



FACULTY OF AGRICULTURAL SCIENCES & ALLIED INDUSTRIES

Lecture No 5

PESTS OF SORGHUM, PEARL MILLET AND FINGER MILLET

I. PESTS OF SORGHUM More than 150 species of insects have been reported to damage sorghum. However over a dozen species are very serious and constitute a major constraint in sorghum production. Shoot fly, stem borers, shoot and ear head bug and aphids are serious pests that bring reduction in the yield.

Major pests				
1.	Sorghum Shootfly	<i>Atherigona soccata</i>	Muscidae	Diptera
2.	Stem borer	<i>Chilo partellus</i>	Crambidae	Lepidoptera
3.	Pink stem borer	<i>Sesamia inferens</i>	Noctuidae	Lepidoptera
4.	Shoot bug	<i>Peregrinus maidis</i>	Delphacidae	Hemiptera
5.	Earhead bug	<i>Calocoris angustatus</i>	Miridae	Hemiptera
6.	Sorghum midge	<i>Contarinia sorghicola</i>	Cecidomyiidae	Diptera
7.	Plant lice (Aphids)	<i>Rhopalosiphum maidis</i> , <i>Melanaphis sacchari</i>	Aphididae	Hemiptera
Minor Pests				
8.	Earhead web worm	<i>Cryptoblabes gnidiella</i>	Pyraustidae	Lepidoptera
9.	Gram caterpillar	<i>Helicoverpa armigera</i>	Noctuidae	Lepidoptera
10.	Plant bug	<i>Dolycoris indicus</i>	Pentatomidae	Hemiptera
11.	Stink bug	<i>Nezara viridula</i>	Pentatomidae	Hemiptera
12.	Mirid bug	<i>Creontiades pallidifer</i>	Miridae	Hemiptera
13.	Slug caterpillar	<i>Thosea apierens</i>	Cochlididae	Lepidoptera
14.	Leaf roller	<i>Marasmia trapezalis</i>	Pyralidae	Lepidoptera
15.	Flea beetle	<i>Cryptocephalus schestedii</i> , <i>Monolepta signata</i>	Chrysomelidae	Coleoptera
16.	Red hairy caterpillar	<i>Amsacta albistriga</i> , <i>A. moorei</i>	Arctiidae	Lepidoptera
17.	Semilooper	<i>Eublemma silicula</i>	Noctuidae	Lepidoptera
18.	Weevils	<i>Mylocerus maculosus</i> <i>M. discolor</i> , <i>M. subfaciatus</i>	Curculionidae	Coleoptera
19.	Wingless grasshopper	<i>Colemania sphenaroides</i>	Acrididae	Orthoptera

MAJOR PESTS

1.Sorghum Shootfly:

Atherigona soccata (Muscidae: Diptera)

Distribution and status: Maharashtra, Andhra Pradesh, Tamil Nadu and Karnataka

Host range: Maize, ragi, bajra, rice, wheat and grasses.

Damage symptoms: The maggot on hatching migrates to the upper surface of leaf and enters between the leaf sheath and stem. After reaching the soil level, the maggot bores inside the stem and cuts the growing point resulting in “dead heart” symptom. The infested plant produces side tillers. The attack is more severe during summer than kharif season.

Bioeconomics: Adult, a whitish grey female fly lays white, cigar-shaped eggs on the lower surface of leaf blades mostly during morning hours. The egg is white, cylindrical, distal end somewhat flattened. The incubation period varies from 2-3 days. Maggot is dirty white and apodous. Mature larvae are yellow and about 6 mm long. The larval period is 8-10 days and has four larval instars. It pupates at the base of the stem or in soil for 8-10 days. The life cycle is completed in 17-21 days.

ETL: 10% dead hearts or 1 egg / plant

Management

1. Use resistant varieties like Co-1, CSH 15R, Maldandi and Hagari, M35-1, Swati, SPV 491, IS - 18551, 5566, 5285, 5613, ICSV 700, ICSV 705, Phule Yashoda, CSH 7, CSH 8
2. Sow sorghum immediately at the onset of monsoon rains to minimise shootfly damage.
3. Use higher seed rate (12.5 kg/ha) and remove the shoot fly damaged seedlings at the time of thinning or raise nursery and transplant only healthy seedlings.
4. Pull out and destroy plants showing dead hearts at the time of thinning.
5. Set up hanging type of plastic fishmeal trap @ 12/ha till the crop is 30 days old.
6. Treat 100 kg seeds with chlorpyrifos 20 EC 400 ml or quinalphos 25 EC 400 ml or imidacloprid 48 FS 1.2 L or imidacloprid 70 WS 1.0 kg or thiomethoxam 30 FS 1.0 L
7. Granular application of phorate 10 G or carbofuran 3 G to the furrow at the time of sowing at 2.5 kg a.i./ha.

8. Spray endosulfan 35 EC @18 ml, dimethoate 30 EC @ 12 ml and methyl demeton 25 EC @12 ml for an area of 120 m² nursery.

9. Spray any one of the following insecticides in the mainfield - endosulfan 35 EC 500 ml, dimethoate 30 EC 500 ml (250 L of spray fluid/ha).

2. Stem borer:

Chilo partellus (Crambidae: Lepidoptera)

Distribution and status India, Pakistan, SriLanka, Indonesia, Iraq, Japan, Uganda, Taiwan, Sudan, Nepal, Bangladesh and Thailand.

Host range Maize, sorghum, sugarcane, bajra, rice, Sorghum halepense, finger millet, etc.

Damage symptoms: It infests the crop a month after sowing and the damage persists upto emergence of ear heads. Central shoot withering leading to “dead heart” is the typical damage symptom. Bore holes are visible on the stem near the nodes. Young larva crawls and feeds on tender folded leaves causing typical “shot hole” symptom. Affected parts of stem may show internally tunneling caterpillars.

ETL: 10% dead heart

Bionomics: The adult moth is medium in size and straw coloured. It lays about 300 scalelike flat oval eggs in batches on the under surface of leaf near the midrib. The incubation period is 2-5 days. The larva is yellowish brown with a brown head and the prothoracic shield measures about 25 mm long. The larval period is 28 - 50 days with seven instars. It pupates inside the stem and emerges in 7-10 days through the larvae's entry holes as adult. The total life cycle is completed in 30 to 40 days.

Management

1. The stubbles should be ploughed up during winter and burnt to destroy the hibernating larvae.
2. Grow resistant cultivars like E 302, E 303, IS 2205, ICSV 700
3. Dead hearts should be pulled out and used as fodder or buried in manure pits.
4. Sow lab lab or Dolichos as an intercrop in the ratio of 4:1 to minimise the stem borer damage.
5. Set up light trap till midnight to attract and kill the stem borer moths.

6. Bio-control agents viz., *Trichogramma chilonis* (egg parasitoids) minutum, *Bracon chinensis* and *Apanteles flavipes*, (larval parasitoids) should be encouraged.

7. Mix any one of the following insecticides with sand to make up the total quantity of 50 kg and apply in the leaf whorls. Phorate - 10 G 8 kg, carbofuran 3 G 17 kg, endosulfan 4D 25 kg or spray endosulfan 35 EC 750 ml (or) carbaryl 50 WP 1 kg (500 L spray fluid/ha).

3. Pink stem borer: *Sesamia inferens* (Noctuidae: Lepidoptera)

Distribution and status: India, Pakistan, Malaysia, Taiwan, Burma, Bangladesh, Sri Lanka, South East Asia, China, Korea, Japan and Indonesia.

Host range: Sorghum, maize, rice, wheat, sugarcane, bajra and ragi, barley, guinea grasses.

Damage symptoms: The pink larva bores into the stem and damages the central shoot resulting in dead heart.

Bionomics: The adult moth is fawn-colored, with dark brown streaks on the fore wings and white hind wings. The female lays about 150 creamy-white and hemispherical eggs that are arranged in two or three rows between the leaf sheath and the stem of the host plant. Egg period 7 days. The fully grown larvae measures about 25 mm and is pale yellow with a purple pink tinge and a reddish-brown head. The larval period 25 days but in cold months it may be extended to 75 days. Pupation occurs in the larval tunnel in the stem and the adult emerges in 12 days. One generation may take 6-7 weeks. The life cycle is completed in 45-75 days. There are 4-6 generations per year.

Management

1. Release egg parasitoids: *Telenomus* sp., *Trichogramma chilonis*; Larval parasitoids: *Apanteles flavipes*, *Bracon hebetor*; Pupal parasitoid: *Tetrastichus ayyari*

2. Spray endosulfan 35 EC @ 1 L/ha or chlorpyrifos 20 EC 1.0 L / ha or apply carbofuran 3 G @ 25 kg/ ha or cartap hydrochloride 4 G @18.75 kg/ha at every 20 days interval after germination of the crop.

4. Shoot bug:

Peregrinus maidis (Delphacidae, Hemiptera)

Distribution and status: Karnataka, Tamil Nadu Andhra Pradesh and Madhya Pradesh

Host range: Sorghum, maize, rice, millets

Damage symptoms: Adults and nymphs suck sap from plants. The attacked plants become unhealthy stunted and yellow. The leaves wither from top downwards. Panicle formation is inhibited and the plants die if attack is severe. Honeydew secreted by the bug causes growth of sooty mould on leaves. The midribs of the leaves turn red due to egg-laying and may dry up subsequently.

Bionomics: The adult is yellowish brown to dark brown with translucent wings. The brachypterous female is yellowish while macropterous female is yellowish brown and male dark brown. It lays eggs in groups of 1-4 inside the leaf tissue and covered with a white waxy substance. The fecundity of the bug is 97 eggs / female. The egg period lasts for seven days. The nymphal stage undergoes five instars in 16 days. The total life cycle is completed in 18-31 days.

Management

1. Conserve egg parasitoids viz., *Paranagrus optabilis*, *Octetrastichus indicus* and Predators - *Coccinella septumpunctatum*, *Menochilus sexmaculatus*, *Geocoris tricolor*
2. Spray dimethoate or methyl demeton 500 ml in 500 L of water.

5. Earhead bug:

Calocoris angustatus (Miridae: Hemiptera)

Distribution and status: South India

Host range: Pearl Millet, maize, tenai, sugarcane and grasses

Damage symptoms The adults and nymphs damage the earheads by feeding on them. They suck the juice from the grains when they are in the milky stage. The sucked out grains, shrink and turn black in colour and become ill filled (or) chaffy. Older grain shows distinct feeding punctures that reduce grain quality.

Bionomics: Adult male is green in colour and female is green with a brown margin. Blue cigar shaped eggs are laid under the glumes or into the middle of the florets. Each insect lays between 150 and 200 eggs. The egg period is seven days. Nymphs are slender, green in colour. First instar is orange in colour. The nymphal period is 10 - 14 days. The life cycle from egg to adult occupies less than 3 weeks. At least 2 generations of the bug can feed on the same crop when the panicles do not ripen at the same time. ETL: 10 Nos/ear head

Management: • Dust with carbaryl 10% at 12 kg/ha (or) quinalphos 1.5% 12 kg/ha synchronising during milky stage • Grow resistant cultivars like IS1760, IS 17645, CSM 388, Chencholam, BBR - 1(ICS V239)

6. Sorghum midge:

Contarinia sorghicola (Cecidomyiidae: Diptera)

Distribution and status: India, Pakistan, Bangladesh, West Iran, Sri Lanka, Sudan, Java, Africa, South East Asia, South China, South America, West Indies, USA and Italy.

Hosts: Sorghum cultivated and wild species

Damage symptoms: A maggot feeds on the developing grains and pupates there. White pupal cases protruding out from the grains and chaffy grains with holes are the damage symptoms.

Bionomics: The adult fly is small, fragile with a bright orange abdomen and a pair of transparent wings. It lays eggs singly in developing florets resulting in pollen shedding. A female lays about 30-35 eggs at the rate of 6-10 in each floret. The incubation period is 3-4 days. The maggot has four instars with duration of 8-10 days. Larvae are colorless, but, when fully grown, they are dark orange. Larval period 9 - 11 days. The larval stage undergoes diapause in a cocoon during December - January within a spikelet. Pupates beneath the glume. The pupal period 3 days. When the adult emerges the white pupal skin remains at the tip of the spikelet. A generation is completed in 14-16 days. The insect's rapid developmental cycle permits 9-12 generations.

Management

1. Grow resistant cultivars like DJ 6541, AF 28, ICSV 197, ICSV 745, ICSV 88032
2. Conserve larval parasitoids - *Apanteles* sp., *Eupelones popa*; Larval and pupal parasitoid - *Tetrastichus* spp.; Predators – *Orius albidipennis*; *Tapinoma indicum*
3. Give first application at nearly 90% earhead emergence and repeat after 4 or 5 days. The insecticides recommended are spray endosulfan 35 EC 1.0 L (or) malathion 50 EC 1.0 L (or) carbaryl 50 WP 2 kg/ha or endosulfan 4 D or malathion 5 D or carbaryl 10 D or quinalphos 1.5 D at 25 kg/ha.

7. Plant lice (Aphids):

Rhopalosiphum maidis, *Melanaphis sacchari* (Aphididae: Hemiptera)

Distribution and status: All sorghum-growing areas of the world.

Host range: Sorghum, maize, ragi

Damage symptoms: Colonies of aphids are seen in central leaf whorl, stems, or in panicles. The young and adults suck the plant juice. This frequently causes yellowish mottling of the leaves and marginal leaf necrosis. The aphid produces an abundance of honeydew on which molds grow. In panicles, honeydew may hinder harvesting. The aphid also transmits maize dwarf mosaic virus.

Bionomics:

Rhopalosiphum maidis The aphid is dark bluish-green and somewhat ovate. It is 2 mm long, with black legs, cornicles, and antennae. Winged and wingless forms occur. Females give birth to living young without mating and a generation requires only a week or so. The adult is yellow coloured with dark green legs.

Melanaphis sacchari The sugarcane aphid is yellow to buff. Numbers increase rapidly during dry spells or at the end of the rainy season. The female of the wingless form deposits 60- 100 nymphs within its reproductive period of 13-20 days. The winged form produces slightly fewer nymphs. The life cycle is completed in 5.5-7.0 days during the dry season.

Management: Spray the base of attacked plants with a contact (or) systemic insecticide like dimethoate 30 EC or methyl demeton 25 EC 500 ml in 500 L of water.

MINOR PESTS

8. Ear head web worm:

Cryptoblabes gnidiella (Pyraustidae: Lepidoptera)

Host: Sorghum, Maize **Damage symptoms** The larvae destroy the grain in the head. They produce webs of silken thread that remain on and inside the head. Heavily infested heads may be covered with webbing.

Bionomics: The adult moth is small with brown forewings and light brown hind wings. Creamy white, round or conical eggs are laid singly on the spikelets and on grains of the panicle. The egg period is 3-4 days. The larva is light brown with dark head and has dark lateral lines on the body.

The larval duration is 9-10 days. It constructs silken cocoon and pupates within the silken webs. Pupal period 7 days. The life cycle is completed in 23-24 days.

9. Gram caterpillar:

Helicoverpa armigera (Noctuidae: Lepidoptera)

Distribution and status: World wide. It is major on cotton, lablab, chillies, tomato, pulses, maize and minor on sorghum.

Host range: Cotton, sorghum, lab lab, soybean, pea, safflower, chillies, tomato, groundnut, tobacco, gram, okra, maize etc.

Damage symptoms: Larvae hide within the ear heads and feeds on the grains. Earheads are partially eaten and appear chalky. Feecal pellets are visible within the ear head.

Bionomics: Adult is brown coloured moth with a 'V' shaped speck on forewings and dull black border on the hind wing. Larva is green with dark broken grey lines and dark pale bands. It shows colour variation of greenish to brown.

Management: Spraying of insecticides as given under cotton

10. Plant bug:

Dolycoris indicus (Pentatomidae: Hemiptera)

Damage symptoms: Grains become chaffy or spotted black and get shriveled.

Bionomics: Brown coloured bug with a white patch on the scutellum.

11. Stink bug:

Nezara viridula (Pentatomidae: Hemiptera)

Damage symptoms Grains become chaffy or spotted black and get shriveled. A stinking smell emanates from the bug.

Bionomics: Adult is green in colour. Nymph is brownish red with multi colour spots.

12. Red hairy caterpillar:

Amsacta albistriga, *A. moorei* (Arctiidae: Lepidoptera)

Distribution and status: Oriental in distribution including India. It is a serious pest on pulses in Rajasthan and groundnut in southern part of India. *Amsacata albistriga* is predominant in South India while *A. moorie* dominates northern parts of the country.

Host range: Maize, sorghum, green gram, sesame, pearl millet, finger millet, groundnut, sunhemp, castor, cotton.

Damage symptoms: The larvae feed on the leaves gregariously by scrapping the under surface of tender leaflets leaving the upper epidermal layer intact in early stages. Later, they feed voraciously on the leaves and main stem of plants. They march from field to field gregariously. Severely affected field looks as if grazed by cattle.

Bionomics Adults are medium sized moths. In *A. albistriga*, forewings are white with brownish streaks all over and yellowish streaks along the anterior margin and hindwings are white with black markings. A yellow spot is found on the head. In *A. moorei*, all markings are red in white wings. On receipt of heavy rains, in kharif season, moths emerge out from soil in the evening hours. It lays eggs on the under surface of the leaves. The eggs are cream coloured or bright yellow and laid in groups. A female moth may lay about 600-700 eggs. Egg period is 2-3 days. Tiny greenish caterpillar feeds on the leaves gregariously. A full-grown larva measures about 5 cm in length with reddish brown hairs all over the body arising on warts. The larval period is 40-50 days. The grown up larva pupate in earthen cells at a depth of 10-20 cm. They pupate mostly along the field bunds and in moist shady areas under the trees in the field and undergo pupal diapause till the next year.

ETL - 8 egg masses / 100 meter

Management

- Use light trap
- Dig trenches around the infested field and dust any of the insecticide viz., endosulfan 6% D or methyl parathion 2% D or fenvalarate 2% D.
- Spray endosulfan 35 EC 750 ml/ha quinalphos 25 EC 750 ml/ha (or) dichlorvas 76 WSC 625 ml/ha (or) chlorpyriphos 20 EC 1250 ml/ha in 375 litres of water