THE OCCURRENCE OF AERIAL CROWN GALL OF GRAPE VINES IN THE NIAGARA PENINSULA OF ONTARIO~

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Introduction

Aerial crown gall of the grape, caused by Agrobacterium tumefaciens (E.F. Smith & Town.) Conn, has been a disease of infrequent occurrence in the Niagara peninsula. It was reported in 1940 (2) and again in 1952, (3). In 1960 it occurred commonly on the hybrid variety Seibel 10878, recently planted in commercial vineyards. Other varieties infected were Seibel 8357, Seibel 7053, Agawam, Niagara, and Veeport. Two vinifera varieties, Pinot Blanc and Gamay, growing in experimental plantings were also infected, The first infections were noted in early July, 1960. However, it was not until March, 1961, on the completion of pruning operations, that much of the infection was observed and its prevalence fully realized.

Field Observations

A survey to determine the extent of the infection was made in 18 plantings of Seibel 10878 in the spring of 1961. The disease was found in 11 of these vineyards, principally on younger vines up to seven years of age. The incidence was very low in vineyards on heavy soil but ranged from a trace to as high as 70 per cent in those on lighter soils where there was evidence of high vigor of growth. The highest incidence was encountered in a vineyard planted following an asparagus crop that had

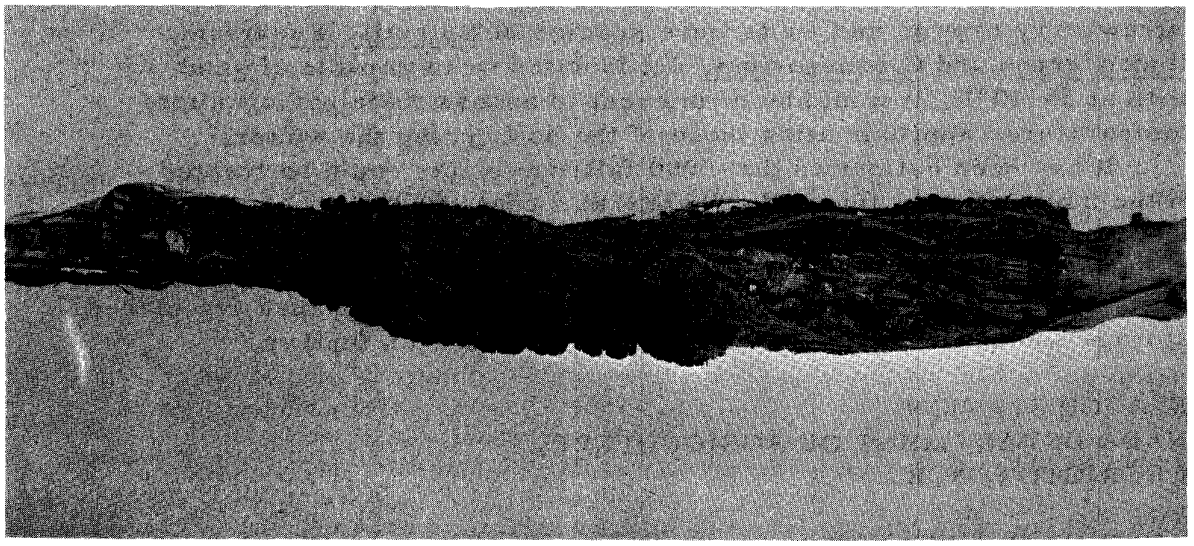

Figure 1 - Aerial crown gall on Pinot Blanc 6 year old vine.

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received heavy annual applications of fertilizers. Consequently, the nutrient level was high and vine growth was excessive; a petiole analysis of the vines showed a high amount of nitrogen, (1.24 ppm) a condition that favors; the development of the disease (5). The average incidence in five of the vineyards was 24%.

Galled areas were found mostly on the lower trunk and generally measured 5 to 8 inches in length and 1 to 2 in width, Sometimes the galled areas ran together and extended 1/3 to 2/3 the length of the trunk (Figure 1). They consisted of abundant small galls in ridges, in clumps, or as large warty outgrowths. The galls at first, when they were pale cream in color and soft, closely resembled callus tissue. Later they enlarged, turned dark, and became very hard. Affected vines were stunted with pale to chlorotic foliage. The weight of wood was found to be reduced by as much as one-half. The more severely infected vines showed a deep cracking in the stalk followed by desiccation, dieback, and eventual death.

Growers were advised to cut off affected vines and, when possible, to select sucker growth from below the galled area as replacements. In a 3-year old block of 200 Seibel 10878 vines, 53 infected vines were so treated, An inspection, a year later, revealed that in 49 cases satisfactory renewal canes had been established and appeared normal and free from gall. Four renewed canes were weak and of doubtful value. Twelve infected vines in this planting were left for further observation. By March, 1962, two of the vines were dead, four were cracked with wood dried out and could be expected to die or support only a weak growth. The remaining six appeared to show normal vigor. In 1961 three of the vines showed a slight advance in the extent of the galled areas. No instance of new infection occurred in the block.

Observation was made in 1961 on 8 infected 6-year old Pinot Blanc vines and 12 infected 4-year old Gamay. Six of the former died and two survived but were seriously weakened. In the Gamay row two vines died, five showed a slight advance of the galled area, and five appeared to be normal in vigor and showed no active gall. In this row of 47 vines one new instance of infection was recorded. Pinot Blanc was much more susceptible to the effect of gall than the other varieties.

The infection enters the vine through cracks and fissures on the stem (4). These may result from low winter temperatures, freezing and thawing in the early spring, late frosts, rapid bark expansion (growth cracks), and the like. In a few instances, infection followed cracking of young stems caused by twisting the cane when tieing. Galls were also found in nursery plantings on vines injured close to ground level by a mechanical weeding device.

Discussion

Environmental conditions are important in predisposing vines to infection. The development of the present outbreak did not appear to be related to injury induced by low temperature as the preceding winter was moderate and subzero temperatures were not recorded. Two other possibilities are suggested as contributing to the widespread occurrence of the disease. An unusual feature of the winter was the heavy snowfall in February and March, 1960, totalling 46 5/8 inches and the periods of light freezing and thawing in those months. The lowest temperature, 2°F was recorded on March 9. Such environmental conditions may have caused the injuries necessary for infection. The second and more likely possibility is that in April, the month when vegetative activity commences, ample soil moisture remaining from the snow coverage combined with frequent warm showers and moderate temperatures to favour an abundant flow of sap. Especially important was a warm spell, accompanied by showers in the period April 20 to 25, when the temperature reached 80°F on two successive days. It can reasonably be assumed that on the lighter and warmer soils these conditions favoured a rapid surge of sap (1) and increased pressure, sufficient to induce bark splitting (growth cracks) on younger vines, Frequent heavy showers in May served to splash and spread the bacteria onto the vine stalks and to provide favorable moisture relations for infection.

Conclusion

In 1960 it was clearly evident that younger vines of the vinifera and hybrid varieties, particularly Seibel 10878, were highly susceptible to aerial crown gall. This must be considered a weakness of the variety when favorable conditions for development of the disease are experienced, According to the Ontario Department of Agriculture fruit census of 1956, Seibel 10878 represents 3.2 per cent of the total vines grown in the Niagara area and it has since increased.

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