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# Important insect and mite pests of carnation in Himachal Pradesh and their management

**Carnation is an important floricultural crop grown globally as well as in Himachal Pradesh for cut flowers. It is well known for its beautiful, attractive and fragrant flowers. It is an important source of economy for the farmers of Himachal Pradesh in protected cultivation. It is infested by a wide range of pests like insect pests, mites and nematodes. *Tetranychus urticae*, *Helicoverpa armigera*, *Myzus persicae* and thrips infest this crop in mid-hill conditions of Himachal Pradesh. This article contains information regarding damage symptoms and management strategies against these pests of carnation which will be beneficial for farmers in identifying and managing these pests and preventing economic damage.**

CARNATION (*Dianthus caryophyllus* L.) belongs to family Caryophyllaceae and holds a significant position as a cut flower crop all over the world. It is known for its beautiful fragrant flowers and wide range of colours. In India, the area under carnation cultivation is 2190 ha with a production of 8940 tonnes while in Himachal Pradesh, it is grown in an area of 60 ha with a production of 2690 tonnes (MoA&FW 2024). It is suitable for almost all the agroclimatic zones of Himachal Pradesh. The major districts in state known for carnation cultivation include Sirmaur, Solan, Mandi and Shimla. Production of carnation is affected by a number of insect pests and spider mite. Following pests were observed infesting carnation in Nauni, Solan viz., spider mites (*Tetranychus urticae* Koch), bud borer (*Helicoverpa armigera* Hubner), thrips (*Frankliniella schultzei* Trybom) and aphid (*Myzus persicae* Sulzer). These arthropod pests attack one or another stage of the crop and cause significant decrease in production of quality cut flowers which causes economic losses to the growers.

**Spider mites-*Tetranychus urticae* Koch (Acari: Tetranychidae)**

It is two spotted spider mite or red spider mite and considered one of the most serious pests of carnation. The adults of these minute mites are red or orange, sometimes reddish yellow to greenish yellow with transparent to pale yellowish eggs. The different life stages consist of egg, larval, two nymphal and adult stage. Webbings can be easily seen on the leaves and floral parts. In more severe situations, mites may be observed clumped together on the leaf tips. The infestation is more severe during hot climatic conditions, i.e. during summer months. It persists throughout the year under polyhouse conditions.

***Damage symptoms***

- The nymphs and adults suck the sap from underside of the leaves causing yellowing or greying of leaves and necrotic spots may also develop in initial stages. Infestation starts on the underside of the leaves and as it progresses, the mites gradually cover the whole leaves.
- Mites' infestation on flower
- When the infestation is high, severe webbing is seen on the leaves as well as on flowers/buds and the webbings by mites can also be observed on iron poles or other structures inserted in the field to support carnation shoots. Mites can also web together the leaves of the plant.
- This feeding and webbing affects the photosynthetic ability of plants. The infestation also deteriorates the quality as well as aesthetic value of the flowers. Heavy infestation leads to stunting and distortion of plants.

***Management***

- The incidence of mites can be reduced by following recommended package of practices and by making

Mites infestation on flower

Webbing on buds

proper ventilation and irrigation to the crop. Observe the field regularly against the incidence of mites and destroy the affected plants and weeds surrounding the crop.

- The mites can be removed from their webs by a vigorous water jet spray directed towards the plant. This method can only be used to dislodge the webs but it cannot manage the damage inflicted by the pest.
- The use of biocontrol agents, such as predatory mites like *Neoseiulus longispinosus* Evans and *Phytoseiulus persimilis* Athias-Henriot has been proven to be an effective approach in controlling mites.
- If the red spider mite remains uncontrolled, then use chemicals such as propargite 57 EC @ 1.0 mL/L or abamectin 1.9 EC @ 0.5 mL/L followed by fenazaquin 10 EC @ 1.0 mL/L.

**Bud borer-*Helicoverpa armigera* (Hubner) (Lepidoptera: Noctuidae)**

It is the most devastating insect pest, with a widespread distribution facilitated by its high mobility, ability to enter dormancy under unfavourable conditions (facultative diapause), and a wide-ranging appetite for various host plants. *H. armigera* exhibits significant migratory behaviour. It can cover extensive distances in pursuit of appropriate host plants or to evade unfavourable environmental conditions. Adult moths are brown to orange-brown in colour whereas the males are greyish-green in colour. There are dots present in series on the margins of forewings and black marking in comma shape in the middle of underside of each forewing. Hind wings are lighter with yellowish margins. Females lay eggs singly and as many as 400-500 eggs/female can be laid during its life cycle. Eggs are yellowish-white initially and later turn brown before hatching. Apical area of eggs is smooth while rest of the surface is longitudinally sculptured. There are six developmental stages of the larva, often exhibiting diagonal stripes along the body, varying colours ranging from yellowish-white to reddish-brown, with a head capsule transitioning from brown to black. Under favourable conditions, the pest can complete its life cycle in 4-6 weeks.

***Damage symptoms***

The caterpillars bore into the bud and feed on the internal contents of bud or flower. The buds become hollow as a result of feeding by the caterpillar. Flowers and buds are the most affected parts by this pest and the presence of round holes in buds or flower heads is the characteristic damage symptom of this pest.

***Management***

- Raking of soil before planting to expose the overwintering pupae. Manual collection and destruction of larvae from the plants.
- Application of biocontrol agents such as egg parasitoid *Trichogramma* spp. and nuclear polyhedrosis viruses i.e., HaNPV@ 250 LE/ha followed any neem formulations spray at 1.0 – 2.0 mL/L. Entomopathogenic fungi such as *Beauveria* spp., *Metarhizium* spp., and *Nomuraea* spp., can also be used for its management.
- Applying Novaluron at a rate of 3 mL per liter, Indoxacarb 14.5 SL at a concentration of 1 mL per litre is effective in managing bud borer infestation.

**Thrips (Thysanoptera: Thripidae)**

A number of thrips species have been found infesting this crop such as *Thrips tabaci* Lindeman, *Thrips florum* Schmutz, *Thrips hawaiiensis* (Morgan) and *Frankliniella schultzei* Trybom infesting this crop. Thrips have a slim, elongated body with a noticeable narrowing towards the rear end and fringed wings, which have a feathery appearance. The wings extend beyond the length of the abdomen.

***Damage symptoms***

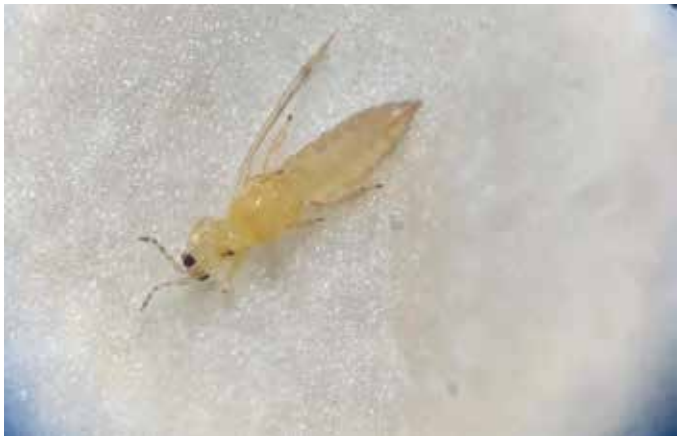
- Thrips suck sap from the leaves, leading to yellowing, patchiness, and occasional black streaks with slight crinkling.
- Flowers also develop streaks, rendering them unsuitable for the market. A pronounced infestation negatively impacts overall plant growth.
- It also acts as vector of a number of plant viruses.

***Management***

To monitor the activity of thrips, traps such as yellow/

Caterpillar boring into the bud

Inside of bud after infestation



Adult thrips (under stereomicroscope)

**Table 1.** Important insect, non-insect and nematode pests affecting carnation in India

| Pests (Common name) | Scientific name | Order: family | Reference |
|---|---|---|---|
| Two-spotted spider mites | *Tetranychus urticae* Koch | Acari: Tetranychidae | Gupta *et al*. 2021, Singh *et al*. 2015, Reddy 2016 and Jawaharlal *et al*. 2010 |
| Bud borer | *Helicoverpa armigera* (Hubner) | Lepidoptera: Noctuidae | Singh *et al*. 2015 |
| Thrips | *Thrips tabaci* Lindeman, *Thrips florum* Schmutz, *Thrips hawaiiensis* (Morgan), *Frankliniella schultzei* Trybom | Thysanoptera: Thripidae | Manju *et al*. 2015, Jawaharlal *et al*. 2010, Raj *et al*. 2019, Sanjta *et al*. 2018, Singh *et al*. 2010 |
| Aphids | *Myzus persicae* (Sulzer) | Hemiptera: Aphididae | Reddy (2016) |
| Cutworm | *Peridroma saucia* (Hubner) | Lepidoptera: Noctuidae | Jawaharlal *et al*. 2010 |
| Carnation tortrix moth | *Tortrix pronubata* (Hubner) | Lepidoptera: Tortricidae | TNAU (2015) |
| Carnation fly | *Hylemya briennescens* | Diptera: Anthomyiidae | Raj *et al*. 2019, TNAU (2015) |
| Nematodes | *Meloidogyne incognita* (Kofoid & White), *Helicotylenchus dihystera* (Cobb) and *Pratylenchus spp*. (Filipjev) | Tylenchida: Heteroderidae Tylenchida: Hoplolaimidae Tylenchida: Pratylenchidae | Chandel *et al*. 2010, Reddy (2016) |

blue sticky can be installed and inspect the plants regularly for infestation.

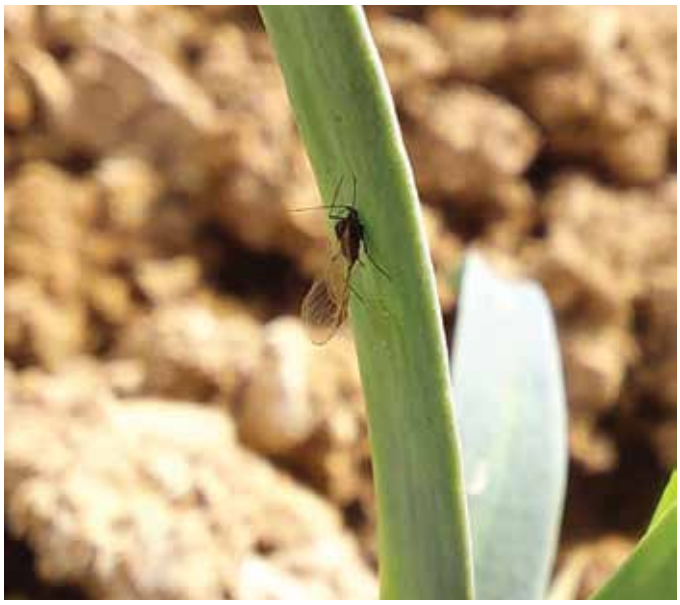
Spraying of acetamiprid 20 SP @ 0.4 g/L or oxydemeton methyl 25 EC @ 2.0 mL/L at fortnightly interval is effective against this pest.

**Aphids- *Myzus persicae* (Sulzer) (Hemiptera: Aphididae)**

This aphid may cause substantial damage to the crop. In Nauni, these insects were observed during the month of January infesting carnation crop in polyhouse conditions. These are small, soft bodied insects with a pear-shaped or oval form. Both wingless and winged forms exist. Aphids typically have a pale green to yellowish-green colour.

***Damage symptoms***

- Aphids suck sap from the leaves of developing plants thereby resulting in a decrease in plant vigour.
- They secrete honeydew on the leaves and flower buds due to which sooty mould develop and blackening of leaves may also occur due to which the cut flowers are not worth marketable.
- They also transmit carnation ring spot and carnation mosaic viruses.



Alate (winged) form of aphid

***Management***

- Maintain proper field sanitation in the field. Timely weeding helps in reducing the incidence of pests. Use yellow sticky traps to monitor as well as trap the alates.
- Release and conserve the natural enemies such as coccinellids, syrphids, chrysoperla, etc.
- Spray the plants with Thiomethoxam 1 mL/L or Acetamiprid 1 mL/L or Imidacloprid 17.8 SL 0.1 g/L if the cultural and biocontrol methods fail to control the pest.

**Nematodes**

Major nematodes present under polyhouse conditions in Himachal Pradesh include *Meloidogyne incognita*, *Helicotylenchus dihystera* and *Pratylenchus spp.* Infected plants typically show stunted growth and tend to wilt during warmer days. These infections cause reduced growth and delayed flowering. Uprooted roots show galling in case of root-knot nematode infestation.

***Management***

Proper field sanitation and infection free planting material should be used. The soil should be fumigated before planting. Neem cake can be added to the soil (1 kg/ $m^2$) and biocontrol agents such as *Pseudomonas fluorescens* and *Paecilomyces lilacinus* can be used to effectively manage nematodes.

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