

## Curly Top Moves East

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It is a commonly accepted fact that sugar beet curly top is likely to cause serious damage in many areas west of the Rocky Mountains and we know that it is occasionally found east of the mountains. The vector, *Circulifer tenellus* (Baker), has been reported from Florida and the West Indies (6)<sup>2</sup> and from Illinois (4), but no proved case of curly top injury to plants has been found farther east than Jacksonville, Texas, previous to 1953.

During the summer and early fall of 1953 shipments of beet leafhoppers were received from Dr. H. H. Thornberry of the University of Illinois and curly top virus was obtained from some of the leafhoppers in each lot. The collections were made in Madison, St. Clair, Peoria and Champaign counties. Some sugar beets from Cook County, north of Chicago, were also sent for testing and curly top virus was obtained from one of them. This proves that curly top was present more than 400 miles farther east than shown by any previous record.

Curly top diseased beets were also received at Riverside from Mason City, Iowa, and Waseca, Minnesota. The virus obtained from these beets and that obtained from the Illinois leafhoppers and beets appear to be mild to intermediate in virulence toward sugar beets according to our present standards. Some of those classed as intermediate now might have been placed in the highly virulent group five years ago, as much more virulent strains have come to light since then.

During September, 1953, there were reports of curly top damage in southeastern Colorado and southwestern Kansas. A visit to those areas in early October revealed an appreciable amount of curly top in the Swink-LaJunta area of Colorado but the amount of actual damage appeared to be relatively small. In the fields visited it was estimated that about 5 percent of the plants showed obvious curly top symptoms.

In the Garden City-Scott City area of Kansas there was evidence of extreme damage similar to that which used to occur in Idaho, Utah and California before curly top-resistant sugar beet varieties were available. Field men reported that some growers were harvesting crops which yielded 4 to 5 tons of beets per acre. There was clear evidence that virulent strains of curly top virus were present but there were undoubtedly other factors involved. Curly top injures or kills the tiny feeder roots of the beets (5) just about as soon as any visible symptoms appear on the leaves and water shortages result in serious injury to such beets much sooner than to beets with a normal root system. Some fields had very poor stands and there was evidence that large beets had died. We have no practical way to determine whether curly top was a major factor in the death of these beets but it may well have been. The injured feeder roots not only require a better supply

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<sup>2</sup> Numbers in parentheses refer to literature cited.

of available water but are also a convenient place for the entry of soil fungi which induce decay. It is rather unusual for relatively large sugar beet plants to be killed by curly top unless some secondary factor is involved. There was definite evidence of some other virus diseases in the area but it is quite certain that they were relatively unimportant. It is also possible that the curly top virus was present at an earlier date than was suspected as some of the virus strains found there induce leaf symptoms which are quite different from our "classical" idea of that disease.

Beet samples were taken from both the Kansas and the Colorado areas and have been carefully tested at the Riverside Field Station of the U. S.



Figure 1. A and B are plants in sugar beet field near Garden City, Kan. A shows lateral curling and dwarfing similar to plants infected by curly top virus strains 5, 6, 10 and 12. B, general distortion with pronounced crinkling of the younger leaves as induced by strains 1, 3, and 11.

C, D, E and F are greenhouse plants infected by curly top virus obtained from sugar beets collected in Kansas and Colorado. C shows symptoms on beet SL 842 characteristic of strains 1, 3 or 11. D, symptoms on beet SL 68 characteristic of strain 11. E, symptoms on beet SL 842 characteristic of strains 5 or 6. F, symptoms on beet SL 842 characteristic of strain 10. H, healthy check of beet SL 842.

Department of Agriculture. Symptoms suggestive of other virus diseases were present on some of the beets selected for testing but curly top virus was obtained from every beet. At least one other virus was present in some of these plants and Dr. C. W. Bennett of this station is giving them some study. The curly top virus strains obtained from the beets have been tested on susceptible and resistant sugar beets and on Turkish tobacco. Some have also been tested on tomato. Many, and possibly each, of the beets had infection by more than one strain of the curly top virus. Results at the time of writing clearly show 3 virus strains in the Swink-LaJunta area and 4 strains in the Garden City-Scott City area. There may well be other strains present. One strain from each area would be classed as intermediate in virulence and the others range from highly virulent to extremely virulent. One strain, or strain complex, from each area appears to be equal in virulence to strain 11 (3), the most virulent curly top strain yet encountered. Three others appear to be strains 1, 3 and 10 (1, 2). Figures 1A and B show typical symptoms induced by two strains.

The explanation of this disastrous curly top outbreak remains to be determined. It might be due to an unusually great influx of leafhoppers from western Texas and from New Mexico. It is quite possible that there have been great changes in breeding areas and/or host plants in this general region. It is certain that the beet leafhoppers entering the southwestern Kansas and southeastern Colorado areas were carrying curly top virus strains which might be disastrous to the beet sugar industry there. It is clearly evident that growers east of the Rocky Mountains must seek sugar beet varieties which are resistant to curly top.

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