

Residual efficacy of spinosad-treated surfaces on *Rhizopertha dominica* and *Tribolium castaneum* adults

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Abstract

Rhizopertha dominica and *Tribolium castaneum* cause massive losses in stored food. These insects are effectively controlled by synthetic insecticides and fumigants but they accompany many demerits on biotic and abiotic environment. Spinosad is a bacterial formulation and a reduced-risk insecticide which is registered for stored grain protection in many countries. Despite many avenues of research on spinosad, its residual efficacy on certain insect species remains undiscovered. The objective of this research was to evaluate the residual efficacy of spinosad-treated surfaces on the survival of *R. dominica* and *T. castaneum* adults. The label rate of spinosad (25 ppm) was sprayed on polypropylene, jute, polythene, metal and filter paper. One-month-old twenty adults of *R. dominica* or *T. castaneum* were introduced on to the surfaces treated with spinosad and maintained at ambient environmental conditions. The mortality was counted at 2 and 6 days following introduction of adults. The mortality differed with the surface, insect species and duration of exposure. The current study highlights the possibility of controlling *R. dominica* or *T. castaneum* by spinosad sprayed on different surfaces.

Keywords: *Rhizopertha dominica*, *Tribolium castaneum*, Spinosad, Surfaces, Residual efficacy

Introduction

Rhizopertha dominica and *Tribolium castaneum* are serious pests of stored products. The synthetic neurotoxic insecticides are the common control methods for these insects (Ghimire *et al.*, 2016; Wijyaratne *et al.*, 2018) but they have many disadvantages such as negative impacts on human, animals and environment (Arthur, 1996). Reduced-risk insecticides (Arthur, 2007) are better options to overcome the above problems (Phillips and Throne, 2010). Spinosad is a bacterial formulation derived from *Saccharopolyspora spinosa* (Bacteria: Actinobacteridae) (Mertz and Yao, 1990). Spinosad negatively affects the insect nervous system (Salgado and Sparks, 2005). It has been tested against several stored-product insects (Boina *et al.*, 2012; Subramanyam *et al.*, 2016; Wijyaratne and Rajapakse, 2018) but information on its residual effect on different surfaces is lacking. Therefore, the objective of this research was to evaluate the residual effect of spinosad applied on different surfaces on the survival of *R. dominica* and *T. castaneum* adults.

Material and methods

The experiments were conducted at ambient environmental conditions according to completely randomized design. There were four replicates. Commercially-available spinosad was sprayed on polypropylene, gunny bag (jute), filter paper, polythene and metal at the label rate. Twenty adults of *R. dominica* or *T. castaneum* were introduced onto each surface. Survival of insects was observed at 2 and 6 days following introduction.

Results and discussion

Higher residual efficacy of spinosad was observed on polypropylene, gunny bag (jute) and filter paper than metal and polythene. Increased exposure to spinosad recorded higher mortality in both *T. castaneum* and *R. dominica*.

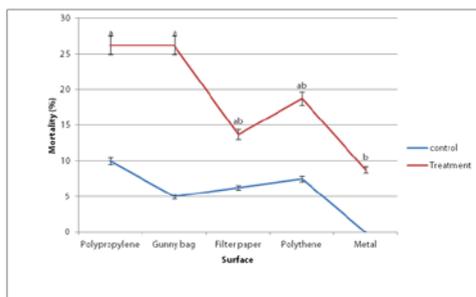


Figure 1. Mortality of *Tribolium castaneum* adults exposed to spinosad-treated surfaces for 2 days.

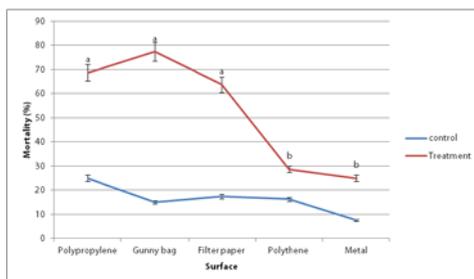


Figure 2. Mortality of *Tribolium castaneum* adults exposed to spinosad-treated surfaces for 6 days.

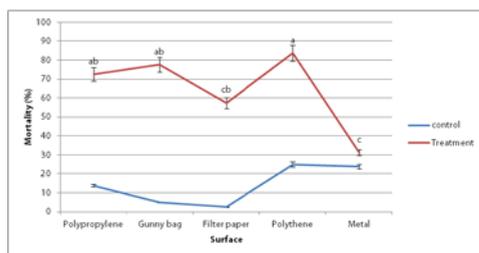


Figure 3. Mortality of *Rhyzopertha dominica* adults exposed to spinosad-treated surfaces for 2 days.

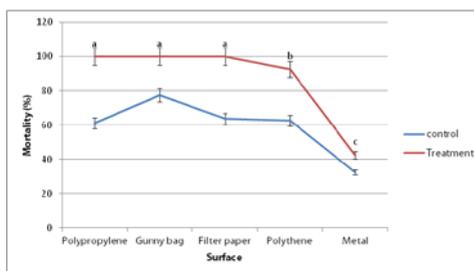


Figure 4. Mortality of *Rhyzopertha dominica* adults exposed to spinosad-treated surfaces for 6 days.

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Effectiveness of spinosad and spinetoram against five stored-product beetle pests under high relative humidity conditions

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