

## Lecture No 4

### PESTS OF MAIZE AND WHEAT

#### I. PEST OF MAIZE

More than 130 insects have been recorded causing damage to maize in India. Among these, about half a dozen pests are of economic importance. Shoot fly, borers, shoot bug and aphid, polyphagous pest like cornworm cause considerable yield reduction in maize.

Major pests				
1.	Maize shootfly	<i>Atherigona orientalis</i>	Muscidae	Diptera
2.	Stem borer	<i>Chilo partellus</i>	Crambidae	Lepidoptera
3.	Pink stem borer	<i>Sesamia inferens</i>	Noctuidae	Lepidoptera
4.	Cornworm/ Earworm	<i>Helicoverpa armigera</i>	Noctuidae	Lepidoptera
5.	Web worm	<i>Cryptoblabes gnidiella</i>	Pyraustidae	Lepidoptera
6.	Aphid	<i>Rhopalosiphum maidis</i>	Aphididae	Hemiptera
7.	Shoot bug	<i>Peregrinus maidis</i>	Delphacidae	Hemiptera
Minor Pests				
8.	Climbing cut worm	<i>Mythimna separata</i>	Noctuidae	Lepidoptera
9.	Ash weevil	<i>Myllocerus</i> sp.,	Curculionidae	Coleoptera
10.	Phadka grasshopper	<i>Hieroglyphus nigrorepletus</i>	Acrididae	Orthoptera
11.	Leafhopper	<i>Pyrilla perpusilla</i>	Lophopidae	Hemiptera

#### Major pests

##### 1. Maize shootfly: *Atherigona orientalis* (Muscidae: Diptera)



#### Distribution and status

Uttar Pradesh, Andhra Pradesh, Tamil Nadu, Maharashtra, Karnataka.

**Host range:** Maize, sorghum, ragi and bajra

#### Damage symptoms

The maggot feeds on the young growing shoots resulting in "dead hearts".

**Bionomics:** Small grey coloured fly.

#### Management

- Grow resistant cultivars like DMR 5, NCD, VC 80
- Furrow application of phorate granules 10 G 10 kg/ha (or) lindane 6 G 25 kg per ha

## 2. Stem borer: *Chilo partellus* (Crambidae: Lepidoptera)

### Distribution and status

India, Pakistan, Sri Lanka, Indonesia, Iraq, Japan, Uganda, Taiwan, Sudan, Nepal, Bangladesh and Thailand.

**Host range:** Jowar, bajra, sugarcane and rice

### Damage symptoms



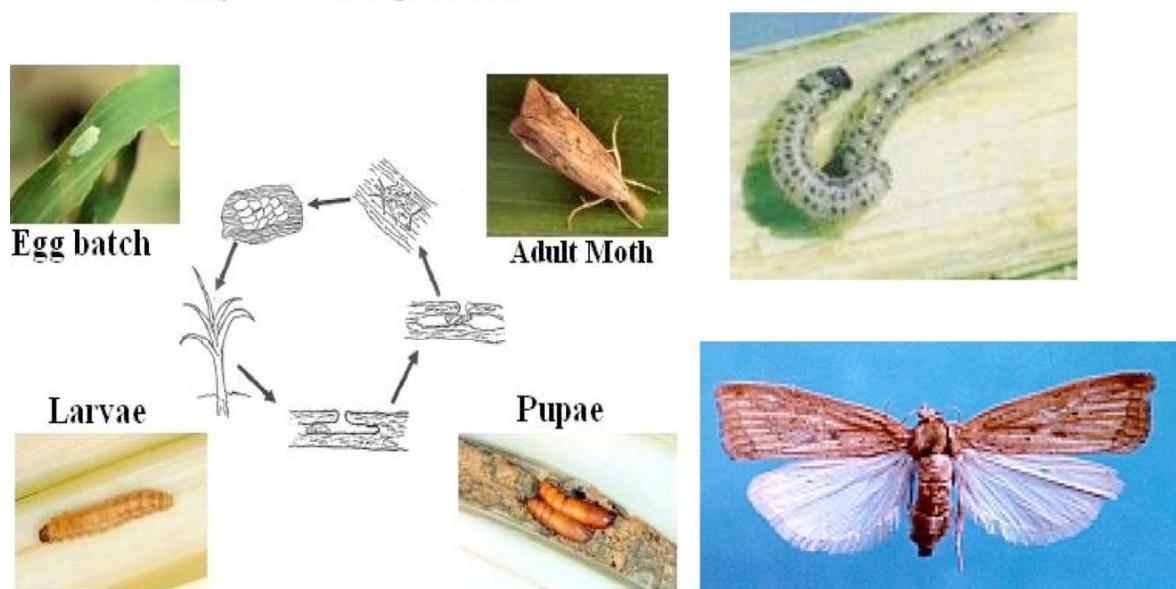
It infests the crop a month after sowing and upto emergence of cobs. Central shoot withering leading to "dead heart" is the typical damage symptom. Bore holes are visible on the stem near the nodes. Young larva crawls and feeds on tender folded leaves causing typical "shot hole" symptom. Affected parts of stem may

show internally tunnelling caterpillars.

### Bionomics

The adult moth is medium sized, straw coloured. It lays flat oval eggs in batches on the under surface of leaves near the midribs. The fecundity is about 25 eggs per female.

### Life cycle of *Chilo partellus*



The incubation period is 2-5 days. The larva is yellowish brown with a brown head which mines the midrib enter the stem and feeds on the internal tissues. The larval period is 28-50 days with 7 instars. It pupates within the stem for 2-15 days. The adult longevity is 2-12 days.

**ETL:** 10% dead hearts.

#### **Management**

1. Grow resistant cultivars like Him 129, Ganga 4,5,7 and 9, Ganga safed 2, Deccan 101 and 103, Him 123, Ageti, C 1, 3 and 7, Kanchan, Kundan
2. Sow lab lab or cowpea as an intercrop to minimise the stem borer damage (Maize : Lablab 4:1).
3. Set up light trap till midnight to attract and kill the stemborer moths.
4. 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, carbaryl + lindane 4G 20 kg, endosulfan 4 D 10 kg (or) spray endosulfan 35 EC 750 ml (or) carbaryl 50 WP 1 kg (500 L. spray fluid/ha).
5. Collect the stubbles after harvest and burn to destroy diapausing borers.

### **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, ragi and guinea grass.

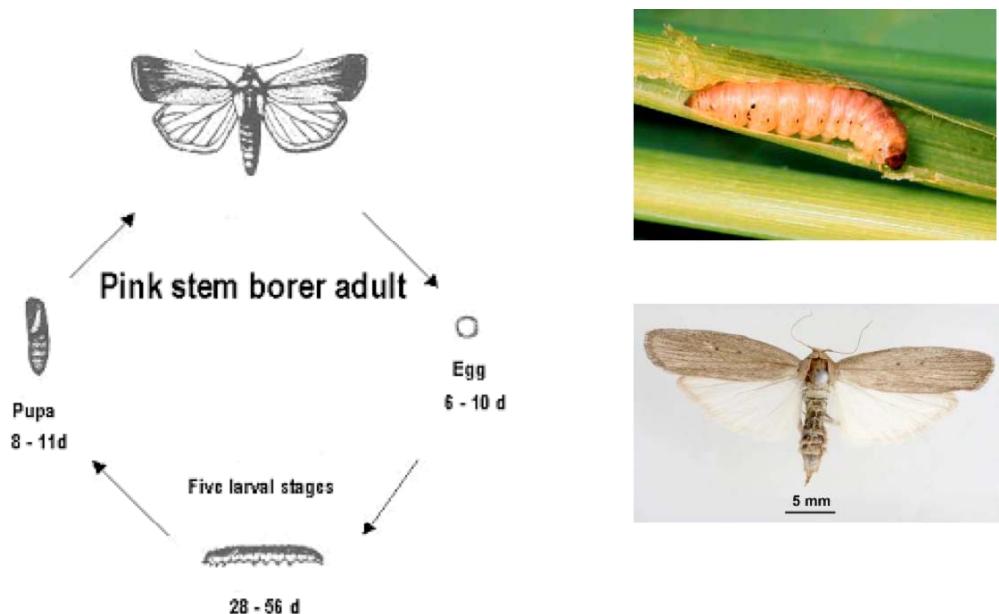
#### **Damage symptoms**



Pink larva enters into the stem causing dead heart symptom similar to that of stem borer.

#### **Bionomics**

The adult moth is straw-coloured with white wings. The larva is pinkish brown with dark head. The life cycle is completed in 45-75 days. There are 4-6 generations per year.



### Management

- Grow resistant cultivars like Deccan 101 and 103
- Spray endosulfan 35 EC 1.0 L/ha. at every 20 days interval after germination of the crop.

#### 4. Corn worm/Earworm: *Helicoverpa armigera*, (Noctuidae: Lepidoptera)

##### Damage symptoms

Larva feeds on silk and developing grains.

##### Bionomics

Adult is brown coloured moth with a 'V' shaped speck on fore wings and has a dull black border on the hind wing. Larva is green with dark broken grey lines and dark pale bands; shows color variation from greenish to brown.



### Management

Apply at silk drying stage either carbaryl 10 D 25 kg/ha (or) spray carbaryl 50% WP 1.0 kg./ha in 500-600 L of water per ha. Repeat the insecticidal application 15 days later

#### 5. Web worm: *Cryptoblabes gnidiella* (Pyraustidae: Lepidoptera)

### **Damage symptoms**

The larva first feeds on the lemma of the flowers scraping the chlorophyll and later on the milky grains. The caterpillar causes damage by constructing webs on maize cobs and feeding on the flowers and grains.

### **Bionomics**

Eggs are laid singly on spikelets and grain. They hatch in 3-4 days. Larva has duration of 9-10 days. The full-grown larva is 12 mm long and dark brown. It forms silken webs on cobs and remains inside them and pupates within. Adult is 7 mm across wings with dark grey forewings. Life cycle is completed in 23-24 days.



### **Management**

Spray monocrotophos 36 SL (or) endosulfan 35 EC 1 l/ha.

### **6. Aphid: *Rhopalosiphum maidis* (Aphididae: Hemiptera)**

For Distribution, status, host range, damage symptoms, bionomics and management refer sorghum

### **7. Shoot bug: *Peregrinus maidis* (Delphacidae: Hemiptera)**

For Distribution, status, and host range refer sorghum

### **Damage symptoms**

Injury to the plants is caused by the adults and nymphs which suck sap from them. 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.



### **Management**

Spray 500 ml dimethoate 30 EC or methyl demeton 25 EC in 500 L of water per ha.

## Minor Pests

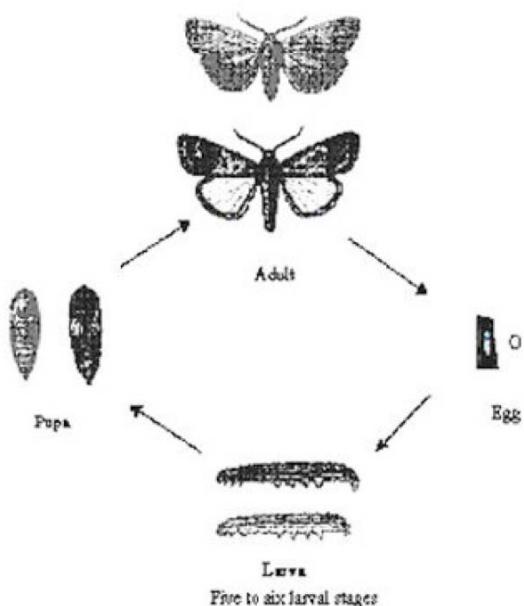
### 8. Climbing cut worm: *Mythimna separata*, (Noctuidae: Lepidoptera)

#### Damage symptoms

Irregular feeding of leaves.

#### Bionomics

Adult is a brown coloured moth with white hind wings. Larva is a light yellowish green caterpillar.



#### Video in agropedia

For bionomics and management refer wheat

### 9. Ash weevil: *Mylllocerus* sp., (Curculionidae: Coleoptera)

#### Damage symptoms

The larva feeds on the secondary roots and adults on leaves.

#### Bionomics

Adult is a grey coloured weevil. A female weevil lays 98-350 eggs and they hatch in 3-12 days. Larvae and pupae are in soil. There are four larval instars of 23-40 days. Pupal period lasts 3-9 days. Life cycle is completed in 29-58 days.



## **Management**

Spray endosulfan 35 EC 0.07%.

## **10. Phadka grasshopper: *Hieroglyphus nigrorepletus* (Acrididae: Orthoptera)**

### **Damage symptoms**

Leaves defoliated from the margin; plants often rendered bare.

### **Bionomics**

Nymphs and adults have green and brown forms, the brown being the most common form. Both have a conspicuous irregular black dorsal pronotal stripe. Adults are mostly brachypterous. Eggs are laid one by one.

### **Management**

Dusting with lindane at 25 kg /ha gives effective control of the pest.

## **11. Leafhopper: *Pyrilla perpusilla* (Lophopidae: Hemiptera)**

### **Refer sugarcane**



## II. PESTS OF WHEAT

Wheat is comparatively less susceptible to insect pests in the field. However in recent years about half a dozen pests have become quite serious.

<b>Major pests</b>				
1.	Wheat Aphid	<i>Macrosiphum miscanthi</i>	Aphididae	Hemiptera
2.	Climbing cutworm/armyworm	<i>Mythimna separata</i>	Noctuidae	Lepidoptera
3.	Ghujhia Weevil	<i>Tanymecus indicus</i>	Curculionidae	Coleoptera
4.	Gram Pod Borer	<i>Helicoverpa armigera</i>	Noctuidae	Lepidoptera
5.	Termites	<i>Odontotermes obesus</i> and <i>Microtermes obesi</i>	Termitidae	Isoptera
6.	Molya Nematode/cyst nematode	<i>Heterodera avenae</i>	Heteroderidae	Tylenchida
7.	Wheat-gall Nematode	<i>Anguina tritici</i>	Tylenchidae	Tylenchida
<b>Minor pests</b>				
6.	Aphid	<i>Schizaphis graminum</i> and <i>Rhopalosiphum maidis</i>	Aphididae	Hemiptera
7.	Hopper	<i>Laodelphax striatella</i>	Delphacidae	Hemiptera
		<i>Pyrilla perpusilla</i>	Lophopidae	Hemiptera
8.	Jassids	<i>Amrasca</i> spp	Cicadellidae	Hemiptera
9.	Wheat bug	<i>Eurygaster maura</i>	Pentatomidae	Hemiptera
10.	Wheat thrips	<i>Anaphothrips favicinctus</i>	Thripidae	Thysanoptera
11.	Cut worms	<i>Agrotis</i> spp.	Noctuidae	Lepidoptera
		<i>Marasmia trapezalis</i>	Pyraustidae	Lepidoptera
12.	Pink borer	<i>Sesamia inferens</i>	Noctuidae	Lepidoptera
13.	Shootfly	<i>Atherigona naqvii</i> and <i>A. orzae</i>	Muscidae	Diptera
14.	Whorl maggot	<i>Hydrellia griseola</i>	Ephydriidae	Diptera
15.	Flea beetle	<i>Chaetocnema basalis</i>	Chtysomelidae	Coleoptera

## Major pests

### 1. Wheat Aphid: *Macrosiphum miscanthi* (Aphididae: Hemiptera)

**Distribution and status:** Widely distributed in wheat growing areas.

**Host range:** Wheat, barley, oats, *Cynodon dactylon*

#### Damage symptoms

Like other aphids, the nymphs and adults suck the sap from plants, particularly from their ears. They appear on young leaves or ears in large numbers during the cold and cloudy weather. The damage is particularly severe in years of cold and cloudy weather. A heavily manured, well-irrigated and succulent crop will harbour the pest for a longer period and suffer greater damage.

#### Bionomics

The insects are green, inert, louse like. The nymphs and the females look alike, except that the latter are larger. It breeds at a fast rate during cold weather and reaches the height of its population in February-March when the ears are ripening. The females give birth to young ones) and are capable of reproducing without mating. During the active breeding season, there are no males and the rate of reproduction is very high. When the wheat crop is ripe and the summer is approaching, the winged forms of both males and females are produced and they migrate to other plants like doob grass (*Cynodon dactylon*). It is not known how the pest passes the summer and the monsoon season. In October-November, the aphids again appear on wheat. If available, barley is preferred to wheat. The losses due to aphids have been reported upto 36 per cent.



English grain aphid adult and nymphs on wheat leaf



**ETL:** 5 aphids/ear head

### **Management**

Spray 375 ml of dimethoate 30 EC or oxydemeton methyl 25 EC or monocrotophos 36SL in 500 L of water per ha. Since the aphids appear first on the borders of the crop, spray only the infected strip to check further spread.

## **2. Armyworm: *Mythimna separata* (Noctuidae: Lepidoptera)**

### **Distribution and status**

Cosmopolitan. Sporadic and has gained prominence as a pest of wheat only recently, particularly after the introduction of Mexican varieties in India

### **Host range**

Wheat, sugarcane maize, jowar, bajra, *baru* grass (*Sorghum halepense*) and other graminaceous crops.

### **Damage symptoms**

The freshly emerged larvae spin threads from which they suspend themselves in the air and then with the help of air currents reach from one plant to another. In the early stages, they feed on tender leaves in the central whorl and later feed on older leaves and skeletonize them totally. The grown-up caterpillars throw out faecal pellets, which are quite prominent.

In the case of a severe attack, whole leaves, including the mid-rib, are consumed and the field looks as if grazed by cattle. The larvae feed voraciously and migrate from one field to another. The pest may also eat away ears, including the awns and immature grains.

### **Bionomics**

Pale brown adults live for 1-9 days and lay eggs singly in rows or in clusters on dry or fresh plants or on the soil. Freshly laid eggs are round, light green, turn pale yellow and finally black. Egg period 4-11 days in summer 19 days in winter. Freshly emerged larvae are very active, dull white and later turn green. In spring, the larval stage is completed in 13-14 days, but in the winter it is prolonged to 88-100 days.

In the pre-pupal stage, the insect spins a cocoon. The pre-pupal stage lasts 1-11 days during January to May. Pupation usually takes place in the soil at a depth of 0.5-5 cm, but it may also occur under dry leaves among the stubble or fresh tillers. Generally, the larvae before pupation seem to select sites near the water-channels. The pupal period is 9-13 days in May and 36-48 days in winter.



### Management

The pest can be suppressed by collecting and destroying the caterpillars. (ii)  
Spray 500 ml of dichlorvos 85 SL or 3 kg of carbaryl 50 WP or 1.0 L of quinalphos 25 EC in 500 L of water per ha.

### 3. Ghujhia Weevil: *Tanymecus indicus* (Curculionidae: Coleoptera)

**Distribution and status:** Sporadic pest of considerable importance in wheat growing areas.

**Host range:** Germinating Rabi crops viz., Wheat, barley, gram and mustard

#### Damage symptoms

Only adults feed on leaves and tender shoots of the host plants. They cut the germinating seedlings at the ground level. Often the crop is resown. The damage is particularly serious during October-November when the *rabi* crops are germinating.

#### Bionomics

Weevils are earthen grey and measure about 6.8 mm in length and 2.4 mm in width. Their fore wings are oblong and hind wings are more or less triangular, but they cannot fly. The pest is active from June to December and undergoes larval or pupal diapause during rest of the year in the soil. Weevils emerging in June mature sexually in October. They mate frequently and lay 6-76 eggs in 5-11 installments in the soil under clods or in crevices in the ground. The egg period is 6-7 weeks. Young grubs enter the soil. Grub period is 10-18 days and pupate in earthen chambers at a depth of 15-60 cm. The pupal stage lasts 7-9 weeks, and the adults emerge next year in June or July. The pest has only one generation in a year.

### Management

Dust carbaryl or malathion 5 D @ 25 kg per ha.

#### **4. Gram Pod Borer: *Helicoverpa armigera* (Noctuidae: Lepidoptera)**

The gram pod borer attacks wheat at maturity. It feeds on the grains in the ear heads. The damage is more where wheat follows cotton.



#### **Management**

Spray 3 kg of carbaryl 50 WP or 2.0 L of quinalphos 25 EC in 500 L of water/ha.

#### **5. Termites: *Odontotermes obesus* and *Microtermes obesi* (Termitidae: Isoptera)**

Termites damage the wheat crop soon after sowing and near maturity. The damaged plants dry up completely and are easily pulled out. The plants damaged at later stages give rise to white ears.

#### **Management**

(i) Treat the seed @ 4 ml of chlorpyriphos 20 EC or 7ml of endosulfan 35 EC/kg of seed. (ii) If the attack is noticed in the standing crop, dilute 2.5 L of endosulfan 35 EC in 5 L of water and mix it with 50 kg of soil and broadcast evenly in one hectare, followed by light irrigation.

#### **6. Molya Nematode/cyst nematode: *Heterodera avenae* (Heteroderidae: Tylenchida)**

**Distribution and status:** Widely distributed in Europe and Australia and has recently been recorded in Rajasthan, Haryana and the Punjab.

**Host range:** Wheat, barley, oats and rye



## **Damage symptoms**

Attacked plants remain stunted and give a shriveled unhealthy appearance. Presence of nematodes stimulates the formation of branched rootlets. The main root remains short or bunchy, bearing small galls. In case of severe infestation, the seedlings may fail to come out of the soil. The plants that escape the early damage produce short stalks and ears, yielding a poor harvest.

## **Bionomics**

This nematode passes unfavourable season in the form of cysts, mostly in the soil. A cyst consists of the dead body of a female containing a large number of eggs. When the conditions are favourable, eggs hatch within the cysts and the larvae are set free into the soil in the second stage of growth. The larvae may invade any underground part of a susceptible plant but most of them enter it at or near the root tips. After moving a short distance through the cortex, they assume a position, more or less parallel to the main axis of the root, with the head away from the tip.

The male increases in girth, until the width is equal to about 1/5th of its length and during this period it undergoes the second and third moultings. The body begins to elongate and becomes folded or coiled within the cuticle during the third stage. After assuming the final cylindrical shape, it moult for the fourth time and becomes an adult. The female does not undergo such metamorphosis, but after the second and third moultings it continues to increase in girth until it becomes ovate. It then undergoes the fourth or final moulting and emerges as a full grown adult. After mating, the eggs mature inside the body of the female and it dies, the body being converted into a cyst.

## **Management**

- Follow crop rotation with non host crops mustard, pulses, fenugreek or carrot for one or two years
- Grow cyst nematode resistant wheat Raj MR-1 or barley RD 2035 or RD 2052
- Plough two to three times during summer
- Apply carbofuran @ 45 kg/ha

## **7. Wheat-gall Nematode: *Anguina tritici* (Tylenchidae: Tylenchida)**

**Distribution and status:** Cosmopolitan. It causes ear-cockle or *mamni* disease. The nematode is also the carrier of the bacterial yellow slime ear-rot (*tundu* disease) caused by *Corynebacterium tritici*

**Host range:** Rye, spelt and emer. Oats and barley are immune.

### **Damage symptoms**

If the black rounded *mamni* galls are soaked in water overnight, the coat softens and a large number of larvae are set free. Affected plants are more or less stunted and their leaves are wrinkled, rolled or twisted. A variable number of grains in an infested ear may produce galls. The diseased ears are shorter and thicker than the healthy ones and the glumes are spread farther apart

### **Bionomics**

Under natural conditions, the dry galls either fall to the ground from the ripe ears or they are harvested and find their way to the stores along with the healthy produce. The galls though dry remain viable for long periods. Single gall contains 800 to 30,000 larvae which revive and become active when the gall is moistened.

When wheat is sown, the galls become soft on imbibing moisture and the larvae are set free into the soil. From there, they reach the host plants, if available within a distance of one third of a metre. They rise up the plant and find a site for feeding as free parasites on the young leaves and the growing-points. Later on, as the plants approach the earing stage, they penetrate into the primordia of the flower-buds and form the galls instead of normal seed.

In the developing galls, the larvae mature into males and females, as the case may be. A single gall at this stage may contain 40 females and an equal number of males. They mate within the gall and the gravid females lay a large number of eggs. The young larvae on emerging from the eggs develop up to the second stage and then become dormant. They remain in that state in the dry galls till the next sowing season. There is only one generation in a year.

### **Management**

- (i) The wheat gall nematode can be controlled by separating the galls from the wheat seed by floating them on water in a tub. The galls, being lighter, float on the surface and may be skimmed off. The seed should then be dried before sowing.
- (ii) The pest can also be suppressed by sowing clean seed in uninfested soil. Only one year's fallowing is sufficient to eradicate this nematode from the fields.

### **Minor pests**

The other pests of wheat are,

- Aphids: *Schizaphis graminum* and *Rhopalosiphum maidis* (Aphididae: Hemiptera)
- Hopper: *Lodelphax striatella* (Delphacidae: Hemiptera)  
*Pyrilla perpusilla* (Lophopidae: Hemiptera)
- Jassids: *Amrasca* spp. (Cicadellidae: Hemiptera)

- Wheat bug: *Eurygaster maura* (Linnaeus) (Pentatomidae: Hemiptera)
- Wheat thrips: *Anaphothrips favicinctus* (Thripidae: Thysanoptera)
- Cut worms: *Agrotis* spp. (Noctuidae: Lepidoptera); *Marasmia trapezalis* (Pyraustidae: Lepidoptera)
- Pink borer: *Sesamia inferens* (Noctuidae: Lepidoptera)
- Shootfly: *Atherigona naqvii* and *A. orzae* (Muscidae: Diptera); *Hydrellia griseola* (Ephydriidae: Diptera)
- Flea beetle: *Chaetocnema basalis* (Chtysomelidae: Coleoptera).

### Questions - Maize and Wheat

1.	Lablab or cowpea is sown as an intercrop to minimise ----- damage. <b>Stem borer</b>	
2.	Maize stem borer undergoes _____ generation per year	
	a. 4-6	b. 2-5
	c. 3-4	d. 3-4
3.	_____ are immune to wheat gall nematode - Oats and barley	
4.	Presence of shot holes and dead heart is the damage caused by _____ in maize <b>Stem borer – <i>Chilo partellus</i></b>	
5.	----- causes damage by constructing webs on maize cobs and feeds on the flowers and grain <b>Web worm</b>	
6.	Dead heart in the later stages in maize is due to	
7.	Ghujia weevil has _____ generation in a year one	
8.	Bunchy roots with galls in wheat is due to the attack by _____ <b>Cyst nematode, <i>Heterodera avenae</i></b>	
9.	Winged forms of wheat aphid migrate to _____ for breeding. <b><i>Cynodon dactylon</i></b>	
10.	Rabi wheat suffers more from the attack of _____ ghujia weevil. <b><i>Tanytarsus inidicus</i></b>	
11.	_____ stage alone does the damage by cutting wheat seedlings at ground level <b>Adult</b>	

	a. Shoot fly	b. Stem borer
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	c. Pink borer	d. <b>b and c</b>
12.	Alternate host of <i>Sesamia inferens</i> is _____	
	a. Sugarcane	b. Bajra
	c. Rice	d. <b>All the above</b>
13.	Alternate host of <i>Atherigona orientalis</i> is	
	a. <b>Bajra</b>	b. groundnut
	c. redgram	d. all the above
14.	Which one of the following larva feeds on silk and developing maize grains	
	a. Stem borer	<b>Earworm</b>
	c. Web worm	d. Cutworm
15.	Site of pupation for ash weevil is	
	a. <b>Soil</b>	b. On leaf
	c. Within leaf	d. In between leaf