

***Neoseiulus californicus* McGregor: A Predatory Mite Species for Controlling Twospotted Spider Mites in Strawberries¹**

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Neoseiulus californicus McGregor (Acari: Phytoseiidae) is an oblong, tiny, mobile, predatory mite that feeds on a variety of prey (Fig. 1). It belongs to the suborder Acariforme in the Acari order. The division includes more than 30,000 described species included in the ancient group of Arachnida (Krantz, 1978).

- Phylum: Arthropoda
- Class: Arachnida
- Order: Acari
- Family: Phytoseiidae
- Genus: *Neoseiulus* (*Amblyseius*)
- Species: *californicus*

Neoseiulus californicus occurs in warm humid areas of the U.S., South America, Europe, and elsewhere around the Mediterranean Sea (Malais and Ravensberg, 2003; McMurty, 1982). This predatory mite is associated with several agricultural cropping



Figure 1. Adult of *Neoseiulus californicus* (0.1 mm in length X 0.06 mm in width). Credits: E. Jovicich, UF/IFAS

systems including strawberries, raspberries, roses, grapes, citrus, ornamentals, and vegetables (Rondon et al. 2004; Liburd et al. 2003; Hoddle, 2000; Johnson and Lyon, 1991).

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Host Range

Neoseiulus californicus feeds on important fruits and ornamental pests such as the twospotted spider mite (*Tetranychus urticae* Koch) (Fig. 2), broad mite (*Polyphagotarsonemus (Stenotarsonemus) latus* Banks) (Fig. 3), cyclamen mite (*Tarsonemus pallidus* L.) (Fig. 4 and Fig. 5), and other mite species (Hoddle, 2000).



Figure 2. Group of twospotted spider mite adults and eggs, (0.15 mm in length X 0.1 mm in width). Credits: J.F. Price and S.I. Rondon, UF/IFAS



Figure 3. Broad mite (0.02 mm in length X 0.01 mm in width). Arrow shows the egg. Credits: J. Castellanos, UF/IFAS

Life Cycle and Biology

Neoseiulus californicus possesses three life stages: egg, nymph, and adult. Eggs are oblong (football shape), small, and pale. The two nymphal



Figure 4. Cyclamen mite feeding on strawberry plants. Credits: J. Castellanos, UF/IFAS



Figure 5. Cyclamen mite damage, petioles are short and leaves are thickened and wrinkled. Credits: J.F. Price, UF/IFAS

instars are the protonymph and the deuteronymph. Nymphs and adults are translucent. Nymphs have three pairs of legs while adults have four pairs. At 25-27°C (77-81°F), the life cycle can be completed in 10-12 days (Table 1). Females are slightly larger than males and lay approximately three eggs per day. The life-span of the adult is about 20 days (McMurtry and Croft, 1997; Krantz, 1978). The upper and lower temperature limits for *N. californicus* developmental range are 10-33°C (50-91°F) (Malais and Ravensberg, 2003). *Neoseiulus californicus* shows a feeding preference for the larval and nymphal stages of the twospotted spider mite when the pest is present at low densities (Malais and Ravensberg, 2003). However, *N. californicus* can survive for a few days without eating a prey by feeding solely on a diet of pollen (Malais and Ravensberg, 2003).

***Neoseiulus californicus* as a Biological Control Agent: Application of Predatory Mites**

Predatory mites have been used as an alternative to miticides on a variety of crops including strawberries (Rondon et al., 2004; Liburd et al., 2003, Giles et al., 1995, Van de Vrie and Price, 1994; Trumble and Morse, 1993), avocado (Hoddle et al., 1999), and other crops (Beard, 1999). Recommended release rates depend upon pest infestation level and crop, but one predatory mite per plant is the current recommendation suggested on strawberries for low infestations (1-5% twospotted spider mite infestation) to moderate infestations (6-10% twospotted spider mite infestation) (Fig.6). Releases in temperatures below 7.2°C (45°F) or above 29.5°C (85°F) should be avoided. Control of twospotted spider mite populations should start early because they reproduce quickly at high temperatures and low humidity. To scout a crop, one should select 100 leaflets per field (about 5-12 acres) randomly on a weekly basis. The undersides of leaves should be examined for the presence of twospotted spider mite with the aid of a 14 X hand lenses. If populations of twospotted spider mites exceed 10% before predatory mites have been released, a compatible miticide, such as Acramite or Vendex, should be applied to reduce the pest density.



Figure 6. Demonstrating how to release predatory mites in the field. Credits: S.I. Rondon, UF/IFAS

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Table 1. Developmental time of *Neoseiulus californicus* McGregor at 21, 25, and 33°C (70, 77, 91°F, respectively) with the twospotted spider mite, *Tetranychus urticae* Koch, as a food supply (modified from Castagnoli and Somini 1991).

Developmental Stage (Days*)	Temperature (°C)		
	21	25	33
Egg	3.1*	2.2	1.6
Larva	1.0	0.8	0.3
Protonymph	2.0	1.7	1.0
Deuteronymph	1.4	1.2	0.8
Total egg-adult	7.5	5.9	3.7
Total egg/female	64	60	65
Eggs/female/day	1.9	2.9	3.5
(Relative humidity of 75%)			