Sugar Beet Virus Yellows Influences Subsequent Curly Top Infection

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There are many areas in the western United States where both virus yellows and curly top occur in sugar beet-growing areas. This fact led the author to investigate the possible effects of virus yellows infection upon subsequent exposure of such plants to curly top infection.

Thirteen separate experiments have been conducted during 1952 and 1953. All yellows-infected plants were inoculated and checked by Dr. C. W. Bennett of the Riverside Field Station of the Division of Sugar Plant Investigations. The infected plants were allowed to develop until there was evidence of partial recovery from virus yellows before they were inocullated with curly top virus. Plants used as checks were of the same variety and age as those infected with yellows and were held under the same environmental conditions.

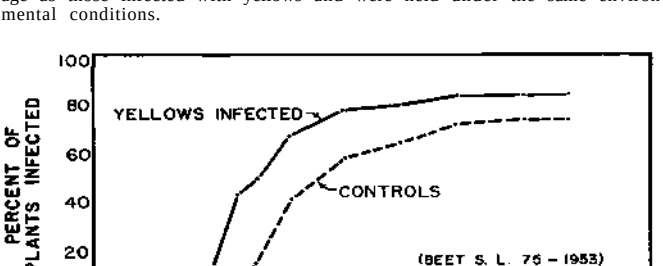

Figure 1. Rate of curly top symptom development and final percent of curly top infection among sugar beet plants of the variety S. L. 75. Solid line indicates yellows-infected plants and broken line controls.

The tests have included beet varieties S. L. 842, S. L. 75 and U. S. 22/3. Curly top inoculations were made with virus strains 1, 2, 3, 11 and 12 but strains 2, 3, and 12 gave low amounts of infection among plants of the curly top-resistant varieties and practically all inoculations were made with strains 1 and 11 after the first two experiments. The first "pilot" test included only ten check plants and 22 which were yellows-infected. The other 12 experiments included 1,133 plants, of which 511 were checks not infected with yellows and 622 were yellows-infected. Figure 1 gives a typical example

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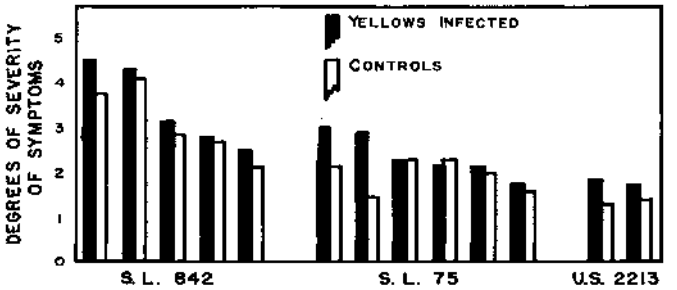

Figure 2. Average severity of curly top symptoms shown by infected sugar beets approximately 6 weeks after inoculation. Solid black bar indicates yellows infected plants and adjacent outline indicates controls.

of the rate of curly top symptom development and the final percent infection among yellows-infected plants and among control plants of the beet variety S. L. 75.

In each of the 13 experiments the appearance of curly top symptoms was distinctly more rapid in the plants which were diseased with virus yellows. In the first experiment, and in one other in which the susceptible beet variety S. L. 842 was used, the final amount of infection was 100 percent, but the controls were several days later than the yellows-infected plants in showing 100 percent curly top. In the other experiments the yellows-infected plants showed a final infection score which was from 3 percent to 23 percent higher than the controls and a general average that was well above 10 percent.

Evidence from the first few experiments indicated that the injury from curly top infection was more severe in plants which were previously infected by virus yellows than in comparable control plants. The data from all 13 experiments are given in Figure 2.

There are 11 tests in which the yellows-diseased plants show greater curly top injury than the controls. Based on a severity grade scale of 1 to 5. the greater amount of injury varied from 0.1 to 1.0 degrees of severity. In one experiment with beet S. L. 75 there was no difference and in another there was a reversal of 0.1. The results as a whole are statistically significant but are not so striking as those dealing with susceptibility to curly top infection and time required for curly top symptoms to appear.

Curly top virus is an obligate parasite. It will infect and develop in only a few specialized living tissues (1, 2). Other factors being equal the curly top virus normally appears to infect more readily and to develop more rapidly in plants which are growing vigorously. Virus yellows certainly interferes with the normal growth of sugar beet plants infected by it, yet it seems to induce some physiological disturbance in the beet which is favorable for curly top virus.

The important fact proved by this work is that sugar beet plants infected by virus yellows are more likely to become infected and injured by curly top. Control measures against virus yellows will help to some extent in keeping down the losses due to curly top.

Literature Cited

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