

Lecture No. 26

PEST MANAGEMENT IN AMARANTHUS AND MORINGA

I. AMARANTHUS AND OTHER LEAFY VEGETABLES

Major pests			
Amaranthus stem weevil	<i>Hypolixus truncatulus</i>	Curculionidae	Coleoptera
Amaranthus caterpillar or webber	<i>Hymenia recurvalis</i>	Pyraustidae	Lepidoptera
Minor pests			
Leaf webber	<i>Eretmocera impactella</i>	Heliodinidae	Lepidoptera
Leaf webber	<i>Psara basalis</i>	Pyraustidae	Lepidoptera
Tortoise beetle	<i>Aspidomorpha exilis</i>	Cassididae	Coleoptera
Grasshopper	<i>Atractomorpha crenulata</i>	Acrididae	Orthoptera
Leaf twisting weevil	<i>Apoderus tranquebaricus</i>	Curculionidae	Coleoptera
Aphids	<i>Aphis craccivora</i>	Aphididae	Hemiptera
Mealy bugs	<i>Ferrisia virgata</i>	Pseudococcidae	Hemiptera
Thrips	<i>Euryaplothrips crassus</i> , <i>Haplothrips ceylonicus</i>	Thripidae	Thysanoptera

1. Amaranthus stem weevil: *Hypolixus truncatulus* (Curculionidae: Coleoptera)

Distribution and status

Specific major pest. Widely distributed in India and neighbouring countries. It attacks both wild and cultivated crops and leafy vegetables with large leaves.

Damage symptoms

Grubs bite into stems, feed on pith region making irregular zigzag tunnels and fill with excreta. Stems split longitudinally. Plants dry completely. Adult feeds on tender leaves, makes circular holes in stems, branches and mid-ribs. Attack causes stunting of plants, twisting and swelling of branches and stem and suppression of shoot and leaf production.



Bionomics

Females lay eggs singly in each hole and cover holes with secretion. A female lays 30-34 smooth, oval and pale yellow eggs, egg period 4 to 10 days. A single stem contains 17-20 grubs in it. Grubs are stout, curved, apodous and white in colour. Grub stage lasts for 12 - 24 days. Full-fed grubs form a greyish-brown hard compact gall like chamber and pupate therein. On emergence, they remain inside the stem for 5 to 6 days, then cut epidermal membrane and emerge out. Adults are ash-grey in colour, with elbowed antennae and brown elytra.



IPM

1. Collect and destroy wild amaranthus hosts in the vicinity of cultivated crop.
2. Collect and destroy affected plant parts along with grubs and adults
3. Spray malathion 50 EC 500 ml or endosulfan 35 EC 500 ml or dichlorvos 375 ml in 500 L of water per ha after the harvest of leaves and stems. Plan next harvest 15-20 days later

2. Amaranthus caterpillar or webber: *Hymenia recurvalis* (Pyraustidae: Lepidoptera)

Distribution and status

Destructive pest. Widely distributed in tropical and subtropical regions including Africa, Asia and Australia. In the Indian sub-continent it is found all the year round, but is more active during warmer, rainy and early winter months.

Host range

Amaranthus, beans, melons, spinach, coleus, *Luffa* spp., grasslands and pastures

Damage symptoms



Larvae scrape the epidermal and palisade tissues of leaves; web the leaves with silken threads resulting in drying of webbed leaves.

Bionomics



Adult is a dark brownish black moth with white wavy markings on wings. Spherical snow-white eggs laid singly or in batches of 2 to 5, in grooves of leaf veins. Fecundity is 50 to 80 eggs. Caterpillars are greenish in colour with white lines and black crescents on thorax below lateral line. Fully fed, caterpillars drop down and pupate in soil. Incubation, caterpillar and pupal periods last for 3 to 4, 12 to 16 and 8 to 12 days respectively. Life cycle is completed in 3 to 4 weeks.

IPM

1. Collect and destroy affected plant parts along with caterpillars
2. Use light traps @ 1- 2 / ha to attract and kill adults
3. Spray malathion 50 EC 500 ml or endosulfan 35 EC 500 ml or dichlorvos 375 ml in 500 L of water per ha after the harvest of leaves and stems. Plan next harvest 15-20 days later.

Minor pests

3. Leaf webber: *Eretmocera impactella* (Heliodinidae: Lepidoptera)

Distribution and status: Sporadic pest. Widely distributed in the Indian sub-continent.

Damage symptoms: Caterpillars web leaves with white silken threads and remain hidden in folds feeding from inside.

Bionomics

Eggs are laid on leaves or on top shoots. Full-grown caterpillars are cylindrical, brownish-yellow to brownish-grey in colour with a broad sub median dark stripe and black tubercles bearing several divergent longitudinal hairs. Long brown pupae in white silken cocoons remain attached to leaves. Moths are small, blackish with prominent yellow spots on fore wings. Life cycle is completed in 3 to 4 weeks.



4. Leaf webber: *Psara basal* (Pyraustidae: Lepidoptera)

Its habits, symptoms of damage and life history are similar to that of *Hymenia recurvalis*. Full fed caterpillars are greenish in colour. Adults are small with yellowish, white thorax and abdomen with brownish red fore wing and dark brown hind wing.



5. Tortoise beetle: *Aspidomorpha exilis* (Cassididae: Coleoptera)

Eggs are laid singly on ventral surface of leaves. Grubs and adults feed by scrapping outer tissues of leaves. Pupation takes place on leaf surface. Life cycle is completed in 15 to 30 days.

6. Grasshopper: *Atractomorpha crenulata* (Acrididae: Orthoptera)

It is a highly polyphagous pest with a very wide range of host plants both cultivated as well as wild. Nymphs and adults nibble leaf lamina causing irregular holes. In case of severe attack, dust with 4% carbaryl or endosulfan.

7. Leaf Twisting Weevil: *Apoderus tranquebaricus* (Curculionidae: Coleoptera)

Refer mango

8. Aphids: *Aphis craccivora* (Aphididae: Hemiptera); Mealy bugs: *Ferrisia virgata* (Pseudococcidae: Hemiptera)

Suck vital sap from leaves.

9. Thrips: *Euryaplothrips crassus*, *Haplothrips ceylonicus* (Thripidae: Thysanoptera)

Infest inflorescence.

II. MORINGA

Major pests			
Pod fly	<i>Gitona distigma</i>	Drosophilidae	Diptera
Bud worm	<i>Noorda moringae</i>	Pyraustidae	Lepidoptera
Leaf caterpillar	<i>Noorda blitealis</i>	Pyraustidae	Lepidoptera
Hairy caterpillars	<i>Eupterote mollifera</i>	Eupterotidae	Lepidoptera
	<i>Pericallia ricini</i>	Arctiidae	Lepidoptera
	<i>Metanastris hyrtaca</i>	Lasiocampidae	Lepidoptera
	<i>Streblote siva</i>	Lasiocampidae	Lepidoptera
Bark borer	<i>Indarbela tetraonis</i>	Metarbelidae	Lepidoptera

Long horn beetles	<i>Batocera rubus</i>	Cerambycidae	Coleoptera
Minor pests			
Aphids	<i>Aphis gossypii</i>	Aphididae	Hemiptera
Scale Insects	<i>Ceroplastodes cajani</i>	Diaspididae	Hemiptera
Bud midge	<i>Stictodiplosis moringae</i>	Cecidomyiidae	Diptera
Leaf eating weevils	<i>Myloccerus</i> spp.	Curculionidae	Coleoptera

1. Pod fly: *Gitona distigma* (Drosophilidae: Diptera)

Distribution and status: Serious pest of moringa in South India.

Host range: Moringa

Damage symptoms

Maggots enter into tender fruits by making small-bore holes at the terminal end. This causes oozing out of gummy fluid from fruits, which ultimately results in the drying of fruits from tip upwards. A maximum of 20-28 maggots are found in a fruit. Internal contents of the fruits rot.



Bionomics

Activity is maximum from April to October and declines thereafter. Adult is a small yellowish fly with red eyes. Wings extend beyond body and have a dark spot near the coastal margin. Cigar shaped, sculptured and white coloured eggs are laid on the grooves of tender pod either singly or in groups of 3-4. Egg period 3-4 days, maggot period 18-25 days. Full-grown cream coloured maggots pupate in soil for 5-9 days.

Management

1. As moringa pod flies are not attracted to methyl eugenol and fish meal, use attractants like citronella oil, eucalyptus oil, vinegar (acetic acid), dextrose or lactic acid to trap flies.
2. Periodically collect and destroy all the fallen and damaged fruits by dumping in a pit and covering with a thick layer of soil to prevent carry-over of the pest.
3. Frequently rake up the soil under the trees or plough the infested field to destroy puparia and apply endosulfan 4% at 25 Kg/ha or drench NSKE 5% at 2 L/tree at 50% fruit set.
4. 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.

2. Bud worm: *Noorda moringae* (Pyraustidae: Lepidoptera)

Distribution and status: Major pest in South India

Host range: Moringa

Damage symptoms

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 down prematurely. Activity is more during summer months in South India.



Bionomics

Adult is small in size with dark brown fore wings and white hind wings with dark brown border. It lays oval, creamy white eggs in clusters or singly on flower buds. Caterpillars are dirty brown with a prominent mid-dorsal stripe and black head and prothoracic shield. Full-fed caterpillars come out or pupate in minute brownish cocoons, either in soil or on ground itself, below dried leaves and debris. Egg, larval and pupal periods occupy respectively 3-4, 8-16 and 6-10 days.

Management

1. Plough around trees to expose and kill pupae
2. Collect and destroy damaged buds along with caterpillars
3. Use light traps to attract and kill adults @ 1-2 /ha
4. Spray carbaryl 50 WP 1.0 kg or malathion or endosulfan 1.0 L in 500 - 750 ml of water per ha.

3. Leaf caterpillar: *Noorda blitealis* (Pyraustidae: Lepidoptera)

Distribution and status: It is a sporadically serious pest of drumstick trees especially in South India.

Host range: Moringa

Damage symptoms: Caterpillars feed on leaf lamina, turning them into transparent parchment like structures. Peak period of infestation is during March to April and December to January.



Bionomics

Adults are medium sized moths. Fore wings are uniformly dark in colour with a small white streak near the base. Hind wings are hyaline with broad black marginal band towards anal side. Eggs are laid in batches usually on ventral surface of leaves. Egg, larval and pupal durations last for 3, 7 to 15 and 6 to 9 days respectively. Pupation in soil.

4. Hairy caterpillars

a. *Eupterote mollifera* (Eupterotidae: Lepidoptera)

Distribution and status: Destructive and specific pest of drumstick in South India.

Damage symptoms

Caterpillars feed gregariously by scrapping bark and gnawing foliage. Severe infestation results in complete defoliation of the tree.

Bionomics

Adults are large-sized moths with light yellowish-brown wings having faint lines. Moths appear with onset of monsoon and lay eggs in clusters on leaves and tender stems. Egg period lasts for 6 days. Full-grown caterpillars are brownish in colour and densely hairy. Hairs are irritating to touch. Larval and pupal periods last for 12 to 14 and 8 to 10 weeks respectively. Pupation takes place in soil. Only one generation/year.

Management

1. Collect and destroy egg masses and caterpillars
2. Use light traps to attract and kill adults immediately after rains
3. Use burning torch to kill congregating larvae on the trunk
4. Spray chlorpyrifos 20 EC or quinalphos 25 EC or endosulfan 35 EC 1.0 L in 500 -750 L of water per ha or fish oil rosin soap 25 g/L on the trunks and foliage, immediately after rain and 15 days later

b. *Pericallia ricini* (Arctiidae: Lepidoptera)

Attacks drumstick, banana, black gram, cotton, cucurbits, castor, cowpea, soybean, tea and yam.

For more information refer castor

c. *Metanastria hyrtaca* (Lasiocampidae: Lepidoptera)

Distribution and status: Generally called as gristly citrus caterpillar and found all over the Indian sub-continent.

Host range: Polyphagous pest and prefers several Citrus species.

Damage symptoms

Caterpillars are nocturnal in habit and feed gregariously and voraciously. During day, they remain crowded on shady side of tree trunks.

Bionomics



Eggs are spherical in shape and pale white in colour. Full-grown caterpillars are cylindrical in shape, greyish-brown in colour, stout and hairy. Stout, greyish-brown moths adults exhibit sexual dimorphism. Male moths have pectinate antennae and chocolate- brown patch in the middle of forewings. Incubation, larval and pupal periods last for 9 to 12, 45 to 100 and 9 to 18 days respectively. Life cycle is completed in 75 to 110 days.

d. *Streblote (Taragama) siva* (Lasiocampidae: Lepidoptera)

Distribution and status: Found all over the Indian sub continent

Host range: Drumstick, rose (preferred host)

Bionomics

Full-grown caterpillars are pale ochreous–brown in colour with small black spots and long lateral tufts of ochreous hair. Moth has greyish-white head and thorax and whitish abdomen. Fore wings are beautifully coloured with reddish-brown spot ringed with white. Hind wings are white with slight fuscous on outer margin.



IPM for hairy caterpillars

1. Collect and destroy caterpillars from the plants
2. Use light traps to attract and kill adults
3. Spray carbaryl 1.0 kg or malathion 50 EC or endosulfan 35 EC 1.0 L in 500 -750 L of water per ha

5. Bark borer: *Indarbela tetraonis* (Metarbelidae: Lepidoptera)

Refer Mango

6. Long horn beetles: *Batocera rubus* (Cerambycidae: Coleoptera)

Distribution and status

It is widely distributed all over the Indian sub-continent.

Damage symptoms

Grubs make zig-zag burrow beneath the bark, feed on internal tissues, reach sapwood and cause death of affected branch or stem. Adults feed on the bark of young twigs and petioles

Bionomics

Eggs are laid singly in cracks or crevices in the bark of the tree. Grubs are stout, about 100 mm long, yellowish in colour with well-defined segmentation. Pupation takes place within the tunnels. Adults are medium-sized beetles and yellowish–brown with white spots on elytra. Egg, grub and



pupal periods last for 1 to 2, 24 to 28 and 12 to 24 weeks respectively. There is only one generation in a year.

Management

1. Clean affected portion of tree by removing all webbed material, excreta etc.
2. Insert in each hole, cotton–wool soaked in monocrotophos 36 WSC 5 ml or any good fumigant like carbon disulphide, carbon tetrachloride, chloroform or even petrol and seal treated hole with mud.

Minor pests

7. Aphids: *Aphis gossypii* (Aphididae: Hemiptera)

It is a polyphagous pest. Nymphs and adults suck vital sap from twigs. As reproduction is mostly parthenogenic, population build-up is very fast. Spray dimethoate 30 EC 500 ml or malathion 1.0 L in 500 – 750 L of water per ha. All pods should be removed before spraying.

8. Scale Insects: *Ceroplastodes cajani* (Diaspididae: Hemiptera)

Though each insect takes only a few drops of sap during its life time, presence of enormous number of insects sucking the sap continuously at times, weaken trees and ultimately affect size of pods. Spray as given for aphids.

9. Bud midge: *Stictodiplosis moringae* (Cecidomyiidae: Diptera)

It is a minor pest of drumstick. Eggs are laid in clusters on anthers within the flower buds. Maggots feed on internal tissues of buds especially on ovaries. Pest is active during August to January. Infested buds soon fall down and the full-fed maggots come out to pupate in soil. Egg, maggot and pupal periods last for 1 to 2, 6 to 9 and 5 to 8 days, respectively; a single life cycle is completed in 12 to 19 days.

10. Leaf eating weevils: *Myloccerus* spp. (Curculionidae: Coleoptera)

It feeds on a variety of crops. Eggs are laid in soil. Grubs feed on roots of cultivated crops; grasses etc. and pupate in soil. Adults come out of soil and nibble leaves causing minor damage.



1. *M. subfasciatus* - Elytra grey with black spots
2. *M. discolor* - Brown elytra with white spots
3. *M. viridanus* - Full elytra light green

Questions - Amaranthus and Moringa

1. Irregular zig-zag tunnels in the pith region filled with excreta is due to -----

Stem weevil - *Hypolixus truncatulus*

2. Site of pupation for amaranthus caterpillar is

- | | |
|----------------|------------|
| a. Soil | b. Stem |
| c. Webbed leaf | d. On leaf |

3. Scientific name of leaf twisting weevil ----- ***Apoderus tranquebaricus***

4. Drying of fruits from tip upwards and oozing of gummy fluid from moringa fruits is due to ----- **Pod fly - *Gitona distigma***

5. Moringa pod fly is not attracted to methyl eugenol and fish meal say **True** or false

6. ----- bore into flower buds, cause shedding of buds and feed on tender tissues on moringa. **Bud worm - *Noorda moringae***

7. *Noorda blitealis* pupates in soil say **True** or False

8. Use of burning torch on the trunk of moringa controls ----- **Hairy caterpillar - *Eupterote mollifera***

9. Male of *Metanastria hyrtaca* has----- antenna

- | | |
|---------------------|-------------|
| a. Pectinate | b. Filiform |
| c. Setaceous | d. Capitate |

10. Presence of huge silken webbed masses comprising chewed wooden particles and entry holes covered with excreta is due to ----- **Bark caterpillar - *Indarbela tetraonis***

11. ----- feeds on internal tissues of moringa buds especially on ovaries

- | | |
|---------------------|----------------------|
| a. Pod fly | b. Bud worm |
| c. Bud midge | d. Hairy caterpillar |

12. Moringa pod fly belongs to the family

- | | |
|-------------------------|------------------|
| a. Agromizidae | b. Tephritidae |
| c. Drosophilidae | d. Cecidomyiidae |

13. Give the scientific name of some hairy caterpillars of moringa ----- ***Eupterote mollifera, Pericallia ricini, Metanastria hyrtaca and Streblote (Taragama) siva***
14. Complete defoliation of moringa tree is due to ----- **Hairy caterpillar - *Eupterote mollifera***
15. Generally, moringa buds infested by bud worm contain ----- number of caterpillar - **One**