

Management of mite infestation in capsicum

Capsicum is an annual or biennial crop having high nutritional value and consumers appreciate fruits for variable size, colour, flavour, and texture. Due to significant economic potential for marginal and small farmers, and hi-technology intervention, production of capsicum has increased considerably in recent years in almost every part of the country from plains to hills and in open field conditions to different types of protected structures. But capsicum is highly threatened by pests mainly mites, in all phases of their lifecycle with an annual loss of up to 40-100%. These are the important pests which limits capsicum cultivation causing low yield and economic loss in net houses and polyhouses and in open fields. This article mainly discusses the life cycle, infestation, symptoms of mites and their management practices.

THE name 'Capsicum' is derived from Greek word 'kapto', meaning 'to bite' or 'to swallow' and scientifically known as *Capsicum annuum* var. *glabriusculum*. It belongs to Solanaceae family with chromosome $2n=24$. Total five species are cultivated globally and Mexico is believed to be the centre of origin of *C. annuum*, whereas *C. frutescens* and the other cultivated species (*C. baccatum* var. *pendulum*, *C. chinense* and *C. pubescens*) originated in South America. Capsicum or sweet peppers can be of different colours (red, green, orange, and yellow) depending on their ripening stages and capacity to synthesize chlorophylls or carotenoids. In open or hilly area, cultivation of green capsicum, depending upon variety and season, usually yields 20-40 tonnes per hectare in about 4-5 months. In the greenhouse, the crop duration of green and coloured capsicums is about 7-10 months and yields about 80-100 tonnes per hectare. One medium green capsicum can provide up to 8% of the recommended daily allowance of Vitamin A, 180% of Vitamin C, 2% of calcium and 2% of iron. Capsicum has attained the status of a high value crop in India during recent years. The high market price it fetches is attributed to the heavy demand from the urban consumers and even a small blemish on the fruit will drastically reduce its market value. From seedlings to mature plants, a variety of pest's attack on capsicum. Crop is highly affected by variable mites at different stage of growth but among them, two are major, i.e. broad mite and spider mite.

Mites belonging to the family of tarsonemids (Tarsonemidae) display a greater diversity of feeding habits than any other mite family. There are species that feed on fungi, algae, plants, as well as insect and mite predators and parasites. Those living on plants can cause considerable damage to their host.

Capsicum Broad mite/Yellow mite/Chilli mite (*Polyphagotarsonemus latus*)

It was previously known as *Hemitarsonemus latus*. The broad mite is one of the notorious capsicum pests in different regions of the world. It occurs in the tropics and in greenhouses in temperate regions. The broad mite has a wide range of host plants, especially peppers, but also aubergine, tomato and cucumber. Broad mite from the group of tarsonemids family, can occur both on vegetable and ornamental crops. Outside in temperate climates, broad mites are not a serious problem, as they are unable to overwinter. These mites are very small, ranging between 1 mm to 3 mm in length. They have the ability to crawl through plant canopy, however they will also move on

Nutritive value of capsicum

- **Rich in antioxidant:** Flavonoids, a type of antioxidant that helps shield the body from oxidative damage and capsanthin, is responsible for rich red colour and shield the skin against UVA and UVB damage.
- **Boost immunity:** Great source of Vitamin A and C which strengthen the immune system.
- **Good for eye:** Lutein and zeaxanthin-carotenoids found in relatively high amount in capsicum, may enhance eye health.
- **Good for heart:** Capsicum are a great source of antioxidants lycopene, Vitamin C and A which are essential for heart health because they shield heart from damage caused by free radicals.
- **Lower risk of cancer:** Capsicum is a true superfood and contain a variety of cancer-fighting antioxidants, including apigenin, luteol, luteolin, quercetin and capsate and carotenoids such as beta-carotene, beta-cryptoxanthin, lycopene.



Broad mite infested capsicum plant. A. Downward curling of leaf with elongation of petioles. B. Young buds with small leaves. C. Mite infested fruits with russeting symptoms.

airborne insects such as white flies and aphids. The broad mite releases a toxin that functions as a growth regulator, affecting the growth of plant tissues. Even at very low densities, this insect can cause considerable damage to fruits and plants.

Distribution and hosts: It has been reported from the Australia, Fiji, Guam, New Zealand, Papua New Guinea, Samoa, and Solomon Islands. Broad mites are being more often observed on a variety of vegetable crops in the field, high tunnel and greenhouse. More than sixty plant families are vulnerable to attack by wide mites, including prominent vegetable varieties like tomato, beetroot, pepper, cucumber, eggplant and beans.

Life cycle and symptoms: Mites usually lays eggs beneath the surface of leaves or fruit. They produce six-legged larvae at hatching, which develop into eight-legged nymphs. The larvae remain in the same place where the eggs were laid, while the adults move to the young leaves in the bud to feed. Males are yellowish brown colour, in contrast to the females, that are yellowish green and their life cycle is generally completed within a week. In addition to flying short distances, broad mites can also be transmitted by the wind and insects. As this group may not be easily visible due to its skill in blending in with the soil or vegetation, identification might be challenging. Accurate identification requires considerable practice, despite using the best magnification tools.

Broad mite infestations can cause noticeable scarring in capsicum fruit and perhaps total crop loss if left unchecked. Leaf deformation, internode shortening, leaf discolouration, blistering and shriveling, fruit russeting, fruit deformity and fruit splitting are among the common symptoms of a mite infestation that are easily confused with a host of plant diseases, herbicide damage and other environmental issues. Broad mite damage can persist in the field, high tunnel, or greenhouse for several weeks after this pest has been eliminated due to the broad mite's ability to regulate growth.

Spider mites (*Tetranychus urticae*, Koch)

The two-spotted spider mite (*Tetranychus urticae*, Koch) and the carmine spider mite (*T. cinnabarinus*, Boisduval) are the important pests of pepper worldwide. These mites cause whitish or yellowish stippling in the upper leaf surfaces and produce silk webbing.

Distribution and hosts: Two-spotted spider mite is found throughout New Zealand on a wide range of fruit, vegetable, ornamental plants, weeds and shelter species. This mite is an important pest of greenhouse crops including tomato, capsicum, cucumber, melon, pepper, bean, rose, carnation, orchid and chrysanthemum. Outbreaks of two-spotted spider mites commonly occur during hot dry conditions, when plant foliage is covered by dust, or when chemicals are used which disrupt biological control agents.

Life cycle: Spider mites are insect-like arachnids that belong to the same family as ticks, scorpions, and spiders. The majority of the species rarely grow larger than sand grains, and some are so small that they have been misinterpreted for microscopic dust grains on pepper leaves. The spider mite has four stages to its life cycle: egg, larva, two nymph cycles, and adult. Depending on the environment they are in, they can go from egg to adult in as little as 5 days. Therefore, it is very important to catch an infestation as quickly as possible. Similar to aphids, the problem can escalate fast.

Symptoms: The major symptoms are described below.

Dusty/gritty feeling leaves: It is normal to see a little dust on capsicum plants, however, if the leaves feel unusually dusty or gritty, it may be due to dead mites, fecal matter, or the shed-off exoskeletons.

Small white or yellow feeding spots: Stippled leaves with lots of small yellow/white spots can indicate spider mite damage. Because they feed on leaves by puncturing small holes, the leaf loses its pigment and this is the damage they will leave behind.

Yellow leaves: Unfortunately, yellowing leaves is a common symptom of many capsicum plant but spider



Spider mite infested leaves of capsicum plant



Healthy capsicum



Microscopic view of adult spider- mite

mite damage will cause the leaves to turn yellow as well.

Webbing: This is the easiest symptom of spider mites to identify. However, if you are seeing webbing on capsicum plants, means spider mite infestation is already quite severe. Ideally, we need to catch the infestation before it gets to this point.

Management of mites

Mite management is very challenging due to their small size and the unavailability of miticides that effectively target this pest. Growers have been recommended to alternate products with different modes of action in order to avoid resistance.

Natural enemies: Predatory mites regulate broad mites in different parts of the world. Biological control is a promising non-toxic method if implemented often and early. Grandevo, Venerate, and Met 52 are biopesticides that appear to be somewhat efficient against mites. It has been demonstrated that two commercially accessible predatory mites, *Neoseiulus cucumeris* (synonym *Amblyseius*) and *N. californicus*, regulate extensive mite populations. Biocontrols are required to be applied during planting if the planting location has previously experienced broad-mite infestations. Further treatments should be considered until the plants reach full maturity. It is also important to use caution when combining biological controls with chemical pesticides and fungicides and allowing enough time between foliar chemical sprays and biological control releases are required to avoid unfavorable off-target effects.

Cultural control: It is divided into three phases.

Before planting: It is not advisable to plant a new crop adjacent to an existing one that is already infested with mites since those mites will transfer to it at an early age and cause severe damage to the plants.

During growth: Frequently, one or two plants begin to exhibit symptoms before the remaining plants got affected. Remove the impacted plants from the plot to stop the disease from spreading or use a miticide as an alternative to prevent the plants from further infestation (see under Chemical Control).

After harvest: Before planting another crop, remove the plants, burn them, and give the area a week or two to recuperate.

Chemical control: Miticides are an effective means of controlling broad mites, but they are rarely available in some parts of the world and the other two natural therapies that are said to be effective against mites are sulphur and derris. Encourage the predatory mite's activity (*Amblyseius ovalis*). Use any of the following insecticides or use Omite (1.5 mL/L) or Sarpanch (2 mL/L) or Shakti 10 (1 mL/L) or ecomite (1 mL/L) or Ulala (1 mL/L).

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Movable screens in rose production

- Use movable screen, an important tool for rose cultivation.
- It can help growers manipulate environment conditions — lowers temperature, changes humidity and influences production numbers.
- The movable screens can be used year-round and in a variety of climates — from the Netherlands to India.