California in 1933 and 1934, and the results showed nearly a 50% decrease in thistle following the first year's operations, and a further reduction of around 40% following the second year's operations.

Some experimental work was done with hoeing by hand, dragging with rails, and disking, and all of these operations are feasible under certain conditions. 1937 three sugar companies contracted nearly 15,000 acres of beets in the central part of the San Joaquin Valley, close to the breeding grounds.

Direct control of Russian thistle is feasible wherever the area of thistle is comparable with that of beets being grown, and where the thistle areas are not too scattered.

In all of the breeding areas, the leafhoppers breed in the spring upon range annuals. Most of these annuals are range weeds, and their presence in large amounts is due to overgrazing.

PLANT ECOLOGY IN RELATION TO THE CURLY TOP DISEASE

R. L. Piemeisel, U. S. D. A.

The curly-top disease is carried by the beet leafhopper. The worst curly-top years are those when leafhopper populations are high. These high populations are produced on weedy areas where the insect breeds on wild mustards and Russian thistle. A grass cover or one of sagebrush and grass produces few or no leafhoppers and is a desirable cover as compared to the undesirable weedy type. Up to the 80's sagebrush and grass formed an almost unbroken cover over southern Idaho. After 1900 large areas were plowed and later some were abandoned.

Russian thistle and wild mustards were introduced and covered the abandoned lands, forming breeding areas for the leafhopper. Also the remaining sagebrush areas were used more intensively by stock; the grasses began to disappear and weeds, including a native wild mustard, appeared to form another type of breeding area. By applying the methods of plant ecology it has been found that there are changes in the weedy cover of the abandoned lands; that the changes form a series in development and that under certain conditions (proper farming and grazing of the lands) the weedy areas may change to the more desirable grass or sagebrush and grass cover.

EXPERIMENTS FOR THE CONTROL OF THE BEET LEAFHOPPER IN IDAHO, 1936-37

J. R. Douglass[1] and J. A. Gillett[2]

Idaho appropriated $50,000 in 1935 as a beet leafhopper extermination fund. On April 28, 1936 the Governor requested the University of Idaho Agri-

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1 U. S. Bureau of Entomology and Plant Quarantine

2 Idaho Agricultural Experiment Station

cultural Experiment Station and the U. S. Department of Agriculture to assume charge of the experimental work. The work was divided into two phases. (1) Control of the beet leafhopper and (2) the breeding of beans resistant to curly top disease.

The material used in 1936 consisted of a mixture of pyrethrum, summer spray oil and kerosene, or pyrethrum and kerosene, in ratios of oil to pyrethrum from 25 to 1 to 50 to 1 gallon. The applications were made with a Super-Spray mounted on a tractor. The infestation counts were taken with a Hills' sampling cage just before the spray was applied and again in about 24 hours.

The percentages of kill ranged from 35.25 to 97.83 with an average of 79.26. Variations in the percentage of kill are evidently caused by many factors, such as per-acre application, ratio of pyrethrum to oil, temperature, humidity, and wind velocity. Factors which were not measured may have been the cause of the fluctuation in results. They are (1) size of plants, (2) weediness of field, and (3) cultural conditions of field at time of spraying. The quantity of material applied per acre ranged from 3.71 to 8.53 gallons with an average of 6.51 gallons per acre. The leafhopper population during the season of 1936 was comparatively low. The average number of leafhoppers ranged from 41 to 435 with an average of 165 per 100 beets, or 100 feet of row. The evidence indicates that the 50 to 1 and 40 to 1 ratios of oil to pyrethrum were too large and best results were obtained at ratios of 25 to 1 and 30 to 1. In general the percentage killed increased as the pyrethrum content increased and the percentage killed increased as the per-acre application increased.

In the 1937 field experiments each plot consisted of one-half acre and was divided into 4 smaller plots. Old German type R. and G. seed was planted in the NE. and SW. plots, and U. S. No. 12 seed in the SE. and NW. plots. There was a general, gradual increase in the infestation from May 20 to June 1 when an average of 26.50 leafhoppers per 100 beets was recorded. By June 3 the average infestation had increased to 90.33 per 100 beets. From June 3 to 14, inclusive, there was a marked increase in population. The number of leafhoppers increased from an average of 501 per 100 beets on June 14 to 965.33 June 16, from 1,227.33 on June 18 to 2,556.67 on June 21, and to 2,939.17 on June 23 when the peak was reached. The material used, number of applications and date applied are presented in table 1. The applications of pyrethrum and oil and of free nicotine and oil sprays, were made with the Super-Sprayer mounted on a tractor. The applications of derris and nicotine sulphate sprays were made with a common water sprayer mounted on a trailer and attached to a tractor. Records show very little difference in beef leafhopper infestation on nonresistant (old type) and resistant (U. S. No. 12) strains of beets until June 23 when the resistant plants began to "break down" with curly top. Following the "break down" the leafhoppers began to move from the old type to the resistant beets. Of the materials tested only pyrethrum and oil gave any specific control. In the pyrethrum and oil plots the decrease in population ranged from 76.12 percent to 86.6 percent, but within a few days the infestation would again be comparatively general over the whole field by redistribution from other plots, nullifying the results. The results of the disease counts show no significant difference between the various treated plots or between the control or untreated plots.

Table 1

Number of applications made and material used in control experiments at Buhl, Idaho, 1937

Exp. No.	Plot No.	Spray material applied		Number of applications	Date of applications
	1 14	Control or untreated		- -	- -
1	2	Kerosene	20 parts	2	6/4-10
2	6	Oil	10 parts	3	6/4-10-17
3	10	Free nicotine	2 percent	4	6/4-10-17-23
4	3	Derris	2 pounds	2	6/4-10
5	7	Aresket	6.4 ounces	3	6/4-10-17
6	11	Water	50 gallons	4	6/4-10-17-23
7	4	Kerosene	20 parts	2	6/4-10
8	8	Oil	10 parts	3	6/4-10-17
9	12	Pyrethrum	1 part	4	6/4-10-17-23
10	5	Nicotine sulphate	1 quart	2	6/4-10
11	9	Summer oil emulsion	1 gallon	3	6/4-10-17
12	13	Water	100 gallons	4	6/4-10-17-23

VARIETAL TESTS FOR RESISTANCE TO SUGAR BEET NEMATODES

F. V. Owen, Gerald Thorne, and C. W. McBeth -
U. S. D. A.

Several attempts have been made during the past ten years to select sugar beets resistant to the sugar beet nematode. Efforts to compare these selections with standard varieties encountered considerable difficulty because the first selections were not made from curly-top resistant varieties. Experiments in 1935 and 1936 were particularly disappointing because curly top developed in the experimental trials resulting in greatly reduced yields, and the added effect due to nematodes was difficult to measure. In 1935 selections for nematode resistance were made from U. S. #1 and U. S. 34 which are known to possess curly-top resistance. The U. S. #1 selection was evaluated in 1937 in comparison with 14 other curly-top resistant strains.

No particular nematode resistance was observed with the selection from U. S. #1 and neither did any of the other 14 varieties show any marked nematode resistance. The more vigorous varieties appeared to give relatively better results under the nematode exposure, but the statistical interactions were not found to be significant.

ALFALFA RESISTANT TO THE STEM NEMATODE

Gerald Thorne, U. S. D. A.

An unusual illustration of nematode resistance in alfalfa was found on the Utah State Agricultural College varietal test plot near Midvale, Utah, in