(64)

Bio-efficacy and Persistence of Inert Dust Formulations as Stored-grain Protectants against *Sitophilus oryzae* (L.)

Ganhewa H.T., Perera A.G.W.U.*

Department of Zoology, University of Sri Jayewardenepura, Gangodawila, Nugegoda, Sri Lanka
**wathsala@sjp.ac.lk*

Abstract

Inert dust formulations of natural origin act as promising alternatives in controlling storage infestations caused by deleterious coleopteran insect pests. In that context, laboratory studies were conducted in order to evaluate the insecticidal activity, progeny inhibition and persistence of three commercially available dust formulations, namely, diatomaceous earth, zeolite and cloisite 20A against *Sitophilus oryzae* adults, a major coleopteran pest of stored grains, throughout 90 days of storage period. Adulticidal and persistence bioassays were conducted to evaluate the toxicity of binary combinations of inert dusts using their sub-lethal doses towards the test insect for 60 days of storage period. Further, ultrastructural architecture of the test insect pest species was examined via Field Emission Scanning Electron Microscopy (FE-SEM), and Energy Dispersive X-Ray Analysis (EDX) to study the uptake/penetration pattern of inert dust particles through the cuticular layers of target insect pest. All inert dust formulations exhibited very efficacious toxic and progeny inhibition activities and extraordinary mortality percentages irrespective of the inert dust used at the end of initial 30 day-long storage period. Thereafter, mortality percentages gradually declined with the progress of the storage time period, declining in the order of, diatomaceous earth>zeolite>cloisite 20A. All the dust formulations successfully inhibited the progeny production and the lowest average progeny production was recorded at the end of initial storage period. Progeny inhibition decreased with the progress of storage time. Binary combinations of inert dust formulations exhibited additive and antagonistic effects against *S. oryzae* and similarly, the mortality percentages gradually decreased with the prolongation of the storage period. The FE-SEM and EDX micrographs clearly indicated the presence of dust particles and the distribution of their constituting elements on the cuticular layer of the exposed insect pests with the appearances of abrasions and scratches that may have led to dehydration and eventual death of *S. oryzae*. Thus, findings of the present study suggest that, naturally-derived diatomaceous earth, zeolite and cloisite 20A can be used as eco-friendly means as stored grain protectants against *S. oryzae* populations successfully in the storage grain systems.

Keywords: *Sitophilus oryzae*, Diatomaceous earth, Cloisite 20A, Zeolite