Supervised Control of Insects

utilizes parasites and predators and makes chemical control more efficient

Ray F. Smith and Gordon L. Smith

Supervised control of field crop insect pests was first developed on the northwest side of the San Joaquin Valley.

For three years it has been in successful operation in connection with the control of the alfalfa caterpillar, and has been expanded to the control of other pests on alfalfa and to pests of cotton.

Supervised control has not been developed for such crops as deciduous and citrus fruits or truck crops. It has its possibilities on other crops but the necessary entomological information either has not been developed or has not been tested for a local supervised control district.

A successful supervised control program in a district requires the following: an intimate knowledge of the insects; a sufficient acreage to finance the district; an informal grower coöperative to administer the district and a properly trained entomologist to supervise the insect control.

Each of the California supervised control districts is managed by a group of growers coöperatively employing a graduate entomologist for the summer. This entomologist is responsible to the growers only.

Supervised control is based on studies of the interrelationship between the pests and their environment—ecological studies—conducted by members of the Division of Entomology and Parasitology.

From these studies it is now possible to predict outbreaks of the alfalfa caterpillar three days to two weeks ahead of injury. These predictions make it possible to utilize cultural controls to their fullest extent and to time any necessary chemical control most effectively.

The methods of supervised control are essentially systematic surveys of the fields in an area with the objective of locating all potentially destructive pest populations before they have had an opportunity to do any damage.

The standard by which economic infestations of the alfalfa caterpillar are judged is a sliding scale centered around 200 large or potentially large larvae per 20 sweeps of the standard net. This center point—of 200—is used for average conditions which rarely exist. Other factors such as growth, stand, time remaining until harvest, oviposition rates and weather must be taken into consideration. For example, this center point is too low for dense, vigorously growing alfalfa and for infestations developing during cool weather.

Insect infestations frequently develop so insidiously that the average grower does not see the evidence of the insects until considerable damage has occurred.

Not all fields require treatment. For example, in outbreaks of the alfalfa caterpillar it is seldom that as much as 50% of the fields require treatment even in heavily infested areas. In such cases, it usually is not more than about 20%.

When the actual populations are not followed, many fields are treated unnecessarily. Under a supervised control program, it is not necessary to treat as an insurance against the possible development of economic infestations. The unnecessary use of insecticides is a needless expense and may be harmful to beneficial insects.

Advantages

A supervised control program makes chemical control more effective by improving the timing of applications and eliminating unnecessary treatments. Full advantage is taken of any biological controls available. When the supervising entomologist determines that the parasite *Apanteles* is going to destroy the caterpillars before damage occurs the field is not treated. When the field can be economically cut to avoid damage, this is recommended to save the parasites and the crop.

Many of the values of supervised control are of such a nature that they can not be easily stated in terms of dollars and cents. Nevertheless the values, especially from a long-range viewpoint, are very great. The elimination of unnecessary treatment is an important aspect of the program.

In the case of cotton, such saving was well demonstrated in the Dos Palos district in 1948 when only 13% of the total acreage required treatment as compared to previous years with comparable infestations when about 75% or more of the acreage was treated at least once.

Parasites and predators are protected and utilized to their fullest extent under supervised control as only those fields are treated in which natural control is inadequate. Any parasites present in the area are favored and a natural balance is fostered.

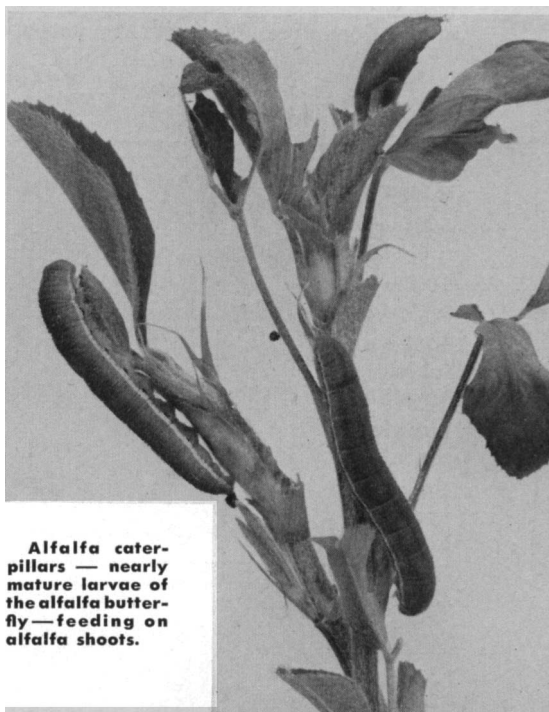
The assurance that the fields are being watched by a trained entomologist and that no sudden outbreaks of insects will destroy a crop in which thousands of dollars have been invested is of inestimable value to the grower. Many growers do not have the time or training to make the surveys necessary for efficient insect control.

Each control recommendation is tailor-made for the individual field. All of the factors involved are considered in relation to the situation in the particular field before any recommendations are made. Because the infestations vary so greatly from field to field and from season to season in the same field, such specific recommendations are necessary with most field crops.

In sections where the supervised control program has covered the area there is evidence that the effective control has reduced the total infestation in the district.

The supervising entomologist follows the insect infestations in each of the members' fields in the district. He checks on insect migrations, oviposition, and parasitism. He recommends procedures to the grower on each field. Cultural control

Continued on page 12



Alfalfa caterpillars — nearly mature larvae of the alfalfa butterfly—feeding on alfalfa shoots.

Canning Tomatoes

color measurement as an aid in grading tomatoes to specifications

John H. MacGillivray

Color is an important quality characteristic of canning tomatoes.

In grades of the United States Department of Agriculture for processed foods, a relative value of 25 out of 100 points for canned tomatoes and tomato catsup is assigned to color. For tomato pulp, 50 points are similarly assigned to color.

Canning tomato standards developed by the federal government, and in use since 1926, have two classes of color differentiations for the raw product—well-colored, and fairly well-colored.

These same color terms also have been used in areas which are not using the federal grades in their entirety. As much as 60% of the canning tomatoes purchased in the United States in recent years probably have been graded according to these two grade terms.

Under these official grades a well-colored tomato means that at least 90% of the flesh has a good red color. A fairly well-colored tomato indicates that at least two-thirds of the flesh of the tomato has a good red color.

Comprehensive tests have been conducted at the University to measure the degree of uniformity of red color appraisal, as it is determined in the assignment of a quality grade to canning tomatoes. Studies also were aimed at defining the minimum colors for these terms.

It is well to remember that color is considered from many different viewpoints. The physicist, for example, expresses color in terms of stimuli or the relative amount of reflection or transmission at different wave lengths of light, while the psychologist measures the sensation of color.

In all instances of this color research—both in California and in other states—the work was performed in areas and at times when tomatoes were received at canneries where they were graded according to those two terms. The inspectors were supervised to insure uniformity of interpretation.

Samples of minimum or borderline well-colored and fairly well-colored tomatoes were obtained from these inspectors. Since the tomatoes were to be pulped, it was possible to examine interior as well as exterior color of the fruit. These fruits were taken to some convenient location and the color measured by the use of Munsell color equipment.

Individual tomatoes were ground coarsely in a food grinder, and then passed through a piece of fine screen wire to remove seeds, core and skin. With smaller fruited varieties, such as San Marzano, several fruits were used as one sample. Except in the above case, the sample from an inspector was made up of four to six individual fruits, whose color was determined individually to obtain the average color of the sample.

Color determinations were made in a dark room with artificial light of 6300° Kelvin—comparable to daylight—and with the aid of an optical comparator. With such equipment it is possible to make an accurate match between the Munsell color determination discs and the sample of tomato juice.

In this report, color has been expressed as color rating, in which a small number indicates the best color.

Tomatoes were obtained from the inspectors during the 1942 and 1943 seasons. Some 750 color determinations were made. Some work was done in each of the important canning tomato areas. There was some difference in color interpretation between the different areas.

The over-all average for well-colored, in these tests was a color rating of 6.8; and fairly well-colored was 8.6. These results indicate a slightly better color than that obtained in similar studies in the East.

Through the coöperation of state and federal supervising inspectors, cuttings were arranged the following fall to select minimum well-colored and fairly well-colored tomatoes.

Many tomato fruits were cut, and then were arranged in order by placing the best fruit color first and the poorest color last. Fruits were numbered consecutively, beginning with No. 1 for the best color. Individuals then picked out the fruit or fruits which were borderline or the minimum for the two color classifications. These numbers were noted on a piece of paper, color determinations were made of the fruits, and the results were summarized.

The results of these studies indicate that minimum well-colored tomatoes varied from 6.6 to 7.0; and fairly well-colored, from 8.9 to 9.4.

It would seem desirable to select a range for interpretation of minimum well-colored and fairly well-colored tomatoes. Since a color difference of one-half step, or between 6.8 and 7.3 is the difference in color which is perceptible to the eye, there is some justification for selecting such a range.

The range in color rating of 6.8 to 7.3 is suggested for minimum well-colored tomatoes, and 8.8 to 9.3 for minimum fairly well-colored tomatoes. Thus, the minimum difference between these two colors is two or four times the difference perceptible to the eye. In any color grading uniformity of interpretation is probably more important than very high standards for the color.

These studies of color determinations of tomatoes indicated a satisfactory interpretation of the color terms for canning tomatoes. There are isolated cases where the accuracy was undesirable, but it is thought that the objective color measurements would increase accuracy of grading.

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INSECTS

Continued from page 3

or biological control is utilized wherever possible. The grower is not bound in any way to follow the recommendations.

The projects organized to date have been entirely financed by grower assessments which have ranged from 15c to 25c an acre.

Supervised control of cotton insects must of necessity, in the present state of knowledge, operate somewhat differently than that in the case of alfalfa insects. Although there are numerous predators and parasites of the insect pests of cotton, their effects apparently are not so strikingly effective as in the case of *Apanteles medicaginis* on the alfalfa caterpillar. Control recommendations for cotton insects are not based on an analysis of a complicated ecological picture, but on experience which has shown that economic damage will result if the populations are not kept below a certain level.

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For further details on whether supervised control will serve for an insect control problem in a particular district consult the local Farm Advisor or the Division of Entomology and Parasitology, University of California College of Agriculture, Berkeley.