Effects of host plant and temperature on *Aphidius colemani* (Hymenoptera: Braconidae) intrinsic rate of population increase

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FIGURE 1: *Aphidius colemani* adult. Photo by Bio-Bee (www.bio-bee.com).

Introduction

Parasitoid

Aphidius colemani Viereck (Hymenoptera: Braconidae, Aphidinae) (Fig. 1) is a solitary generalist aphid endoparasitoid commonly used in augmentative biological control of aphids. The green peach aphid *Myzus persicae* Sulzer (Homoptera: Aphididae) (Fig. 2) is a frequent target pest in vegetable greenhouses.

FIGURE 2: *Myzus persicae* adult. Photo by Scott Bauer (www.ars.usda.gov).

Effects of host plant

- Several studies documented that variation in plant quality, commonly referred to as *bottom-up* factors (as they originate from the base of a food web), can not only influence the population dynamics of herbivorous insects directly, but can also alter the effect of natural enemies.
- The potential implications of host plant effects on the effectiveness of *A. colemani* as a biological control agent should be taken into account when parasitoid mass-rearing methods or IPM programs are optimized.

Aim

The aim of our study was to investigate the aphid-mediated effects of plant on *A. colemani* life-history characteristics.

Materials and Methods

A. colemani was reared on *Myzus persicae* using either the tobacco *Nicotiana tabacum* (Fig. 3) or the bean *Vicia faba* as a host plant for aphids. The experiments were carried out at four constant temperatures 18, 22, 26 and 29°C.

FIGURE 3: Tobacco plant, *Nicotiana tabacum*.

The intrinsic rate of increase r_m was estimated from the life table data using Lotka's (1924) equation

$$\sum_{x=0}^{\infty} e^{-r_m x} l_x m_x = 1 \qquad (1)$$

where x is the age (measured in days), l_x the survival rate from birth to age x and m_x the mean number of female progeny produced per adult female of age x. A parameter r_m, as well as other derived parameters, were estimated by means of the Pascal program developed by Hulting et al. [1]. The standard error of the parameters was estimated using a Jackknife subsampling method [2, 3].

Results

The highest mean total number of offsprings per female was found when parasitoids were offered to *M. persicae* grown on bean at 22°C while the lowest one was found at 29°C when tobacco was used as a host plant (Fig. 4).

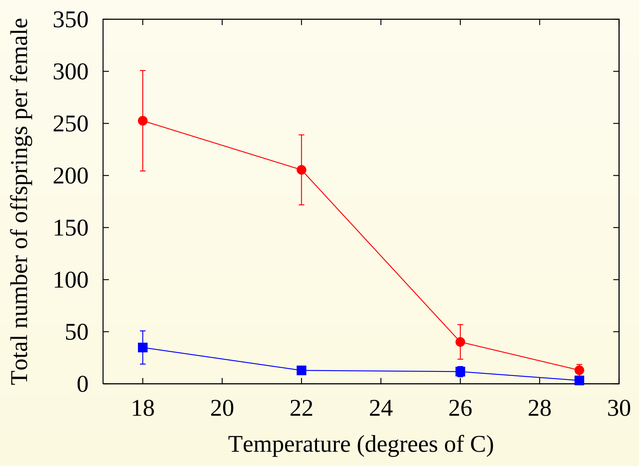

FIGURE 4: The effect of temperature on the number of offsprings in *Aphidius colemani* when tobacco (red line) or bean (blue line) were used as a host plant for aphids. Vertical lines indicate standard errors.

Survivorship of females was significantly higher on tobacco than bean at 26°C while at the other temperatures no differences were found (Fig. 5). The intrinsic rate of increase was higher for *A. colemani* parasitizing aphids on bean than tobacco although significant differences were found only at optimal temperature 22°C (Fig. 6).

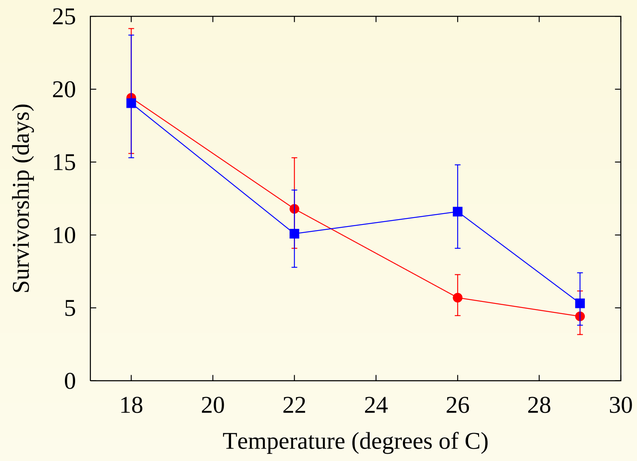

FIGURE 5: The effect of temperature on *Aphidius colemani* survivorship when tobacco (red line) or bean (blue line) were used as a host plant for aphids. Vertical lines indicate least significant differences.

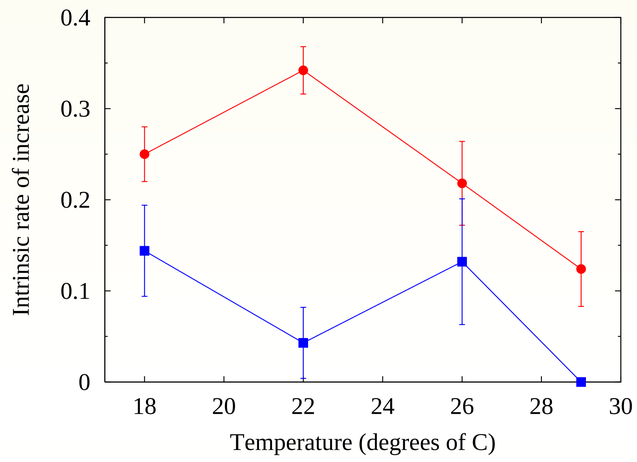

FIGURE 6: The effect of temperature on *Aphidius colemani* intrinsic rate of increase when tobacco (red line) or bean (blue line) were used as a host plant for aphids. Vertical lines indicate standard errors.

Conclusions

- **The obtained results corroborated our hypothesis that the host plant is an important factor in an aphid-parasitoid relationship.**
- **Plant toxins are probably the cause of lower rate of population increase in *A. colemani* developed on tobacco-reared aphids.**

Acknowledgements

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