Species occurrence of phytophagous and predatory mites (Acari: Tetranychidae, Phytoseiidae) on fruit vegetables in Ho Chi Minh City, Vietnam

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ABSTRACT

We investigated the occurrence of phytophagous and predatory mite species (Acari: Tetranychidae, Phytoseiidae) on fruit vegetables in Ho Chi Minh City from June 2011 to October 2012. We found eight phytoseiid mite species on solanaceous and cucurbitaceous crops, of which seven were identified: Amblyseius matinikus Schicha & Corpuz-Raros, Amblyseius tamatavensis Blommers, Graminaseius polisensis (Schicha & Corpuz-Raros), Neoseiulus longispinosus (Evans), Paraphytoseius multidentatus Swirski & Schechter, Proprioseiulus dahonagnas (Schicha & Corpuz-Raros), and Scapulaseius asiaticus (Evans). Neoseiulus longispinosus was the most populous species. The predatory mites were associated with the occurrence of the phytophagous mites from flowering to fruiting, at harvest, and after harvest.

Key words: phytophagous mite, predatory mite, Phytoseiidae, species occurrence, species composition

INTRODUCTION

Phytophagous mites are potentially and practically a major pest group of major field, fiber, fruit, and ornamental crops. Damage caused by them has become increasingly evident during the last few decades (Rabbinge 1985), and significantly reduces yield in more than 180 crops (Johnson and Lyon 1991). Phytophagous mites are difficult to control owing to their small size (hard to see with the naked eye), high fertility, short life cycle, pesticide resistance, and ease of epidemic outbreak on many crops (Jeppson et al. 1975).

Recently in Vietnam, populations of phytophagous mites have increased rapidly and have damaged various crops in many regions of the country. At the same time, populations of predatory mites have become common. Around the world, there are over 1600 predatory mite species in the family Phytoseiidae. However, there is no holistic record of species composition
and population density or of the distribution of phytophagous and predatory mites in Vietnam, especially in southern regions.

This study of populations of phytophagous and predatory mites on fruit vegetable crops in Ho Chi Minh City is one of the first surveys in Vietnam of the species composition of mites.

MATERIALS AND METHODS

Observations were conducted in 2011 to 2012 in crops of African eggplant (*Solanum macrocarpon* L.), eggplant (*Solanum melongena* L.), cucumber (*Cucumis sativus* L.), winter melon (*Benincasa hispida* (Thunb.) Cogn.), pumpkin (*Cucurbita pepo* L.), and Chinese okra (*Luffa acutangula* (L.) Roxb.) in the districts of Hoc Mon and Cu Chi, the Agriculture Hi-tech Park, and Dong Tien hatchery plants II and III, all in Ho Chi Minh City. At each site, five sampling points were chosen and marked. Random samples of 10 leaves at each point were taken from different parts of marked plants every 7 days, from 15 days after planting for spider mites and at 1 month after planting for predatory mites, until harvest time (along the guidelines of the Vietnam Ministry of Agriculture and Rural Development 2006). Investigations focused on the important periods of before flowering, flowering, after flowering, fruiting, and harvesting.

Sample leaves were examined for the presence of mites in the laboratory under a stereomicroscope. Mites were mounted in Hoyer’s medium and identified according to Zhang (1963) and Chant and McMurtry (2007). Mite abundance was estimated by the frequency of appearance (*f*), calculated as:

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f(\%) = 100 \times \frac{\text{No. samples containing a species}}{\text{No. collected samples}}
\]

RESULTS AND DISCUSSION

Species occurrence of mites on solanaceous plants

From June 2011 to April 2012, the red form of a spider mite, *Tetranychus* sp., was found on both *S. macrocarpon* and *S. melongena*. Its frequency of appearance increased from just 24.2%
in June to October 2011 to 80.0% in November 2011 to April 2012 (Table 1).

We found two predatory mite species on *S. melongena* (*Scapulaseius asiaticus* and *Paraphytoseius multidentatus*) and three on *S. macrocarpon* (*Neoseiulus longispinosus*, *Amblyseius matinikus*, and *Graminaseius polisensis*) (Table 1). *Neoseiulus longispinosus* was the most populous of these, with 43.5%. Other predatory mite species were less populous (6.5% to 15.5%; Table 1).

Tetranychus sp. was also found on *Benincasa hispida*, *Cucurbita pepo*, *Luffa acutangula*, and *Cucumis sativus*. Both the level of occurrence and the frequency of appearance depended on host and time of year (Table 2).

We found two predatory mite species on *S. melongena* (*Scapulaseius asiaticus* and *Paraphytoseius multidentatus*) and three on *S. macrocarpon* (*Neoseiulus longispinosus*, *Amblyseius matinikus*, and *Graminaseius polisensis*) (Table 1). *Neoseiulus longispinosus* was the most populous of these, with $f=43.5\%$. Other predatory mite species were less populous ($f=6.5\%$ to $15.5\%$; Table 1).

### Species occurrence of mites on cucurbitaceous plants

*Tetranychus* sp. was also found on *Benincasa hispida*, *Cucurbita pepo*, *Luffa acutangula*, and *Cucumis sativus*. Both the level of occurrence and the frequency of appearance depended on host and time of year (Table 2).

*Tetranychus* sp. seriously damaged *C. sativus* throughout the year ($f=75.5\%$ from May 2011 to March 2012) and *B. hispida* in the dry season ($f=71.6\%$ from September to December 2011). It appeared more densely and more often on these than on *C. pepo* and *L. acutangula* (Table 2).

Three predatory mite species were found on *C. sativus*: *N. longispinosus* ($f=49.3\%$), *A. tamatavensis* (30.5\%), and *P. dahonagnas* (8.3\%) (Table 2).

*Neoseiulus longispinosus* was also found on *B. hispida* ($f=43.3\%$), *C. pepo* (33.7\%), and *L. acutangula* (29.3\%) (Table 2).

The predatory mite *A. tamatavensis* was found on *C. sativus*, *B. hispida*, and *L. acutangula* ($f=30.5$ to $35.3\%$), but not on *C. pepo* (Table 2). In contrast, *P. dahonagnas* occurred only on *C. sativus* at low frequency (8.3\%). Additionally, an unidentified *Typhlodromus* species was found on *B. hispida* at low frequency (6.7\%).

The results show that *N. longispinosus* was generally the most populous predatory species on fruit vegetables grown in Ho Chi Minh City.

These are the first observations of mites on fruit vegetables in southern Vietnam. Further research will be conducted next on various crops in different parts of the country to assess the

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| Table 2. Species occurrence and presence on cucurbitaceous plants |
|---------------------------------------------------------------|
| Species                        | Host plant       | Occurrence level | Appearance frequency (%) | No. of leaves with mites / total leaves | Investigation time |
| Tetranychus sp.                | *Benincasa hispida* | + + + +          | 71.6                     | 43/60                                    | Sep. 2011 – Dec. 2011 |
|                                | *B. hispida*     | + + +            | 36.7                     | 22/60                                    | Mar. 2012 – Jun. 2012 |
|                                | *Cucurbita pepo* | + + +            | 34.3                     | 103/300                                  | Sep. 2011 – Jun. 2012 |
|                                | *Luffa acutangula* | + + +           | 39.3                     | 118/300                                  | Sep. 2011 – Jun. 2012 |
|                                | *Cucumis sativus* | + + + +         | 75.5                     | 151/200                                  | May 2011 – Mar. 2012 |
| Neoseiulus longispinosus       | *B. hispida*     | + + +            | 43.3                     | 130/300                                  | Mar. 2011 – Jun. 2012 |
|                                | *L. acutangula*  | + + +            | 29.3                     | 88/300                                   | Sep. 2011 – Dec. 2012 |
|                                | *C. pepo*        | + + +            | 33.7                     | 101/300                                  | Sep. 2011 – Dec. 2012 |
|                                | *C. sativus*     | + + +            | 49.3                     | 148/300                                  | Mar. 2011 – Jun. 2012 |
| Proprioseiulus dahonagnas      | *C. sativus*     | +                | 8.3                      | 15/180                                   | Jun. 2011 – Mar. 2012 |
| Amblyseius tamatavensis        | *C. sativus*     | + + +            | 30.5                     | 55/180                                   | Jun. 2011 – Mar. 2012 |
|                                | *B. hispida*     | + +              | 35.3                     | 106/300                                  | Mar. 2011 – Jun. 2012 |
|                                | *L. acutangula*  | + +              | 35.3                     | 106/300                                  | Mar. 2011 – Jun. 2012 |
| Typhlodromus sp.               | *B. hispida*     | +                | 6.7                      | 12/180                                   | Mar. 2011 – Jun. 2012 |

Occurrence level: + <10%, less populous; + + 11%–25%, average; + ++ 26%–50% populous; + +++ >50%, very populous.
utility of phytoseiid mites as biological control agents. This study forms part of a nationwide project focused on the use of predatory mites to suppress spider mites on greenhouse crops in Vietnam. The most promising predatory species will be selected, mass-reared, and released into the field. The goal is the successful control of spider mites, one of the most serious pests in Vietnam.

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