

Management of Insect Pests

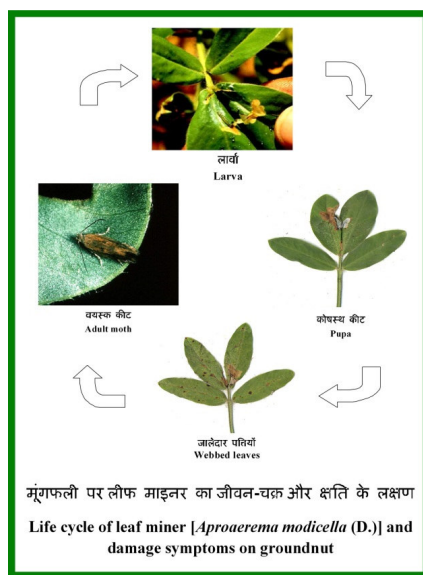
Pest Situation in Groundnut

Among the insects inflicting heavy damage to groundnut, defoliators such as groundnut leaf miner, red hairy caterpillars, tobacco caterpillar, gram pod borer, Bihar hairy caterpillar, and castor semi-looper are the most important yield barriers in India.

Defoliators

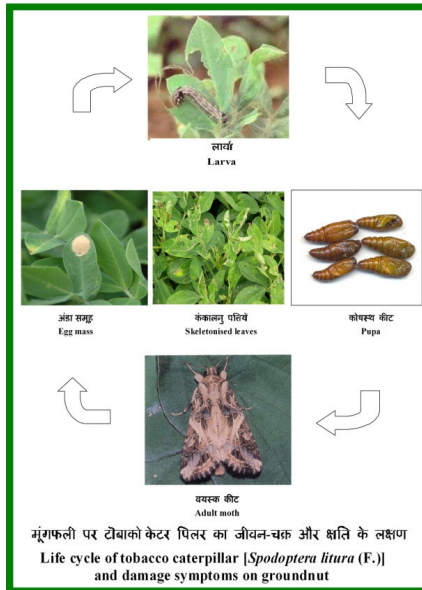
Groundnut Leaf Miner *Aproaerema modicella* (Deventer)

The young larvae mine into the leaves as soon as they hatch. The presence of small brown blotches on the leaf can be seen. The mines are about 1mm long when noticeable. The mines enlarge as the larvae grow. When they become too large and the larvae complete the different instars, emerge out and web the adjacent leaflets together and continuously feed on leaf tissue from inside the webbed leaves. A severely attacked field looks like a burnt appearance.



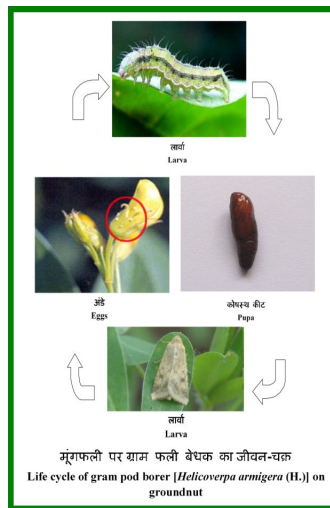
Tobacco Caterpillar *Spodoptera litura* (F.)

The first instars feed by scrapping under the surface of the leaves leaving the vein and upper epidermis giving a fabric surface. When the damage is severe, they defoliate totally leaving only the stems. The 2nd & 3rd instar larvae feed by making small holes here and there on the leaf. The subsequent instars feed voraciously on the entire lamina, petioles and sometimes on the tender twigs on the terminal shoot of the plant. In certain cases they feed on the flower and bore the tender groundnut pods, which are just below the soil surface. More than 65% of the foliage damage is done during nighttime.



Gram Pod Borer *Helicoverpa armigera* (Hubner)

It is a polyphagous pest and distributed widely. The larvae are voracious feeders, they feed on flower and foliage and defoliate the plants.



Management of Defoliators (groundnut leaf miner, tobacco caterpillar and gram pod borer)

- Light traps
- Pheromone traps
- Intercropping with
 - ✓ Soybean (for leaf Miner)
 - ✓ Castor (for Spodoptera)
 - ✓ Marigold (for Helicoverpa)
- Spray of bio-pesticides viz., NPV-Spodoptera, NPV-Helicoverpa.

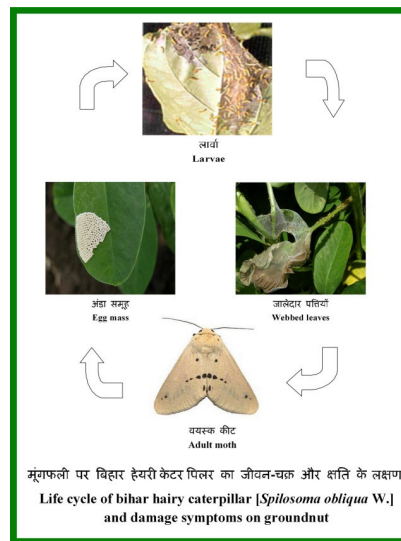
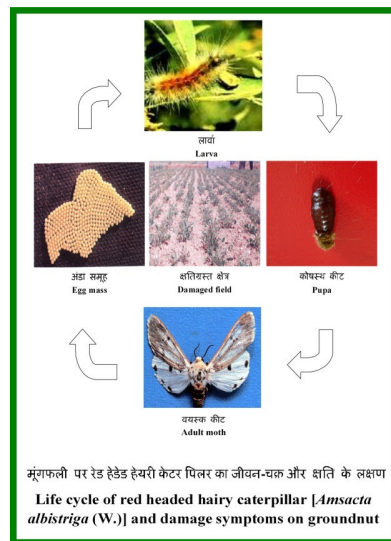
Hairy Caterpillars (*Amsacta albistriga*, *A. moorei* and *Spilosoma oblique*)

Young larvae of *A. albistriga* feed gregariously on the under surface of the leaves by scrapping them. The grown up larvae are voracious feeders, defoliate the crop presenting a cattle grazed field. They feed on leaves, flowers and growing points. When large number of

larvae feed on the crop, the field with only bares stems of crop leading to total loss of yield. Similar pattern of feeding was observed by *A. moorei*. While the young larvae of *S. obliqua* scrap leaves, some leaves become papery thin and dry, while full-grown larvae devour the foliage completely.

Management of Hairy Caterpillars

- Deep ploughing during April-May to expose the pupae to sunlight and predatory birds.
- Set bonfires on community basis on the field bunds from 7-10 pm starting from the next day of the rainy.
- Setup the light traps to attract and kill the moths during June-August.
- Cowpea as trap crop.
- Intercrop with castor or red gram in the ratio of 1:11.
- Form a deep trench around the field and dust with 2% methyl parathion or 5% carbaryl to avoid the migration of larva from one field to the other.
- Collection and destruction of egg mass and just emerged larva.
- Place the vegetative traps like jatropha or calotropis in and around groundnut fields to attract and kill larva.
- Spray neem oil @5 ml l⁻¹water along with suitable surfact like nirma powder 1g l⁻¹ or NSKE 5%.
- Spray AaNPV (Baculovirus for *Amsacta albistriga*) @ 200 LE acre⁻¹ at third instar stage.



Sucking Pests

Aphids (*Aphis craccivora* Koch)

The aphids congregate on young leaves and young leaf buds sometimes even on flowers and aerial pegs. They desap through a phloem vessels. Under heavy infestation, plant become chlorotic and leaves curl.

Leaf Hoppers (Jassids) *Empoasca kerri* Pruthi

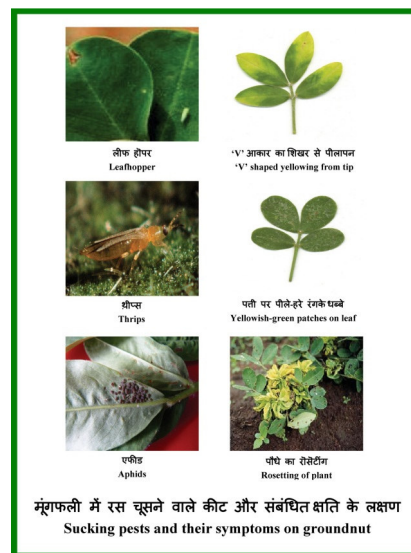
The nymphs as well as adults suck sap from the leaves mainly from under surface. The initial injury to groundnuts appears on young leaves and veins become white. The terminal leaves may wilt if plants attacked are young. In older plants wilting of leaflets is rare. Prolonged exposure to jassids results in a 'V' shaped yellowing on the tips of leaflets, which may spread, and the entire leaflet may become yellow. Groundnuts when infested with jassids look yellow when compared to unaffected crop.

Thrips *Scirtothrips dorsalis* Hood, *Frankliniella schultzei* Trybom, *Thrips palmi* Karny and *Caliothrips indicus* Bagnell.

Thrips species occur on groundnut as a complex, starting from vegetative stage till harvest of the groundnut crop. Thrips feed by rasping the upper surface of the leaves, when they are in bud stage, the unfolded leaves thus distorted, condition known as "pouts". There is frequent discoloration which may tinged with red or even black colour.

Management of Sucking Pests

- Plating trap Crop like Bajra (for thrips), Maize (for Aphid), and Cowpea (for Jassids).
- Seed treatment with imidacloprid @ 2 ml kg⁻¹ seeds.
- Monocrotophos 2 ml L⁻¹ of spray solution or imidacloprid or acetamiprid or *thiamethoxam* @ 4 ml 15L⁻¹ of spray solution is applied if the pest population reached the economic injury level.



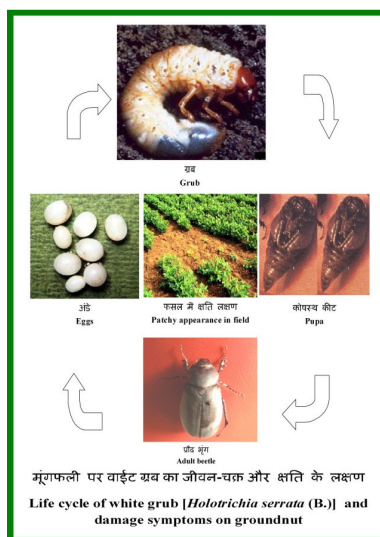
Root and Pod Feeders

White Grubs *Holotrichia consanguinea* and *H. Serrata*

Although the damage to roots starts in the early first instar stage. The maximum damage occurs when the grubs are in the third instar. The attacked plants show varying degrees of wilting, and ultimately die. The grubs also damage the pod by scratching the nut shell. The damaged plants are easily pulled out. They feed on soil organic matters for a few weeks and then to the roots. They also damage pods. The roots show a sharp cut which can be distinguished from the damage by termite where the main root becomes hollow and is filled with soil. Patches of dead plants are seen throughout the field, which later coalesce and produce intensive areas of damage.

Management of White Grubs

- Field should be ploughed from the end of April to middle of May to expose the grubs and pupae to sunlight and predatory birds.
- Mechanical control by large scale collection and destruction of adults at the time of their mass emergence.
- Use of light traps and synthetic pheromone traps for monitoring adults.
- Early sowing (pre-monsoon, irrigated) of crops should be done to allow roots to get established and evade from white grub attack.
- Soil treatment: pre-sowing soil treatment with phorate 10 G or quinalphos 5 G.
- Pheromone dispenser be placed (2-3 per tree) on the host tree in the evening continuously for three evenings after beetle emergence as mass trapping method.



Termites *Odontotermes* sp. and *Microtermes* sp.

Odontotermes obesus and *Microtermes obesi* Holmgren are the two species of termites reported to cause damage to groundnut. Termites damage the groundnut plants from seedling stage to maturity. They gnaw and hollow out taproot causing wilting and premature death of plants especially in sandy and red soils. When the damage is on pod, they feed on pod shell by removing the corky material between the strands of vascular tissues, which is called 'scarification'. The scarified pods are liable to shatter or crack during harvest. Breakage results in loss of kernels especially during mechanical harvesting.

Table 1. Economic threshold level (ETL) for key pest of groundnut

Common name	ETLs
Leaf miner	5 mines per plant at 30 days of crop age
Tobacco caterpillar	20-25% defoliation at 40days
Gram pod borer	20-25% defoliation at 40days
Hairy caterpillars	20-25% defoliation at 40days
Thrips	5 thrips/terminal at seedling stage
Jassids	5 to 10 adults per plant up to 30 DAE

Aphids	5-10 aphids per terminal at seedling stage
White grub	1 grub/square meter
Termites	-

Management of Termites

- Destruction of termatorium and queen termite in and around field.
- Pre-sowing soil treatment with phorate 10 G or carbofuron 10 G.

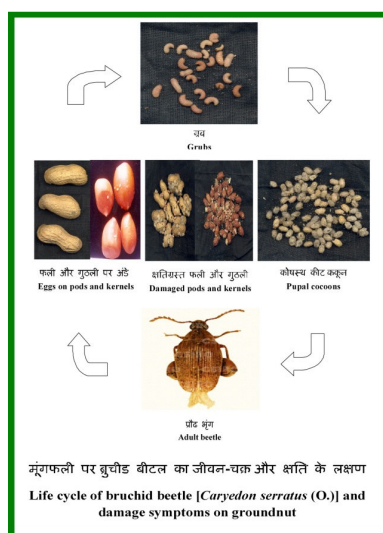
Storage pests

Groundnut Bruchid *Caryedon serratus* (Olivier)

Groundnut pods/seeds during storage are susceptible to the attack of many insect pests including groundnut seed beetle (bruchid) and grubs of bruchid beetles causes extensive damage to kernels. Groundnut bruchid beetle has become a major storage pest particularly in warmer conditions of Gujarat causing higher economic damage to the stored produce. The heat and moisture generated by a large insect population in storage also increases the risk of mold growth, which indirectly spoils the quality through mycotoxin contamination, rendering the stock unfit for human and animal consumption. Under optimum condition (30-33°C and 70-90% RH), the life cycle completes in about 60 days (Fig. 8).

Management of Bruchis

- Proper drying of pods
- Cleaning of gunny bags and fumigation of godowns before storage using aluminium phosphide @ 2-3 tablets (5g) ton⁻¹ of pods in airtight godowns.



Management of Nematode Diseases in Groundnut

Groundnut crop is susceptible to several species of nematodes of which *Meloidogyne* spp., *Pratylenchus* spp. and *Tylenchorhynchus brevilineatus* are prominent in India.

1. Root-knot nematodes (*Meloidogyne arenaria* and *M. javanica*)

Root-knot nematodes are the most destructive soil dwellers limiting groundnut yield. Losses due to root-knot nematodes individual infested fields ranged from 14-20 %.

Symptoms

Above-ground symptoms of root-knot nematodes infection may show various degrees of stunting and chlorosis (yellowing) and tend to wilt under drought conditions. Infected rows appear thinner compared to healthy rows and give the patchy appearance. Below ground symptoms includes, galls often forms on roots, pegs, and pods of infected plants and develop into various sizes resulting from an internal swelling from the root tissue. Root development is commonly reduced. Pegs and pods occasionally begin to deteriorate at maturity. Pod set can be drastically reduced under severe root-knot pressure.



Root-knot nematodes (*Meloidogyne arenaria* and *M. javanica*)

2. Root lesion Nematode (*Pratylenchus* spp.)

Lesion nematodes are migratory endoparasites that attack groundnut roots, pegs, and pods. They feed within parenchymatous tissues. Both mechanical and chemical damage result from the nematodes feeding within the tissues.

Symptoms

Symptoms occur mainly below-ground, although severely attacked plants may show stunted growth with and chlorotic leaves. Roots are restricted in length and total volume, and tend to be discolored as the nematodes feed on the tissues of roots, pegs and pods. The pod lesions begin as tiny, tan to brown colored, pin point-size spots appear on the infected pods. As the nematodes feed and reproduce, the affected areas on pods eventually darken and enlarge. Older lesions are characterized by a blotchy appearance and indistinct margins. Nematode feeding also may weaken the pegs resulting in pod loss at harvest. Severely attacked plants are stunted and chlorotic with reduced root systems. Other microorganisms may colonize the necrotic area and penetrate the pod causing seed damage.



Root lesion Nematode (*Pratylenchus* spp.)

3. Stunt Nematode (*Tylenchorhynchus brevelineatus*)

Tylenchorhynchus brevelineatus causes Kalahasti malady diseases in Groundnut and is serious disease in parts of Chittoor and Nellore district of Andhra Pradesh.

Symptoms

Infected plants appear in patches in the field, and are stunted with greener than normal foliage. Small brownish yellow lesions appear on the pegs, and on young developing pods. Peg length is reduced. Entire pod surface becomes blackened and giving a scabbed appearance on advanced stage of infection. Discoloration can also be observed on roots, but less conspicuous than pod discoloration. Kernels from diseased pods are healthy, but commonly smaller than normal.



Stunt Nematode (*Tylenchorhynchus brevelineatus*)

Approaches for Nematode Management

- Root-knot nematode populations are reduced in the absence of a host plant. Hence, crop rotation with poor or immune host crops like cereals will reduce its population and thus its effect on groundnut plants.
- Deep summer ploughing in states having hot and dry summers help in reducing infestation of plant parasitic nematodes.
- Soil solarization by a transparent polythene sheet (25-50 μm) for 15 days during summer also helps to control nematodes.

- Soil amendments such as neem cake or castor cakes @ 1 tonnes/ha preferably seven days prior to sowing has been found to reduce nematode population. Their combination with seed treatment, with carbosulfan (25 DS) @ 3% a.i. (W/W) further improves efficacy in reducing the nematode population and enhancing yield significantly.
- Use Resistant varieties like Tirupathi-2 and 3 for the management of kalahasti malady disease.
- Farmers of south saurashtra region of Gujarat are advised to sow groundnut with castor as an inter crop (row ratio 2:1) along with soil application of Carbofuron @ 1kg a.i/ha to reduce the population of root-knot nematodes infecting groundnut.
- Good weed control should be practiced as many weed species act as hosts for root-knot nematodes.