BIOLOGY AND ECOLOGY OF SOME PHYTOSEIIDAE, MITES IMPORTANT FROM THE AGRICULTURAL PERCEPTION

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ABSTRACT

Mites are numerous species of minute arthropods, members of class Arachnida subclass Acari or Acarina and pests of many economic prominence living in a wide range of habitats. Mites are predators and parasites, performing crucial means of biological control, essential herbivores and detritivores, acting fungivorous and saprophytic, vectors of diseases, and play vital role in soil formation. These live on plants and animals, in the depths of ocean, in soil and fresh or brackish water, in lungs of birds and animals, in stored grains and stored products, on leaves of rainforest, and in human clothes and bedding.

Keywords: Phytoseiidae, Acari, mite, pest, arthropod.

INTRODUCTION

Mite complex is worldwide in its distribution in all regions of globe and more prominent in tropical a well as subtropical climates. All harmful types of mites are able to devastate agricultural crops, fruits and vegetables. During the previous few decades, owing to increasing concerns over health, environment and pest resistance risks accompanying with chemical control, and the use of alternate pest management strategies has received considerable attention.

Currently, mites belonging to the family Phytoseiidae (Arachnida: Mesostigmata) are economically important predators of some phytophagous mites and insects in seed orchard. Amongst others predators, mass reared phytoseiid mites are commercially available and used, against spider mites, thrips and whiteflies infestations on plants. The existence of a water-soluble feeding stimulant on prey eggs as well is postulated.[1]

METHODOLOGY

Predator mites which fit to the family Phytoseiidae, are categorized by long legs, with the front pair pointing frontward and comparatively have few hairs (<20 pairs) on their back. The color of mites can differ from deep red to pale yellow liable to the prey items eaten. Mites that feed on whiteflies and thrips are commonly pale yellow to pale tan. Phytoseiid mites have five life stages in life cycle like egg, larva, protonymph, deutonymph and adult. Most mites of this family are free-living predators in the deutonymphal and adult stages on a variety of arthropods in plants or crops.[2]

Neoseiulus (Amblyseius) fallacis (Garman). Mite Neoseiulus (Amblyseius) fallacis (Garman) is an excellent general predator for control of many different types of mites in warm and moderately humid environments. Particularly, it targets two-spotted spider mite (T. urticae), broad mite, European red mite (Panonychus ulmi Koch), other small arthropods and is also able to feed on an array of pests, especially their eggs in seed orchards. Fallacis can also be effective in orchards as it tolerates higher temperatures and lower humidities. For the reason that N. fallacis is a hungry user of mites and owing to its density rises rapidly relatively to its prey, it is able to surpass an intensifying pest populations. Additionally, it progresses into the mature stage in nearly one third the time needed by other mite predators. Moreover, this may also feed on pollen and can survive for periods having pollen alone, which makes it an excellent preventative natural enemy.[3]

Adults of N. fallacis are about 0.5 mm long, with pear-shaped bodies. These can vary in color from cream to orange-beige, shiny and semi-transparent, with long legs (Figure 1). The immature stages are generally a semi-transparent cream color and difficult to see without a microscope. The eggs are oval, almost transparent, and 0.33 mm in diameter (double than size of a two-spotted spider mite egg). Adult females lay 1–5 eggs per day along the ribs on the undersides of leaves and a total of 26–60 eggs over their lifetime (which could be between 14 and 62 days) are laid. The eggs hatch in 2–3 days and newly hatched predators do not eat, but later stages and adults feed on all stages of prey.

DISCUSSION END RESULTS

Growth from egg to adult takes place in 7–9 days at 70°F, 3 days at 85°F and at 78°F a fourfold rise in numbers can occur within 4 days. Under optimum conditions in the field, densities may increase from 10 predators per 100 leaves to 200–500 predators per 100 leaves in just 2 weeks. Adult mated females enter diapause in response to the short days in the fall (<14 hours of daylight) in plant crevices or other protected areas.



Figure-1 (Neoseiulus fallacis)

As a result, these stop reproducing and move into sheltered areas, such as under bark or ground cover. But, these do not enter diapause in green- houses or interior plantscapes if the temperature is 64°F (18°C) or above. These emerge as early as bloom, but in reduced numbers due to heavy winter mortality. Fallacis increases in number rapidly and adults become numerous by July or August, and on an average 40–60 eggs are laid. Warmer or cooler conditions accelerate or slow down reproduction feeding, respectively, and these live about 20 days (Figure 2). Mite predator N. fallacis works extremely well to control mite infestations in seed orchard. In seed orchard, before introducing N. fallacis, monitoring and counting should be done to deter- mine numbers of spider mites and existing predators. Inoculate only those orchard having spider mite populations of 0.3 mites per leaf and higher.[4]



Figure-2 Adult (Neoseiulus fallacis)

Phytoseiulus persimilis Athias-Henriot Predator mite Phytoseiulus persimilis Athias-Henriot, is a specific predator of web-spinning spider mites like two spotted spider mite. Indeed, P. persimilis nourishes, breeds, and completes growth merely on mites in the subfamily Tetranychinae, even though it too feeds on young thrips and may be cannibalistic at what time spider mite prey is absent [49]. This species is approximately 0.5 mm long, fast moving, orange to bright reddish orange in color, has a teardrop-shaped body, long legs and is slightly larger than its prey (Figure 3). Adult females are reddish, pear-shaped and active at room temperature. Immatures and males are smaller and lighter in color. The life cycle of P. persimilis has been determined under a diurnal temperature cycle of 58–83°F. Eggs are oval, oblong and approximately twice as large as the pest mite eggs and hatch in 2–3 days. The adult female may lay up to 60 eggs during its 50 day-long lifetime at 17–27°C.



Figure 3-(Phytoseiulus persimilis)

Larvae do not attempt to feed and remain inactive near the old egg shell. Although the larval stage does not feed, yet the subsequent nymphs and adults feed on all stages of prey. Both males and females remained in the larval stage for an average of 1.0 ± 0.1 days. Immatures are normally pale salmon in color. The male and female protonymphal stages lasted 1.7 and 1.6 days, respectively. During this time both males and females ate an average of 4–4 eggs of T. urticae. The eight-legged final nymphal stage (deutonymphal stage) remained active throughout the period. Both males and females remained an average of 1.7 ± 0.1 days in this stage, and during that time the deutonymphs ate 6.0 eggs. Both males and females start to forage just about instantaneously afterward these have molted. Afterwards nourishing, the females become very active and spend plentiful of its time running around the cell enclosure.[5]

Harmful mites. Although mites are tiny creatures, these could be extremely harmful to cause great trouble for peoples or in other ways inflicting a variety of problems associated to plants.

Spider mites (Order: Acari Family Tetranychidae). Spider mites (Acari: Tetranychidae), belong to the superfamily Tetranychoidea that comprises five families, of which Tetranychidae is the largest. The common name ‘spider mites’ is so-called because of their ability to produce silken strands as do spiders, which is used to spin webs under that to reproduce and feed. Conversely, the silk glands in mites are situated close to mouth and allied with the mouthparts. From an applied opinion, the silk-producing habit has two vital uses for mites, firstly, falling from foliage and being adjourned from the host on a silk strand permits easy spread by wind and convection currents. Secondly, mats or tents of webbing around the mite colonies provide some degree of protection from natural enemies and treatments with pesticides.

Spider mites appear as tiny moving dots on their hosts by the naked eye. Spider mites are established on a wide variety of vascular plants, comprising shrubs, trees and herbaceous plants, from entirely all over the biosphere. Several horticultural and agricultural crops are affected by these pests, together with seen orchards and field crops, extending from low-growing bushes to fruit trees. Generally, spider mites forage on the lower side of foliage, however will cover the whole leaf surface while their densities are extraordinary. These puncture the plant cells and extract the cell contents. Their nourishing results in tiny clumps of dead cells and a spotted look of infested foliage. Wilting, leaf distortion, dryness and abscission take place with extended and high population invasions.[2,4]

Two-spotted spider mite Tetranychus urticae Koch Two-spotted spider mite Tetranychus urticae Koch, feeds on an enormous variety of plants, including fruit trees, ornamental trees, vegetables, small fruits, shrubs and many species of weeds. The adults are typically pale green in color and adult females <0.4 mm lengthy, and in color greenish yellow having two conspicuous dark spots on either side of the back. As the mite feeds, these spots may become large enough to cover the body (Figure 4). Coloring and spots can be variable and may lead to misunderstanding with other mite species. Pest mite T. urticae reproduces through arrhenotoky, that is, a form of parthenogenesis in which unfertilized eggs develop into males. Mite overwinters as spotless, orange diapausing female beneath bark at the bottoms of trees or else in rubbish on the plantation floor. Shortly prior to bloom, these transfer to renewed shrubbery (particularly vetch and other legumes) and start nourishing on new green matter. As the climate warms and these hosts shrivel up, mites will transfer into trees, generally invading the middle portion initially. Through this time, these will have return to their characteristic green and spotted summer form and start laying eggs on the underneath of foliage.

If a female has mated, the fertilized eggs develop into both male and female mites, if not mated, the unfertilized eggs develop into males. Eggs are shiny spheres, clear to pale green in color, pearl-like and about 0.14 mm in diameter. Eggs are laid singularly, with females depositing 5–6 eggs per day, with a total of 60–100 eggs per female. Eggs hatch in 3–6 days depending on temperature. Eggs hatch into six-legged larvae, then progress through protonymph and deutonymph stages before becoming to adults. Larvae are about the same size as eggs and the only life stage with six legs (protonymphs, deutonymphs and adults are all eight-legged). The octopods deutonymph is generally larger than the protonymph, although similar in color pattern. Larvae and nymphs complete development in 4–9 days depending on temperature and the females have a pre-oviposition period of 1–2 days. Since generations overlap, all life stages can usually be found simultaneously. There can be nine or more generations per year and adults live about 30 days.

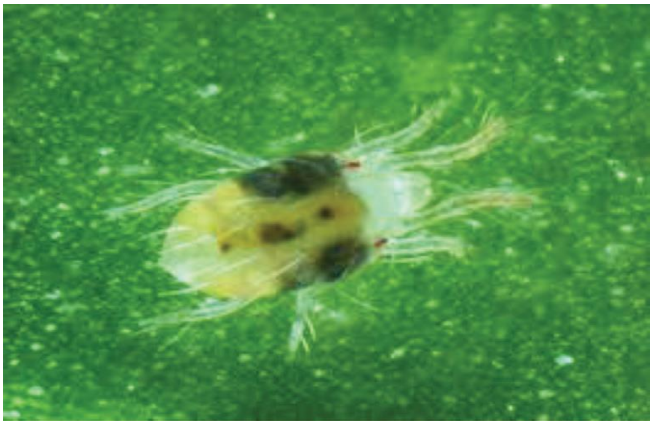


Figure-10 (Tetranychus urticae)

Generally, the earlier a foliage is injured by mites, the more detrimental the damage will be to tree health. Midseason injury is less significant, but can combine with other stresses to cause fruit drop, poor fruit color, or reduced effectiveness of growth regulating chemicals.[3,5]

CONCLUSION

Ongoing studies include the biology and ecology of some mite predators along with pest mites and how biotic and abiotic factors affect pests and their natural enemies. To cut a long story into short, from lookout of biological control of pest mites or insect pests, the knowledge on biology and ecology of some predacious as well as harmful mites is undoubtedly important. A successful management plan requires information about a species biology including its diet, lifecycle and mass releases of predator, how it interacts with the environment and with other species as well as species behavior and how the behavior of both pests and beneficial enemies can be manipulated to reduce or prevent yield losses.

REFERENCES

1. Skirvin, D. J., & Fenlon, J. S. (2003). The effect of temperature on the functional response of Phytoseiulus persimilis (Acari: Phytoseiidae). Experimental & applied acarology, 31(1-2), 37.
2. Mori H., Chant D. A. The influence of prey density, relative humidity, and starvation on the predacious behavior of Phytoseiulus persimilis Athias-Henriot (Acarina: Phytoseiidae) //Canadian Journal of Zoology. – 1966. – Т. 44. – №. 3. – С. 483-491.
3. Rhodes, E. M., Liburd, O. E., Kelts, C., Rondon, S. I., & Francis, R. R. (2006). Comparison of single and combination treatments of Phytoseiulus persimilis, Neoseiulus californicus, and Acramite (bifenazate) for control of twospotted spider mites in strawberries. Experimental & applied acarology, 39(3-4), 213-225.
4. Zhang, Z. Q., & Sanderson, J. P. (1990). Relative toxicity of abamectin to the predatory mite Phytoseiulus persimilis (Acari: Phytoseiidae) and twospotted spider mite (Acari: Tetranychidae). Journal of Economic Entomology, 83(5), 1783-1790.
5. Cote K. W., Lewis E. E., Schultz P. B. Compatibility of acaricide residues with Phytoseiulus persimilis and their effects on Tetranychus urticae //HortScience. – 2002. – Т. 37. – №. 6. – С. 906-909.