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Capability and limitation of anoxic treatments in museum collections protection

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Without precaution, insects may cause serious damage to museum collections. Quarantine of potentially infested objects can be logistically challenging. Anoxia under controlled nitrogen atmosphere is a most compatible but also time-consuming method to eradicate insect pests in all kinds of different materials. Treatment results are usually effected by duration, temperature, humidity and residual oxygen content. During a two-year research project, 34 relevant pest insect species of all developmental stages were tested in several different materials (wood, paper, wool) to monitor treatment success and to determine optimum treatment parameters. Duration of treatment ranged from one to three weeks at temperatures of 20 - 27 °C. As expected, results showed significant differences in mortality among tested species. Highest tolerance of hypoxic conditions was found in older larvae of *Hylotrupes bajulus*. However, this species is an unlikely museum pest. Anobiids and other wood boring beetles are more often an issue related to cultural heritage. Tested imbedding materials in general had no mortality lowering influence. A combination of three weeks exposure time at up to 0.5 % residual oxygen and at 24 °C and 50 % RH is recommended for infested artefacts.

Susceptibility of phosphine-resistant cigarette beetles to various insecticides

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Abstract

Management of phosphine resistance in the cigarette beetle *Lasioderma serricorne* (F.) has become a topic of great interest to the tobacco industry in recent years. Effective use of contact insecticides with modes of action different from that of phosphine can be a key element in preventing or delaying the evolution of phosphine resistance. This study was conducted to ascertain whether five insecticides selected from three mode-of-action classes (fenitrothion, pirimiphos-methyl, permethrin, bifenthrin, and spinosad) can be incorporated into a phosphine-resistance management strategy. Specifically, we examined the contact efficacy of the insecticides to a phosphine-susceptible strain and six resistant strains (38–184-fold in resistance ratio based on LC₅₀). Susceptibility to organophosphates (fenitrothion, pirimiphos-methyl) and spinosad was not significantly different between phosphine-susceptible and phosphine-resistant strains (within 2.3-fold resistance ratio). The absence of the cross-resistance between these insecticides and phosphine makes them ideal for resistance-management programmes. However, high resistance to synthetic pyrethroids (>145-fold for permethrin and >1697-fold for bifenthrin) was found in three of six phosphine-resistant strains. Based on these results, synthetic pyrethroids cannot be recommended as insecticides of primary choice.

Keywords: *Lasioderma serricorne*, resistance management, contact insecticides, pyrethroid resistance

1. Introduction

The cigarette beetle, *Lasioderma serricorne* (F.) is the most important pest of stored tobacco. Fumigation by phosphine, the most important method for disinfestation of stored tobacco, has been used for post-harvest management of insect pests since the 1970s. Phosphine resistance in *L. serricorne*, although first recorded in India and the United States in the 1990s (ZETTLER, 1990;