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Insecticidal effect of phosphine in different life stages of the khapra beetle, *Trogoderma granarium*

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ABSTRACT

The khapra beetle, *Trogoderma granarium* Everts (Coleoptera: Dermestidae), is an important pest of stored products worldwide. It is considered as one of the most serious quarantine pests in many parts of the world, and often cannot be controlled by insecticides that are usually effective against other stored product insects. The use of phosphine gas has been proven to be effective against a wide range of stored-product insect species, but there is still inadequate information in the case of *T. granarium*. In the present study, we evaluated the effectiveness of phosphine in different life stages of this species, including its diapausing larvae. The evaluation protocols used were: a) the Food and Agricultural Organization (FAO) protocol, i.e., exposure for 20 h at 30 ppm, b) the dose response protocol, i.e., exposure for 3 d at different concentrations (50, 100, 200, 500 and 1000 ppm), and c) the Detia Degesch Phosphine Tolerance Test Kit (DDPTTK, Detia Degesch GmbH), which is based on short exposures (usually minutes) at 3000 ppm. The adults, pupae and larvae of *T. granarium* were susceptible to phosphine, as mortality was 100 % after 3 d of exposure, even at 50 ppm. The same holds for diapausing larvae, which had similar susceptibility to phosphine with non-diapausing ones. In contrast, after 3 d exposure, there was some egg survival at 500 ppm, while mortality was 100 % only at 1000 ppm. The data of the present study can be further utilized for the control of this species, especially in the case of quarantine and pre-shipment treatments.

Keywords: *Trogoderma granarium*, Phosphine, Life stages, Fumigation, Quarantine species