Lecture 14: TRADITIONAL METHODS OF PEST CONTROL

CULTURAL CONTROL

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

I. Farm level pratices

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

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^{o}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^{o}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 CO_2 concentration in controlled atmosphere of stored grains to cause asphyxiation in stored product pests.

E. Use of irradiation

Gamma irradiation from Co^{60} 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 :

Kaolinite clay
↓
POWDERING
↓
ACID ACTIVATION
In H_2SO_4 10 N
↓
DIGESTION (Autoclave - 1 hr in 15 lb)
↓
WASHING
↓
DRYING
↓
POWDERING AND SIEVING IN 100 MESH HEAT
↓
ACTIVATION (Muffle furnace - 4hrs at 400^oC)
↓
ACTIVATED CLAY

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
8. Brushing : Woolen fabrics for clothes moth, carper beetle.

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. Mechnical 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 pomegrante fruit borer.
2. Banding : Banding with grease or polythene sheets - Mango mealybug.
3. Netting : Mosquitoes, vector control in green house.
4. Trenching : Trapping marching larvae of red hairy catepiller.
5. Sand barrier : Protecting stored grains with a layer of sand on the top.
6. Water barrier : Ant pans for ant control.
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

1. Home labour utilization
2. Low equipment cost
3. Ecologically safe
4. High technical skill not required in adopting.

Disadvantages

1. Limited application
2. Rarely highly effective
3. Labour intensive

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 elctrocuted 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.

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MID-SEMESTER EXAMINATION – MODEL QUESTION PAPER

AEN 201. Principles of Applied Entomology (2+1)

Date : 14-6-2002
Time : 1hr.
Marks : 20

PART- A

Match the following (any eight) 8 x 0.5 = 4

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 6 x 1 = 6

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

PART - C

Answer any five 5 x 2 = 10

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