SUMMARY

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Research entomologists frequently ask consulting biometricians how to determine the amount of sampling that is necessary to provide statistically reliable estimates of insect populations, damage, yield, etc. When provided with the standard deviation of the data from a given treatment, the smallest difference between treatments that is of interest and the probability of detecting that difference, as well as the probability of spuriously finding a difference, the biometrician can provide the statistical tools for estimating differences with various degrees of precision. He can also advise the researcher on the appropriate size for an experiment, one wherein the prescribed objectives can be met with neither waste nor want of manpower and monetary expense. Utilizing these tools, researchers in various cotton-growing areas of the United States can develop models for sampling fruiting forms and destructive and beneficial insects of cotton.

In certain field tests with cotton, Gaussian distributions of flower buds, flowers, and bolls occurred at midseason when these forms were most numerous. In early and late season when these forms were sparce, the data fitted a negative exponential equation. The size of the samples that had to be taken to achieve reliable estimates varied inversely with the profusion of buds, flowers, and bolls. These data from the Lower Rio Grande Valley of Texas indicated that from 15 to 100 plants had to be sampled once or twice weekly throughout the growing season to achieve reliable estimates of the numbers of flower buds, flowers, and bolls.

A model for predicting the potential of the convergent lady beetle, _Hippodamia convergens_ Guerin-Meneville, and the soft flower beetle, _Collops quadrimaculatus_ (F.), to reduce damage to the fruit of cotton by the _Heliothis_ spp. complex was devised and tested by workers in southwestern Oklahoma. Damage reduction could be predicted by estimating the percentage occupancy of the two predators in about 1 m of row, and when one or more of either species was present in a quadrat, _Heliothis_ spp. damage would probably not occur in cotton grown in southwestern Oklahoma.

When sample sizes of 14 and 7 row-ft. were compared in an area-wide bollworm management community at Portland, Arkansas, four 7 row-ft. samples per field were found to provide data comparable to those from 14 row-ft. samples per field from mid-June through mid-July. Thus, during a critical month in the growing season the conventional sample size was reduced by one-half.

In the central Texas area data obtained from sampling 9 fields for overwintering boll weevils in nonfruiting cotton plants or in plants with few flower buds early in the season, indicated that all plants in sixty 30.5-m (100-ft.) rows would have to be examined to achieve a probability of 0.05 that there were 123 overwintered weevils per 0.4 ha. Thus, sampling for such low level populations is unfeasible. However, as the population size increases, the amount of sampling that must be done decreases.

In Georgia, a new scouting technique capable of attaining greater accuracy in evaluating the success of the sterility-inducing chitin inhibitor diflubenzuron in reducing boll weevil damage to cotton was developed. This technique requires the monitoring of the ovicidal effects, rather than the enumeration of egg-punctured fruiting forms which might cause overestimation of ultimate damage. Four days proved to be the best interval between counts of fallen squares or squares that had flared as a result of boll weevil damage.

Although the models or techniques described here were developed to accommodate the needs of specific areas, modifications might be made to suit other conditions.