

# Beet Leafhopper and Curly-Top Disease Survey in Washakie County<sup>1</sup>

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Sugar beets in Washakie County of Northern Wyoming have been seriously damaged by curly top of sugar beets each year since 1960. Yield losses have been high to growers in an area that has been and still is economically dependent on sugar beets. Losses of 2 tons per acre in 1960, 4 to 5 tons in 1961, and 2 to 3 tons in 1962 have been estimated by county agricultural officials.

Washakie County is within the territory of Holly Sugar Corporation, one of their factories being located at Worland, Wyoming. Resistant sugar beet seed has been used in this county for many years and until 1960 appeared to be adequate in withstanding curly top disease.

The cultivated area of the county is situated in an irrigated valley formed by the Big Horn River, traversing the county south to north. Cultivated lands on both the west and east sides of the river merge with arid rangeland on the west, east, and south sides of the county. The arid rangeland is characterized by sparse vegetation.

Curly top is a virus disease that damages sugar beets. The only known method of transmission is by the beet leafhopper, *Circulifer tenellus* (Baker) (1)<sup>3</sup>. In other sugar-beet-growing regions the beet leafhopper overwinters in desert areas and migrates into cultivated valleys in the spring (2). However, its habits and behavior are incompletely known, and this lack of information has contributed to inadequate control and preventive measures. Information as to where and how the beet leafhopper overwinters and on the time of migration is necessary to initiate controls. Limits of the insect's host range would also be of value.

This survey was conducted to determine the extent of curly top infection and to answer some of the questions pertaining to the habits of the beet leafhopper. It was hoped that the survey would provide a clue or starting point in the search for a better understanding of the beet leafhopper-curly top relationship in Washakie County.

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<sup>3</sup> Numbers in parentheses refer to literature cited.

### Methods

Sugar beet fields in Washakie County were surveyed for the beet leafhopper on five occasions—April 17, May 8, June 16, June 21, and July 11, 1962. Thirty-eight fields were designated as check fields and each of these fields was examined during every survey (Figure 1). Fifteen additional fields were examined on each of the five surveys, using different fields each time. The 38 permanent fields were picked largely at random; however, a few were picked on the basis of curly top infection in 1960 and 1961.

Two methods were used to survey each field: (a) a standard insect net and (b) a square-foot sampler. The sampler is a modification of the Hills Square Foot Sampler (3). It is a cage con-

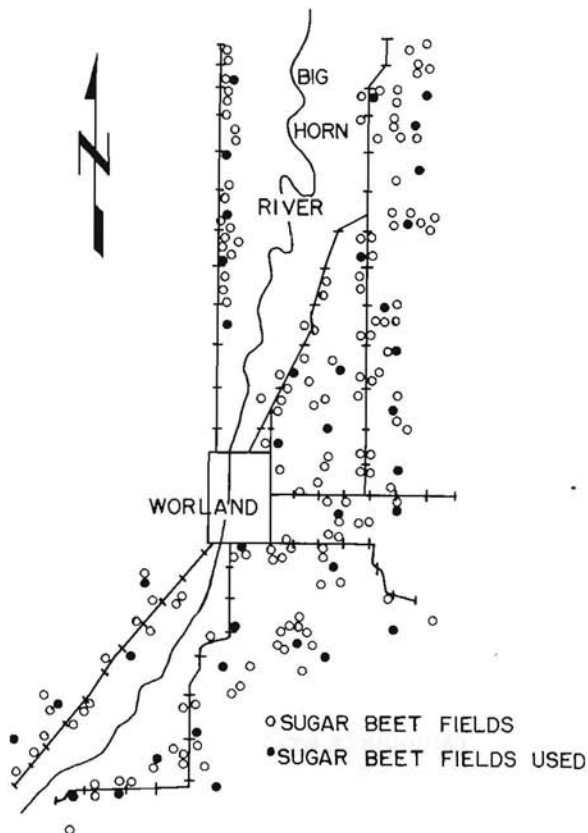


Figure 1.—Location of sugar beet fields used as checks in the survey for beet leafhoppers.

sisting of a circular frame wrapped with cheesecloth and is open at both ends. When a desired plant is found, the operator places the sampler over the plant. The operator then disturbs the plant, causing the leafhoppers to jump to the cheesecloth. The insects can be counted or picked off the sides with an aspirator, which can be any form of suction or vacuum pump. The insects are then removed from the aspirator, counted, and preserved.

Fifty square-foot samples were taken at random locations in each field with the sampler, and 200 sweeps were taken in each field with the insect net. Weed hosts of the beet leafhopper that were near to beet fields, or bordered them, were also examined, using both methods of survey.

The curly top survey was conducted in Washakie County during the week of August 6 to 10, 1962, and was designed to include the entire sugar beet acreage in the county. A total of 187 fields was examined, a few fields may have been missed because of their hidden or unseen location.

A total of 1,000 plants was visually inspected by examining 100 plants at each of 10 locations selected at random in each field. The infected plants from each of the locations were then counted to give the total number of infected plants, thus determining the percentage of infected plants. Each field was given a degree of infection rating based on a scale of five ratings as follows:

Percent infection	Degree of infection
0	none
1-10	light
11-20	moderate
21-50	severe
51-100	very severe

Plants showing questionable curly top symptoms were not counted. Symptoms were determined entirely by visual observations in the field. A map was constructed to show the location of the sugar beet field and the degree of infection in each field. No attempt was made to show the location of host plants other than sugar beets. It is probable that some infection occurred after the survey was completed, however, it is unlikely that these new infections would appreciably change the general conclusions.

### Results and Discussion

The first beet leafhoppers were collected during a survey on July 11. The first symptoms of curly top, found during the survey conducted on June 21, occurred 21 days before discovery of the first beet leafhoppers. Neither the beet leafhoppers nor symptoms of the disease were noted in surveys made April 17, May 8, or June 16. On July 11, when the beet leafhopper was first dis-

covered, an average of three individuals per 200 sweeps were taken. More beet leafhoppers were found at the end of the fields nearest to the desert area than at the opposite end. Symptoms of curly top occurred first in the end of the fields bordering the desert area indicating that migration from the desert area to cultivated areas had just begun.

The first symptoms of the disease and the first beet leafhoppers were noted in fields bordering the desert area on the east side of the cultivated area. Curly top infection was not found on the west side of the Big Horn River until 14 days after the first symptoms appeared on the east side.

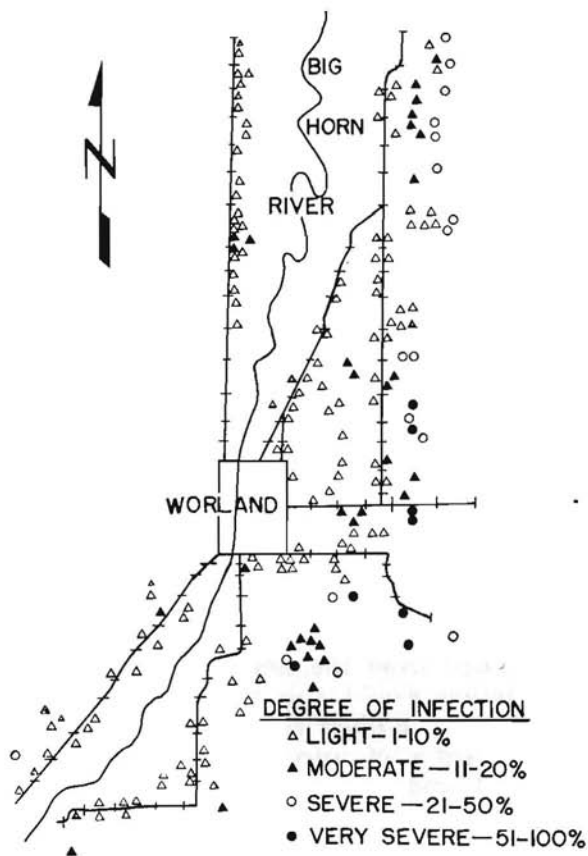


Figure 2.—Distribution of sugar beet fields and degree of curly top infection in Washakie County.

All of the sugar beet fields had some infected plants; in no case was a field rated absolutely free. The percentage of plants infected in each field ranged from 1.2 to 73.5 percent. Eight fields or 4.3 percent were very severely infected, 17 fields or 9.1 percent were severely infected, 31 fields or 16.6 percent were moderately infected, and 131 fields or 70 percent were considered to have a light infection.

The map (Figure 2) shows the distribution of sugar beet fields and the degree of infection for each field. The most heavily infected fields were found on the extreme boundaries, where the cultivated areas meet the arid rangeland. Most of the fields in the center of the area had only light infections. Fields considered to be very severely infected were found in the southeastern corner of the beet-growing area. There appeared to be a gradual decrease in the degree of infection from the outer borders toward the center of the cultivated area.

Fields on the east side of the river had more infection than those on the west side. Five fields on the west side of the river were considered to be moderately infected, one was severely infected, none was very severely infected, and the rest had only light infections.

### Conclusions

The fact that beet leafhoppers were not found until 21 days after detection of curly top infection indicates that the method of survey and detection may not have been as effective as desired. It is apparent that small populations of beet leafhoppers did exist in the fields before detection of the disease symptoms. More intensive sampling may have picked up the insects much sooner than was reported. A shorter time lapse in days between surveys might also have detected the beet leafhopper before the July 11 date.

Detection of symptoms and beet leafhoppers on the east side of the river before detection on the west side indicates that the beet leafhopper population or at least the majority of the population exists in the desert area on the east side of the river.

Large numbers of beet leafhoppers were found on the end of the fields bordering the desert area, which indicates that beet leafhoppers migrated from the desert area into the cultivated area. The migration would also account for the most severe infection in fields on the outer edges of the cultivated area.

A decreasing degree of infection occurred from the outermost fields inward, and fields in the middle of the valley had only light infection. Apparently the beet leafhoppers are either overwintering in the desert area or are migrating from other overwintering grounds into the desert area. Migration to the cultivated area occurs as suitable host plants become available.

A larger population of leafhoppers occurred on the eastern side of the river than on the western side. The most severely infected fields were found southeast of Worland and may indicate that a more dense population of weed hosts are on the desert near these fields than occurs along the borders of the remaining fields. Visual observations before the survey showed that the earliest signs of curly top were also found in this area.

### Summary

A survey was conducted in Washakie County on April 17, May 8, June 16, June 21, and July 11, 1962, to detect the earliest possible presence of the beet leafhopper. The first beet leafhoppers were found on July 11, or 21 days after the first symptoms of curly top appeared.

The first indication of curly top and the presence of beet leafhoppers occurred on the east side of the Big Horn River in fields bordering the desert area. Apparently the bulk of the population exists on the desert on the east side of the river.

A survey of sugar beet fields in Washakie County to determine the degree of curly top infection was conducted on August 6-10, 1962. A total of 187 sugar beet fields were surveyed, and 1,000 plants in each field were examined visually.

The most severely infected fields were found along the outer edges of the cultivated areas adjacent to the arid rangeland. The eastern edge was more severely infected than was the western edge. An area southeast of Worland had the most severely infected fields.

Seventy percent of the fields had light infections, 16.6 percent were moderately infected, 9.1 percent were severely infected, and 4.3 percent were very severely infected.

### Literature Cited

- (1) DOUGLASS, J. R. and W. C. COOK. 1954. The Beet Leafhopper. USDA Circ. 942: 1-21.
  - (2) FOX, D. E. 1938. Occurrence of the Beet Leafhopper and Associated Insects on Secondary Plant Successions in Southern Idaho. USDA Tech. Bul. 607: 1-14.
  - (3) HILLS, O. A. 1933. A new method for collecting samples of insect populations. J. Econ. Ent. 26: 906-910.
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