VIRUS DISEASES OF CEREALS IN THE EASTERN PART OF THE CANADIAN PRAIRIES IN 1966[1]

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Introduction

These observations are based mainly on weekly surveys during spring and summer in south-central Manitoba. A more extensive survey, which included other areas of Manitoba and the eastern part of Saskatchewan was made in the last week of July.

Aster yellows

The incidence of aster yellows virus (AYV) infection in barley in 1966 was the highest on record for commercial barley fields in Manitoba. The amount of infection, based on the number of sterile heads, ranged from a trace to 6.5%, with a mean of 3.2% for 25 fields. There was less virus infection in early fields than in late fields.

The six-spotted leafhopper, Macrosteles fascifrons (Stål), the main vector of AYV, was more abundant than usual. The leafhopper migrated into Manitoba in late May in about the usual numbers but the population increased rapidly due to favorable weather conditions. Three percent of the leafhoppers tested in late May and early June were carrying AYV. In late June the figure was 2.6%.

High temperature, which favors development of the leafhopper and shortens the incubation period of the plant (3), appeared to be the most important factor contributing to the high incidence of AYV in 1966. From June 17 to 30, the daily mean temperature was 22°C compared with the long-term mean for this period of 18°C. Above-normal temperatures continued throughout July. Much of the barley in Manitoba was sown late and had just emerged by the latter half of June. At this stage barley is highly attractive to leafhoppers and probably most susceptible to AYV infection.

Barley stripe mosaic

Barley stripe mosaic was found in one of 32 commercial fields examined. The diseased barley was a two-row variety, and was located near Kamsack, Saskatchewan. Approximately 50% of the plants exhibited symptoms and the density of diseased plants was relatively uniform throughout the field. The virus was readily transmitted by mechanical means, from diseased plants to 'Selkirk' and 'Rescue' wheat, 'Herta' and a black, hulless barley and 'Golden Bantam' sweet corn. Twelve seedlings each of 'Clintland' and 'Letoria' oats were also inoculated, but only one of the 'Clintland' plants became infected. This disease was also observed on barley in experimental plots near Winnipeg.

Barley yellow dwarf

Sweeping by net and visual examinations of cereals in fields for the aphid vectors of barley yellow dwarf virus (BYDV), began on May 6.

As in 1965, the English grain aphid, Macrosiphum avenae (Fabricius), was the first vector species to be found in the spring. There is strong evidence that the first English grain aphids in 1966 were migrants. No aphids were found in fields of winter rye near Carman and Elm Creek by May 20. Strong southerly winds prevailed in southern Manitoba on May 21 and 22. When the same rye fields were re-examined on May 24, *six* English grain aphids were collected in 100 sweeps. Only winged adult forms were present. By June 22, the counts for this aphid were 20 per 100 sweeps on rye and 6 per 100 sweeps on spring cereals, which indicated that there were few additional migrants during this 4-week period. Only by late July was there a marked increase in the numbers of English grain aphids. Figures then rose to an average of 250 aphids per 100 sweeps on spring cereals.

One cherry-oat aphid, Rhopalosiphum padi (L.), was found on spring barley on June 8, but this species was not seen again until August 3 when 50 were collected in 100 sweeps on wheat. This was the largest population of the species found during the season.

One greenbug, Schizaphis graminum (Rondani), and one corn leaf aphid, Rhopalosiphum maidis (Fitch), were found in 300 sweeps on rye on June 15. Populations of the greenbug became prominent (18 per 100 sweeps on spring cereals) only by the middle of July, and then it rapidly increased in numbers and finally competed with the English grain aphid as the dominant species on cereals. The corn leaf aphid was never abundant on barley, its favored host among the cereals. The highest count on barley was 4 per 100 sweeps. The first rose-grass aphids, Metopolophium dirhodum (Walker), were found on oats on August 4. This species remained rare throughout the season.

The efficiency of sweeping for different aphid species was tested in one field of green, headed oats on August 11. In 50 sweeps, 464 English grain aphids and 129 greenbugs were collected. The ratio of English grain aphids to greenbugs was thus 3.6 to 1. Visual inspection of the field appeared to indicate that populations of the greenbug were higher than those of the English grain aphid. Forty plants, adjacent to the area swept, were pulled at random and aphids found on these plants were counted. The totals were 429 greenbugs and 118 English grain aphids. The ratio of greenbugs to English grain aphids was thus 3.6 to 1, The number of greenbugs was higher than the number of English grain aphids on all except five of the forty plants.

It would appear, therefore, that sweeping for the greenbug is much less efficient than for the Eng-

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lish grain aphid. One reason for this may be that adults of the English grain aphid are more easily dislodged in sweeping than those of the greenbug, since the former drop readily to the ground when disturbed. Also, it has been our experience that adults are usually more easily disturbed and dislodged than nymphs. Since nymphs of the greenbug appeared to be more numerous on these plants than those of the English grain aphid, this may explain the smaller number of greenbugs collected by sweeping.

The proportion of aphids caught in the field throughout the season, that transmitted virus when allowed to feed on oat seedlings in the greenhouse, was very low. The number of aphids that transmitted out of the number tested was as follows: English grain aphid, 4 out of 5653; greenbug, 1 out of 484; rose-grass, cherry-oat and corn leaf aphids, each 0 out of 4. These results contrast strongly with those for 1964, when at least 25% of each of the five species collected in the first week of August transmitted BYDV to test seedlings (1). The small proportion of aphids that was found to transmit BYDV agreed with the low incidence of this disease in commercial fields. Disease ratings were as follows: Wheat, trace in 13 fields and nil in 34; oats, 1% in 1 field, trace in 15 and nil in 13; barley, 1% in 1 field, trace in 3 and nil in 28.

Oat necrotic mottle

This disease was first observed in 1965 and was described as a ngw virus disease of oats in Manitoba (2). Studies were subsequently made on host range, transmission and stability of the virus (4). In 1966, the disease was not observed on oats and the field where the disease was originally seen was sown with flax.

Host range studies revealed that quackgrass, Agropyron repens (L.) Beauv. and bromegrass, Bromus inermis Leyss. could not be infected mechanically, but that Canada bluegrass, Poa compressa L. and Kentucky bluegrass, Poa pratensis L. were susceptible (4). These grasses, with the exception of Canada bluegrass, were the chief components of the grassy sward alongside the field where the disease was found. On June 8, 26 samples of Kentucky bluegrass were collected from the area. Partially developed flower heads were present on most samples. When sap from each sample was rubbed on 'Clintland' oat seedlings, infection resulted, with symtoms typical of oat necrotic mottle.

Slight chlorotic mottle was observed on the youngest leaves of only two of the 26 samples of bluegrass. No symptoms were seen on the other samples. Transmission occurred readily. Each sample of grass was assayed on about 10 oat seedlings, and the average proportion of test plants infected was 93%. When sap from samples of quackgrass, collected in the same area, was rubbed on oat seedlings, no infection resulted.

Specimens of thrips found in the partially developed flower heads of the bluegrass were allowed to feed on 'Clintland' oats, but no infection resulted. Later in the season, eriophyid mites were observed on the leaves of the bluegrass in the same area. Some of these were transferred to caged oat seedlings, but again no infection developed. Up to now, therefore, the natural vector for oat necrotic mottle virus has not been found.

Other diseases

Wheat striate mosaic was observed in two out of aboat 50 commercial wheatfields. There was less than 1% infection in both cases. Oat blue dwarf was not seen in commercial fields of oats, but was present in experimental plots near Winnipeg.

Literature cited

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