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**REPRODUCTIVE BEHAVIOUR OF**  
***EPHESTIA KUEHNIELLA* ZELLER**  
**(LEPIDOPTERA: PYRALIDAE)**

**Jin Xu**

**2010**

**REPRODUCTIVE BEHAVIOUR OF  
*EPHESTIA KUEHNIELLA* ZELLER  
(LEPIDOPTERA: PYRALIDAE)**

**a thesis presented in partial fulfillment of the requirements**

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**Jin Xu**

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## Abstract

*Ephestia kuehniella* is a pest of stored grain products. It also is widely used to rear parasitoids and predators. Prior to this study, little information was available on its reproductive behaviour. The fitness of *E. kuehniella* decreases with the increase of rearing density; a density of 100 larvae/50g food is recommended to produce high quality insects. Females emerge earlier than males. Emergence peaks at dusk; calling, courtship and mating peak in the late part of the 1st scotophase following emergence; oviposition peaks in the early part of the 2nd scotophase following emergence. Newly emerged virgin females carry <5 mature eggs, and the egg load increase to  $\approx 240$  three days after emergence and remains unchanged thereafter. Male accessory gland secretions stimulate egg maturation; mated females produce  $\approx 300$  mature eggs. Males produce two types of sperm, eupyrene (nucleate) and apyrene (anucleate) sperm. After mating, it takes 11 h for most eupyrene and apyrene sperm to reach the spermatheca. The presence of eupyrene sperm in the spermatheca is the main factor that elicits oviposition. The highest fecundity can be achieved when both sexes are 1-d-old at mating compared to older insects; delaying mating for 7 d reduces female fecundity by 60%. There is no significant effect of parental age on offspring fitness. Virgin females live longer than mated ones because the former allocate less resource for egg production. Larger females have higher fecundity and larger males produce larger spermatophores. Larger parents have larger sons and daughters. Females prefer large and mid-aged males for mating. Males prefer large, young and virgin females for mating. Males strategically adjust ejaculate size according to the degree of sperm competition risks. Both sexes mate multiply where males can copulate up to 9 times and females up to 4 times in their lifetime. Larger and younger females are more likely to remate. Multiple mating does not increase female fecundity, fertility and longevity. Females discriminate against previous mates and strategically adjust oviposition to gain genetic benefit via increasing offspring genetic diversity. Using a chemosterilant, thiotepa, I determined that the last male to mate with a female sires most of her offspring. The last male sperm precedence may be due to sperm displacement at both sperm ejaculation and storage sites, where the 2nd male physically displaces the 1st male's spermatophore with his own in the bursa copulatrix and triggers the female to dump  $\approx 50\%$  resident sperm in the spermatheca. Spermathecal contractions appear to be the mechanism for sperm ejection. The outcome of sperm displacement is the result of male $\times$ female interactions.

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