

Effect of storage temperature and duration on viability of eggs of *Helicoverpa armigera* (Lepidoptera: Noctuidae)

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Abstract

The ability to store different insect stadia for prolonged periods provides considerable flexibility and ability to conduct experiments properly. Therefore, studies were undertaken to determine the effect of storage temperature and duration on viability of eggs of *Helicoverpa armigera* (Hübner). The percentage egg hatch and incubation period were significantly ($P=0.01$) influenced by egg age, storage temperature, and storage duration. Egg hatch ranged from 0.0 to 96.8% across temperatures and storage durations. None of the eggs hatched when stored at -20 and 0°C . The regression model with the optimum Mallow Cp statistic for any of the identified linear and quadratic terms did not improve the precision of prediction in egg hatch beyond 67.0%. Forecasting of incubation period based on egg age, storage duration, and duration $\times$ temperature was quite effective ($R^2=84.2\%$). Day degrees required for egg hatching decreased with an increase in temperature from 10 to 27°C , and egg age from 0 to 3 days. The day degree requirements were highest for 0-day-old eggs at 10°C , and lowest at 27°C . Although the incubation period was higher, the hatchability was lower for 0- and 1-day-old eggs stored at constant 10°C , these eggs can be stored for 10 days at 10°C , with a hatchability of $>75.0\%$. It was safer to store the *H. armigera* eggs for 10 days at 10°C , which will hatch within 1.6 to 2.0 days after restoration at 27°C with a hatchability of $>75.0\%$. This information will be useful in planning and execution of experiments involving *H. armigera* on various aspects of research in entomology.

Keywords: *Helicoverpa armigera*, storage, egg viability, temperature

Introduction

Helicoverpa armigera (Hübner) (Lepidoptera: Noctuidae) is one of the most important pests of cotton, pigeonpea, chickpea, maize, vegetables, fruits, and fruit trees worldwide (Sharma, 2001). The pest status of *H. armigera* is mainly the result of its physiological, behavioural, and ecological characteristics that enable it to survive in diverse habitats. Polyphagy, high mobility, high fecundity, and facultative diapause enable it to survive in adverse conditions (Fitt,

1989). *Helicoverpa armigera* is widely distributed in Asia, Africa, Australia and Mediterranean Europe (IIE, 1993) and causes an annual loss of over US\$ 2 billion worldwide (Sharma, 2005). Having a status of high priority pest worldwide, it is routinely used in bioassays in the pesticide industry for monitoring the efficacy of pesticides, and as a tool for research on insect–host–plant interactions, insecticide resistance, transgenics, molecular markers, and biological, physiological and behavioural studies. To facilitate insect availability for use in a diverse array of research fields, it is desirable to manipulate various aspects of insect biology in order to have adequate numbers of insects at the appropriate stage of development for experimental purposes. Exposure of insects to temperatures below the typical rearing temperature of 27°C to slow down the rate of insect

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