Pen Cap M. All treatments resulted in reduced larval counts when compared with the check. Similar results were obtained following the second application, with the exception that both formulations of Lannate appeared as effective as any other treatment.

Topical application of several insecticides or insecticide combinations showed that the tobacco budworm, Heliothis virescens is considerably harder to kill than is the bollworm, H. zea. These studies also showed that both species are highly resistant to DDT alone but that relatively good kill can be obtained with the combination of toxaphene-DDT.

An experiment was conducted near Coolidge, Arizona to determine the effects of placement and time-of-application of Temik on lygus bugs and cotton yields. The early Temik application was made on June 19 and 20 and the late application was made on July 9 and 12. Twenty pounds of granules were applied per acre at each date, either as a side-dress application or applied at the bottom of the furrow. These treatments were compared with untreated checks which were tilled in the same manner as the Temik plots but with no insecticide being applied.

Sampling was performed weekly to assess populations of lygus and selected predators. Additionally, squares were examined to compare lygus damage among the various treatments. Yield data were taken on November 14 and 15.

Although statistical analyses have not been completed, the results indicate that generally lower adult and nymphal lygus counts were prevalent during the major fruiting period in the Temik-treated plots than in the untreated check. Square damage was also lower in the treated plots.

Yield data indicated little difference between the two types of granular placement--as a side-dress on the shoulder or in the water furrow. Some increase in yields was observed in the Temik treatments as compared to the untreated checks. When considering both types of placement, the yield increases were 4% and 12.5%, respectively, in the late-applied and early-applied Temik treatments.

Indications were that certain predators were adversely affected in the treated plots. This was particularly true with Geocoris sp., Nabis sp. and Orius sp.

MONITORING INSECT PARASITES IN A COTTON PEST MANAGEMENT PROGRAM

F.G. Werner and C.E. Mason

Objective: The objective was to develop a method for incorporating monitoring of adult parasitic insects in the Pinal County Cotton Pest Management Project. The parasite information was to be provided in such a way that the grower could readily use it in deciding whether to apply insecticides.

Progress:

Initially, most effort went into developing a taxonomic key to the parasitic insects found in Arizona crops. Source information came from identified specimens in the University of Arizona insect collection, a literature search, and some new identification efforts. All parasite groups were included in the key at one level or another, to family if no species were known to affect crop pests or predators, to genus if an included species was of potential importance.

The keys prepared erred on the side of being too inclusive. Therefore, modifications have been made and the keys are continually being simplified for more practical use. Our goal was to develop a key to the important parasites which could be used by nontechnical personnel.

Beginning in June, a sampling and identification program was started in 19 Pinal County cotton fields in 4 areas (Coolidge, La Palma, Mammoth, and Maricopa), with adjacent fields being sampled in 4 directions from each cotton field. Vegetation in adjacent fields included cotton, alfalfa, desert, safflower, sorghum, sugar beets, mesquite, and weeds. All cotton fields sampled were included in the Pinal County Pest Management Project. Fields were sampled weekly with a sweep net from June 25 to October 18. Each sample, 100 strokes of the sweep net, was returned to the laboratory in alcohol, sifted, and the parasites identified under a stereomicroscope. Parasite data from each field were compiled, using a computer, and distributed to cotton scout supervisors within one week after being collected.

A total of 81 parasite taxa were recorded from all samples. All records have been computer-processed and have been used for some preliminary analyses. Parasites averaged 29 per sample over all and 10 per sample in cotton. The 12 most abundant parasite taxa found in cotton are listed in Table 1.

Our findings indicated that it is feasible to monitor parasite information for making pest management decisions. A practical approach would likely use parasite monitoring when a pest population approaches an economic level with greatest emphasis being placed on identifying parasites which are known to parasitize the pest.

Table 1. Most abundant parasites sampled from cotton during June 25 to October 18, 1973.

Taxon	Number of Individuals	What It Parasitizes
Copidosoma	745	Mainly loopers, plus other lepidoptera
Telenomus	542	Lacewing and lepidoptera eggs
Trissolcus	401	Stinkbug eggs
Chrysocharis	371	Leaf Miners
Derostenus	368	Leaf Miners
Closterocerus	217	Leaf Miners and Perforators
Trichogramma	198	Lepidoptera eggs
Abbella	166	Leafhopper eggs
Aphelinoidea	154	Leafhopper eggs
Anagrus	144	Leafhopper eggs, plus other eggs
Encarsia	125	Whiteflies and Lepidoptera eggs
Tetrastichus	84	Lacewing and other eggs, alfalfa seed chalcid

ENVIRONMENTAL IMPROVEMENT THROUGH BIOLOGICAL CONTROL AND PEST MANAGEMENT

T.F. Watson, B.W. Engroff and D.T. Langston

Objective: To develop information and methods essential to the management of insect pests in cotton.