

*** Sucking Pests:**

O: Hemiptera.

Aphid :- Sorghum, wheat, cotton, safflower
Tomato, okra, cruciferous.

white fly :- S. cane, cotton, Tomato

mealy bug :- S. cane, cotton, Tomato.

S. cane → wooly aphid, ~~Py~~ Sorghum-delphacids.
Pyralia

*** Damage:-**

- 1) Nymph & Adult suck cell sap from Leaves (Generally lower side of leaves)
- 2) Leaves turn yellow & dry.
- 3) It secrete honey dew like secretion
- 4) Black sooty mould (fungus) develop.
- 5) Leaves turn black & affect on photosynthesis activity.
- 6) stunted plant & reduce yield

Egg :- on leaves.

Some Aphid & white fly → by parthenogenetically

*** D. stage** :- Nymph & Adult

*** Management:-**

- 1) Dust methyl parathion 2-4%.
- 2) spray dimethoate 30 E @ 0.03% or Monocrotophos 36 SL @ 0.05% or 0.1% malathion or 0.08% methyl demeton
- 3) spray 5% NSKE. For white fly
- 4) Use sticky trap. Spray Nirmg @ 0.5%
- 5) clean cultivation
- 6) Lady bird beetle → Aphid
- 7) Release C. Cornetia @ 2500 egg/h.

Jassid

Hemiptera,

Cotton, okra, Brinjal, potato

• Damage:-

- 1) Nymph & Adult suck cell sap from underside of leaves.
- 2) Hopper burn symptoms are noticed.
- 3) leaf get yellowish & curl.
- 4) In heavy infestation, leaves shows brown necrotic patches.
- 5) growth of plant get stunted.
- 6) Affect on flowering & reduce yield

• Egg:- Inside the leaf veins.

• D. stage Nymph & Adult.

• management

Same as sucking pest.
like Aphids & white flies.

* Thrips:

Thysanoptera

cotton, G. Nut, Tomato, chilli, mango,
Pomegranate, Rose, cucurbits.

* Damage

- 1) Thrips has rasping & sucking type of mouth parts.
- 2) scrap the epidermis of leaves.
- 3) suck the oozing cell sap.
- 4) Result that brown patches on leaves.
- 5) Excess feeding cause curling leaf
- 6) growth of plant is stunted.

* Eggs: lower surface of leaves.

* D. stage Nymph & Adult.

* management

Same as sucking pests. +

- 1) Resistant varieties
- 2) Seed treatment imidacloprid @ 7.5g.
- 3) spray dimethoate, methyl demeton

* Helicoverpa armigera Lepidoptera

[American bollworm, Tobacco earhead caterpillar, Gram pod borer, Tur borer, Tomato fruit borer, chilli fruit borer, Sunflower capitulum borer.]

* Damage:

- 1) Young larvae feed on tender foliage
- 2 full grown larvae attack fruit.
- 3 They make circular hole on fruit & eat inner content.
- 4 Insert only head into fruit & other body remain outside.
- 5 Single larvae can damage many fruits.
- 6 Larvae moves from one fruit to another

* Eggs: tender plant parts [leaves, fruit, flower]

* Pupa: soil & organic materials

* no. of generations : 8/18. D. stage - Larvae.

* Management:

- 1) Hand picking of larvae & destroy
- 2 collect & destroy infected plant parts.
- 3 deep ploughing to expose the pupa.
- 4 Use pheromone trap (Helio lure)
- 5 Spray HANPV @ 250 LE/ha
- 6 Spray azadirachtin
- 7) Spray 0.05 % quinalphos.
- 8 spray Bt @ 1 kg/ha.

Leaf miner

Lepidoptera,

[G. nut, Soybean, Red gram, citrus]

Damage

- 1) on hatching larvae feed on leaf tissue betⁿ upper & lower surface of leaves (epidermis).
- 2) It mines the upper epidermis of leaves.
- 3) mined leaves shows white streaks.
- 4) damaged leaves get folded or bring adjacent leaves together.
- 5) Larvae makes zig-zag tunnel in leaves epidermis.
- 6) damaged leaves get dry.

↑ Eggs: Underside of leaves.

↑ Pupa: Inside the larval mines of leaves.

↑ D. stage: Larvae

Management:

- 1) Remove infected parts.
- 2) Spray monocrotophos 36 SL @ 0.05% or quinalphos @ 0.05-1.
- 3) Dusting methyl parathion 2% D. or malathion 5D @ 20 kg/ha
- 4) spray NSKE 5%.
- 5) spray azadirachtin.

Horticultural trees!

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* fruit fly!

[Mango, Guava, Ber]

* Damage:

- 1) Larvae bore into fruit
- 2) feed on pulp.
- 3) fruit start rotting.
- 4) Dropping of fruits
- 5) Brown rotten patches on fruits.

* Eggs: Rind of fruits.

* Pupa: In soil.

* Damaging stage Larvae

* Management:

- 1) Remove & destroy fallen & affected fruits
- 2) spray bait [20 ml malathion + 200 gm gur + 20 lit water]
- 3) spray hedges with Quinalphas @ 0.05%.
- 4) Apply methyl eugenol trap.
- 5) Smoke in field.
- 6) Set light trap.

* Fruit Borer

[Pomogranate, guava, ber, Aonla]

* Damage: Damage!

- 1) Larvae bore into fruit.
- 2) It feed on pulp & seed
- 3) fruit get rotten
- 4) dropping of fruits
- 5) Bacterial infection cause rotting.
- 6) fruit gives ~~no~~ bad smell.
- 7) Seen excreta ~~on~~ at entry hole of larvae

Eggs! small fruits.

Pupa! Inside fruits.

D.S. : Larvae

* Management!

- 1) Remove & destroy affected fruits.
- 2) Bagging of fruits.
- 3) spray carbaryl @ 0.2%.
- spray chloropyrifos @ 0.25%.

* fruit sucking moth (A. Janata).

[citrus, pomegranate, mango, grape]

* Damage:

- 1) moths are nocturnal in nature & flying in orchard after dusk.
- 2) ~~moth~~ moth puncture the ripen fruits.
- 3) suck juice from fruits.
- 4) Rotting of fruit due to bacterial infection.

* Eggs :- weed hosts (gulvel & vasanvel)

* pupa :- In soil

* D. stage : Adult (moth)

* management:

- 1) Remove weed hosts.
- 2) Bagging of fruit
- 3) Remove & destroy fallen fruits.
- 4) smoke in orchard.
- 5) poison bait

[20 ml malathion + 200ml Jaggery
+ 2 lit water]

management.

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* spraying :-

* ~~Boring~~ ~~pest~~ :-

* sucking pests : [Hemiptera]

Aphid, Jassid, mealy bug, white fly, Thrips.

1) Dimethoate 30 Ec

2 Monocrotophos 36 WSC

3 methyl demeton 25 Ec

4 Thiometon 25 Ec

5 Malathion

6 Phosphamidon 85 WSC

Systemic
Insecticides

* Remaining pest (boring) [Lepidoptera]

1) Quinalphos 25 Ec

2) chlorpyrifos

3) Cypermethrin 20 Ec

4) Decamethrin 2.8 Ec

5) Permethrin 25 Ec

6) Phosalone 35 Ec

7) Carbaryl 50 WP

* Dusting [sucking + chewing + foliage]

1) methyl parathion 2% D

2) Carbaryl 10 D

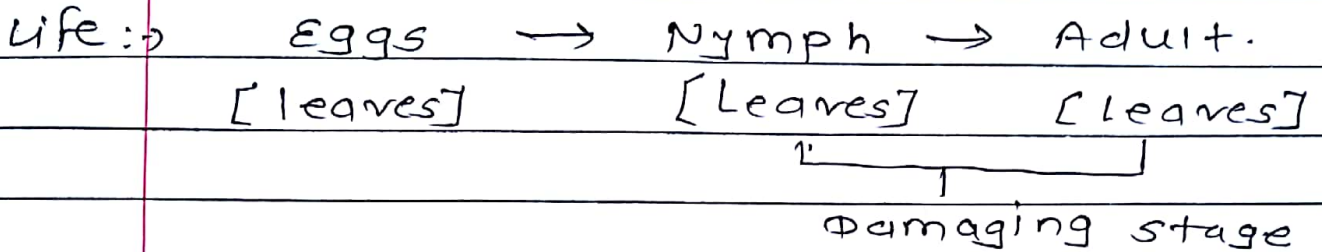
3) Quinalphos 1.5 D.

4) Malathion 5 D.

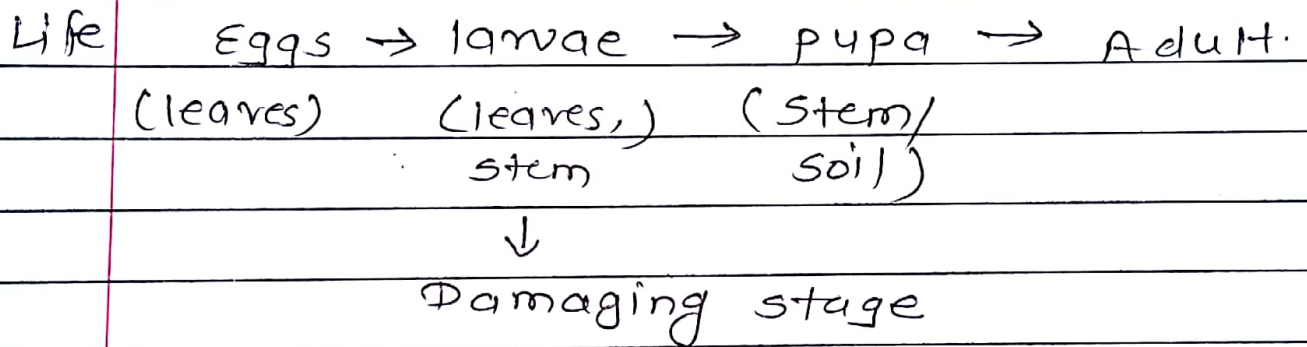
soil application

- 1) phorate 10 g
- 2) Carbofuryon 30 g
- 3) Quinalphos 5 g

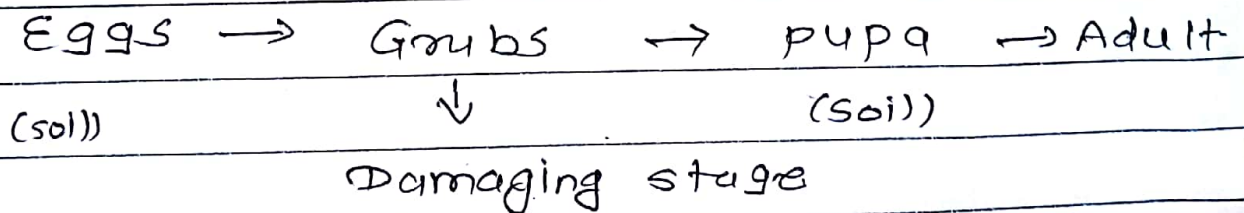
* chewing & sucking



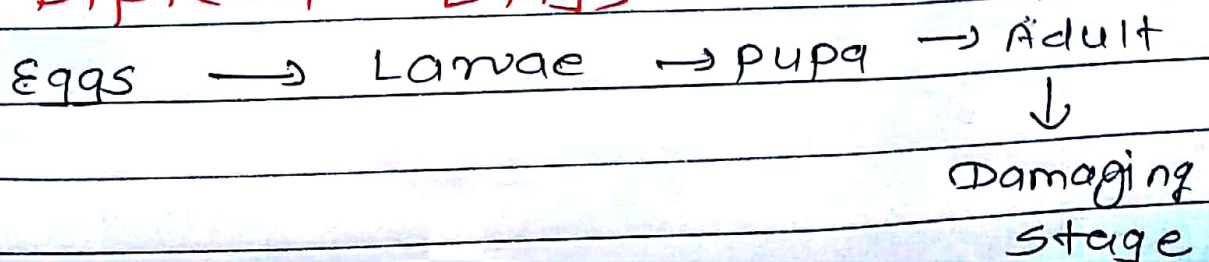
* lepidoptera (moths)



* coleoptera (beetles)



* Diptera [fly] [moth]



* polyphagous pests.

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Lepidoptera

1) Army worm:- Mythimna separata

[maize, Rice, s.cane]

* Damage:-

1) Active during night & hide in soil during day

2) feed on leaves from margin

3) complete defoliate the plant.

4) Excreta of larvae on leaves

5) on exhausting food from one field

caterpillar march like an army to another.

* Eggs:- on leaves.

* Pupa:- soil

* Management:-

1) Hand collection & destruction of eggs masses & larvae

2) Deep ploughing to expose pupae

3) Digging trench around the field

4) methyl parathion 2% D @ 20 kg/ha.

5) spray 50% carbaryl

6) Chlorpyrifos @ 0.05 %

* white grub [*Holotrichia serrata*]

Host:- sugarcane, maize, sorghum, gram, chilli, cotton, potato.

* Damage:-

- 1) Grubs feed on roots & rootlets.
- 2) Infected plant dried up.
- 3) Attacked plant get easily pulled out
- 4) roots can not provide nutrition to shoot & get dried.

* Eggs:- In soil.

* Pupa:- Soil.

* Larva Host:- S. cane, gram, cotton etc

* Adult host:- Neem, babul, shevga, ber, bel.

* Management:-

- 1) collect beetle during night by shaking host trees (Neem, babul)
- 2) collect & destroy grubs from field.
- 3) flooding of field
- 4) spray host trees with 0.1-1% carbaryl.
- 5) Soil applⁿ of phorate 10G, carbofuran 3G, Quinalphos 5G @ 25 kg/ha.

3. Spotted bollworm of cotton

Earias vittella

E. insulana

Id:

- caterpillars are brownish white & have dark head

- Body is irregularly covered with black spot (E. vittella) & spines (E. insulana).

Damage:

- beginning of cotton season, larvae bore into growing shoot of young plants.

- curling of attacked shoot

- during flower bud appear, larvae found boring into them, & shedding of early formed floral buds.

- Also bore into bolls & holes plugged with excreta.

- Infected bolls are shed.

- If not shed, open prematurely.

Host:

Bhendi, ambadi, etc

Bionomics:

- female lays bluish eggs singly on tender shoots, flower bud, bracts & bolls.

- Pupation in soil.

- Active throughout yr.

- 7-8 generation in yr.

5. Pink bollworm:-

Idⁿ:-

- Larvae is pinkish in colour.
- Pupa is brownish.
- Adult is dark brown with spot on wing.

Damage:-

- Unlike spotted bollworms, pink bollworm never attack shoot but affect floral bud, flowers & boll on

- In beginning caterpillars feed on floral bud, flowers & cause their shedding.
- Later, enter into developing boll through tip portion.
- entry hole get closed up as boll matures & it become extremely difficult to locate the infested bolls unless they drop down to ground.
- Larvae feed on inner content (Particularly seeds) & move to adjacent locule by making a hole through septum.
- So, it affect ginning % & oil qualities.

* Host: Bhendi, ambadi.

* Bionomics:

- single female lays 100-150 eggs on under surface of leaves, bolls, floral bud.
- newly hatched larvae is whitish colour.
- Pupation in soil. (short time cycle)
- In case of long cycle, fully grown larvae does not go into pupation & remains in hibernating stage.
- 9 generations in a year.

* Management of Spotted, American & Pink B.W.

- B.W are internal feeder, so it is difficult to control externally.

- sowing chawli around field.
- Removal & destruction of cotton stalks, shed bolls & plant debris after last picking.
- Avoid growing of bhendi & other malvaceous crop during off season.
- Fumigation of seed to kill hibernating larvae of pink B.W. with Aluminium phosphide @ 600/100 cu. m space.
- collection & destruction of affected buds, squares, flowers & bolls.
- Use of pheromone & light traps.
- Use resistant & tolerant varieties.

- 1st spraying at square formation & subsequent at 15 days interval.
- Spray only one insecticide from G-I & later on G-II.

Group-I : carbaryl 0.2%, quinalphos 0.05%.

Group-II : Cypermethrin 0.0075%.

decamethrin 0.0025%.

6 Red cotton bug (*Dysdercus cingulatus*)

Idⁿ: Red in colour except eyes & antennae.

- Black spot on each forewings.

+ Damage:

- Nymph & adult suck cell sap from leaves & shoots.

- Attack on bolls in all stage of its growth.

- They feed by inserting mouth into

2) Castor:

- 1) Leaf eating caterpillar. - *Spodoptera litura*
- 2) Castor semi looper - *Achoea janata*
- 3) Castor capsule borer - *Dichocrosis punctiferalis*
- 4) Castor jassids - *Empoasca distinguenda*

1) leaf eating caterpillar:-

Idⁿ: - pale greenish brown & smooth with dark marking on prothoracic plates.

Damage:

- caterpillar feed on leaves, leaving behind a net-work of vein.
- Affect yield adversely

Host: sunflower, pea, brinjal, tomato, cotton, g. nut & soybean.

Management:

- Spray monocrotophos @ 0.05% carbaryl @ 0.2% quinalphos @ 0.05%
- dusting with Malathion SD, quinalphos 1.5D methyl parathion 2% Dust.

2) Castor semi looper:-

Idⁿ: larvae is semi-looper with gray on black colour with red or white stripes on sides.

Damage: larvae feed on leaves, from lower side.

- only veins are left

Sugarcane

1) Borer pest

- 1) Early stem borer - *Chilo infuscatellus*.
- 2) Top shoot borer - *Scirpophaga nivella*.
- 3) Internode borer - *Sesamia inferens*.

2) Foliage ~~feeder~~ feeder

- 1) Pyrrilla (leaf hopper) - *Pyrrilla perpusilla*
- 2) white fly - *Aleurolobus barodensis*.
- 3) mealy bug - *Saccharicoccus sacchari*.
- 4) woolly aphid - *Ceratovacuma lanigera* & *C. graminum*.

1) Early stem borer! *Chilo infuscatellus*

Idⁿ:

- larvae have dark brown head & dirty white body.

Damage:

- attack during early stage of crop upto 3 weeks after germination.
- minute caterpillar on hatching initially feed on leaves
- enter into young shoot & tunnel downwards.
- In some cases larvae enter the plants from side at ground level by making hole in stalk.
- central shoot dries up causing dead-heart

* Host: Jowar, maize, grasses

* Bionomics: lays eggs in group around leaves.

2. Scane Top shoot borer

→ Id?

larvae have yellowish in colour.

→ Damage:-

- After hatching, larvae enters into midrib of leaf & later bores down into shoot from top causing death of central shoot.

- Upper most internode giving a bunchy top appearance.

→ Bionomics:

- egg are in cluster on inner side of the sheath.

- pupation takes place inside tunnel.

⑤ Internode borer

- larvae have pink coloured with dark spots on body.

→ Damage:-

- firstly act as early shoot borer case dead heart & later as internode borer.

- activity as an internode borer starts 3-4 month after planting & till upto harvesting.

- 80% attack is on 1st 5 internodes.

- due to feeding larvae inside the cane galleries are formed & filled by excreta.

management practice for cut sugarcane borers

- Borers are internally feeder & difficult to control.
- collectⁿ & destruction of egg masses
- Removal of infected plants.
- Early earthing up.
- mulching with trashes.
- Release of an egg parasitoid (Trichogramma japonicum) @ 25 lakh/ha.
- soil app^ln of phorate 10 G carbaryl 3 G @ 25 kg/ha.
- spray carbaryl @ 0.2%.

Brinjal / egg plant

- | | | |
|---|-------------------------|-------------------------------|
| 1 | Shoot & fruit borer | - <i>Leucinodes orbonalis</i> |
| 2 | Jassid | - <i>Amrasca biguttula</i> |
| 3 | Aphids | - <i>Myzus persicae</i> |
| 4 | white fly | - <i>Bemisia tabaci</i> |
| 5 | Epilachna beetle (Hadd) | - <i>Epilachna</i> spp. |
| 6 | mites | - <i>Tetranychus telarius</i> |

1) Shoot & fruit borer: *Leucinodes orbonalis*

* Damage:

- Infection start after transplanting
- larvae bore into growing shoot, midribs & feed on internal tissue.
- affected shoot wither & dry up.
- After fruit formation, larvae make their entry under calyx, when they are young.
- holes are plugged with excreta
- large circular holes seen on fruits are exit holes.

* Bionomics:

- lay eggs singly on ventral side of leaves & some times on fruits.
- pupation on plant

* Management:-

- Avoid cont. cropping of brinjal
- Remove & destroy affected fruit & shoot.
- spray 0.2% carbaryl or 0.25% monocrotophos

- dust 10% carbaryl dust @ 20 kg/ha

Cruciferous veget.

- | | | |
|---|-------------------|--------------------------------|
| 1 | Diamond back moth | - <i>Plutella xylostella</i> |
| 2 | Aphids | - <i>Brevicoryne brassicae</i> |
| 3 | Painted bug | - <i>Bagrada cruciferarum</i> |
| 4 | Head borer | - <i>Spodoptera litura</i> |

1) Diamond Back moth = *Plutella xylostella*

* Damage:

- young larvae feed on leaves.
- full grown larvae bore inside the head.
- round transparent patches appear on leaves due to feeding.
- In severe infe. plant may be completely skeltonized.

* Management

- Trap crop with mustard
- Intercropping with tomato.
- spraying with Bt. @ 1 kg/ha
- spray 4-1. NSKE
- 0.05-1. malathion / quinalphos.

5. Earhead midge / midge fly. of sorghum.

* Identification: adult is slender bodied insect

- abdomen is bright orange

* Damage:-

- maggots feeds on developing grains & pupate.

- chaffy grains with holes.

- Result of complete or partial sterility.

- Injury can be easily noticed as it is stained with red colour

* Bionomics: (Jowar, bajra & gramini family).

- deposit eggs in flowering spikelets.

- Pupate beneath the glume

* Management:-

- zonal sowing of same type of varieties

- Sowing done upto 1st week of July

- bhusa may be feed to cattle or burnt

- spray malathion 50 EC @ 0.1 %.

carbaryl @ 0.2 %.

A. Stem boring insect:

- i) Paddy stem borer: Scirpophaga incertulas.

B. Foliage pest.

a) chewing

- Grass hopper: Hieroglyphus banian.

b) Sucking

- Green leaf hopper: Nephotettix virescens.
plant hoppers.

- i) Brown plant h: Nilaparvata lugens.

- ii) white backed P.H.: Sogatella furcifera.

c. Non-insect pests:

- 1) Land crab Paratelphusa spp.

- 2) Snails Achatina fulica.

- 3) Slugs Limax spp.

- 4) Rats Bandicota bengalensis.

1. Paddy stem borer:-

- major & serious pest (Monophagous).

Identifit:-

female moth have straw coloured,
black spot on each fore wing.

Damage:-

- caterpillar feed on tender leaves.
- Then bore into stem & feed internally.
- cause dead heart of central shoot.
- when attack at seedling stage, seedling killed.
- during tillering stage, tillers get damaged.
- If attacks at letter stage, plants bear empty ears, called 'Paling' or 'white ear head'.

Host: monophagous pest, wild rice

Bionomics:-

- female lays eggs on upper surface of leaves
- Pupation in stem.
- damaging stages, larvae & adult.

Management:-

1) cultural :-

- avoid late transplanting, Resist vr. Ratna, IR
- clipping of leaf tips at transplanting to destroy egg masses.
- conservation of frogs.

2) chemical

a) Nursery:

applied phosphate 10 g @ 10 kg.

carbofuron 3 g @ 16.5 kg.

spray. quinalphos

b) Dipping of seedling:

chloropyrifos 20 Ec @ 0.02 %

c) field application:

T. japonicum @ 50,000 parasitoid / ha

Brown plant hopper

+ Identification:

- 1) BPH: nymph are yellowish, adult brown.
- 2) WBPH nymph are dull white.

+ Damage:

- Both ~~sata~~ starts the attack from middle of the field.
- Both nymph & adult sucks cell sap from leaf sheath / plant withers & dry up.
- Attacked plant turn yellowish.

+ Host: Haryali.

+ Bionomics:

- Both hoppers have similar life style.
- female lay eggs inside leaf sheath.

+ Management:

- Regular surveillance of crop.

Sweet Potato.

- 1 Sweet potato weevil - *Cylas formicarius*.
- 2 leaf eating caterpillar - *Herse convolvuli*.
- sphinx caterpillar.

1 Sweet potato weevil: *Cylas formicarius*.

* Damage:

- Grub infest stems & cause tunneling inside.
- Grubs as well as adults bore into tuber both in field & godowns.
- They feed on inner content & spoil them.
- Dark black patches are noticed on tubers & stems.

* Management

- Healthy cutting should be selected for planting.
- collect & destroy harvested parts.
- crop rotation
- spray 0.1% carbaryl.
- apply phosphate 10 g in soil at planting @ 10 kg/ha.

