

**שונות תוך מינית בכשירות מושית השלוש-עשרה**  
***Hippodamia variegata* הניזונה על אבקת פרחים**

עבודת-גמר

מוגשת לפקולטה לחקלאות, מזון וסביבה ע"ש רוברט ה.

סמית

האוניברסיטה העברית בירושלים

**לשם קבלת תואר**  
**' מוסמך למדעי החקלאות '**

ע"י

מריה דלה

## Summary

In recent decades, our appreciation of the importance of plant-insect interactions and our understanding of the complexity of food webs in nature have grown. True omnivores, which feed on both prey and plant resources, have a very wide dietary range. Studies of mixed plant and prey diets have shown that, in many cases, the combination of these foods in the diet improves larval development and survival. Many species of predaceous Coccinellidae feed on pollen in addition to prey. Pollen can also serve as a food substitute during times when prey is scarce, and in many cases it contributes to beetle fitness. The degree of integration of pollen in the diet and its relative contribution to fitness vary according to beetle and plant species; there is a difference in the nutritional value of pollen from different plant species. In addition, within a given plant species, genetics and the environment can produce differences in the nutritional compatibility of pollen for various insects. The central goal of this study was to examine how the quality of plant food affects intra-specific variability in *Hippodamia variegata*, a coccinellid which feeds on pollen as a supplement to prey. Thus, the objectives of the present study were 1) to compare the contribution of pollen from different plant species to the survival of *Hippodamia variegata* larvae, 2) to quantify the effect of pollen age on its contribution to the survival of *Hippodamia variegata* larvae, and 3) to determine the effect of maternal age at the time of oviposition on the survival of offspring reared on a mixed diet.

The first two objectives are addressed in the first chapter of this work, while the third objective is covered in the second chapter. In order to examine the effect of the addition of various pollen species to a prey diet on the fitness of *Hippodamia variegata* larvae at various developmental stages, two experiments were conducted. The first experiment evaluated the effect of canola (*Brassica napus* L.; Sary) pollen compared to sweet corn (*Zea mays*) pollen. In a second experiment, the effect of sweet corn pollen was compared to that of field corn pollen. Feeding on canola pollen was found to significantly increase survival time relative to feeding on sweet corn pollen. The dry weight and developmental rate of 4<sup>th</sup>-instar *H. variegata* larvae were significantly

influenced by the type of diet on which the larvae were reared; the weight of larvae reared on a diet of aphids and *Ephestia* eggs was significantly higher than that of larvae reared on pollen of sweet corn or canola. Additionally, a significant inverse relationship was found between the age of the pollen and its contribution to the survival of *Hippodamia variegata* larvae; as a supplement to prey, fresh pollen improved the survival time of the larvae to a greater degree than did three-year-old pollen.

The second chapter of this thesis examines the influence of female age at the time of oviposition on the survival time of offspring feeding on a mixed diet of prey and pollen. In *Hippodamia variegata*, larval survival time decreased with an increase in maternal age at the time of oviposition. In other words, offspring hatching from eggs produced by a female of advanced age were found to have a shorter lifespan than those hatching from the eggs of a younger female, when both groups were reared on a mixed diet.

Omnivores are of great importance for the biological control of pests in various agricultural crops. In the context of biocontrol, feeding on plant resources contributes to the fitness of these natural enemies and will improve their ability to suppress pest populations. Since the results of this study indicate a decrease in the contribution of plant-based resources to the fitness of offspring with increasing maternal age at the time of oviposition, biocontrol programs should benefit from encouraging continuous oviposition by omnivores in the early adult stage. Additional research is required to understand the effects of age and differences in pollen quality on omnivore competency, and the mechanisms involved, as well as the hereditary basis of the influence of maternal age on omnivore offspring.