Identification and Control of Alfalfa Insects

Vernon E. Burton

There are approximately 1,210,000 acres of alfalfa hay grown in California. In contrast to the land devoted to annual crops such as cotton, melons, safflower, beans, and small grains which is barren by late fall, this vast alfalfa acreage provides protection and food for a large and diverse number of insect species. Several of the insect species found in alfalfa are potentially serious pests not only on alfalfa but on other crops grown in the area. Other species are unimportant in alfalfa hay production, but represent serious potential problems on other crops, while still other members of the insect community would not be classified as either injurious or beneficial although they may be very important in the food chain of beneficial species. In addition to supporting populations of potentially damaging insect species, alfalfa hay paradoxically represents the greatest reservoir of beneficial insects in California.

The variety of insect species inhabiting alfalfa makes it imperative that chemical control programs used to suppress one or more of these populations be as selective as possible. Insect populations in alfalfa must be manipulated in a manner resulting in reduction of a damaging population while preserving the beneficial insect complex thus reducing the possibility of rapid resurgence of the target pest or the development of a secondary pest problem.

Resurgence of a target pest population and the development of secondary pest problems were amply illustrated 15 years ago before the spotted alfalfa aphid was brought under practical, economical control. The application of broad spectrum insecticides resulted in temporary reduction of spotted alfalfa aphid and beneficial insect populations followed by resurgence of the spotted alfalfa aphid which required additional insecticide applications to protect the alfalfa. Later in the season we frequently found increased populations of such common pests as the western yellow striped armyworm, the beet armyworm, and the alfalfa caterpillar--insects that are sporadic problems under normal conditions but were found more frequently in areas where repeated insecticide treatments were being made for spotted alfalfa aphid control. The serpentine leaf miner which is commonly found at low levels of infestation in alfalfa became extremely abundant to the point that it was a serious secondary pest. The development of a truly integrated control program utilizing introduced parasites, selective insecticides and resistant plant varieties solved the spotted alfalfa aphid problem and returned the alfalfa ecosystem to what might be referred to as its "normal" condition. Today, the central valley is faced with another introduced insect pest in the name of the Egyptian alfalfa weevil that once again threatens to upset the established balance in the alfalfa fields due to the extensive use of insecticides required on the first and sometimes the second hay cutting of the season. Since the weevil complex in alfalfa hay is being discussed in another presentation, time will not be devoted to these pest problems in this presentation. It is important that we recognize the need and value of the research programs that have been initiated on the weevil problem. Entomologists are presently investigating the life history and habits of the weevil, evaluating insecticides, and releasing imported parasites of the Egyptian alfalfa weevil. Entomologists and botanists are cooperating in the evaluation of cultural practices such as flaming, oiling, and cutting as integrated control programs against both the weevil and weeds. Plant breeders are investigating the possibility of alfalfa varieties resistant to the weevil. These research efforts ultimately will provide the practical control techniques that we must have, but these research activities need vigorous support at the present time.

Insect Identification

The first and obvious step in properly planning a pest control program in alfalfa hay is the ability to recognize the important insect species present in an alfalfa field. Aside from the weevil complex, a list of insects that present a potential problem in alfalfa production would look like this:

The spotted alfalfa aphid is a small pale yellow or grayish aphid with four to six rows of spined black spots on its back. The mature females may either be wingless or have wings with smokey areas along the veins. It jumps or drops readily when disturbed, excretes large amounts of honey

dew, and is first found on the undersides of the lower leaves of the plant Severe aphid infestations retard plant growth resulting in reduced yields and feed value. A sooty mold fungus which grows in the honeydew deposits reduces palatability of the hay.

Pea aphid is a large green individual which is first found on the terminal tender parts of the plant, but when present in high numbers will be found on both the upper and lower leaf surfaces, leaf petioles, and the main stem. When present in high numbers, the pea aphid will cause weak, stunted, and misshapen plants. This aphid is present in all production areas and has adapted to hot weather; therefore, damaging populations may develop at any time during the year.

The alfalfa caterpillar--the yellow-orange or whitish butterflies lay eggs on short alfalfa; therefore, a tip-off to a potential caterpillar problem is the presence of many butterflies in a field that is less than six inches tall. The small cigar shaped eggs are deposited singly on the upper surface of alfalfa leaflets. The caterpillars have velvety green bodies with white lines along the sides and attain a length of 1 1/2 inches when full grown. Damaging populations may occur at any time from June through September; however, they are most commonly encountered during August and September.

The western yellow striped armyworm. This insect might be referred to as a cyclic pest since damaging outbreaks occur about five to seven years apart, and 1971 was an outbreak year. In coloration, the larva is characteristically black with two prominent stripes and many narrow bright ones on each side. At maturity, it is approximately 1 1/2 to 2 inches in length. The female moth deposits her eggs in clusters on the leaves of the alfalfa plant. The egg cluster is covered with scales from the females' body giving it a gray, cottony appearance. The early instar larvae remain near the oviposition site where their feeding results in skeletonized leaves. This early feeding injury appears as a small circular gray area in the field. Older larvae not only move about within the alfalfa field, but when the alfalfa is cut, they frequently move to nearby crops where their feeding results in defoliation. This insect may be abundant at any time from June to early September.

The beet armyworm. The beet armyworm may become prevalent in late spring to early summer. Damaging populations typically occur during the late summer and fall period. The eggs are laid in clusters; however, these egg masses have a white cottony appearance. The small larvae skeletonize the leaves during their early feeding period in a manner similar of the western yellow striped armyworm. Although the larvae move away from the egg cluster as they increase in size, they do not migrate from the field as do the western yellow striped armyworm. The larvae attain a length of approximately 1 1/4 inches, are pale to olive green, with a pale or yellowish stripe down each side of the body.

Aside from the two alfalfa weevils, these five insects constitute the most common insect problems encountered on alfalfa. Hay producers and fieldmen should be thoroughly familiar with these species so that population evaluations can be made at frequent intervals throughout the season.

Several other insect species that may occasionally, or under certain conditions, reach damaging levels include: thrips, treehoppers, leafminers, cutworms, and webworms During recent years, spider mites have occasionally become sufficiently abundant to cause defoliation and stunting of the plants particularly next to dusty roadways.

Since alfalfa contains such a great number of beneficial insect species, the field checker must be able to recognize the most common members of this segment of the insect community. Though space prohibits a detailed discussion of the many important parasites and predators, the following species are those that are most commonly encountered:

Green lace wing adults are approximately 3/4 inch long, green to yellow green with golden eyes and large delicate netted wings. The larvae are alligator shaped, mottled gray, or yellowish gray, and attain a length of 3/8

inch. Through the use of their long sickle like mandibles, the larvae feed upon such soft bodied hosts as spider mites, lepidopterous larvae, aphids, and insect eggs.

Minute pirate bug adults are less than 1/4 inch long, black and white, somewhat flattened and oval shaped. The nymphs are yellowish and become amber or brownish in their later stages of development when they have the same shape as the adults. Both adults and nymphs feed upon thrips, but are frequently found feeding in spider mite colonies.

Big-eyed bug adults are 1/8 to 1/4 inch in length and range in color from gray to tan to black. The eyes in both the adults and nymphs are quite large as the common name implies. This gives the insect the appearance of having a head that is wider than the thorax. Both adults and nymphs are predaceous feeding upon lygus bugs, leafhoppers, spider mites, small larvae, and various insect eggs.

Damsel bug adults are slender, tan, or grayish insects about 3/8 to 1/2 inch long. The forelegs are developed for seizing prey but are not grossly swollen or spined. The nymphs closely resemble the adults except that they are smaller and lack wings. Both adults and nymphs feed on a variety of hosts including aphids, leafhoppers, lygus bugs, spider mites, and small caterpillars.

Lady beetles may be found in alfalfa at almost any time of the year. Several species occur, however, the larvae of most species are less tapered than green lacewing larvae, and lack the long sickle-like mandibles.

Among the parasites commonly found in alfalfa, perhaps those that attack aphids are most familiar to growers and fieldmen because their presence and activity is indicated by the dead, mummified aphids which remain on the plant.

An important parasite of the alfalfa caterpillar is *Apanteles* which is a dark brown to black wasp about 1/4 inch long. The wasp stings the very small caterpillar, depositing an egg inside of the body. The egg hatches, and the wasp larva consumes the body contents The parasitized caterpillar dies before it reaches 1/2 inch in length. A parasitized alfalfa caterpillar is recognized by being lighter in color than normal, somewhat shiny rather than velvety, and markedly swollen toward the rear 1/3 of the body. Following maturity, the wasp larva pupates within a golden cocoon that can frequently be seen on the leaves of the alfalfa plant.

Hyposoter exiguae is a common wasp parasite of the beet armyworm and other caterpillars. It works in a manner similar to that described for the parasite of the alfalfa caterpillar. The cocoon in this case is white with two black bands.

Field Inspection

A field of alfalfa hay should be examined periodically to assure that damaging insect populations do not develop undetected. During the period of June through September, it is desirable to inspect the field at weekly intervals. Such field inspections need not be time consuming. Tell-tale signs such as the activity of butterflies over a field when the alfalfa is less than 6 inches tall would indicate the possibility of a subsequent alfalfa caterpillar problem. The sudden appearance of scattered circular gray areas in a field indicates the increase in either western yellow striped armyworm or beet armyworm populations. Although the standard California insect sweep net is not the ultimate tool for checking insect populations, it is a very useful tool, and one that should be used liberally in an alfalfa field. Net sweeps should be taken randomly over the field with each sample constituting at least two sweeps. A sweep is defined as one pass of the insect net through an arc of 180° (from one side of the sweeper's body to the other side) with the net passing vigorously through the alfalfa to a depth of about 8 to 10 inches. The hoop of the net should be tilted slightly so that the lower edge of the hoop is the leading edge during the arc of the sweep. This position forces the alfalfa to be slapped into the net, dislodging the insects before the alfalfa is pushed out of the way. Sweepers should take one or two steps between sweeps so that the same area is not struck more than once in taking a sample. A quick look in the net will frequently tell the sweeper whether a damaging population is developing in the area sampled without the need for spending time in making detailed counts. If a given species is

abundant, then detailed counts should be made

Very few alfalfa hay fields show completely uniform plant growth throughout the field area. When inspecting a field for insect populations, the slower or uneven growth should be inspected just as vigorously as the more rapid growing areas, particularly if the uneven areas amount to any significant part of the acreage. Aphid and alfalfa caterpillar populations are frequently higher in areas of the field that are growing at a slower rate. While walking through the field, the field checker should be alert for shot-holing or chewing damage on the younger terminal leaves, skeletonized leaves or circular gray areas where many leaves have been skeletonized, western yellow striped or beet armyworm egg masses (gray or white cottony masses respectively) on the upper surface of the leaves which are signs of worm activity in the field.

Control Programs

Specific insecticide recommendations will not be discussed because this information is published annually and available through the farm advisor's offices.

All of the key alfalfa hay pests are attacked by natural enemies which greatly restrict the damaging potential of the pest species. Poor timing of insecticide treatments, unnecessary applications, or the use of improper material may reduce populations of natural enemies to the point that rapid resurgence of a pest species or secondary pest outbreaks will occur. Not only are the resurgence and secondary pest problems costly to the farmer, but unnecessary treatments also hasten the development of pest resistance to insecticides. To avoid unnecessary applications, a grower should either qualify himself to check insect populations, employ a qualified entomologist, or have other competent personnel check his fields and make control recommendations.

In selecting an insecticide, attention should be given to use of selective dosage rates such as Systox at 1 to 2 ounces of actual material per acre for pea aphid control or selective materials such as *Bacillus thuringiensis* for alfalfa caterpillar. Short residual materials such as Dylox, Dibrom, and Phosdrin provide rapid knockdown of the insect populations, but very short residual activity, and at recommended rates, the beneficial insect complex recovers rapidly.

Early cutting can frequently be employed to control insect problems. This technique has been used to solve pea aphid, alfalfa caterpillar, western yellow striped armyworm, and beet armyworm problems. Early cutting has also been recommended for use against the alfalfa weevil; however, it has been unsuccessful in several areas of the central valley in combating Egyptian alfalfa weevil infestations.

Strip-cutting of alfalfa hay is a harvesting technique that has proven effective in the lower San Joaquin Valley as a method of reducing lygus bug migration into cotton and other nearby crops and thereby reducing the lygus bug problem and the need for insecticide treatments for lygus control in these crops. Further, strip cutting benefits hay production by maintaining populations of parasites and predators of alfalfa pests within the alfalfa field. Insect problems in strip cut alfalfa hay are not eliminated; however, it has been shown that aphid and worm problems do not develop to the degree in strip cut fields that is encountered in nearby solid cut fields.

Each control measure used on alfalfa hay should be part of an integrated control program. In such a program, the grower will employ cultural, mechanical, and biological controls to the fullest extent possible. When the infestation of an insect or group of insects approaches the point of reducing yields, chemical control measures must be applied.