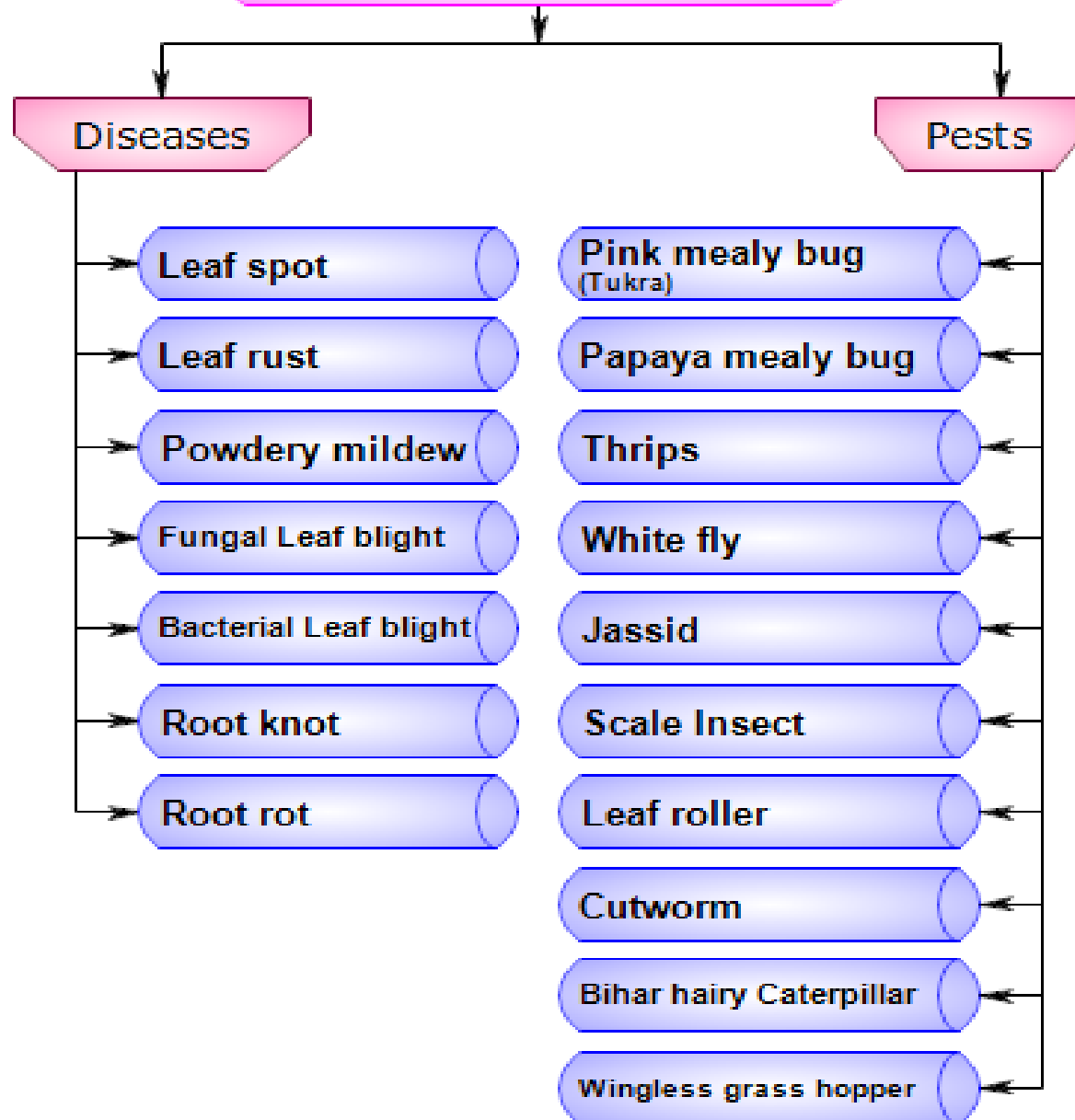


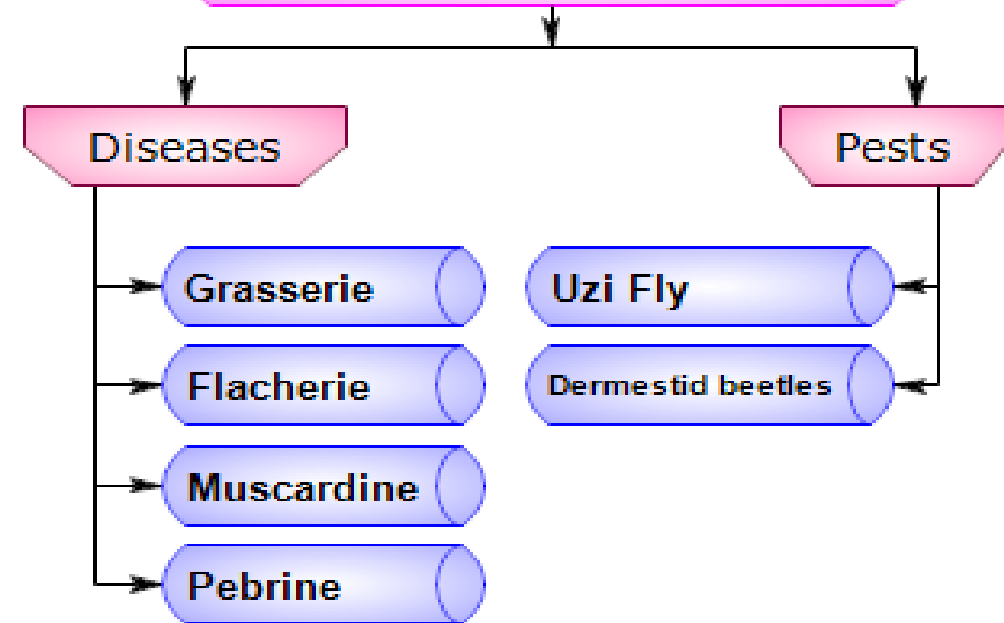
PESTS OF SILKWORM

Compiled by DR. NIDHI GARG

Mulberry Diseases & Pests



Silkworm Diseases & Pests



PESTS OF SILKWORM

- Any (insect or non-insect) organism, which interferes with human welfare, leading to economic loss is termed a **pest**.
- Two important pests are found to cause economic loss of silkworm crop.
- The silkworm in **larval stage** is attacked by a **tachinid fly (*Exorista bombycis*)**, commonly known as **uzi fly**, leading to **considerable decline in cocoon yield**.
- In cocoon stage (seed / stifled / moth pierced cocoons), the silkworms are attacked by **dermestid beetles (*Dermestes spp.*)** These beetles are commonly referred to as **carpet beetles**. They are reported to cause considerable **reduction in egg production** in silkworm egg production centers (grainages).

Uzi Fly *Exorista bombycis* (Diptera : Tachinidae)

- The adult Uzi fly is **blackish grey** in colour.
- It is **bigger** than the common Housefly, *Musca domestica* and is more **efficient in flight**.
- It has **four longitudinal black stripes** on the dorsum of the thorax and **three cross-wise stripes** on the abdomen.
- Male are 11.9 mm to 12.00 mm and the female 10.20 mm to 10.40 mm in length. Width varies from 3.60 to 3.90 mm.
- Wing span is about 10 mm and the wings are covered with dark grey hairs.
- Eyes are chocolate brown in colour.



Uzi fly (*Exorcista bombycis*) : a dipteran fly of the family Tachinidae, commonly known as Uzi or Uji fly, is a serious pest of silkworms.



Fig.2.1: Adult uzi fly



**Fig.2.2: Female abdomen
(Ventral)**

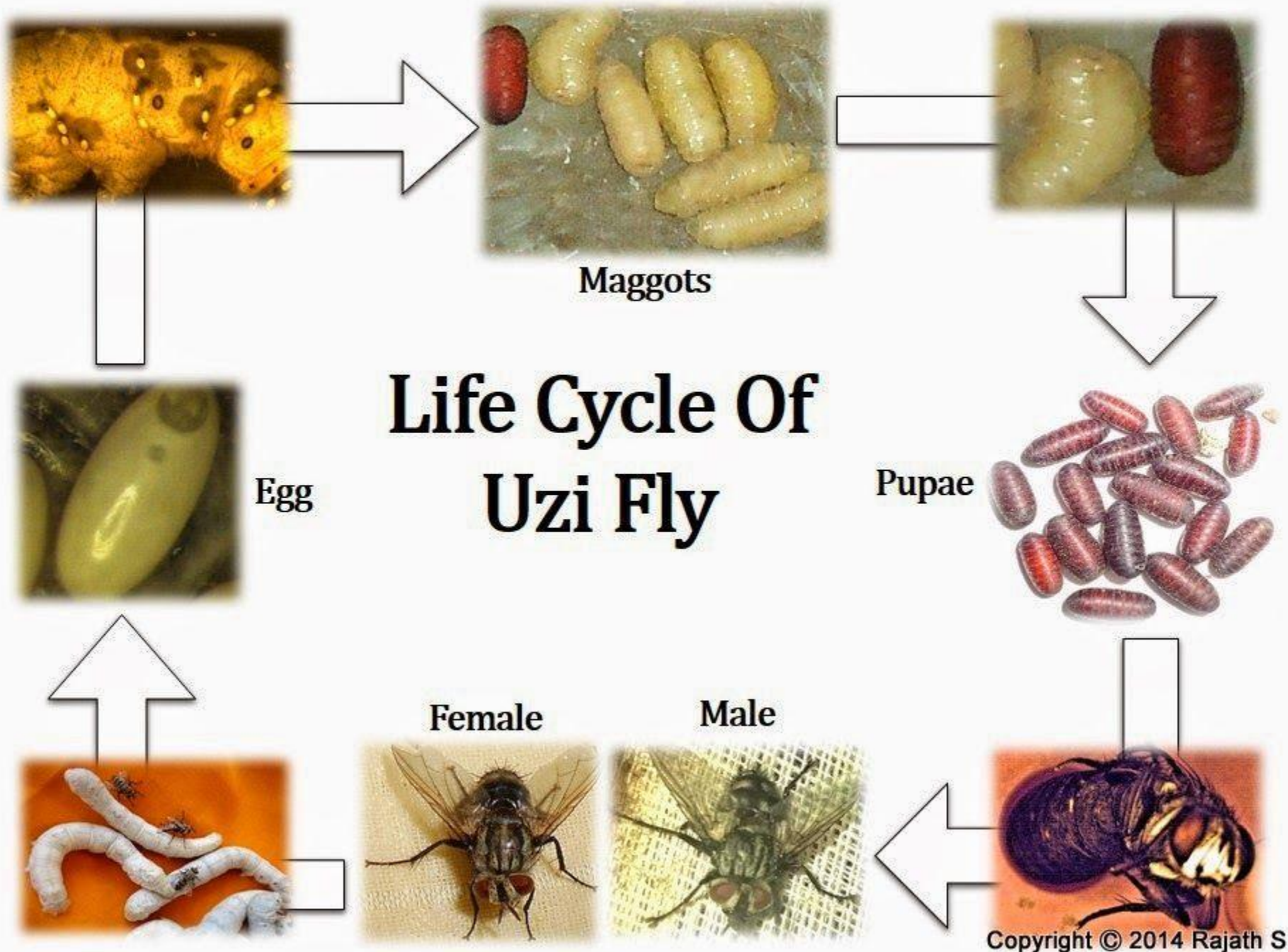


**Fig.2.3: Male abdomen
(Ventral)**

- The lateral margins of the abdomen are covered with bristles, which are thicker and longer in males than in females (Fig. 2.2 & 2.3).
- Males can be easily distinguished from the females by the presence of external genitalia (pinkish brown in colour) at the tip of the abdomen on the ventral side and well developed tips of the legs (tarsal pads).

LIFE CYCLE OF Uzi Fly

- A female lays **500 - 600 eggs** during her life time (18 - 22 days), each day laying about **20-30 eggs**.
- Eggs hatch in **48 - 60 hours**.
- The **Maggot** after hatching from the egg immediately pierces into silkworm body using the pro-thoracic hook attached to the mouth.
- The place of entry of maggot into silkworm body **develops a black scar**.
- The maggot feeds on the silkworm tissues for **5-7 days** during which time it **moults twice**.



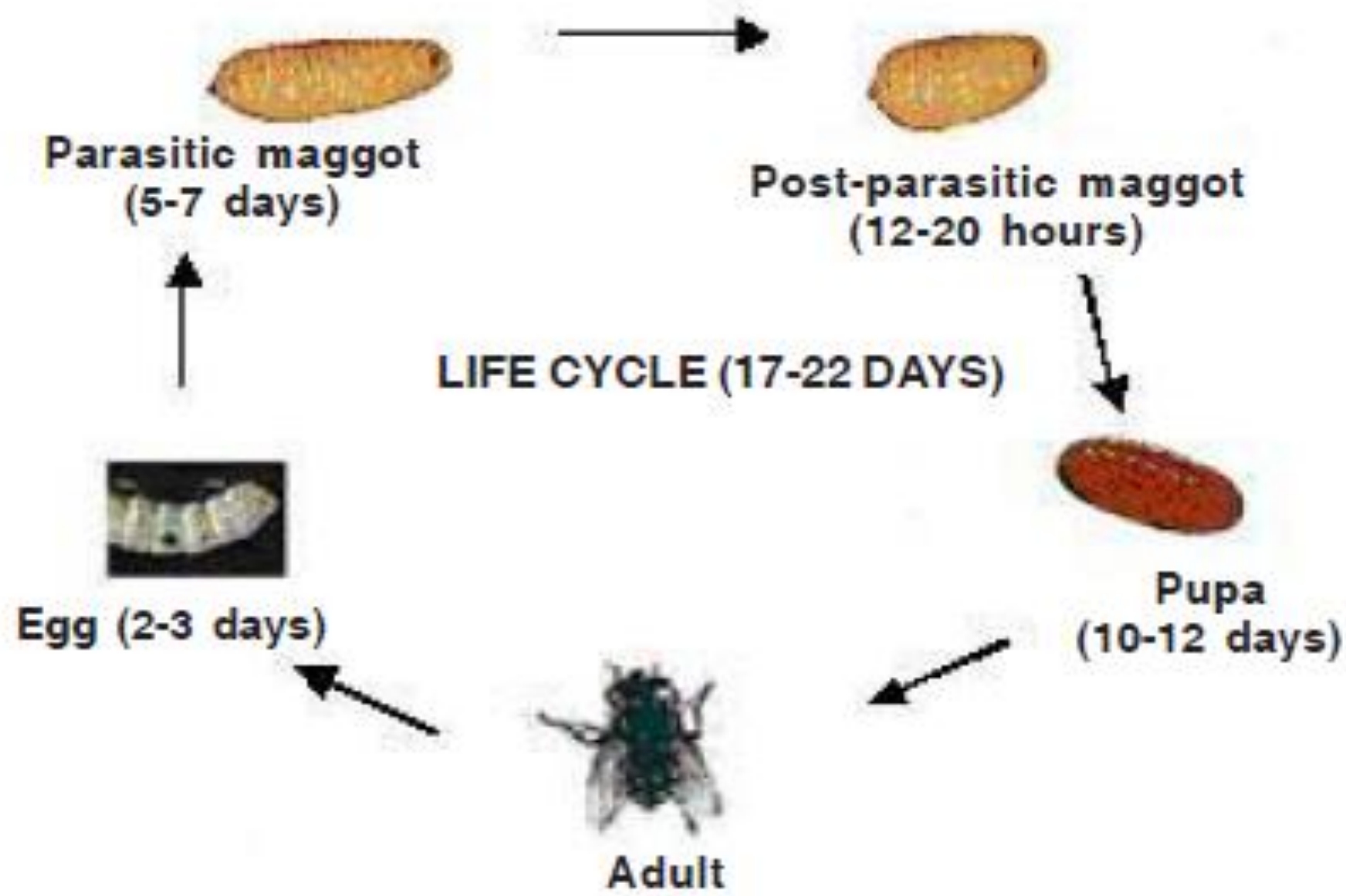


Fig.2.4: Life Cycle of Uzi fly



Uzifly maggots that fell from infested silkworm cocoons are being collecting by a farmer.



Uzifly infested damaged silkworm cocoons

LIFE CYCLE OF Uzi Fly

- The maggot comes out of silkworm body by creating an opening on the body (integument) and spends **12-20 hours time as post-feeding (post- parasitic) maggot** and becomes pupa in dark places like cracks, crevices, corners of the rearing house, loose soil, etc
- Adult uzi fly emerges from the pupa after **10 to 12 days**.
- Life cycle is completed in **17-22 days**.
- Adult fly survives for 10 - 18 days (males) and 18-22 days (females).
- Adult fly feeds on pollen, rotten fruits, nectar, etc.

Uzi Fly: Period of occurrence

- In the southern **sericultural belt** (Karnataka, Andhra Pradesh and Tamil Nadu), the **uzi fly is prevalent throughout** the year.
- In other parts of the country, it does not prevail throughout the year because of **discontinuous rearing of silkworm and environmental extremities**.
- Maximum infestation is recorded **during rainy season followed by winter**.
- The infestation is **least during summer** months.

Uzi Fly: Symptoms of attack and extent of damage

- The Uzi fly lays **one or two cream coloured eggs** (measuring the size of a pin head) on the silkworm larva.
- Generally, it **prefers grown up larva** (i.e., 4th or 5th instars) for egg laying (Fig.2.5 & 2.6).
- The eggs hatch in **48 to 62 hours**.
- A **black scar** is formed at the point where the egg hatches and the uzi larva (maggot) enters the body of the silkworm using the hooks (pro-thoracic hook) attached to the mouth.
- From this **black scar, the pest attack can be identified**.



Fig.2.5: Adults of Uzi fly laying eggs on silkworm larvae

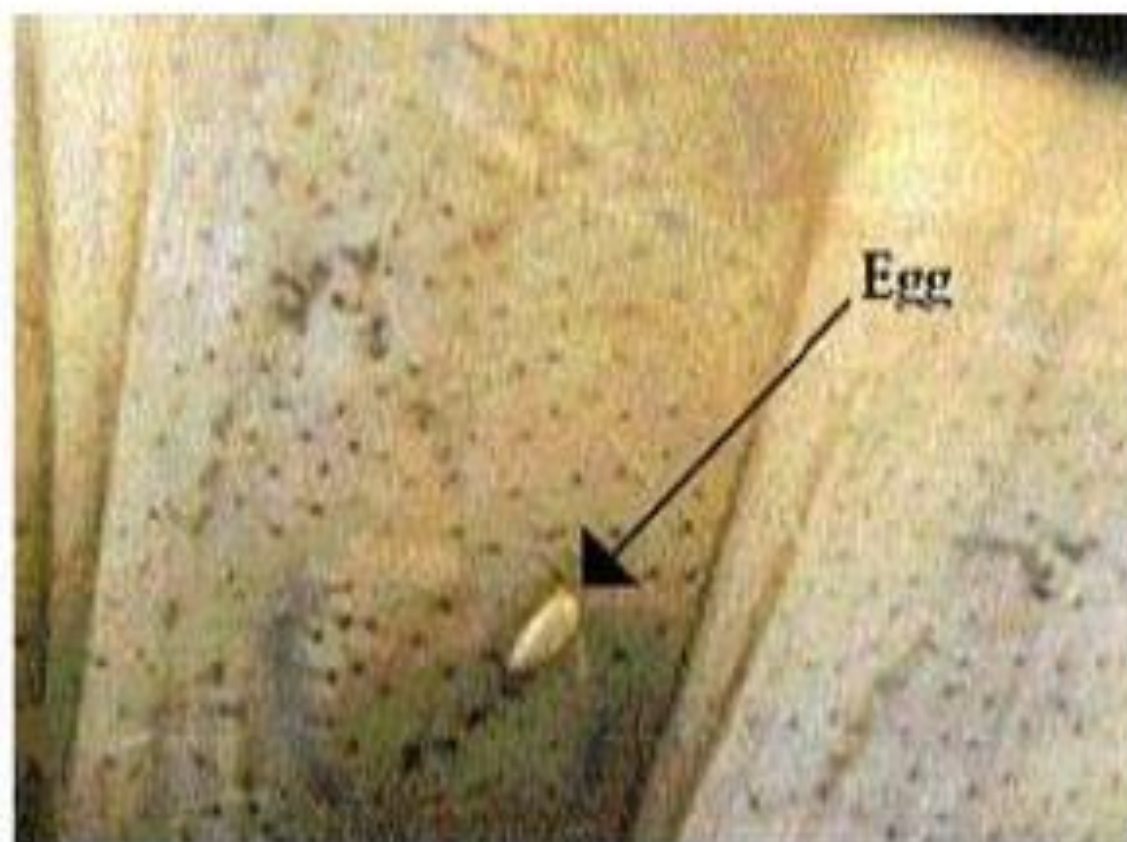


Fig.2.6: An Uzi egg on silkworm larva



**Scar formed by entering of uzi larva
into the body of silkworm**



Fig.2.7: Black Scar on silkworm larva



Fig.2.8 : Uzi Maggot



Fig.2.9: Uzi Pupa

The silkworm crop loss due to this fly pest is 10-20% i.e., on an average 6 kg reduction in cocoon yield is observed for every 100 dfls of silkworm reared.

Factors responsible for outbreak of Uzifly

- Large scale and overlapping rearing of host (silkworm).
- Favourable climatic conditions (temperature range of 20 – 30°C and relative humidity of 60 – 90%) facilitates continuous host / silkworm rearing which in turn helps the host availability.
- Increased adult (uzi fly) longevity.
- Higher egg production and egg hatchability.
- Reduced activity of the natural enemies like parasitoids, predators and pathogens in nature.

Managment of Uzi Fly

- **Various management methods have been evolved for the suppression of the uzi fly incidence.**
- **These are classified as –**
- **Cultural / Mechanical**
- **Exclusion**
- **Physical**
- **Chemical**
- **Biological**
- **Legislative/Quarantine**

Cultural / Mechanical Control of Uzi Fly

- Silkworm rearing in a village should be conducted **at a time by all farmers.**
- A **minimum gap of 20 days** should be maintained between the two silkworm rearings.
- The **cracks and crevices** on the rearing house floor **must be kept closed.**
- **Collection and destruction of uzi infested silkworm larvae.**
- Collection and destruction of uzi maggots and pupae from rearing house, grainage, cocoon market and reeling establishment.
- Collection and destruction of adult uzi fly.

Exclusion is by avoiding the contact of uzi fly with the silkworm.



Fig. 2.10: Use of Nylon net

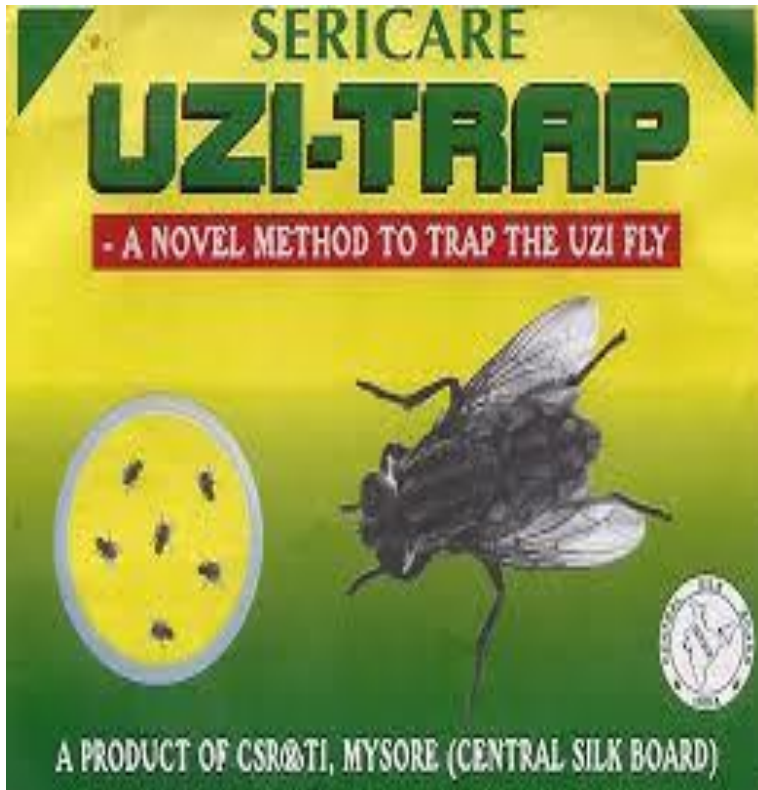


Fig. 2.11: Fixing of Wire mesh

- Use nylon net enclosure to the rearing stand.
- Fix wire mesh to windows and doors.
- Provide a small ante-room at the entrance of rearing house. Cover the individual rearing tray with nylon net.

Physical Control of Uzi Fly

- Keep **uzitrap solution** in white trays near doors and windows (3 ft above ground level) both inside and outside the rearing house to trap adult uzi fly.



3. Uzi Trap

Dissolve one table in 1 litre of water and keep the solution in white trays both inside and out side the rearing house at window base from 3rd instar onwards up to spinning.

Place uzi traps inside the rearing house/mounting hall after spinning up to 20 days under close-door condition to trap uzi flies emerging inside.



Chemical Control of Uzi Fly

- Spray / dust the ovicides like **uzicide / uzipowder** to kill the uzi eggs laid on silkworm body.
- Spray **2% bleaching powder solution** on the body of silkworm larvae to detach / kill the uzi egg.



Fig. 2.13: Spraying of uzicide



Fig. 2.14: Dusting of uzipowder

Biological Control of Uzi Fly

- Release of *Nesolynx thymus* by keeping parasitised pupae ready for emergence on 2nd day after keeping packets (50 ml x 2 packets/100 dfls) on second day of fifth instar of silkworm rearing.
- Shifting of the parasitised pupa packets to places where mountages with silkworms are kept spinning.



Fig. 2.15: A pouch containing *N.thymus*, parasitised host pupae



Fig. 2.16: An egg laying *N. thymus* adult

Legislative / Quarantine control of Uzi Fly

- **Avoid transportation of uzi infested cocoons from infested area to new area.**

Control of Uzi Fly

- The above management methods when applied individually do not keep the **pest incidence below the economic injury level (5%)**.
- Hence, an **Integrated Pest Management (IPM)** package is developed for the suppression of the pest by selecting a few effective management strategies listed above.
- The IPM package for the control of uzi fly comprises Mechanical (use of nylon net enclosure), Physical (use of an adult trap – uzitrap), Chemical (spraying of uzicide or bleaching powder solution / dusting of uzi powder) and Biological (release of an ecto-pupal parasitoid, *N. thymus*) methods.

Dermestes Beetle *Dermestes* spp. (Coleoptera: Dermestidae)

- The most important species of dermestid beetle prevalent in egg production centers is *Dermestes ater*.
- Identification of pest
- Adults of *D. ater* are black in colour, elongate oval in shape and about 7 mm in body length.
- Grubs (larvae) are also black in colour and are covered with bristles ('hairs').



**Dermestes
beetle**

Dermestes Beetle- Life cycle

- The female lays **150-250 eggs in the floss of the cocoons.**
- Egg hatching duration: **3-6 days.**
- Larval (grub) duration (5-7 instars): **28-40 days.**
- Pupal duration: **7-8 days.**
- Total life cycle: **38-54 days.**

Dermestes Beetle

- **Period of Occurrence**
- **The pest prevails throughout the year.**

Dermestes Beetle- Symptoms of pest attack and extent of damage

- The grubs cause more damage than adults.
- The infested cocoons (especially seed and stifled cocoons) show the presence of multiple irregular holes on them.
- Though they show preference for feeding on the left over/dead matter in the cocoons, they do attack the green cocoons as well as the egg laying moths whenever their population gets increased.
- The estimated damage level due to the beetle attack to the pupae is 16.62% and moth 3.57% with 20.19% reduction in egg production in grainages, especially those coming under government sector.

Dermestes Beetle



Damage caused by dermestid beetles to the cocoons and egg laying silk moths

Dermestes Beetle

- **Factors responsible for pest outbreak**
- **Storage of large quantities of moth pierced as well as stifled cocoons over a long period of time (more than 6 months).**

Dermestes Beetle

- Management involves two steps

1. Control measures
2. Preventive measures

Dermestes Beetle- management

- **Preventive measures**

- Storage of rejected cocoons and perished eggs in the grainages for long period should be avoided.
- The cocoon storage rooms should be cleaned periodically.
- Before and after emergence of silk moth, the grainage premises should be kept clean and tidy.
- Provide wire mesh to doors and windows in Pierced Cocoon (PC) storage rooms to avoid free movement of the beetles and grubs from PC storage room to grainage operation rooms.

Dermestes Beetle- management

- **Control measures**

- **1) Mechanical**

- **Collect the grubs and adults either by sweeping or by using a vacuum cleaner and destroy them by burning or dipping in soap solution.**

- **2) Physical**

- **Exposure of beetle infested (grubs and adults) pierced / stifled cocoons packed in HDPE (black) bags to sunlight for a period of 6 hours.**

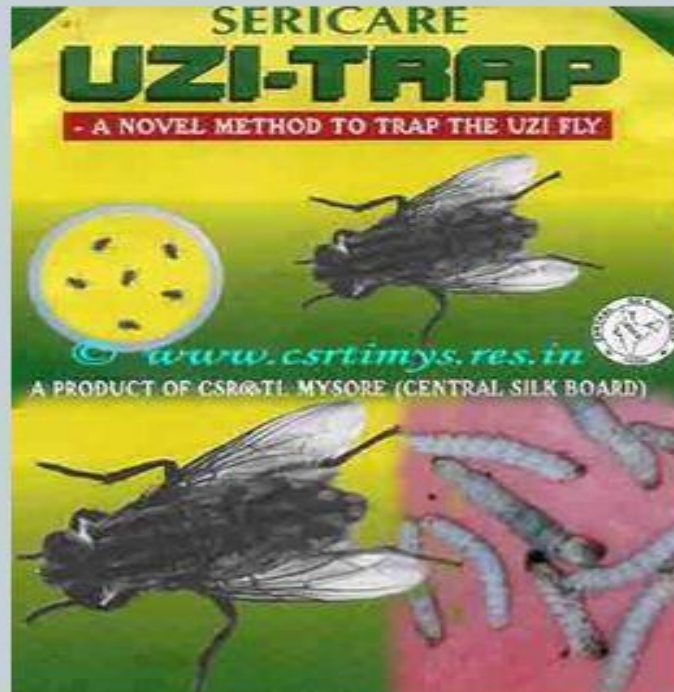
Dermestes Beetle- management

- Chemical

- **Wooden articles** of the cocoon storage room and grainage should be dipped in **0.2% Malathion solution for 2-3 minutes**. After 10 days, the trays should be thoroughly washed in water and sun dried for 2-3 days before reusing.
- Store pierced cocoons in **Deltamethrin treated bags** (bags soaked in 0.028% Deltamethrin solution and dried in shade).
- Spray **0.028% Deltamethrin solution** on walls and floor of PC storage room once in 3 months.
- Sprinkle **commercial grade bleaching powder @ 200 gm/m²** in the PC storage room (close to wall) to prevent migration of grubs from PC storage room.

Problems

- Pests: ants, wasps, crickets, praying mantis, Uzi fly



http://www.csrtimys.res.in/index_files/album_files/swdp.php



http://www.seri.ap.gov.in/2_seri_Diseases_Uzifly.htm

Nesolynx thymus



<http://www.nbaii.res.in/Featured%20insects/nesolynxthymus.htm>



Ants: This insect pest attacks silkworms in the rearing trays and this can be prevented by placing the legs of the rearing stands in ant wells.

Pest and Predators of Muga

Food Plant Pest



Amphutkoni



Fighting Beetle



Sucking Pest



Chafer beetle



Leaf beetle



Black citrus aphid

Silkworm Pest



Apanteles



Uzi Fly



Black Ant



Praying mantis



Wasp



Red Ant

Predators



House Sparrow



Indian Crow



Owl



Bat



Squirrel



Red Fox



Rat



Wild Rabbit



Monkey