YELLOW-LEAF CONDITION OF UNKNOWN CAUSE ON OATS IN ONTARIO

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A severe leaf yellowing appeared in early June on oats in at least 12 counties in southwestern Ontario. In co-operation with staff of the Department of Crop Science, Ontario Agricultural College, Guelph, affected oat fields were examined on June 4 and 5. Tests were made to determine the cause, and some fields were re-examined during the last week of June and on July 22.

On June 4 and 5 the yellowing was severe in scattered, irregular patches varying from a small group of plants to extensive areas in oat fields seeded before May 1. Plants in the affected fields were in the 3 and 4 leaf stage. The most severely affected fields were entirely yellow except for isolated patches of green plants. The youngest leaves of the affected plants were the least chlorotic, being yellow to almost white toward the tips or in blotches and streaks, but green toward the base. Older leaves were progressively more severely chlorotic. On some plants the lowest leaves had dried to a light brown color. Darker water-soaked blotches were also present on some of the lower leaves. The symptoms resembled barley yellow dwarf on oats except that there was no bronze or reddish discoloration and leaves did not stand erect. Macrosiphum avenae (F.), one of the known important vectors of barley yellow dwarf virus in Ontario, was present in low numbers in most fields. The condition occurred on most oat varieties grown in the area, including Rodney and Garry, but no similar symptoms were found on barley even when mixed with oats in the same field. Halo blight symptoms occurred in some fields but they did not appear to be specifically associated with the severe leaf yellowing. There did not appear to be any correlation between the yellow leaf condition and the previous crop, cultural practices, topography, soil type, nematodes, fertilizers or herbicidal sprays.

Samples of diseased plants and aphids were collected and tests were made to determine if either barley yellow dwarf virus or bacteria were the cause of the leaf yellowing. Although barley yellow dwarf virus was transmitted by some of the aphids collected in the field, the virus was not transmitted by non-infective Macrosiphum avenae (F.), Rhopalosiphum padi (L.) or R. maidis (F.) fed on leaves with the yellow-leaf condition. Two types of bacteria were isolated from diseased plants[4]. One isolate induced halo-blight symptoms on oat plants, but neither isolate induced symptoms

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resembling the disease seen in the field.

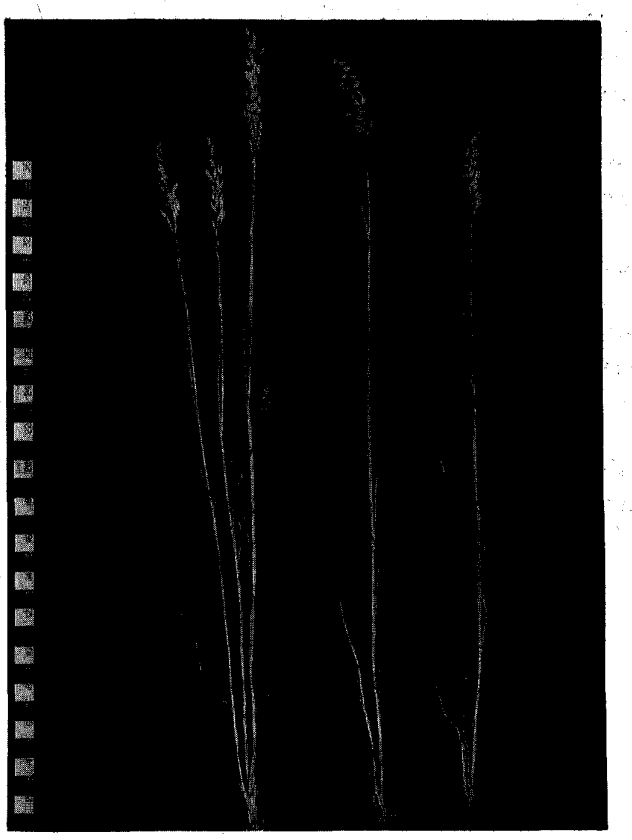

Figure 1. Mature oat plants showing effects of the yellow-leaf condition first observed in the 3-to 4-leaf stage. The first tiller, which was severely chlorotic on June 4, died, but the later tiller did not develop symptoms and grew to almost equal the tillers on adjacent non-affected plants (left).

When the oat fields-were re-examined during the last week in June, yellow patches were no longer visible, The affected leaves and early tillers had withered and darkened but had become obscure under a growth of new green leaves. The new tillers were free from the chlorotic symptoms, but the affected plants were shorter and less vigorous than plants in other areas of the fields,

By July 22 when the oats had headed and were nearing maturity the early tillers on the affected plants were dead and dried out, but the later tillers appeared to be developing normally without the blasting which occurred on the early tillers (Fig. 1).

Discussion

Although the yellow-leaf condition on oats in Ontario was initially attributed to a strain of barley yellow dwarf virus, the inability to transmit the condition with three known vectors of the virus and the failure of symptoms to develop on new tillers during the warmer weather in June, discouraged this hypothesis. Halo blight and other mottle symptoms were present on many of the affected plants but none of the bacteria isolated from diseased plants appeared to have a direct relation to the yellow-leaf condition.

Similar conditions have been reported in the U.S.A. Yellowing symptoms that developed on winter oats in South Carolina, Georgia and Virginia soon after growth started in the spring were attributed to such varied causes as barley yellow dwarf virus, Helminthosporium sp., halo blight and weather conditions (1, 2, 3). In a personal communication, Dr, H. C. Murphy of Beltsville, Md. reported that an outbreak of leaf yellowing occurred on spring oats in Iowa in 1955 and was at first suspected to be caused by barley yellow dwarf, but virus transmission by aphids was not obtained. Halo blight was found among affected plants but was also ruled out and the cause was not determined,

A common characteristic of all these conditions appears to be that they developed early in the spring, The yellow-leaf condition in Ontario was severe only on early-sown oats and developed during the 3- and 4-leaf stage. It failed to progress further even on affected plants when the weather became warm later in June, and it did not appear on oats sown after May 1. Regardless of the cause, it appears that temperature and possibly other environmental factors are of critical importance to the development of the disease.

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