Lecture No. 25

PEST OF TUBER VEGETABLES

I. POTATO

	Major pests			
1.	Potato tuber moth	*Phthorimaea operculella*	Gelechiidae	Lepidoptera
2.	Cutworms	*Agrotis ipsilon, A. segetum, Xestia C. nigrum and Peridroma saucia*	Noctuidae	Lepidoptera
3.	White grubs	*Holotrichia excisa, H. repetita, H. notaticollis Anomala communis, A. nathani*	Melolonthidae	Coleoptera Coleoptera
4.	Bihar hairy caterpillar	*Spilosoma obliqua*	Arctiidae	Coleoptera
5.	Hadda Beetles	*Epilachna dodecastigma*, *Henoesepilachna vigintioctopunctata*	Coccinellidae	Coleoptera
6.	Egg plant shoot borer	*Leucinodes orbonalis*	Pyraustidae	Lepidoptera
	Minor pests			
7.	Aphids	*Aphis gossypii, Myzus persicae, Lipaphis erysimi* and *Brevicoryne brassicae*	Aphididae	Hemiptera
8.	Leafhoppers	*Empoasca kerri*	Cicadellidae	Hemiptera
9.	Whiteflies	*Bemisia tabaci*, *Trialeurodes vaporariorum*	Aleyrodidae	Hemiptera
10.	Thrips	*Selenothrips indicus*	Thripidae	Thysanoptera
11.	Green stink bug	*Nezara viridula*	Pentatomidae	Hemiptera
12.	Green leaf Beetle	*Chalaenosoma metallicum*	Chrysomelidae	Coleoptera
13.	Tussock moth	*Dasychira mendosa*	Lymantriidae	Lepidoptera

1. Potato tuber moth: *Phthorimaea operculella* (Gelechiidae: Lepidoptera)

Distribution and status

World wide. It is the most destructive pest of potato. It is a cosmopolitan pest, found in warmer countries.

Host range: Tomato, tobacco, brinjal, potato, sugarbeet and solanaceous weeds.

Damage symptoms

Pest of field and storage. Larva tunnels into foliage stem and tubers which lead to loss of leaf tissue, death of growing points and weakening or breaking of stems. In tubers, irregular shaped galleries are seen with excrements near tuber eyes.

Bionomics

Adults are nocturnal in habit. With the onset of winter, moths fly from godowns to fields and lay eggs singly, near eyes of exposed tubers and on ventral surface of leaves. A single female lays 150 to 250 eggs. Eggs are minute, oval and yellowish in colour. Full-grown caterpillars are pinkish-white to pale greenish in colour. Pupation takes place in rough silken cocoons. Adults are small moths with silvery body. Fore wing is greyish-brown with minute dark spots and fringes of hairs. Hind wings are dirty white. Egg, larval and pupal periods last for 3 to 4, 7 to 14 days respectively with at least 5 to 7 generations in a year.

ETL: 5% leaf damage

IPM

1. Select healthy tubers and avoid shallow planting of tubers and plant them to a depth of 10-15 cm deep
2. Adopt inter-cropping with chillies, onion or pea
3. Earthing-up at 60 days after planting to avoid female moths egg laying on the exposed tubers
4. Install pheromone traps in the field @ 20/ha
5. Remove and destroy infested tubers
6. Release egg-larval parasitoid, *Chelonus blackburni*@ 30, 000 adults/ha twice, 40 and 70 days after planting
7. Store only good and clean tuber in well-ventilated, cool, dry place with temperature not exceeding 21ºC. Cold storage is highly preferable.
8. Keep pheromone traps in godowns also and destroy trapped moths.
9. Fumigate godowns in airtight condition with carbon disulphide (CS_2) or a mixture of carbon disulphide and carbon tetrachloride or with Ecofume.
10. In godowns, cover the upper surface of potato leaves with *Lantana* or *Eupatorium* branches to repel oviposting moths.
11. Spray NSKE 5% or quinalphos 25 EC 1.0 L in 500 L of water per ha to manage foliar damage
12. Treat seed tubers with quinalphos 1.5 D or endosulfan 4D dust @ 1 kg/100 kg of tubers

2. Cutworms: *Agrotis ipsilon, A. segetum, Xestia C. nigrum and Peridroma saucia* (Noctuidae: Lepidoptera)

Distribution and status

India, China, northern Europe, Canada, Japan down to South America and New Zealand. They are cool climate pests. In plains, they actively migrate to hilly regions.

Host range

Ppolyphagous pests. Besides potato, they also feed on barely, beet-root, cole crops, okra, linseed, lucerne, millets, oats, peas, poppy, pulses, tobacco, wheat etc. They can cause economic loss under favourable cold conditions in northern plains.

Damage symptoms

Young larva feeds on tender foliage and grown up larva cuts the stem at collar region.

ETL: 2 larvae /meter row

Bionomics

Moths appear after dusk, mate and lay eggs on ventral surface of leaves or moist soil. Freshly ploughed fields are preferred for oviposition. A female lays 300 to 450 eggs in 10 to 15 clusters. Eggs are globular in shape, ribbed and whitish in colour. Tiny caterpillars feed gregariously on foliage for a few days and then enter into soil.

Caterpillars are nocturnal in habit and hide during day in cracks and crevices in soil or under debris around plants. At night they come out, cut seedlings near ground level and eat tender parts. Damage is more pronounced in low-lying waterlogged areas. Full-grown caterpillars enter soil and pupate in earthen cocoons. Egg, caterpillar and pupal stages last for 2 to 13, 10 to 30 and 10 to 30 days, respectively. Total life cycle is 30 to 68 days. Two larvae / mt row is considered as ETL.

Cutworm species	**Larval description**	**Adult description**
Agrotis ipsilon	Black with pale mid-dorsal stripes. Head is pale-brown	Fore wing is pale brown with dark purplish brown along costal end. Hind wing is white with brown tinge. Male has bipectinate antenna and female has filiform antenna
A. segetum	Black coloured with brown head. Triangular spots at spiracular region	Fore wing is grey with peg and spot like marking. Hind wing is dull white. Male has bipectinate antenna and female has filiform antenna
Xestia C. nigrum	Brownish larva with series of black markings on lateral area	Reddish brown fore wing with concave sunken pale area. Hind wing is dull brown
Peridroma saucia	Light brown with 4-7 yellowish markings on mid-dorsal line	Reddish brown fore wing with dark brown margin. Male has bipectinate antenna and female has filiform antenna

Agrotis ipsilon ***A. segetum***

Xestia C. nigrum ***Peridroma saucia***

IPM

1. Fork soil during summer months to expose larvae and pupae to avian predators
2. Install light traps during summer to attract adult moths
3. Install pheromone traps @ 5/ha to monitor and attract male moths
4. Install sprinkler irrigation system to irrigate in day time to expose larvae for predation by birds
5. Drench collar region of plants in evening hours with chlorpyriphos 20 EC or endosulfan 35 EC 4 ml/ L a day after planting
6. In endemic areas, apply NSKE 5%, endosulfan 35 EC 1 L or chlorpyriphos 20 EC 1 L or neem oil 5 L in 500 - 750 L of water per ha . Focus nozzle at the collar region and apply insecticides during evening hours.

3. White grubs: *Holotrichia excisa, H. repetita, H. notaticollis*, *Anomala communis, A. nathani* (Melolonthidae : Coleoptera)

Host range: Potato, groundnut and sugarcane.

Distribution and status: All over India

Damage symptoms: Grubs feed on roots and tubers; Adults feed on foliage during night; damage more during autumn.

Bionomics

Eggs are laid in the soil near host plants. On hatching, grubs feed on developing roots and tubers of potato as well as other grasses growing around. When full-fed, grubs over winter deep down in the soil. Grubs are C shaped with orange head. Adults emerge as soon as temperature starts rising, but continue to remain in the soil till onset of monsoon. Adults feed on foliage during night and damage is more during autumn. *Holotrichia* adults are brown beetles with pale thorax. *Anomala* adults are smaller than *Holotrichia* and are pale-yellowish.

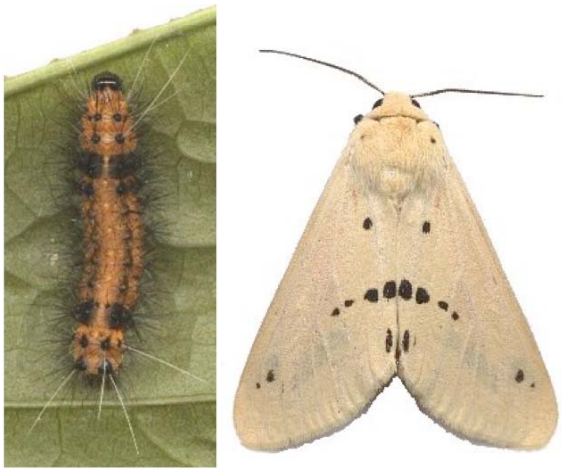
IPM

1. Do summer ploughing to expose pupae and adults
2. Dust endosulfan 4% or quinalphos 5% D at 25 kg/ha 10 days after first summer rains
3. Install light traps between 7 PM and 9 AM in April-May months
4. Do presowing soil application of entomogenous fungus *Metarhizium anisopliae*1 × 10 FIB/g during May @ 20 kg/ha and fork the soil
5. Hand pick adult beetles in the morning
6. Hand pick 3rd instar grubs during July-August
7. In endemic areas, apply phorate 10 G at 25 Kg/ha during autumn (August-October)

4. Bihar hairy caterpillar: *Spilosoma obliqua* (Arctiidae: Coleoptera)

It attacks a wide range of cultivated crops including potato. Among vegetables, preferred host of *S. obliqua* is sweet potato.

For distribution and status, host range, bionmics, damage symptoms and management refer sunflower or mustard



5. Eggplant shoot borer: *Leucinodes orbonalis* (Pyraustidae: Lepidoptera)

Refer brinjal

6. Hadda Beetles: *Epilachna dodecastigma*, *Henoesepilachna vigintioctopunctata* (Coccinellidae: Coleoptera)

Refer brinjal

7. Aphids: *Aphis gossypii, Myzus persicae, Lipaphis erysimi* and *Brevicoryne brassicae* (Aphididae: Hemiptera)

Damage symptoms

Colonies of nymphs and adults are seen on ventral surface of leaves and shoots and suck sap there from. Infested leaves become yellowish, wrinkled and cupped, while, tender shoots turn yellowish and die away. They also excrete honeydew on which sooty mould develops covering affected parts with a thin superficial black coating that hinders photosynthetic activity of leaves resulting in stunted growth of plants. In addition, they also act as vectors, for transmitting several viral diseases.

Management

To control aphids, spray dimethoate or oxy-demeton methyl 500 ml or thiamethoxam 25 WG 100 g in 500 L of water per ha or drench thiamethoxam 25 WG 200 g. Repeat the spraying, if necessary, after 10 to 12 days.

8. Leafhoppers: *Empoasca kerri* (Cicadellidae: Hemiptera)

Refer cotton and groundnut

9. Whiteflies: *Bemisia tabaci,* (Aleyrodidae: Hemiptera)

Refer cotton

***Trialeurodes vaporariorum* (Aleyrodidae: Hemiptera)**

Both nymphs and adults desap the plants causing yellowing and wilting of plants. Adult small moth like insect lays pedicellate yellow eggs that turn dark chocolate brown on maturity. Nymph yellowish white.

Management: As given for *Bemisia tabaci*

10. Thrips: *Selenothrips indicus* (Thripidae: Thysanoptera)

These are tiny, slender, fragile insects. Adults have fringed wings. Both nymphs and adults scrape epidermal tissues of leaves usually near tips and rasp oozing sap. Affected tips get curled

and dry up. Spray 0.2% carbaryl or 0.5% monocrotophos or thiometon to check pest population, if damage is severe.

11. Green stink bug: *Nezara viridula* (Pentatomidae: Hemiptera):

Distribution and status

It is cosmopolitan in distribution and recorded from South Europe and Japan down to Australia and South Africa. It is a minor pest and does not need management exclusively.

Host range

It is a polyphagous pest and also breeds on coffee, citrus, cotton, millets, pulses, potato, rice, indigo, tomato, wheat etc.

Damage symptoms

Nymphs and adults suck cell sap from tender leaves, and shoots, thereby devitalize plants.

Bionomics

Adults are medium-sized bugs and green to reddish-brown in colour. A female lays up to 300 eggs, stuck together in rafts, on dorsal surface of leaves. Eggs are barrel-shaped, whitish in colour, turning pink with age. Freshly hatched nymphs remain clustered around egg-raft and it is only after first moult that nymphs disperse and start active feeding.

12. Green leaf Beetle: *Chalaenosoma metallicum* (Chrysomelidae: Coleoptera)

These green coloured flea beetles feed on potato leaves and cause defoliation in South India.

13. Tussock moth: *Dasychira mendosa* (Lymantriidae: Lepidoptera)

Host range

This is a polyphagous pest, attacking a number of fruit trees, potato, castor cauliflower etc.

Damage symptoms: It is a gregarious feeder and causes defoliation of leaves

For bionomics refer castor

II. SWEET POTATO

Major pests				
1.	Sweet potato weevil	*Cylas formicarius*	Apionidae	Coleoptera
2.	Hairy caterpillar	*Creatonotus gangis*	Arctiidae	Lepidoptera
3.	Blue pansy	*Precis orithya*	Nymphalidae	Lepidoptera
4.	Leaf folder	*Brachmia convolvuli*	Gelechiidae	Lepidoptera
5.	Tortoise beetles	*Aspidomorpha miliaris* *Metriona circumdata* *Chirida bipunctata*	Cassididae	Coleoptera
Minor pests				
6.	Sphinx caterpillar	*Agrius convolvuli*	Sphingidae	Lepidoptera
7.	Stem borer	*Omphisa anastomosalis*	Pyraustidae	Lepidoptera
8.	Spiny beetle	*Oncocephala tuberculata*	Hispidae	Coleoptera
9.	Brown looper	*Hyposidra successaria*	Geometridae	Lepidoptera
10.	Sweet potato hopper	*Exitianus indicus*	Cicadellidae	Hemiptera
11.	Fig bug	*Riptortus linearis*	Coreidae	Hemiptera
12.	Lygaeid bug	*Graptosethus servus*	Lygaeidae	Hemiptera
13.	Mealy bugs	*Geococcus coffeae*	Pseudococcidae	Hemiptera

1. Sweet potato weevil: *Cylas formicarius* (Apionidae: Coleoptera)

Distribution and status

It is a specific pest of sweet potato. Seen in Pantropical, Tropical Africa, India, South East Asia, Australia, Hawaii, South USA, West Indies and South America.

Host range

Ipomoea litoralis, I learii, I.purpurea, I.prescaprae, I trifida and I.sepiaria

Damage symptoms

Grubs bore into stems, cause tunneling inside and feed on soft tissues. Grubs and adults bore into tubers both in field and storage godowns. Affected tubers develop dark patches, which later start rotting. Pest is disseminated from field to field through infested vines and is carried over from season to season by breeding in damaged tubers left in the fields after harvest.

Bionomics

Adult weevils are ant-like, slender bodied having elongated snout-like bluish-brown head with non-geniculate antenna, bright red thorax and legs and brownish-red abdomen. Females make small cavities on the tubers or stems and lay eggs singly. Each female lays 100-200 eggs. Grubs are apodus, pale-yellowish white in colour. Pupation takes place in larval burrows. Incubation, grub and pupal stages last for 5 to 10, 16 to 20 and 4 to 8 days respectively. Life cycle is completed in 4-5 weeks.

IPM

1. Remove previous sweet potato crop residues and alternate host, *Ipomoea* sp. and destroy them. Discourage growing sweet potato in the same field year after year.
2. Use pest free planting materials
3. Mulch with leaves of *Chromolaena doormats, Clerodendron infortunatum* at 3 tonnes/ha at 30 days after planting (DAP)
4. Use cut sweet potato tubers (100 g) as trap during 50-80 DAP at 10 days intervals. Set the traps at 5 m apart at 4 pm and collect and destroy adult weevils at 6 am next day
5. Dip planting materials in monocrotophos 36 WSC 15 ml per L of water.
6. Rake up soil and earth up at 50 days after planting
7. Drench soil with endosulfan 35 EC @ 4 ml /L. Spray endosulfan 35 EC 1.5 L in 750 L of water per ha any of these, if needed from 30 DAP
8. Harvest immediately after maturity and destroy the crop residues
9. Install yellow sticky trap @12/ha

10. In godowns, treat the bag surface with malathion 5% or carbaryl 5 % dust.

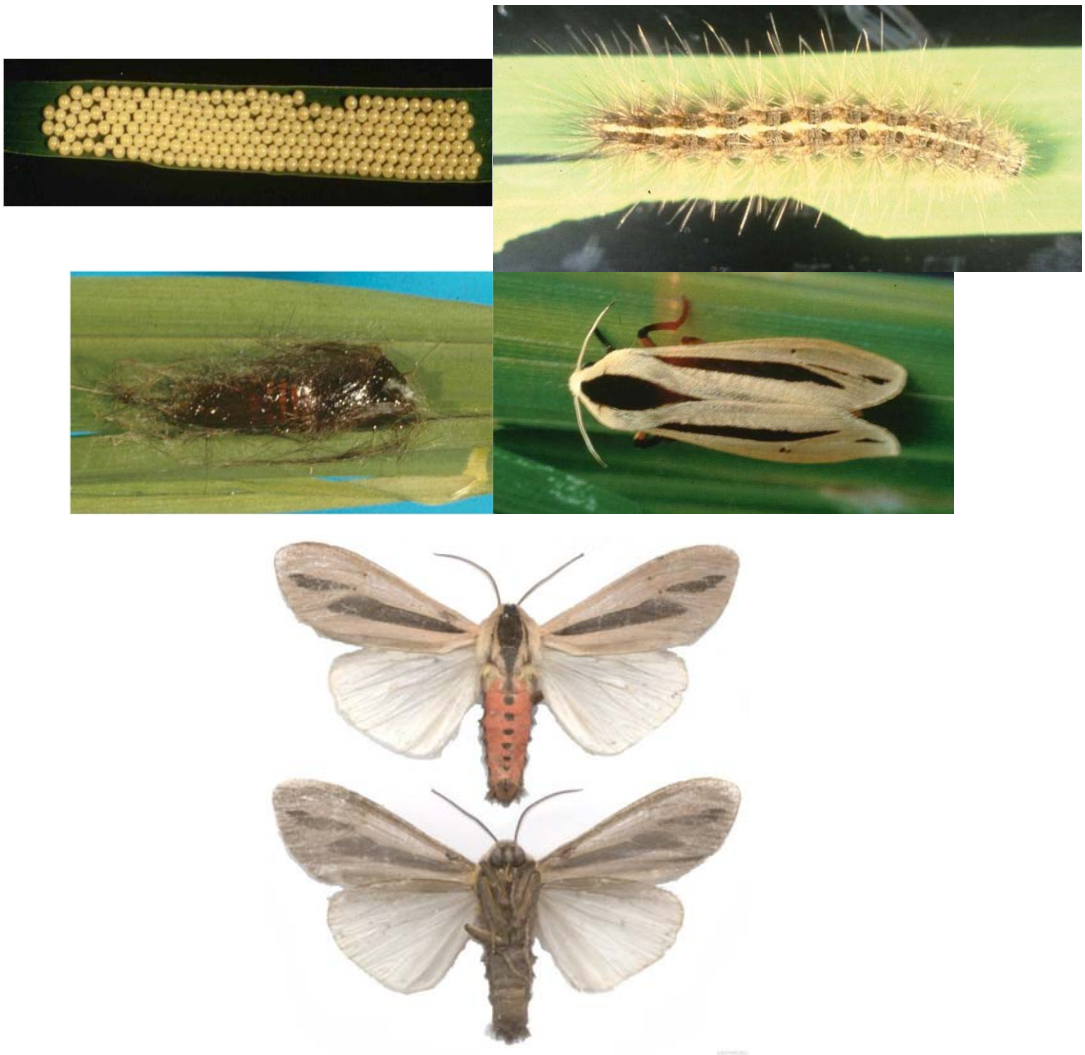
2. Hairy caterpillar: *Creatonotus gangis* (Arctiidae: Lepidoptera)

Distribution and status: Sporadic pest in sweet potato growing region in India

Host range: Polyphagous pest Lucerne, rice, maize, grasses, coffee, groundnut, Johnson grass and also feeds on pastures.

Bionomics

It appears in July and continues till November. Eggs are round in shape and shiny creamy-yellow in colour. Caterpillars are cylindrical, slightly tapering posteriorly and dark violet to black in colour. Meso and Meta thorax are light golden-yellow and head black, hairy with characteristic yellow stripe dorsally. Adults have shiny black head. Fore wings are straw coloured with pinkish tinge and a transverse black band at the center. Hind wings are whitish with few black dots at the margin. A female lays 285 to 695 eggs in clusters arranged in rows closely set together. Incubation period is 4-5 days, larval period 22-32 days, pupal period 5-7 days. Adult period 12 days.



Management: as given under Bihar Hairy caterpillar and Red Hairy caterpillar

3. Blue pansy: *Precis orithya* (Nymphalidae: Lepidoptera)

Host range: Sweet potato, weed striga

Bionomics

Moths are medium-sized with only two pairs of functional legs. More than half of fore wings are velvety black. Hind wings are blue shaped with velvety black towards the base, thus wing pattern resembles the pansy flower. Incubation, larval, pupal periods, adult longevity and life cycle last for 3, 14 to 16, 4 to 8, 3 to 7 and 27 to 29 days respectively.

It is actually a beneficial insect as it feeds on *Striga*, a weed parasite on sugarcane roots.

Damage symptoms: Defoliation

Management

1. After harvesting, give deep ploughing and flood infested fields to kill pupae and to prevent carry-over of pests
2. Collect and destroy egg clusters and leaves bearing caterpillars to prevent population build-up
3. Spray dichlorvas 660 ml or endosulfan 35 EC 750 ml to control widespread infestation

4. Leaf folder: *Brachmia convolvuli* (Gelechiidae: Lepidoptera)

Distribution and status: It is regarded as a pest of several *Ipomoea* species.

Host range *Ipomoea triloba* and *I. aquatic,* weed *Mikania cordata* (Asteraceae).

Damage symptoms

Young larva scrapes the tender surface tissues of leaves remaining in thin webbings. Later on leaves folded longitudinally and green tissues eaten resulting in drying of leaves. Folds are usually single, but sometimes two folds are made, or two leaves are joined together.

Bionomics

Adult is a small slender moth and grayish-brown in colour. It lays eggs in small groups at the base of radiating veins on the underside of leaves. The eggs are oval, yellowish white when newly laid and turn pinkish yellow. Egg period three days. White neonate larva feeds on leaves and becomes full grown in 14 days undergoing five instars.Full-grown larva is slightly flattened and tapering towards both ends. Head is reddish-brown, glossy and flattened; thorax and two abdominal segments are velvety black and other segments are yellowish-white with a velvety black band. It pupates within leaf fold in 7 days.

IPM

- Use of insect-free planting materials.
- Conserve ichneumonid parasite, *Macrocentrus* sp. that attacks young larvae when they have not yet folded the leaf margins.
- If level of infestation warrants the use of chemicals, then contact-systemic insecticides can be applied.
- Collect and destroy folded leaves along with egg clusters,larvae and pupae
- Spray dichlorvos 76 SC 660 ml or endosulfan 35 EC 750 ml or carbaryl 50 WP 1.0 kg or phosalone 35 EC 750 ml in 500 L water per ha to control widespread infestation

5. Tortoise beetles: (Cassididae: Coleoptera)

Distribution and status

Throughout Africa, Southern China, Southeast Asia becomes serious occasionally.

Host range

Sweetpotato, *Ipomoea triloba,* coffee, beet, potato and various flowers.

Damage symptoms

Skeletonization of leaves by grubs. Later grubs and adults gnaw holes in leaf lamina. Grubs are green, flat with anal projection always carry debris on its back. Pupation takes place in ventral surface of leaves.

Bionomics These metallic coloured beetles are active during monsoon. Eggs are laid on ventral leaf surface. Grubs are nocturnal in habit

Species	Adult	Grub	Egg	Life cycle
Aspidomorpha miliaris 	Broad oval shaped, brownish-red in colour with black dots	Flattened with spiny processes covering their body. Dried excreta are seen on the anal process	Laid in 5 to 10 rows	Egg, grub and pupal stages last for 9 to 11, 15 to 20 and 4 to 6 days respectively. Life cycle is completed in 28 to 36 days.
Cassida circumdata 	Broad oval shaped, greenish-yellow in colour with green crescent mark in middle	Pale greenish in colour	Laid singly. Fastened on leaf surface by filaments	Egg, grub and pupal stages last for 3 t0 5, 10 to 15 and 6 to 8 days respectively. Life cycle is completed in 30 days.
Chirida bipunctata 	Small metallic green in colour with six black spots on elytra	Pale greenish in colour	Laid singly	Egg, grub and pupal stages last for 4 to 6, 12 to 14 and 5 to 8 days respectively. Life cycle is completed in 30 days.

Management

Removal of convolvulaceous weeds in the surrounding area may reduce their numbers.

Conserve or encourage larval parasitoids *Tetrastichus* sp, predator *Stalilia* sp., (Mantidae).

Chemical control of this pest is seldom necessary.

Minor pests

6. Sphinx caterpillar: *Agrius convolvuli* (Sphingidae: Lepidoptera)

Distribution and status

It is commonly called as hornworm or giant hawk moth. It is widely distributed from Europe, Africa, Iran, Indian sub-continent, South-East Asia, South-China, Australia and New Zealand. It is of minor importance

Host range

It is a polyphagous pest attacking a number of crops including fruit trees, legumes, vegetables, etc.

Bionomics

It is active during monsoon season. Moths are stout, pale grey in colour having pale grey wings with transverse violet bands on abdomen. Females lay conspicuous seed-like shiny eggs singly on the tender parts of plant.

Eggs are sub-spherical in shape. Full-grown caterpillars are robust, green to dark brown in colour with reddish patches on sides and a curved horn like process at the anal end. Caterpillars feed voraciously on leaves and defoliate the vines. Pupae are reddish-brown in colour and pupation takes place in soil. Incubation, larval and pupal stages last for 5-10, 14-21, 7-11 days respectively. A complete life cycle occupies 4 to 5 weeks.

Management: No specific control measures are required.

7. Stem borer: *Omphisa anastomosalis* (Pyraustidae: Lepidoptera)

Whitish stout caterpillar bores into vines of plant in South India. Pupation takes place within larval tunnels. Moth has straw-coloured wings with wavy markings on them.

7. **Spiny beetle: *Oncocephala tuberculata* (Hispidae: Coleoptera)**

It occurs commonly in South India. Adult is a small brownish, hispine beetle with blunt projections all over body. It has a life up to 50 days. Eggs are thrust inside leaf tissues. Larva mines the leaf and causes it to wither. When full grown, it constructs a short tunnel in a healthy leaf in which it pupates. Eggs, larval and pupal stages last for 7-10, 17-23,and 8-15 days respectively. Adult also injures the leaves by feeding on them.

8. **Brown looper: *Hyposidra successaria* (Geometridae: Lepidoptera)**

Larvae feed on leaves. Its egg, larval and pupal periods is 4-5, 18-29 and 8-9 days respectively.

9. **Sweet potato hopper: *Exitianus indicus* (Cicadellidae: Hemiptera)**

Both nymphs and adults suck sap from leaves and tender shoots, but damage caused is negligible. Adults are active, slender, white leaf hoppers with head, thorax and scutellum greenish in colour.

10. **Fig bug: *Riptortus linearis* (Coreidae: Hemiptera):**

Nymphs and adults infest and damage tender shoots. Adults are elongated and dark brown bugs.

11. **Lygaeid bug: *Graptosethus servus* (Lygaeidae: Hemiptera)**

These are greyish-black bugs. Adults and nymphs suck cell sap from tender leaves and devitalizing them.

12. **Mealy bugs: *Geococcus coffeae* (Pseudococcidae: Hemiptera)**

Crawlers and adults infest tender roots and tubers. Damage is more severe when slightly infested tubers are stored. Under normal storage conditions, mealy bug multiplies rapidly and stored tubers get thickly covered with mealy growth and become shriveled due to loss of sap. Problem is perpetuated by use of infested tubers as seed. Tubers from infested fields should not be used. Dip the tubers in 0.5% phenthoate solution just before planting.

III. COLACASIA

	Major pests			
1.	Flea beetle	*Monolepta signata*	Alticidae / Galerucidae	Coleoptera
2.	Hairy caterpillar	*Pericallia ricini*	Arctiidae	Lepidioptera
3.	Sphinx caterpillar	*Theretra gnoma*	Sphingidae	Lepidoptera
4.	Sphinx caterpillar	*Agrius convolvuli*	Sphingidae	Lepidoptera
5.	Aphid	*Pentalonia nigronervosa*	Aphididae	Hemiptera
		Aphis gossypii	Aphididae	Hemiptera
	Minor pests			
6.	Thrips	*Heliothrips haemorrhoidalis* *Caliothrips indicus*	Thripidae	Thysanoptera
7.	Grasshopper	*Gesonula punctifrons*	Acrididae	Orthoptera
8.	Tingid	*Stephanitis typicus*	Tingidae	Hemiptera
9.	Horned caterpillar	*Hippotion oldenlandiae*	Sphingidae	Lepidoptera

1. Flea beetle: *Monolepta signata* (Alticidae: Coleoptera)

Distribution and status: More severe in South India.

Host range: Polyphagous pest, wide range of host plants like beet root, cabbage, cauliflower, chilli and radish.

Damage symptoms

Bite holes on leaves. In severe cases tuber development affected.

Bionomics:

Adult is 3-4 mm long, reddish brown elytra with two big white spots on each elytron.

Management:

Spray endosulfan 35 EC 1.0 L or carbaryl 50 WP 1.0 Kg in 500 L of water per ha or dust endosulfan 4 D 25 kg per ha .

2. Hairy caterpillar: *Pericallia ricini* (Arctiidae:Lepidioptera)

Distribution and status: Sporadic pest

Host range: Castor, green manure, moringa

Damage symptoms

The damage is caused by caterpillar. It feeds on leaves resulting in defoliation. Larvae nocturnal and feed voraciously at night.

Bionomics

The larva is robust, greyish black or blackish brown larva with red head and thick tuft of hairs arising from the body. The adult is greyish brown or black colour and black spots on wings. Hind wings are pink or red colour with black spots.

Management

Spray endosulfan 35 EC or malathion 50 EC 1.0 L or carbaryl 1.0 kg in 500 L per ha

3. Sphinx caterpillar: *Theretra gnoma* (Sphingidae: Lepidoptera)

Distribution and status: Peninsular India

Damage symptoms

Caterpillars feeds on leaves gregariously and cause defoliation.

Bionomics

Larva 80-85 mm long with green head and yellowish green body speckled with dark green sripes. Adult has greenish brown head and thorax with a white lateral stripe; abdomen brown with a black dorsal patch. Forewings are brown with one discal line parallel to outer margin. Hind wings are black.

Management

Hand picking and destruction of caterpillars in initial stage of attack.

Spray endosulfan 35 EC 1.0 L or carbaryl 50 WP 1.0 kg in 500 L water per ha

4. Sphinx caterpillar: *Agrius convolvuli* (Sphingidae: Lepidoptera)

See under Sweet potato

5. *Pentalonia nigronervosa* (Aphididae: Hemiptera)

See under banana

6. Aphis gossypii

See under cotton

7. Thrips: *Heliothrips haemorrhoidalis* (Thripidae, Thysanoptera)

Silvery white patches and faecalglobles on leaves.Nymph: Freshly hatched whitish; fully grown greenish brown. Adult: Dark brown.

Minor pests of colocasia

- Thrips: *Caliothrips indicusi* (Thripidae: Thysanoptera)
- Grasshopper: *Gesonula punctifrons* (Acrididae: Orthoptera)
- Tingid: *Stephanitis typicus* (Tingidae: Hemiptera)
- Horned caterpillar: *Hippotion oldenlandiae* (Sphingidae: Lepidoptera)

Question paper on Tubers

1.	---------- tunnels into foliage, stem and tubers which lead to loss of leaf tissue, death of growing points and weakening or breaking of stems **Potato tuber moth**	
2.	Potato tuber moth is a pest of storage as well as field. Say **True** or false	
3.	Fumigation of godowns in airtight condition with carbon disulphide (CS_2) or a mixture of carbon disulphide and carbon tetrachloride or methyl bromide is the control measure for ---------- **Potato tuber moth**	
4.	Both grubs and adults of epilachna beetle feed on leaf tissues and skeletonize potato leaves completely. Say **True** or False	
5.	---------- and ---------- type of antenna is found in male and female sex of Bihar hairy caterpillar **Pectinate** and **filiform**	
6.	What is the scientific name of tussock moth ---------- **Dasychira mendosa**	
7.	Barrel shaped eggs is laid by ---------- **Green stink bug**	
8.	The scientific name of blue pansy is ---------- **Precis orithya**	
9.	Name the brownish red tortoise beetle infesting sweet potato **– *Aspidomorpha miliaris***	
10.	Sweet potato weevil has ---------- type of antenna – **Non geniculate**	
11.	Which pest feeds on tender foliage and grown up larva cuts the stem at collar region.	
	a. Potato tuber moth	b. **Potato cutworm**
	c. Shoot borer	d. Tussock moth
12.	Which is the tiny insect which sucks sap from ventral surface of leaves and devitalize	

	a. Leaf hopper	b. Aphid
	c. **Whitefly**	d. Thrips
13.	Site of pupation for sphinx caterpillar in tubers	
	a. **Soil**	b. Leaf
	c. Inside tubers	d. Within leaf

IV. TAPIOCA

Common Name	Scientific Name	Family	Order
Major pests			
Cassava scale	*Aonidomytilus albus*	Diaspididae	Hemiptera
Whitefly	*Bemisia tabaci*	Aleyrodidae	Hemiptera
Spiraling whiteflies	*Aleurodicus dispersus*	Aleyrodidae	Hemiptera
Mealy bug			
Minor pests			
Thrips	*Retithrips syriacus*	Thripidae	Thysanoptera
Red spider mites	*Tetranychus urticae*	Tetranychidae	Acari

Major pests

1. Cassava scale : *Aonidomytilus albus* (Diaspididae: Hemiptera)

Distribution and status: India, Africa.Major pest in tapioca growing regions

Damage symptoms

Scales infest stems. Leaves of attacked plants become discoloured and dry up. In severe cases desiccation of the stem and death of plants occur. Stunting of the plants results from thousands of the scales feeding on the stems.

Bionomics

This is a hard scale, oval and mussel-like. Male is winged. Eggs are laid inside scale. They hatch in 4 days. Nymphs are active and move on stems spreading to new areas of new stems. They settle close to one another, feed on sap and become full grown in 20

to 25 days. Pest is distributed through movement of crawlers, winged males and infested stems.

Management

1. Select pest-free setts for planting
2. Collect and burn the stems infested with scales
3. Encourage activity of coccinellid predators, *Chilocorus nigritus*
4. Dip setts in methyl demeton 25 EC or dimethoate 30 EC 0.05% or malathion 50 EC 0.1%

2. Whitefly: *Bemisia tabaci* (Aleyrodidae: Hemiptera)

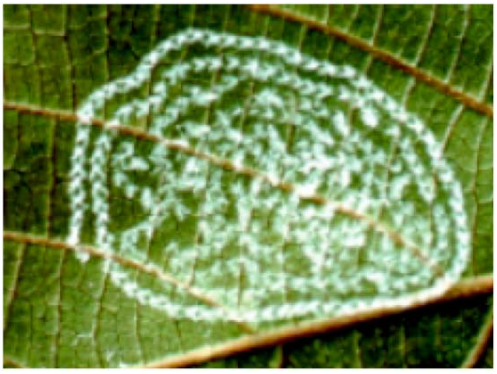
It transmits cassava mosaic disease in tapioca

Refer cotton for more information

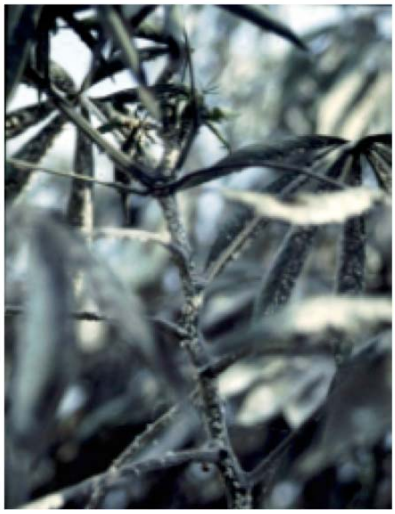
Cassava mosaic symptom

3. Spiraling whiteflies: *Aleurodicus dispersus* (Aleyrodidae: Hemiptera)

Refer Guava



Blackened by spiraling whitefly attack



Minor pests

4. Thrips: *Retithrips syriacus* (Thripidae: Thysanoptera)

Thrips infest both sides of leaves. Infested leaves become discoloured and young plants become stunted. In older plants, leaves dry up and fall.

5. Red spider mites: *Tetranychus urticae* (Tetranychidae: Acari)

They cause damage during rainless summer. Mites infest underside of leaves on either side of the mid-rib. Infested regions turn yellowish. Attacked plants are stunted. Developmental period varies from 9 to 12 days and adult life from 4 to 10 days. A female lays about 4-26 eggs. Mites can be controlled by using acaricides like monocrotophos 750 ml or dicofol 750 ml or wettable sulphur 1.0 kg in 500 L of water per ha