TIME/DOSE MORTALITY OF LOW LEVEL PHOSPHINE TO ALMOND MOTH

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Turkey is one of the most important dried figs producing and exporting country, with a production amounting to some 50,000 tones annually, comprising from 60 to 75% of the international market. Almond moth is one of the main pests of dried fruits in Turkey. To control storage pests, which infest dried fruits in the processing and storage, methyl bromide (MB) had been used to disinfest for many years in Turkey. MB is already banned-out in post harvest sector in Turkey. The only chemical alternative to MB available in Turkey, is phosphine.

The current study was conducted to determine the mortality of life stages of almond moth, *Ephestia cautella* (Walker) (Lepidoptera, Pyralidae), exposed to low level of phosphine at 20°C and 65% relative humidity. Egg (0-1, 1-2, and 2-3 d-old), larva (25 d-old), pupa (1-2 d-old), and adult (0-1 d-old) stages of *E. cautella* were exposed to a fixed gas concentration (100 ppm) of phosphine in a recirculation apparatus consisting of four flasks over a range of exposure periods, from 30 min to 72 h. The recirculation apparatus was setup to provide small fumigation chambers for one concentration and four exposure periods. The flasks were connected together to a small electric pump, which was set up to recirculate the gas evenly throughout the apparatus (Hasan and Reichmuth, 2004). Phosphine was generated in a gas burette from which the required quantity was drawn using a gas-tight syringe. After dosing, phosphine concentrations were checked in the recirculation apparatus at start of an exposure by a Bedfont phosphine monitor fitted with a built-in suction pump for sampling the gas. The sample gas was circulated back into the chambers. At the end of the exposure, insect vials were taken out and transferred to the incubator at 20°C insect mortality was determined. Mortality data was subjected to Probit analysis using the POLO PC and LD_{50} values were calculated.

The present laboratory tests showed that complete mortality for all stages of insect was achieved within 48 h of exposure (Figures 1 and 2.). At the tested all life stages, mortality increased with increasing exposure periods. The adults followed by larvae were the most susceptible life stage to phosphine; 50% mortality was achieved within 1.85 and 2.03 h, respectively. The pupae were the most tolerant life stage to phosphine, requiring 11.66 h exposure period to achieve 50% mortality. Early stage eggs (0-1 d-old) experienced

lower mortality (value for LT_{50} of 10.00 h) compared with intermediate stage eggs (1-2 d-old) and late stage eggs (2-3 d-old) (values for LT_{50} of 3.72 and 1.99 h).

In the current experiments, 100% mortality of all stages of almond moth was observed at the end of 2 days of exposure of low level of phosphine at 20^{o}C. Currently, 1-2 g PH_3 during 3 days of exposure was recommended to control of dried fruit pests at the harvesting season where temperature was high in the Aegean region of Turkey. According to our results, phosphine hold promise as a replacement for methyl bromide fumigations for the dried fruit pests.

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References

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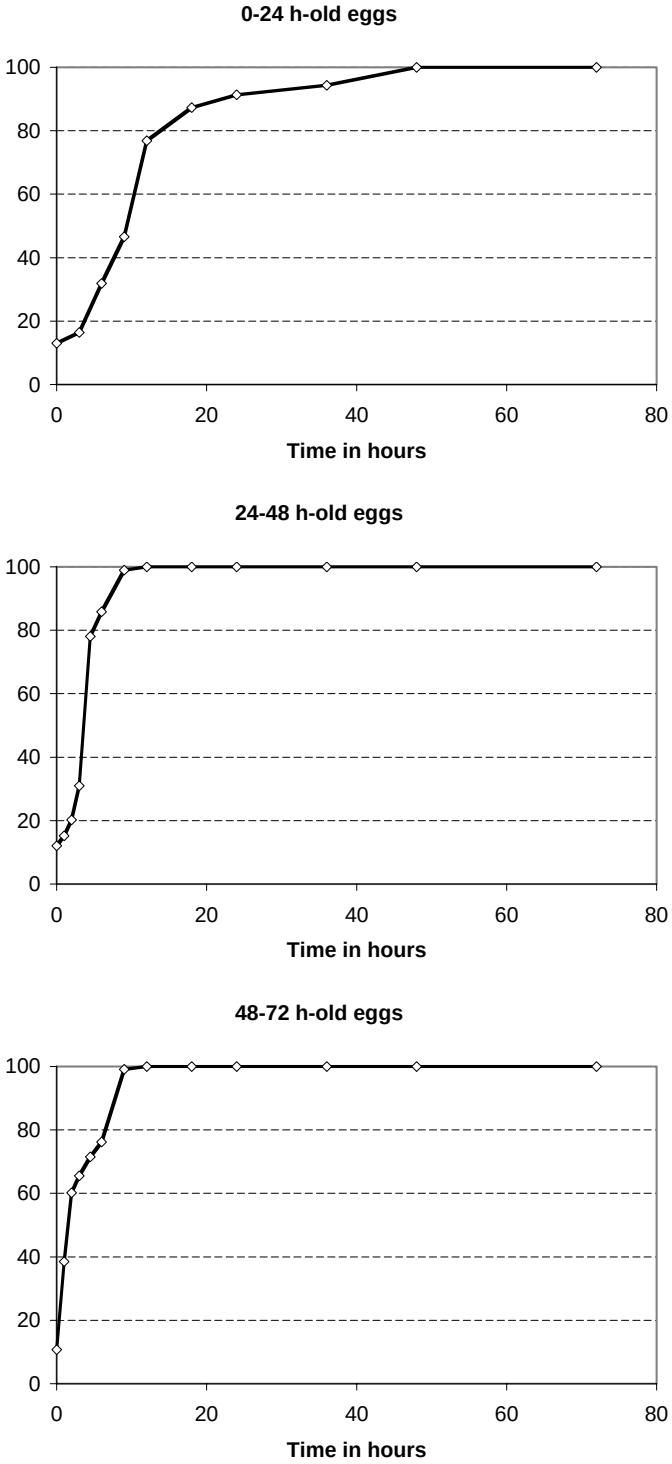

Fig. 1- Effect of 100-ppm phosphine on mortality of egg stage of almond moth at various exposure times at 20^{o}C and 65% r.h.

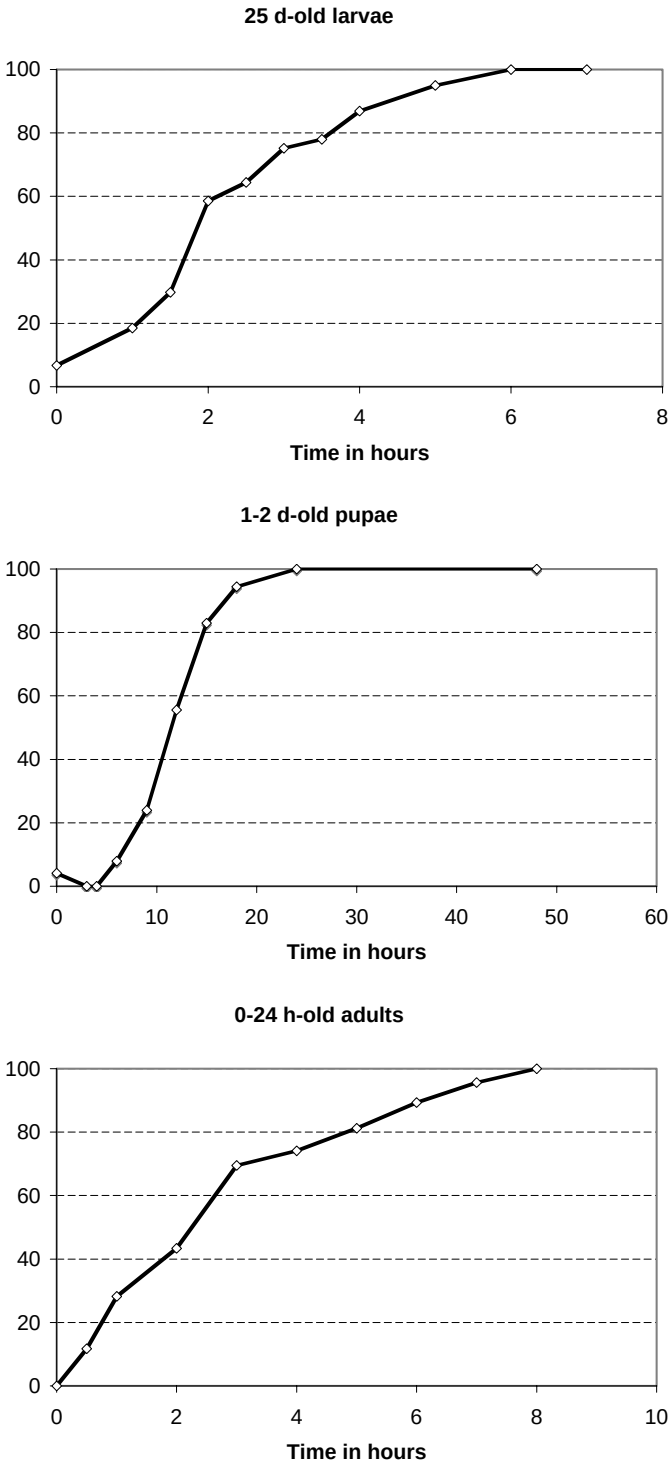

Fig. 2- Effect of 100-ppm phosphine on mortality of larvae, pupae and adult stages of almond moth at various exposure times at 20^{o}C and 65% r.h.