Determination of temperature-time combination for the control of *Callosobruchus maculatus* in pigeon pea

Loganathan, M.*#, Prabakar, S., Alagusundaram, K.
Indian Institute of Crop Processing Technology, Thanjavur, Tamil Nadu, 613 005, India

*Corresponding author, Email: logu@iicpt.edu.in
#Presenting author, Email: logu@iicpt.edu.in

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Abstract

The pigeon pea (*Cajanus cajan*) is one of the most common pulse crops in the world and cultivated in more than 25 countries. India is the largest producer, contributing to around 85% of the world total production with an area of 3.73 million hectares. Pigeon pea is consumed throughout the world as a staple food. The domestic consumption in India is estimated at around 3.4 million tons. Storage is an important aspect of post harvest management because pigeon pea is seasonally produced but consumed throughout the year. Pulse beetle, *Callosobruchus maculatus* is an important storage insect of pigeon pea. Being an internal feeder, it is very difficult to control the larval stage of *C. maculatus* with insecticides. There is a need to control this insect before it can cause severe damage. Thermal disinfestation is one the alternative technique for the control of this insect. Based on the results of preliminary studies, experiments were conducted for determining the required time - temperature combination at 60°C and 50°C for disinfestation. Different exposure times ranging from 5 to 25 min for 60°C and 10 min to 420 min at 50°C were done in a hot air oven. Twenty five adults of the pulse beetle in test tubes without grains were kept in the hot air oven at 60°C for various exposure times. In a different set of experiments, attempts were made to determine the time-temperature combinations for control of pulse beetle when they were exposed along with 20 whole grains. The presence of grains was expected to cause an effect on the efficacy of treatment because the pulse beetles are internal feeders and stay inside the grains. A third set of experiments were tried with bulk grains. The diffusion of heat inside the grains may take time and is expected to cause delay in control. All the experiments were replicated three times for confirmation. The treated insects were allowed to recover at 30±2°C and 65±2% RH for 12 h for further observation. A set of controls were maintained for comparison. Mortality was 100% when the adult insects alone were exposed to 60°C for 60 min. The pigeon pea grains along with insects exposed to an elevated temperature of 60°C for 130 min or 50°C for 540 min were found to be suitable for killing all stages of *C. maculatus*

Keywords: *Callosobruchus maculates*, pigeon pea, thermal disinfestation, temperature