

BOLL WEEVIL INVESTIGATIONS

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Objectives:

To determine the biology and ecology of the boll weevil, Anthonomus grandis (Boheman), in Arizona and to use this information to improve control and to predict its damage potential in the arid Southwest.

Summary of Progress:

The major factor influencing the boll weevil, Anthonomus grandis (Boheman), in Arizona is heat. The development and mortality of individual weevils as well as the entire population development are directly associated with the temperatures in the oviposition sites and on the soil surface and indirectly with the heat input associated with the maturation of the cotton plants. Estimation of temperatures associated with individual weevil development, the population fecundity, longevity, and mortality and the maturation of the cotton plants may be accomplished with equations developed with least squares analysis from several untransformed and transformed forms of cubic and quadratic, the Fourier series, asymptotic and logarithmic models. The equations accurately describe the relation of the several phenomena with time or heat input as the independent variables.

The boll weevil is suppressed by high temperatures through the months of June and July and frequently August, but the weevil populations increase as cooler fall temperatures ensue and the early maturing cotton bolls release an accumulated population of boll weevils to oviposit in late fruit.

The percentage of boll weevils occurring at various heights on cotton plants is described by a mathematical model,

$$f(x) = \frac{x^k e^{-x}}{k!} (1 + e^{-x})$$

where $f(x)$ is the percentage of insects in a given interval (x) from the top of the plant, k is the value of x when $f(x)$ reaches a maximum considering all values of x , and e is the base of Napierian logarithms. The model was derived intuitively from cotton plant parameters and fitted to field data. The model may be used to obtain estimates of infestation levels in a field. A Chi-square test of the model using field data gave a nonsignificant value which indicated an acceptable fit.