HELPFUL INSECTS

Role of pollinators, weed killers and other beneficial insects

I. Role of pollinators

Pollination refers to the transfer of anther to stigma in flowering plants for sexual reproduction.

Insects aid in cross pollination in fruits, vegetables, ornamentals, cotton, tobacco, sunflower and many other crops.

Insect pollination helps in uniform seed set, improvement in quality and increase in crop yield.

Entomophily refers to cross pollination aided by insects

Pollination classes	Type of insects
Melitophily	Bees
Cantharophily	Beetles
Myophily	Syrphid and Bombylid flies
Sphigophily	Hawk moths
Psychophily	Butterflies
Phalaeophily	Small moths

1. Honeybees as pollinators

All bee species aid in pollination

Value of honey bees in pollination is 15-20 times higher than that of the honey and wax it produces.

Per cent increase in yield due to bee pollination

Mustard	-	43%
Sunflower	-	32 - 48%
Cotton	-	17 - 19%
Lucerne	-	112%
Onion	-	93%
Apple	-	44%
Cardamom	-	21-37%

2. Hoverflies *Syrphus* sp. (Syrphidae:Diptera)

Brightly coloured flies

Body is striped or banded with yellow or blue

Resemble bees and wasps

Larval stage predatory, adults are pollinators

Crops pollinated - carrot, cotton, pulses

3. Carpenter bee, *Xylocopa* sp. (Xylocopinae:Anthophoridae)

Robust dark bluish bees with hairy body

Dorsum of abdomen bare, pollen basket absent

Adults are good pollinators
Construct galleries in wood and store honey and pollen

4. Digger bees, *Anthophora* sp. (Anthophoridae:Hymenoptera)

Stout, hairy, pollen collecting bees
Abdomen with black and blue bands

5. Fig wasp *Blastophaga psenes* (Agaonitae:Hymenoptera)

Fig is pollinated by fig wasp only. There is no other mode of pollination. There are two types of fig Caprifig and Symrna fig.

(i) Capri fig

a. It is a wild type of fig - not edible
b. Has both male and female flowers
c. Pollen is produced in plenty
d. Natural host of fig wasp

(ii) Smyrna fig

a. It is the cultivated type of fig - Edible
b. It has only female flowers
c. Pollen not produced
d. Not the natural host of fig wasp

Fig wasp: Male - wingless, present in caprifig
Female - winged

wasp lays eggs in caprifig, larvae develops in galls in the base of the flowers mates with female even when the is inside gall

Mated wasp emerges out of flower (caprifig) with lot of pollen dusted around its body.

The fig wasp enters smyrna fig with lot of pollen and deposits it on the stigma But it cannot oviposit in the ovary of symrna fig which is deep seated
It again moves to capri fig for egg laying. In this process smyrna fig is pollinated Caprifig will be planted next to smyrna fig to aid in pollination

6. Oil palm pollinating weevil: *Elacidobins kamerunicus* (Curculionidae : Coleoptera)

Aid in increasing oil palm bunch weight by 35% and oil content by 20%

7. Other pollinators

Butterflies (eg *Deilaphila* spp.) and moths (*Acherontia* spp.) Ants, flies, stingless bees, beetles etc.,

II. WEED KILLERS

Insect which help in controlling weeds by feeding on them are called weed killers.

1. *Dactylopius tomentosus* cochnieal insect to control prickly pear *Opuntia dillenii*

This insect was introduced into India in 1925. Within 5-10 years it controlled the weed.

2. Aristalochia butterfly, *Papilio aristolochiae* (Papilionidae:Lepidoptera). It feeds on Arista lochia which a weed.

3. Caotropis butterfly - *Danaus chrysippus* (Nymphalidae:Lepidoptera) - feeds on calotropis.

4. AK Grosshopper - *Poecilocerus* pictus (Actididae:Orthoptera)

Feeds on Calotropis and controls it

5. Water hyacinth weevil *Neochetina eichhorniae* and *N. bruchi*

The larvae tunnel and feed inside the petioles. Ten pairs of adults and progeny controls plant growth in 0.58 m^2.

6. Parthenium weed killer, *Zygogramma bicolorata* (Chrysomelidae:Coleoptera)

Adults and grubs feed on leaves and flowers. 2 beetles controls and destroys one plant in 45 days.

A successful weed killer has following qualities

Should not be a pest of cultivated plants - at present or in future
Effective in damaging and controlling the weed
Should be a borer or internal feeder of the weed
Should not be affected by parasitoids/predators

III. SCAVENGERS

Insects which feed on dead and decaying plant and animal matter are called scavengers.

Remove decomposing material and prevents health hazard
Convert complex material into simple substances

a. Rove beetles (Staphylinidae:Coleoptera)
   Adults and larvae feed on decaying matter
b. Chafer beetles (Scarabaeidae:Coleoptera)
c. Darkling beetles (Tenebrionidae:Coleoptera)
d. Nitidulids (Nitidulidae:Coleoptera)
e. Water scavenger beetle (Hydrophilidae:Coleoptera)
f. Daddy long legs (Tipulidae:Diptera)
g. Muscid flies (Muscidae:Diptera)
h. Termites (Isoptera)
i. Ants (Hymenoptera)

IV. INSECTS OF AESTHETIC VALUE

Insects which are beautiful are admired

Jewel beetle (Buprestidae:Coleoptera)
- necklaces, bracelets and made of whole insects

Nymphs of scale insects - made as stings
Butterflies - symbol of beauty

V. SOIL BUILDERS

Insects which live in soil, male tunnels. During this process, the soil disintegrates, and soil aeration is facilitated. Subsoil is brought to the surface. Excreta of insects also enrich the soil.

eg. Beetles, ants, cutworms, larvae of flies, crickets, termites, wasps etc.,

VI. INSECTS OF SCIENTIFIC VALUE

1. **Fruitflies** - ***Drosophila melanogaster***

Useful in biological investigations such as cytology, and genetics for studying principles of inheritance.

These flies have short life cycle, easy to culture and multiply - They have large chromosomes and easily recognizable heritable variations.

2. Mosquitoes - Used in bioassay of insecticide residues
3. Cockroaches - Used in Zoology and Entomology courses, also used in nutritional studies

VII. INSECTS AS FOOD

Termites, grubs of beetles are being used as food
They are rich in protein

MANAGEMENT OF HOUSEHOLD PESTS, VECTORS OF HUMAN DISEASES AND PESTS OF CATTLE AND POULTRY

I.HOUSEHOLD PESTS AND VECTORS OF HUMAN DISEASES

1. Housefly *Musca nebulo* (Muscidae:Diptera)

Biology: Larvae - feed on decaying organic matter, faeces etc.,
Adults - Frequent human dwelling and transmits diseases

Damage

- Source of nuisance
- Transmits many diseases in human beings such as diarrhoea, dysentry, cholera, typhoid, enteric fevers, tuberculosis, leprosy, anthrax, trachoma, gonorrhoea and many helmithic diseases.

Management

Proper disposal of manure, garbage, sewage, human excrement, dead animals etc., Covering manure pits with soil.
Inside houses, spraying with malathion/diazinon 2%, lindane 1% or tricholorphon 0.5%. The deposits are effective for long periods.
Smearing doors and windows with malathion 3% or diazinon 1.5% emulsion with a bruch.
Using fly swatters to manually kill flies.
Protecting eatables from flies to prevent transmission of diseases.
Use of poison baits such as formaline + sweetened milk (or) fermented banana + milk or cheese + sugar + insecticide

2. Mosquitoes

Culex sp., *Anopheles* sp., and *Aedes* sp. Culicidae : Diptera

More than 2500 sp world wide

Mosquitoes

Biology	:	Egg, larval and pupal stages spent in water, marshy lands, stagnant ponds etc., Adults cause problem to humans and animals.
Damage	:	Their bile causes itching and irritation (Females only bite and suck blood)

Diseases transmitted

Anopheles sp. transmits malaria (caused by *Plasmodium* sp.)
Culex sp. transmits filariasis (caused by *Wuheretia bancrofti*)
Aedes sp. transmits dengue fever, encephalitis and yellow fever

Management of mosquitoes

- Stagnant water should be drained (or) treated with 0.025% malathion emulsion. Kerosine oil can also be used.
- Grasses and weeds around buildings should be cut or sprayed with 1% malathion every week when mosquitoes are active.
- Mosquito nets or repellents such as citronella oil (creams).
- Adults can be killed with space sprays of propreitary products such as pyrethrins, dichlorvos, synthetic pyrethroids.
- Spray human dwellings, cattle shed with lindane 0.5 g/m^2 and propuxur, fenitrothion and malathion 2 g/m^2.

3. Sandflies *Phlebotomus argentipes* (Psychodidae:Diptera)

Larvae found in decaying organic matter.

Damage

Adults cause painfaul bite, itching and swelling
Transmits diseases in man like kala-azar, three day fever, tropical ulcer etc.,]
Transmits anthrox in cattle

Management

- Cleanliness in and around human inhabitations
- Surface spraying with Lindane 5% as residual spray
- Insecticides recommended for mosquito control
- Pyrethrum oinment to repel the sand flies

4. Eye flies *Siphunculina funicola* (Chloropidae : Diptera)

Breeds in decomposing organic matter, near latrines, stables and drains.

Damage

- Frequents the eye with buzzing sound and feeds on eye secretions
- Transmits diseases like *Conjunctivitis* and *Ophthalmia*

Management

✔ Good sanitary and hygienic condition

5. Human lice

Head louse *Pediculus capitis*	Pediculidae:
Body louse *Pediculus humanus*	Siphunculata or Phthiraptera
Crab louse *Phthirus pubis*	

Damage

- Biting causes cutaneous lesions, itching

- Severe infestation by lice is called pediculosis - discolouration hardening and ulceration of skin
- Transmits diseases like typhus, trenchfever, European relapsing fever

Management

Powder containing malathion 2% or lindane 1% is effective in delousing on clothes
On infested head/body lindane 0.2% mixed in hair oil or lotions containing 0.2% lindane
Cleanliness to have constant relief

6. Rat fleas: *Xenopsylla cheopsis* (Pulicidae:Siphonaptera)

Damage

- Painful bites - cause irritation, itching on skin

Transmits bubomic plague - caused by bacterium *Pasteurella pestes* which affects both rats and humans.

Also transmits endemic or murine typhus

Management

Keep houses rat free by poison baits
Cleaniless, proper ventilation and occational spraying with malathion 0.5% or lindane 1%

7. Cockroaches

Periplanata americana, *Blatela germanica*, *Blatella orientalis* Blathidae:Dictyoptera

Live in dark unclean kitchens, restaurants, filthy places

Damage

- Starchy material are ruined by excreta, offensive smell
- Feed on damp books and leather articles

Management

Observing cleanliness
Sealing pipelines and drains leading to basement
Spraying room with malathion / chlorpyriphos 0.5% without contaminating food material
Combined application of dichlorvos 0.5% (quick knock down) and persistent insecticide (Chlorpyriphos)

8. Crickets *Grylloides sigillatus, Acheta domesticus* Gryllidae:Orthoptera

Damage

- Nuisance and disturbance to humans by producing monotonous chirping sound produced at night
- Eat food and clothings

Management

Dusting corner and floors with malathion / carbaryl 5% dust at night (care not to contaminate food)

9. Bed bugs

legion
Cimex hemipterus (Tropical) Cimicidae:Hemiptera
Cimex lectularius (Temperate)

Damage

Nymphs and adults suck blood and inject toxic saliva during night- (irritating, painful, itching) (Does not transmit any diseases)

Management

Exposing bed, bedsheets to hot sun will kill bed bugs
Using steel cots instead of wooden cots
Applying kerosine, turpentine or petroleum oils in furniture
Treating furniture with malathion 1% or lindane 0.1%

10. Silverfish

Lepisma saccharina, Thermobia domestica Lepismatidae : Thysanura

Management

Cleaning and ventilation.
Use of naphthalene balls in cupboards

11. Other minor household pests

Ants, termites, book lice, wood boring, beetles, carpet beetles, cloth moth.

MANAGEMENT OF PESTS OF CATTLE AND POULTRY

Farm animals are attacked by pests under following categories

1. Blood sucking flies (Adults - flies suck blood)

2. Myiasis flies (Tissues eaten by maggots of flies)
3. Lice - (a) sucking lice (b) biting lice
4. Fleas
5. Arachnids - (a) Ticks (b) Mites

I. Blood sucking flies

a. Sand flies: *Phlebotomus argentipes* (Psychodidae:Diptera)

Damage

Both male and female flies such blood from horses, dogs, man and cattle
Causes weakening and reduction of milk
Transmits anthrox in animals

b. Horseflies: *Tabanus striatus* (Tabanidae:Diptera)

Other species *Chrysopa* sp., *Hamatopota* sp.

Damage

- Females are blood suckers - even on running animals
- Animal weakened, loses lot of blood
- Transmits anthrox
- Attacks horse, cattle, camel, elephant, rarely man

c. Stableflies *Stomoxys calcitrans* (Muscidae:Diptera)

Damage

Bite causes itching, pain, restlessness in animals
Reduction in milk yield
Transmits diseases like anthrax, surra, swamp fever, *Trypanosomiasis* and *Leishmaniasis* in animals

d. Hornflies: *Haematobia irritans* (Tahinidae:Diptera)

Damage

- Both sexes suck blood from neck region from cattle, goats, horses, gods and sheep
- Transmits anthrax

e. Dogflies: *Hippobosca maculata* (Hippoboscidae:Diptera)

Damage

Permanent ectoparasites on cattle, horse, dog, goat, sheep
Painless but irritating bite cause annoyance

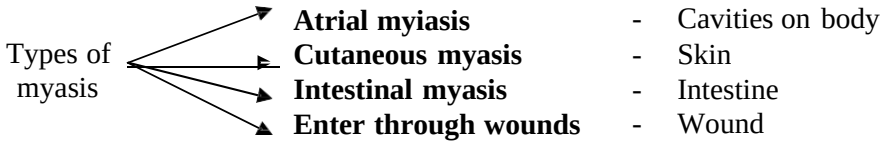
Management of blood sucking flies on cattle

- Elimination of breeding of flies through cleanliness
- Residual spray of cattle shed with lindane 5% or diazion 1%
- Draining stagnant water to prevent breeding
- Spraying 0.1% pyrethrin + 1% piperonyl butoxide at 1-2 lit/animal, twice or thrice a week
- Cover or dry the fresh dung as it attracts egg laying by hornflies
- To manage dog flies, apply malathion 5% dust on neck, back and flanks of animal every 10-14 days

II. MYIASIS FLIES

Myiasis refers to an infestation of living organs or tissues of man and other mammals by maggots (larvae) of flies (order Diptera) and disturbances resulting therefrom

caused by insects belonging to *Calliphoridae* (Blousflies)
Oestridae (Botflies, warble flies), *Sarcophagidae* (Flesh flies)



Botflies

1. Horse botfly - *Gastrophilus intestinalis*, *G. nasalis* (Oestridae:Diptera)

Damage

- Eggs laid on body of animal - while licking gets into intestine - larva develops inside intestine
- Maggots injure tongue, stomach and intestine
- Animal dies if not treated

Management

If larva detected in faeces - give 25 ml tolerance or 1.5 g carbon disulphide / 100 kg body weight in gelatin capsule to horse.

2. *Oestrus ovis* Sheep bot fly (Oestridae:Diptera)

Maggots attacks nasal passage of sheep - discharge of mucus, distress to the sheep.

Management

Irrigating the sheep's nostrils with 3% lysol
Carbondsulphide + Paraffin injection into nostrils

3. Warble fly/Heal fly: *Hypoderma lineatum* (Oestridae:Diptera)

Cutaneous/subcutaneous myiasis caused
Causes holes in skin - less value
Even causes eye myiasis

Management

- During monsoon, hair close to loof may be cut to prevent egg laying
- Treating animal with 1% trichlorphon or 0.05% rotenone every 45 days when warbles appear on skin

Blowflies

Chrysomyia bezziana (Calliphoridae:Diptea)
Cochliomyia hominivorax, Calliphora, Lucilia, Phormia sp.

Also called screw worms
Cause cutaneous myiasis by entering through wound/sores

Management of blowflies

- Disposal of carcasses to prevent egg laying
- Removing maggots with forceps after spraying with 5% chloroform
- Dressing wounds with pine oil which is a repellent

III. LICE

a. Sucking lice: Has sucking mouth parts

1. Cattle louse: *Haematopinus eurystermus* (Haematopinidae:Siphunculata)

Ectoparasites on cattle, cling, bite and irritate

Management (Delousing) DELOUSNG CATTLE

- Applying linseed oil all over the body could kill lice
- Malathion 5% dust or 0.5% suspension spray/dip of animal

b. Biting lice: Has biting and chewing MP

Bevicola caprae (on goat) *B. ovis* (on sheep); *B. bovis* (on cattle)
(*Trichodectidae*:Mallophaga)

Menopon gallinae (Menoponidae:Mallophaga)
Shaft louse of focol (on birds)
Feed on feathers of birds and cause annoyance
Menacanthus stramineus (Chicken body louse)

Prefers skin to feathers

Management of biting lice on birds (Delousing birds)

Spray individual chicken or in groups with 0.5% carbaryl or malathion (5 lit/100 birds)
Apply 5% Malathion / Carbaryl dust on individual birds @ 500 g/100 birds
On walls and ceiling spray 3% malathion

Delousing birds not only removes the lice but also poultry tick and fleas.

IV. FLEAS

a. Poultry stick fast fleas *Echidnophaga gallinacea* (Hectosyllidae : Siphonaptera)

Attack comb, wattle, around eyes, beaks
Birds become anaemic and egg production reduced

V. ARACHNIDS

Ticks (1) *Boophilus microplus* cattle tick

Cause inflammation and haemarrhage
Produce tick paralysis
Transmits tick fever, texas fever, tulanemia

Management

Careful removal with hand/forceps along with capitulum
Use 1% lindane dust or 5% malathion dust

2. Poultry tick: *Argas persicus* (Fowl tick)

Suck blood, causes weakness, annoyance
Transmits fowl diseases

Mites: *Sarcoptes scabiei* called mange mite

Mite damages or eats the skin
Ecto parasite on horse, cattle, mule, sheep, goat

Management
Repeated application of powdered sulphur in vegetable oil