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## Mechanical Methods of Pest Control

By means of manual devices or labour.

### a) Hand picking and collection with hand nets and killing insects:

Egg masses of paddy stem borer (*Scirpophaga incertulas*) and groundnut hairy caterpillar

Early stages of *Spodoptera litura* and hairy caterpillars are easily located by their typical damage symptoms

The moringa caterpillars, which collect at tree trunks in the mornings can be burnt.

Most of the insects can be collected with hand nets and destroyed.

Collection and destruction of fallen fruits is effective against fruit flies and fruit borers.

Manual collection and destruction of pink bollworm attacked rosette flowers, withered and drooped terminals infested by

*E. vitella* can reduce the incidence of these pests in cotton.



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## **b) Provision of preventive barriers:**

Trenches of 30 -60 cm wide and 60 cm deep or erecting 30 cm height tin sheets around the fields against hairy caterpillars.

Bagging / wrapping of pomegranate and mango fruits in paper bags avoids the infestation of pomegranate butterfly *Virachola isocrates* and mango fruit fly *Bactrocera dorsalis*

Tin bands over coconut palms to prevent rats.

## **c) Other mechanical methods:**

Extraction of adult Rhinoceros beetle (*Oryctes rhinoceros*) from the coconut crown using an arrow headed rod/hook.

Rat proof godowns

Alkathene band around the tree trunks of mango against mealybugs & red ants

Sticky bands around tree trunks against red tree ant (*Oecophylla samaragdina*)

Shaking tree during evenings to dislodge rott grub adults and to dump in fire.

Shaking of redgram plants to collect and destroy *Helicoverpa armigera*

Sieving and winnowing against stored grain pests

Using mosquito nets fly proof cages etc.



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## Physical Methods of Pest Control

**Drie-die** highly porous, finely divided silica gel results in loss of moisture from insect cuticle in stored product pests.

**Kaolinic clay** after activation with acid and heat absorbs lipoid layer of the insect cuticle there by insects lose their body moisture and die due to desiccation.

Artificial heating and cooling of stored products will prevent insect damage. Usually high temperatures are more effective than low temperatures.

Stored products can be exposed to  $55^{\circ}\text{C}$  for 3 hours to avoid stored product pests

Steam sterilization of soil kills soil insects

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



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## 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 conc of carbon dioxide. High conc of carbon dioxide leads to death of stored products insects.

Male are made sterile by exposing to gamma radiation or by using chemosterilants and are released into normal population to compete with normal males for normal females.

Pupae of screwworm (*Cochliomyia hominivorax*) were sterilized and sterile males were released @ 400/sq mile for 7 weeks to result total eradication of the pest in South East parts of America and in the Curacao islands.

**Light traps** are useful for monitoring the population of insect pests

Flame thrower is a compressed air sprayer with kerosene oil for producing flames through a lance, which is fitted with a burner. When the burner is heated, the kerosene oil is released and it turns into flames. Used against locusts, caterpillar groups *etc.*,



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## Legislative / Legal / Regulatory Methods of Pest Control

Early days no restrictions on the transport of plants and animals from one country to another since the danger involved in it is not realized,

Foreign pests inflict greater damage than the indigenous ones.

Some exotic pests introduced into our country.

Potato tuber moth - *Pthorimea operculella*

Cotton cushiony scale - *Icerya purchasi*

Woolly aphis - *Eriosoma lanigerum*

San jose scale - *Quadraspidiotus perniciosus*

Golden cyst nematode - *Globodera rostochinesis*

Giant African snail - *Achatina fulica*

Predatory snail - *Eugladina rosea*



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Serpentine leaf miner - *Liriomyza trifolii*

Spiralling whitefly - *Alerodicus dispersus*

Coconut mite - *Aceria guerreoronis*

## Quarantine

Derived from Latin word “Quarantum means” - ‘forty (40)’.

It is defined as the legal enforcement of the measures aimed to prevent pests from spreading or to prevent them to multiply further in case they have already introduction of any insect, fungus or other pests into our country.

1917 - Later supplemented with a more comprehensive act.



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## The legislative measures can be grouped into

International quarantine - Legislation to prevent the introduction of new pests and weeds *etc* from foreign countries

Domestic quarantine - Legislation to prevent the spread of already established pests, diseases and weeds from one part of the country to another

Legislation to enforce upon the farmers regarding the application of effective control measures to prevent damage by already established pests.

Legislation to prevent the adulteration and misbranding of insecticides and determine their permissible residue tolerance levels in food stuffs and

Legislation to regulate the activities of men engaged in pest control operations and application of hazardous insecticides



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## Legislation to Prevent the Introduction of Foreign Pests

To prevent the entry of foreign the imported plant material has to be thoroughly examined at the ports of entry.

The Directorate of Plant Protection Quarantine and Storage (DPPQS) was established in **Faridabad in 1946**. Prior to which customs authorities did the enforcement of quarantine laws.

From 1949, DPPQS has its network of 35 Plant Quarantine Stations

Government of India also approved

NBPGR, New Delhi for all germplasm including transgenics

Forest Research Institute (FRI) Dehadradun for forest plants

Botanical Survey of India (BSI), Kolkatta for ornamental plants

The consignment should accompany 'Phytosanitary certificate' issued by the Officers of agriculture department of the exporting country



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Import of plants by post or air is not permitted, except by experts for scientific purpose.

Import of potatoes with wart disease or golden cyst nematode is prohibited in to our country.

## **Legislation to Prevent the Spread of Already Established Pests**

**The Destructive Insect and Pests Act, 1914**, has empowered the states to prevent the spread of dangerous insects within their jurisdiction.

The Madras Government was the first state to enact 'Madras Agricultural Pests and Diseases act in 1919'

Cottony cushiony scale when localized in Nilgiris and Kodaikanal none of the alternate host plants were permitted to get transported from these areas.

Quarantine stations were opened at Mettupalayam and Gudalur of Nilgiris and at Shenbegmur station of Kodaikanal in 1943 and were closed subsequently.



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## Legislation to Enforce the Application of Effective Control Measures to Prevent the Damage by Established Pests

Under the state pests act, the farmers were asked to remove and destroy coconut leaf lets infested with black headed caterpillar *Opisina arenosella* around Mangalore in 1923 and in 1927 in Krishna and Guntur districts. Later it was withdrawn as the pest was successfully controlled by biological control agents.



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## Legislation to Prevent the Adulteration and Misbranding of the Insecticides

To avoid malpractices and supply of substandard chemicals, the pesticide products are to be standardized through the Indian Standards Institute. Such products carry **ISI mark** and are expected to confirm the level of *a.i* (Active ingredient)

The Insecticide Act, **1968** has been enforced on 2<sup>nd</sup> September, 1968 by the Government of India to regulate the import, manufacture, sale, transport and distribution and use of insecticides.

Central Insecticide Board (CIB) to advise the state and central governments as per this act.

The insecticide rules of 1971 framed under the Insecticides Act 1968 had come in to force in 1971.



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## Legislation to Regulate the Activities of Men Engaged in Pest Control Operations

They have to take certain precautionary measures to avoid pesticide poisoning and undergo regular medical checkup.

**Invasive Alien Species (IAS):** It is a species outside of its native range whose introduction and or spread threatens biodiversity.