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## **Insect Pests of Oilseed Crops and Their Management**

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The oilseeds crop occupies an important position in agriculture economy in the world. Indian agriculture has made considerable progress, particularly in respect of food crops such as wheat and rice in irrigated areas; however, performance has not been so good in case of other crops particularly oilseeds, pulses, and coarse cereals. Therefore, after achieving self sufficiency in food grains the government is focusing attention on these agricultural commodities. On the oilseeds map of the world, India occupies a prominent position, both in regard to acreage and production. India is the 4<sup>th</sup> largest edible oil economy in the world and contributes about 10 percent of the world oilseeds production, 6-7% of the global production of vegetable oil, and nearly 7 percent of protein meal. This sector also has an important place in the Indian agricultural sector covering an area of about 26.5 million hectares, with total production of over 25.3 million tonnes in the triennium ending 2015-16 (GOI, 2016). This constitutes about 14.8 per cent of the gross cropped area in the country. A wide range of oilseed crops is produced in different agro-climatic regions of the country. Insect-pests are one of the limiting factors in the production of oilseed crops. Management of these pest problems by using possible control techniques could increase the quality and quantity of the products. These crops are damaged by a more number of insect pests, of which some are more serious. These pests can be effectively controlled by the integration of different techniques such as use of various safe insecticides/biopesticides, some modification in cultural practices and use of pest tolerant varieties. Integrated pest management approaches will help to increase the production and productivity of oilseed crops by reducing the pest damage without any adverse effect on the agro- system and erosion in the environment.

Pest wise information of oilseed crop and management of major pests are described below.

### **Mustard / Rapeseed / Toria**

This oilseed crop is inflicted by several insect pests of economic importance, viz., Mustard Aphid, Painted bug, Mustard saw fly, etc.

#### **Mustard aphid, *Lipaphis erysimi* (Aphididae; Homoptera)**

It is the most serious pest of the mustard crop in India. Besides brassicas to which mustard belongs, this pest attacks a number of other economic plants, particularly those of the family Cruciferae. Like many other important aphid pests, this species has a very wide distribution in the world. The mustard aphid is a most damaging pest of cruciferous oilseeds crops like Toria, Sarson, Raya, Taramira and *Brassica*. The aphids are minute, soft-bodied and light green insects having a pair of short tubes called cornicles on the fifth abdomen segment.

**Life cycle:** The insect reproduce partheno-genetically and the females give birth to average 26-133 nymphs. In favourable conditions they grow very fast and are full-fed in 7-10 days. Cloudy weather is most favourable for the multiplication of this insect. About 45 generations are completed in a year. The winged (alate) forms are produced in autumn and spring, and they move from one field to another field.

**Nature of damage:** Both nymphs and adults suck cell sap from leaves, stems, inflorescence and the developing pods of plants. Due to the very high population of the pest, the growth of plant greatly reduced. The leaves acquire a curly appearance, the flowers fail to form pods formation and not produce healthy seeds. The honeydew excreted by the aphids provides congenial conditions for the growth to development of sooty mould on the plant. In case of severe infestation the crop yield may be reduced up to 80 per cent.



**Fig. 1:** Mustard plant attacked by aphid, *Lipaphis erysimi*

### Management Strategies

- Early sowing of mustard before 15<sup>th</sup> October will help to escape the attack of the pest and economic damage.
- Use tolerant varieties
- Three rounds of manual removal (clipping) of aphid infested twigs at 15 day intervals starting with the first appearance of the pest have been found effective if cheap labour is available.
- Installation of yellow sticky traps @ 10 traps/ha to monitor the activity of aphids and to take the timely decision for foliar spray of insecticides before reaching the population at ETL level.
- Biological control: Ladybird beetles viz., *Coccinella septempunctata*, *Menochilus sexmaculata*, *Hippodamia variegata* and *Cheilomones vicina* are most efficient predators of the mustard aphid. A single adult beetle may feed an average of 10 to 15 adults/ day
- Botanical pesticides: Foliar spray of Neem oil 2 % and Neem Seed Kernel Extract (NSKE) 5 % effective against the mustard aphid
- Apply any one of the following insecticides when the population of the pest reaches 13-15 aphids per 10 cm terminal portion of the central shoot or when an average of 0.5-1.0 cm terminal portion of central shoot is covered by aphids or when plants infested aphids reach 20 per cent: Foliar sprays with 625 ml of oxydemeton methyl (Metasystox) 25 EC or 625 ml of dimethoate (Rogor) 30 EC or in 625 litres of water per ha or imidacloprid 0.01% or acetamiprid @ 0.01%.

### Painted bug, *Bagrada hilaris* (Pentatomidae; Hemiptera)

The Painted bug *Bagrada cruciferarum* and *B. hilaris* (Burmester) have been recorded as major pests of various *Brassica* spp. as also other cruciferous crops and weeds. The painted bug is widely distributed in Myanmar, Sri Lanka, India, Iraq, Arabia and East Africa.

**Life cycle:** Painted bugs lay oval, pale-yellow eggs singly or in groups of 3-8 on leaves, stalks, pods and sometimes on the soil. A female bug may lay an average 37-102 egg in its life-span of 3-4 weeks. The eggs hatch in 3-5 days during summer and 20 days during December. The nymph moults and passing through five stages to attain adult stage in 16-22 days during the summer and 25-34 days during the winter. The entire life-cycle is completed in 19-54 days and it passes through 6-8 generations in a year.

**Nature of damage:** Both nymphs and adults suck cell sap from tender plant parts causing yellowing of leaves which gradually dry up and ultimately fall down exposing the plants to secondary invasion of bacteria and fungi. The plants wilt and wither affecting adversely the yield both quantitatively and qualitatively.

### **Management Strategies**

- Deep summer ploughing to destroy eggs of painted bug
- Clean cultivation by removing weeds harbouring this pest is imperative for avoiding infestation of these bugs.
- Early sowing is beneficial to avoid pest attack.
- Seed treatment with Imidacloprid 70 WS or Thiamethoxam @ 5gm/ kg seed.
- The bugs usually congregate on the leaves and stem which can be jerked to dislodge them and killed in kerosin water
- Infected crop residues of mustard should be burned to avoid the painted bug infestation in next year crop.
- Biological control: Conserve bio-control agents such as *Alophora* spp. (tachinid fly) parasitizing eggs of painted bugs.
- Chemical control: In case of heavy infestation, spray with dichlorvos 76% EC @ 250.8 ml in 200-400 l of water/acre or Imidacloprid 70% WS @ 700 g/100 Kg seed or Phorate 10% CG @ 6000 g/acre

### **Mustard Sawfly, *Athalia lugens proxima* (Tenthredinidae; Hymenoptera)**

#### **Distribution**

Mustard sawfly is a major pest of cole crops but it also affects almost all cruciferous plants, including rape and mustard. The peak period of activity is during September to December after which the activity declines; the pest is hardly noticed from March to July and appears on radish by the end of July.

**Life cycle:** A female lays on an average 35 eggs. Eggs hatched in 6 - 8 days. Newly hatched grubs are 2 -3 mm long, smooth, cylindrical and greenish-grey in colour; full grown ones are cylindrical in shape, 16 - 20 mm long and greenish-black in colour. They look and behave like caterpillars but have 8 pairs of prolegs. Grub development takes 21 - 31 days. Adults are 8 - 12 mm long, having dark head and thorax, orange coloured abdomen and translucent smoky wings with black veins. Females have a strong saw-like ovipositor – hence it has been given the popular name sawfly. They generally do not fly long distances but hop

from leaf to leaf or fly from one plant to another plant. In South India where there is no severe winter, the pest undergoes as many as 10 overlapping generations in a year.

**Nature of damage:** Eggs are laid singly, mostly during day time and inserted into leaf tissues with the help of saw like ovipositor. On hatching the grubs nibble the margins of tender leaves but later on bite holes in the leaves. Grubs are diurnal in habit and feed generally during early morning and evening hours.

### Management Strategies

- Deep summer ploughing of the field should be done to destroy the pupae.
- Apply irrigation in seedling stage for sawfly management because most of the larvae die due to drowning effect.
- Hand collection and destruction of larvae of saw fly during morning and evening hours.
- Release and conserve larval parasitoid, *Perilissus cingulator*.
- Chemical control: Seed treatment with imidacloprid 70% WS @ 700 g/ 100 Kg seeds. Foliar spray with dimethoate 30 % EC @ 264 ml or quinalphos 25 % EC @ 480 ml in 200-400 l of water/acre or spraying with malathion 50 EC @ 1000 ml/ha in 600-700 l water/ ha.
- Hand-picking of grubs which are not active during dawn and dusk if the area under crop is limited.

### Sesame

Sesame (*Sesamum indicum* Lin.) is an important kharif oilseed crop of rainfed areas. It is known as one of the oldest oilseed crops grown in India, known as 'queen of oil seeds'. India ranks first in area under cultivation representing 30% of the world production and Rajasthan, Maharashtra, Gujarat, Madhya Pradesh, Andhra Pradesh, Karnataka, Uttar Pradesh, West Bengal, Orissa, Punjab and Tamil Nadu are the major states of sesame cultivation (Singhal, 1999). It is attacked by several major insect pests viz. sesame leaf webber and capsule borer, *Antigastra catalaunalis*; gall fly, *Asphondylia sesame*; leaf hopper, *Orosius albicinctus*; sphingid moth, *Acherontia styx* and white fly, *Bemisia tabaci* etc. Out of these, sesame leaf webber and capsule borer is the notorious pest of sesame and causes up to 90% losses.

**Leaf webber and capsule borer, *Antigastra catalaunalis* Duponchel (Pyralidae; Lepidoptera)**

The sesame leaf and pod caterpillar is a serious and regular pest of *Sesamum* and is also distributed throughout India. The caterpillars are pale yellow, when young, but gradually become green and develop black dots all over the body. The full grown larva measures 14-17 mm. The moth is a small insect with a wing span of about 2 cm having dark brown markings on the wing-tips.

**Life cycle:** Females laying up to 140 eggs singly on the tender portions of plants at night. The eggs are shiny, pale-green and they hatch in 2-7 days, depending upon the season. On emerging, the young larva, which measures about 2 mm in length, feeds for a little while on the leaf epidermis or within the leaf tissue. Soon after, it binds together the tender leaves of the growing shoot with the help of silken threads and continues to feed in the webbed mass. The size of this rolled mass increases gradually as the caterpillar grows older. It becomes full-grown in about 10 days in summer, but the period may be prolonged to 33 days in winter. The grown-up larvae creep to the ground and pupate in silken cocoons in soil. Sometimes, pupation also takes place in the plant itself. Pupal development is completed in 4-20 days, depending upon the season. In summer, a generation is completed in about 23 days but in the winter it takes about 67 days.

**Nature of damage:** Young caterpillars feed on leaves of plants. They also bore into the shoots, flowers, buds and pods. An early attack kills the whole plant, but infestation of the shoots at a later stage hampers further growth and flowering.

**Management Strategies**

- Timely sowing of crop during June to July will escape from leaf webber damage.
- Collection and destruction of infested plant parts reduce the further damage of caterpillar.
- Conservation of existing predators like spiders, coccinellid beetles, stink bugs, preying mantids etc and parasitoids (Braconids and Ichneumonids) through application of botanical insecticides and safer chemicals.
- Spraying with Neem oil 2% or Neem Seed Kernel Extract (NSKE) 5% at the early stage of infestation would be effective and safer to natural enemies.
- Chemical control: Need based spray of carbaryl 50 WP 1000 g/ha in 500 litre of water

- Two sprays of 625 ml monocrotophos 36 SL or 500 ml diclorvos 76 EC or 1250 ml quinalphos 25 EC in 600-700 liters of water per hectare at pest appearance, flowering and pod formation or 30 and 45 days after sowing will control the pest effectively

### **Gall fly, *Asphondylia sesame* Felt (Cecidomyiidae; Diptera)**

It is one important pest in south India and also in Rajasthan and a specific pest on gingelly.

**Life cycle:** The adult is a 5 mm long red-bodied midge. The small mosquito like fly inserts the eggs into the ovaries of flower buds. The pupation takes place inside the malformed capsule or pod. Life cycle is completed in 23 – 37 days. Activity of the pest starts at bud initiation and reach on its peak in September - November.

**Nature of damage:** Maggots feed inside the floral bud leading to formation of gall like structure which does not develop in to flower/capsules. The affected buds wither and drop. The larvae also feed on leaves and young shoots. Excreta (frass) remain between the leaves and the loose web. At a later stage, the larvae infest the sesame fruit capsule making an entrance hole on the lateral side and feeding on the seeds inside the capsule; they leave excreta on the seeds.

### **Management Strategies**

- Natural enemies of gall fly: Conserve the existing parasitoids (*Pteromalus fasciatus*) and predators like spider, ladybird beetle, lacewing etc. to check the population of gall flies.
- Botanical pesticides: Foliar spray of Neem oil 2% or Neem seed kernels extract 5%, twice.
- Chemical control: Foliar spray of Quinalphos 25% EC @ 2000 ml in 500-700 liter of water/ha or Carbaryl 50 WP 1000 g/ha in 500 litre of water.

### **Leaf hopper: *Orosius albicinctus* Distant (Cicadellidae; Hemiptera)**

The hoppers are light brown in colour and soft bodied insects. This is a national significance pest and distributed throughout the India. It multiplies very fast under favourable conditions.

**Life cycle:** On the basis of biological studies, mating occurs during dusk and last for 3-4 minutes. Both the sexes mate several times. A female lays many viable eggs. The eggs are inserted singly into midribs or veins, on the undersurface of petioles and stem of young plants. The average fecundity-cum-fertility is 6.5 and 140 during December-March and April-May, respectively.



The incubation period ranges from six days in June to 96 days in December; the nymphal period depends on the environmental conditions and being 11 to 107 days. Longevity of adults ranges from 19 to 105 depending on the season. The insect is predominant in summer.

**Nature of damage:** Both nymph and adult suck the sap from plants which leads to curling of leaf edges and leaves turn red or brown. In the later stages, leaves dry up and start shedding. The leafhopper also transmits sesamum phyllody disease.

### Management Strategies

- Destroy all infested plant part to minimize pest damage
- Natural control of leaf hopper – Conserve the population of predators like spider, ladybird beetle, lacewing etc to maintain the population of this soft bodied insect below ETL.
- Chemical control: On the appearance on insect foliar spray of Oxydemeton–methyl 25% EC @1200 ml or Quinalphos 25% EC @ 2000 ml in 500-700 liter of water/ha.

### Castor

#### Castor semilooper, *Achaea janata* (Noctuidae; Lepidoptera)

This is a serious pest of castor in all parts of India, Sri Lanka and Thailand. The adult of *A. janata* is a pale reddish brown moth with a wing expanse of 6-7 cm. The wings are decorated with broad zig-zag markings, a large pale area and dark brown patches. The full grown larva is dark and is marked with prominent blue-black stripes.

**Life cycle:** Female lays up to 450 eggs during its life span. The egg, being about 1 mm in length, is fairly large and also has on its surface a few ridges and furrows which radiate from the circular depression at the apex. The larva emerges by cutting a hole in the egg-shell in 3-5 days and devours it immediately. The larva feeds and moults 4-5 times and becomes full-grown in 15-20 days. The grown-up larva prepares a loose cocoon of coarse silk and some soil particles, and pupates under the fallen leaves on the soil, usually at the edge of the field. In some cases, pupation also takes place within the folded leaves on the plant itself. The pupal stage lasts 10-15 days and the moths, on emergence, feed on the soft fruits of citrus, mango, etc. There are 5-6 generations in a year.

**Nature of damage:** The caterpillars feed voraciously on castor leaves, starting from the edges inwards and leaving behind only the midribs and the stalks. With the excessive loss of foliage, the seed yield is reduced considerably.





Fig. 2: Affected leaves of castor plant by semi-looper, *Achaea janata*

#### Management Strategies

- Hand collection and destruction of the egg masses and first instar larvae.
- Spray of 0.05 % quinalphos 25 EC in 250 litres of water per acre and repeat at 15-day intervals.

#### Castor hairy caterpillar, *Euproctis lunata* (Lymantriidae; Lepidoptera)

The castor hairy caterpillar is widely distributed in India particularly in Uttar Pradesh, Orissa, Haryana, Madhya Pradesh, Andhra Pradesh, Karnataka and Tamil Nadu. It is observed feeding on linseed, groundnut and grapevine. Full-grown larvae are dark grey, with a wide white dorsal stripe, and have long hair all over body. The moths are pale yellow color.

**Life cycle:** The eggs are covered with the female anal tuft of brown hair. They hatch in 5-7 days and the young larvae feed gregariously for the first few days. Later on, they disperse and feed individually. They pass through six stages and are full-fed in 2-3 weeks. The full-grown caterpillars make loose, silken cocoons in the plant debris lying on the ground and pupate inside. The pupal stage lasts about one week in the summer. The pest passes through several generations in a year.

**Nature of damage:** Caterpillars feed on the leaves of various host plants and in case of severe infestation, they may cause complete defoliation. The attacked plants remain stunted and produce very little seed.

#### Management Strategies

- Deep summer ploughings to destroying the weeds and hibernating stages
- Use of light traps help in reducing the population of this pest.
- Hand collection and destruction of the egg masses and first instar larvae.

- Spray the crop with 200 ml dichlorvos (DDVP) 76 EC or 500 ml quinalphos 25 EC in 250 liters of water per acre.

## Linseed

### Linseed gall-midge, *Dasineura lini* (Cecidomyiidae; Diptera)

This insect appears as a serious pest of linseed in some parts of India, including Andhra Pradesh, Madhya Pradesh, Bihar, Uttar Pradesh, Delhi and Punjab. The adult is small delicate, mosquito like orange coloured insect.

**Life cycle:** The female lays 29-103 smooth, transparent eggs in the folds of 8-17 flowers or in tender green buds, either singly or in clusters of 3-5. The eggs hatch in 2-5 days. Just after emergence, the larvae are transparent, with a yellow patch on the abdomen. These larvae feed inside flower buds and eat the contents. They pass through four instars in 4-10 days and when full grown become deep pink and measure about 2 mm in length. The full-grown maggots drop to the ground, prepare a cocoon and pupate in the soil. The pupal period lasts 4-9 days. A generation is completed in 10-24 days. There are four overlapping generations during the season.

**Nature of damage:** Damage is the result of feeding by maggots on buds and flowers feed ovary. Consequently, no pod-formation takes place.

### Management Strategies

- The adult killed by using light traps.
- The flies are also attracted in day-time to molasses or *gur* added to water.
- The incidence of this pest is more on the late-sown crop as compared with the normal-sown crop, the practice of normal-sown crops should be adopted if possible.
- If pest incidence is more (10 per cent) then spray the crop with 600 gm carbaryl 50 WP in 200 liters of water per acre.

## Sunflower

Sunflower (*Helianthus annus* L.) is an important oilseed crop in India. Among oilseeds, sunflower commonly known as 'Surajmukhi' is one of the potential oil yielding crops gaining popularity because of its wider adaptability to different agro-climatic conditions. The production of this crop is seriously affected by the insect pests, attacking at different stages of crop growth. These losses can be minimized by adopting effective pest management strategies. Few major pests and their management practices have been discussed below.

**Head borer, *Helicoverpa armigera* (Noctuidae; Lepidoptera)**

The head borer or capitulum borer, *H. armigera* is highly polyphagous with about 181 host plants including important crop plants such as pulses, cotton, vegetables, oilseeds etc. and the pest is cosmopolitan in nature (prevalent throughout India).

**Life history:** The life cycle of this pest depends on the climatic conditions from north to south; it completes four generations in Punjab while seven to eight generations in Andhra Pradesh. Emergence of *H. armigera* moth has been observed evening any time after 04:00 p.m. The peak emergence being between 08.00 p.m. and 10.00 p.m. Female moth lays average 700-1000 eggs. The incubation period ranges from 2-5 days. There are normally six instars, but exceptionally seven instars are found in cold season. The larval period ranges from 8 to 33.6 days with 8 to 12 days on tomato, 21-28 days on chickpea, 21 - 28 days on maize, 33.6 days on sunflower and 20-21 days on cotton. The full grown larvae pupate in earthen cocoons in the soil. Pupal period vary from 5 - 8 days in India.

**Nature of damage:** The head or capitulum borer causes considerable damage to developing grains in the head capsule. The young larvae first attack the tender parts like bracts and petals, and later on shift to reproductive parts of the flower heads. Bigger larvae mostly feed on seeds by making tunnels in the body of the flower heads and often remain concealed. They may also shift to the backside of the heads and even leaves, and feeding may continue upto maturity. Star bud stage of the crop is most vulnerable and suffers maximum yield loss.

**Management Strategies**

- Early sown crop usually suffers lower attack of the pest.
- A significant reduction in pest density is achieved with the spray of HaNPV @250-500 LE/ha.
- Neem based insecticidal formulations such as Neem oil 2% or NSKE 5% are found effective in reducing damage due to *H. armigera*.
- In case of severe attack especially on late sown crop, when one larva per plant, average of 20 plants is present, spray the crop with 1500 ml of quinalphos 25 EC in 500 liters of water per hectare at the initiation of star bud Stage, and repeat after two weeks if necessary.

### **Bihar hairy caterpillar, *Spilosoma obliqua* (Arctiidae: Lepidoptera)**

Hairy caterpillars are highly polyphagous pest found throughout the year. Among various hairy caterpillars, Bihar hairy caterpillar is major ones causing severe damage to the sunflower crop. Besides sunflower, it infests millets, cotton, jute, sunhemp, castor, cauliflower, cabbage etc. It has been reported to feed on 96 plant species in India. They are called hairy caterpillar because they have profused hairy growth on their body in larval stage.

**Life cycle:** The female lays eggs in cluster on the lower surface of leaves. After hatching, the tiny larvae feed gregariously on the chlorophyll content of the leaf upto second instar. The larva defoliates the plants and move from one field to another. The full grown larva is darkened with yellowish brown abdomen having numerous pale white brown and black hairs and measures about 43 mm. It pupates in soil. The adult is dull yellow with oblique line of black dots on hind wings. The dorsal side of the abdomen is red with dull yellow ventral side.

**Nature of damage:** The attacked leaves look like a dirty paper, which can be recognized from a distance. After this stage larvae start dispersing throughout the field and feed voraciously leaving only the veins of the leaves without any green material. The full grown larvae are more harmful. After finishing the foliage of one field they migrate to the adjacent field resulting in complete destruction of the crop.

### **Management Strategies**

- Use of well rotten manures.
- Intercropping with pigeon pea at a row ratio of 2:1 is effective in reducing the insect attack. Hand collection and destruction of egg masses and gregarious larva should be done. The leaves on which large numbers of first instar larvae feed gregariously can also be collected and destroyed mechanically.
- To monitor the adult moths light trap should be installed in the field and attracted moths should be destroyed.
- Biological control: Application of *Bacillus thuringiensis* (Bt) @ 1.0 Kg/ha has been found effective in controlling hairy caterpillars.
- Botanical insecticides: Spray 5% neem seed kernel extract preferably in the evening.
- Chemical control: Need based application of cypermethrin 10% EC @ 650-700 ml/ha diluted in 500 – 650 liter of water or quinalphos 25 EC @ 1.5 ml/ liter of water should be done in the evening. Spot application of chlorpyrifos 20 EC 1.0 ml/litre of water is highly effective for the control of gregarious phase larvae.

- Digging trench around the field and dusting them with carbaryl 10% dust prevents the migration of caterpillars from one field to another. 7.

**Jassid, *Amrasca biguttula biguttula* Ishida (Cicadellidae: Homoptera)**

This pest is of economic importance in Maharashtra, Tamil Nadu and Karnataka causing crop loss up to 46 %. Though it may appear on the crop round the year, it is serious during certain months at different places. Summer crops are likely to suffer more with this pest than kharif crop.

**Life history:** The female lays on an average 15 eggs into the spongy parenchymatous tissue between the vascular bundles and the epidermis and they hatch in 4-11 days. The nymphs moult five times and the whole life cycle is completed in two weeks to one and half month depending upon the temperature and humidity prevailing in the field.

**Nature of damage:** The incidence would start from seedling stage and prevail right through entire plant life. Stunted growth of plant, cupped and crinkled leaves, burnt appearance of leaf margins are symptoms of damage.

**Management Strategies**

- Seed treatment with imidacloprid @ 5 ml/kg of sunflower seed protects from sucking insects up to 35-40 days after sowing.
- Need based foliar spray with any one insecticide like phosphamidon (0.03%) or dimethoate (0.03%) or imidacloprid (0.01%) may be mixed in 650-700 litre water per hectare.

**Groundnut**

**Ground aphid, *Aphis craccivora* (Aphididae; Homoptera)**

Aphid is the most serious pests of groundnut in India. It also attacks peas, beans, pulses, safflower and some weeds. Its distribution is throughout India. It has also been recorded in Africa, Argentina and Chile. The winged adults are soft-bodied insects with black wings and they reach the freshly germinated groundnut plants after over-wintering on collateral host plants.

**Life cycle:** The females are parthenogenesis may produce 8-20 young ones in a life span of 10-12 days. The young nymphs are brownish and they pass through four moults to become adults in 5-8 days. The apterous females start producing brood within 24 hours of attaining that stage.

**Nature of damage:** The nymphs and adults suck the cell sap, usually from the underside of leaves. Infestation in the early stages causes stunting of the plants as well as reducing their vigour. When the attack occurs at the time of flowering

and pod formation, the yield is reduced considerably. Infestation on the groundnut crop usually occurs 4-6 weeks after sowing. The aphid causes rosette disease of groundnut.

### **Management Strategies**

- The pest appears on growing points, spray 500 ml of malathion 50 EC or 500 ml dimethote 35 EC in 500-600 litres of water per hectare.
- Detail of management practices see in mustard.

### **White grub, *Holotrichia consanguinea* (Melolothidae; coleoptera)**

Whitegrub, *Holotrichia consanguinea* is the most serious scarab pest in India. This is a polyphagous pest in nature and prefers light sandy soils. This species predominantly found in Rajasthan, Gujarat, M.P., U.P., Haryana, Punjab, Bihar. Rajasthan and Gujarat has a long history of whitegrub, *H. consanguinea* infestation in all most the Kharif crops. The damage in different crops ranges from 20 to 100 per cent. This pest most preferably feed on groundnut and bajara.

**Life cycle:** The biology, of *H. consanguinea* has been worked out in Gujarat State by Patel *et al.* (1967), whereas in Rajasthan (Rai, *et al.*, 1969). Adult beetles lay eggs singly up to a depth of 9-10 cm. The eggs hatch in 8-10 days. The newly hatched grubs measure about 12 mm in length and their development is completed in 8-10 weeks. After the rainy season full-grown larvae migrate in soil to the depth of 40 to 70 cm or more in search of suitable moisture zone for pupation. The pupa is semicircular and creamy white and the pupal stage lasts about a fortnight. The beetles remain in the soil at a depth of 10-20 cm and come out for feeding at night. Adults formed in November remain in soil till next June. The beetles remain in the soil in inactive state upto middle of May at a depth of about one meter. The average duration of one life cycle is 122 days and there is only one generation in a year.

**Nature of damage:** The beetles of *H. consanguinea* emerge from the soil during dusk after good pre monsoon or monsoon rain in mid May. The beetles are polyphagous, and may feed on the foliage of a wide variety of host trees and bushes found in the nearby places. However, they have some preference for certain hosts like Jujube (ber), Khejri, *Prosopis cineraria*, Neem, *Azadirachta indica*, Cluster fig (gular), Jambolana (Jamun) and Drumstick (sainjana).

The grubs makes chamber by compressing the surrounding soil particles and then eats the rootlets exposed into the chamber; thereafter it little bit moves vertically to eat more of the same root. Then the, grubs move horizontally

making chambers and feeding on the exposed roots. The grubs continue active feeding from July to mid-October.

### Management Strategies

- The cultural management of white grub through deep summer ploughing exposes the grubs which are fed by birds and adult of grub can be killed by light trap.
- Annihilation of whitegrub beetles on host trees by application of insecticides and pheromone loading of selected host trees.
- Among the microbial control agents, entomopathogenic fungi, *Metarhizium anisopliae* and *Beauveria bassiana* were more effective, when placed at soil depth of 10-15 cm. Nematodes, *Setainernema glaseri*, *Heterorhabditis sp.* and a local strain were found to be pathogenic to several whitegrub species including *H. consanguinea*.
- Seed furrow application of Phorate 10G @ 20 kg/ ha or Quinalphos 5G @ 30 kg/ha or Thiamethoxam 70 WP @ 80 a.i. /ha in pearl millet crop.
- In groundnut, seed treatment with Clothianidin 50 WG (Dantotsu) @ 2g/ kg seed or Imidacloprid 17.8 SL @ 3 ml/ kg seed.
- In standing crop, chlorpyrifos 20 EC or quinalphos 25 EC @ 4l/ ha applied with irrigation water after 3 weeks of first shower of monsoon.

### Red hairy caterpillars, *Amsacta albistriga* Wlk. and *A. moorei* Butler (Arctiidae: Lepidoptera)

This is a serious and devastating pest of rainfed groundnut crop. It is an endemic pest and its seasonal outbreak in various areas is largely dependent on the climatic conditions and the local agricultural practices of the areas.

**Life history:** The adults are medium sized moths. After the receipt of heavy rains on the second evening at about 4 p.m. the moths emerge from their earthen cells in the soil. The moths mate and commence oviposition on the same day. The egg laying may last for 2 - 6 days. The creamy or bright yellow eggs are laid in groups mostly on the under surface of cowpea leaves usually sown along with groundnut as an inter crop and also on groundnut and occasionally on other vegetation, clods of earth, stones, dry twigs, etc. A female moth lays about 600 - 700 eggs but it has also been observed that as many as 2300 eggs have been laid by a moth. The incubation period ranges from 2 - 3 days. The larva becomes full grown in 40 - 50 days. It is about 5 cm long, reddish brown with hairs all over the body arising on warts. With the receipt of some showers, the grown up larvae burrow into the moist soil and pupate in earthen cells at a depth of 10 - 20 cm.



**Nature of damage:** Newly hatched larvae feed gregariously by scarping the under surface of tender leaflets leaving the upper epidermal layer intact. As they grow they feed voraciously on leaves leaving behind the petiole and midribs of leaves and the main stem of plants. They may be seen marching from one field to another in thousands. Severely damaged crop fields present the appearance as though the entire area has been grazed by cattle. Often it results in total loss of pods.

### Management strategies

- Deep summer ploughing to destroy the pupae of this insect.
- Setting bonfires or light traps to monitor and attract the adult moths at night.
- Collection and destruction of egg masses should be carried out during the early stages of attack.
- After the mass emergence of moths, the field should be dusted with phosalone 4% or carbaryl 10% dust to kill the first instar larvae which are vulnerable at this stage.
- Grown up larvae are killed by spray application of phosalone 0.05 % or endosulfan 0.075%.
- Nuclear polyhedrosis virus @ 250 LE/ha has been found promising in field scale control of the pest in Tamil Nadu.

### References

- Bakhetia, D.R.C. and Sekhon, B.S. 1989. Insect-pests and their management in rapeseed mustard. *J. Oilseeds Research*, 6 (2): 269-299.
- Chander, S. and Phadke, K.G. 1994. Economic injury levels of rapeseed aphid, *Lipaphis erysimi* determined on natural infestation and after different insecticides treatments. *International Journal of Pest Management*, 40:107-110.
- Kalra, V.K., Gupta, D.S. and Yadav, T.P. 1983. Effect of cultural practices and aphid infestation on seed yield and its component traits in *Brassica juncea* (L.) Czern and Coss. *Haryana Agricultural University Journal Research*, 13:115-120.
- Nain, Rohit, Dashad, S.S. and Singh, S.P. 2009. Relative efficacy of newer insecticides against pod borer, *Helicoverpa armigera* (Hubner) infesting sunflower crop. Proc. National Symposium on role of pesticide application technology in crop protection: towards sustainability in agriculture. 20-22 January, 2008 organised by Institute of Pesticide Formulation Technology, Gurgaon, India. pp.61-62
- Patel, R. M., Patel, G. G. and Vyas, N. 1967. Further observations on the biology and control of white grubs (*Holotrichia* sp. near *consanguinea* Bl.) in soil affecting groundnut in Gujarat. *Indian J. of entomology*, 29(2): 170-176.
- Rai, B. K., Joshi, H. C., Rathore, Y. K., Dutta, S. M. and Shinde, V. K. R. 1969. Studies on the bionomics and control of white grub *Holotrichia consanguinea* Blanchin lalsot, distt. Jaipur, Rajasthan. *Indian J. of entomology*, 31(2): 132-142.
- Singh, S.P. 2009. Insect pest management in oilseed crops. *Indian farming*. 58(7): 29-33.
- Singhal V. 1999. *Indian Agriculture*. Indian Council of Agricultural Research, New Delhi. pp. 600.