6 times at 8-day intervals. The seasonal average populations per 100 plants were as follows: untreated, 18.0; bollworm virus, 13.0; and 5-lbs. toxaphene plus 0.4 lb. methyl parathion 11.8. The bollworm virus was slower in killing bollworms and, as a result, more squares were destroyed. This was reflected in the yield which showed a gain of 0.44 bale per acre in the virus plot and a 0.56 bale per acre increase in the toxaphene-methyl parathion plot. The check plot yielded 1.34 bales per acre and part of this high yield may have been due to the partial control of bollworms obtained by the virus spreading over from the treated plot.

Insecticides A toxaphene-DDT mixture was found to be still the best control for bollworms. Satisfactory control was obtained with spray formulations. An organic phosphate, Shell-9129 was equally as effective when applied at 4-day intervals. However, when applied at an 8-day interval, this insecticide flared-up the bollworm infestations.

Two other insecticides, Chemagro's 44646 and Upjohn's Banol, show promise in controlling bollworms in 1964 and will be investigated further.

Sevin failed to control bollworms.

Light Traps

(George P. Wene)

Three experiments were conducted to evaluate light traps for the control of cotton insects. Each of the fields was surrounded with the number of light traps recommended by the manufacturer. Check fields (untreated) were located within a half mile of the light trap fields. All fields were examined at weekly intervals. The light traps apparently reduced the bollworm populations from 10 to 8 per cent but did not control lygus bugs or stink bugs. Stink bugs took one third of the crop in one of the light trap fields.

Lygus Bug Injury to Presquaring Cotton

(George P. Wene)

A report of recent investigations is published in University of Arizona Experiment Station Technical Bulletin 166: 1-25. December, 1964. The following conclusions are reported from this work:

Lygus bugs can kill cotton seedlings within two or three days after the seedlings emerge from the ground. At this stage of growth, lygus bugs feed on the cotyledons.

After the cotyledons have hardened, lygus bugs feed only on the growing points of the seedling plants. Such feeding results in deformed plants and retards squaring for a period of two to four weeks. Lygus bugs may injure both Deltapine Smooth Leaf and Pima S-2 varieties in the seedling stage.

Lygus bug injury to cotton plants in the seedling stage may be reflected in lower yields during a normal growing season. Conditions favoring the maturity of a large late-season crop of bolls may offset most of this early loss.

Blank squares may result from feeding by lygus bugs on meristematic tissues of presquaring cotton.

Presquaring cotton plants grown in fields adjacent to preferred host crops, such as alfalfa or safflower, or near areas of native desert vegetation, can be seriously injured by heavy, inward-migrating infestations of lygus bugs. Under the conditions of irrigated agriculture found in central Arizona, such migrations may result when preferred host plants are no longer available or are not in a condition to support the existing populations of lygus bugs.

Laboratory Studies of Cotton Insects and Their Natural Enemies

(George D. Butler, Jr.)

Detailed laboratory studies have been made on the biology and feeding habits of the black fleahopper, Spanagonicus albofasciatus. The fleahoppers fed readily on cotton aphids, whitefly eggs and nymphs, spider mite eggs, nymphs, and adults, bollworm eggs, and lygus bug eggs. It is believed that this insect may have to be an early-season predator in Arizona cotton fields, but additional field evaluations are needed. A related fleahopper, Rhinacloa forticornis, was observed but, for the second year, it could not be reared in the laboratory. It, too, has been observed as a predator.

The life cycle of the banded-wing whitefly, Trialeurodes abutilonea, on cotton was studied in detail in the greenhouse and in temperature cabinets. Preliminary experiments were conducted on the development of whiteflies on cotton plants with different nutrient levels. The low nutrient and very high nutrient levels were less favorable for whitefly development. The whitefly parasite, Encarsia, was studied. It developed from egg to adult in from 9 to 17 days. Parasitized whitefly pupae turned black. The number of whiteflies in the field varied on different cotton varieties with high populations developing on some pubescent lines.

Future work will emphasize a study of the more important natural enemies, particularly insect parasites, of the bollworms and other caterpillar pests of cotton.

Stub Cotton Provides Haven for Western Boll Weevil
(From "Progressive Agriculture", January, 1965)

(G. T. Bottger)

A few fields of cotton in central Arizona which were infested with the western boll weevil, Anthonomus grandis thurberiae Pierce, in 1963 and stubbed in 1964, provided excellent conditions for this weevil to overwinter and produce a generation of boll weevils on the first cotton squares available in 1964.

Live weevils were found from November to April within their pupal cells in the bolls of this cotton, which remained on the soil surface during the winter, thus making hibernation in the edge of the field ground trash or other shelter necessary.