

EFFECTS OF SPINOSAD ON THE HEAT TOLERANCE AND COLD TOLERANCE OF RED FLOUR BEETLE AND LESSER GRAIN BORER

R.R.M.L.B. Bambaradeniya and L.K.W. Wijayarathne

Department of Plant Sciences, Faculty of Agriculture, Rajarata University of Sri Lanka, Puliyankulama, Anuradhapura

Insects cause enormous damage to stored grains as represented by 80% of storage losses due to insects; *Tribolium castaneum*, the red flour beetle and *Rhyzopertha dominica*, the lesser grain borer are two important pests. There is a higher demand for insecticides with low mammalian toxicity to replace synthetic neurotoxic chemicals used to control stored-product insects. Spinosad is a fermented bacterial formulation. High or low temperatures are used to control stored-product insects but are expensive. Objectives of this study were to determine if spinosad affects high or low temperature tolerance of the two insect species. Experimental design was a two-factor factorial. Completely Randomized Design (CRD). *Castaneum* larvae (aged 10-12 days) were exposed to a series of spinosad concentrations, maintained at 43 °C for different durations, and the development of adults from larvae was recorded. Alternatively, adults of *R. dominica* of undetermined age were maintained at 39 °C or 7 °C for different durations and their survival was recorded. Percentage adult emergence or survival, after square root transformation, was analyzed using ANOVA of SAS to determine the significance of treatments. The LT_{50} values were calculated using probit analysis. Spinosad was highly toxic to *T. castaneum* larvae and reduced the adult emergence at no exposure to heat. Spinosad reduced the cold tolerance of *R. dominica* adults but their heat tolerance was not affected. Spinosad did not reduce heat tolerance in *T. castaneum* larvae. The LT_{50} of *T. castaneum* larvae was low at the label rate (25 ppm) of spinosad than in the control (0 ppm). Furthermore, the LT_{50} values of *R. dominica* adults exposed to 39 °C and 7 °C were also lower at the label rate (25 ppm) of spinosad than in the control (0 ppm). Further experiments are needed to determine the effect of spinosad on high and low temperature tolerance of other stored-product insect species.

Keywords: Cold tolerance, Heat tolerance, Spinosad, *Rhyzopertha dominica*, *Tribolium castaneum*