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Integrated management of pests on onion and garlic

Onion and garlic are most important vegetable and spice crops grown throughout India. Like any other vegetables, full yield potential of both is not realized due to a number of constraints. Among them, pests and diseases are major constraints in onion production. Onion thrips (*Thrips tabaci*), is the key pest of onion and garlic, causing 35-45% yield loss. Besides, it also acts as vector for various plant viral diseases. Pest and disease may occur simultaneously, while pest may even aggravate the disease severity. Although thrips remains the major pest, some other pests with less importance also occurs sporadically. In recent times, impact of climate change is more evident and visible with a shift of pest scenario, wherein the rise in temperature may facilitate mite infestation. To ward off these pests, farmers solely rely on chemical pesticides. However, chemo-intensive practice alone cannot provide adequate protection. This warrants an integrated approach to minimize the yield loss and to obtain good quality marketable bulb.

ONION and garlic are susceptible to various pest, *viz.* thrips, mites, armyworms, cutworms, leaf miner *etc.* Onion thrips being cosmopolitan, appears wherever onions are cultivated and increases tremendously under hot and dry conditions. Even today, chemical control remains mainstay to manage this pest. Owing to widespread use of chemicals and high residue problems pose serious threat to human health and environment. Hence, integrated pest management has become imperative.

Integrated Pest Management

Monitoring: Timely monitoring of pest population and their natural enemies are helpful to decide appropriate management strategy at right time. Various traps can be used as monitoring device.

Pheromone traps: For insects, *viz. A. ipsilon, S. litura* and *H. armigera* about 4-5 traps /acre should be installed for each species, separated by a distance of >75 feet in the vicinity of the selected field. Fix the traps at a height of one foot above the plant canopy. The lures should be changed at regular intervals (2-3 week interval).

Blue pan water / yellow sticky traps: For monitoring thrips, install 4-5 traps/ acre at 15 cm above the canopy. The traps are retrieved after a period of time and then examined under a microscope. In addition to onion thrips, flies, midges, bugs and other thrips species may also be trapped in the sticky trap.

Light traps: light traps are install @ 1 trap/acre 15 cm above the crop canopy for monitoring and mass trapping insects, and operated around dusk (6 pm to 10 pm) as it is limited to attract only nocturnal insect.

Cultural Control

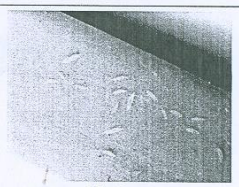
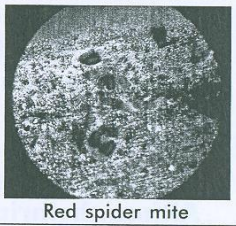
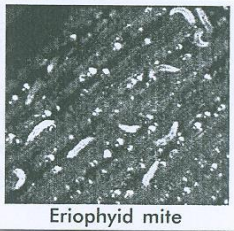
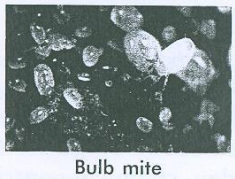
- `Field sanitation by removal of weeds and destruction of culls of onion and garlic to reduce thrips population buildup.
- Avoid successive planting / mono cropping of onion and garlic or other preferred/alternate host such as cabbage, cotton, tomato, cucumber, melons, pumpkins, strawberries *etc.* Crop rotation with non hosts minimizes the chance pest carryover.
- Adjust the transplanting dates, so as to create asynchrony between the susceptible crop stage and peak pest infestation. For example: transplant onion crop from 15 September -15 October to avoid thrips and diseases.
- *Mulching:* Reflective plastic silver colour and aluminium painted black mulches repel the thrips in seed crop.
- Avoid close planting to control onion maggots.
- Flood irrigation reduces mite population.

Ecological Engineering for Pest Management – above ground

Raise the flowering plants / compatible cash crops surrounding the main field by arranging shorter plants towards main crop while taller plants along the borders to attract natural enemies as well as to avoid pest immigration.

Barrier cropping: Plant 2 rows of maize or inner row wheat and outer row maize as barrier surrounding onion crop (250 m^2) at least 30days prior to onion transplanting. Will block adult thrips movement up to 80%.

Major insect pests of onion and garlic with symptoms and management practices

Insect	Family : order	Damaging stage	Damage symptom	Images
			Sucking pests	
Onion thrips ***(Thrips tabaci)***	Thripidae : Thysanoptera	Nymphs and adults	Causes silvery leaf spots that later turn into white blotches along the leaves. Damaged tissues coalesces exhibiting blast like appearance.	 Thrips
Red spider mite ***(Tetranychus cinnabarinus)***	Tetranychidae : Trombidiformes	Nymphs and adults	Upper surface of the leaves becomes stippled with little dots that are the feeding punctures. Silk webbing are also visible. Eventually leaves turn bleached/ discolored and wither.	 Red spider mite
Eriophyid mite ***(Aceria tulipae)***	Eriophyidae : Trombidiformes	Nymphs and adults	Causes stunting, twisting, curling and discoloration of foliage. yellow mottling is seen mostly on the edge of the leaves. In storage bulbs dry and desiccate.	 Eriophyid mite
Bulb mite ***(Rhizoglyphus robini)***	Acaridae : Trombidiformes	Nymphs and adults	Causes reduced plant stand, stunting and promote bulb rot in storage. In nursery, radical developed from seeds are cut off.	 Bulb mite
			Foliage feeders	
Armyworms ***(Spodoptera exigua)***	Noctuidae : Lepidoptera	Larvae	Early instars mostly scrape the leaf tissues leaving the epidermal layer intact, while later instars cause extensive defoliation. Heavily infested field is visible as white papery patches from a distance.	 *S. exigua*
Spodoptera ***litura***	Noctuidae : Lepidoptera	Larvae	Cuts through the stalks, and causes wilting and death of the crop.	 *S. litura*
Cutworm ***(Agrotis ipsilon)***	Noctuidae : Lepidoptera	Larvae	Cuts through the stalks, and causes wilting and death of the crop.	 Cutworm
Head Borer ***(Helicoverpa armigera)***	Noctuidae : Lepidoptera	Larvae	Invades the umbel and feeds on seeds. As a result, complete drying of flowers and complete loss of seed occurs. The larva of this insect cuts the pedicel of the flower and feeds on the stalk.	 Head Borer
Onion maggot ***(Delia antique)***	Anthomyiidae: Diptera	Grub	Tunnels into the bulb. Causes growth distortion, yellowing and wilting of plants. Always associated with secondary rotting organisms.	 Onion maggot
Leafminer ***(Liriomyza huidobrensis, L. sativa)***	Agromyzidae : Diptera	Grub	Make meandering tunnels under the leaf surface. Rarely tunnels into bulb onion.	 Leafminer

Repellant plants: Grow garlic with repellant plants like *Ocimum*/Basil and marigold as ovipositional trap crop for lepidpteran pests.

Erect bird perches @ 20/acre for encouraging predatory birds such as king crow, mynah *etc.* against lepidopteran pests.

Ecological Engineering for Pest Management – below ground

Crop rotation with leguminous plants enhances nitrogen content of the soil.

Add organic matter as farm yard manure (FYM), vermicompost or crop residue to enhance soil biodiversity.

Apply balanced dose of nutrients using biofertilizers like mycorrhiza, plant growth promoting rhizobacteria (PGPR), *Trichoderma* spp. and *Pseudomonas fluorescens*

Biological Control

Conserve and augment the natural enemies likes parasitoids and predators such as syrphid flies, damselflies, lacewings (*Mallada basalis* and *Chrysoperla zastrowi sillemi*), praying mantis, anthocorid bug (*Orius tantilus*), staphylinid beetle (*Oligota* spp.) and spiders etc. should be done.

Thrips: parasitoid *Ceranisus menes* (nymphs) and predators such as predatory thrips (*Aeolothrips fasciatum*), coccinellids (*Cheilomenes sexmaculata*), and spiders *etc.*

Mites: predatory mites (*Amblyseius alstoniae, A. womersleyi, A. fallacies* and *Phytoseiulus persimilis*), predatory coccinellids (*Stethorus punctillum*), predatory cecidomyiid fly (*Anthrocnodax occidentalis*) and predatory gall midge (*Feltiella minuta*).

Lepidopteran Pests: Inundatively release parasitoids such as *Tricogramma pretiosum* @ 40,000/acre 4-5 times from flower initiation stage at weekly intervals. Also conserve egg parasitoids such as *Tetrastichus* spp. and *Telenomus* spp. and larval parasitoid, *viz. Campoletis chlorideae etc.* Predators such as pentatomid bug (*Eocanthecona furcellata*), earwigs, ground beetles *etc.* Apply entomopathogenic nematodes (EPNs) @ 20-120 crore infective juveniles of *Steinernema feltiae*/acre. NPV (*HaNPV or SlNPV*) and *Btk* formulations can be also employed to manage these pests.

Chemical Control

Seed treatment: Thiram + carbendazim (2:1) @ 3kg/kg seed or trichoderma @ 4-6 g/kg seed.

Seedling dip treatment: Seedlings roots are dipped in a solution of 0.1% Carbendazim + 0.025% Carbosulfan, for two hours to reduce the incidence of fungal diseases and thrips damage till 30-40 days in the main field.

For thrips: Spray insecticides when thrips population crosses ETL of 30 thrips /plant. Insecticides recommended are Carbosulfan @ 2ml/L (0.2%) or Fipronil @ 1ml/L (0.1%) and Profenophos 1ml/L (0.1%). Need based foliar application of insecticide sprays from 30 days after planting at 10-15 days interval. Add a spreader or sticker (0.5-1.0%) to spray fluid for retention and spread of insecticide on erect leaves of onion. Avoid using same insecticide repeatedly.

For mites: Sulfur @ 0.5ml/L (0.05%) or Dicofol @ 2ml/L (0.2%) as pre-sowing and post-sowing treatments. Even a through water spray also washes off the mites from the plant.

For further interaction, please write to:
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