Lecture 14: TRADITIONAL METHODS OF PEST CONTROL

CULTURAL CONTROL

Definition: Manipulation of cultural practices to the disadvantage of pests.

I. Farm level practices

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Cropping Techniques</th>
<th>Pest Checked</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Ploughing</td>
<td>Red hairy caterpillar</td>
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<td>2.</td>
<td>Puddling</td>
<td>Rice mealy bug</td>
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<td>3.</td>
<td>Trimming and plastering</td>
<td>Rice grass hopper</td>
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<td>4.</td>
<td>Pest free seed material</td>
<td>Potato tuber moth</td>
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<td>5.</td>
<td>High seed rate</td>
<td>Sorghum shootfly</td>
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<td>6.</td>
<td>Rogue space planting</td>
<td>Rice brown planthopper</td>
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<td>7.</td>
<td>Plant density</td>
<td>Rice brown planthopper</td>
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<td>8.</td>
<td>Earthing up</td>
<td>Sugarcane whitefly</td>
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<td>9.</td>
<td>Detrashing</td>
<td>Sugarcane whitefly</td>
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<td>10.</td>
<td>Destruction of weed hosts</td>
<td>Citrus fruit sucking moth</td>
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<td>11.</td>
<td>Destruction of alternate host</td>
<td>Cotton whitefly</td>
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<td>12.</td>
<td>Flooding</td>
<td>Rice armyworm</td>
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<td>13.</td>
<td>Trash mulching</td>
<td>Sugarcane early shoot borer</td>
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<td>14.</td>
<td>Pruning / topping</td>
<td>Rice stem borer</td>
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<td>15.</td>
<td>Intercropping</td>
<td>Sorghum stem borer</td>
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<tr>
<td>16.</td>
<td>Trap cropping</td>
<td>Diamond back moth</td>
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<td>17.</td>
<td>Water management</td>
<td>Brown planthopper</td>
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<td>18.</td>
<td>Judicious application of fertilizers</td>
<td>Rice leaf folder</td>
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<tr>
<td>19.</td>
<td>Timely harvesting</td>
<td>Sweet potato weevil</td>
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</table>

II. Community level practices

1. Synchronized sowing: Dilution of pest infestation (eg) Rice, Cotton
2. Crop rotation: Breaks insect life cycle
3. Crop sanitation
   a) Destruction of insect infested parts (eg.) Mealy bug in brinjal
   b) Removal of fallen plant parts (eg.) Cotton squares
   c) Crop residue destruction (eg.) Cotton stem weevil
Advantages                                      Disadvantages
1. No extra skill                               1. No complete control
2. No costly inputs                             2. Prophylactic nature
3. No special equipments                        3. Timing decides success
4. Minimal cost                                 
5. Good component in IPM                        
6. Ecologically sound                           

PHYSICAL CONTROL
Modification of physical factors in the environment to minimise (or) prevent pest problems. Use of physical forces like temperature, moisture, etc. in managing the insect pests.

A. **Manipulation of temperature**
1. Sun drying the seeds to kill the eggs of stored product pests.
2. Hot water treatment (50 - 55°C for 15 min) against rice white tip nematode.
3. Flame throwers against locusts.
4. Burning torch against hairy caterpillars.
5. Cold storage of fruits and vegetables to kill fruitflies (1 - 2°C for 12 - 20 days).

B. **Manipulation of moisture**
1. Alternate drying and wetting rice fields against BPH.
2. Drying seeds (below 10% moisture level) affects insect development.
3. Flooding the field for the control of cutworms.

C. **Manipulation of light**
1. Treating the grains for storage using IR light to kill all stages of insects (eg.) Infra-red seed treatment unit (Fig.1).
2. Providing light in storage go downs as the lighting reduces the fertility of Indian meal moth, *Plodia*.
3. Light trapping.

D. **Manipulation of air**
1. Increasing the CO₂ concentration in controlled atmosphere of stored grains to cause asphyxiation in stored product pests.

E. **Use of irradiation**
Gamma irradiation from Co⁶⁰ is used to sterilize the insects in laboratory which compete with the fertile males for mating when released in natural condition. (eg.) cattle screw worm fly, *Cochliomyia hominivorax* control in Curacao Island by E.F.Knipling.
F. **Use of greasing material**
   Treating the stored grains particularly pulses with vegetable oils to prevent the oviposition and the egg hatching. eg., bruchid adults.

G. **Use of visible radiation**: Yellow colour preferred by aphids, cotton whitefly: yellow sticky traps.

H. **Use of Abrasive dusts**
1. Red earth treatment to red gram: Injury to the insect wax layer.
2. Activated clay: Injury to the wax layer resulting in loss of moisture leading to death. It is used against stored product pests.
3. Drie-Die: This is a porous finely divided silica gel used against storage insects.

**Preparation of activated clay**:

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<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
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<tbody>
<tr>
<td>1.</td>
<td>Kaolinite clay</td>
</tr>
<tr>
<td>2.</td>
<td>POWDERING</td>
</tr>
<tr>
<td>3.</td>
<td>ACID ACTIVATION</td>
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<tr>
<td>4.</td>
<td>In H₂SO₄ 10 N</td>
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<tr>
<td>5.</td>
<td>DIGESTION (Autoclave - 1 hr in 15 lb)</td>
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<tr>
<td>6.</td>
<td>WASHING</td>
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<tr>
<td>7.</td>
<td>DRYING</td>
</tr>
<tr>
<td>8.</td>
<td>POWDERING AND SIEVING IN 100 MESH HEAT</td>
</tr>
<tr>
<td>9.</td>
<td>ACTIVATION (Muffle furnace - 4hrs at 400°C)</td>
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<tr>
<td>10.</td>
<td>ACTIVATED CLAY</td>
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**MECHANICAL CONTROL**
Use of mechanical devices or manual forces for destruction or exclusion of pests.
A. **Mechanical destruction**: Life stages are killed by manual (or) mechanical force.

**Manual Force**
1. Hand picking the caterpillars
2. Beating: Swatting housefly and mosquito
3. Sieving and winnowing: Red flour beetle (sieving) rice weevil (winnowing)
4. Shaking the plants: Passing rope across rice field to dislodge caseworm and shaking neem tree to dislodge June beetles
5. Hooking: Iron hook is used against adult rhinoceros beetle
6. Crushing: Bed bugs and lice
7. Combing: Delousing method for Head louse

**Mechanical force**
1. **Entoletter**: Centrifugal force - breaks infested kernels - kill insect stages - whole grains unaffected - storage pests.
2. Hopper dozer: Kill nymphs of locusts by hording into trenches and filled with soil.
3. Tillage implements: Soil borne insects, red hairy caterpillar.
4. Mechanical traps: Rat traps of various shapes like box trap, back break trap, wonder trap, Tanjore bow trap.

B. **Mechanical exclusion**
Mechanical barriers prevent access of pests to hosts.
1. Wrapping the fruits: Covering with polythene bag against pomegranate fruit borer.
2. Banding: Banding with grease or polythene sheets - Mango mealybug.
4. Trenching: Trapping marching larvae of red hairy caterpillar.
5. Sand barrier: Protecting stored grains with a layer of sand on the top.
7. Tin barrier: Coconut trees protected with tin band to prevent rat damage.
8. Electric fencing: Low voltage electric fences against rats.

**Advantage of mechanical control**                      **Disadvantages**
1. Home labour utilization                           1. Limited application
2. Low equipment cost                                 2. Rarely highly effective
3. Ecologically safe                                  3. Labour intensive
4. High technical skill not required in adopting.

**Appliances in controlling the pests**
1. Light traps: Most adult insects are attracted towards light in night. This principle is used to attract the insect and trapped in a mechanical device.

   a) Incandescent light trap: They produce radiation by heating a tungsten filament. The spectrum of lamp include a small amount of ultraviolet, considerable visible especially rich in yellow and red. (eg.) Simple incandescent light trap (Fig. 2), portable incandescent electric (Fig.3). Place a pan of kerosenated water below the light source.

   b) Mercury vapour lamp light trap: They produce primarily ultraviolet, blue and green radiation with little red. (eg.) Robinson trap (Fig.4). This trap is the basic model designed by Robinson in 1952. This is currently used towards a wide range of Noctuids and other nocturnal flying insects. A mercury lamp (125 W) is fixed at the top of a funnel shaped (or) trapezoid galvanized iron cone terminating in a collection jar containing dichlorvos soaked in cotton as insecticide to kill the insect.

   c) Black light trap: Black light (Fig.5) is popular name for ultraviolet radiant energy with the range of wavelengths from 320-380 nm. Some commercial type like Pest-O-Flash, Keet-O-Flash are available in market. Flying insects are usually attracted and when they come in contact with electric grids, they become electrocuted and killed.

2. Pheromone trap: Synthetic sex pheromones are placed in traps to attract males. The rubberised septa, containing the pheromone lure are kept in traps designed specially for this purpose and used in insect monitoring / mass trapping programmes. Sticky trap (Fig.6), water pan trap (Fig.7) and funnel type (Fig.8) models are available for use in pheromone based insect control programmes.

3. Yellow sticky trap: Cotton whitefly, aphids, thrips prefer yellow colour. Yellow colour is painted on tin boxes and sticky material like castor oil / vaseline is smeared on the surface (Fig.9). These insects are attracted to yellow colour and trapped on the sticky material.

4. Bait trap: Attractants placed in traps are used to attract the insect and kill them. (eg.) Fishmeal trap: This trap is used against sorghum shootfly. Moistened fish meal is kept in polythene bag or plastic container inside the tin along with cotton soaked with insecticide (DDVP) to kill the attracted flies (Fig.10&11).

5. Pitfall trap helps to trap insects moving about on the soil surface, such as ground beetles, collembola, spiders. These can be made by sinking glass jars
(or) metal cans into the soil. It consists of a plastic funnel, opening into a plastic beaker containing kerosene supported inside a plastic jar (Fig. 12).

6. Probe trap: Probe trap is used by keeping them under grain surface to trap stored product insect (Fig. 13).

7. Emergence trap: The adults of many insects which pupate in the soil can be trapped by using suitable covers over the ground. A wooden frame covered with wire mesh covering and shaped like a house roof is placed on soil surface. Emerging insects are collected in a plastic beaker fixed at the top of the frame (Fig. 14).

8. Indicator device for pulse beetle detection: A new cup shaped indicator device has been recently designed to predict timely occurrence of pulse beetle *Callosobruchus spp*. This will help the farmers to know the correct time of emergence of pulse beetle. This will help them in timely sun drying which can bill all the eggs.
PART- A
Match the following (any eight)  

A1. Drones - Pollination by honeybees  
A2. Sun drying of foodgrains - Transmits bubonic plague  
A3. Sudden outbreak of pest - Inactivity of insects in winter  
A4. Gause's principle - Emerge from unfertilized eggs  
A5. Myiasis - Communication in bees  
A6. Newspaper method - Pest epidemic  
A7. Mellitophily - Competitive exclusion  
A8. Rat flea - Infestation of tissues by maggots  
A9. Karl von Frisch - Kills stored product insects  
A10. Hibernation - Uniting bee colonies

PART - B
Answer any six  

B1. Wagtail dance  
B2. Supercedure  
B3. Management of mosquitoes  
B4. Key pest and potential pest  
B5. ETL and EIL  
B6. Roving survey and fixed plot survey  
B7. Delousing cattle and birds  
B8. Ripening of honey

PART - C
Answer any five

C1. Draw a flow chart to show economic classification of insects  
C2. List 5 major differences between rock bee (Apis dorsata) and Indian bee (Apis cerana indica)  
C3. Discuss the ways to reduce pesticidal poisoning to bees.  
C4. Write in brief the causes for pest outbreak  
C5. Discuss pollination in fig by fig wasp  
C6. Define IPM. Give a diagrammatic representation of various components of IPM  
C7. Define cultural method of pest control. Mention any eight farm level cultural practices with examples

WISH YOU ALL THE BEST