# Feeding Preference and Reproduction of the Beet Leafhopper on Two Russian Thistle Plant Species

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## Introduction

Curly top disease is one of the most destructive diseases of sugarbeet. In the United States, it is transmitted only by the beet leafhopper, *Circulifer tenellus*. The extremely complicated life cycle (1)[2] of this insect in California involves migrations in the fall from the cultivated area of the San Joaquin Valley to the major breeding ground areas in the foothills on the west side of the valley, where eggs are laid on various host plants (3). Large areas of open range, beet leafhopper breeding areas, are infested with species of Russian thistle.

In an effort to reduce curly top losses in California, each fall thousands of acres of Russian thistle are treated with insecticides by the State Department of Agriculture to control the vector.

It has become apparent in the last several years that the vegetation in the beet leafhopper breeding areas is changing. Among such changes, the dominant species of Russian thistle, *Salsola iberica* (2), is being replaced by another Russian thistle species, *S. paulsenii* (2) (barbwire thistle). The ecological basis for this replacement is not known but it is quite possible that these plant population changes will continue and will have an impact on the epidemiology of the beet leafhopper in the San Joaquin Valley and in the adjacent breeding areas.

The high operational cost of the spraying program and the preliminary observation by the State Department of Agriculture that *S. paulsenii* seems to be a poor host of the beet leafhopper prompted us to investigate some of the biological properties of the beet leafhopper on these hosts.

## Materials and Methods

Russian thistle (*S. paulsenii* and *S. iberica*) were grown in 9 cm pots under normal greenhouse conditions. In all experiments, 7-8 week old plants were used. Healthy beet leafhoppers were reared on sugar-

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[2]Numbers in parentheses refer to literature cited.

beets at 30°C. Only the adults were used. To study the feeding or selection preference of the beet leafhopper, we designed a box with glass sides and with four 9 cm holes in the bottom. Two plants of each thistle species, *S. paulsenii* and *S. iberica*, of the same size were randomly placed in the box through the bottom holes and then 100 healthy beet leafhoppers were added. The plants were isolated from each other at the base but the box was common to the plants at the top. The leafhoppers had a free choice to move on the plant species and were allowed to feed for 30 min. After this time period, they were anesthetized by administering $CO_2$. Plants were removed from the box and insects were immediately counted. In preliminary tests, anesthetized insects frequently fell into the soil surrounding the plants and were lost; therefore the soil was covered with aluminum foil to reduce error. To determine the breeding characteristics of the beet leafhopper, plants of each Russian thistle species were placed in a standard leafhopper cage with 50 healthy female beet leafhoppers at 30°C. After ten days, the beet leafhoppers were removed. After 30 days, the nymphs were counted on the test plants. Leafhoppers placed on sugarbeet plants served as controls.

## Results and Discussion

Results of our investigations show that *S. iberica* is the preferred feeding host of the beet leafhopper (Table 1). On the contrary, no differences were found regarding the reproduction of the beet leafhopper on these two Russian thistle species (Table 2).

**Table 1. — Preference of beet leafhoppers on two plant species, *Salsola paulsenii* and *S. iberica*.**

| Plant Species | No. of leafhoppers recovered |
|---|---|
| Salsola paulsenii | 13 |
| Salsola iberica | 58.7 |

In one experiment, 100 leafhoppers were randomly allowed to feed on two of each plant species in a specially designed insect-proof cage. After 30 min., leafhoppers were anesthetized by $CO_2$ and counted. Values are significant at the 1.0% level and represent the average of 10 experiments.

**Table 2. — Breeding characteristics of beet leafhoppers on two Russian thistle plant species.**

| Plant species | No. of beet leafhoppers hatched[a] |
|---|---|
| Salsola paulsenii | 35 |
| Salsola iberica | 40 |
| Control (Beta vulgaris) | 90 |

[a]Fifty female beet leafhoppers were placed on three different plant species. After 10 days, they were removed and 30 days after, the newly hatched nymphs were counted. Values represent the mean of 9 experiments.

In light of our data, the questions arises, what species of Russian thistle should be sprayed and when in order to obtain an effective control of the beet leafhopper.

Russian thistle plant populations occur mainly in mixed strands; however, large acreages covered by the barb-wire type of thistle can be detected by aerial mapping. On the basis of the low numbers of beet leafhoppers found on this species and our findings that this Russian thistle species is not the preferred feeding host of beet leafhoppers, the spraying of these plant populations in the fall is probably not justified. In areas where the dominant plant species is *S. iberica* and where large numbers of beet leafhoppers are found, spraying should be recommended.

The epidemiology of the beet leafhopper pertaining to these two Russian thistle plant species is further complicated by the fact that neither of these species is a good host for the curly top agent in nature (Magyarosy and Duffus, unpublished).

## Summary

The host plant selection and reproduction of the beet leafhopper (*Circulifer tenellus*), vector of the curly top agent, was investigated on two epidemiologically important Russian thistle species. *Salsola iberica* (tumbleweed) is the preferred feeding host of the beet leafhopper. No difference was detected between *S. iberica* (tumbleweed) and *S. paulsenii* (barb-wire thistle) as far as the reproduction of the beet leafhopper is concerned.

## Literature Cited

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