Pest Management - Holistic Pest Control?

2. Modern control tactics and the birth of IPM

IPM_2 2008

Biological Control

The action of parasites, predators, and pathogens in maintaining another organism's density at a lower average than would occur in their absence

De Bach (1964)

Biological Control

- American Innovation
  - Plums in Missouri
  - Sunny California
    - Cottony-cushion scale
- Tropical islands
- Not always a Success!
  - *Partula* snails

Biological Control

- American Innovation
  - Plum curculio in Missouri
  - First case of transporting parasitic insect from one locality to another (CV Riley, 1869)

Biological Control

- Islands in the Sun
  - Hawaii: Sugar cane weevil
  - Mauritius: Rhinoceros beetle

Cottony-cushion scale in California

- 1888-89

Biological Control

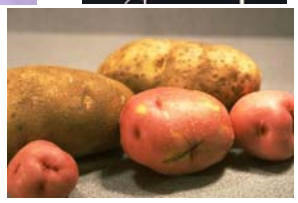
Not always a Success!

e.g. Partula snails in Polynesia

- African land snails were introduced to Tahiti as a source of food - they escaped and started eating crops.
- 1974 , in an effort to control the land snails, a smaller predatory species of snail was introduced; *Euglandina rosea*.
- This species started to feed on the native Polynesian tree snails.
- *Partula nodosa*: one of nine species once common on Tahiti; 3 now extinct in the wild

Plant breeding

- Crop improvement
  - Bigger yields, better quality
- Plant resistance
  - Pest and disease control
- What are the pay-offs?



Plant Resistance

- Grape phylloxera
- Hessian fly on wheat
- Wheat stem sawfly
- Chinch bug on sorghum
- Bugs on cotton

Blast Those Pests!

- DDT and other organochlorines
- OPs
- Carbamates
- Pyrethroids
- IGRs
- Neonicotinoids
- *Etc* ...

Blast Those Pests!

- Rachel Carson: *Silent Spring*

- Resistance
- Resurgence

The Pesticide Debate: Costs and Benefits

- *The chemical barrage, as crude a weapon as a caveman's club, has been hurled against the fabric of life*
  Rachel Carson (1962)
- *If pesticides were completely banned, crop losses would probably soar to 50% and food prices would increase 4-5 fold*
  Norman Borlaug (1972), Nobel Prize Winner for work on the Green Revolution

More recently …

- Is organic really better for health & the environment?
- Does fair trade help the majority?
- "Food miles" - misleading?

Integrated Pest Management?

Let a man profess to have discovered some new *Patent Powder Pimperlimplimp*, a single pinch of which being thrown into each corner of a field will kill every bug throughout its whole extent, and people will listen to him with attention and respect.

But tell them of any simple common-sense plan, based upon correct scientific principles, to check and keep within reasonable bounds the insect foes of the farmer, and they will laugh you to scorn.

The Practical Entomologist - Benjamin Walsh, (1866)

Organic / biodynamic farming

How is biodynamic different from organic?

- Every biodynamic farm aims to become self-sufficient in compost, manures and animal feeds.
- All external inputs are kept to a minimum.
- Compost is treated with special herb-based preparations.
- Crop quality is improved using natural manure and quartz based preparations.
- Ecological diversity is a goal of landscape management.
- An astronomical calendar is used to determine auspicious, planting, cultivating and harvesting times.

www.biodynamic.org.uk/

Integrated Pest Management (IPM) – first formal definition

Integrated Pest Control *is applied pest control which combines and integrates biological and chemical control –*

Stern *et al* (1959)

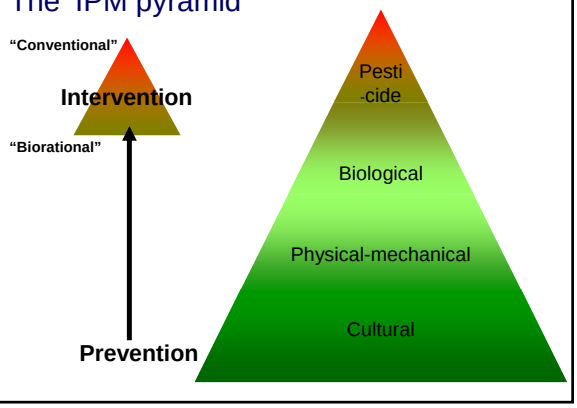
Integrated Pest Management (IPM)

Integrated Pest Management *is the intelligent selection and use of pest control measures to ensure favourable economic, ecological and sociological consequences*

IPM

- The aims of IPM are to
- Modify the population of the pest to achieve levels below the economic threshold
- Apply **all** suitable biological and technological knowledge to achieve this
- Do this in a manner compatible with economic and environmental requirements.

The 'IPM pyramid'



Basic Components of an IPM Programme

- Prevention
- Observation
- Intervention

Prevention – indirect measures

- Aim to limit or prevent initial severity of pests
  - Crop location
  - Crop rotation
  - Crop husbandry
  - Plant breeding
  - Habitat management
    - Trap cropping
    - Inter-cropping

Observation – Decision tools

- To determine when and what action to take
  - Crop monitoring
  - Decision support systems
  - Area-wide management

Intervention – direct measures

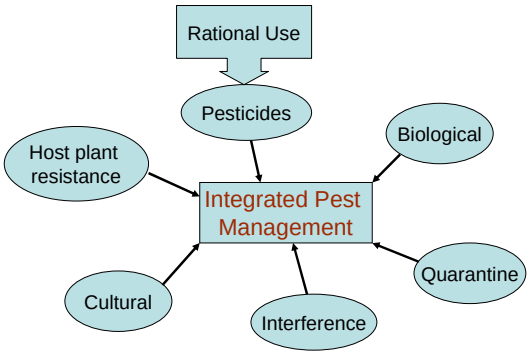
- To reduce effects of damaging pest populations to acceptable levels
  - Cultural
  - Biological
  - Interference
  - Chemical

Deciding when to intervene

Thresholds

- Action threshold
  - Pest density that warrants initiation of a control measure
- Economic damage threshold
  - Amount of damage that justifies the cost of controls
- Economic injury level
  - Lowest pest density that will cause economic damage
- Economic threshold
  - Level at which controls should be implemented to prevent increasing pest population reaching economic injury level

Summary of available methods



Integrated Crop Management (ICM), Integrated Farming Systems (IFS)

Integrated Crop Management *is a cropping strategy in which the grower seeks to conserve and enhance the environment while economically producing a safe and wholesome product. Its long term aim is to optimise the needs of consumers, society, the environment and the producer.*

Or is "Good Agricultural Practice" (GAP) a better expression?

- "Integrated Pest Management" (IPM) or alternatively "Incredibly Popular Mantra"
- "Integrated Crop Management" (ICM) or alternatively "Input Costs Marginalized"
- "Integrated Farming Systems" (IFS) or alternatively "Inadequately Funded Solution"

ICM - GAP

- Conservation headlands
- Crop islands
- Diversity
- Soil science
- IPM
- GM crops

www.dropdata.org