

### Discussion and Conclusions

Great progress has been made in breeding for curly-top resistance, as shown in table 1.

Table 1.—Comparative yields of varieties under drastic curly-top exposure, Buhl, Idaho, 1941.

Variety	Tons per acre
R. & G. Old Type	.73
U. S. 1 (0137)	6.31
U. S. 33 (823)	8.40
U. S. 12 (018)	11.25
U. S. 22 (922)	14.32
Improved U. S. 22 (97)	16.61

In spite of the progress that has already been made in the development of sugar-beet varieties resistant to early top losses of importance are still occasionally sustained and greater resistance is therefore needed. As the severity of curly-top damage fluctuates widely from year to year it is unwise to depend entirely upon the natural infestation if the greatest progress is to be made.

## A General Appraisal of Plant Cover in Relation to Beet Leaf Hoppers, Forage Production, and Soil Protection

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The semi-arid lands of the northern portion of the intermountain region at one time were covered with bunch grass or with widely spaced sagebrush where bunch grass and other perennials occurred between the shrubs. Today, very little of the sagebrush-grass vegetation remains, and instead there are weedy areas composed almost entirely of annuals, or if sagebrush remains, the spaces between the shrubs are largely weeds. Such weedy vegetation now covers most of the dry lands that stretch from the irrigated portions of the valleys to the wooded mountain slopes. In southern Idaho alone there are approximately 2 1/2 million acres of weedy lands and several million more of the sagebrush and weed type.

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### Kinds of Plant Cover

An appraisal of the kinds of plant cover with respect to numbers of leafhoppers produced, forage value, and soil protection can be given briefly. The information is based on the author's plant-ecological studies in southern Idaho; on statements regarding the beet leafhopper, published by the Bureau of Entomology and Plant Quarantine, and on statements concerning forage and protection of the soil against erosion, by the U. S. Forest Service and other agencies.

There are essentially five kinds of plant cover in this region. One kind, the original cover, is desirable from all viewpoints. Three of them are undesirable in that they afford an unsatisfactory supply of forage, give poor protection to the soil, and because they produce large numbers of the beet leafhopper. This insect is an important pest because it is the vector of the virus of curly top, a destructive disease of sugar beets and other crops. The fifth kind of cover produces very few beet leafhoppers, but is relatively undesirable for other reasons.

**Sagebrush.**—With a good growth of bunch grass and perennial herbs between the shrubs, sagebrush produces few if any beet leafhoppers. It maintains good year-round protection of the soil against erosion. It affords a steady supply of good forage, and in dry years a much greater amount than that from downy chess, Russian-thistle, mustards, or other annuals.

**Russian-thistle.**—A stand of Russian-thistle produces some forage in favorable seasons but very little in others, so that the supply is not dependable and affords a comparatively poor year-round protection for the soil. It supports and reproduces large numbers of beet leafhoppers during the summer. The beet leafhoppers move, after Russian-thistle dries in the fall, to the newly sprouted mustards where they live over winter and reproduce in the spring.

**Mustards.**—A stand of mustards (tumblemustard, flixweed, or green tansymustard) produces poor forage and the supply is unreliable. It affords a poor or temporary protection for the soil, since in summer the dry plants may be broken off and blown away, leaving the soil bare all fall. It produces large numbers of beet leafhoppers in the spring. When the mustards dry late in the spring, the leafhoppers move to Russian-thistle or infest beet fields and other crops.

Sagebrush with weeds, particularly green tansymustard, usually includes hosts of the beet leafhopper. An appraisal of this kind of vegetation would be similar to that just given for the mustards for it plays the same role in the yearly cycle of the beet leafhopper. Though the sagebrush gives somewhat increased protection to the soil, heavy erosion may take place in the spaces between the shrubs.

**Downy Chess.**—A cover of downy chess produces few if any beet leafhoppers, but there is little else to recommend it. As a forage, it is not dependable. There may be a good supply in wet years but almost none in dry years. It affords a fair protection to the soil only when the stand is good. It constitutes a fire hazard and is an unstable cover that may be quickly destroyed, after which such leafhopper weed hosts as Russian-thistle and mustards become abundant.

**Hosts to Leafhoppers.**—Stands of Russian-thistle and of mustards, the 2 principal kinds of plant cover that carry the beet leafhopper through the year, may be replaced, if there is not excessive feeding by livestock and rodents, by stands of downy chess which produce few if any beet leafhoppers. So too, with adequate protection, the stands of downy chess in turn may be replaced by the more stable and more desirable sagebrush-grass cover. Conversely, if stands of Russian-thistle appear year after year on the same area, it is an indication that there is excessive feeding by livestock and rodents; in time the soil as well as the plant cover will deteriorate. Again, if in the sagebrush adequate protection is given to the areas where some of the perennial grasses are left, the weeds, including weed hosts such as mustards, will be replaced by the spreading perennial grasses and other perennials that are not hosts of the beet leafhopper.

### Conclusion

Thus the weed hosts and downy chess on abandoned lands and the weeds in the sagebrush may be replaced, under proper conditions, by the more stable sagebrush-grass that is not productive of large numbers of beet leafhoppers, that yields a greater and more reliable supply of forage, and that affords a good year-round protection for the soil.