

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

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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

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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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