Oregon Agricultural Experiment Station
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CONTROL OF THE ALFALFA WEEVIL IN SOUTH WESTERN OREGON

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INTRODUCTION

The alfalfa weevil was first discovered in southwestern Oregon near Medford in 1929. By 1932 its importance led the Bureau of Entomology and Plant Quarantine to establish a laboratory at Medford for the purpose of determining whether the control measures developed in Utah would be suited to the climatic and agronomic conditions of this area. On completion of the biological studies, experiments in application of the results were undertaken in cooperation with the Oregon Agricultural Experiment Station, the Oregon Extension Service, and the Bureau of Plant Industry of the United States Department of Agriculture. This cooperative work, together with methods developed and successfully applied by the Bureau of Entomology and Plant Quarantine in other weevil-infested States, forms the basis of the control recommendations given in this paper.

THE ALFALFA WEEVIL

The adult weevil is a brown snout beetle, about three-sixteenths inch long, which overwinters in the trash of alfalfa fields and nearby waste areas. A few of the adults lay eggs late in the summer and early in the fall of the same year in which they were produced, but the majority do not lay eggs until the following spring. The eggs are about one thirty-second inch long, oval, and lemon yellow. They are laid in groups of 2 to 25 or more, first in dead stems on the ground and later in growing weed and alfalfa stems.

Newly hatched larvae, or worms, feed in the growing tips of the alfalfa plant, whereas larger larvae feed on opening leaves. The larger larvae cause most of the injury, and the damage increases rapidly as they become numerous, about the time the first crop of alfalfa becomes mature. The full-grown larva is about one-fourth inch long and has a brown head and a green body with a light stripe along the middle of the back, paralleled by another light stripe along each side. When the larvae have completed feeding they spin white, oval, netlike cocoons about one-fourth inch long, usually in litter around the bases of plants, in which they change to adult weevils and from which they emerge during the summer.

THE PROBLEM

In recent years from 10 to 40 per cent of the alfalfa fields in the infested area of southwestern Oregon have been severely injured by the alfalfa weevil. As in other areas, the principal injury is to the first crop and is caused by the feed-

ing of hordes of larvae, which frequently gives the leaves a ragged appearance and a gray color. The larvae begin feeding on the tips of the plants and as they increase in number and size they injure more and more of the lower foliage. Much of the leaf surface that is not actually consumed dries out and makes poor-quality hay. These feeding habits are especially important since approximately two-thirds of the food value of alfalfa hay is in the leaves.

Under harvesting practices existing in the Rogue River Valley, most of the larvae are destroyed by the first cutting, but the few that survive cause slight delay of the second growth of alfalfa by attacking the young shoots already present when the first crop is removed. Cool, moist weather at the time of the first harvest increases the survival of larvae and consequently causes greater delay of the second growth. In such weather many eggs also survive harvest and increase the population of larvae that will feed on the second crop. These larvae rarely injure the second crop severely, however.

Thin stands of alfalfa are frequently intercropped with grass, oats, rye, vetch, or barley, or various combinations of these, for the purpose of increasing hay tonnage and suppressing weed growth. The chief objection to this practice is that the two crops do not mature simultaneously, and growers tend to delay harvest until the intercrop is ready to be cut. By that time the alfalfa is overmature and has suffered the full severity of weevil attack. Consequently, the hay quality is lowered, weevil injury is aggravated because the larvae are concentrated upon a small quantity of alfalfa, and maximum numbers of weevils are produced for the following season. In the light of findings in Utah it appears that these difficulties can be avoided by maintenance of dense, vigorous alfalfa stands in a proper crop rotation. A suggested rotation includes grain for two years followed by alfalfa for six years, or until the stand becomes unproductive. In districts infested by the alfalfa weevil intercropping should be practiced only in cases of necessity.

THE PARASITE

A small wasplike parasite, imported from Europe into Utah about 25 years ago, has been found helpful in controlling the alfalfa weevil in this and other infested States. The parasite lives inside the host larva and kills it before it develops to the adult stage, thus reducing the weevil population for the following year in proportion to the number of larvae killed. In 1934 the parasite was liberated in Jackson County, Oregon, by the Bureau of Entomology and Plant Quarantine. It is now abundant throughout that county and shows promise of becoming an important factor in weevil control. Although its effectiveness in southwestern Oregon is yet to be determined, it is not expected, judging from the work conducted in Utah, that the weevil will be held in check by the parasite alone. Therefore, early cutting or the use of insecticides will be necessary.

CONTROL MEASURES

Excessive damage to the first and second crops of alfalfa in Jackson County can be prevented by early cutting or insecticidal treatment. Early cutting means harvesting when the majority of plants are in the bud stage and before new shoots of the succeeding crop appear. In some seasons in southwestern Oregon, however, the alfalfa will reach this stage before the spring rains are over, and during such seasons early cutting is impracticable because proper curing of the hay is endangered. In such cases control must be obtained by spraying or dusting with calcium arsenate. Also severe weevil injury may occasionally develop before the alfalfa reaches the bud stage, and in this case spraying or dusting will be necessary to minimize damage until the first crop can be harvested.

EARLY CUTTING

The practice of early cutting was developed in Utah through studies of the combined influences of weather, parasite, and cultural factors on the alfalfa weevil. In that State growers are able to prevent serious weevil damage to the first alfalfa crop by clean cutting while the flowers are in the bud stage and only the earliest basal shoots of the second crop are appearing. This leaves the larvae on bare fields where nearly all of them, together with the eggs and pupae, die of starvation and exposure to heat. Consequently, when the second-crop shoots appear in profusion they grow unhindered. Comparatively few new adults will therefore be produced to carry the insect over until the following year, and the few surviving old adults lay very few eggs in the second crop.

In southwestern Oregon the value of early cutting has not been so fully realized, as the parasite has not yet exerted its full effectiveness, and frequent cool, wet springs, together with the prevalence of weeds and grass in alfalfa fields, afford protection to weevil eggs and larvae.

To obtain the best results from early cutting the following practices are recommended:

1. Cut the alfalfa in the bud stage.
2. Mow the field clean and close, leaving it as bare as possible.
3. Remove the hay promptly after curing to expose the clean stubble field to maximum sun and heat.
4. Keep the field surface as dry as possible for one week before cutting and 7 to 10 days after.

Early-cut alfalfa, pound for pound, has a higher food value than later cut hay, and any increased tonnage due to delayed cutting consists largely of fibrous, indigestible material, when the leaves, which contain most of the beef- and milk-producing qualities of the hay, have been damaged or destroyed by the weevils.

Early cutting of all three crops is believed to thin out stands more rapidly than cutting at a more advanced stage of development. Before the third crop is cut, therefore, it should be allowed to become fully developed to promote growth of the roots and storage of food in them. Experiments are now under way at Talent to determine the effect of early cutting on maintenance of stands.

Some larval feeding is likely to occur on the second crop even if the first crop is cut early. The extent of this feeding will depend upon the degree of the infestation, the weather, and the procedure followed in harvesting the first crop. Early cutting of the second crop will rarely be necessary to prevent material injury but is essential to minimize the production of weevils of the next generation.

Finally, it must be emphasized that early cutting of the first and second crops of alfalfa should be practiced every year regardless of the weevil injury.

SPRAYING

Resort must be made to insecticidal treatment when weather is unfavorable for curing hay or when an unusual abundance of weevils causes severe damage before alfalfa reaches the bud stage. Spraying (or dusting, as mentioned below) with calcium arsenate will reduce the number of worms and thus prevent damage until the

crop can be harvested. Hay treated with calcium arsentate in the amounts prescribed has been found by chemical analysis and by feeding tests in other States to have no harmful effects upon livestock.

One spray application to the first crop is usually all that is required if it is properly timed. For maximum benefit, plants should be sprayed as soon as the larvae have caused the upper leaves, though still green, to become noticeably ragged, and before many of the plants begin to show a grayish color. To make the treatment effective and to reduce the residue on the hay, the alfalfa should be allowed to grow for at least a week or ten days after it is sprayed. Spraying of the second crop may be desirable occasionally if severe injury develops as the crop matures.

The effectiveness of calcium arsenate sprays depends largely upon the methods and care used in spraying. Calcium arsenate should be applied at the rate of 2 pounds to 100 gallons of water per acre. The spray mixture should be thoroughly agitated during application to obtain a uniform coverage. Either a traction or a power sprayer may be used. An orchard sprayer may be adapted for use by attaching a spray boom such as that described in Farmers' Bulletin 1528 of the United States Department of Agriculture. One of these booms costs from $30 to $35.

The cost of spraying an acre of alfalfa will vary with local prices, but it is estimated at $1 to $1.25, including interest on investment and depreciation.

Spraying the stubble after cutting to prevent retardation of the second crop has not proved successful in other areas and is not recommended.

DUSTING

Calcium arsenate may be applied as a dust instead of as a spray. The dust may be applied more easily and quickly than the spray but it has given somewhat lower kills. Nevertheless, where dusting equipment is available, growers may obtain satisfactory protection for their alfalfa crops by dusting. Power or traction dusters may be used, but hand dusters are more practical for small acreages. Two or 3 pounds of calcium arsenate to the acre should be applied. The quantity of commercial dusting materials to be applied per acre will depend on the percentage of calcium arsenate they contain.
