MECHANICAL METHODS FOR CONTROLLING INSECT PESTS OF VARIOUS CROPS

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Hand Picking

Handpicking and destruction of large sized, conspicuous, immature or mature stages of insects is the most ancient method. It can prove fairly effective under certain conditions. This is still being used for picking out lice from human hair (at home).

In the field, insects can be handpicked if they are:

a) easily accessible to the picker,

b) large and conspicuous, and

C) present in large numbers.

Collection and destruction of egg masses of top borer of first and second brood during March and May in ratoon (sprouted from roots) and autumn-planted sugarcane crops, reduces top borer damage in endemic pockets. Destruction of infested cane stocks harbouring larvae of borers is useful for reducing the incidence of these borers. Handpicking is also generally useful for the management of hairy caterpillars, leaf rollers, tobacco caterpillar, cabbage butterfly, mustard sawfly, *Epilachnn* beetle, white grubs etc.

Collection and destruction of fallen infested fruits is effective against fruit flies and fruit borers. Manual removal of pink boll worm attacked flowers, withered and drooped terminals infested by spotted boll worms, shed floral bodies attacked by bollworms, leaves with egg masses or younger instars of tobacco caterpillars can reduce the incidence of these pests in cotton crop.

Exclusion by Screens and Barriers

a) **Mechanical exclusion:** Mechanical exclusion consists of the use of devices by which insects are physically prevented from reaching crops and agricultural produce. The various methods include:

b) The application of a fluffy cotton band 6" wide, or a band of a sticky material or a band of slippery sheets like alkathene around the tree trunk of a mango tree to prevent the upward movement of the mango mealy bug.

c) **Screening** windows, doors and ventilators of the house to keep away houseflies and mosquitoes, bugs etc. In the morning and at dusk when mosquitoes gather on the screen they can be squashed with a piece of cloth. Screening placed over cavities and windows serves to exclude termites.

d) **Packaging** is a barrier to prevent insect infestation. Polymer films, and laminations can protect packages from insect infestation, whereas polyester, polyurethane resist insect penetration. Wrapping individual fruits of pomegranate and citrus with butter paper envelope to save them from attack of the anaar butterfly and fruit-sucking moths respectively. fruits wrapped in paper bags or cloth or straw remain protected to the extent of nearly 95 per cent against fruit flies (Fig. 10.2). Maize cobs can be protected from the attack of crows if the nearest leaf is wrapped around the exposed portion of the cob.

e) **Digging trenches:** Digging of 30 to 60 cm deep trenches or erecting 30 cm high tin sheet barriers around field is useful for protecting them from moving bands of locusts and hairy caterpillars.

f) Use of **ant pans** to prevent ants from ascending.

g) **Lighting:** Using red light in the monsoons to keep away most of insects, and to keep the field well lit with white light at night to protect it against certain insects. Light reflection by aluminium foil is effective against aphids. Similarly, light reflected by plastic ribbon bands or plastic flags hung in the ripening rice fields will protect the crop from bird attack.

h) **Scaring birds** by creating noise with explosives; an automatic device is available in which an explosive gas catches fire intermittently and a loud noise is produced. Model of predators and raptors (e.g. owls, snakes) can be placed in areas of high visibility to discourage vertebrate pests or farmers themselves can scare birds ways from crop.

i) **Row covers** used in broccoli and cabbage production reduces damage by its pests. Floating row cover (FRC) along with transparent polyethylene mulch (TPM) are found to be effective against whiteflies and aphids.

j) **Trenches:** Plastic lined trenches were found to restrict the movement of beetles in potato fields.

k) **Particle barriers:** Materials such as sand, granite, glass splinters can act as termite barriers.

l) **Inert dusts** are used to protect the grain from stored grain insects. These dusts are **non-silica** dusts, sand or **silica aero gels.** Though these dusts act slowly, however their mammalian toxicity is low and develop negligible resistance.

Trapping and Suction Devices

Several types of mechanical devices are used for collecting insect pests. Insects are attracted by suitable baits into cages, from which their exit is difficult. Traps have been in use since long as effective control measure for insects. In the past, traps were the sole method of controlling pests. Other than insect control, traps also provide valuable information for:

- estimating pest intensity crop loss assessment.
- monitoring initial infestation.
- monitoring the periodicity of pest activities.

Various types of traps have been devised for collecting and killing different types of insects:

i) **The cricket trap: A** deep cylindrical vessel containing beer as a bait and having wooden splinters to aid crickets to reach the bottom.

ii) **House-fly trap:** A box , containing a piece of stale cake, with a side opening for the insects to get in only to be trapped in a wire gauze cage on the top.

iii) **Light traps:** Light traps for attracting and mass killing of several species of moths and beetles were used as a control measure before the advent of synthetic organic insecticides. The traps could still be useful for monitoring the population of important pests in an area. Trapping of adults through light traps has proved encouraging in controlling top borer, root borer and white grub damage in sugarcane, red hairy caterpillar and ber beetle. A typical light trap uses an ultraviolet fluorescent tube above a collecting jar containing a killing agent UV light has the wavelength from 320-380 nm. Light trap efficiency is improved by placing it irkdark areas.

v) **Air suction traps:** These traps are fixed in godowns against stored grain pests. Suction light traps are very effective for those insects which form a group or some supporting surface like windows e.g. Cigarette beetles which congregate together during sunsel or cloudy days can be trapped by this method.

Electrocuting trap: Live metal screens on which insects are electrocuted. These traps have been efficiently used to reduce housefly populations as you must have seen their placement in restaurants.

vi) **Plant materials as traps:** Compacted plant materials such as sprouts or milkweed placed in fields are used to control cut worms.

vii) **Fermentation traps:** Pheromone baits used in traps are being used for reducing lepidopteran (moths and butterfly) pests. Moths are naturally attracted to molasses, fermenting fruit, tree sap, honeydew and flower nectar.

viii) Coloured traps: Different insects respond to different colours. The selection of the colours depend upon the position of traps, physiological stage of insect and quality of the incident wavelengths hitting the traps.

ix) **Trap versus vertebrates:** Trapping has been used to control vertebrates pests for thousands of years. There are two main types of traps for vertebrates. One type kills the animals, such as the Maccabee trap for killing gophers. The trap is placed in the burrow and catches the gopher (ground squirrel) as it crawls through the trap. One problem with kill traps is that they do not always kill the animal the other type is live trap, because they catch the animal without killing it. The household mouse trap is familiar example of this type.

x) **Banding of fruit trees:** This is effective against caterpillars, ants and mealy bugs which crawl up the trunk from the soil to the shoots. The banding material like grease smeared around trunk trees arrests the crawling insects below the banded part where either they die of starvation or by getting entangled with the sticky banding material.

Use of Hand-nets and Bag-nets

The collection of adults with hand nets is recommended for *Pyrilla* (pest of sugarcane),when these insects are migrating in April- May from maize to sugarcane. The field bag is a strong cloth bag, 2 meters long with its mouth measuring lx 1.5 meters supported with bamboo sticks and two strings on the upper side. It is scraped on the surface of the ground by two men and is recommended against surface grasshoppers, rice grasshoppers, crickets etc. Even a one-man bag can be devised by reducing the size of its mouth.

Clipping, Pruning and Crushing

Pruning and destruction of infested shoots and floral parts is effective in checking the multiplication of scales, mealy bugs and gall midges attacking fruit trees like grapes, citrus, ber, fig, custard apple etc. A useful approach for the management of mustard aphid infesting *Brassicu* (mustard) crop involves clipping and destruction of aphid-infested twigs.

Beating and Hooking

Killing houseflies with fly wrappers and locusts with brooms or thorny bushes is effective. On coconut palms, the borer can be picked out of the holes with the help of crooked hooks made of iron.

Shaking or Jarring

Shaking small trees and shrubs, particularly early in the morning in the cold season when the insects are benumbed, and collecting them in open tubs containing kerosinized water or simply burying them in pits is effective against locust and the defoliating beetles.

Hopperdozer

Hopperdozer is a physical technique used to control grasshoppers by catching them. Rased on the leaping behaviour of grasshoppers, hopperdozer is designed. Hopperdozer has been in use since early nineties.

Sieving and Winnowing

These are commonly employed against insect pests of stored grains. **A** good number are removed with these operations, particularly the grubs of *Tribolium* and *trogoderma*, which infest wheat.

Flaming and Burning

Flaming and burning are methods which use heat to kill insects and to eliminate breeding sites. Flaming, with kerosene as the fuel, started in US to control chinch bugs and the green Dug. The burning of locust adults and hoppers with the help of flamethrowers and flame torches, although costly, has a good psychological effect in mobilizing the public for locust control operations. In Suriname agricultural land was developed from rain forests by burning and flaming.