Comparison of Five Weeds as Hosts for Beet Leafhopper and Beet Curly Top Virus*

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INTRODUCTION

Two major factors influencing the severity of curly top attacks on commercial crops are the size of the initial spring beet leafhopper populations and the percentage of those leafhoppers that carry beet curly top virus (BCTV) (3). In central California, the beet leafhopper overwinters and produces spring populations almost exclusively on weed hosts. Therefore, how rapidly the leafhoppers reproduce on these weed hosts and how readily the weed hosts become infected with BCTV are important in determining the occurrence of disease outbreaks.

Although much is known about the weed host range of beet leafhopper and BCTV (1), most of that information is based on field observations. In 1957, Douglas and Hallock (2) reported differences in the number of eggs deposited by beet leafhoppers on several weeds grown in the greenhouse. Wallace and Murphy (94) reported differences in susceptibility to BCTV among three weed hosts in southern Idaho. The purpose of this study was to compare the most important spring weed hosts of central California for their beet leafhopper buildup and BCTV infection under controlled greenhouse conditions. One of the major curly top control efforts is directed toward reducing leafhopper populations during the spring. Information on

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the role of specific weed hosts should be helpful in setting priorities for this control program.

MATERIALS AND METHODS

Five major weed hosts of the beet leafhopper in the foothill breeding areas of central California are filaree *(Erodium circutarium)*, plantago *(Plantago erecta)*, peppergrass *(Lepidium nitidum)* London rocket (*Sisymbrium* sp.) and Russian thistle *(Salsola kali tenicifolia)*. Seedlings used for leafhopper production were grown for 6 - 9 weeks until they were large enough for 10 adult leafhoppers to be caged on them without showing noticeable seedling injury. Seedlings used for curly top inoculation were grown for 4 - 6 weeks. The planting dates of each species were varied to produce seedlings of comparable size. Sugarbeet seedlings were included in all tests for comparison.

Leafhopper production was measured by caging 10 female leafhoppers on each plant for 30 days giving the leafhoppers complete access to the entire plant. Plants were maintained in a greenhouse with 16-hour days and 8-hour nights. Day length was extended by use of fluorescent lighting for approximately 4 hours. Temperatures varied from a nighttime low of 18C to a daytime high of 34C. After 30 days, the number of nymphs on each plant was counted and the plant weighed. Eight to 10 plants of each species were used for each of three tests.

Susceptibility to infection by BCTV was measured by caging four viruliferous leafhoppers on each plant for 5 days. The leafhoppers were caged on the plants in such a way that they had complete access to the entire plant. After the leafhoppers were removed, the plants were kept in the greenhouse for 30 days to allow symptom development. Percentage infection was determined by visual observation, then each plant was assayed for virus by enzyme-linked immunosorbent assay. Eight to 10 plants of each species were used for each of three inoculation tests. Plants were considered infected if either visual symptoms or the laboratory assay were positive. Tests were considered as replicates in the analysis of variance.

RESULTS AND DISCUSSION

Beet leafhopper production was highest on sugarbeet and London Rocket (Table 1). Peppergrass plants survived in only one test and had a high production of leafhoppers. Plantago was intermediate. Filaree and Russian Thistle produced the fewest leafhoppers. When data on leafhoppers produced per plant rather than per gram of host tissue were considered, results were similar to those in Table 1, except the variability was greater.

Table 1. Comparison of beet leafhopper production and susceptibility to beet curly top virus infection on sugarbeet and five weed hosts.

Host	Percentage infection	Nymphs/gm host tissue
Sugarbeet	92	28
Filaree	88	6
Peppergrass	57	–
Plantago	28	10
London Rocket	5	24
Russian Thistle	0	6
LSD (5%)	23	18

Sugarbeet sustained a higher percentage of infection with BCTV than did any of the weed hosts tested, although it was not significantly higher than Filaree. Peppergrass and plantago were intermediate in susceptibility with peppergrass being significantly more susceptible. London rocket and Russian thistle had little or no infection.

Major differences were recorded in how the weed hosts responded to BCTV infection and leafhopper production. Filaree was one of the most susceptible to BCTV infection but was the lowest in leafhopper production. London rocket was one of the least susceptible to infection but was the highest in leafhopper production. Differences such as these should be considered when directing leafhopper control efforts.

These results were obtained under very specific conditions. Leafhoppers did not have free choice of hosts on which to feed-inoculate or to lay eggs. Therefore, vector preference was not a factor. However, the treatment of

different hosts was similar. Future tests may allow for vector preference and additional virus strains may be utilized.

The results show that, under controlled conditions, there are major differences occurring in beet leafhopper production and susceptibility to BCTV among the principle weed hosts in central California. The observations identified additional factors to be considered by those implementing control measures in this area.

ACKNOWLEDGMENT

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