PRACTICAL MANUAL

on

Insect Pests of Vegetable, Ornamental and Spice Crops and Management

HPP 328 3(2+1)

2020

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Syllabus HPP 328 3(2+1)

Study of symptoms, damage, collection, identification, preservation, assessment of damage/population of important insect-pests affecting vegetable, ornamental and spice crops in field and during storage.

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Exercise No.1

Objective: To learn about insect collection equipments

Collecting and identifying insects requires a basic understanding of insect anatomy (morphology), development, and physiology (digestion, reproduction, nervous system, circulation, and respiration), as well as behavior. This exercise deals with the methods of collection of insects, their setting and storage in the insect collection boxes for proper taxonomic studies.

Materials required: ……..

Insect collection net: ……

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Uses: ……..……

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Insect collection box: ……..……

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Light Trap: ……

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Killing Bottle: ……

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Setting Boards: ……

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Cabinets: ……

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Entomological Pins: ……

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Pinning Block: ……

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Draw diagram

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Double mounting (write process): ……

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Pinning of insects in collection box (write process): ……

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Relaxing Jar: ……

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Uses: ……

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Exercise No.2

Objective: To learn about collecting and preservation of insect specimens

How to preserve insects:

Solid Preservation: ……

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Liquid Preservation: ……

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Exercise No. 3

Objective: To study nature, symptoms of damage and management of Insect-pests of Brinjal, Potato and Tomato

Sl. No.	Scientific name	Order: Family	Nature & symptoms of damage	Management
1.	**Brinjal**			
	Brinjal fruit and shoot borer			
	Hadda beetle			
	Brinjal stem borer			
	Brinjal leaf roller			
	Brinjal lace wing bug			
2.	**Potato**			
	Potato tuber moth			
	Greasy cut worm			

	Green peach aphid			
	Cotton whitefly			
3.	**Tomato**			
	Tomato fruit borer			
	Leaf miner			
	Stem borer			
	Caterpillar			

Exercise No. 4

Objective: To study nature, symptoms of damage and management of Insect-pests of Radish, Turnip and Carrot

Sl. No.	Scientific name	Order: Family	Nature & symptoms of damage	Management
1.	**Radish**			
	Painted Bug			
	Cabbage Borer			
2.	**Turnip & Carrot**			
	Pea Leaf Minor			
	Flea Beetle			

Exercise No. 5

Objective: To study nature, symptoms of damage and management of Insect-pests of Cabbage and Cauliflower

Scientific name	Order: Family	Nature & symptoms of damage	Management
Diamond Back moth			
Cabbage Borer			
Cabbage semilooper & Cabbage green semilooper			
Cabbage butterfly			
Tobacco caterpillar			
Crucifer leaf webber			
Cabbage flea beetle			

Exercise No. 6

Objective: To study nature, symptoms of damage and management of Insect-pests of Sweet potato and Walnut

Sl. No.	Scientific name	Order: Family	Nature & symptoms of damage	Management
1.	**Sweet Potato**			
	Sweet Potato weevil			
	Tortoise beetle			
	Tobacco caterpillar			
	Bihar Hairy Caterpillar			
2.	**Walnut**			
	Singhara beetle			

Exercise No. 7

Objective: To study nature, symptoms of damage and management of Insect-pests of Onion and Chilly

Sl. No.	Scientific name	Order: Family	Nature & symptoms of damage	Management
1.	**Onion**			
	Onion Thrips			
	Onion Maggot			
	Tobacco caterpillar			
	Thrips			
2.	**Chilly**			
	Chilly Thrips			

Exercise No. 8

Objective: To study nature, symptoms of damage and management of Insect-pests of Beans and Leafy vegetables

Scientific name	Order: Family	Nature & symptoms of damage	Management
Beans and Leafy Vegetables			
Beetles			
Leafy Vegetable Caterpillar			

Exercise No. 9

Objective: To study nature, symptoms of damage and management of Insect-pests of Cucurbits

Scientific name	Order: Family	Nature & symptoms of damage	Management
Red Pumpkin Beetles			
Melon Fruit Fly			
Pumpkin Caterpillar			
Serpentine leaf miner			

Exercise No. 10

Objective: To study nature, symptoms of damage and management of Insect-pests of Okra

Scientific name	Order: Family	Nature & symptoms of damage	Management
Spotted bollworms			
Red Cotton Bug			
Cotton Jassids			
Cotton whitefly			
Dusky cotton bug			
Cotton leaf roller			

Exercise No. 11

Objective: To study nature, symptoms of damage and management of Insect-pests of Rose

Scientific name	Order: Family	Nature & symptoms of damage	Management
Rose Aphid			

Exercise No. 12

Objective: To study nature, symptoms of damage and management of Insect-pests of Lily and Jasmine

Scientific name	Order: Family	Nature & symptoms of damage	Management
Lily Moth			
Jasmine Leaf Webworm			
Jasmine gallery worm			
Jasmine budworm			
Jasmine thrips			

Exercise No. 13

Objective: To study nature, symptoms of damage and management of Insect-pests of Chrysanthemum and Sunflower

Scientific name	Order: Family	Nature & symptoms of damage	Management
Chrysanthemum			
Aphids			
Thrips			
Leaf Folder			
Leaf Miner			

Red Spider Mite			
Sunflower			
Head Borer			
Bihar Hairy Caterpillar			
Semilooper			

Exercise No. 14

Objective: To study nature, symptoms of damage and management of Insect-pests of Cardamom and Large Cardamom

Scientific name	Order: Family	Nature & symptoms of damage	Management
Cardamom			
Banana Aphids			
Cardamom Thrips			
Rhizome Weevil			
Cardamom Hairy Caterpillar			

Cardamom Whitefly			
Large Cardamom			
Banana Aphid			
Grapevine Thrips			

Exercise No. 15

Objective: To study nature, symptoms of damage and management of Insect-pests of Ginger and Garlic

Scientific name	Order: Family	Nature & symptoms of damage	Management
Ginger			
Scale			
Castor Capsule Borer			
Skipper Butterfly			
Garlic			
Onion Thrips			

Exercise No. 16

Objective: To study nature, symptoms of damage and management of Insect-pests of Coriander and Black Pepper

Scientific name	Order: Family	Nature & symptoms of damage	Management
Coriander			
Coriander Aphid			
Cotton Whitefly			
Black Pepper			
Pollu Beetle			
Pepper Shoot Borer			

Exercise No. 17

Objective: To study nature, symptoms of damage and management of Insect-pests of Cinnamon and Turmeric

Scientific name	Order: Family	Nature & symptoms of damage	Management
Cinnamon			
Cinnamon Butterfly			
Cinnamon Leaf Miner			
Turmeric			
Skipper Butterfly			
Castor Capsule Borer			
Bihar Hairy Caterpillar			

Exercise No. 18

Objective: To study the insect pests during storage

Sl. No.	Scientific name	Order: Family	Nature & symptoms of damage	Management
1.	Potato tuber moth			
2.	Weevils			

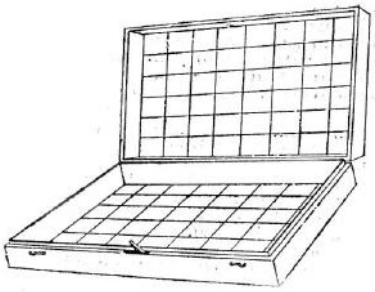
INSECT COLLECTION EQUIPMENTS

Insects occurs everywhere and make up more than half of all living things on earth. For proper identification of the insect pests, it is essential to collect the adult insects from the plant nurseries, agro and natural ecosystem and natural or cultivated forests in different seasons. Collecting and identifying insects requires a basic understanding of insect anatomy (morphology), development, and physiology (digestion, reproduction, nervous system, circulation, and respiration), as well as behavior. This exercise deals with the methods of collection of insects, their setting and storage in the insect collection boxes for proper taxonomic studies.

Insect collection net

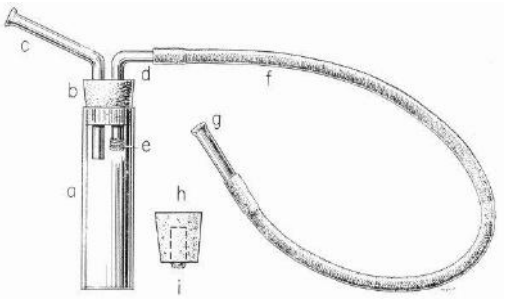
- There are three basic types of insect collecting nets that are available for collecting insects like: aerial, aquatic, and sweeping nets.
- Basically, a collecting net consists of a long wooden/iron handle fitted with a metal ring, holding the cloth or fine mesh.
- The metal ring is about 30-40 cm dia. With an iron or wooden handle. Rotate the loop of the net by 90^0 immediately after trapping a flying insect.
- The net may be used for aerial collection of insects like butterflies, dragonflies, wasps etc.

Insect collection box



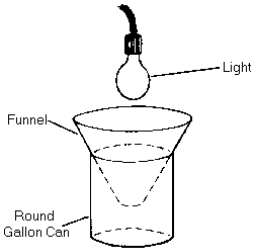
- The insect collection boxes are used to storage of the mounted insects specimens.
- The size of the collection boxes is 17.5x12x4 deep lined in both the inner side with soft cork and covered with white paper.
- Proper space are left on both the side of the boxes to put paradichlorobenzene crystals.
- Naphthalene balls fixed to the head of the ordinary pins by heating may also be kept inside the box to repel the insect scavengers.

Aspirator



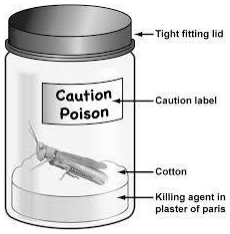
- Simple device for collecting small insects from vegetation.
- It consists of a tube or bottle with two holes bored in its cork for the insertion of two glass tubes.
- Each tube is fitted with a length of rubber tube to give range and flexibility, around the inner end of the suction tube is tied with a small piece if fine muslin cloth to prevent the entry of insects.
- The end of the inlet tube, is bought down close to the insect to suck into the container by sucking the air through the mouth through the suction tube.
- After collection, the insect can be tapped to the bottom and an ordinary cork quickly fitted, the cork with tubes being put into a new container.

Light trap



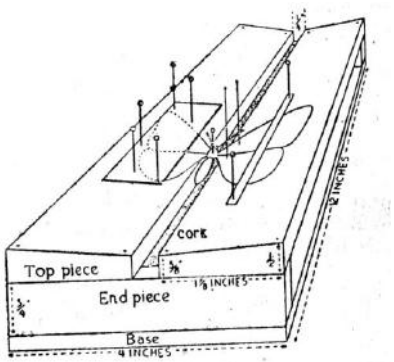
- This device is used to collect the photophilic insects.
- A 200 watt bulb or mercury vapor bulb is fitted over a metal funnel which is connected with a container at its base for insect collection.
- The light trap may remain lighted from dusk to dawn to attract the several species of insects.

Killing bottle



- This device is useful to kill the insects without causing any external injury.
- After collection insect should be killed as quickly as possible in a killing bottle.
- Any wide mouthed bottle can be used for preparing a killing bottle which is deadly poisonous.
- Above the bottom of the killing bottle, put cyanide layer over which a thick saw dust layer is kept and finally, a thick paste of plaster of Paris is poured to form a 1.0 cm thick layer over saw dust layer.
- Put the live insect in the killing bottle for killing. Remove the insects from the bottle immediately after killing. Destroy the broken/used bottle carefully by burying it. Bottle should be labeled '**POISON**'.

Stretching board:



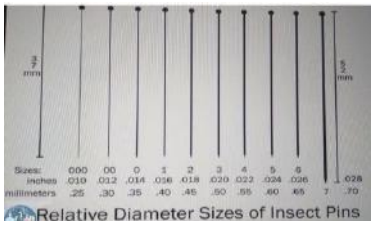
- Moths and butterflies are mounted with their wings spread on the setting boards.
- It is made of parallel strips of wood covered with papered cork sheet and with a space between to receive the bodies of insects.
- Properly pinned insect body is put in the groove so that the wing bases are in level with the near edge of the top pieces.
- Hold the wings at the top level by two narrow strips of paper and pull them forward until the hind margin of the front wing is at right angle to the body axis and the front margin of hind wing is just under the front wing.
- Lay Long strips of card sheet over the spreaded wings and pin them down with large pins inserted close to the wings but not through them.
- Put the specimen in a dry, pest proof container for 2 or 3 weeks.
- After this process the specimen, be removed from the board.
- Save the specimens from ants.

Cabinets

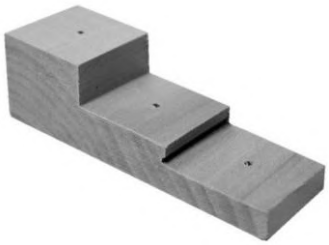
- Cabinet consists of a series of box trays.
- Lined at the bottom with paper covered cork and having removable glass lids.

Entomological pins

- Entomological pins are available of various sizes, length and thickness.
- The pins should made-up of a hard and non-corrosive metal with sharp point and slender in diameter.
- Entomological pins are available from 00 to 05 No.
- Decreasing the number of pin, the pin size and fineness will also be decrease. Size 02 and 03 are the most useful for general collectors.



Pinning block



- It is used to adjust the height of insects as well as labels.
- It is a small wooden piece with three steps.
- Each step has a hole drilled in the centre. This is useful to position legs and other body parts before the insect dries.
- It can also be used as a mounting board by cutting a rectangular slit large enough to position an insect body and allow the wings to lay flat.

Double mounting

- Small insects are glued on small triangular pieces of thick paper.
- A spot of glue is put on the tip and right side of the insect is pressed against the glued surface.
- Set the card of the mounted insect on a regular insect pin.

Pinning of insect in collection box

- To prevent the ingress of insect pests like psocids and beetles etc., saturated solution of camphor, naphthalene or paradichlorobenzene in 1 part chloroform, 1 part colourless creosote and 6 parts benzene (benzol).
- If pests do gain entry, the box should be isolated and fumigated with carbon disulphide. Insects infected with mould must be isolated and painted with an alcoholic solution of mercuric chloride.

Relaxing jar

- It is best to pin insects soon after they die and while they are still relaxed to minimize the breaking of any body parts.
- A relaxing jar is like a killing jar with wide mouth and a tightly fitting lid. Place an absorbent layer (such as sand, cotton, cloth, sponge) in the bottom of the jar.
- Saturate the material with water and add a little carbolic acid or ethyl acetate to inhibit fungus development.
- Place a protective layer (such as cork, cardboard) over the absorbent material. Place insects that need to be softened on the top layer for several days until they are relaxed.

Labels: A specimen in a collection box is accompanied by label bearing essential information. The following information must be written on a label in black India ink.

Host of the Insect:
Locality of collection:
Date of collection:
Name of the insect (with order and family):
Name of the collector:

Pinning

- Generally pure nickel pins, sizes 16 and 20, which are 35 mm and 15 mm long are used for large and small insects.
- These two sizes of pins can be obtained from any entomological supply house.
- Insects are pinned vertically through the body.
- The place where the pin is inserted depends upon the type of insects.

The following rules are followed in pinning the different group of insects.

- Orthoptera (Grasshopper, crickets & locusts etc.)- Pin through the back of the pronotum, slightly to the right of the middle line.
- Hemiptera- (Bugs etc.) – Pin through the scutellum, slightly to right of the middle line.
- Coleoptera (beetles) – Pin through the right elytron (wing cover) about mid way of the body.
- Lepidoptera (butterflies and moths)- Pin between the base of the fore wings.
- Diptera (flies) and Hymenoptera (bees, wasps etc) Pin through the thorax, slightly to the right side of middle line.
- Odonata (dragonflies)- Pin through the middle of the thorax.
- Very small insects be mounted on card points or on minute pins. Card points are small triangle of cardboard or on minute pins. A spot of good glue is put on the angle tip and right side of the insect is pressed against the glued surface.

Collecting Insects: Locating Insects: • on plants (leaves, flowers, bark) • in decaying matter • under rocks, leaf litter • in homes, garages, sheds • in food or clothing • in/on water with nets • on animals • black lights, camp lights, mercury vapor lights around stores and gas stations.

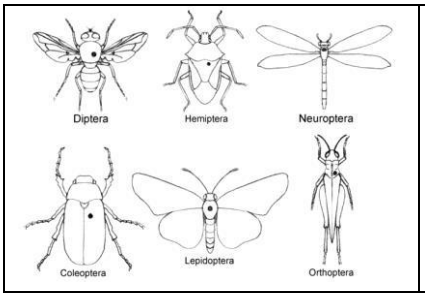
Collecting Insects Basic equipment needed: • sweep net • aerial net • aquatic net • forceps • pitfall traps • killing jar • killing agent (ethyl acetate)

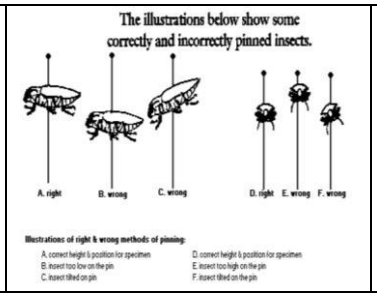
Preserving Insects Materials needed: • "relaxing jar" for dry specimens • insect pins (#s 2,3,7) • Labels (acid free card stock) • permanent black ink pen • box / container • vials (pill vials with tight cap) • Alcohol (75% ETOH preferably) • Magnifier (10X-20X hand lens) • light

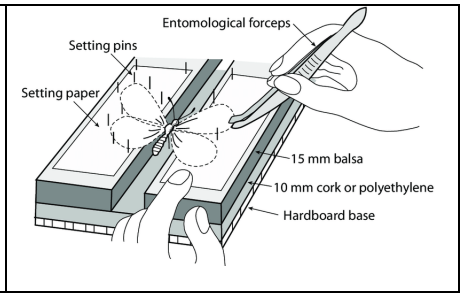
Preserving Insects Once collected: • place in killing jar • allow insect to die • once dead, pin as soon as possible so legs and wings can be positioned easily Detailed pinning instructions • pinning block / support • spreading board

Preserving Insect Specimens Preservation of Hard Bodied Insects

Earwigs, dragonflies, damselflies, grasshoppers, katydids, roaches, mantids, true bugs, tree hoppers planthoppers, cicadas, beetles, moths & butterflies, scorpion flies, dobsonflies, true flies, ants, bees, and wasps
• Specimens 1/4" pinned with #2 or #3 pins
• Large, robust specimens pinned with #7 pins (pinned and dried with appendages visible)





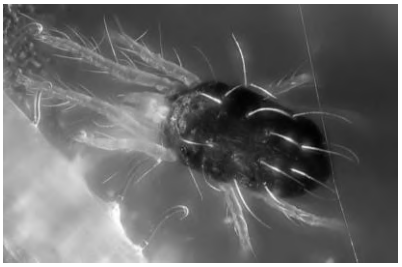
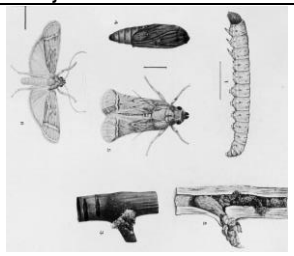
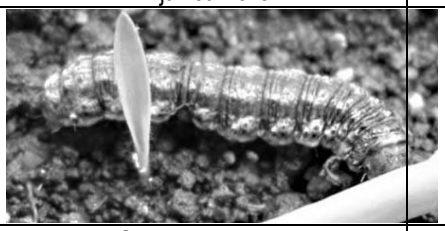
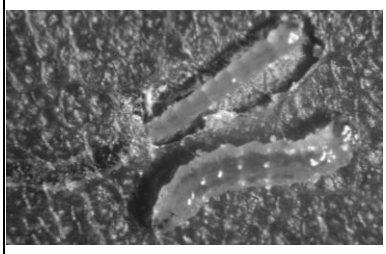
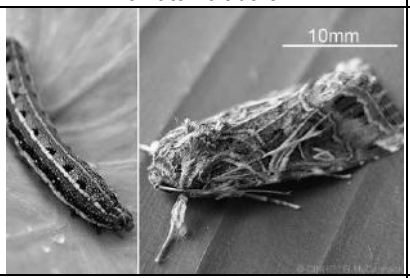


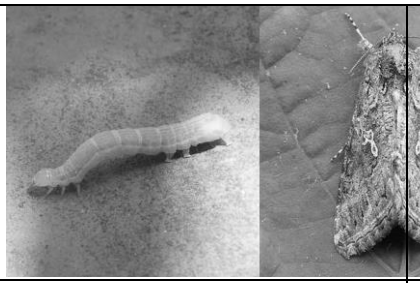
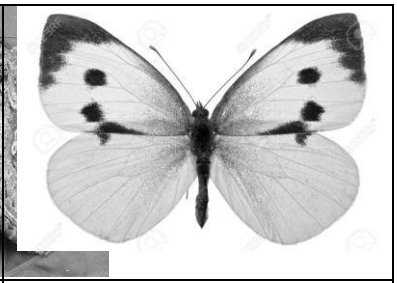
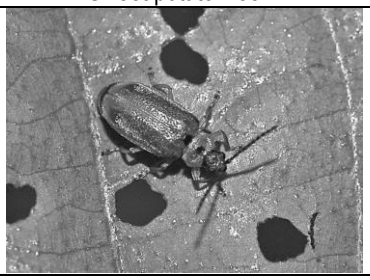
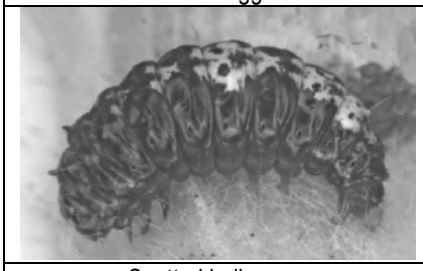
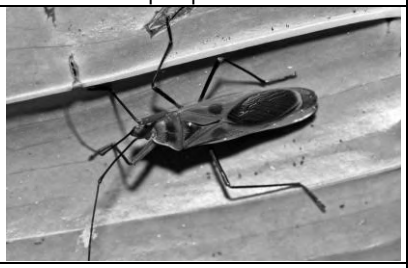
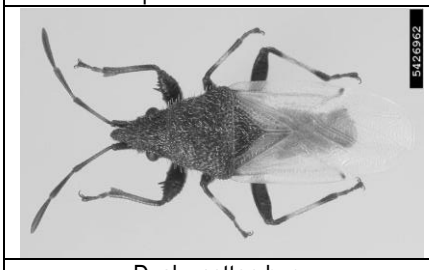
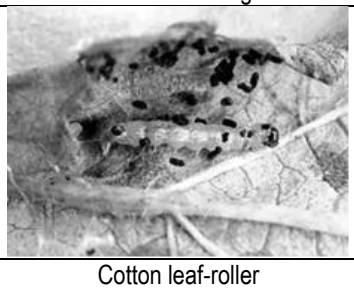
Preservation of Soft Bodied Insects: Springtails, silverfish, aphids and scale insects, web spinners, termites, lice, bark lice, thrips, fleas, and other small or soft-bodied specimens that are easily crushed

- Specimens placed in glass vial with 75% ethyl alcohol or isopropyl alcohol. Insert label with data in #2 pencil or a permanent ink. A screw-cap vial with a tight-fitting lid is preferred for permanent collections.
- Many small insects such as springtails, lice, fleas, thrips, bedbugs, and bat flies are cleared and then permanently mounted in balsam on microscope slides.

INSECT-PESTS

Common Name	Scientific Name	Order	Family
Brinjal			
Brinjal shoot and fruit borer	*Leucinodes orbonalis*	Lepidoptera	Pyralidae
Hadda beetle	*Henosepilachna vigintioctopunctata, H. dodecastigma*	Coleoptera	Coccinellidae
Brinjal stem borer	*Euzophera perticella*	Lepidoptera	Pyralidae
Brinjal leaf roller	*Eublema olivacea*	Lepidoptera	Noctuidae
Brinjal Lace-wing bug	*Urentius sentis*	Hemiptera	Tingidae
Potato			
Potato tuber moth	*Phthorimaea operculella*	Lepidoptera	Gelechiidae
Greasy cutworm	*Agrotis ipsilon*	Lepidoptera	Noctuidae
Green peach aphid	*Myzus persicae*	Hemiptera	Aphididae
Cotton whitefly	*Bemisia tabaci*	Hemiptera	Aleyrodidae
Tomato			
Tomato fruit borer	*Helicoverpa armigera*	Lepidoptera	Noctuidae
Serpentine Leaf miner	*Liriomyza trifolii*	Diptera	Agromyzidae
White fly	*Bemisia tabaci*	Hemiptera	Aleyrodidae
Tobacco caterpillar	*Spodoptera litura*	Lepidoptera	Noctuidae
Radish, Turnip and Carrot			
Painted Bug	*Bagrada hilaris*	Hemiptera	Pentatomidae
Cabbage Borer	*Hellula undalis*	Lepidoptera	Pyralidae
Pea leaf-miner	*Chromatomyia horticola*	Diptera	Agromyzidae
Flea Beetle	*Chaetocnema basalis*	Coleoptera	Alticidae
Cabbage, Cauliflower, Knol Khol, Radish and Broccoli			
Diamond Back Moth	*Plutella xylostella*	Lepidoptera	Plutellidae
Cabbage Semilooper & Cabbage green Semilooper	*Thysanoplusia orichalcea* & *Trichoplusia ni*	Lepidoptera	Noctuidae
Cabbage butterfly	*Pieris brassicae*	Lepidoptera	Pieridae
Tobacco Caterpillar	*Spodoptera litura*	Lepidoptera	Noctuidae
Cabbage borer	*Hellula undalis*	Lepidoptera	Crambidae
Crucifer Leaf-webber	*Crocidolomia binotalis*	Lepidoptera	Pyralidae
Cabbage flea beetle	*Phyllotreta cruciferae*	Coleoptera	Chrysomelidae
Cabbage aphid,	*Brevicoryne brassicae*	Hemiptera	Aphididae
Sweet Potato			
Sweet potato weevil	*Cylas formicarius*	Coleoptera	Apionidae
Tortoise beetle	*Aspidomorpha miliacis*	Coleoptera	Cassididae
Tobacco caterpillar	*Spodoptera litura*	Lepidoptera	Noctuidae
Bihar hairy caterpillar	*Spilosoma obliqua*	Lepidoptera	Arctiidae
Walnut			
Singhara beetle	*Galerucella birmanica*	Coleoptera	Chrysomelidae
Onion			
Onion thrips	*Thrips tabaci*	Thysanoptera	Thripidae
Onion maggots	*Delia antiqua*	Diptera	Anthomyiidae
Thrips	*Caliothrips indicus*	Thysanoptera	Thripidae
Tobacco caterpillar	*Spodoptera litura*	Lepidoptera	Noctuidae
Chilly			
Chilly thrips	*Scirtothrips dorsalis*	Thysanoptera	Thripidae
Cucurbits			
Red pumpkin beetle	*Raphidopalpa foveicollis, Aulacophora intermedia, A. cincta*	Coleoptera	Chrysomelidae
Melon fruit fly	*Bactrocera cucurbitae, B. tau, B. dorsalis*	Diptera	Tephritidae
Pumpkin caterpillar	*Diaphania indica*	Lepidoptera	Pyralidae
Serpentine leaf miner	*Liriomyza trifolii*	Diptera	Agromyzidae
Okra			
Spotted bollworms	*Earias vitella, E. insulana*	Lepidoptera	Noctuidae
Red cotton bug	*Dysdercus koenigii*	Hemiptera	Pyrrhocoridae
Cotton jassid	*Amrasca biguttula biguttula*	Hemiptera	Cicadellidae
Cotton whitefly	*Bemisia tabaci*	Hemiptera	Aleyrodidae
Dusky cotton bug	*Oxycarenus hyalinipennis*	Hemiptera	Lygaeidae
Cotton leaf-roller	*Sylepta derogata*	Lepidoptera	Pyralidae
Gram pod borer	*Helicoverpa armigera*	Lepidoptera	Noctuidae
Aphids	*Aphis gossypii*	Hemiptera	Aphididae
Red spider mite	*Tetranychus* spp.	Class: Acarina	Tetranychidae

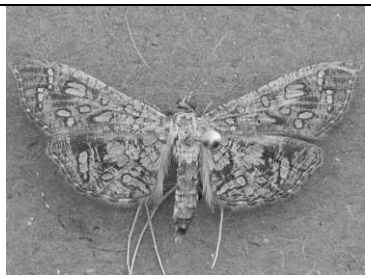
		
Brinjal shoot and fruit borer	Red spider mite	Hadda beetle
		
Brinjal stem borer	Brinjal leaf roller	Brinjal Lace-wing bug
		
Potato tuber moth	Greasy cut worm	Green peach aphid
		
Cotton whitefly	Tomato fruit borer	Serpentine Leaf miner larva
		
Serpentine Leaf miner adult	Tobacco caterpillar	Painted Bug
		
Cabbage Borer	Pea leaf-miner	Flea Beetle

		
Diamond Back Moth	Cabbage Semilooper & Cabbage green Semilooper	Cabbage butterfly
		
Brevicoryne brassicae	Sweet potato weevil	Tortoise beetle
		
Bihar hairy caterpillar	Singhara beetle	Onion thrips
		
Onion maggots	Red pumpkin beetle	Melon fruit fly
		
Spotted bollworms	Red cotton bug	Cotton jassid
		
Dusky cotton bug	Cotton leaf-roller	Aphids

INSECT-PESTS OF ORNAMENTAL CROPS

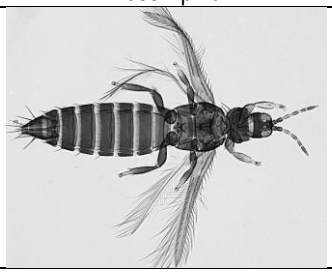
Common Name	Scientific Name	Order	Family
Rose, Lily, Jasmine, Chrysanthemum, Sunflower			
Rose Aphid	*Macrosiphum rosaeformis*	Hemiptera	Aphididae
Jasmine leaf webworm	*Nausinoe geometralis*	Lepidoptera	Pyraustidae
Jasmine gallery worm	*Elasmopalpus jasminophagus*	Lepidoptera	Pyralidae
Jasmine bud worm	*Hendecasis duplifascialis*	Lepidoptera	Pyraustidae
Jasmine Thrips	*Thrips orientalis*	Thysanoptera	Thripidae
Lily moth	*Plytela gloriosae*	Lepidoptera	Noctuidae
Banded Blister Beetle	*Mylabris phalerata*	Coleoptera	Meloidae
Milkweed bug	*Lygaeus civilies*	Hemiptera	Lygaeidae
Sunflower Lacewing bug	*Cadmilos retiarius*	Hemiptera	Tingidae
Hollyhock tingid bug	*Urentius euonymus*	Hemiptera	Tingidae
Ak butterfly	*Danais chrysippus*	Lepidoptera	Nymphalidae
Cotton aphid	*Aphis gossypii*	Hemiptera	Aphididae
Cotton whitefly	*Bemisia tabaci*	Hemiptera	Aleyrodidae
Dusky Cotton bug	*Oxycarenus hyalinipennis*	Hemiptera	Lygaeidae
Red Cotton bug	*Dysdercus koenigii*	Hemiptera	Pyrrhocoridae
Citrus psylla	*Diaphorina citri*	Hemiptera	Aphalaridae
Groundnut aphid	*Aphis craccivora*	Hemiptera	Aphididae
Grapevine thrips	*Rhipiphorothrips cruentatus*	Thysanoptera	Thripidae
Bihar hairy caterpillar	*Spilarctia obliqua*	Lepidoptera	Arctiidae
Castor hairy caterpillar	*Euproctis lunata*	Lepidoptera	Lymantriidae
Pea Leaf miner	*Chromatomyia horticola*	Diptera	Agromyzidae
Cotton grey weevil	*Myllocerus undecimpustulatus*	Coleoptera	Curculionidae
Groundnut white grub	*Holotrichia consanguinea*	Coleoptera	Scarabaeidae

Rose Aphid

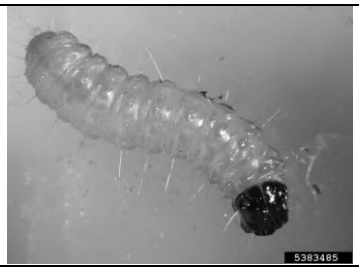


Jasmine leaf webworm

Jasmine gallery worm



Jasmine Thrips



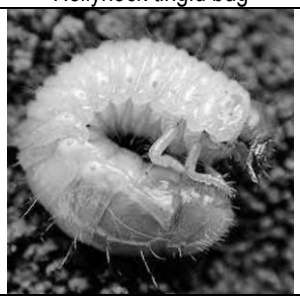
Jasmine bud worm

Lily moth

Sunflower Lacewing bug

Ak butterfly

Citrus psylla

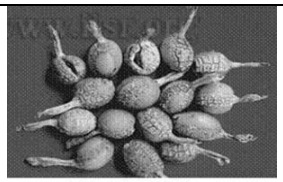
		
Banded Blister Beetle	Milkweed bug	Hollyhock tingid bug
		
Castor hairy caterpillar	Cotton grey weevil	Groundnut white grub
		
Groundnut aphid	Grapevine thrips	Pea Leaf miner

INSECT PESTS OF SPICE CROPS:

Common Name	**Scientific Name**	**Order**	**Family**
Cardamom and Large Cardamom			
Banana aphid	*Pentalonia nigronervosa*	Hemiptera	Aphididae
Cardamom thrips	*Sciothrips ardamom*	Thysanoptera	Thripidae
Cardamom whitefly,	*Kanakarajiella ardamom*	Hemiptera	Aleyrodidae
Rhizome weevil	*Prodioctes haematicus*	Coleoptera	Curculionidae
Cardamom hairy caterpillars	*Eupterote cardamom*	Lepidoptera	Bombycidae
Grapevine thrips thrips	*Rhipiphorothrips cruentatus*	Thysanoptera	Heliothripidae
Ginger and Garlic			
Scale	*Aspidiotus hartii*	Hemiptera	Diaspididae
Castor capsule borer	*Dichocrocis punctiferalis*	Lepidoptera	Pyralidae
Skipper butterfly	*Udaspes folus*	Lepidoptera	Hesperidae
Coriander			
Cotton aphid	***Hyadaphis coriandri***	**Hemiptera**	**Aphididae**
Skipper butterfly	*Udaspes folus*	Lepidoptera	Hesperidae
Castor shoot borer	*Dichocrocis punctiferalis*	Lepidoptera	Pyralidae
Bihar hairy caterpillar	*Spilarctia obliqua*	Lepidoptera	Arctiidae
Black Pepper			
Pollu Beetle	*Longitarsus nigripennis*	Coleoptera	Chrysomelidae
Pepper Shoot borer	*Cydia hemidoxa*	Lepidoptera	Tortricidae
Cinnamon			
Cinnamon Butterfly	*Chilasia clytia*	Lepidoptera	Papilionidae
Cinnamon Leaf miner	*Phyllocnistis chrysophthalina*	Lepidoptera	Phyllocnistidae
Turmeric			
Skipper butterfly	*Udaspes folus*	Lepidoptera	Hesperidae
Castor shoot borer	*Dichocrocis punctiferalis*	Lepidoptera	Pyralidae
Bihar hairy caterpillar	*Spilarctia obliqua*	Lepidoptera	Arctiidae

Banana Aphid

Cardamom White fly

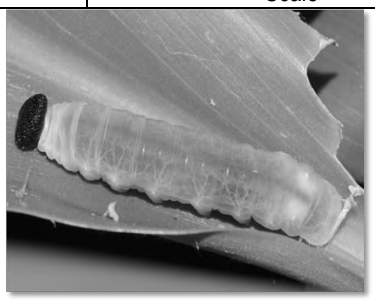


Cardamom Thrips

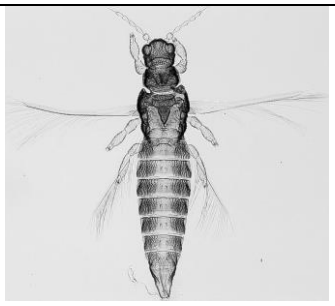
Cardamom Hairy caterpillar

Rhizome weevil

Scale



Skipper butterfly



Grapevine thrips

Castor capsule borer

Cotton aphid

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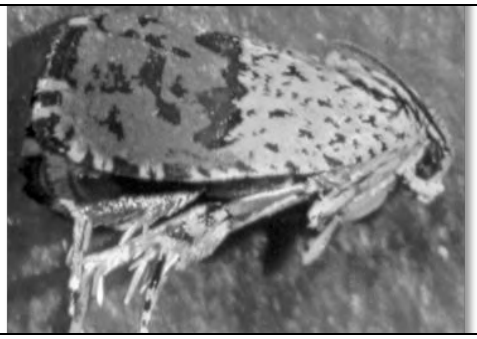
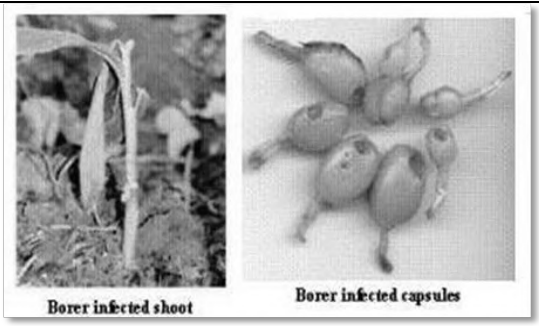
<tr><td>  </td><td> 
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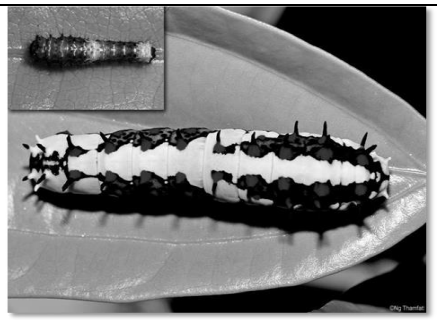
<tr><td>  </td><td>  </td></tr>
<tr><td colspan="2">Cinnamon Butterfly</td></tr>
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<tr><td colspan="2">Cinnamon leaf miner</td></tr>
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