Sugarbeet Virus Diseases in Arizona, 1965-1968

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Most virus diseases known to affect sugar beets in the United States were recognized within the past 20 years in the seed crop in Arizona. However, little, if any, information was available in regard to the relative incidences and epidemiology of the diseases. It was conceivable that the advent of a large commercial root-crop acreage could alter the disease situation. Thus, a study was undertaken to determine the relative incidences of sugarbeet virus diseases in Arizona and to follow their epidemiology over several seasons.

Methods

Monthly disease surveys were conducted in sugarbeet fields throughout the Salt River Valley in central Arizona from November through June of 1965-66, 1966-67 and 1967-68. Six experimental strip-fields were included the first year and 30 commercial fields were surveyed in each of the latter two seasons. In each experimental field, an area of approximately 4500 ft^2 was selected for plant-by-plant disease counts. Virus incidence in commercial fields was assessed by counting diseased plants in 20 samples of 50 plants each, situated at equal intervals along two random diagonals of the fields. New diagonals were traversed each month. Data included the monthly incidence of yellows (beet and western), curly top, beet mosaic, cucumber mosaic, yellow vein and rosette virus diseases. All fields were planted with Spreckels' Sugar Company's curly-top resistant variety S 301-H.

Results and Discussion

In 3 years the relative incidence of the virus diseases were similar. That is, yellows was the most prevalent, followed by curly top, the mosaics, yellow vein and rosette. Only trace incidences (mean = less than 0.8%) of beet and cucumber mosaic, yellow vein and rosette were observed each year. The yellow net and savoy diseases were not encountered.

Monthly mean incidences of yellows and curly top are presented graphically in Figure 1A & B. During the 1966-67 cam-

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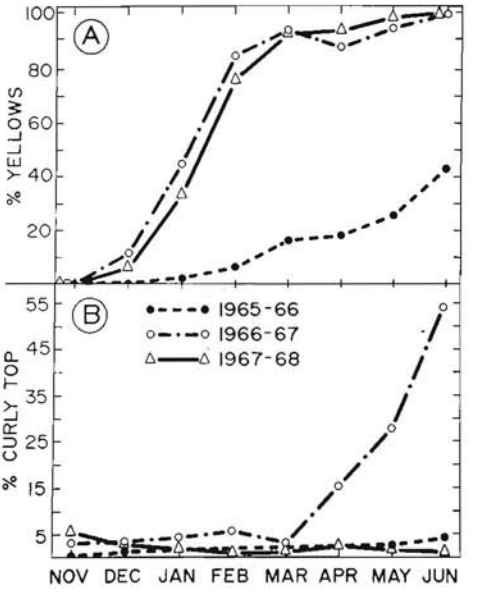

Figure 1.—Mean monthly incidence of sugarbeet yellows (beet and western) and curly top in central Arizona from November through June in 1965-66, 1966-67, and 1967-68; A, yellows incidence, and B, curly top incidence.

paign, when the first commercial root crop was grown, the incidence of yellows and curly top rose appreciably over that of the previous year. In December 1965, only a trace of yellows was encountered; in December 1966, the mean incidence of plants examined was 11%, with a range of 0 to 56% between fields. Final mean incidence of yellows in 1965-66 was only 42%; whereas in 1966-67, 100% of the plants exhibited symptoms of the disease. The mean incidence of curly top remained below 5% in 1965-66. Observations of curly top were discontinued from January to March because recovery (symptom masking) of infected plants made it almost impossible to detect the disease.

Curly top-infected plants were evident throughout the 1966-67 season, and by June the disease reached a mean incidence of 54%, with a range of 14 to 83% between fields. The more rapid build-up of yellows and the 10-fold increase in curly top in 1966-67, as compared to the previous season, can be attributed in part to environmental conditions that were more favorable to the insect vectors in the latter season. An unusually wet and cold winter in 1965-66 suppressed reproduction of aphids and leaf-

hoppers in Arizona. Increased acreage of sugarbeets also provided an abundance of host beets for the viruses and their vectors in 1966-67.

The mean monthly incidence of yellows during the 1967-68 season closely paralleled our results from the previous year. Although monthly incidence of the disease was somewhat lower until March, the final incidence of yellows reached 100% by June. Curly top incidence remained below 5% after our December survey.

Attempts were made to qualitatively correlate disease incidence and yields during the last two seasons. No consistent, general relationships were found; however, yields of certain individual fields apparently were adversely affected by early and high incidence of virus diseases, particularly curly top. For example, one field in the 1967-68 surveys had an initial incidence of 48% curly top and also an early high incidence of yellows. This field yielded about 16 tons of beets per acre with 15% sucrose, whereas the average yield in the Salt River Valley was about 22 tons with 15% sucrose.

The unusually high incidence of curly top in the 1966-67 season cannot easily be explained. The occurrence of more virulent strains of the virus late in the season could account for the increase in incidence and disease severity (2)[2]. However, isolates of curly top collected in March 1968 proved to be more virulent than Giddings' severe "Strain 11" (3) and almost as virulent as Bennett's (1) Los Banos strain (McFarlane, personal communication). Yet, recovery of the beets from early infection made it almost impossible to detect curly top infection late in the 1967-68 season. Apparently, factors other than the presence of highly virulent strains are necessary for the development of severe curly top symptoms in central Arizona.

The incidences of the sugarbeet virus diseases probably will vary from year to year depending on several factors. The effects of environment on the insect vectors and the reservoir hosts of the viruses are important considerations. Also, the maintenance of a beet-free period coupled with complete field cleanup operations of previous beet crops would reduce the potential of beets serving as reservoirs of virus for succeeding beet crops.

No consistent directional migration of green peach aphids [*Myzus persicae* (Sulz.)] or beet leafhoppers [*Circulifer tenellus* Baker)] into central Arizona has been observed. However, a hypothetical division of the Salt River Valley into four equal quadrats revealed that yellows incidence always was higher in the northwest quadrat early in the season. Qualitative estimates

[2] Numbers in parentheses refer to literature cited.

of green peach aphid populations early in the 1967-68 season nicely correlated the high incidence of disease with the greater aphid populations. Curly top, conversely, always has shown a higher early incidence in the southeast quadrat. Such information may be of help in searches for primary-inocula reservoir hosts of the viruses and the oversummering habitats of the insect vectors.

Literature Cited

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