Does sulfuryl fluoride and heat combination overcome the egg-weakness of almond moth?

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ABSTRACT

The effects of sulfuryl fluoride at different dosages were studied on the mortality of egg stage of *Ephestia cautella* at a temperature of 15, 20, 25, 30 and 35°C in chamber (28.3 l) modified from Labconco® vacuum desiccator cabinet for fixed exposure time (24 h). Studies were conducted with 0-1, 1-2, 2-3 d-old eggs, of *Ephestia cautella*.

Results showed that complete mortality of the egg stage of E. cautella was achieved at 190g/m3 concentration of the fumigant gas for 24 exposure period at 15°C-75% rh. Complete mortality were recorded at 140, 90, 60 and 30 g/m3 at 20, 25, 30 and 35°C – 75% rh, respectively.

Key words: Ephestia cautella, *Almond moth*, sulfuryl fluoride, heat

INTRODUCTION

Turkey is one of the leading dried figs producing and exporting country, with a production amounting to some 50.000 tonnes annually, comprising from 60 to 75% of the international market. Main pests of dried fig in the processing and storage are *Ephestia cautella, Carpoglyphus lactis, Oryzaephilus surinamensis, Carpophilus spp.* To control storage pests that infest dried figs in the processing and storage, methyl bromide (MBr) was used to disinfest till 2004 in Turkey. The phase-out schedule of methyl bromide in Turkey has increased the urgency to search for alternatives.

Sulfuryl fluoride (SF) is registered as ProFume gas fumigant for stored-product insect control. It is considered a feasible alternative to methyl bromide (MB) for fumigation of stored-product insects infesting structures e.g. empty flourmills and selected, harvested, agricultural products (Drinkall et al., 1996; Reichmuth et al., 2003; Baltaci et al., 2009).

As MBr alternatives, beside phosphine and sulfuryl fluoride, other control methods mainly, high CO_2 based MA applications, deep freezing, high pressure-CO2, cold storage are effective in controlling dried fig pests in Turkey. For conventional dried fig processing sector (90-95% of the total production) in Turkey, sulfuryl fluoride is the leading alternative due to short exposure period.

The weakness of sulfuryl fluoride against the egg stage of insects is the key factor for effectiveness. Thus, the combination of sulfuryl fluoride and heat can be the way to overcome the weakness of this fumigant gas This study was undertaken to address the lack of published data on efficacy of sulfuryl fluoride against the egg stage of *Ephestia cautella*.

MATERIALS AND METHODS

The effects of sulfuryl fluoride at different dosages were studied on the mortality of egg stage of *Ephestia cautella* at a temperature of 15, 20, 25, 30 and 35^{o}C in chamber (28.3 l) modified from Labconco® vacuum desiccator cabinet for fixed exposure time (24 h). Studies were conducted with 0-1, 1-2, 2-3 d-old eggs, of *Ephestia cautella*. Treatments were conducted by placing plexi-glass slide each with 100-drilled ‘‘wells’’ was used to house 100 eggs individually from each of the studied ages; eggs after exposure to gas were then enclosed with a cover glass. The chambers were equipped with air circulation fan that is operated at the first 15 minutes of exposure during fumigation. Using a gastight mega syringe, fumigant gas injected into the chamber. Once the target concentration was attained according to the reading on the portable gas measuring equipment, gas injection was stopped. Fumigant concentrations were determined at the beginning and at the end of exposure period by portable gas measuring equipment (Fumiscope). After 24 h of exposure, cabinet was transferred to out side and the door of cabinet was opened. Then, the plexiglas plates were removed and covered with glass slides (15*20 cm), then kept in controlled room at 25°C and at 65 % relative humidity. Daily observations of egg hatch were made using a binocular microscope, from the time of termination of exposure until there were no more emergences.

RESULTS AND DISCUSSION

The effect of sulfuryl fluoride on the mortality of 0-24, 24-48 and 48-72 h egg stages of *Ephestia cautella* at 15, 20, 25, 30 and 35^{o}C and 75% rh. is shown in Figures 1. The young

eggs of *E. cautella* seem more susceptible then old eggs at 15, 20 and 25°C. There is no difference between the ages of eggs to sulfuryl fluoride at 30 and 35°C

Complete mortality of the egg stage of *E. cautella* was achieved at 190g/m3 concentration of the fumigant gas for 24-exposure period at 15°C-75% rh. Complete mortality were recorded at 140, 90, 60 and 30 g/m3 at 20, 25, 30 and 35°C – 75% rh, respectively.

Results show that mortality increased with increasing exposure temperature. According to our results, sulfuryl fluoride with heat hold promise to overcome the weakness of egg stage of pests.

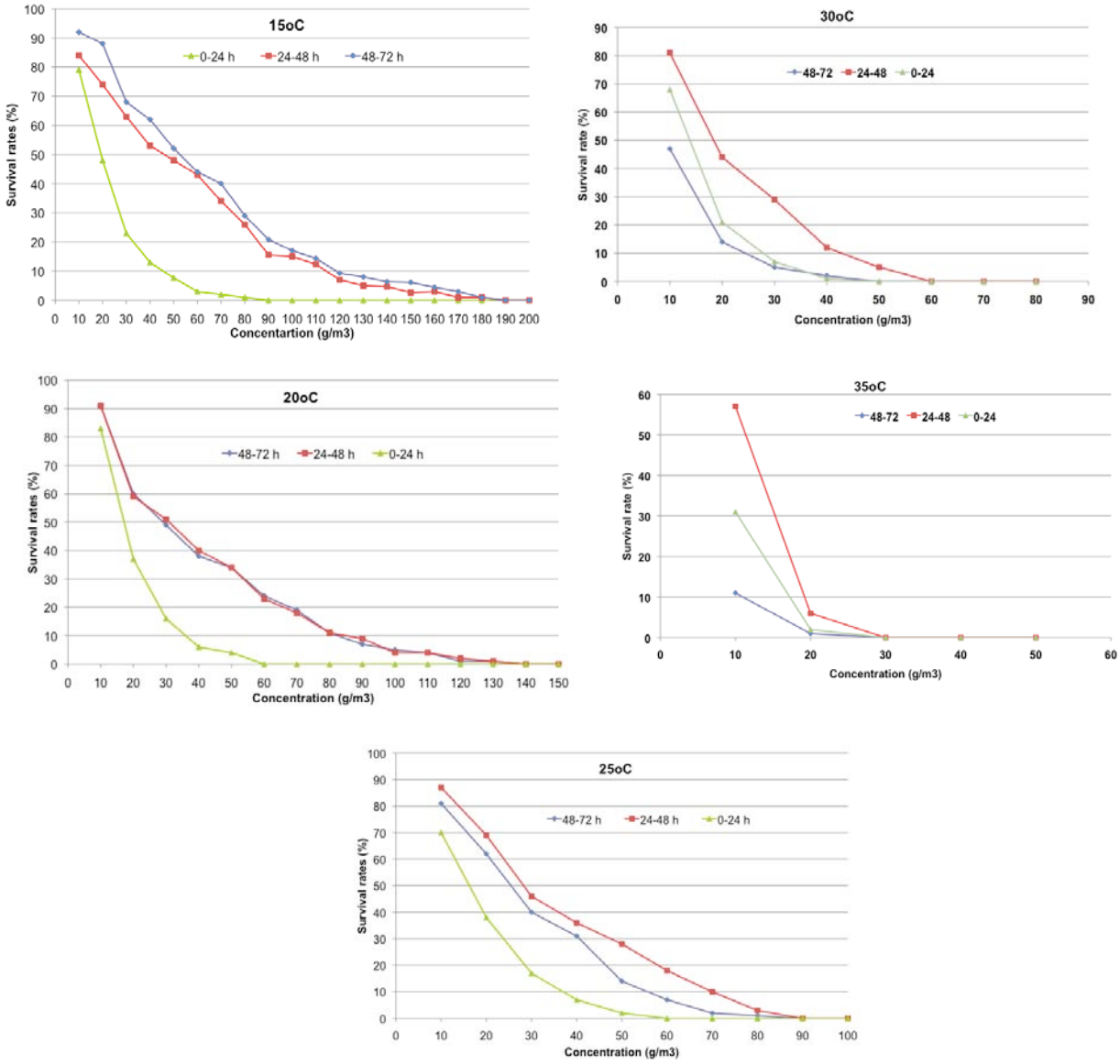

Fig. 1- Mortality of 0-24, 24-48 and 48-72 h egg stages of *Ephestia cautella* exposed to different concentrations of sulfuryl fluoride at 24 h exposure period at 15, 20, 25, 30 and 35°C.

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