

COURSE CODE:	CPT 501
COURSE TITLE:	INSECT PESTS OF TROPICAL CROPS
NUMBER OF UNITS:	2 UNITS
COURSE DURATION:	TWO HOURS PER WEEK

COURSE DETAILS:

Course Coordinator:	DR. OSIPITAN ADEBOLA ADEDOYIN, <i>B. Sc. M. Sc. Ph. D.</i>
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Other Lecturers:	DR. PITAN OLUFEMI RICHARD

COURSE CONTENT:

Life cycles and economic importance of insect pests of arable and permanent crops in the tropics e.g. Maize, Rice, Cowpea, Cassava, Yam, Oil-palm, Cocoa, Kola, Cashew, Okra, Garden egg, Tomatoes, Fruits, etc

PRACTICAL:

- (i) Observation, description and identification of insect pest activities on arable and permanent crops
- (ii) Collection of insect pests of arable and permanent crops
- (iii) Preparation of collected insect specimens for insect box

Visit to insect museum

COURSE REQUIREMENTS:

The course is compulsory for students majoring in Crop Protection. Students are expected to attend classes and participate in all practical activities. The student must have minimum of 75 % attendance to be able to write the final examination. Lateness to classes will not be tolerated.

READING LIST:

1. Common African Pest and Diseases of Cassava, Yam, Sweet potato and Cocoyam. Edited by Robert L Theberge. International Institute of Tropical Agriculture, Ibadan, Nigeria. 69PP.
2. Natural Crop Protection in the Tropics. Gabystoll. 188PP
3. Insect Pests of Tropical Food Legumes. Edited by S.R Singh, International Institute of Tropical Agriculture, Ibadan, Nigeria. 451 pp.

LECTURE NOTES

A. INSECT PEST OF MAIZE

(i) ***Cicadulina mbila* (Maize leaf hopper)**. The most important leaf hopper of maize is *Cicadulina mbila*. The insect does not cause economically significant damage through its feeding but is economically important because it transmits the maize streak virus.

(ii) ***Busseola fusca* (Maize stalk borer)**. They attack only graminaceous crops especially maize and sorghum. The major economic effect of *B. fusca* is typical rows of concentric holes called "Windows" caused by feeding and mining activities of young caterpillars.

(iii) ***Sesamia calamistis* (Pink Stalk Borer)**. Adult moth is pale yellow with dark markings on the forewings. The boring activity of larvae into the stem of the crop weakens the stem mechanically and reduces crop yield.

(iv) ***Eldana saccharina* (Sugarcane Stalk Borer)**. They are often the most important borer species at the end of the growing season. They cause damage by boring into the cob, weakening the stem and making it prone to lodging.

(v) ***Heliothis armigera* (American Bollworm)** The insect lays round, yellow-brown eggs (100-1500 per female) singly on young buds, stalks or fruit.

(vi) ***Spodoptera* spp. (Army worms)** – army worms are the caterpillars of a number of different moths of the genus *Spodoptera*. The spp include *S. littoralis* (Egyptian cotton leaf worm), *S. exempta* (African army worm), *S. litura* (Cotton leaf worm). They occasionally act as cut worms.

(vii) ***Heteronychus* sp. (Black maize beetle)** – Adult beetles are black, roundish and 15- 20mm long. A single beetle can eat through several plants in row and can cause dead-heart effect.

(viii) ***Sitophilus zeamais* (Maize weevil)**. These are small brown to dark brown or almost black weevils with a long snout or rostrum and an elbowed antenna which ends in distinct claws. The life cycle is completed in about 5 weeks at 30°C and 70% R.H.

B. INSECT PESTS OF COWPEA

1. **Pod Sucking Bugs:** There are several species of pod sucking bugs that are frequently found on cowpea plants. The most important ones are:

(a) ***Anoplocnemis curvipes***. The insect is a black fairly large coreid; fully grown bugs are about 3.0cm long. Adult bugs suck the sap of the green pods and they shrivel and dry prematurely.

(b) ***Clavigralla tomentosicollis***. Adult bugs are light brown, sluggish and about 1.2cm long with males generally smaller than female. Eggs are laid in batches of 10-70 and on the average about 200 eggs are laid by each female on the cowpea plants. The bug has five instars which are similar and the total nymphal period is about 14 days.

(c) ***Riptortus dentipes***. The insects are brown, about 2.0cm long, cylindrical coreid bugs with a characteristic whitish or yellow line on both sides of the ventral surface.

(d) ***Nezara viridula* (Green Sting Bug)**. The entire life cycle takes 30 - 60 days. Adults suck the sap from pods, causing premature drying and hindering seed formation. The bugs also inject a fungus *Nematospora coryli* into the developing seed.

(e) ***Aspavia armigera* (Fabricius)**. The insect is a sporadic pest of cowpea in Africa. Adults are brown with large scutellum and three white or orange angular spots. They mostly lay their eggs on cowpea.

2. FOLIAGE BEETLE

(a) ***Ootheca mutabilis***. The beetle is about 6mm long, oval and light brown or black. The adult lays eggs in the soil; larvae feed on the plant roots and pupate in the soil and adult emerge immediately after rains. The beetle is the most important vector of Cowpea mosaic Virus (CPMV).

3. STEM AND POD BORER

(a) ***Maruca testulalis***. The moth is light brown with whitish markings on forewings and nocturnal in habit. About 150 eggs are laid by female. There are five larval instars and the larval instars period varies between 8 - 13 days.

4. LEGUME BUD THRIPS

(a) ***Megalurothrips sjostedti***. The thrips are shiny black and are found easily in cowpea flowers. They have two larval instars, a pre pupa and a pupa stage. The nymphs and adults feed on flower buds and can completely suppress flower production.

5. LEAF HOPPERS

(a) ***Empoasca dolichi***- Leafhoppers are greenish and are found feeding on the underside of the leaf. Life cycle takes about 20 days. Characteristic damage symptoms are leaf cupping or curling and later the leaves dry and fall off.

6. STORAGE INSECT PEST

(a) ***Callosobruchus maculatus*** is a small beetle with dark markings on elytra. Adult lay eggs on the seeds surface. The larvae after hatching in about 6days enter the seeds and spend the rest of the life cycle inside. The adults have a short life span of 5 - 8days. The entire life cycle takes about 30days.

3. INSECT PEST OF RICE

(a) **Rice Stem Borers:** Stem or stalk borers are found wherever rice is grown and are usually present in the greatest numbers at the end of the rainy season. The most important ones are:

- (i) *Chilo polychrysus* – Dark-headed Rice Stem Borer
- (ii) *Chilo suppressalis* – Stripped Rice Stem Borer
- (iii) *Sesamia inferens* – Purple Stalk Borer
- (iv) *Scirpophaga innotata* – White Paddy Stem Borer
- (v) *Scirpophaga incertulas* – Yellow Paddy Stem Borer

The developmental cycle of all stem borers is similar. The adult female moth lays about 200 eggs on the leaves or sheaths of the rice plant. The caterpillars hatch after 5 – 10 days and begin to feed on the leaves; they later bore into the stalk and feed on the plant.

(b) **Rice hoppers:** Rice hoppers devour rice and inflict great damage because they are carriers of destructive virus diseases. The most important ones are:

- (i) *Nilaparvata lugens* - Brown Rice Plant Hopper
- (ii) *Nephotettix nigropictus* – Green Rice Leaf Hopper
- (iii) *Nephotettix furcifera* –White-backed Rice Plant Hopper
- (iv) *Recilia dorsalis* – Zigzag Rice Leaf Hopper

The life cycle is completed in 3 weeks and 6 generations are possible in a year.

D. INSECT PEST OF CASSAVA

- (i) ***Zonocerus variegatus*** (Elegant Grasshopper)

The nymphs are black with yellow ringed legs and antennae. The adults (3.5cm long) are dark green, boldly patterned with yellow, black and orange. There are five instars and total nymphal period is about 4 months. Adult life span is 3 - 4 months.

(ii) *Mononychellus tanajoa* or *M. Progresivus* (Cassava Green Mites)

They are smaller than many spider mites, green in colour at a young age turning yellowish as adult. Adult female produce between 20 – 90 eggs during a life time of 4 weeks. Developmental time from egg to adult is about 14 days.

(iii) *Phenacoccus manihoti* – Cassava mealy bug. Live adult female are pinkish in colour, 1-3mm in length. Life cycle from egg to adult takes 33 days at 27°C. *P. manihoti* is a parthenogenetic species

(iv) *Bemisia tabaci* (Tobacco white fly) -. The eggs are 0.2mm in size, pear-shaped and white when first laid, but later turns brown. They hatch after about 7 days. The total nymphal period last 2 - 4 weeks according to temperature. They are particularly important as vector of Cassava Mosaic Virus.

E. INSECT PEST OF YAM

(i) *Heteroligus* sp. (*H. meles* and *H. appius*) - Yam Tuber Beetles: Female *H. meles* lay eggs in moist soil in swampy breeding site. Development is completed in 4-5months.

(ii) *Crioceris livida* and *Lema armata* – Yam Leaf Beetles. Adult *C. livida* is red- brownish to black with hard wings or elytra that are yellow to brown with black spots. The larvae of both species are shiny. Female beetles lay eggs in clusters on the underside of the leaves. Pupation takes places in the soil and the total developmental period is 3 - 4 weeks.

F. PEST OF FRUITS

(i) *Cryptophlebia leucotreta* – False Codling Moth. These are little brown moth with wing span of about 16mm. Flattish, oval and whitish eggs are laid singly on ripening fruit. Larvae emerge after 3 - 6days. Pupation takes places in the soil in cocoon made of silk and earth. The moth emerges after 8-12days.

(ii) Fruit Flies

(a) Mango fruits fly - *Ceratitis Cosyra*

(b) Melon fruits fly – *Dacus cucurbitae*

© Mediterranean fruit fly – *Ceratitis capitata*

(d) Natal fruit fly – *Ceratitis rosa*

Fruit flies lay their eggs in groups immediately under the skin of the fruit. Eggs hatch into whitish legless maggots in 2-4 days. Life cycle could be completed in 10 days when the weather is warm.

G. PEST OF VEGETABLE

(a) OKRA - *Hibiscus esculentus* (*Abelmoschus esculentum*)

Insect pests of okra are:

- ***Podagrica* spp- Flea Beetles** - Larvae feed on the roots and the beetles eat numerous small holes in the leaves causing defoliation.
- ***Cyagrus calcaratus* – Leaf Beetles** – Larvae feed on the roots and the beetles eat numerous small holes in the leaves causing defoliation.
- ***Earias biplaga* – Spiny Bud Worms** – Larvae bore into buds destroying them and reducing fruit set. Other insect pests of Okra are:
- ***Empoasca fasciata* – Cotton Jassids**
- ***Aphis gossypii* – Cotton Aphids**
- ***Bemisia tabaci***
- ***Dysdercus superstitionis* – Cotton Stainer**
- ***Sylepta derogata* - Cotton Leaf Roller**
- ***Pectinophora gossypiella* – Pink Bollworms**
- ***Anoplocnemis curvipes* – Pod Sucking Bug.**

(b) GARDEN EGG - *Solanum melongena*

- (i) ***Nezara viridula* – Green Shield Bug** – the bugs feed on the developing flowers, fruits, stem and foliage.
- (ii) ***Pachnoda* spp - Flower beetles** – Adults feed on leaves, flowers and fruits
- (iii) ***Spodoptera littoralis* – Leaf Worms** Larvae or caterpillars feed on foliage and may bore into fruits.
- (iv) ***Podagrica* spp – Flea beetles.** Larvae feed on plant roots and beetles eat numerous small holes in the leaves.

(v) ***Sylepta derogata*** – **Leaf roller**- larvae or caterpillars feed on and roll leaves.

© **TOMATOES** – *Lycopersicon esculentum*

- (i) ***Dysdercus supersticiosus*** - **Cotton stainer** – These piercing and sucking insect feed on plant stems and flower reducing plant vigour.
- (ii) ***Bemisia tabaci*** – **white flies** – Nymphs and adults feed on the underside of leaves. Adults transmit virus disease.
- (iii) ***Heliothis zea*** – **Bud worms** – Larvae bore into buds and fruits enhancing the entry of rot organism.
- (iv) ***Ophideres fullonia*** – **Fruit piercing moths** – Adults pierces fruits during the raining season. This allows entry of rot organism and fruits are destroyed. Other insect pest of tomatoes are:
 - ***Nezara viridula*** – **Green Shied Bug**
 - ***Spodoptera littoralis*** – **Leaf worm**
 - ***S. derogata*** – **Leaf roller**
 - ***Nesidiocoris tenhis*** - **Mirids.**

H. INSECT OF COCOA

(a) COCOA MIRIDS (CAPSIDS)

- (i) ***Sahbergela singularis* (Hagl.) Brown Cocoa Mirid**
- (ii) ***Distantiella Theobroma* (Dist.) Black Cocoa Mirid**
- (iii) ***Helopeltis bergrothi* (Reut) Cocoa Mosquito**

Adult cocoa mirids are 8 -10mm long with distinct humps in the thorax. The eyes protrude and the tip of the antenna are clubbed. Adult female mirid insert her eggs in the green shoots, stems and pod. The egg hatch in 13 - 18days and young nymphs begin to feed on the tree at night. Five nymphal instars are passed in about 4 week. The life cycle is completed in about 40-50days. The feeding injury of these insects allows a die back fungi, *Calonectria rigidiscula* to infect the cocoa tree. The attack of capsid in cocoa plantation leads to capsid pockets and stag head

(b) COCOA MEALYBUGS

(i) *Planococcus citri* (Risso)

(ii) *P. njalensis* (Laing)

(iii) *Ferrisiana virgata* (Ckll)

They are primary important due to their ability to transmit the virus strains collectively called swollen shoots. The females of *P. njalensis* are commonly parthenogenetic. They lay 30-40 eggs which hatch few minutes after being deposited.

© *Selenothrips rubrocinctus* (Giard) - **Red-banded Thrips**. Adult thrips are about 1.5 long and black with fringed wings. Female thrips lay their eggs single on the underside of leaves and cover them with small black spots of excreta. Eggs hatch in 2-3 days. Nymphs develop to adults in about 2 weeks.

(d) *Bathycoelia thalassina* (H. and S.) Cocoa Shied Bugs: - Female deposit 16 eggs in a circle on the pod. Eggs hatch in about 10 days and nymphs feed on the pods.

(e) *Characoma stictograpt* (Hmps) Pod husk miners.

Female moths deposit their eggs on cocoa during the dry season. The eggs hatch and larval development is completed in about 1 month. Other insect pests of cocoa are:

- Scale insect - *Stictococcus sjostedti* (Ckll)
- Red-band Thrips - *S. rubrocinctus* (Giard)
- Stem Borer- *Eulophonotus myrmeleon* (Fidr)
- Spiny Bud Worms - *Earias biplaga* (Wlk)

I. INSECT PEST OF CASHEW- *Anacardium occidentale*

(a) Mirids - *Helopeltis* spp - The feeding injury of these piercing and sucking insects cause leaves to become spotted and curl downward. Fruits become spotted and do not develop properly.

(b) Red-banded Thrips - *Selenothrips rubrocinctus* (Giard) – Cause leaves drying and discolouration.

© **Fruit piercing moths - *Achaea lienardi* (Boisd)** - Moth puncture ripening fruits enhancing the entry of rot organism causing fruit drop.

(d) Flower beetle - *Pachnoda* spp. Beetles feed on buds, blossoms, leaves and fruits. A large robust beetle is about 23cm long. Their larva is a white grub. Eggs are laid in the soil and larvae or grubs feed on decaying vegetable matter and plant roots.

J. INSECT OF KOLA - COLA SPP.

(i) Brown Cocoa Mirids - *Sahlbergella singularis* (Hagl) - The piercing and sucking feeding injury of this insect causes yellow and die back of new growth and distort pod growth.

(ii) Cocoa mosquitoes - *Helopeltis bergrothi* (Reut) - Their piercing and sucking feeding injury cause yellowing and die black of new growth.

(iii) Green Shield Bugs - *Nezara viridula* (L) - They feed on the developing new growth causing yellowing and withering of plant parts.

(iv) Red-Banded Thrips - *Selenothrips rubrocinctus* (Giard) - Their feeding injury cause leaves to wilt and drop.

(v) Mealy bugs - *Planococcoides njalensis* (Laing). The piercing and sucking injury of large colonies of mealy bugs causes yellowing of plants and reduce yield.

(vi) Kola Pod Borers - *Bolanogastriis kolae* (Desbr) and *Sophrorhinus insperatus* (Faust). Female weevils insert their eggs singly in the pods causing them to crack. They are field to store insect pest

(vii) Kola Stem Borer - *Phosphorus virescens* (Olivier) and *P. gabonator* (Thomson)

Adults are long horn beetle, 20-35mm long. Eggs are deposited in shoot. The beetles are found on leaves, shoots chupon and young branches.

(viii) Defoliator – *Anaphe venata* (Btlr). Moths are large with a wing spread of 55- 65 mm. Eggs are deposited on leaves of the host plant and hatch in about 1 month. Pupation takes place in large communal cocoons about mid-August. Other insect pest of kola are:

- *Oecophylla* spp,
- Tailor ants
- *Zonocerus variegatus* (Variegated Locust)
- Termites
- *Characoma stictograpt*. (Pod Husk Miner)
- *Anomis leona* - Defoliators e.t.c.

K. INSECT PEST OF PALM: COCONUT, OIL & DATE.

(i) **Rhinoceros beetles - *Oryctes* spp.** - Rhinoceros beetles are active at night and bore into the young fronds in the top of palms. Female beetles lay up to 150 eggs in the trunks of dead palms or living plants (*O. monoceros*). Other insect pests of palms are: Palm - weevil *Rhycolophorus phoenicis*; Leaf miner - *Coelanomenodera elaidis* (Maulik); Mole cricket - *Gryllotalpa Africana*; variegated locust - *Zonocerus variegatus*; Leaf weevils - *Temnoschoita quadripustulata* (F).