

INSECT PESTS OF SUGARCANE

- Sugarcane is grown throughout the tropical and sub tropical parts of South and South east Asia
- India is the world's largest producer of sugar and sugarcane
- In India this crop is grown in 4.00 million ha and the total production of 236.2 million tonnes.
- **As many as 200 species of insect pests have been reported. However, only a dozen species are recognized as major pests.**
- 78% canes are affected by one or other pests
- 19-20 % loss in yield
- 3% loss in sugar recovery



MAJOR PESTS OF NATIONAL SIGNIFICANCE

Sl. No.	Common Name	Scientific Name	Family	Order
1	Early shoot borer	<i>Chilo infescatellus</i>	Pyralidae	Lepidoptera
2	Internodal shoot borer	<i>Chilo sacchariphagus indicus</i>	Pyralidae	Lepidoptera
3	Top shoot borer	<i>Scirpophaga nivella</i>	Pyralidae	Lepidoptera
4	Stalk borer	<i>Chilo auricilus</i>	Pyralidae	Lepidoptera
5	Pink stem borer	<i>Sesamia inferens</i>	Noctuidae	Lepidoptera
6	Root borer	<i>Emmalocera depresella</i>	Pyralidae	Lepidoptera
7	Pyrilla	<i>Pyrilla perpusilla</i>	Lophopidae/Fulgoridae	Hemiptera

MAJOR PESTS OF NATIONAL SIGNIFICANCE

Sl. No.	Common Name	Scientific Name	Family	Order
8	Whitefly	<i>Aleurolobus barodensis</i>	Aleyrodidae	Hemiptera
9	Spottedfly	<i>Neomaskellia bergii</i>	Aleyrodidae	Hemiptera
10	Mealy bug	<i>Saccharicoccus sacchari</i>	Pseudococcidae	Hemiptera
11	Aphid	<i>Melanaphis sacchari</i>	Aphididae	Hemiptera
12	Woolly aphid	<i>Ceratovacuna lanigera</i>	Aphididae	Hemiptera
13	Termite	<i>Odentotermes spp., Microtermes spp.</i>	Termitidae	Isoptera
14	Mites	<i>Oligonychus sacchari</i>	Tetranychidae	Acarina

MAJOR PESTS OF REGIONAL SIGNIFICANCE

Sl. No.	Common Name	Scientific Name	Family	Order
1	Plassey borer	<i>Chilo tumidicostalis</i>	Pyralidae	Lepidoptera
2	White grub	<i>Holotrichia consanguinea</i> , <i>Anomala spp.</i>	Scarabaeidae	Coleoptera
3	Gurdaspur borer	<i>Donacoscaptes steniella</i> (<i>Bissetia steniella</i>)	Crambidae	Lepidoptera
4	Green borer	<i>Raphimetopus ablutellus</i>	Pyralidae	Lepidoptera
5	Scale	<i>Melanaspis glomerata</i>	Diaspididae	Hemiptera

MINOR PESTS

Sl. No.	Common Name	Scientific Name	Family	Order
1	Grasshopper	<i>Oxya nitidula</i> , <i>Hieroglyphus banian</i> , <i>Hieroglyphus nigrorepletus</i>	Acrididae	Orthoptera
2	Black leafhopper	<i>Proustista moesta</i>	Derbidae	Hemiptera

PEST SCENARIO

- Among borers, the **pink borer**, *Sesamia inferens* is prevalent in all cane growing area and abundant during **March-June** in Bihar, Haryana, Punjab and Uttar Pradesh.
- The **green borer**, *Raphimetopus ablutellii* and the **stalk borer** *Chilo auricilius* infest sugarcane during **April-June** and **October-February**, respectively.
- **Root borer**, *Polyocha depresella* is prevalent in Andhra, Karnataka and northern parts of the country during **April-June**.
- The **Gurdaspur borer**, *Donacoscapes steniella* has a single brood and occurs in Haryana, Punjab, M.P. and U.P. during **August**.
- In Assam, Bihar and West Bengal the **Plassey borer** *Chilo tumidicostalis* attacks sugarcane.

PEST SCENARIO

- The plant lice include a dark brown aphid, *Melanaphis indosacchari* and a cream coloured aphid *M. sacchari*, which infest the leaves and impair the growth of young canes.
- The aphid, *Tetraneura javensis* infests roots of sugarcane during monsoon in Tamil Nadu.
- A large brownish scale with waxy covering *Aclerdatokionis spp.* (Aclerdidae) is sometimes found in small numbers.
- A black winged fly, *Proutista moesta* (Derbidae) is known to be the vector of grassy-shoot disease of sugarcane caused by a mycoplasma.
- The bugs *Tropidocephala signata*, *T. serendiba* and *T. marginepunctata* (Delphacidae) occur occasionally on sugarcane.
- The adults and nymphs of the leaf hopper *Pruthiana senotata* (Delphacidae) suck up the sap from leaves and cause browning and gradual drying of leaves in Tamil Nadu, West Coast and Assam.

PEST SCENARIO

- The black bug *Cavalerius sweeti* and *Dimorphopterus gibbus* (Lygaeidae) occasionally infest the crop.
- The rice grasshopper *Hieroglyphus banian* feeds on leaves.
- A hispid leaf scraper *Asmangulia cuspidata* (Chrysomelidae) is of minor importance on the crop.
- **The larvae of the skipper butterfly *Telicota ancila* roll the leaves.**
- The thrips that infest sugarcane are *Sorghothrips jonnaphilus*, *Bregmatothrips ramakrishnae*, *Anaphothrips sudanensis* and *Stenchaetothrips Saccharicidus*

CHANGING PEST SCENARIO

- **The indigenous sugarcane varieties (*Saccharum barberi*) are not grown in India now, except in some isolated far-off places.**
- **Instead, Coimbatore varieties produced by crossing *Saccharum officinarum* and kahi (*Saccharum spontaneum*) are universally grown throughout India, except In the Himalayan region, eastern India and Bangladesh.**
- **These varieties are more prone to the attack of a number of species of sugarcane borers.**
- **As many as 200 species of insect pests have been reported to cause damage to the sugarcane crop at one stage or the other of crop growth. However, only a dozen are recognized as major pests.**
- **The root borer *Emmalocera depressella*, is more abundant in eastern India.**
- **The shoot borer, *Chilo infuscatellus* and the top-borer, *Scirpophaga nivella* are more or less uniform throughout India and more serious in the early stages of the crop.**

CHANGING PEST SCENARIO

- In the north- western parts of Indian Sub-continent, the Gurdaspur borer, *Bissetia steniella* is far more destructive than the other species.
- However, in mid seventies its population started declining and by the early eighties it became an insignificant pest.
- Punjab, western Uttar Pradesh, Haryana and northern Rajasthan, the stalk borer, *Chilo auricilius* has gained great importance in recent years.
- The mealy bug *Saccharicoccus sacchari* is more prevalent in tropical India than in the northern regions.
- The pyrilla, *Pyrilla perpusilla* and whitefly. *Aleurolobus barodensis* appear as extremely destructive pests in certain years in one or the other regions.

CROP STAGE WISE PEST MANAGEMENT

CROP STAGE	PEST
Sowing	Termites and White grubs
Tillering	Early shoot borer, Root borer
	White grubs
	Top shoot borer
	Black bug
	Scale
	Sugarcane woolly aphid
Cane formation stage	Pyrilla
	Stalk borer, Internode borer, Pink borer and Plassey borer
	Scale and Mealy bug
	Whitefly
	Rodents

Classification of Sugarcane pests

- ❖ **Borer pests**
- ❖ **Subterranean pests**
- ❖ **Sucking pests**
- ❖ **Leaf feeders**
- ❖ **Non insect pests**

1. Sugarcane Pyrilla

S.N: *Pyrilla perpusilla*

(Lophopidae: Hemiptera)

- **Distribution:** Throughout India.
- **Host range:** Sugarcane, rice, wheat, barley, oats, maize, sorghum, baru, Guinea grass, swank, sudan grass etc.
- **Serious pest of sugarcane** [JRF 2001].
- Most destructive foliage sucking pest in sugarcane and it occur in epidemic form in the subtropical states in cycles of 5-6 years.
- Pyrilla occurs throughout the country but more severe in North India especially in Bihar, Delhi, Haryana, Punjab, M.P and U.P.
- Yield loss: 31.60 %, sucrose content reduction: 34%, Sugar recovery: 2 to 3 %.



Morphology

- Full-grown nymph is pale yellow and **has two white prominent feather like filaments at the tail end of its body**; very agile and jumps around in large numbers, making a faint noise when a person walks through a heavily infested field.
- Adult is active, and has a straw-coloured body with dark patches or spots on the wings.
- **At the front end it has a snout like prolongation and prominent red eyes**



Biology

- **The insect breeds throughout the year, migrating from one crop to another for fresh food.**
- **S.O.O.- Underside of leaves during the summer and within the leaf sheaths during winter in clusters (300-536 eggs).**
- **These clusters are covered with a white, fluffy material from the anal tufts of the females.**
- **As this fluff is removed, oval, pale-white eggs are seen in 3-5 longitudinal-rows of 35-50 each.**
- **The nymphs which hatch out from the eggs are pale brown in colour and they do not possess snout, wings and tufts.**
- **Within a week they are characterized by the possession of two long tufts of waxy secretion at the end of the abdomen.**
- **They start sucking the sap of canes and grow to maturity through 5 stages.**
- **3-4 generations are completed in a year. Nymphs overwinter.**



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MINDEN
PICTURES





Favourable Conditions.

- **The insects are generally found from August - September.**
- **The intermittent periods of drought during July - September**
- **Heavy manuring and irrigation and luxuriant growth help in its profuse multiplication.**
- **It is also found that broad and soft-leaved varieties are more susceptible to this pest.**
- **Mild winter followed by mild summer with some showers help on the survival of over-wintering population and their multiplication, respectively.**
- **Failure of monsoon, cloudy weather**
- **Late activity of the parasitoid *Fulgoraecia spp.* favour rapid multiplication of the pest.**

Nature of Damage

- **It remains in colonies on the lower Surface of leaves.**
- **Both the adults and nymphs suck up the sap causing yellowing and drying of leaves.**
- **Succulent varieties of sugarcane with broad leaves are preferred by this pest but when it occurs in abundance, no variety is spared.**
- **Owing to the loss of cell-sap the leaves turn pale-yellow and shrivel up later.**
- **Even the canes dry up and die when the attack is very severe.**
- **The insects excrete honeydew which falls on the leaves and act as a good medium for black mould.**
- **Leaves give sickly appearance and the attacked crop can be spotted from a distance.**
- **This black coating interferes with photosynthesis and very little food is manufactured by the plants.**

Nature of Damage

- **The existing sucrose in the canes is also used up and about 35 per cent reduction in sugar yield is not uncommon.**
- **The cane juice becomes high in glucose, turns insipid and, if used for making gur, gives rise to a soggy mass which does not solidify properly.**
- **Yellowing, sooty mould formation in leaves, drying up of top leaves and formation of lateral buds is the symptom of attack.**



Pyrilla infested Sugarcane



Feeding punctures of *Pyrilla*



Honey dew secretion



Sooty mould development



Yellowing of leaves



Severely infested field of sugarcane

Management

- **Collect and destroy all the trashes immediately after harvest.**
- **Remove sprouts and stubble from the sugarcane field.**
- **Collect egg masses from the lower surface of the leaves and destroy them.**
- **Avoid late application of nitrogenous fertilizers.**
- **Collect and put egg masses in cage to facilitate emergence of parasitoids.**
- **Removal and destruction of lower dried leaves.**
- **The reported parasitoids are *Ooencyrtus pyrillae* (Encyrtidae) and *Ageniopsis pyrillae* (egg parasitoids).**
- **Nymphal parasitoids: *Tetrastichus pyrillae* (Eulophidae), *Lestodryms pyrillae*, *Drynius pyrillae*, *Epipyrops melanoleuca* (Epipyropidae) etc.**

Management

- Release of the *Fulgoraecia melanoleuca* (*Epipyrops melanoleuca*) @ 4000 - 5000 cocoons or @ 4-6 lakh eggs/ha
- Predators (eggs and nymphs) - *Brumus suturalis*, *Menochilus sexmaculatus* and *Coccinella septempunctata* (Coccinellidae) and Chrysopods.
- Conservation of natural enemies
- The green muscardine fungus, *Metarhizium anisopliae* (Moniliaceae), has also been reported from this pest.
- Apply the following insecticides at an economic threshold level of 3-5 nymphs or adults per leaf [IARI PhD 2002]

Management

- **One litre of malathion 50EC per ha in 250 litres of water in August to October.**
- **Chlorpyrifos 20% EC @ 600 ml in 200-400 l of water/acre**
- **Dichlorvos 76% EC @ 150.4 ml in 200-400 l of water/acre**
- **Monocrotophos 36% SL @ 200 ml in 200-400 l of water/acre**



Ooencyrtus pyrillae



Tetrastichus pyrillae



Fulgoraecia melanoleuca



Brumus suturalis



Menochilus sexmaculatus



Coccinella septempunctata

2. Sugarcane black bug

S.N: *Cavelerius excavates*

(Lygaeidae: Hemiptera)

- **Distribution:** widely distributed throughout India and Pakistan, and it is believed that the ratooning has helped its multiplication in Punjab.
- **Host range:** Sugarcane, rice, maize and a number of grasses.
- **Morphology:** The adults are black with white patches on the wings extending slightly beyond the abdomen.
- The eggs are creamy white.
- The shape and colour of nymphs is similar to those of the adults but are smaller in size.



Biology

- **The pest breeds throughout the year but during the winter the adults and eggs are more noticeable.**
- **The S.O.O.- on the inner side of the leaf sheaths.**
- **In winter the eggs are laid in soil at a depth of 5-7 cm and they hatch during the next spring.**
- **The egg and nymphal duration is 9-17 and 30-37 days respectively.**
- **The nymphs grow through 5 stages.**
- **The adults are long lived ; males die earlier than the females.**
- **The insects complete approximately three generations in a year.**

Nature of Damage

- **On young plants, the nymphs and adults suck cell-sap from the central whorl.**
- **On the grown up plants they prefer to feed within the leaf-sheaths, and varieties having broad and loosely attached sheaths are preferred by this pest.**
- **The attacked leaves become paler and also show holes after feeding.**

Management

- **Spray chlorpyrifos 20EC in 1000 litres of water per ha, Direct the spray material into the leaf-whorl.**
- **Egg Parasitoids- *Nardo cumaeus* and *N. phaeax***
- **Spray Quinalphos 25 % EC @ 800 ml in 200-400 l of water/acre.**

3. Sugarcane Whitefly

S.N: *Aleurolobus barodensis*
(Aleyrodidae: Hemiptera)

- **Distribution:** In recent years it has assumed serious proportions on sugarcane in Bihar, Gujarat, Haryana, Karnataka, Maharashtra, Punjab, Tamil Nadu and Uttar Pradesh and in a mild form in Andhra Pradesh.
- **It is serious on ratoon crops under water-logged as well as drought conditions.**
- **Host range:** In the absence of sugarcane, it can also survive on sarkanda (*Saccharum munja*).



Morphology

- **The grown up nymphs are oval in outline but flattened and scale like in form, thus remain sticking to the same spot on a leaf.**
- **They are black and have a silvery grey waxy coating on the body.**
- **The adults are small, delicate, pale-yellow insects, and their wings have a white mealy appearance, mottled with black dots.**
- **They flutter about briskly, but they are not easily noticed in the field.**
- **Eggs are creamy white and conical.**

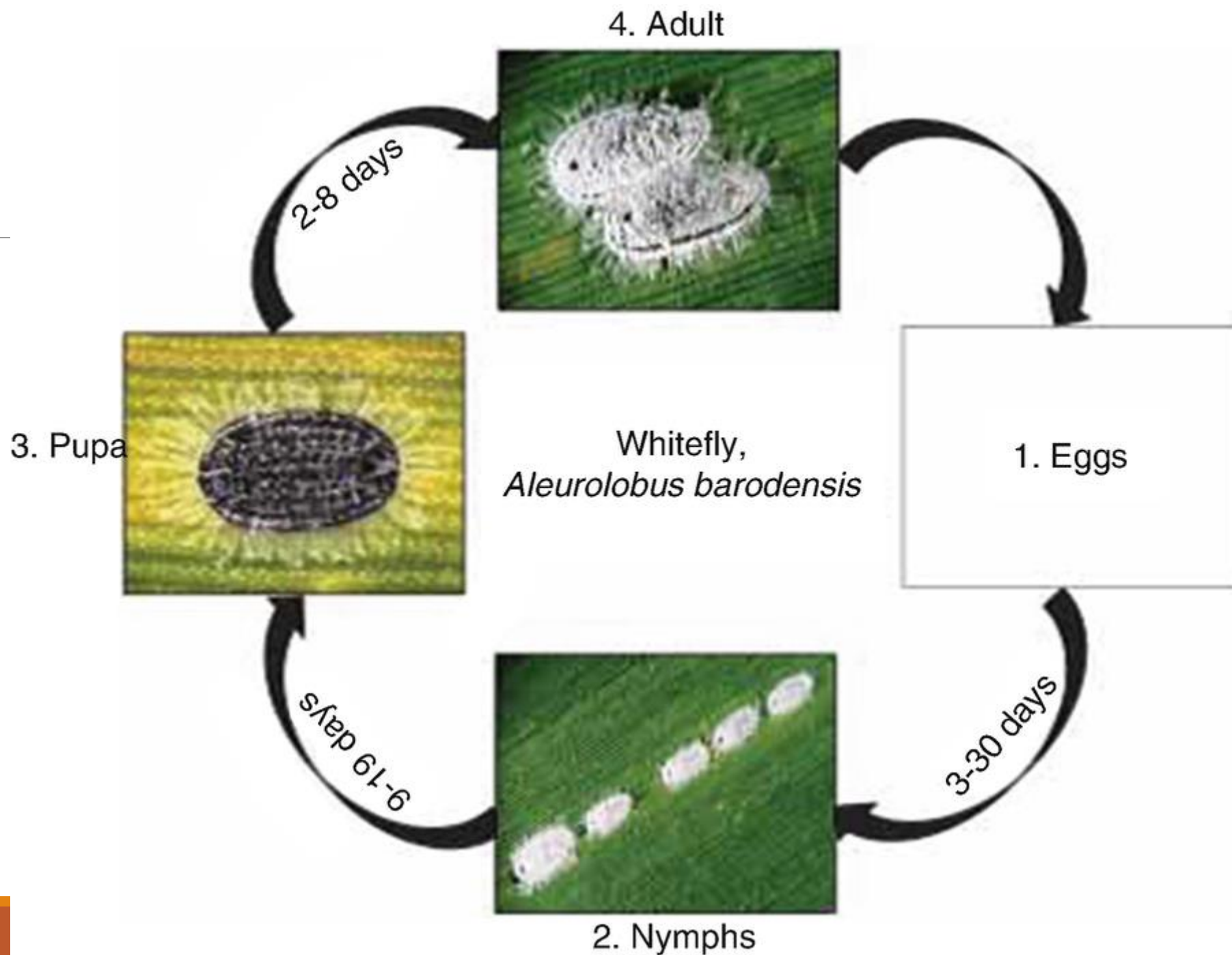


Biology

- The pest breeds practically throughout the year, except during winter when there are mostly nymphs and pupae present.
- Winged adults appear in the spring and soon after emergence, they copulate in an end to end position for 30-40 seconds.
- **S.O.O.- Eggs are inserted in linear masses on first and second top tender leaves on both the surfaces.**
- Within a couple of hours, the eggs turn black and hatch in 9-13 days.
- The three nymphal instars last for respectively 4 -7, 3-7 and 3-8 days.
- The fourth instar (pupal stage) lasts for 9- 14 days.
- On emergence, the young nymphs are pale yellow and they move away from the egg-shell to find a suitable place for feeding by the insertion of their piercing mouthparts.

Biology

- **The last nymphal instar is the pupal stage from which through a T-shaped opening the adult emerges.**
- **Their movements are very restricted and they complete their development in 32-44 days after passing through 4 instars.**
- **The pupal stage lasts 10-11 days and the adults, on emergence, live only for 24-48 hours.**
- **Among adults, the females are in preponderance and they out-number the males by 2:1.**
- **The insect completes 9 generations in a year and in March-April, they migrate from the old to the new sugarcane plants.**
- **Their life is prolonged in autumn when the nymphal and pupal stages are completed in 3-4 months**



Nature of Damage

- **Only the nymphs cause damage by sucking the cell-sap.**
- **Yellow streaks appear on the attacked leaves and the crop acquires a palish green appearance.**
- **The general vitality of the plants is reduced, and the quality and quantity of gur production is poor because of subnormal crystallization of sugar.**
- **Sugar recovery is reduced by about 15-25 percent and loss in sugar up to 2.9 units.**
- **A black mould develops on the honeydew excreted by the pest and it interferes with proper functioning of the leaves and renders them unfit as fodder.**
- **A comparatively poor crop with a thin stand is attacked more readily than a well-manured and heavy crop.**



Management

- **Avoid ratooning especially in low lying and water logged areas.**
- **Plant the repellent plants like Peppermint**
- **Grow attractant plants for natural enemies like French bean (predatory thrips)**
- **Plant tall border crops like maize, sorghum or pearl millet to reduce white fly infestations.**
- **Yellow sticky traps or cards to monitor the activity of white flies**
- **Clipping of infested leaves**
- **Synchronization of sugarcane planting and harvesting maybe adopted zone wise.**
- **Detrashing the puparia bearing leaves and immediately disposing by burning or burying to prevent emergence of adult white flies.**

Management

- **Conserve parasitoids:** *Azotus delhiensis* (Pupal); nymphal parasitoids- *Amitus alerolobi*, *Encarsia issaci*, *E. muliyali* and *Eretmocerus delhiensis* (Aphelinidae).
- **Spray imidacloprid 0.01% or monocrotophos 0.05% or acetamiprid @ 0.01% after removing infested lower leaves.**
- **At least two or more sprays will be required at fortnightly intervals.**



4. Sugarcane Spottedfly

S.N: *Neomaskellia bergii*
(Aleyrodidae: Hemiptera)

- **Distribution:** India, Sri Lanka, Java, the Philippines, Reno Manila, Mauritius and Fiji.
- Another species *N. andropogonis* occurs on sugarcane in Uttar Pradesh.
- **Host range:** Sugarcane and sorghum
- **Morphology:** The nymphs are pale brown to dark in colour and are covered with white wax.
- The adult flies are pale brown with black markings on the fore wings.
- The hind wings are short, thin and more or less transparent.





Biology

- This pest is most active on sugarcane during September-October. **The female lays 120-150 eggs in circular or semi-circular masses on the underside of the leaves during an oviposition period of 2-3 days.**
- The freshly laid white egg is elliptical in shape and it turns black later on.
- The eggs hatch in 2-3 days.
- There are four moultings during larval period of 5-7 days.
- The pupal stage lasts 7-10 days and the life-cycle is completed in 15-18 days.



0.5 mm



0.5 mm



Nature of Damage

- **Nymphal stage is only destructive.**
- **The nymphs suck plant sap and in case of severe attack, cause stunting of canes and drying of leaves.**



Adult sugarcane whiteflies, *Neomaskellia bergii*, attended by ants.

Management

- **The puparia are attacked to the extent of 45 per cent by parasites, *Eretmocerus delhiensis*, *Encarsia neomaskelliae* and *E. isaaci* (Aphelinidae).**
- **The parasitized puparia turn dark in colour and can easily be distinguished from non-parasitized ones.**
- **Fungal parasites *Aschersonia placenta* and *Fusarium subglutinens* infect the nymphs during high humid conditions.**
- **Same as in case of sugarcane whitefly.**

5. Sugarcane Scale Insect

S.N: *Melanaspis glomerata*
(Diaspididae: Hemiptera)

- **Distribution:** The insect infests sugarcane crop in Tamil Nadu, Andhra Pradesh, Gujarat and Maharashtra.
- **Morphology:** The greyish black circular scales can be seen covering the nodal regions and forming a thick encrustation on the whole stem in course of time.
- It is abundant during May-February.



Biology

- **The female reproduces ovoviviparously 100-250 crawlers.**
- **There are five larval instars and the total lifecycle of female varies from 34 to 62 days.**
- **The differentiation of the sex could be determined in the third instar.**
- **The male passes through a definite pupal period ranging from 6-13 days and the total life cycle varies from 19 to 36 days.**
- **The insect completes 9 generations in a year.**
- **Heavy infestation occurs on varieties with high stomatal density as the stylets enter through stomata.**



Nature of Damage

- The nymphs and adult females inside this scale covering feed by sucking the juice and cause **shriveling up and stunting of canes.**
- **Drying of canes with reduced internodes** [ARS NET/PRE 2013].



Management

- **Stripping of cane leaves may minimize attack** [ARS NET/PRE 2016].
- **Hot water treatment to setts**
- **Setts free from scale infestation should be used for planting.**
- **dipping of sets for 15 minutes in 0.1% malathion 50 EC before planting**
- **Dethrashing and burning-Sugarcane whitefly and scale** [ARS PRE/NET 2014]
- **Three species of hymenopteran parasitoids *Anabrolepis mayurai*, *Microterys delhiensis* and, *Cheiloneurus sp.* are parasitic on the scale insect. Among them, *Anabrolepis mayurai* occurs in large proportions.**
- **In addition, two predatory mites, *Saniosulus nudus* and *Tyrophagus putrescentiae* feed on the scale insect.**
- **Spray application of malathion or dimethoate 0.1% three times at 30-day interval from June reduces infestation.**
- **Soil application of carbofuran at 2 kg a.i./ha in 4-6 months old crop may also afford relief.**





6. Sugarcane Mealy-bug

S.N: *Saccharicoccus sacchari*

(Pseudococcidae: Hemiptera)

- **Host range:** This species and a number of others are minor pests of sugarcane.
- They also feed on reeds and some of the grasses.
- **Morphology:** They are inert pink insects, having a rotund, sack-like, segmented body covered completely with a white mealy powder.
- The males, whose only function is to fertilize the females, are sluggish having only one pair of wings and are short-lived.



Biology

- **The pest breeds practically throughout the year.**
- **The females are highly fecund and lay a large number of eggs at short intervals.**
- **The eggs are yellowish, smooth, cylindrical and rounded at both ends.**
- **Within a few hours the eggs become soft and elongated, and the crawlers emerge.**
- **The tiny young ones are transparent, pink and very active.**
- **They wander about for some time and spread all over the field or may even be blown away by the wind to the adjoining fields of sugarcane.**



Biology

- **After finding a suitable host plant, they force themselves underneath the leaf sheaths near the basal nodes.**
- **As the canes grow taller, the older bugs remain at the lower end and the crawlers reach the higher nodes.**
- **The nymphs feed voraciously and pass through 6 stages before they are full-grown in 2-3 weeks.**
- **The life of a full-grown winged female is approximately 3-5 days.**
- **The entire life-cycle is completed in about a month during the summer.**
- **The pest completes several generations in a year.**



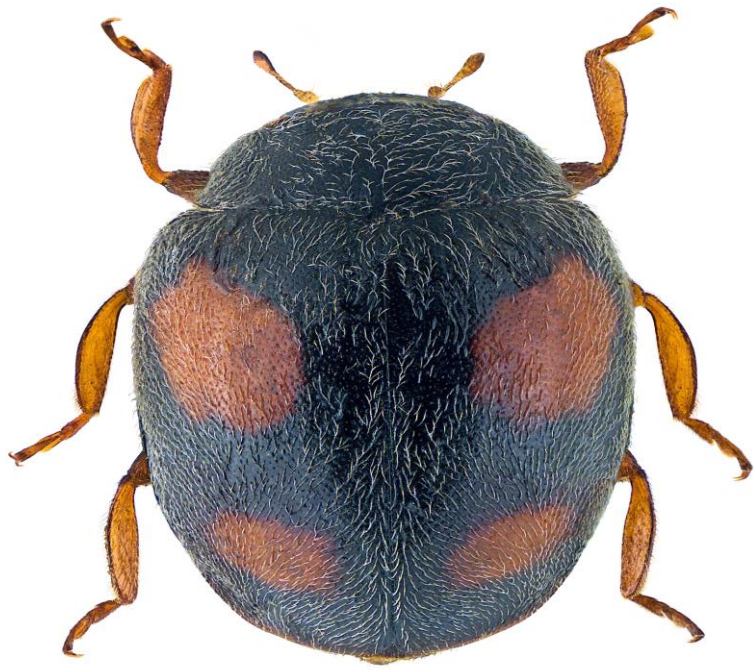
Nature of Damage

- **Mealy-bugs are seen clustered at the basal nodes of canes and are exposed when a leaf sheath is removed.**
- **Nymphs and the wingless female adults cause damage by sucking the cell-sap.**
- **Mealy-bugs are first noticed in appreciable numbers when canes are four months old till harvest.**
- **Canes having tight fitting sheaths are more or less free from the attack, whereas a drought affected crop is more severely damaged.**
- **The bugs drain away large quantities of sap from the canes and befoul them by their mealy secretions and honeydew.**
- **A sooty mould develops on these secretions giving a blackish appearance to the canes.**
- **It is also suspected that the mottling disease of sugarcane which is serious in certain parts of India is transmitted by these bugs**
- **In severe cases of infestation sucrose content decreases by 24 per cent.**



Management

- **Grow Attractant plants like Coriander that attract wasps**
- **Use resistant/tolerant varieties**
- **De-trashing of canes and removal of water shoots.**
- **Drain excess water from the field and avoid water stress conditions.**
- **Conserve and augment the natural enemies such as *Chilocorus*, *Hyperaspis*, *Crysoperla*, *Aphytis*, *Coccophagus*, *Encarsia* etc.**
- **Predators- *Pharoscymnus grimeti*, *Scymnus coccivora*, *S. andrewsi* and *S. nubilis*.**
- **A coccinellid, *Hyperaspis trilineala* was introduced in Tamil Nadu and Karnataka in 1970.**
- **Spray 1.25 litres of malathion 50 EC or 2.0 litres of diazinon 20 EC in 1250 litres of water per ha.**



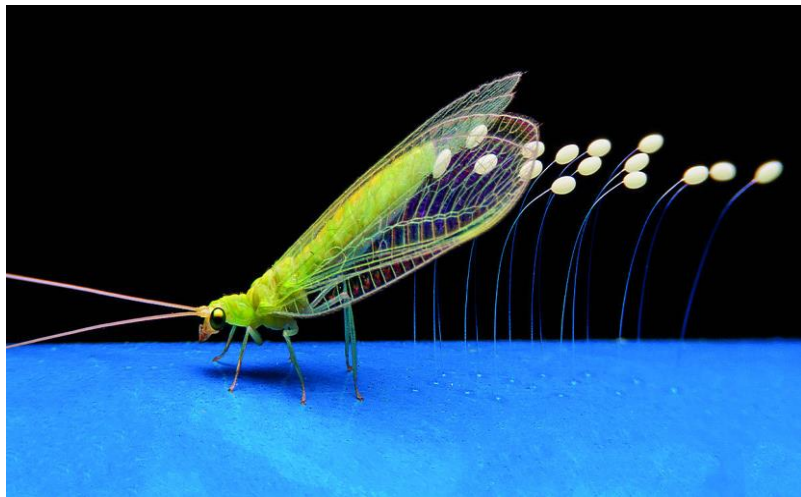
Scymnus coccivora



Hyperaspis trilineata



Chilocorus spp.



Crysochroa spp.



Coccophagus spp.



Encarsia spp.

7. Sugarcane woolly aphid S.N: *Ceratovacuna lanigera* (Aphididae: Hemiptera)

- **Distribution:** Recorded earlier as a minor pest on sugarcane from North Eastern States like Nagaland, Assam, Tripura, Sikkim, West Bengal and Uttar Pradesh in 1974.
- **In July 2002 severe infestation of this pest in sugarcane crop was noticed in Maharashtra.**
- Later this pest was found distributed in Karnataka, Andhra Pradesh, Tamil Nadu, Kerala, Uttaranchal and Bihar.
- **Host range:** Sugarcane is a primary host of this aphid while bamboo, *Cynodon dactylon* are the secondary hosts.



Morphology

- Newly emerged nymphs are yellowish or greenish yellow in colour devoid of woolly filaments.
- **White coloured woolly filaments are observed on the dorsal side of the 3rd and 4th instar nymphs and not on the 1 and 2nd instars.**
- Adults are black in colour and they possess two pairs of transparent wings and a pair of cornicles.
- **Nymphs are found congregated at both the sides of the mid rib on the lower surface of the leaves.**



Biology

- **There are four instars observed after which they become adults.**
- **Winged and wingless females are found to reproduce parthenogenetically throughout the year.**
- **Each female produced a maximum of 217 nymphs in 20 days.**
- **Nymphs completed four instars to become adults in 6-22 days depending on the climatic conditions and sugarcane varieties.**
- **Overlapping generations are observed in the field.**
- **During severe infestation on an average 1600 nymphs may be found on a single leaf to a maximum of 8000 nymphs.**
- **The winged female of wooly aphid can fly with wind to a distance of 1.5 km to 2.0 km.**
- **This facilitates further spread of the pest.**

3. Adult
3-5 days



White woolly aphid,
Ceratovacuna lanigera

2. Nymphs



1. Eggs



1-3 days

Nature of Damage

- **Nymphs and adults are found on the lower surface of the sugarcane leaves and suck the cell sap and excrete honey dew which is dropped on the upper surface of the lower leaves.**
- **Honey dew encourages the growth of the fungus *Capnodium spp.* which results in black coating called 'sooty mould' on the upper surface of leaves affecting photosynthesis.**
- **The sap drainage results in the leaf gradually turning yellow and pinkish and ultimately the leaf dries up.**
- **Severe infestation causes mottling of leaves, stunted growth, and loss in sugarcane yield and sugar recovery.**
- **Losses up to 26% in sugarcane yield and 24% in sugar content have been reported.**



Management

- **In endemic pockets, promote paired or wider row planting to help take up pest management practices.**
- **Avoid excess irrigation.**
- **Select seed material from pest free areas and uninfested fields.**
- **Destroy affected leaves when the pest problem is initially noticed in a limited area.**
- **Utilize sugarcane varieties less susceptible to the woolly aphid.**
- **Ensure that no chemical pesticides are used in at least 1 % of the sugarcane field to serve as a refuge for the build-up of natural enemies.**
- **Conserve and augment natural enemies like *Dipha aphidivora*, *Micromus igorotus* and syrphids by avoiding the use of chemical pesticides whenever natural enemy activity is seen.**

Management

- Set up *D. aphidivora* and *M. igorotus* nurseries under shade nets and augment their population in woolly aphid infested areas by periodic releases especially during June-July.
- Augmentation may also be effected during this period from fields where *Dipha* is present to fields where it is absent.
- **Release of the natural enemies *Dipha aphidivora* or *Micromus igorotus* in shade net cages (5m x 5m) @ 50/cage and allow them to develop and disperse by removing the cages [CSB, 2016].**
- Release of *D. aphidivora* larvae @ 1000/ha and *M. igorotus* larvae @ 2500/ha.
- Many pesticides have been found to be effective.
- They may be used only as a last resort and with caution.
- **However, since methyl parathion and phorate are highly toxic they should be avoided**

Management

- **Need based application of chlorpyrifos or dimethoate or quinalphos or monocrotophos @ 2ml/ lit. of water in case of severe infestation without the presence of natural enemies**
- **Thiomethoxam (Actara) @ 0.2 gm / lit. of water is more effective**



Diphia aphidivora

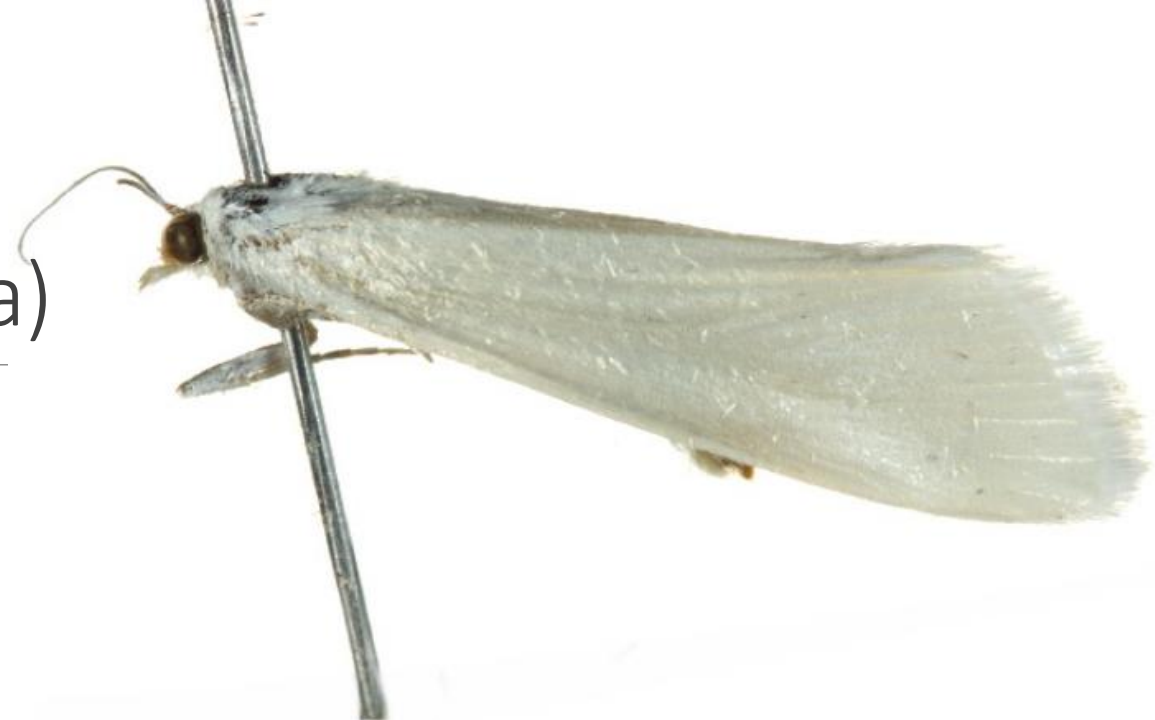


Micromus igorotus

8. Sugarcane Top Borer

S.N: *Scirpophaga nivella*
(Pyralidae: Lepidoptera)

- **Distribution:** This insect is one of the most destructive pests of sugarcane in North India and Pakistan.
- It is also distributed in Myanmar, Sri Lanka, China, Formosa, Japan, the Philippines and Thailand.
- **Host range:** Sugarcane, sarkanda (*Saccharum munja*), kahi (*Saccharum spontaneum*) and some other grasses.



Morphology

- **When full-grown, a caterpillar is creamy white and rather sluggish.**
- **Moth is uniformly white in colour.**
- **Males are considerably smaller than females.**
- **The first pair of wings of certain moths bears a black spot on each wing.**
- **Females have a crimson hairy tuft at the anal end.**
- **Eggs are oval shaped and flattened.**



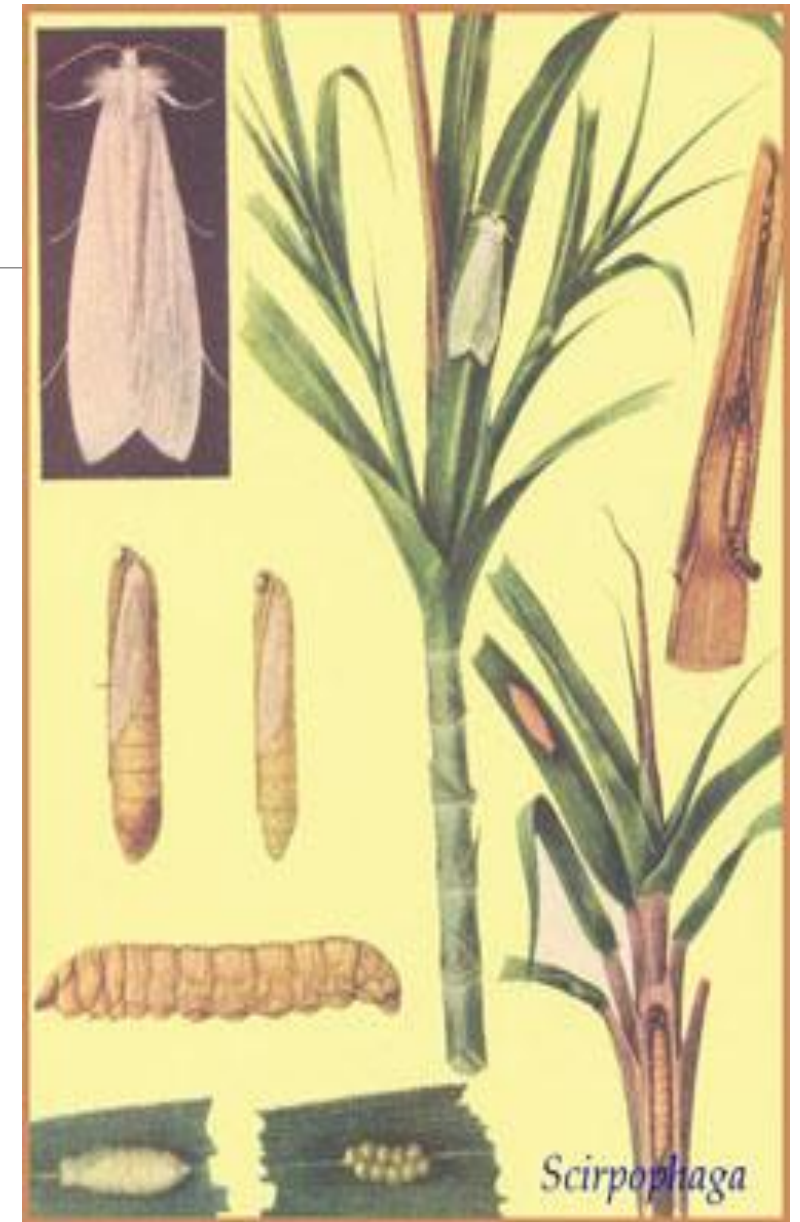


Biology

- This pest is active from March to November and passes the winter as a full grown larva in cane tops.
- These larvae pupate in the second half of February and the moths emerge during March.
- **S.O.O.- on the lower surface of the leaves and covers with crimson coloured hairs.**
- **These clusters are covered with a brown tuft of hairs and are quite prominent.**
- The egg, larval and pupal periods are 5-7, 30-37 and 12-21 days respectively.
- **The young larvae bore into the mid-rib of a leaf, mining their way to the base and slowly reaches the central region.**
- **From there, they enter the spindle, feeding on the growing point and the soft portion of the cane.**
- They grow to maturity in five stages.
- **When full-fed, a larva constructs a chamber with an emergence hole in the rind just above a node.**
- **S.O.P.-inside the chamber.**

Biology

- The moths are commonly seen sitting on cane tops early in the morning.
- They become active at night when they mate and the females lay eggs.
- The moths are short-lived; hardly live more than 4-5 days.
- Four to five generations are completed during a year.
- Full-grown caterpillars of the last generation, however, do not pupate.
- They hibernate in cane tops throughout winter in northern India.
- The total life cycle lasts 45–75 days.
- Heavy rains are usually conducive for the multiplication of the pest.





Egg Mass



Larva



Adult

Nature of Damage

- **The first two broods of this pest attack young plants before the formation of canes and tunneling of midrib in a leaf show characteristic reddish streaks on the mid-ribs on the second to fifth leaves.**
- **These plants are killed and are a total loss.**
- **They also show a number of shot holes in the leaves which ultimately cause dead-hearts (2–4 months old).**
- **In subsequent broods, the pest attacks the terminal portions of the canes, causing bunchy tops [JRF 2011, 2015, IARI PhD 2011, ARS PRE/NET2015]**
- **Sprouting of the eye buds affects the quality of the juice.**
- **Damage by the third and fourth broods may result in more than 25 per cent reduction in weight and a decrease in the quality of the juice. Since the growth is restricted, the yield is also affected.**
- **The loss in weight in different varieties may vary from 21 to 37 per cent and loss in sugar recovery from 0.2 to 4.1 units and early maturity of the crop.**





Shot holes on leaves



Several side shoots at terminal region called as

'bunchy top'

Bunchy top symptoms



Management

- **Collect and destroy moths and egg clusters.**
- **Cut the attacked shoots at the ground level from April to June.**
- **Use of pheromone traps @ 3/acre for monitoring coinciding with brood emergence**
- **Installation of light trap with exit option for natural enemies @ 1/ acre.**
- **Variety Co-419 is comparatively resistant to this borer.**
- **Other resistant varieties are CoS - 767, CoJ - 67 and Co - 1158.**
- **Since about one-third of the larvae remain in the underground portion of the stem, the sharp edge of a sickle should be inserted to kill them.**
- **Cutting and destroying cane tops which harbour the over-wintering larvae before mid-February, also reduce the incidence of this pest.**

Management

- Egg parasitoid- *Telenomus beneficiens* (Scelionidae) infests in all the sugarcane growing areas of India.
- *Isotima javensis* (Ichneumonidae) is a parasitoid found in North India and Myanmar, and it attacks the larvae and pupae of this pest.
- Release of *Trichogramma japonicum* @ 20,000/acre 2-3 times at 10 days interval
- The other parasitoids reported are, *Trichogramma chilonis* (Trichogrammatidae) and *Telenomus dignoides* (Scelionidae) on eggs.
- *Goryphus* spp. *Xanthopimpla mursei* and *X. predator* (Ichneumonidae), *Rhaconotus roslinensis*, *R. scirpophagae*, *R. signipennis*, *Stenobracon deesae* and *S. nicevillei* (Braconidae), *Goniozus indicus* (Bethyridae) and a tachinid parasitoid, *Sturmiopsis inferens* (Tachinidae) on larvae.
- Chlorantraniliprole 18.5% SC @150 ml in 400 l of water/acre or Phorate10% CG @ 12,000 g/acre or Carbofuran3%CG @ 26640 g/ acre or Chlorantraniliprole 0.4% GR@7.5 kg/acre

9. Sugarcane early Shoot-borer S.N: *Chilo infuscatellus* (Pyralidae: Lepidoptera)

- **Distribution:** Very serious pests of sugarcane in India.
- Tamil Nadu, Andhra Pradesh, Punjab, U.P., Bihar, West Bengal, Madhya Pradesh, Rajasthan and Maharashtra.
- **Host range:** Sugarcane, maize, bajra, sarkanda, kahi, baru (*Sorghum halepense*) and some other grasses.
- Attacks 1 to 3 months old crop of sugarcane



Morphology

- Larvae are dirty white and have five light- violet longitudinal stripes on the body.
- The crochets in the proleg are crescentic or semi-circular.
- The moths have straw coloured fore wings and whitish hind wings with apical light buff areas and attracted to light at night.
- Creamy white scale like eggs.
- The pupa is light brown in colour.





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Biology

- **The pest is active from March to November and passes winter as a full-grown larva in the stubble.**
- **The larvae pupate some time in February and emerge as moths during March.**
- **S.O.O.- on the lower surface of leaves by the side of the midrib in three or more rows, one overlapping the other.**
- **Eggs are laid on the leaf sheath also.**
- **The egg, larval and pupal periods are 4-5, 23-30 and 10 days respectively.**
- **The larvae reach the plant base, bore into the shoot and feed there.**
- **They grow through five stages.**
- **Then each larva constructs a chamber for pupation in the cane and makes an exit hole from which it emerges as moth.**
- **The life-cycle is completed in 5-6 weeks. There are 5 to 6 broods of the insect.**

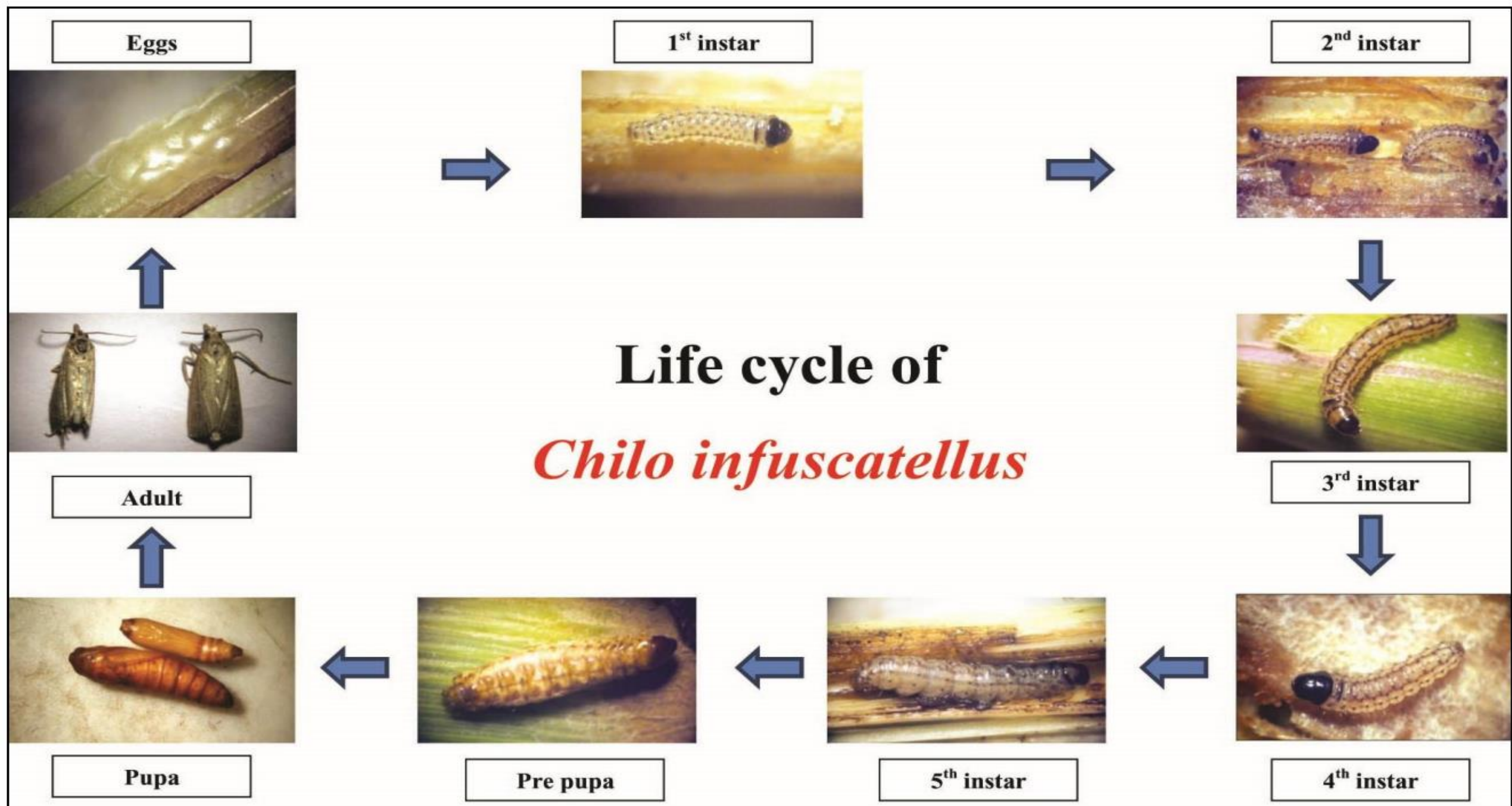


Plate 1: Different life stages of *Chilo infuscatellus* on sugarcane genotype CoH119

Nature of Damage

- **The caterpillars cut a hole on the side near ground level and enter the shoot and feed downwards.**
- **The affected tiller will decay emitting a foul smell.**
- **Each caterpillar migrates and attacks a number of shoots [JRF 2002]**
- **Dead heart in 1-3-month-old crop, which can be easily pulled out, rotten portion of the straw coloured dead- heart emits an offensive odour.**
- **A number of bore holes at the base of the shoot just above the ground level.**
- **The central whorl of leaves in the attacked shoots dries up, forming a "dead heart" from April to June, and completely dry up.**
- **Though it occurs during pre-monsoon periods March- July its multiplication is favored by high temperature and low humidity**
- **If the attack is in early stages the mother shoot dies completely and late attack induces profuse tillering.**

Nature of Damage

- A loss of 10-20 per cent of young shoots is not uncommon during this period and in years of serious infestation it may be as high as 70 per cent.
- **After the formation of canes, the attack does not produce dead-hearts and the damage is confined to a few internodes only.**
- Even then, there is considerable reduction in cane yield and sugar content.
- At harvest, losses of 22-33 per cent in yield,
12 per cent in sugar recovery,
2 per cent in commercial cane sugar (CCS) and
27 per cent in jaggery have been estimated.









Dead heart



Bore holes



Rotten portion

Management

- **To control the shoot borer, plant the crop early, i.e. before the middle of March.**
- **Deep summer ploughing, Inter culture and hand weeding and Timely irrigation**
- **In ratoon crop mulching with trash reduce shoot borer attack**
- **Use of pheromone traps @ 2/acre for monitoring**
- **Grow onion/garlic/coriander as intercrop**
- **Light earthing up of the tillers at the early stages of the crop (month old) during May and June reduces the incidence.**
- **A second earthing up at a month later reduces the borer attack considerably [JRF 2015, ICAR NET 2019]**
- **The varieties CO- 312, CO -421, CO- 661, CO- 853, CO- 917, CO- 987 and CO- 1007 are resistant to the insect**
- **Mulching with cane trash at the early stages also has been reported to reduce the incidence and help in conserving moisture.**

Management

- Cutting the affected tillers as close to the ground as possible and destroying them.
- Inundative releases of the egg parasitoid *Trichogramma chilonis* @ 50,000/ha from first month of planting at 7 - 10 days interval till one month prior to harvest.
- The other egg parasitoids associated with this borer are, *Trichogramma exiguum*, *T. intermedium* and *Trichogrammatoidea nana* (Trichogrammatidae), *Telenomus beneficiens* and *T. dignoides* (Scelionidae).
- The parasitoids associated with larvae are *Campyloneurus mutator*, *Apanteles flavipes*, *Stenobracon spp.* (Braconidae), *Goniozus indicus* and *G. rephoterycis* (Bethylidae).
- The tachinid, *Sturmiopsis inferens* and *S. semiberbis* (Tachinidae) also parasitize the larvae of this pest.
- The only parasitoid associated with pupae is *Tetrastichus ayyari* (Eulophidae).
- Release of 125 gravid females of *Sturmiopsis inferens* (Tachinidae) per ha at 45th day of crop growth.
- At 30, 45h and 60h day of crop growth spray granulosis virus of *Chilo infiscatellus* (107- 10 inclusion bodies/ml) at 500 /ha.

Management

- **Apply 25 kg granules of fipronil 0.3G per ha, before the cane setts are covered with earth by planking.**
- **Apply Fipronil 5% SC @ 600-800 ml in 200 l of water/acre or**
Fipronil 0.3 % GR @ 30-40 ml in 10000-13320 lt of water/ acre or
Chlorpyrifos 20% EC @ 500-600 ml in 200-400 l of water/acre or
Chlorantraniliprole 18.5% SC@ 150 ml in 400 l of water/acre or
Cypermethrin 10% EC @ 260-304 ml in 200-280 l of water/acre or
Quinalphos 5% Granule @ 2000 g/acre or
Chlorantraniliprole 0.4% GR@75 g/acre
- **The economic threshold level is 15 per cent incidence.**

10. Stalk-borer

S.N: *Chilo auricilius*

(Pyralidae: Lepidoptera)

- **Distribution:** The stalk-borer or tarai borer is perhaps the most destructive pest of sugarcane in northern India
- Bihar, the Tarai areas of Uttar Pradesh, and Haryana and Punjab.
- **Host Range:** Sugarcane, paddy, wheat, oats and baru



Morphology

- **The full-grown caterpillar is with a light bluish pink body and has a dark brown head and five longitudinal violet dorsal stripes.**
- **The moth is straw-coloured.**
- **The fore wings have golden spots and the hind wings are silvery-white.**





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Biology

- The pest is found practically throughout the year but breeds from March to October.
- The winter months are passed as full-grown larvae in canes or stubble.
- They pupate sometimes during January and emerge as moths at the beginning of February.
- **S.O.O.- in leaf sheaths or on the underside of leaves of the late water-shoots and early ratoon sprouts.**
- The larvae develop through 5 stages and are full-grown in 3-6 weeks.
- **Then the mature larva constructs a chamber with an exit hole and begins pupation.**
- Moths emerge in about one week and the life-cycle is completed in 5.9 weeks.
- In all, 5 or 6 overlapping generations are completed in a year.
- The winter life-cycle is rather prolonged and is completed in 17-19 weeks, out of which 14-16 weeks are spent in the larval stage and 2-3 in the pupal stage.

Nature of Damage

- **In spring, when the pest first appears on the ratoon crop, the late "water shoots" play an important role in its multiplication.**
- **By the time the canes are fanned in August-September, 75 per cent of them may be infested, the heavily manured fields and soft varieties suffering more.**
- **The lodged crop and the waterlogged fields are also more severely infested.**
- **It causes damage in the larval stage by feeding inside the stem.**
- **They feed on leaf sheaths or on mid ribs and then bore into stalks by making circular holes in the rind.**
- **Dead-hearts are produced in young plants but after cane formation, the attack is not easily seen from a distance.**

Nature of Damage

- **The caterpillars have the habit of boring into one internode after another and moving from plant to plant, thus infesting up to 90 per cent of the canes in certain fields.**
- **According to one estimate, this pest causes on an average, 16 per cent reduction in cane yield and a loss of 2.16 units in sugar recovery.**

Management

- **Grow resistant varieties in the area where the stalk borer is a serious pest.**
- **Do not use the cane-seed from the infested field.**
- **Spread of the pest to uninfested areas may be prevented by restricting the movement of infested canes.**
- **The pest population can be suppressed by burning the trash in the fields after harvest and by removing and destroying the water-shoots over large areas during February-March.**
- **This practice also induces tillering and is useful.**
- **Do not ratoon a heavily infested crop; plough up the affected fields, collect the stumps and destroy them.**
- **At harvest, do not leave the water-shoots in the field.**
- **Staple 100 tricho-cards (5 cm x 2.5 cm) to the underside of sugarcane leaves from July to October at 10 days interval. Each card should have approximately 500 parasitized eggs and be spread uniformly at 100 spots/ha. Normally 10-12 releases are required.**

11. Sugarcane Root-borer

S.N: *Emmalocera depressella*
(Pyralidae: Lepidoptera)

- **Distribution:** This is a very serious pest of sugarcane in eastern India but in Pakistan, Haryana and Punjab it is of minor importance.
- **Host range:** Sugarcane, sarkanda, baru, Napier grass, etc.
- **Morphology:** A full-grown caterpillar creamy white with yellowish brown head and a rather wrinkled body.
- The moths are pale yellow-brown and have white hind wings.



Biology

- **The root borer is active from April to October and passes winter as full grown larva within the stubble.**
- **It pupates sometimes in March and emerges as a moth within 2-3 weeks.**
- **The moth lives for 5-7 days.**
- **A female lay, on an average, 277-355 scale-like, creamy-white eggs singly on the leaves, the stem or on the ground.**
- **The eggs hatch in 5-8 days and the young larvae bore into the stem below the soil surface.**
- **The larvae complete their development through five stages in about four weeks.**
- **When full- grown, they pupate inside the canes after making emergence holes just above the soil surface.**
- **The pupal stages lasts 9-14 days and moths emerges from these holes.**
- **The life-cycle is completed in 6-7 weeks.**
- **During a year, four generations are completed and the caterpillars of the fifth generation hibernate in winter.**

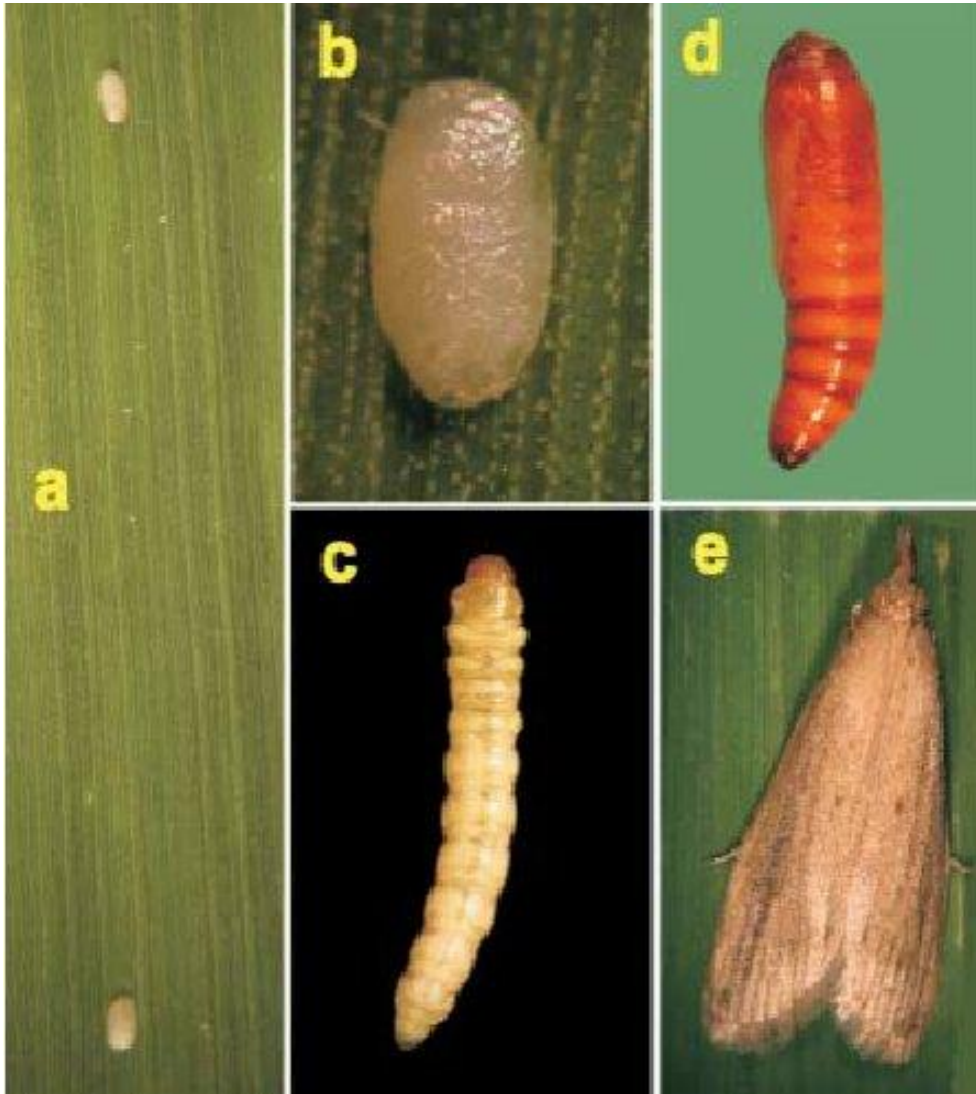




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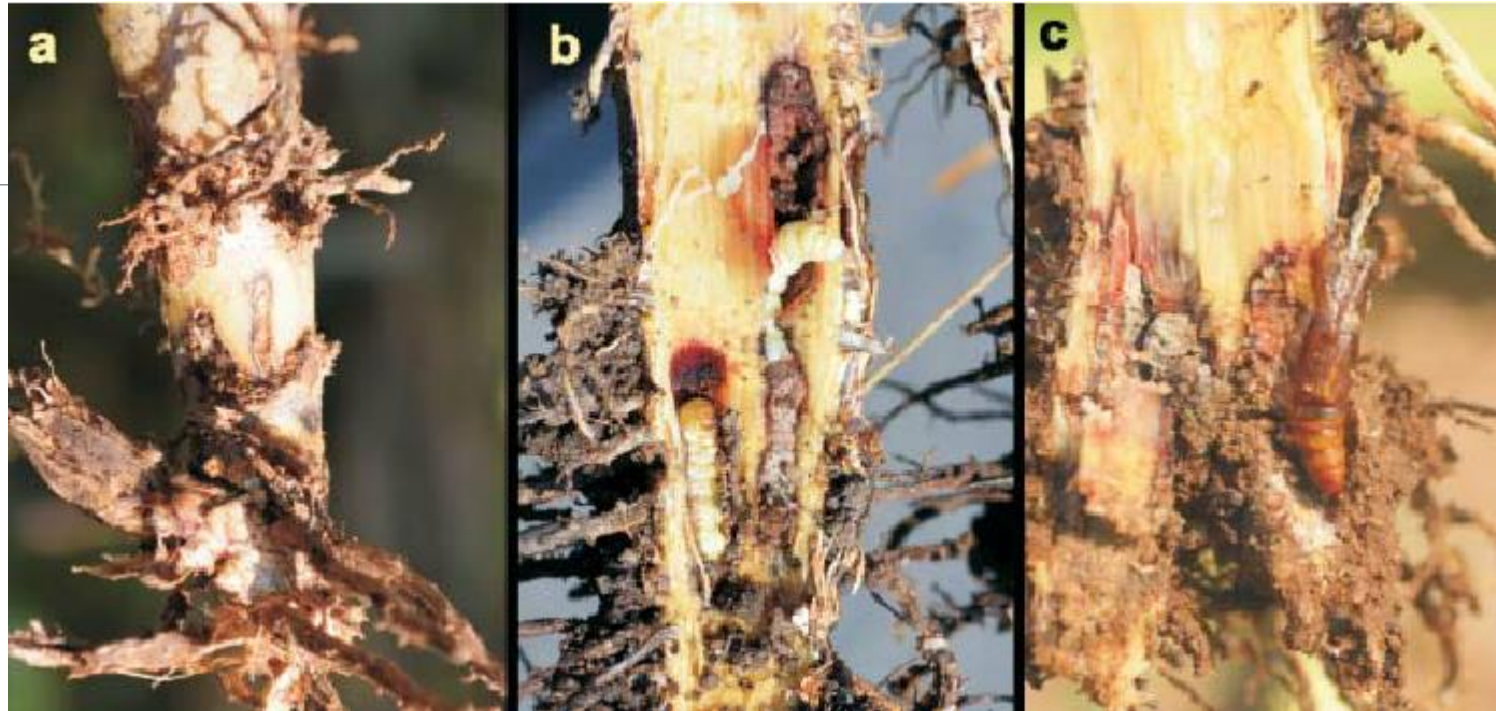


Life stages of sugarcane root borer *Polyocha depressella*:

- (a) singly laid eggs on leaf lamina**
- (b) single egg**
- (c) grown-up larva**
- (d) pupa**
- (e) moth**

Nature of Damage

- **Damage is caused by the caterpillars which feed on the underground portions of plants, resulting in drying up of the central whorl of leaves.**
- **Caterpillar damage to stem/shoot [ARS PRE/ NET 2015] and it is wrongly called as root borer.**
- **As they feed, they cut right across the stem, reaching the adjoining tillers.**
- **Central leaves of the attacked plants dry up and form dead-hearts before the cane-forming stage.**
- **These dead-hearts are not easily pulled out & are not offensively smelled like other dead hearts produced by stem borers.**
- **This pest is primarily destructive to young plants and the attack is particularly severe from April to June.**
- **Plants attacked after the formation of canes are not killed, although their weight and sugar content are reduced**
- **At harvest, a decrease in yield up to 10 per cent and reduction of sucrose in juice by about 0.3 unit have been reported.**



Damage symptoms and stages of root borer *Polyocha depressella* in late stage sugarcane:

(a) external bore holes on cane surface

(b) internal tunnels with larvae

(c) pupal case in damaged cane

Management

- **The pest can be suppressed by ploughing up and burning the stubble in the fields not kept for ratooning.**
- **The canes should be harvested below the soil surface in order to kill the caterpillars.**
- **Light earthing up of crops three months after planting**
- **In ratoon crop mulching with trash reduce shoot borer attack**
- **Use of pheromone traps @ 2/acre for monitoring**
- **Grow onion/garlic/coriander as intercrop**
- **In nature, this pest is attacked by *Trichogramma chilonis* (Trichogrammatidae), *Apanteles flavipes* and *Stenobracon sp.* (Braconidae).**
- **Staple 40 Tricho-cards to the under-sides of sugarcane leaves from July to October at 10 days intervals.**
- **Each card should have approximately 500 parasitized eggs and be spread uniformly at 100 spots per ha.**
- **Normally, 10-12 releases are required.**

Management

Chemical Control:

- **Fipronil 5% SC @ 600-800 ml in 200 l of water/acre**
- **Fipronil 0.3% GR @ 30-40 ml in 10000-13320 l of water/ acre**
- **Chlorpyrifos 20% EC @ 500-600 ml in 200-400 l of water/acre**
- **Chlorantraniliprole 18.5% SC @ 150 ml in 400 l of water/acre**
- **Chlorantraniliprole 0.4% GR @ 7.5 g/acre**

12. Internode Borer

S.N: *Chilo sacchariphagus indicus*
(Pyralidae: Lepidoptera)

- **Distribution:** The insect is found throughout India and usually occurs on sugarcane **late in its growing phase** during June to December.
- It is a serious pest in Andhra Pradesh, Karnataka, Kerala, Tamil Nadu and Uttar Pradesh.
- **Host range:** Pearl millet, sorghum, maize, paddy and wild plants like *Sorghum spontaneum*, *S. fusca* and *Pennisetum hoockenhackeri*.



Morphology

- **Moth- Pale brown with white hind legs.**
- **Larva has a white body with dark spots and a brown head and four violet stripes on the dorsal surface.**
- **The dorsal median line is absent.**
- **The head is shiny yellowish brown.**
- **The crochets on the prolegs are circular.**





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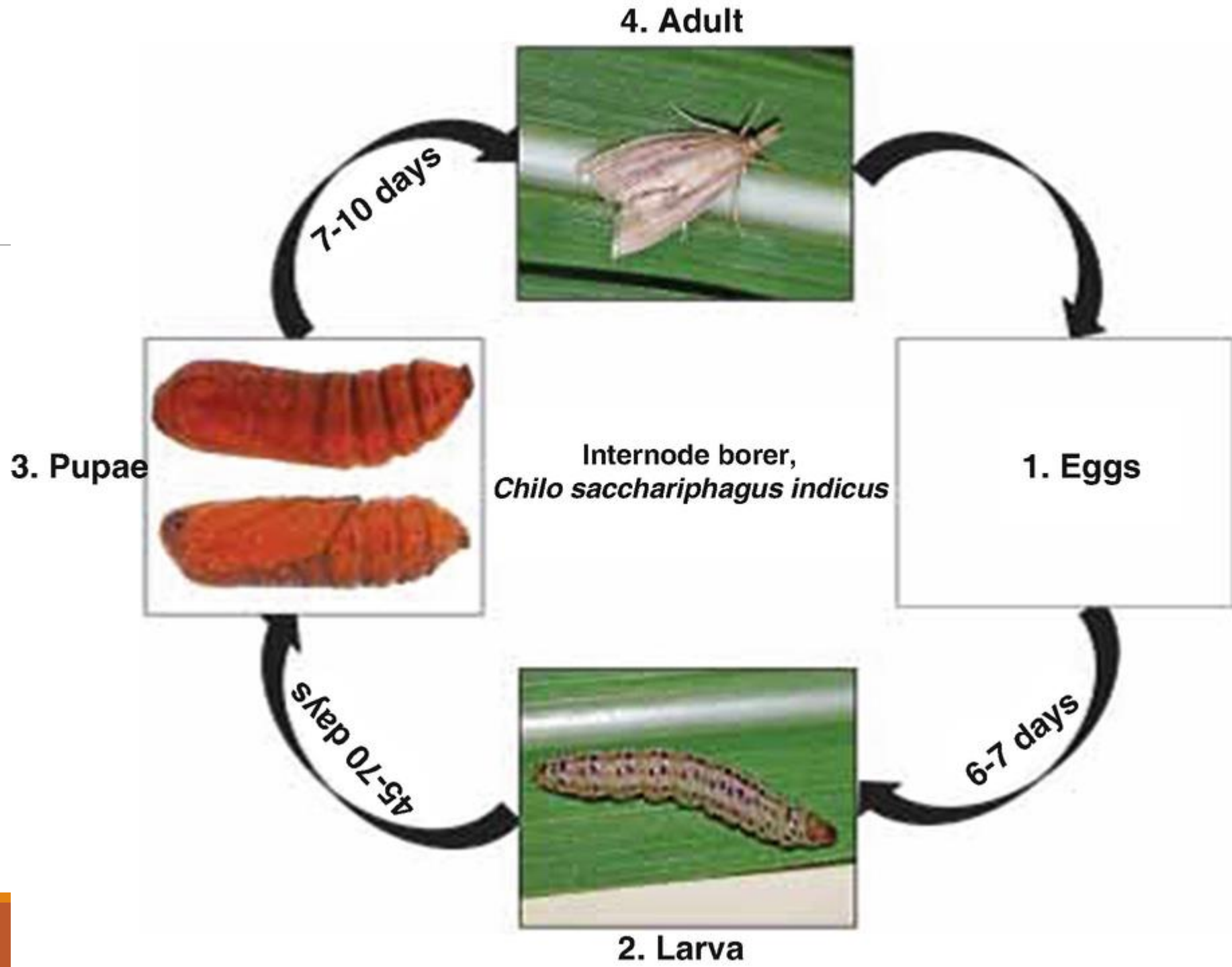
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Biology

- **The females lay white scale like eggs in masses of 9-11 near the midrib of the leaves, on leaf sheaths and on stems.**
- **A maximum of 400 eggs are laid by a female. The incubation period is 5-6 days.**
- **The larva becomes full grown in 37-53 days and pupates in the leaf sheath.**
- **The pupal period lasts for 8-10 days and the adults survive for 3-4 days.**
- **The total life-cycle occupies 50-70 days and there are six broods of the insect in a year.**
- **Its multiplication is rapid under condition of low temperature and high humidity and the infestation ranges from 20 to 50%.**





Nature of Damage

- **Clones with higher tillering capacity show higher borer incidence.**
- **It infests the crop after the third month when internodes begin to form and continues till the time of harvest.**
- **Symptoms will be visible only on close examination,**
- **The caterpillar bores into the canes near the nodes and feeds on the fibrous tissue by tunneling and the tissues turn red; the entry holes being plugged with excreta.**
- **Attack results in constriction and shortening of internodes. It migrates and damages many nodes.**
- **A larva may attack 1-3 internodes and mostly the attack is seen in the top five internodes.**
- **The loss to cane is more to its tonnage than to its quality.**
- **Its attack significantly affects juice quality if damage extends to 3 or more internodes or more than 10% of the total length of the cane.**



Larvae feeds on the fibrous tissue by tunneling and the tissues turn red



Larvae feeds on the fibrous tissue by tunneling and the tissues turn red



Entry holes plugged with excreta



Management

- Periodical collection and destruction of egg masses may be useful.
- Detrashing at 5,7,9 months. [IARI PhD 2014]
- Inundative release of the egg parasitoid *Trichogramma chilonis* at 50,000 parasitoids /ha /week from the 4th up to 11th month after planting affords protection.
- Resistant varieties are Co 285, 453, 513,617, 853, 915, 1007, 1287, 6806 and CoJ 46.

13. Green Borer

S.N: *Raphimetopus ablutellus*
(Pyralidae: Lepidoptera)

- **Distribution:** The green borer is a regular pest of sugarcane in Bihar, Uttar Pradesh, Haryana and Punjab.
- In certain years, it becomes quite a serious pest.
- **Morphology:** The insect is named after the caterpillar which is uniformly copper green and has a characteristic greyish prothoracic shield.
- The adult moth has ochreous fore wings and white hind wings.



Biology

- **The pest is active in the sugarcane fields from February to June only and the rest of the year, it lives as a hibernating larva in the stubble.**
- **The moths appear from the pupae towards the end of February or early March.**
- **After mating, the females lay, on an average, 37 oval shaped eggs, in small clusters scattered in cracks and crevices in the soil or among loose soil particles.**
- **The dull white eggs are seen just below the surface of the ground, near the host plants.**
- **The eggs hatch in 7-8 days in April.**
- **On emergence the larvae bore into the soft cane shoots and feed inside.**
- **They undergo five moultings in 20-25 days during April and May. The total life cycle is completed in 35-40 days.**
- **They pupate in the cane, leaving an exit holes and emerge as moths in about 7 days.**
- **They complete 3 generations in a year.**

Nature of Damage

- **The damage by this borer is generally found in association with other shoot borers, e.g. *Chilo infuscatellus*, *Sesamia sp.* and *Enmmalocera depressella*, during the summer months.**
- **The larvae attack the growing point of the plants, causing dead-hearts.**
- **In Uttar Pradesh, it has been found to kill 24-76 per cent of the mother shoots from April to June.**

Management

- **The larvae are parasitized by *Stenobracon deesae* (Braconidae) which results in some natural control.**
- **The timely removal and burning of stubble further help to suppress this pest.**
- **Rake 35 kg of carbaryl 10 per cent dust per ha into the soil at the time of planting of sugarcane.**

14. Gurdaspur Borer

S.N: *Bissetia steniella*
(Pyralidae: Lepidoptera)

- **Distribution:** In the fifties and sixties it was considered to be the most destructive pests of sugarcane in northern India.
- Its importance as a pest started declining in the late sixties.
- The exact causes of its natural population decline are not known, although a multiple of factors are considered to have contributed to it.
- **Morphology:** A full-grown caterpillar, creamy white, with orange brown head.
- There are four prominent longitudinal violet stripes on the body.
- The moth has a number of dark spots along the outer margins of the forewings.
- The hind wings are white.

Factors responsible for declining of the pest status

- **Removal and destruction of infested cane through campaigns in the sugar factory areas during July-September.**
- **Introduction of new varieties, viz COJ 46 and COJ 64, replacing the susceptible variety CO 312.**
- **Activity of natural enemies like larval parasite, *Stenobracon nicevillei* (Braconidae) and the egg parasite, *Trichogramma spp.* (Trichogrammatidae)**

Biology

- **The pest is active from July to October and passes the winter and the early part of summer as a full-grown larva in sugarcane stubble.**
- **The larvae pupate sometimes in June and start emerging as moths in the end of June or in the first week of July.**
- **The moths are nocturnal. A female lays 90-300 flattened scale-like eggs in clusters of 3-22.**
- **The eggs are laid on the upper surface of the leaves along the mid-rib and they hatch in 4-9 days.**
- **In 4 or 5 hours, the young larvae enter the top portion of a cane through a single hole just above a node. There, they feed gregariously by making spiral galleries which run upward about 7-10 days. when the cane top has dried up, the larvae (in the third stage) come out and enter the adjoining canes single or in twos. They may again come out of these canes and attack more plants.**

Biology

- **The larvae grow through five-stages and are full-fed in 19-27 days.**
- **When mature, they make exit holes and pupate inside.**
- **The pupal stage lasts 6-12 days and, on emergence, the moths live for 4-5 days.**
- **The pest pupates in stubble and the life-cycle is completed in 5-6 weeks.**
- **It breeds two or three times in a year.**
- **In the beginning of September, the full-grown caterpillars start migration from the upper part by coming out and re-entering the cane near the base.**
- **They enter the stubble and hibernate there till June of the next year.**

Nature of Damage

- **In the initial stages, the larvae feed gregariously in the top portion of the canes by making spiral galleries thus killing the plant.**
- **At about the time the larvae leave these canes and move on to new ones, the dried cane tops can be spotted in a field.**
- **Later on large patches of dried canes appear.**
- **The pest destroys 20-25 per cent of the crop.**
- **In case of severe infestation, the loss may be as high as 70-75 per cent and sugar recovery from the affected crop is also greatly reduced.**
- **A loss of 17 per cent in total solids. 29 per cent in sucrose and an increase of 84 per cent in glucose has been reported due to borer infestation.**

Management

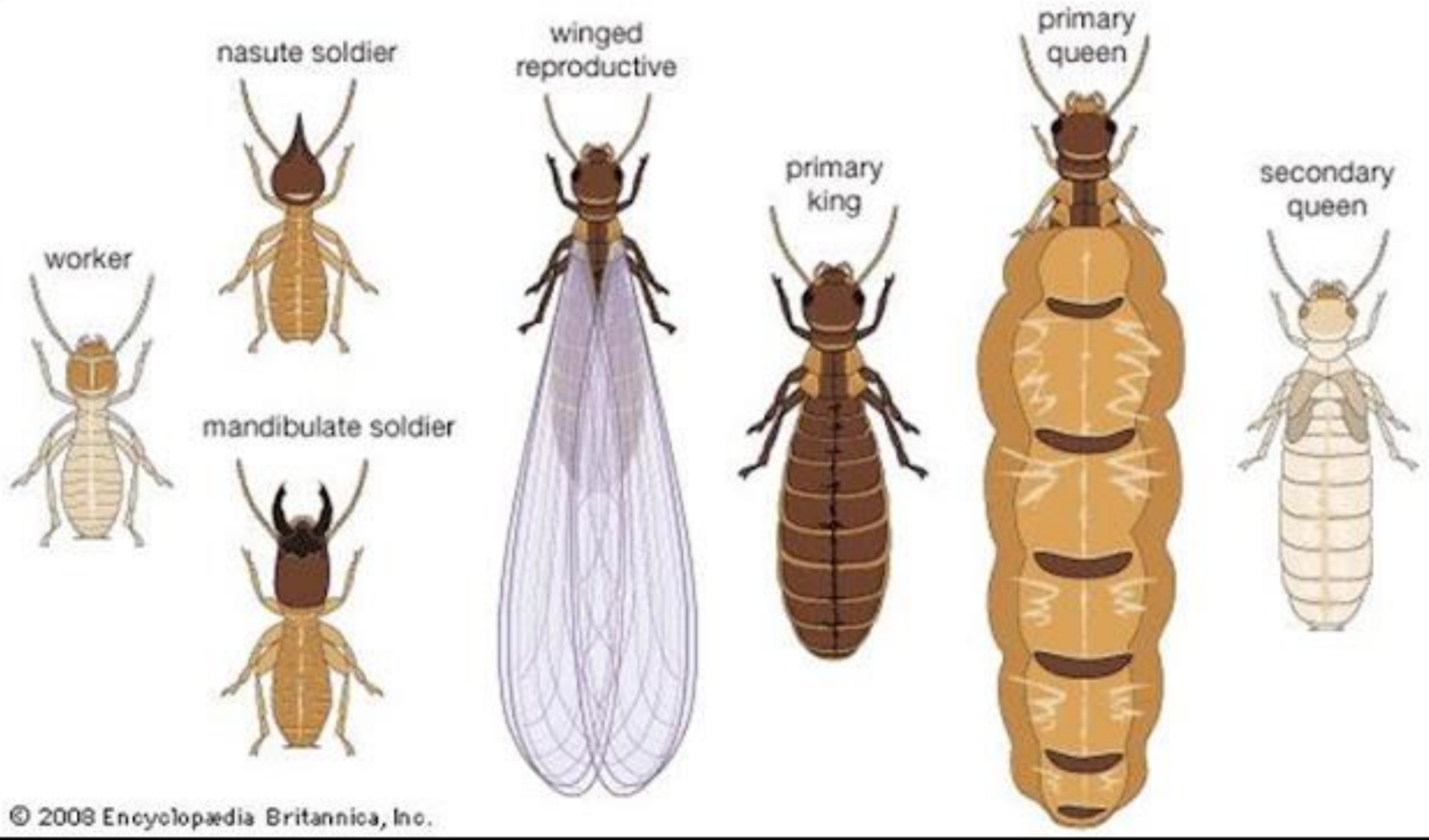
- **Rogue out the canes showing withered tops in the afternoon every week from June to September.**
- **The tops should be cut off well below the point of attack [JRF 2001].**
- **Do not ratoon a heavily affected crop.**

15. Termites

S.N: *Odontotermes obesus*
(Termitidae: Isoptera)

- Mainly two species of termites viz, *Odontotermes obesus* and *O. assamthi* attack sugarcane in this country.
- Two other species *O. bengalensis* and *Trinervitermes biformis* are also known to infest sugarcane in India.





Nature of Damage

- **The infestation commences with planting of setts and the termites damage the cut ends and buds of setts affecting their germination to the extent of 28 to 67% resulting in gaps in the field.**
- **Setts are completely eaten away leaving only the outer hard rind.**
- **In the attacked plants the outer leaves first show signs of drying and attacked canes may come off easily if pulled.**
- **The damage may vary from 40% to 50%.**
- **The internal part of millable canes are eaten away up to sixth internode and filled with earth.**
- **Termite attack results in heavy loss in yield of cane (2.5% in tonnage) and also in sugar production**
- **The crop raised in light soils suffers to a greater extent, particularly under drought conditions.**
- **Gappy appearance at seedling stage and sugarcane setts filled with soil [ARS PRE/NET 2014].**

Nature of Damage

- **The termites enter planted setts from the cut ends and make them partly or wholly hollowed inside, filled with mud galleries.**
- **The buds are destroyed leading to poor germination.**
- **They also occasionally attack roots, hollow the interior and ascend upwards into the stalk that are filled with mud galleries.**
- **The affected plants show drying of leaves and death of plants.**





Management

- **Use well rotten manure only.**
- **Remove stubble and debris of previous crops**
- **Dig of termitaria and destroy the queen.**
- **Remove the stubble and debris of the previous crop from the field.**
- **Application of well rotten neem cake manure @ 60 cartloads/ha reduces the population of termites**
- **Chlorpyrifos emulsion application on setts in furrows at the time of planting affords protection against termite damage.**
- **Use of fipronil granules in the basal region offers protection.**

16. Sugarcane Mite

S.N: *Oligonychus indicus*

(Acari: Tetranychidae)

- **Distribution:** Most abundant and is a minor pest of sugarcane in Punjab and Haryana and other adjoining States.
- **Host range:** sugarcane, baru, kahi, jowar and bajra or pearl millet.
- Both the nymphs and adults cause damage by sucking cell-sap from the undersurface of the leaves.
- The mites are microscopic and their damage is characterized by red streaks and webbings on the undersurface of leaves.



Biology

- **This mite remains active on baru throughout the year and migrates to sugarcane in April becoming serious in June.**
- **A female mite spins a web on the underside of a leaf in which it lays 35-69 dirty-white spherical eggs during its average life-span of 12-33 days.**
- **The eggs hatch in 3-4 days and the resulting nymphs develop within the webs by feeding on the leaf.**
- **In summer, the male nymphs grow to maturity through three stages completing their development in 2-3 weeks.**
- **The females are full-fed in 3-5 weeks.**
- **The nymphal development is considerable slowed down in the winter, the duration being 9-23 days in males and 16-24 days in the females.**
- **The life cycle of the mite during summer is completed in 3-6 weeks and the pest breeds three times in a year.**





Nature of Damage

- **The mite feeds by sucking plant sap with its stylets.**
- **The males feed rarely and the damage is done mainly by the females and nymphs.**
- **As a result of their feeding, the leaves turn red and gradually dry up.**
- **Sugarcane varieties with soft leaves are attacked more readily and damage is noticed to the greater extent during the pre-monsoon period.**

- **The pest can be suppressed by the destruction of baru grass from the bunds around sugarcane fields**



17. White grubs

S.N: *Holotrichia consanguinea*, *H. serrata*, *H. insularis*
(Scarabaeidae: Coleoptera)

- **Distribution** These are prevalent in Bihar, Uttar Pradesh, Punjab, Karnataka, Tamil Nadu, Andhra Pradesh and Kerala.



Biology

- **The fleshy grubs are highly destructive to the roots, rootlets and underground stalks of cane.**
- ***H. serrata* is abundant during March- October in Maharashtra, U.P., Karnataka and Tamil Nadu**
- ***H. consanguinea* during June-October in Bihar, U.P, Haryana and Rajasthan.**
- **At the slightest pull the canes come off easily.**
- **The life cycle is annual.**
- **The beetles become active with the onset of summer showers during May- June.**
- **The beetles come out of the sod during dusk, feed on leaves of neem, *Acacia*, *Ailanthus* etc. and mate.**
- **The female lays the eggs in moist soil (ICAR NET 2019)**
- **The damage to sugarcane by the grubs is noticeable during July-September.**
- **Later they pupate in the soil in earthen chambers.**

Eggs

Gravid females deposit about 30-50 eggs in the soil from October to December



Hatching grubs, feed and develop through three larval instars. First instars feed on organic matter, second instars feed on roots for 4-6 weeks and finally third instars feed on roots for 6-7 months



Larva

Grubs remain in the soil from March to November feeding on sugarcane roots.

For 2, 3 or 4-year life cycles, the third instar grubs remain in the soil

A typical white grub life cycle



Adult

Adults mass emerge from soil in October-November. They mate and feed in host plants.

Pupae occur in the soil from August and the pupal phase lasts up to 30 days



Pupa





Management

- **Collection and destruction of adult beetles when they are found feeding or spraying of chlorpyrifos or carbaryl on the trees may be useful.**
- **Application of quinalphos 5% granule at 50 kg a.i/ha during June to the soil controls the grubs.**



THANK YOU....