



Garlic insect vectors and their management

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Introduction: Garlic (*Allium sativum* L.) is one of the most important bulb vegetables grown in India. The cloves are often used for seasoning and as condiment in number of forms for its flavour. The cloves are a good source of minerals and vitamins and containing properties that are rich in medicinal value for various human health hazards such. Garlic is grown as a *Rabi* vegetable planted in October-November and harvested during March-April. Globally, India ranks second next to China in terms of garlic cultivation area (14% of the world area) and production (5%). The major garlic growing states of India are Madhya Pradesh, Gujarat, Rajasthan, Uttar Pradesh and Maharashtra.

Garlic hosts of many arthropod pests including mites. Thrips *Thrips tabaci* Lindeman (Thysanoptera: Thripidae), Aphids, *Myzus persicae* (Sulzer), *Aphis craccivora* (Koach), *Aphis Gossypii* (Glover) (Aphididae: Hemiptera) and eriophyid mite *Aceria tulipae* Keifer (Acari: Eriophyoidea), bulb mite, *Rhizoglyphus robini* Claparede (Astigmata: Acaridae) almond moth *Ephestia cautella* are important pests of garlic (Srinivas *et al.*, 2017 and Karuppaiah *et al.*, 2018). Among the various insect pests, that attacks garlic thrips, aphids and mites considered as a pest of field and vectors of various latent viruses.

Insect vectors of garlic: Three groups of insect vectors are considered to be potential vector which causes various virus diseases on garlic. *Thrips* has been confirmed as the main vector of Iris Yellow Spot Virus (IYSV), an economically important tospovirus that can cause upto 100 per cent crop losses. In India, the occurrence of IYSV on garlic was reported during 2015. Aphids transmit viruses in a non-persistent manner. Onion yellow dwarf virus (OYDV), Leek yellow stripe virus, (LYSV), Garlic common latent virus (GarCLV) and Shallot latent virus, (SLV) are some of the major aphid-borne garlic viruses which are transmitted by aphids. Eriophyid mite, *Aceria tulipae* Keifer is capable of transmitting *Allium I* virus. However, in India *A. tulipae* is not a regular pest.

Onion thrips, *Thrips tabaci* Lindeman: *T. tabaci* is one of the key and destructive pest of garlic in India. The colour of the nymphs is white to pale yellow in colour, elongated, the pupa is pale yellow to brown, the body more

stout than younger instars. The adults are slender, yellowish brown and measure about 1 mm long. The males are wingless and the females have long narrow fringed wings. Both nymphs and adults of *T. tabaci* prefer to feed on young leaves, confined to neck region of the garlic plant. Eggs are inserted individually into the leaves by adult females. It damages the crop as direct pest by causing injury to the green foliage and as indirect pest (vector) by transmitting viral diseases and also aggravates fungal disease like purple blotch.

When the population of *T. tabaci* is high, it feeds on the entire plant. The pest sucks the plant sap, the injured plants show curling and white patchy blisters on the leaves; leading to reduction of photosynthetic area which ultimately led to the formation of undersized bulbs.



Fig. 1 : Garlic plants infested by onion thrips

Aphids, *Myzus persicae* (Sulzer)/*Aphis gossypii* Glover/*Aphis craccivora* Koch (Hemiptera: Aphididae): Aphids are soft bodied insects that are about the size of a pinhead. Most species have a pair of tubes like projections called cornicles on the abdomen. Both nymphs and adults are damaging the crop either by sucking plant sap or by transmitting viral diseases. By sucking leaves sap it makes stunted growth Aphids transmits viruses in a non-persistent manner. Onion yellow dwarf virus (OYDV), Leek yellow stripe virus, (LYSV), Garlic

common latent virus (GarCLV) and Shallot latent virus, (SLV) are some of important garlic viruses which are transmitted by aphids. Among the aphid species infesting

garlic, *M. persicae* is to be considered as a most efficient transmitter of OYDV than other aphid species. The appearance of aphid population in garlic crop is not as

Garlic insect vectors, damage symptom and management		
Insect Vector/ Virus disease	Damage symptom	Management
Thrips, <i>Thrips tabaci</i>	Leaves shows curling and twisting and have white or silvery blisters Entire plant looks blemished and turns white. Transmit the IYSV in garlic	The late planting of garlic must be avoided as it harboured more thrips population compared early sown crop. The successive planting of onion and garlic must be avoided All plant debris, crop residues of earlier crop/ weed host like parthenium. amarathus needs to destroyed properly to avoid off season survival of thrips. Use sticky traps blue/yellow for monitoring as well as mass trapping the adults is recommended. Planting of two rows of maize or one outer row of maize and an inner row of wheat as a barrier crop around the garlic crop at least 30 days before planting helps to block movement of adult thrips. Spray insecticides Profenofos (0.1%), Carbosulfan (0.2%) or Fipronil (0.1%) or Spinosad (0.03%) when thrips population crosses the economic threshold level for 30 thrips/plant
Aphid, <i>Myzus persicae</i> , <i>Aphis craccivora</i> , <i>Aphis gossypii</i>	By sucking leaves sap it makes stunted growth. Transmit OYDV	A use yellow sticky trap is advised for monitoring and mass trapping of adults. Spray broad spectrum insecticide Profenofos (0.1%) is recommended against aphids.
Eriophyid mite, <i>Aceria tulipae</i>	The leaves show curling, twisting, folded and yellow mottling on the edges. Transmit the mite-born mosaic virus in garlic	Spray wetable sulphur (0.05%) as soon as the symptoms appear. And repeat the spray after 15 days will give substantial control of mite.
Onion yellow dwarf virus (OYDV)	Mild chlorotic stripes to bright yellow stripes, mosaic, curling of leaves and stunted growth	Use-virus-free planting material is advised. Use-virus-free planting material
Leek yellow stripe virus (LYSV)	Causes light yellow striping on the distal part of leaves, and can lead to dwarfing of the entire plant. The virus also causes bulbs to smaller and malformed, which results in yield loss and post-harvest storage loss	Foliar spray of insecticides Profenofos (0.1%), Carbosulfan (0.2%) or Fipronil (0.1%) for controlling aphids is advised.
Iris yellow spot virus	Straw-coloured, spindle shaped spots with poorly defined end leaves. These spots coalesce to form larger patches on leave. Clearly visible on the older leaves	The volunteers, culls and weeds in around garlic fields should be eliminated to avoid off seasonal survival source of infestation. Use virus-free planting material is suggested. Avoid crop stress; foliar spray of insecticides Profenofos (0.1%), Carbosulfan (0.2%) or Fipronil (0.1%) for controlling aphids



Fig. 2 : Aphid born virus infested garlic



Fig. 3 : Aceria tulipae infested garlic

much as severe when compared to thrips. Occurrence of aphids is mostly prevalent during January-February months when the cool climate persists.

Eriophyid mite, *Aceria tulipae* Keifer (Acari: Eriophyoidea): *Aceria tulipae* is also known as the curl mite of wheat. They are microscopic, white, wormlike organisms about 0.25 mm long. The eggs are round and white in colour. The legs are very small and on liliaceous bulbs, cereal grains, and wild grasses. Both larvae and adults are seen near midrib region. The garlic plants that are infested with *A. tulipae* show sign of stunting, twisting, curling and yellow mottling and reduce the plant stand as well as yield. Mites also attack the stored garlic bulbs. Mostly mites are located at the basal portion of cloves

and due to its infestation, cloves become dry and desiccated. The mite is capable of transmitting the *Allium 1* virus. However, in India *A. tulipae* is not a regular pest.

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