the dominant species or was codominant with the English grain aphid.

The rose grass aphid was not found in the southern part of the prairies except in the Red River valley of Manitoba. Very small populations were found north of a hypothetical line joining Lacombe, Alberta, and Yorkton, Saskatchewan, and the aphid was often the dominant species in the northwestern part of this area. The distribution of the cherry oat aphid was very similar to that of the rose grass aphid, but the cherry oat aphid was usually less numerous. The corn leaf aphid was very scarce and was found in south-central and northwestern Manitoba and around Lethbridge in southern Alberta. The quackgrass aphid was found on cereals only in south-central Manitoba and near Lethbridge.

The western wheat aphid, Brachycolus tritici Gillette, was found infesting heads of durum wheat in experimental plots at Swift Current. It was apparently responsible for causing distortion of the infested heads.

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literature cited

1. Conners, I. L. (Compiler). 1955. 34th Ann. Rept. Can. Plant Dis. Surv. 1954. p. 7.

1. ENGLISH GRAIN APHID, Macrasiphum avenae (Fabricus)
2. GREENBUG , Schizaphis graminum (Rondani)
3. CHERRY OAT APHID, Rhopalosiphum padi L.
4. ROSE GRASS APHID, Acyrthosiphon dirhodum (Walker)
5. CORN LEAF APHID, Rhopalooiphum maidis (Fitch)
6. QUACKGRASS APHID, Sipha kurdjumovi (Mordvilko)

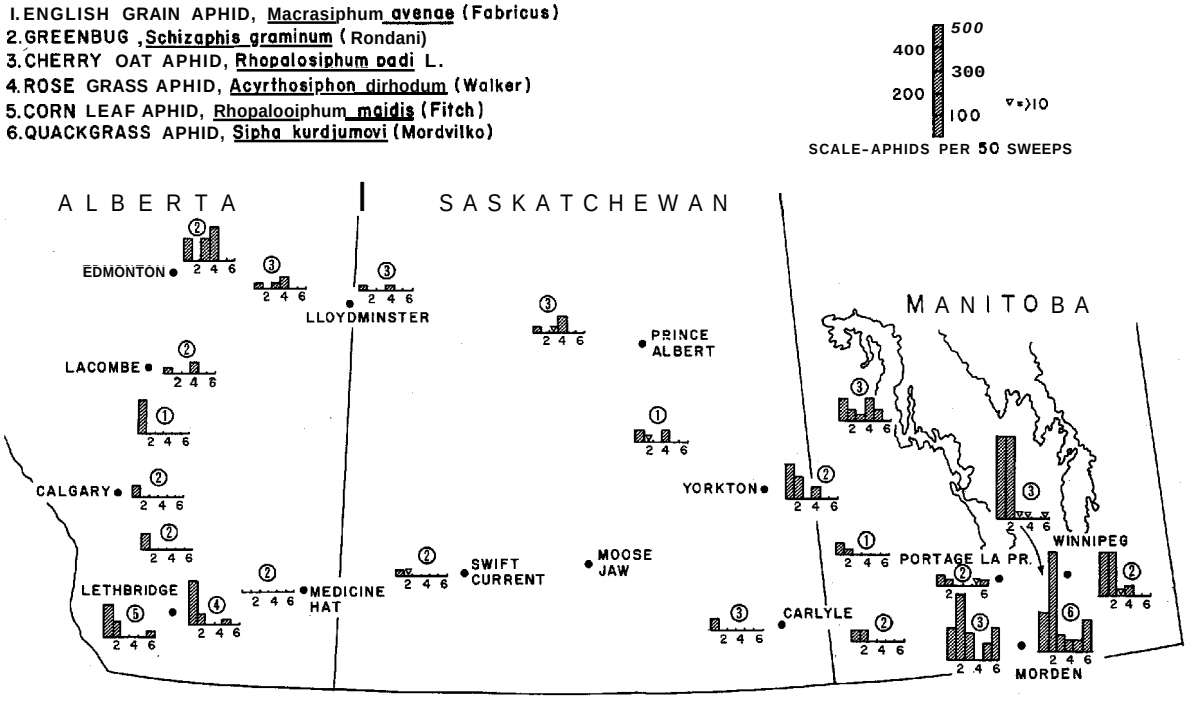

Figure 1. Relative abundance and distribution of six species of cereal-infesting aphids on the Canadian Prairies, 1967. The samples were taken during a 3-week period from 24 July to 14 August. Each histogram represents the average number of aphids collected from one or more fields of wheat, oats, and barley. The number of fields involved for each histogram is shown by the circled numeral.