Curly Top Epidemic in Western Idaho[1]

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A curly top outbreak occurred in western Idaho in 1969. Damage was severest in the beet-growing area near Grand View, Idaho, and became milder, moving north toward Nampa and southeast toward Castleford. It is difficult to estimate losses caused by curly top. Growers using timely cultural practices had much less loss than others. However, curly top was a significant factor in the abandonment of approximately 3,000 acres in western Idaho, and in the most severely diseased area the average yield was reduced by 27%.

Some 40 years ago this disease threatened to eliminate sugarbeet production in much of the Intermountain area (3)[3]. The development of resistant varieties, early planting, and vector control have greatly reduced the curly top problem in recent years. During the last 3 or 4 years, however, severe local outbreaks have been more frequent.

The epidemic in western Idaho in 1969 was analyzed to seek explanations for the increased frequency of local outbreaks and offer insight enabling us to anticipate future occurrences and what measures might reduce losses. We determined the relative virulence of isolates of curly top virus collected in the affected area. Information also obtained on the leafhopper vectors migrating into the area and on the percentage of viruliferous hoppers.

Analysis of Curly Top Virus Isolates Collected from Affected Area

Six isolates of curly top virus were collected from different locations within the affected area. These were transferred in the greenhouse to a susceptible inbred variety to provide uniformity of virus source material. Two additional isolates were included for comparative purposes. One isolate was strain 11, described in 1954 by N. J. Giddings (2) as a severe strain obtained from

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[3] Numbers in parentheses refer to literature cited.

Idaho. The other isolate (66-10) was collected by D. L. Mumford in 1966 in a curly top disease evaluation nursery located west of Thatcher, Utah. Isolate 66-10 has been compared with the most virulent strains described to date, including the Los Banos strain from California (1), and has been found to be more virulent than any other known strain.

The virulence of each isolate was evaluated by inoculating both resistant and susceptible sugarbeet varieties (Table 1). Four of the isolates were equal to or greater in virulence than strain 11, but none were as virulent as 66-10 described above.

Although a new highly virulent strain of curly top virus was not found in the affected area, virus isolates similar to strain 11, which was considered unusually virulent in that area less than 10 years ago, are now quite prevalent. The history of our knowledge of strains of curly top virus has been one of increasing prevalence of more virulent strains. The highly virulent isolate 66-10 was obtained from the most resistant sugarbeet breeding lines being evaluated in 1966. It seems likely that widespread use of more resistant sugarbeet varieties will tend to gradually select and favor increased prevalence of more virulent strains of the virus.

Table 1.—Virulence of curly top isolates from western Idaho.

Location	Identification No.	Grade[a]	
		3561[b]	NB-1[c]
Mt. Home	69-1	5.3[d]	1.8
Grand View	69-2	6.8	1.7
Nampa	69-3	6.4	2.0
Dry Lake	69-4	5.4	1.0
Grand View	69-5	6.6	2.0
Buhl	69-6	6.3	1.7
Idaho	Strain 11	5.9	1.7
Utah	66-10	7.9	3.3

[a] Grades based on scale of 0-9 with 0 = no symptoms and 9 = dead
[b] Susceptible variety
[c] Resistant variety
[d] Mean of 20 plants

Analysis of the Leafhopper Vectors Migrating Into the Affected Area

A high population of leafhoppers moved into the affected area 3 to 4 weeks earlier than normal. At this time most of the beets in the area were in the susceptible cotyledon stage. Tests on hoppers in the breeding areas before they moved into the beet fields showed that the percentage carrying the virus ranged from 4 to 48; the average of those tested was 37% viruliferous. This is the highest average percentage of viruliferous hoppers in these breeding areas since 1935. During the 10 years prior to 1969, the percentage of hoppers carrying the virus has averaged about 7.

This situation suggests an abundance of curly top infected host plants in the leafhopper overwintering areas. A survey of beet leafhopper host plants in 1968 in eastern Oregon, conducted by the research staff of Amalgamated Sugar Company and USDA personnel, reported an abundance of infected host plants.

There is a rather unstable balance between factors favoring severe curly top development on one side, and factors favoring early establishment of vigorous stands of resistant sugarbeets on the other. Changes in these factors on either side can increase the frequency of curly top epidemics. Efforts must be continued to develop more resistant sugarbeet varieties. Growers must use cultural practices that establish sugarbeet stands early and avoid unnecessary stress on plant growth. The use of systemic insecticides should be more extensively tested in the western Idaho area. Surveys for overwintered beet leafhoppers are made each year by the Plant Pest Control Division. By utilizing greenhouse tests of hoppers collected, information can be obtained on percentage of hoppers carrying the virus as well as overall abundance of hoppers. This information might be used as a guide to utilize insecticides in those years when the potential for disease is high.

Summary

A major cause of an outbreak of curly top in western Idaho in 1969 was the movement of an unusually high population of viruliferous beet leafhoppers into the affected area 3 to 4 weeks earlier than normal.

The increased prevalence of more virulent strains of curly top virus was clearly indicated and is suggested as a major factor in the increased frequency of curly top outbreaks in recent years.

Literature Cited

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