

Programme-	B.Sc (Agriculture)
Course -	Non-Insect Pests, Pests of Farm Animals and Plant Disease Vectors
Course Code-	BSCAG-416
Semester -	VIIth
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Unit-	2
Topic-	Management and families of mites
Sub-Topic-	Classification, morphology, distribution, nature of damage and management of important mites under families : Tetranychidae, Tarsonemidae, Tenuipalpidae and Eriophyidae
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Classification non-insect pest:

Pests:

In layman terms pest is the organisms that disturb the human life. Scientific definition of pest is that those organisms which damage our cultivated plant, our forest, storage, domestic product including other aesthetic qualities are called pest. In agricultural concepts; the pests are those organisms which harbor in cultivated crops that reduce quantity and quality of crops. Entomology: This is the branch of zoological science which deals with insect's morphology, physiology and their life-cycle as well their importance to be studied. Economic entomology: This is the branch of entomology which deals with the economic aspects of insects on crop. Insects: It is generally defined as the animals of phylum arthropods of class insecta having: 1 pair of antenna• 2 pairs of wings• 3 pairs of legs• Segmented body•

Classification of insects: A. On the basis of host association: a) Monophagous insects: These insects depends only one species of plants for whole life-cycle. Eg., Bombyx mori on Morus alba b) Oligophagous insects: Confined only one family for the whole life-cycle Eg., Potato tuber moth: depends

on the solanaceous crop Diamond back moth (*Plutella xylostella*, *Plutellidae*) feeds on crucifer crops Cabbage butterfly (*Pieris brassicae*) feeds on crucifer crops c) Polyphagous insects: Many agricultural pests fall on polyphagous pests. Those insect-pests visit the diverse plant species to complete the lifecycle. Eg., *Helicoverpa armigera*, *Noctuidae* If on chickpea: chickpea borer If on tomato: tomato fruit borer

On the basis of Biological characteristics:

a) **r- pest:** Those species which possess high fecundity and strong dispersal

b) k- pest:

Low fecundity, low dispersal, larger body size eg., all stem bugs c) r-k pest: Mixer characteristics of r-k pest eg., all the Dipteran C. On the basis of Metamorphosis: a) **Ametabola:** No or simple metamorphosis There is no difference between adult and im-matures except size and some internal developmental process Egg- Young- Adult b) **Paurometabola:** The immature is not well distinct with mature stage Eg., grasshopper and crickets Egg-Nymph-Adult They lay eggs in bunds of fields. Only 5% agricultural insects fall on this.

c) Hemimetabola:

Incomplete metamorphosis The im-matures are aquatic and bear gills for breathing They differ from adults in appearance Eg: mayflies, dragonflies etc Egg- Naid- Adult d) **Holometabola:** About 90% insects of economic importance fall in it. The stage is completely differ from one another Eg., all the **Lepidopteron, Coleopteron, Hymenopteron**

D. On the basis of plant part damage:

- a) **Leaf damaging insects:** Well-developed mandibles The symptoms possess by leaf damage insects are small holes or transparent spots. Eg., all the adults of white grub at evening period. b) **Stem damaging insects:** They inhibit the stem and make the tunnel inside soft or hard stem. Basically they fall on two orders: **Lepidopteron:** prefer to damage soft tissues Eg., Rice stem borer (*Scirpophaga incertulas*) Family: *Pyralidae* **Coleopteron:** they prefer hard stem eg., mango stem borer (*Batocera rufomaculata*), Family: *Torambycidae* Orange stem borer (*Stromatium barbatum*), Family: *Torambycidae* c) **Fruit damaging insects:** Citrus fruit fly *Bactrocera dorsalis*, Family: *Tephritidae* B. tau, Family: *Tephritidae* these species are identified in Nepal B. zonatus, Family: *Tephritidae* d) **Root damaging insects:** Root damaging insects are: Red ants (*Dorylus orientalis*) White grub (*Phyllophaga rugosa*) *Scarabacidae* (*Holotrichia* spp.) They lay eggs in fresh dung. So, don't use the fresh dung Light trap can be done e) **Flower damaging insects:** Thrips: (*Thrips tabaci*); *Thripidae*
- b) **E. On the basis of Extend on damage:** 1. Major pest: - Economic loss high - More studied in entomology - E.g., Brown plant hopper in rice is major pests (*Nilaparvata lugens*) Family: *Delphacidae* Rice earhead bug/ Rice gundhi bug (*Leptocaris oratorius*), Family: *Alydidae* Citrus major pest: *Rhynchocaris humeralis*

Mango major pest:

Mango hopper (*Idioscopus niveosparus*) Note: leaf hopper – Cicadellidae Plant hopper – Delphacidae Tree hopper - Membracidae 2. Minor pest: - Economic loss is low - Not studied generally in economic entomology F. On the basis of population level and ecological principle: 1. Perennials pest: Green sting bug (*Xylocopa*) Not damage significantly though present yearly. This is controlled by natural environment. 2. Occasional/ sporadic pest: Those pests which are controlled by natural environment but sometimes it may occur huge loss as sometimes. e.g., Cotton jassids (*Amrasca biguttula biguttula*), Family: Jassidae 3. Key pest: Those pests which are responsible for damaging even the few population are called key pest. e.g., Helicoverpa armigera is key pest of chick pea Apple aphid (*Eriosoma lewigeri*), Family: Pemphigidae Tobacco caterpillar (*Spodoptera litura*), Family: Noctuidae Termite (wld/f) and its Managements: Termite is a social insect which has well defined cast differentiation and work division. It has king, queen, worker and soldier King for progeny, after mating their wings falls Queen Worker and soldier are sterile. A queen can lay up to 10 million of eggs in her life cycle, which is equivalent to 13,000 eggs/day or 1 egg/sec. The number of the king and queen in colony is very few. About 80-90% of the population is of workers which have feeding function for young. 1-2% of the population is occupied by the soldiers that act for defense mechanism in colony. Termites fall under the order Isoptera.

Isoptera Holotermitidae Mastigotermitidae Kalotermitidae Rhinotermitidae Serritermitidae Termopsidae Termitidae Most of the economic important termites fall on the family Termitidae

Management practices of termites:

It is very difficult to manage because it rest in the deep tunnel. So, preventive measure is useful. - Colony disruption in large trees like mango - Strong foundation in building - Use of eco-friendly materials like neem based pesticides Margosom• Nemacol @ 2-5 ml/lit of water• Nemarin• - Use of water barriers in the leg of furniture - Pasting the servo engine oil in the beam and dead wood (In live plant it is not good to use due to phytotoxicity effect) Locust (;nx) and its Managements: Order: Orthoptera Family: Acrididae No problem in Nepal, but problem is sever in desert areas

There are two types of locust:

Migratory• It is more serious Two types: - Desert locust (*Schistocera gregaria*) and - Migratory locust (*Locusta migratoria*) **Solitary:•** Not so serious Female locust lays 40-120 eggs at a time inside the sand below 10-15 cm in group The egg hatches in 2-3 weeks or 2-5 weeks If temperature increases hatching will be in 2 weeks Mild cold temperature, the hatching period is lengthened It has 5-different Nymphal stages The 1st Nymphal stage can be differentiated by observing the wing development whereas in adult full wing development take place. It has only one generation per year.

Management of Locust: Here, we generally concern the management of migratory locust. - Making the small water drain (15 cm wide) towards the movement of locust. It should be 25 cm depth -

Management options should be applied in the morning time because in morning the locust is sluggish and passive. As temperature increases locust activity also increases. - Collection of the eggs mass and destroy it to reduce further its population increment. - Flame thrower through helicopter is also used in farmer of India. - Where radio broadcasting is effective, management practice is very effective (like in China) - Use of neem based pesticides which is anti-feedant in nature. Storage Insect Pest and their Managements: Major storage insects-pest: Common Name Scientific Name Family Rice weevil *Sitophilus oryzae* Curculionidae Maize weevil *S. zeamais* " Granary weevil *S. granarium* " Rice moth *Corcyra cephalonica* Gelechiidae Angouimous grain moth *Sitotroga cerealella* " Khapra beetle *Trogoderma granarium* Dermestidae Brachids/ pulse beetle *Callosobruchus chinensis* Bruchidae Cowpea weevil *Callosobruchus maculatus* " Rust-Red flour beetle *Tribolium castaneum* Tenebrionidae Confused flour beetle *T. confusum* " Lesser grain borer *Rhizopertha dominica* Bastrichidae Angouimous grain moth (cgfh k'tnL): In Nepal, Angouimous grain moth Female lays eggs in kernel of seed. After 5 days egg hatch into larva and passes 5 different larval stages. 1 st instar enters into seed and consumes the starchy part of seed, including embryo. The pupation takes place in seed itself and sometimes outside of seed in between seed and wall. The pupal period is 7-9 days, about 5 generation have been reported per year

References Books:

1. Y.K Mathur and K.D Upadhya (2012), *Crops Pests and Management*.
2. K.R Nair, *Integrated production and pest*