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Bio-rational control of red flour beetle *Tribolium castaneum* (Herbst) in stored wheat with Calneem® oil derived from neem seeds

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DOI: 10.5073/jka.2010.425.167.505

Abstract

The red flour beetle, *Tribolium castaneum* (Herbst) (Coleloptera: Tenebrionidae) is one of the most serious secondary pests that feeds on a wide range of durable stored products including cereals, cereal products and other high value produce such as cocoa beans and dried fruits. Toxicity and protectant potential of Calneem® oil (derived from the seeds of the neem tree *Azadirachata indica* (A. Juss)) to *T. castaneum* were evaluated in stored cracked wheat in the laboratory using contact toxicity, grain treatment, persistency, progeny emergence and repellency assays. Calneem® oil is a biopesticide produced, registered and marketed in Ghana by AQUA AGRIC Community Projects (AACP), Tema, Accra. Calneem® contains about 0.3% azadirachtin as its major active ingredient. The Calneem® was applied at six concentrations (0.1, 0.2, 0.5, 1.0, 2.0 and 3.0%). The oil was emulsified with water using 0.07% soap. Different doses of Calneem® oil were toxic and highly repellent to *T. castaneum* with an overall repellency in the range of 52-88%. The highest concentration of 3.0% of Calneem® oil killed at least 90% of the beetles within 72 h on grain and 88% on filter paper. Beetle mortality was dose-dependent. The development of eggs to adults on cracked wheat was significantly (P<0.05) inhibited by Calneem® oil treatments. The effectiveness of Calneem® oil was significantly reduced by the length of storage after application.The results obtained suggest good potential for the practical use of Calneem® oil as a grain protectant for stored-product pest control. The use of plant materials such as neem oil may be a safe, cost-effective method of grain preservation against pest infestation among poor subsistent farmers who store small amounts of grain.

Keywords: *Tribolium castaneum*, *Azadirachta indica*, Cereals, Repellency, Contact toxicity