

EFFICACY OF TRICALCIUM PHOSPHATE AS A LEGUME GRAIN PROTECTANT

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Since the publication by Majumder and Bano (1964) reporting the toxic effects of calcium phosphate salts to insect pests of stored grain, little further research has been undertaken on the potential of using mineral salts as insecticidal protectants. The mechanism for the reported toxic effects is still largely unexplained. Majumder (1974) reported that interactions of potentiation and antagonism were observed between the mineral salt tricalcium phosphate ($\text{Ca}_3(\text{PO}_4)_2$ or TCP) and various organic acids, amino acids, sugars, and vitamins. He suggested that some of these reactions possibly could be responsible for the adverse effects of this salt on insect development. Baker et al. (1976) reported that the effect of TCP on Tribolium castaneum (Herbst) and Tenebrio molitor L. was probably due to water loss rather than to disruptive mineral metabolism. Baker et al. (1978) found when using TCP as a 24 hr contact treatment on Tribolium castaneum that the branched-chain alkanes, methylheptacosanes and dimethylheptacosanes produced were significantly reduced apparently as the result of absorption by the TCP. They suggested that TCP may have a contact toxicity or cause some metabolic aberration.

In 1972, Pratt et al. stated that the use of mineral salts offered a new promising method of insect control. They suggested that commodities could possibly be stored that were unsuitable or even toxic as insect diets but safe as food for man. Research on several species of stored product insects by Press et al. (1972), Highland (1975), Boczek et al. (1983a and 1983b) and Kruk et al. (1983) indicate that the use of TCP may offer this possibility of control.

In this paper we wish to present a report of two studies of effects of TCP on three common bruchids that attack grain legumes.

Material and Methods

Stock colonies of all three bruchids were maintained at $27 \pm 1^\circ\text{C}$ and 60% RH in a 12-12 hr light-dark photoperiod. The bean weevil, Acanthoscelides obtectus (Say), and Callosobruchus chinensis (L.) were maintained on navy beans, Phaseolus vulgaris and were received in 1981 from the Pest Infestation Laboratory at Slough. The cowpea weevils, Callosobruchus maculatus (F.), originally from Fresno, California, have been maintained on cowpeas, Vigna unguiculata, at Savannah for more than 20 years. In these studies A. obtectus and C. chinensis were maintained on dry navy beans and C. maculatus was maintained on dry cowpeas purchased on the local market.

In the study on effects of TCP on production of F₁ adults and their developmental times, tests were conducted in 1 qt (946 ml) mason jars with screen lids. Each jar contained 250 g. of beans or cowpeas and were treated with TCP by shaking them together in a jar for 20 min. Treatments used were at the following TCP concentrations: 0.0, 0.01, 0.05, 0.1, 0.25% (w/w). Each treatment was replicated 5 times.