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Physical Methods of Insect Pest Management

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Physical Methods

Modification of physical factors in the environment to minimize or prevent pest problems is called physical control. Use of physical forces like temperature, moisture, air, light etc. for managing the insect pests population.

Manipulation of temperature

- Application of dry heat including exposure to sun rays during hot summer months of April-June helps in killing a number of pests in seeds and storage e.g., Rice weevil (*Sitophilus oryzae*)
- Superheating of empty go downs to a temperature above 50^{0}C for 10-12 hrs kills the hibernating stored grain pests.
- Double dip method: Immersion of mango fruits in water at 40^{0}C for 20 minutes, followed by 10 minutes at 46^{0}C to get 100 per cent mortality of Mango fruit fly (*Bactrocera dorsalis*) eggs.

Flame throwers against locusts: Flame thrower is a compressed air sprayer with kerosene oil for producing flames. There is a lance, which is fitted with a burner. When the burner is heated, the kerosene oil is released and it turns into flames. They can be burnt with fire torches (flame throwers) at night or early morning when they are sluggish.

Burning torch against hairy caterpillars: Bonfires at night between 7-11 pm within 48 hours after monsoon rains to attract and kill emerging moths of hairy caterpillars.

Cold storage of fruits and vegetables to kill fruit flies: temperature of 10^{0}C for several days kills the fruit fly maggots.

Vapour Heat Treatment (VHT): Heated air is saturated with water (>RH 90%) for specified period of 6 to 8 hours for raising pulp temperature to 43-44.5°C in case of mango against fruit flies.

Manipulation of moisture

- Alternate drying and wetting rice fields against Brown Plant Hopper. Removal of water from field reduces the moisture content in the field that reduces the multiplication of pest.

- Drying of seeds (below 10% moisture level) : insects are highly sensitive to reduction of moisture and it affects insect development.
- Flooding of the field with water causes the floating of larvae on the surface of water due to asphyxia. The larvae can be collected and destroyed. This method is used for the control of cutworms.

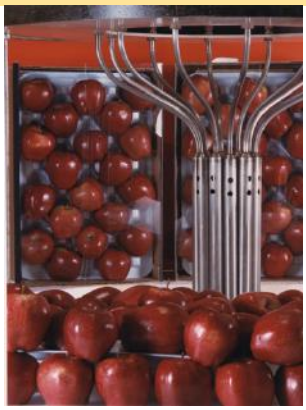

Sun Drying


Flooding of field


Light trap


Flame thrower


VHT


Irradiation


Cold storage

Some examples of Physical control

Manipulation of air

Oxygen stress and carbon dioxide concentration: In air tight containers small volume of air is enclosed, the available oxygen is quickly utilized by insects and raise concentration of carbon dioxide. High CO_2 concentration in controlled atmosphere of stored grains to causes asphyxiation in stored product pests.

Use of irradiation

Male insects can be made sterile by exposing them to gamma radiation of CO^{60}. When sterile males are released in normal population they compete with normal males in copulation and to that extent reductive capacity of the population are reduced. By sterilizing the pupae of screwworm, livestock pest (*Cochliomyia hominivorax*) with radiations, sterile males were obtained. They were released @ 400/sq mile for 7 weeks. By this method total eradication was achieved in South East parts of America and in the Curacao islands in case of screwworm.

Use of visible radiation

Light traps are arranged for attracting the insects, which are trapped by keeping water or oil in a container or a killing bottle below the light trap. Light traps are useful for monitoring the population of important insect pests in an area e.g: Most of the moths and beetles.

Use of Abrasive dusts

Diatomaceous earth is composed of finely ground skeletons of fossil diatoms. Sharp edges of the ground diatoms scratch the waxy or oily outer layer of soft-bodied insects, which die eventually from dehydration. It may also be considered a mechanical barrier or repellent because some insects will not crawl on or feed upon plant foliage sprinkled with it.

Drie-die, consist of highly porous, finely divided silica gel which when applied abrades the insect cuticle thus encouraging loss of moisture resulting in death. It is mainly used against stored grain pests.

Kaolinic clay after successive activation with acid (H_2SO4 10 N) and heat (4hrs at 400^0C) can be mixed with stored grain. The clay minerals absorb the lipoid layer of the insect cuticle by which the insects lose their body moisture and die due to desiccation.

Use of greasing material

Treating the stored grains particularly pulses with vegetable oils to prevent the oviposition by rapid immobilisation on grain and the egg hatching due to anoxia or interference in normal respiration resulting in suffocation e.g., bruchids (*Callosobruchus maculatus*).

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