

Review

Revision of the lifestyles of phytoseiid mites (Acari: Phytoseiidae) and implications for biological control strategies

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ABSTRACT

A new classification of lifestyles of phytoseiid mites is proposed based on the findings and suggestions from many studies conducted in the fifteen years since the publication of the lifestyle system by McMurtry & Croft (1997). In this newly proposed classification, Type I (Specialized mite predators) is divided into three subtypes to highlight mite prey specificity: subtype I-a—Specialized predators of *Tetranychus* species (Tetranychidae); subtype I-b—Specialized predators of web-nest producing mites (Tetranychidae); subtype I-c—Specialized predators of tydeoids (Tydeoidea). Type II (Selective predators of tetranychid mites) remains essentially the same. Type III (Generalist predators) is a huge and diverse group of general feeders; predators in this category are now grouped into five subtypes based on the microhabitat occupied and morphology: subtype III-a—Generalist predators living on pubescent leaves; subtype III-b—Generalist predators living on glabrous leaves; III-c—Generalist predators living in confined spaces on dicotyledonous plants; III-d—Generalist predators living in confined spaces on monocotyledonous plants; III-e—Generalist predators from soil/litter habitats. Type IV (Pollen feeding generalist predators) also remains essentially the same. Two possible additional lifestyles include phytoseiids living on aquatic plants and phytoseiids able to pierce leaf cells. Behavioral and biological information is updated and implications for biological control strategies are discussed.

Key words: Ecology, predator, feeding habit, biological control

INTRODUCTION

Phytoseiid mites are important biological control agents of other mite groups, thrips and whiteflies. They have been extensively used in biological control programs (Helle & Sabelis 1985; Lindquist *et al.* 1996; Sabelis & Van Rijn 1997; McMurtry & Croft 1997; Gerson *et al.* 2003). The general biology of these mites has been thoroughly studied. Despite being known mainly as predators of small arthropods and nematodes, most phytoseiids also have other feeding habits, consuming food items such as fungi, plant exudates, pollen, etc. Some are even able to extract liquid from leaf cells.

Although apparently all phytoseiids avoid exposure to direct sunlight, they vary in relation to their preferred substrates. Some are often found in smooth microhabitats, where they find their food sources, resting near the main leaf veins or under non-plant structures, such as webbing produced by insects, spiders or mites, or particles carried by the wind and deposited on plant parts, especially leaves and fruits. Others are favoured by non-homogeneous microhabitats, such as pubescent leaves, natural plant structures (domatia, meristematic regions) or structures produced by plants because of exogenous determining factors (galls or erinea). Still others seem to commute regularly between plant microhabitats showing those two extreme characteristics while looking for food or protection. McMurtry (2010) diagrammed hypothetical pathways of evolution of phytoseiid food habits.