Artificial diets are constantly being improved, and techniques for rearing are being tested for use in mass production.

An egg parasite believed to be a Trichogramma sp. was recovered from parasitized bollworm eggs during 1967. A laboratory culture is being maintained on bollworm and cabbage looper eggs. In laboratory studies, this egg parasite has successfully parasitized eggs from bollworms, tobacco budworms, cabbage loopers, salt-marsh caterpillars, beet armyworms, and pink bollworms. Further tests are to be conducted to determine host preference.

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INVESTIGATIONS OF SAMPLING AND STATISTICAL METHODS FOR THE ASSESSMENT OF COTTON INSECTS

R. O. Kuehl, Statistician
C. D. Bonham, Ecologist
R. E. Fye, Entomologist, U.S.D.A.

Objective:

To determine methods to properly assess populations of cotton insects for purposes of biological and chemical control of injurious cotton insects.

Summary of Progress:

During 1967 data were obtained to determine: (a) the distribution of insects on individual plants; (b) the distribution of insects in the field; (c) the effect of ecological factors on insect distribution; (d) the proper sampling unit for the various pests.

The insects studied include: (a) the cotton bollworm; (b) the pink bollworm; (c) the cabbage looper; (d) the beet armyworm; (e) the salt-marsh caterpillar; (f) the boll weevil.

The data are in the process of detailed analysis.

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INSECT PARASITES AND PREDATORS OF INSECT PESTS OF ARIZONA CROPS

T. F. Watson, Associate Entomologist
P. H. Johnson, Assistant in Research

Objectives:

A. To determine the identity, distribution, relative abundance, host relationships, and life histories of representative common and significant species of insect parasites and predators in various taxonomic groups.

B. To evaluate by field and laboratory studies the relative effectiveness of the more common species of insect parasites and predators in controlling insect pests of important Arizona crops. To study the life histories of the more effective species and the various factors that influence their abundance.

Summary of Progress:

Additional studies on the biology of *Nabis alternatus* and *N. ferus* were conducted during 1967. Colonies of both species were established in the greenhouse to provide a source of experimental animals. Individuals of the F_1 progeny were paired and used to initiate studies which continued through several successive generations.

The preoviposition periods of both species were similar, usually ranging from 4 to 10 days. However, no eggs were laid by one female of *N. ferus* and one of *N. alternatus* until 28 and 42 days, respectively, had elapsed. *Nabis alternatus* females generally deposited more eggs and continued oviposition for a longer period of time than did those of *N. ferus*. Maximum egg production by any *N. alternatus* female was 267 compared to 198 by an *N. ferus* female. Duration of oviposition averaged 29 and 36 days, respectively, for *N. ferus* and *N. alternatus*, with maximum periods of 66 and 88 days respectively. The percent egg hatch was poor for both species, usually between 35 and 40 percent. Incubation periods were similar, usually from 7 to 9 days.

The nymphal development of *N. alternatus* was more rapid than with *N. ferus*, ranging from 18-24 and 20-26 days, respectively. Many of the *N. ferus* nymphs died during the 5th instar.

Adult longevity was approximately the same for both species. When paired, females lived longer than males; however, when maintained individually, there was no difference. Observations indicated that this was due to the female killing her mate, even when other food was plentiful. Maximum adult longevity was 125 days for *N. alternatus* and 94 days for *N. ferus*.

Several points regarding the biology of the two species were investigated to compliment work done previously. Eggs of both species held at a temperature of 50°F failed to hatch. At 59°F *N. alternatus* eggs hatch in a mean time of 30.55 days compared to 32.48 for *N. ferus*.

Newly-emerged 1st instar nymphs were placed in constant temperature cabinets ranging from 50° to 104°F. None survived at either 98° or 104°F. Shortest developmental times for both species occurred at 91° and the longest at 59°F. None matured at 50°F and those maturing at 59° had deformed wings.

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