Control of the Salt Marsh Caterpillar in Sugar Beets Grown for Seed

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The salt marsh caterpillar *(Estigmene acraea* Drury), first described in Europe by Drury in 1770, has been reported throughout the United States, Canada and Mexico. These caterpillars are general feeders and have been cited as injuring alfalfa, cabbage, beans, clover, potatoes, cotton, sunflowers, maize heads, guayule, asparagus, beets, turnips, lettuce, grapes, trees and ornamentals. There are also a number of weed hosts which are attractive to the larvae. Outbreaks of large populations of the salt marsh caterpillar are usually more or less localized, but cause considerable damage.

In the Salt River Valley of Arizona, the salt marsh caterpillar was first reported as affecting cotton, beans and other truck crops in 1918 (2)[2] and there have been spasmodic outbreaks since then, with one of the most serious occurring in 1951. Cotton is one of the most favorable breeding hosts and there are probably three to four generations a season developing on this crop. By late September and October, it is quite possible for populations to reach astronomical figures. The caterpillars are voracious feeders and often completely defoliate entire cotton fields. Before a cotton field is defoliated, the available food supply becomes inadequate and the caterpillars start migrating in search of a new source of food. These migrations will occur over a period of several weeks and may extend one-fourth mile or farther.

There are indications that the large buildup of populations in 1951 was due, at least in part, to the general insect control program followed by the cotton growers. Their main problems are with sucking insects, the cotton boll worm and the red spider mite. The control of these insects consists, mainly, of applications of DDT and sulphur. Occasionally, when stink bugs are present, the gamma isomer of BHC is combined with the DDT and sulphur.

The normal cotton insect control program, consisting of 15 to 20 pounds per acre of 5 percent DDT, with 40 percent sulphur, has little effect on the salt marsh caterpillar. However, it does drastically reduce their natural parasites. The resulting unchecked huge increase of the caterpillars in the cotton fields is largely due to the fact that no effort has been made to control them. The effect of the caterpillar on cotton is a moot question. Most cotton growers recognize there is a certain amount of damage due to their feeding. Their general feeling, though, is that the benefits of defoliation more than offset any injury.

Defoliation of cotton fields just before picking is desirable because the direct sunlight will open up the bolls more rapidly. Also, due to the absence of leaves, a cleaner picking job can be obtained, both by mechanical and hand picking. In early fields of cotton, this complete defoliation by the salt marsh caterpillar may more than offset the amount of injury to the

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[2] Numbers in parentheses refer to literature cited.

crop. Late fields of cotton, however, are often seriously damaged because the bolls have not reached sufficient maturity at the time defoliation occurs, resulting in reduced yields.

The logical solution in Arizona to the salt marsh caterpillar problem would be for the cotton growers to incorporate an effective insecticide, such as toxaphene, into their general insect control program and, unless this is done, salt marsh caterpillars will continue to jeopardize other crops.

Particularly vulnerable to the migrating caterpillars are such crops as newly planted sugar beets grown for seed, young alfalfa and truck crops. These crops can be completely destroyed in a matter of a very short time, and immediate control steps are mandatory. Generally, the salt marsh caterpillar is a leaf feeder; however, in the case of sugar beets, it has been observed that in heavy infestations it will consume the entire petiole and will feed well into the crown of the beet.

Chemical control is not always adequate, as there are a number of problems involved; mainly, that the migration of the caterpillars can extend over a period of several weeks, with additional larvae entering the fields each day. Early attempts to control them with arsenicals and sodium fluosilicate met with little success. These insecticides act as a stomach poison and, in the case of the salt marsh caterpillar, their action is rather slow. A crop treated with these materials may suffer considerable damage before the caterpillars have assimilated a lethal dose.

ft was not until chlorinated hydrocarbons became available that there was any promise of a satisfactory insecticidal control. Dusts containing 15 to 20 percent toxaphene, or 15 percent toxaphene combined with 5 percent DDT, applied at rates of 30 to 40 pounds per acre, have proven quite effective. The 15 percent toxaphene-5 percent DDT dust may have some advantages, as it is suspected that there may be some synergistic action due to their combination.

In crops such as sugar beets grown for seed, where there is no injurious action due to its use, three pounds of toxaphene in an emulsifiable oil, with 30 to 40 gallons of water per acre, will probably give the most efficient control. However, as mentioned earlier, since migrations of this pest occur over a considerable period of time, none of the above mentioned chemical controls has sufficient residual action for one application to give complete control and the cost of additional treatments makes them prohibitive. Therefore, insecticidal control alone is not adequate in controlling heavy migrations over a long period; however, a small migration, occurring over a short time, can be economically controlled by use of insecticides.

For many years, attempts have been made to stop the migration of the salt marsh caterpillars by the use of barriers around the fields. Chemical barriers made by placing bands of insecticides, containing toxaphene and BHC, through which the migrating caterpillars would have to crawl, have been ineffective. The first attempts at the use of mechanical barriers consisted of a furrow or a ditch, which were relatively ineffective. The next step was to fill the ditches with water. Two types of water barriers are often used—the most effective one being the use of running water, rather

than stagnant water. Even on ditches where running water is utilized, during heavy migrations, it is often advisable to have diesel fuel oil drip into the water. Although quite effective, a water barrier is often difficult to install and, in many cases, it is not possible to divert enough water into these ditches.

During the last two years, aluminum foil has been used as a barrier against migrating caterpillars with considerable success. The idea of using aluminum foil was first conceived at Salinas, California, in 1949, by J. Mandeen, general sales manager of Growers Aluminum Supply Company. Through his efforts, a suitable grade of aluminum foil is now on the market.

This aluminum foil is .0015 inch in thickness, 7 inches wide, and comes in rolls approximately $^{3}/_{8}$ of a mile in length. It is embedded vertically into the soil, with 2 to 3 inches under ground, leaving 4 to 5 inches above ground. The surface of the foil is very smooth and migrating caterpillars are unable to crawl over it and, therefore, collect in large numbers in front of the barrier. Since they are unable to proceed forward, they travel in both directions parallel to the foil. To relieve this situation, holes two to three feet deep are dug in front of the barrier. These holes trap the caterpillars and prevent them from building up along the foil barrier in such numbers as to become high enough to form a bridge over it into the field. When these holes become completely filled, they are covered with dirt and new ones dug.

During the 1951 season, aluminum foil became very short in supply and it was necessary to turn to substitute materials which would be effective in stopping the migrating larvae. Several types of waxed paper were used and were found to be quite effective for a short period of time. However, waxed paper was especially vulnerable to winds and rain; consequently, such a barrier was very difficult to maintain and, generally, was found unsatisfactory for these reasons.

When aluminum foil was practically unobtainable, members of the staff of Western Seed Production Corporation, with the cooperation of Reynolds Metals Company, tested some products used in the building trades as experimental barriers. One type of roofing material, consisting of aluminum foil embossed on tar paper, was found to be equally as effective as the straight aluminum foil and had several other rather distinct advantages, such as properties of rigidity, which simplified the erection of the barrier and, also, due to generally heavier construction, enabled it to withstand very high winds and rain, with a minimum of maintenance. This material has been sold under the trade name of Kool-rey. Reynolds Metal Company have preliminary plans whereby this material will be available in another year in 500-foot lengths, cut 614 inches in width.

The aluminum foil barrier is a very efficient method of controlling the salt marsh caterpillar and, at present price levels, the cost of the foil is approximately one cent per lineal foot. Three men should be able to set up one mile of barrier per day or the equivalent of a barrier surrounding a 40-acre field. Such a barrier will cost only about one-third as much as one dust application and is much more effective.

The ideal control program combines the use of both efficient barriers

and insecticides. Barriers are seldom installed until a considerable number of caterpillars have already migrated, and a few will invariably get over any barrier. These can easily be eliminated by the application of insecticides around the border of the field immediately after installation of the barrier. Such a program will keep damage to an absolute minimum and protect the crop for the duration of the migration.

Summary

When small migrations of caterpillars occur over a rather short period, insecticidal control is probably adequate.

Where large scale migrations extend over a considerable period of time, barriers are a necessity. The aluminum foil and the foil-embossed roofing material barriers are cheaper and, generally, more satisfactory than the water barrier. However, in the use of any type of barrier, it is often necessary to resort to some insecticidal control because, in many instances, there are already some caterpillars in the fields to be protected. Also, with any barrier, a few caterpillars will make their way into the field.

Where insecticidal control is needed, dusts containing 15 to 20 percent toxaphene, or 15 percent toxaphene with 5 percent DDT, applied at the rate of 30 to 40 pounds per acre, will give adequate control. A spray containing three pounds of toxaphene in an emulsifiable oil, at the rate of 30 to 40 gallons of water per acre, will assure equal or better results.

Literature Cited

(1) MORRIL

1918. Insect Pests of Interest to Arizona Cotton Growers. Arizona Bulletin No. 87, P. 183.