Article

When do the predators leave their patch? Leaving tendency in *Phytoseiulus persimilis* and *Neoseiulus californicus* (Phytoseiidae)

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Abstract

Patch departure decision is influenced by different factors such as progeny prey needs. Here, we tested developmental time, oviposition rate and patch leaving strategies in two phytoseiid predators, *Phytoseiulus persimilis* and *Neoseiulus californicus* when their diets consisted of spider mite eggs with and without pollen. Gradual decreasing trend in developmental times was obvious by increasing the number of prey eggs in both predators. Immature *P. persimilis* and *N. californicus* needed at least six spider mite eggs to reach adulthood. Predation rates of *P. persimilis* and *N. californicus* increased (6 to 24.4 and 6 to 21.9 respectively) with increasing the number of available spider mite eggs from 6 to 25. We recorded no significant differences in the developmental times and oviposition rates neither for *P. persimilis* nor for *N. californicus* after adding pollen to the predators' diet. Our experiments showed that both predator species left enough prey for their progeny before leaving patch.

Key words: patch, oviposition, pollen, Phytoseiidae, density

Introduction

Charnov's marginal value theorem predicts that the predator should leave a patch when the rate of prey in that patch drops below the rate of prey elsewhere (Charnov 1976, Tenhumberg *et al.*, 2001) so the predator should spend more time on the patch with more prey. Maeda *et al.* (1998) discussed that predator's take-off behavior from the current prey-patch is mediated by cues related to prey and predator densities. They showed that the predatory mite *Phytoseiulus persimilis* increased its residence time with increasing prey density. Bernstein (1984) and Takafuji and Chant (1976) also reported density dependent dispersal of *P. persimilis*. Predator dispersal timing has been considered as a critical behavior in predator-prey interaction which is based on conflicting signals and information related to prey density, local and distant volatiles (Mayland *et al.,* 2000).

"Patch selection" and "patch time" are two decisions made by predators and parasitoids during their foraging behavior (Waage, 1979). Krebs (1973) reviewed three models for patch time including: (1) remaining on the patch until a fixed number of prey have been captured, (2) remaining on the patch for a fixed period of time and (3) remaining on the patch until the prey capture rate falls below a certain value. Foraging time allocation has mostly been studied in herbivorous and parasitoid arthropods. Nachman and Zemek (2002) reported a high tendency of spider mites to leave their host plant when it is overexploited. Li and Margolies (1993) investigated the effect of mite age, population density and leaf quality on aerial dispersal behavior of *Tetranychus urticae* and suggested that poor quality leaves, long starvation time and desiccation of adult females may enhance their