



Insect Pests of Drumstick and their Management

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Moringa oleifera L. is also known as the 'drumstick' or horseradish tree. This little deciduous tree has a light, feathery canopy and is typically 5 to 10 meters tall, but can occasionally reach 15 meters. Because of its nutritional and medicinal qualities, it is one of the most beneficial trees on earth. Thus, it has been referred to as a "miracle tree" worldwide (Yishehak *et al.*, 2011). There are several other names for it, including "mother's best friend tree," "cabbage tree," "drumstick tree" or "horseradish tree," "benzoil tree," and "miracle tree" (Koul & Chawe, 2015). According to Leone *et al.* (2015), *M. oleifera* L. is native to the northern foothills of India, Pakistan, and Nepal. Most of the genetic diversity is found in Uttar Pradesh of India, and the Tarai region of Nepal. Thirteen species in the genus *Moringa* of the family Moringaceae are known to exist in the *Moringa* tree, which has a far higher species diversity.



Importance of Moringa

Moringa is well known for being a powerful nutrient supplement and a natural energy booster. The WHO has worked for it as a substitute food source to address malnutrition (Sreelatha *et al.*, 2009). *M. oleifera* contains essential nutrients and antinutrients in abundance in every part of the plant. Minerals including calcium, potassium, zinc, magnesium, iron, and copper are high in *M. oleifera* leaves. *M. oleifera* also contains vitamins such as beta-carotene, vitamin A, and vitamins B, C, D, and E. Examples of these vitamins are folic acid, pyridoxine, and nicotinic acid. According to Zaku *et al.* (2015), every component of the *Moringa* tree—fruits, seeds, leaves, flowers, bark, and roots—is linked to the existence of one or more benefits. Iron from *Moringa* can overcome iron deficiency, according to research on dietary iron supplements in the liver affected by *M. oleifera* leaves (Saini, 2014). Additionally, *moringa* is utilized for ecosystem services like pollution control, intercropping, boundary/barrier/support, erosion control, soil improvement, and ornamental uses (Mridha, 2015). Animal forage, biogas, fuel, blue dye, fencing, fertilizer, foliar nutrient, green manure, gum, honey, and sugar cane juice—as well as medicine, biopesticide, pulp, rope, tannin, and water purification—are just a few of the uses for the plants.

The main pests in India that have been reported are the pod fly (*Gitona distigma*), which is a serious pest of *moringa* in South India; the budworm (*Noorda moringae*); the leaf caterpillar (*Noorda blitealis*); hairy caterpillars (*Eupterote mollifera*); bark borer (*Indarbela tetraonis*); and longhorn beetles (*Batocera rubus*), which are widely distributed throughout the Indian subcontinent. Aphids (*Aphis gossypii*), one of the minor pests, are polyphagous. Adults and nymphs suck the essential sap from the twigs. Population growth occurs quickly

because parthenogenic reproduction predominates. Leaf-eating weevils (*Myllocerus* spp.), bud midges (*Stictodiplosis moringae*), and scale insects (*Ceroplastodes cajani*) are additional minor pests.

Insect Pests of Moringa

1) Major Insect Pests:

A. Pod Fly, *Gitona distigma* Meigen (Drosophilidae: Diptera)

Nature of damage:

- Drying and splitting of fruits from the tip
- Oozing of gummy exudates from fruit

Identification:

- Eggs are cigar-shaped sculptured and white-colored and are laid on the grooves of tender pods either singly or in groups of 3-4.
- Maggots enter into tender fruits by making small-bore holes at the terminal end. A maximum of 20-28 maggots are found in a fruit. Internal contents of the fruits rot.
- Full-grown cream-coloured maggots pupate in the soil.
- The adult is a small yellowish fly with red eyes. Wings extend beyond the body and have a dark spot near the coastal margin.



B. Bud Worm, *Noorda moringae* Tams (Crambidae: Lepidoptera)

Nature of damage:

- Larvae bore into flower buds and cause shedding of buds up to 75%. Generally, infested buds contain only one caterpillar.
- Damaged buds seldom blossom; fall prematurely.

Identification:

- It lays oval, creamy white eggs in clusters or singly on flower buds.
- Caterpillars are dirty brown with a prominent mid-dorsal stripe, black head and a prothoracic shield.
- Full-fed caterpillars come out and pupate in minute brownish cocoons, either in soil or on the ground itself, below dried leaves and debris.
- The adult is small in size with dark brown forewings and white hind wings with a dark brown border.



C. Leaf Caterpillar, *Noorda blitealis* Walker (Crambidae: Lepidoptera)

Nature of damage:

- Larva feeds on the leaflets reducing them into papery structures

Identification:

- Eggs are creamy white and are laid in batches usually on the ventral surface of leaves. Pupation occurs in soil.
- Caterpillars feed on leaf lamina, turning them into transparent parchment-like structures. The peak period of infestation is from March to April and December to January
- Adults are medium-sized moths. The forewings are uniformly dark in colour with a small white streak near the base. Hind wings are hyaline with a broad black marginal band towards the anal side.



D. Hairy Caterpillar, *Eupterote mollifera* Walker (Eupterotidae: Lepidoptera)

Nature of damage:

- Larva seen in groups in tree trunks

- Feed gregariously
- Scraping the bark and gnawing foliage
- Severe infestation leads to defoliation of the tree



Identification:

- Eggs are laid in clusters on leaves and tender stems.
- The larvae are whitish, speckled with black and with dorsal tufts of black hairs arising from a whitish hump. There is a dorsal blue-black band and a subdorsal pinkish band traversed by a grey line, as well as a series of small lateral black spots.
- The adult is yellow or drab in both sexes, with reddish-brown markings spread over the wings.

E. Bark Caterpillar, *Indarbela tetraonis* Moore (Indarbelidae: Lepidoptera)

Nature of damage:

- Zig-zag galleries and silken webbed masses comprising of chewed material and excreta of larva

Identification:

- Larvais long, stout and dirty brown in colour.
- The adult moth is pale brown in colour. Forewings have brown spots and streaks; Hind wings are white in colour.



2) Minor Insect Pests:

A. Scale Insect, *Ceroplastodes cajani* Maskell (Diaspididae: Hemiptera)

The shoots, fruits and their stalk were fully covered by the scale in the case of a severe attack, and the tender shoots dried up (Ayyar, 1929). Though each insect takes only a few drops of sap during its lifetime, the presence of the enormous number of insects sucking the sap continuously at times weakens trees and ultimately affects the size of pods. Spray as given for aphids.

B. Aphid, *Aphis craccivora* Koch (Aphididae: Hemiptera)

The nymphs of Aphids, a small brown-coloured aphid, were observed on leaves. Both the nymphs and adults suck the sap and cause the yellowing of leaves and drying of leaves. As reproduction is mostly parthenogenic, population build-up is very fast.

3) Non-Insect Pests:

Feeding activity of the vegetable mite, *Tetranychus neocaledonicus* (Andre) on *M. oleifera* led to the formation of conspicuous white spots, manifested through chlorosis of the leaves. Affected leaves exhibited chlorophyll loss and subsequent drying up and shedding. Cattle, sheep, pigs, and goats were found to eat drumstick seedlings, pods and leaves and mites' populations were also reported to increase during dry and cool weather (Palada and Chang, 2003).

Integrated Pest Management

- Collect and destroy the mealy bug-infested leaves, twigs and fruits.
- Collect fallen-infested fruits and destroy them.
- Provide summer ploughing to expose the pupae.
- Flooding of orchards with water in the month of October kills the eggs.
- Ploughing of orchard in November.
- Avoid plant stresses - healthy plants are much less susceptible to attack
- Use attractants like citronella oil, eucalyptus oil, vinegar (Acetic acid), dextrose or lactic acid
- Rake up the soil under the trees or plough the infested field to destroy the puparium
- Adopt bagging of fruits.

- Immersion of fruits in hot water (45 to 47°C) for 60 minutes to kill eggs and maggots
- Use 10 traps per acre of methyl eugenol.
- Clean all webbed material, plug the holes with cotton wool soaked in fumigants like chloroform, formalin or petrol and seal it with mud
- Spray insecticides like Nimbecidine 3ml/lit during 50 % fruit set and 35 days later
- Release *Cryptolaemusmontrouzieri* beetles @10/tree or @ 30 larvae/plant twice at 15-day intervals.
- The Coccinellid *Menochilussexmaculatus* (F) is a predator of the nymphs and adults, and the Hymenopterous parasite *Anaysisalcocki* (Ashm.) *Anagyrusdactylopii* and *Aenasiusadvena* are three parasitoids on mealy bugs.
- Release of coccinellid *Scymnuscoccivora* @ 10 beetles/tree or 30 larvae/plant is a good predator of both nymphs and adults.
- Field release of natural enemies *Opiuscompensates* and *Spalangiaphilippines*.
- Apply well rotten sheep manure @ 4 t/ acre in two splits or poultry manure in 2 splits
- Control ants and dust which can give the scale a competitive advantage.
- Field release of ladybird beetle.
- Use of braconid parasitoids (*Apanteles* spp.) to parasitize larvae
- Spray dimethoate 30 EC 500 ml or malathion 1.0 L in 500 – 750 L of water per ha to control sucking pests.
- Spray dichlorvos 76 SC 500 ml or malathion 50 EC 750 ml in 500 - 750 ml of water per ha when pods are 20-30 days old and apply Azadirachtin 0.03 % 1.0 L during 50% fruit set and 35 days later.

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