



Population dynamics of mites in slow-release sachets used in biological control: a new study methodology

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Abstract

Predatory mite species (Acari: Phytoseiidae) are essential tools in the biological control of greenhouses pests. The natural enemies can be released directly into a crop. A better, partly preventive system is to place slow-release sachets on the plants. Inside such sachets is a factitious prey's food substrate—which also acts as refuge—and the predator. The objective of this study was to develop a new methodology to evaluate the population dynamics of this sachet system, based on the factitious prey *Carpoglyphus lactis* and the predatory mite *Amblyseius swirskii*. Through two tests carried out under laboratory conditions, the sachets were first compared to the traditional extraction method that uses Berlese-Tullgren funnels and an extraction method using flotation in hexane. The latter method proved more effective at sampling the motile states (larvae, nymphs, and adults), both for the predatory species and for the factitious prey, extracting up to $3.7\times$ more mites than the Berlese-Tullgren funnel. Second, the population dynamics of both mite species was studied in a laboratory test, both inside and outside the sachets. In this way, a positive correlation was demonstrated between the number of predatory mites and the number of prey mites inside the sachets. Conversely, no correlation was found between the interior population of predatory mites and the number that venture outside. We can conclude that hexane extraction is very useful both in quality control of predatory mites and in studying how the sachets behave when faced with various factors.

Keywords Phytoseiidae · Carpoglyphidae · *Amblyseius swirskii* · *Carpoglyphus lactis* · Hexane flotation · Quality control

Introduction

The worldwide use of predatory mites (mainly the family Phytoseiidae) constitutes one of the basic pillars of integrated pest management in greenhouse crops (Knapp et al. 2018). There are several commercial formulations for manipulating and releasing them in crops, all of which have food substrate for factitious prey (usually astigmatid mites) and/or carrier substances (Vila and Cabello 2014).

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