

INSECT PESTS OF MILLETS



MAJOR PESTS OF NATIONAL SIGNIFICANCE

Sl. No.	Common Name	Scientific Name	Family	Order
1	Cutworms	<i>Agrotis ipsilon</i>	Noctuidae	Lepidoptera
2	White grub	<i>Holotrichia consanguinea</i>	Scarabaeidae	Coleoptera

MAJOR PESTS OF REGIONAL SIGNIFICANCE

Sl. No.	Common Name	Scientific Name	Family	Order
1	Shoot fly	<i>Atherigona soccata</i>	Muscidae	Diptera
2	Grasshopper	<i>Hieroglyphus spp.</i>	Acrididae	Orthoptera
3	Termites	<i>Chrotogomu spp.</i>	Termitidae	Isoptera
4	Grey weevil	<i>Myloceru spp.</i>	Curculionidae	Coleoptera
5	Stem borer	<i>Chilo partellus</i>	Pyralidae	Lepidoptera
6	Ear head bug	<i>Calocoris angustatus</i>	Miridae	Hemiptera
7	Hairy caterpillar	<i>Spilosoma oblique</i>	Arctiidae	Lepidoptera
8	Earhead worm	<i>Cryptoblabes gnidiella</i>	Pyralidae	Lepidoptera
9	Blister beetle	<i>Mylabris pustulata</i>	Meloidae	Coleoptera
10	Chaffer beetle	<i>Rhizotrogus majalis</i>	Scarabaeidae	Coleoptera

MAJOR RODENTS OF REGIONAL SIGNIFICANCE

Sl. No.	Common Name	Scientific Name	Family	Order
1	Smaller bandicoot	<i>Bandicota bengalensis</i>	Muridae	Rodentia
2	Soft furred field rat	<i>Millardia meltada</i>	Muridae	Rodentia
3	Indian gerbil	<i>Tatera indica</i>	Muridae	Rodentia
4	Field mice	<i>Mus spp.</i>	Muridae	Rodentia

1. pink stem borer

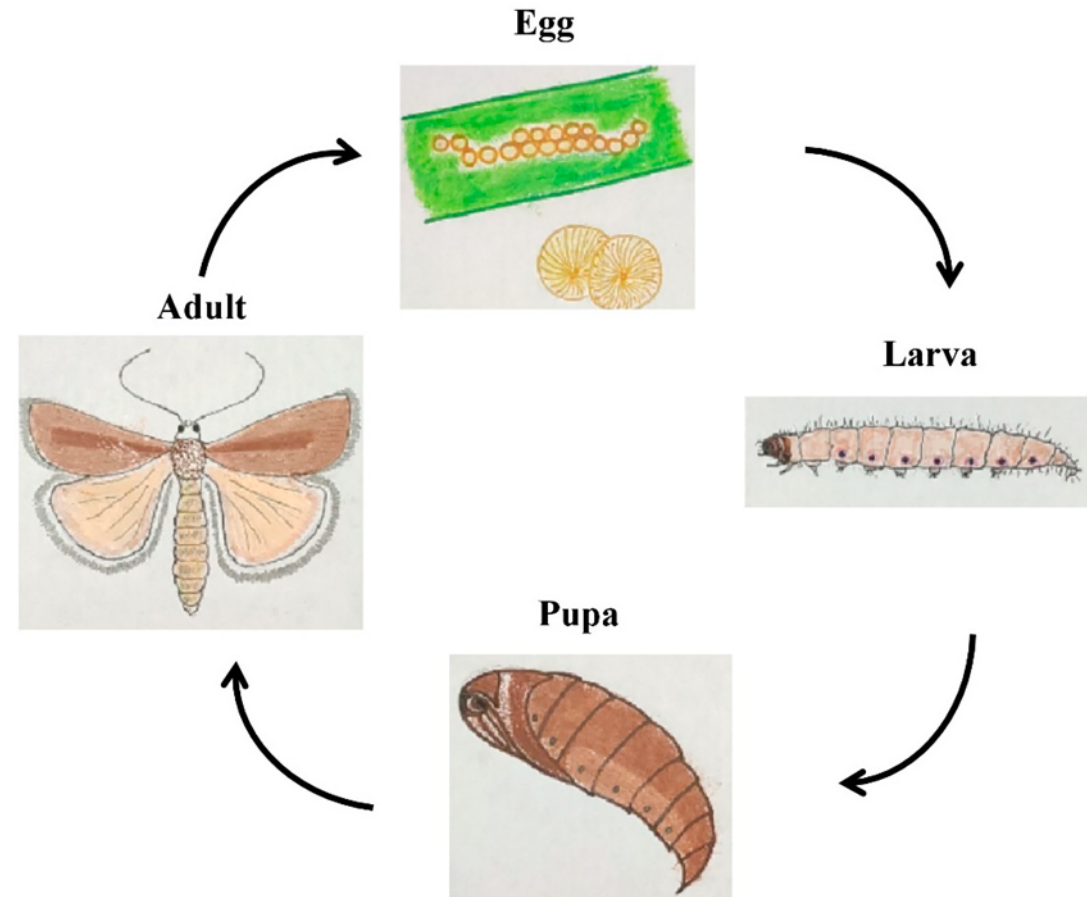
S.N: *Sesamia inferens*
(Noctuidae: Lepidoptera)

- This is a widely distributed species and is considered to be one of the important pest of finger millet in India
- **Alternate hosts:** Apart from ragi, it also attack sorghum, maize, rice, wheat, bajra etc.,
- Adult is a stout bodied medium sized, straw coloured moth or pale yellow brown coloured moth
- Fore wings: are light brown with a prominent mid longitudinal dark brown streak or prominent radial vein.
- Hind wings: are white with light yellow scales along the major veins



Biology

- Eggs : Yellowish eggs laid in small groups in between stem and leaf sheath (I.P- 3-7 days).
- Newly hatched larva is pale yellow with anal plate pale brown in colour.
- Fully grown larva pinkish to brown in colour with reddish brown head and and measures about 3 - 3.5 cm long (L.P- 25-30 days).
- Pupae - in the stem, (P.P-8-10 days)





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Nature of Damage

- Larvae congregate inside the leaf whorls and feed on the central leaves causing typical **'pin holes'**
- Later bore into the central shoot and feed on internal tissue and severe feeding results in drying of the central shoot called dead heart formation or **dead heart** symptoms in the early stage of the crop.
- **Bored holes are plugged with excreta**
- **The lower leaves remain green and healthy**



Nature of Damage

- **After panicle initiation – damage results in the drying of panicle called white ears which do not grains or empty ear heads are prominent in the field.**
- Some times, after panicle initiation, the damaged panicle may not be emerge at all, besides, many stems looking healthy on outside may harbour larvae inside with varying levels of feeding injury



Management

- **Ploughing the fields immediately after harvesting to kills the larvae and pupae overwintering on the stubbles, which serves as chief source of infestation in the succeeding seasons.**
- **Crop rotation with short duration non-graminaceous (Legumes) crop to reduce the borer population**
- **Application of optimal rates of nitrogenous fertilizer in split application to minimizes the crop susceptibility to the borer.**
- **Removal and destruction of dead hearts at the initial stages of infestation.**
- **Harvesting the crop close to the ground level will greatly help in eliminating the larval and pupal stages of the pest**
- **The eggs of the borer are naturally parasitized by – *Telenomus dignus*, *Trichogramma sp.***
- **The larvae are naturally infected by fungus, *Beauveria bassiana* during winter**
- **Spiders and birds also prey efficiently on adult moths during brood emergence in the fields.**

Management

- In case of wide spread of infestation
- Spray the crop 2-3 weeks after sowing or as soon as borer injury to the leaves is noticed
- Spray the crop with synthetic pyrethroids like fevalerate 20 EC @ 100 ml / ha or cypermethrin 36SL @ 100 ml / ha or deltamethrin 2.8 EC @ 200 ml / ha.
- Alternatively the crop should sprayed with any one of the following insecticides – fenitrothion 50 EC @ 250 ml /ha or monocrotophos 36 SL @ 400ml / ha.

2. Ragi white stem borer

S.N: *Saluria inficita*
(Pyralidae : Lepidoptera)

- **A specific and potential pest of ragi in south India**
- **Adult** : is a medium sized, dark brown coloured moth
- **Forewings** are pale white with a white band along the anterior margin.
- **Hindwings** are white in colour
- **Eggs**: laid singly or in small groups in the leaf sheath (I.P – 3-4 days).
- **Larva**: the matured larva 2-2.5cm in length, creamy white with yellow coloured head (L.P – 20-25 days).
- **Pupa**: Pupation takes place inside the stem or inside the tunnels (P.P – 9-10 days).



Nature of Damage

- **Infestation usually seen at the base of the tillers very close to soil.**
- **Larva bore the stem close to the ground level and feed on internal tissues and cause **dead heart** symptom in the early stage.**
- **However incidence more common in early stage of the crop.**
- **Control measures is similar to the pink stem borer**

3. Ragi leaf hopper

S.N: *Cicadulina bipunctata*

(Cicadellidae : Hemiptera)

- **Adults are minute, wedge shaped white coloured hopper and measures 2-3 mm in length and posses 2 black spots on the vertex**
- **Legs and wings are longer than the body and presence of 2 or 3 rows of spines on the hind tibia.**
- **Leaf hopper lays eggs by piercing it ovipositor in to the plant tissue along the vein preferably on ventral surface.**
- **Fecundity – more than 60 eggs / female (I.P – 4-5 days).**
- **Nymphs: There are 3-5 nymphal instars (N.P – 15-16 days).**



Nature of Damage

- **Both nymphs adults suck the sap from the leaves, initially produce white specks further yellowing and drying of leaves.**
- **Leaf hoppers are also vectors of finger millet virus.**

4. Ragi Aphid

S.N: *Hysteroneura setariae*
(Aphididae : Hemiptera)

- Adults are soft bodied, brown or black coloured winged or wingless insects.
- Identified by the presence of a pair of cornicles on the 5 or 6 abdominal segments.
- Found in clusters on the ear heads and on young leaves

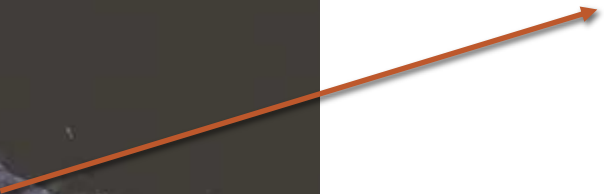


Nature of Damage

- **Both nymphs and adults suck the sap from the leaves as a results yellowing of leaves.**
- **Excrete honey dew as a result the development of sooty mould develop and plants are sickly appearance.**
- **Aphids are more common in irrigated summer ragi.**



**Aphids found in clusters
on Young leaves**





Winged or Wingless aphids
found in clusters on
the ear head

5. Ragi root aphid

S.N: *Tetraneura nigriabdominalis*
(Aphididae : Hemiptera)

- **This pest common in South India and It infests root system and infestation prevails up to flowering stage in irrigated ragi during May – July.**
- **Pest occasionally reaches the pest status**
- **Adults are numerous, minute, soft bodied pale green coloured insects.**



Photo from: <http://www.nbaii.res.in/insectpests/Tetraneura-nigriabdominalis.php>

Biology

- **The insect is parthenogenetic and viviparous and develops on several grasses throughout the year.**
- **After 2 or 3 generations of wing less individuals it gives rise to alate forms and thus get dispersed or they are carried to the field by wind.**
- **These alate forms produce young ones which infests the roots of finger millet and number of other grasses like *Pennisetum purpureum*, *Sorghum vulgare* etc.,**
- **Moderately old plants are preferred for infestation by the aphids**
- **Nymphs: There are four nymphal instars are completed in 7-9 days**
- **Adult produce 10-35 off springs.**

Nature of Damage

- **Both nymphs and adults attack under ground parts of the plants, they suck sap from roots causing gradual wilting and drying of plants in patches.**
- **The roots when pulled show colonies of aphids on the root system upto 100 adults and 150 nymphs are found in the single plant.**
- **Both stages feed persistently causes the collar region of the root to turn black and secondary roots show a burnt up appearance.**
- **Plants turns yellow and seed setting is reduced**
- **The black ant, *Camponotus compressus* can be seen attending on the aphids for their honey dew excretion and presence of the ants at the base of the tillers is a clear indication of root aphids infested plants**



Aphids infesting root system



**Black ant attending on the
Aphids for their honey dew
secretion**

Management

- **Mixing of crude oil emulsion in irrigation water is a common method suggested for its control**
- **Spray the base of the attacked plants with systemic insecticides like dimethoate @ 0.03 %**
- **Drenching the soil with chlorpyrifos @ 0.05 % or lindane @ 0.05 %**

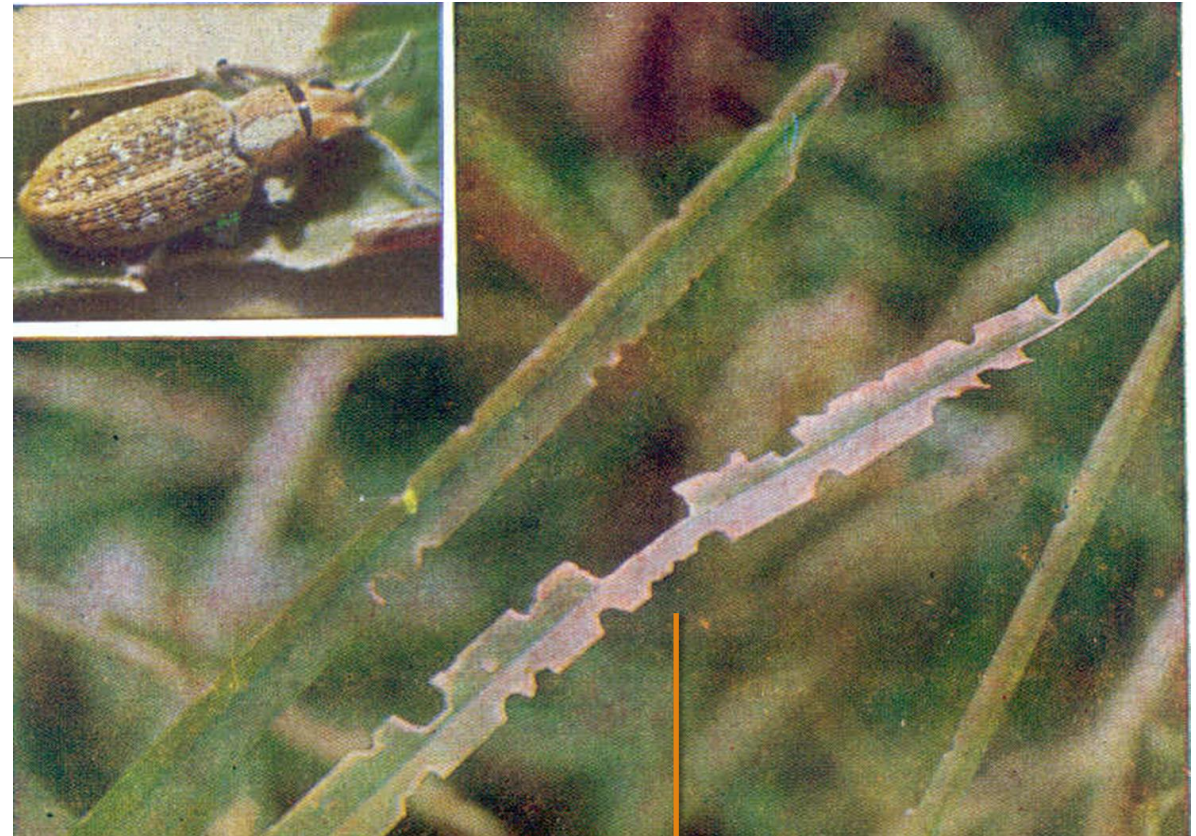
6. Ash weevil

S.N: *Myllocerus discolor*

(Curculionidae: Coleoptera)

- A small weevil about 1cm in length mottled brownish with small grey coloured patches on the elytra and a large grey coloured patch on the thorax
- **Eggs:** are laid in moist soil at the base of the plant
- Fecundity – 100-350 eggs / female (I.P – 5-12 days)
- Larva : L.P – 35-60 days
- **Pupa:** Pupation takes place in soil (P.P – 5-10 days)





**Adults feed on leaf edge and cutting U shaped pattern and thus defoliate the plants
Grubs feeds on the roots**

7. Red headed hairy caterpillar S.N: *Amsacta albistriga* (Arctiidae: Lepidoptera)

- **This polyphagous pest often do considerable injury to young sorghum, ragi, Maize and Bajra crops.**
- **The caterpillars are reddish brown and hairy and are voracious feeders of the foliage.**
- **After feeding they move from field to field in large swarms in search of suitable host plants thus causing large scale devastation of millet crops.**
- **Dusting malathion 5 % D for killing early instar larvae or Spraying the crop with monocrotophos @ 0.05 % or quinalphos @ 0.05% for control grown up larvae**



Caterpillars feeds on leaves and ear heads

8. Black hairy caterpillar

S.N: *Estigmene lactinea*
(Arctiidae: Lepidoptera)

- **Among the millets ragi is particularly damaged by this pest in South India.**
- **Adult moth is having white coloured wings with dark markings.**
- **The red streak along the anterior margin of the fore wing**
- **A prominent red band is found on the head**
- **Eggs: are laid on the plants**
- **Larva: Caterpillar is thickly hairy and black in colour**
- **Pupa: It pupate in soil**



Nature of Damage

- **Voracious defoliator destroys many crops like Sorghum, ragi, Castor, Maize,nground nut etc.,**
- **The hatched caterpillars feeding on the leaves and tender ears of the crop.**
- **They migrate in groups from field to field feeding voraciously on the crops that come across on their way giving them cattle grazed appearance.**
- **The habits of this pest are similar to RHC, their control is also similar**



9. Grasshopper
S.N: *Hieroglyphus spp.*
(Acrididae: Orthoptera)

- They act as defoliators feeding on the leaves.



10. Ragi cut worm

S.N: *Spodoptera exigua*

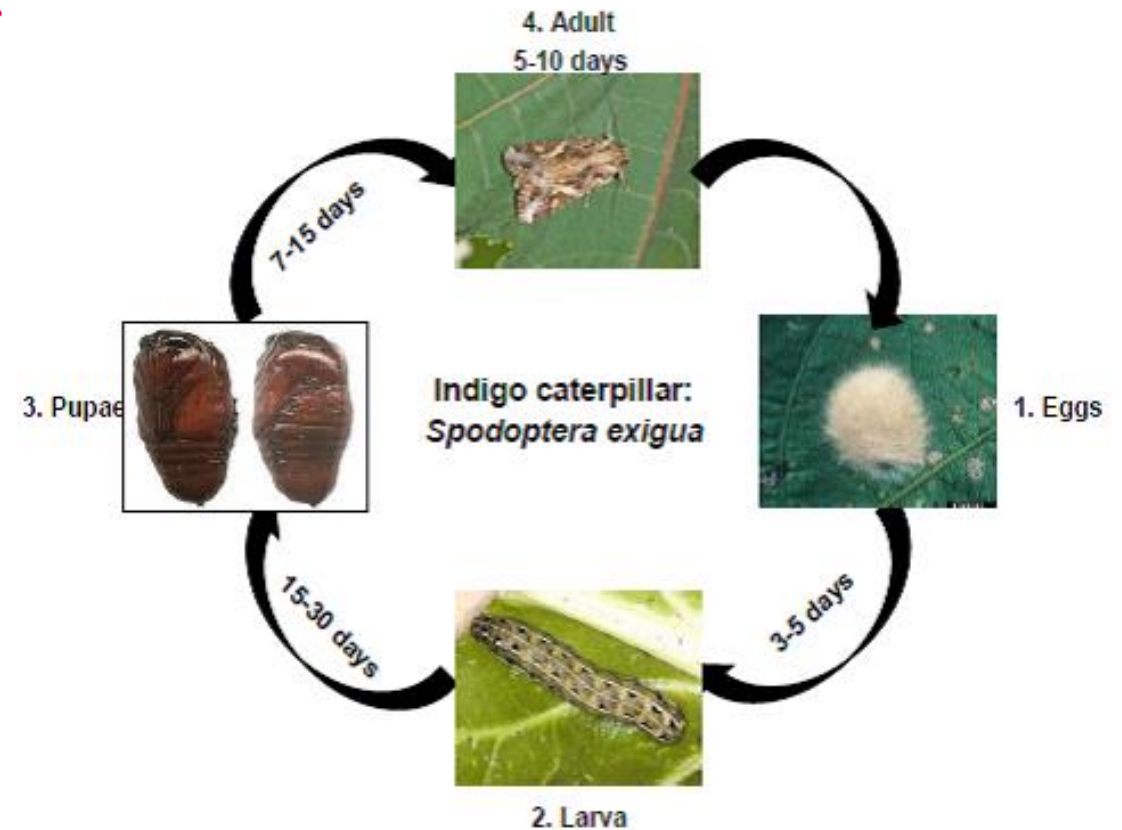
(Noctuidae : Lepidoptera)

- **This insect is widely distributed in India and defoliate the plants especially in the nursery stage in South India.**
- **Adults are medium sized, stout bodied dark brown coloured moths.**
- **Fore wings – pale brown with grey coloured markings**
- **Hind wings – white in colour**
- **Alternate hosts: Apart from finger millet t also infests crops such as Onion, Brinjal, Cotton, Cowpea, Chllies, Safflower, Castor etc.**



Biology

- **Eggs** : are laid in clusters on the lower portion of leaves of young nursery plants
- **Fecundity** – more than 80 eggs / female (L.P – 3-4 days).
- **Larva**: there are 5 larval instars
- **Fully grown larva** 3 cm long, brownish green in colour with wavy lines on dorsal surface and lateral stripes. (L.P – 14-15 days).
- **Pupa** : Pupation takes place in soil (P.P – 9-10 days)





Nature of Damage

- **Early instars larvae skeletonize the leaves by scraping the green matter and later instars feed on leaves and thus defoliate the plants.**
- **By presence of excretory pellets along the rows and cut pieces of seedlings is the indication of attacked by cut worms**



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Management

- **Mechanical collection and destruction of early instars**
- **Use poison baits – Rice bran – 20-25 kg + molasses + insecticides**
- **Mix well and make them in to balls and broadcast during evening hours**
- **Spray the crop with chlorpyrifos @ 2ml / lit. or methyl parathion @ 2 ml / lit.**

11. Flea beetle

S.N: *Monolepta signata*

(Chrysomelidae: Coleoptera)

- **Adult is a black coloured beetle with long antennae and four pale yellow spots on the elytra.**
- **Adults feeds on ears and leaves make small holes on the leaves**
- **Dusting malathion 5 % D to control the pest**



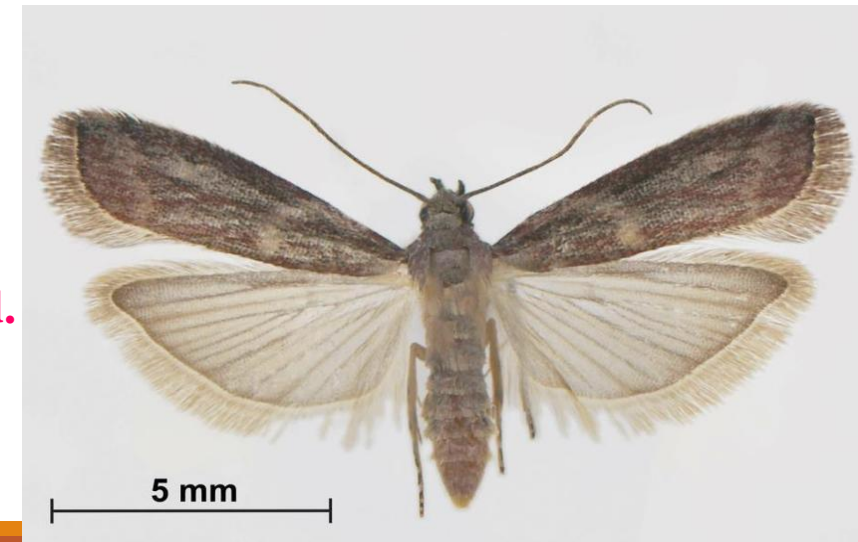
12. Ear head web worm

S.N: *Cryptoblabes gnidiella*
(Pyralidae: Lepidoptera)

- **The adult moth is small with brown fore wings and light brown hind wings.**
- **Eggs: 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.**
- **Larva: The larva is light brown with dark head and has dark lateral lines on the body. (LP: 9-10 days).**
- **Pupa: It constructs silken cocoon and pupates within the silken webs. (P.P: 7 days).**
- **The life cycle is completed in 23-24 days.**

Nature of damage

- **The larvae destroy the grain in the ear head.**
- **They produce webs of silken thread that remain on and inside the ear head.**
- **Heavily infested ear heads may be covered with webbing.**



13. Ear head webbing caterpillar

S.N: *Stenachroia elongella*
(Pyralidae : Lepidoptera)

- **The larva of this pyralid has a wide distribution**
- **Adult is a dry grass coloured moth with long narrow wings**

Nature of damage

- **Caterpillar on occasions seen in abundance webbing up the ears of sorghum and ragi and destroying grains**
- **It also bores into the stems the attacked ear heads become deep purple black from the excrement entangled in the webbings and decayed grains**



14. Ear head Caterpillar

S.N.: *Helicoverpa armigera*
(Noctuidae : Lepidoptera)

- Larva attack the crop at maturity stage and feeds on the grains on the ear heads.



**15. Castor shoot and capsule borer: *Conogethes punctiferalis*
(Pyralidae : Lepidoptera)**



- **Young caterpillar make webbings and feed on flowers and grains and they pupate with in the webbings**
- **Each larva destroys about 1gm of grains**

**16. Chafer beetle : *Oxycetonia* spp.
(Scarabaeidae : Coleoptera)**



**A light brown coloured beetle with white spots on the elytra
Adults feeds on ear heads of sorghum and maize**

**17. Blister beetle : *Zonabris pustulata*
(Meloidae : Coleoptera)**



- Adult beetle with pink coloured zigzag markings on black coloured elytra
- Grubs are predators on short horned grass hopper ‘egg pods’
 - Adults feeds on flowers and tender grains of sorghum and cause damage

18. Sorghum shoot/ stem fly

S.N: *Atherigona soccata*
(Muscidae: Diptera)

- **This is a serious pest of bajra in Karnataka, TN and AP during cold weather season**
- **Host range:** Wheat, maize, broom corn, small millets and grasses, besides sorghum.
- **Morphology:** The eggs are elongate, flattened and somewhat boat- shaped and are provided with two wing like lateral projections.
- Adult fly resembles house fly, little smaller and grayish brown in colour with 6 black spots on the abdomen
- It is active during early morning and evening.



Biology

- **S.O.O. eggs singly or in rows on the underside of the leaves during its life span of 12-14 days during morning hours. [JRF 2002]**
- **Eggs are pale white, cigar shaped or cylindrical and distal surface flattened.**
- The tiny maggots creep out and reach in between the sheath and axis, and bore into the stem.
- They feed inside the main shoot for 6-10 days.
- There are 4 larval instars and the larval period lasts 8 to 10 days.
- **S.O.P either inside the stem or come out and pupate in the soil. the pupal duration in 7 days.**
- Several generations are completed in a year.
- In northern India, the pest over-winters in the pupal stage.
- The whole life-cycle occupies 17 to 21 days.



Maggot inside the shoot



Full grown maggot

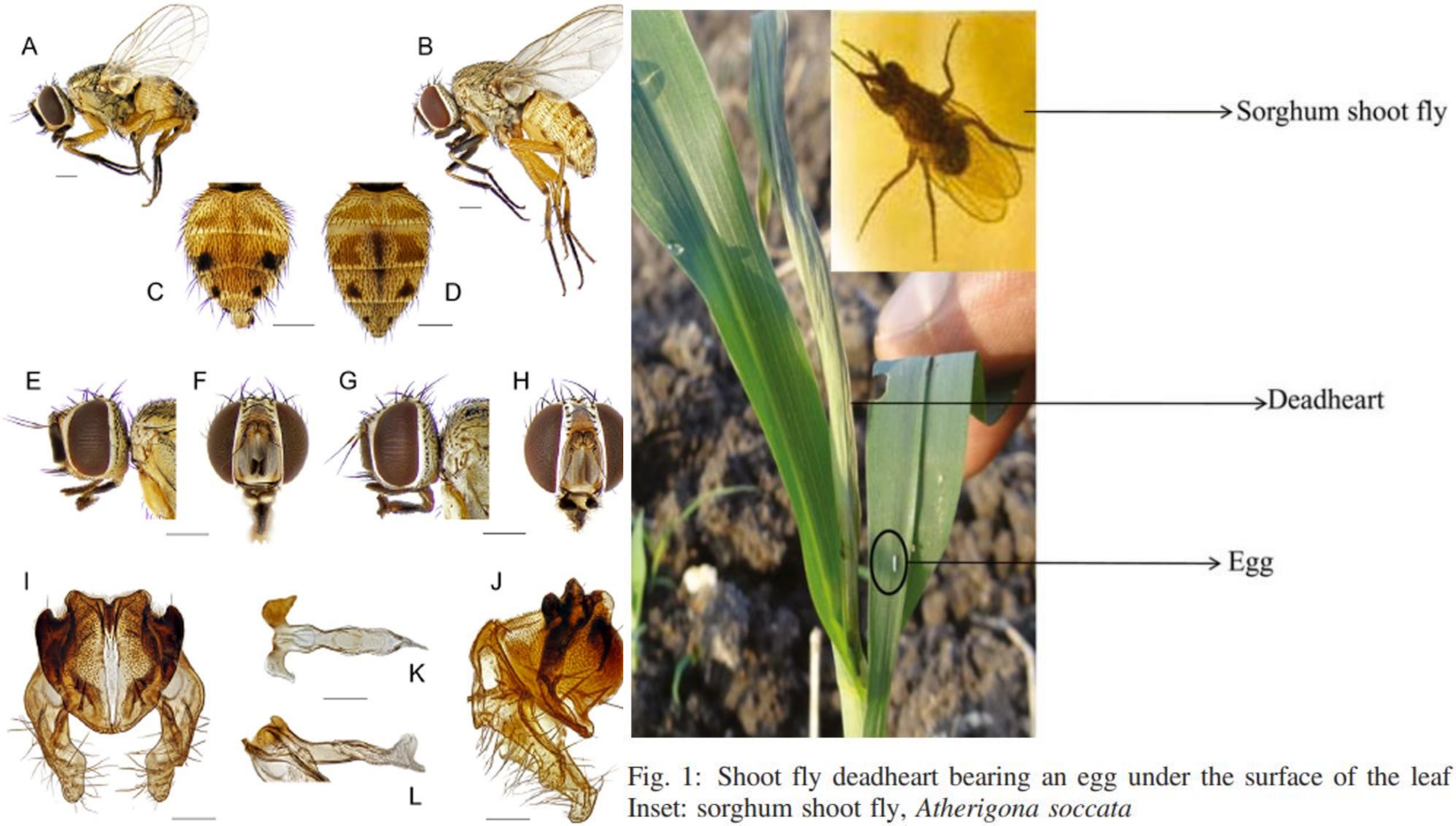


Fig. 1: Shoot fly deadheart bearing an egg under the surface of the leaf
Inset: sorghum shoot fly, *Atherigona soccata*

Nature of Damage (Cont..)

- **Maggots feeds on internal tissues of young seedlings causes 'dead hearts' .**
- **Incidence severe at initial stage of the crop i.e. 4 or 5 weeks after sowing**
- **Later stage seed set is affected considerably resulting chaffy grains in the tip and well developed grains in the lower portion of ear heads**
- **Young plants – causes dead hearts**
- **Ear heads – chaffy grains with thin panicles**
- **% age of incidence – 29.9 – 58.6 %**
- **Grain loss - 23.3 – 47.4 %**



Dead heart symptoms



2. Sorghum stem borer

S.N: *Chilo partellus*
(Pyralidae: Lepidoptera)

- **Distribution:** It is found in all places of India where sorghum is grown.
- **Host range:** Finger-millet, maize, pearl-millet, sugarcane, wild grasses, *Sorghum halepense*, sugarcane etc.
- **Morphology:** The eggs are flat, oval, yellowish.
- The grown up caterpillars are long and dirty greyish white, with black head and four brownish longitudinal stripes on the back.
- The adults are yellowish-grey moths
- **The moths are usually nocturnal in habit**



Biology

- The moth is medium sized and straw coloured.
- **The female lays flat oval eggs on the underside of the leaves, near the midrib. The eggs hatch in 2 - 6 days.**
- The larva is pale white with black dots and brown head.
- It bores into the stem near the node and feeds upwards.
- Most of the second instar larvae migrate to neighboring plants.
- The larva is yellowish brown with brown head and prothoracic shield.
- **The larvae remain dormant in winter and hibernate.**
- The average number of caterpillars per plant is four.
- The larval period lasts from 28 - 50 days in summer to 193 days in winter.
- Pupation take place inside the stem and the adults emerge in 7- 15 days depending upon the climatic conditions.
- Total life cycle is completed in 30- 40 days.

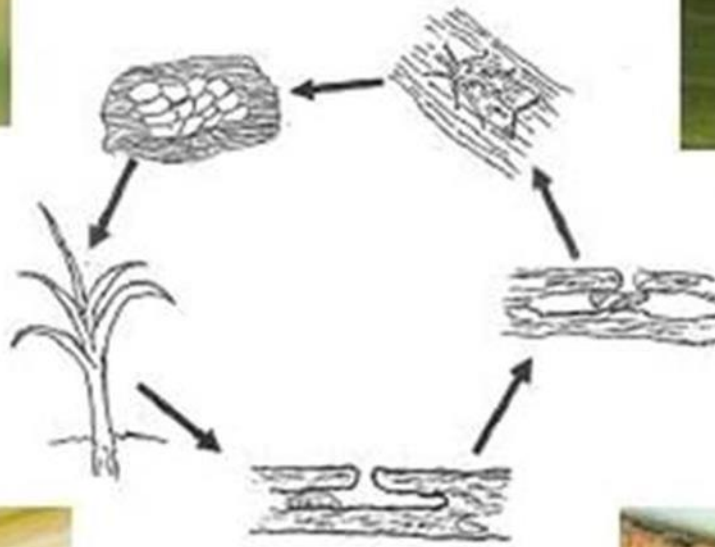
Life cycle of *Chilo partellus*



Egg batch



Adult Moth



Larvae



Pupae



Nature of Damage

- **It infests the crop usually a month after sowing.**
- **Presence of dead heart and window like symptoms on leaves in the early stages one the main symptom** [JRF 2000, ARS PRE/ NET 2010]
- **The bore holes may be visible in contrast to the dead-heart caused by the stem fly.**
- Later it acts as an internode borer and is found till the time of harvest.
- **In the grown up plants, when damaged, lose their vigour and put forth weak ears.**
- Yield is affected much and the quality of the fodder is also reduced.
- **The damage caused to the crop by this pest is estimated to range between 70 - 80 %.**
- **Causes bore holes at the base of the stem resulting in dead hearts, reddening of midrib and pinholes on the whorl of newly opened leaves.**







**Dead
heart**





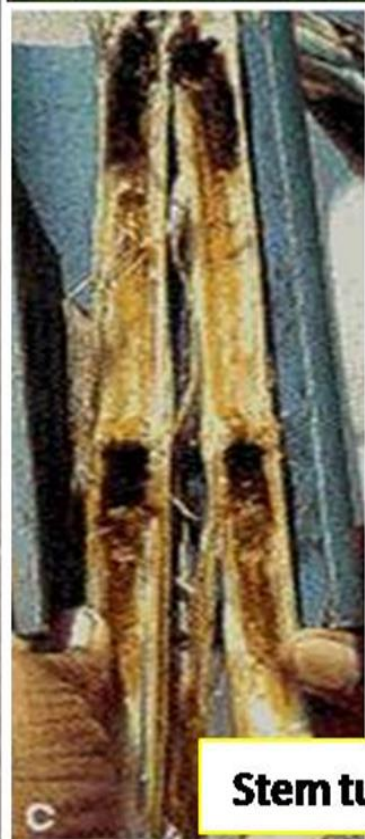
Deadheart



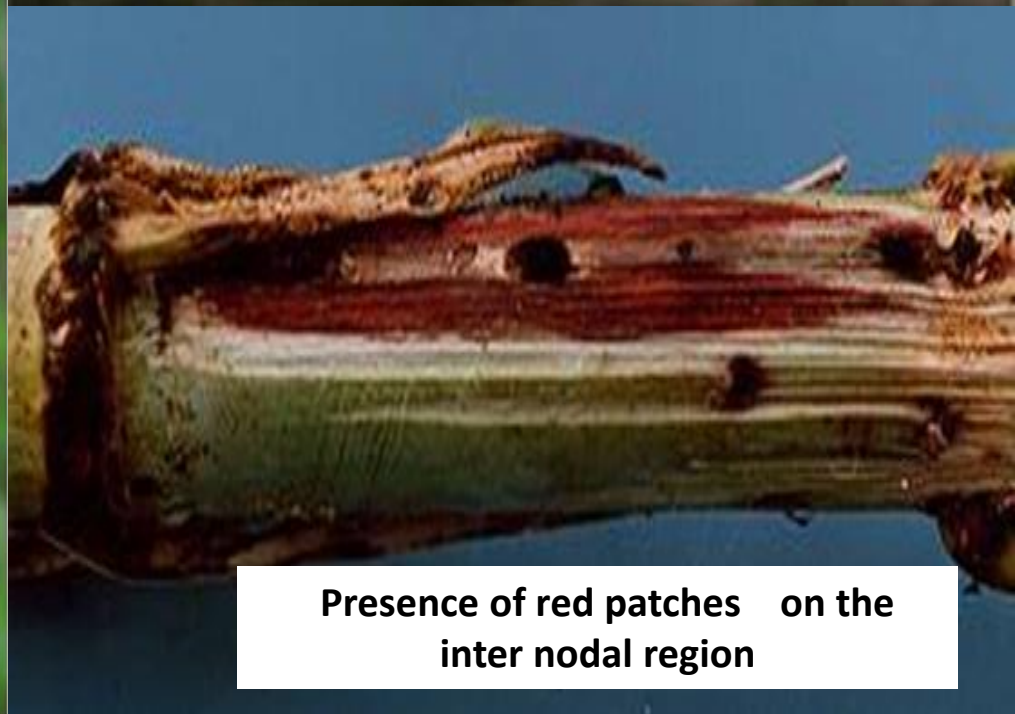
Shot-holes



Bored hole on the stem



Stem tunneling



Presence of red patches on the inter nodal region

Field symptoms

- **Mid rib tunneling by early instar larva**
- **A series of pin holes on newly emerged leaves / windowing**
- **In young plants, the pest causes a typical dead hearts**
- **In older plants the upper part of the stem usually dies due to boring of the caterpillars in the stem pith**
- **The feeding areas turns red colour on the inter node / mid rib**
- **Larval entry hole can also be seen near feeding site**

Management

- Collection and destruction of the stubbles which are left in the field or heaped in one corner of the field since they act as a source of infestation, as the larvae hibernate in them.
- **Select and grow varieties resistant to spotted stem borer.**
- **Sow the lablab or cowpea or pigeon pea as an intercrop (Sorghum: Lablab, 4:1) reduces the damage by stem borers [ICAR NET 2019]**
- Spray carbaryl 50% WP @ 800g in 200-400 lt of water/acre;
carbofuran 3% CG @ 3320gm/acre or
quinalphos 5% G 6000 @ g/acre.



Thank you