



Concepts and Principles of Pest Management



Landmarks in the history of agricultural insect pest management

ERA OF TRADITIONAL APPROACHES

Ancient :

- The Chinese - chalk and wood ash - pests in enclosed spaces.

- Ants - biological control of stored grain as well as foliage insects.

- In India - neem leaves were placed in grain bins to keep away troublesome pests.

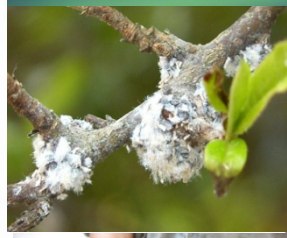
- In Middle and Near East- powder of chrysanthemum flowers as an insecticide.

- **300 AD:** First record of the use of biological control agents in citrus orchards in China.

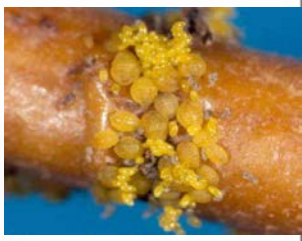
- **900 AD:** The Chinese used arsenic to control garden pests.

- **1690: The tobacco extract was used as a plant spray in parts of Europe.**
- **1762: Mynah bird from India was imported for the control of locusts in Mauritius.**
- **1782: "Underhill" variety of wheat reported resistant to Hessian fly in USA.**
- **1831: "Winter Majetin" variety of apple reported resistant to woolly apple in USA.**
- **1848: *Derris* (Rotenone) reported to be used in insect control in Asia.**
- **1858: Pyrethrum first used for insect control in the USA.**





- **1889: Biological control of cottony cushion scale on citrus in the USA by use of Vedalia beetle imported from Australia.**



- **1890: Control of grape *Phylloxera* in Europe by grafting of European grapevine scions to resistant North American root stocks.**

- **1898: The coccinellid, *Cryptolaemus montrouzieri* Mulsant from Australia was released against coffee green scale, *Coccus viridis* (Green) in India. It established but failed to control the scale.**

- **1931: The cottony cushion scale attacking wattle of commerce, *Acacia decurrens* was controlled in India by release of predatory beetle, *Rodolia cardinalis* Mulsant from California.**

Era of pesticides

- **1939: Insecticidal properties of DDT reported by Paul Muller in Switzerland.**
  First microbial insecticide- *Bacillus thuringiensis*

- **1941: Insecticidal activity of HCH- France**

- **1946: Organophosphate insecticide –parathion**

- **1948: Use of DDT and HCH on agricultural crops in India**
  "Doom" based on *Bacillus popilliae* and *B. lentimorbus* registered in USA against Japanese beetle larvae on turf.

Foundation of IPM

- **1959: concepts of integrated control involving integration of chemical and biological control introduced**
  Concept of EIL and ETL by V.M. Stern and coworkers.

Green Revolution era

- **1975: Elcar *(Heliocoverpa* NPV*)* against bollworm and tobacco budworm on cotton.**
  First Insect Growth Regulator (Methoprene) in USA.

Post-Green Revolution era

- **1987: Development of transgenic plant, tobacco for control of *Manduca sexta.***

Gene Revolution Era

- **2002:Bt cotton approved for commercialization in India.**
- **2005: First agreement to develop Bt Brinjal was signed.**
- **2006: Bt Brinjal approved for large scale field trials in India.**
- **2009: Bt brinjal for commercialization on 14 October in India.**

Series of Phases in the evolution of an IPM programme

i. **Single tactic phase:** Emphasis placed on a single pest utilizing a single tactic.

ii. **Multiple tactic phase:** Variety of tactics for manipulation pest population.

iii. **Biological monitoring phase:** monitoring of pest, natural enemies and host on timely basis.

iv. **Modeling phase:** Pictorial, flowchart and mathematical models to generate data in pest management systems.

v. **Management or optimization phase:** construction of a functional IPM system.

vi. **Systems implementation phase:** ultimate phase, optimal systems are delivery to and utilization by the farmers.

IPM……. Some definitions

- **Integrated Pest Management (IPM) is a system that, in the context of associated environment and population dynamics of the pest species, utilizes all suitable techniques and methods in as compatible a manner as possible and maintains pest populations at levels below those causing economic injury.**

-FAO (1967)

Kogan, 1988

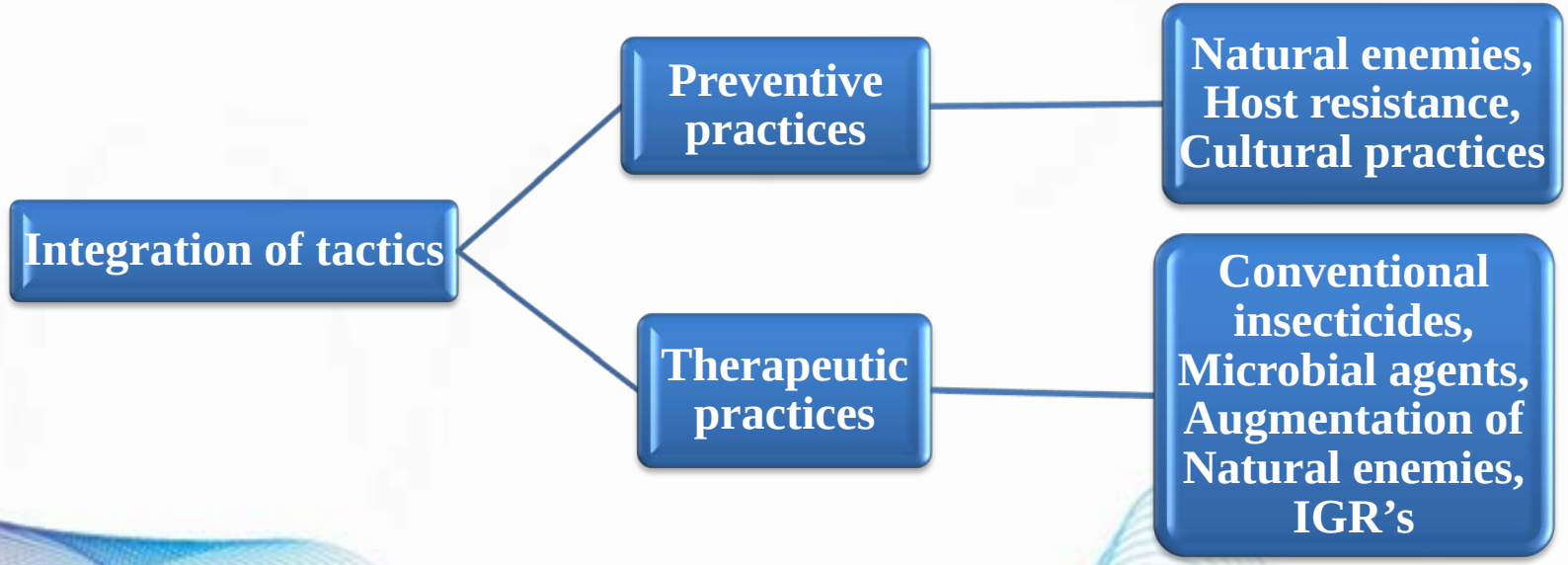
- **Integration:** the harmonious use of multiple methods to control single pest as well as the impacts of multiple pests.
- **Pest:** any organism detrimental to humans, including invertebrate and vertebrate animals, pathogens and weeds.
- **Management:** a set of decision rules based on ecological principles and economic and social considerations.

IPM is a Multidisciplinary Endeavour

Contd…,

Dhaliwal and Arora (2012):

- **Evolving approach which utilizes all the suitable management tactics and available surveillance and forecasting information.**
- **To develop a holistic management programme as part of a sustainable crop production technology.**
- **Based on an understanding of pest ecology and begins with steps to accurately diagnose the nature and source of pest problems.**
- **Relies on a range of preventive and curative measures.**



Objectives of pest management

1. To reduce pest status below economic injury level.

   Complete elimination of pest is not the objective……

2. To manage insects by not only killing them but by preventing feeding, multiplication and dispersal.

3. To use eco-friendly methods, which will maintain quality of environment (air, water, wild life and plant life)

4. To make maximum use of natural mortality factors, apply control measures only when needed.

5. To use component in sustainable crop production.