

# Field Techniques in IPM

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## Alternatives to Pesticides

- ✓ Pheromone Pest Management
- ✓ Attract-and-Kill Systems
- ✓ Host Plant Resistance
- ✓ Cultural control techniques

## Insecticides tactics

Conventional Versus Reduced-risk Insecticides

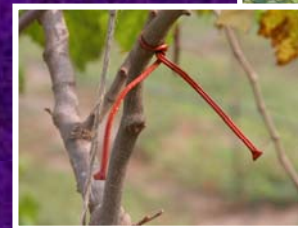
# Pheromone Pest Management

Pheromone - A chemical substance secreted by an organism that affects the behavior of other organisms of the same species.

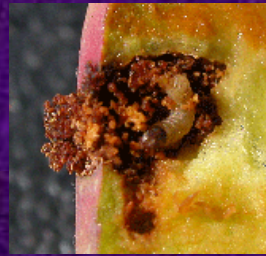
Sex pheromones - Usually produced by females to attract males for mating, but they may also be produced by males to attract females.

## Uses of pheromones in pest management

- 1) To monitor populations of insect pests
- 2) To prevent mating in orchards
- 3) In attract-and-kill
- 4) Mass trapping



# Mating Disruption



Codling moth  
*Cydia pomonella*



Penetration



Pheromone delivery system



# Mechanisms in Mating Disruption

- Sensory fatigue
  - unresponsive receptors on antennae
  - habituation in central nervous system
- False trail-following – male moths follow synthetic pheromone plume as opposed to the plume from a female moth
- ❖ **Kairomones** - chemical substances produced by one species and received by a second species.
  - The chemical substance is beneficial only to the receiver. These chemical substances include attractants, excitants, and stimulants

## Advantage

- ✓ Promote host finding, oviposition and feeding

# Attract-and-Kill Systems

A pest control device consisting mainly of an attractant and a toxicant.

LastCallGRB®

Newly applied    Versus 6 wk

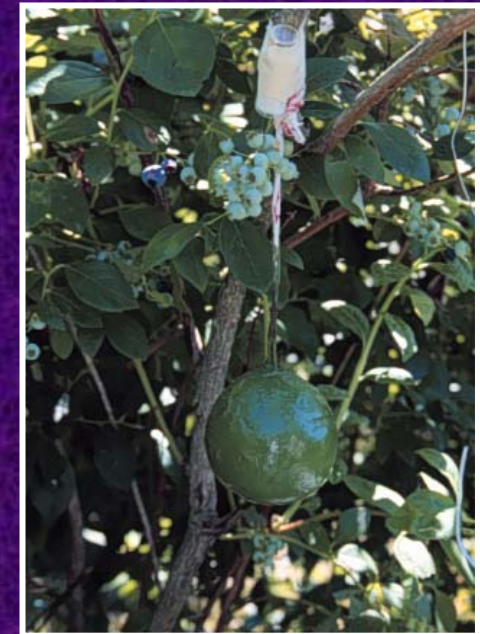


Contained 0.16% of  
the GRB pheromone  
and 6% Pyrocide

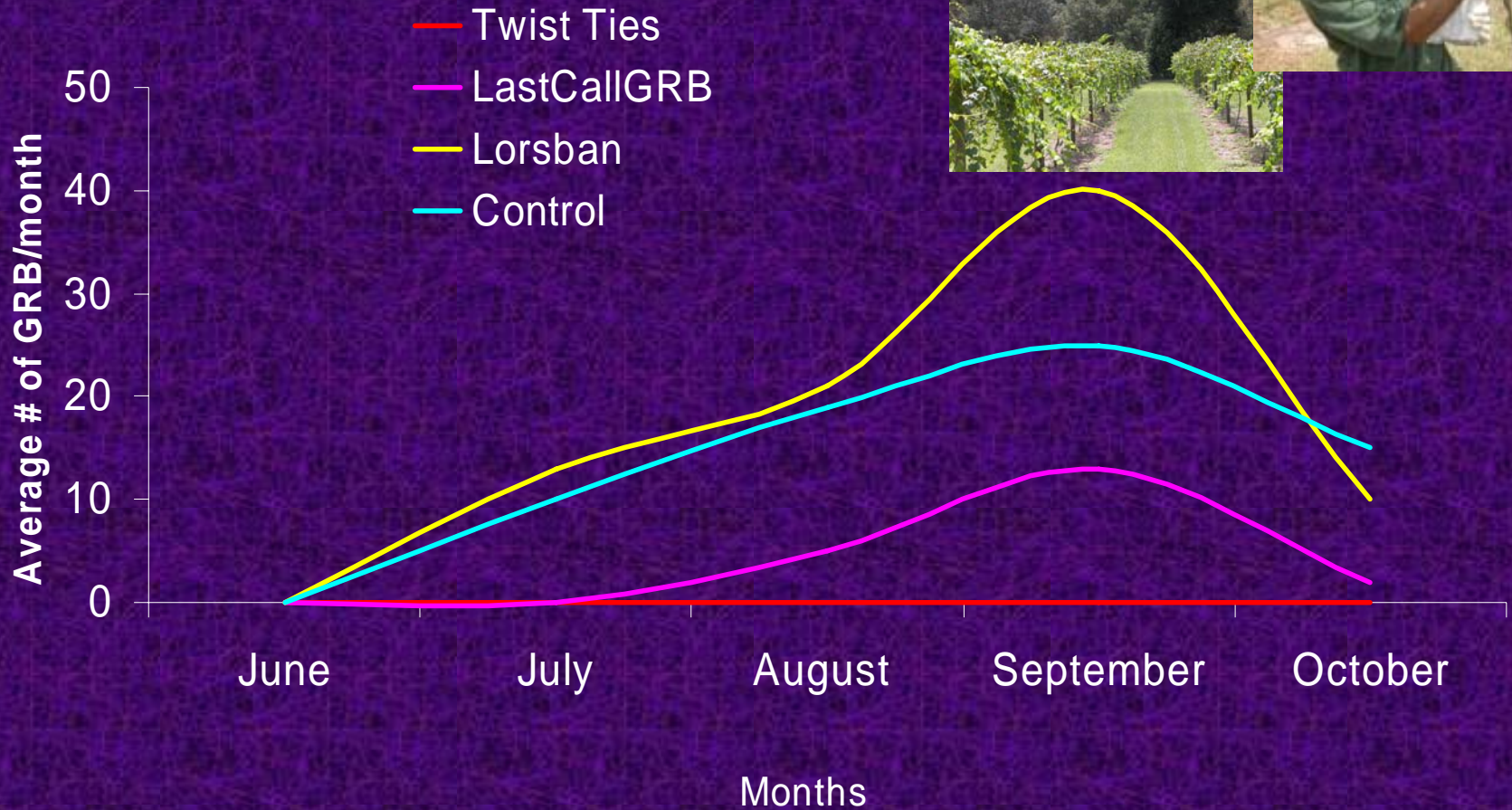


3 droplets per vine

Kairomone  
baited trap



# Captures of GRB in Florida Vineyards (2003)



# Host Plant Resistance

Resistant cultivars: insects may avoid plants for a variety of reasons:

## Genetic Control

- ❖ Non-preference (Antixenosis)
  - ➔ Allelochemic nonpreference  
*Diabrotica* spp. avoiding cultivars that lacks cucurbitacins
  - ➔ Morphological non-preference  
Corn earworm, *Helicoverpa zea* avoid ovipositing in cotton that lacks hair
- ❖ Antibiosis – Plant characteristics that impairs an insect's metabolic processes. Example pea cultivars with low amino acid levels (nutritional deficiencies) shows resistance to pea aphids
- ❖ Tolerance – The plant has the ability to give satisfactory yields in spite of fairly high injury levels

# Cultural Techniques

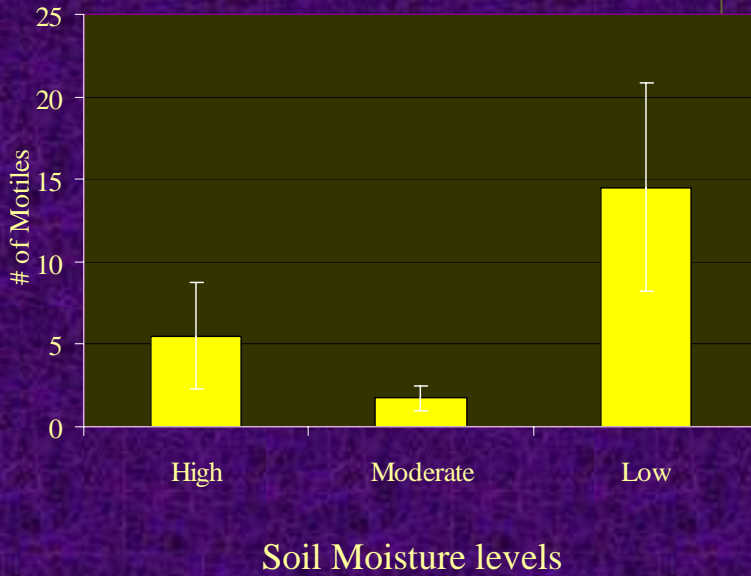
## Common cultural techniques

- ✓ The use of mulches (reflective and living mulch)
- ✓ Managing field moisture/irrigation
- ✓ Clean cultivation
- ✓ Pruning
- ✓ Adjust planting dates

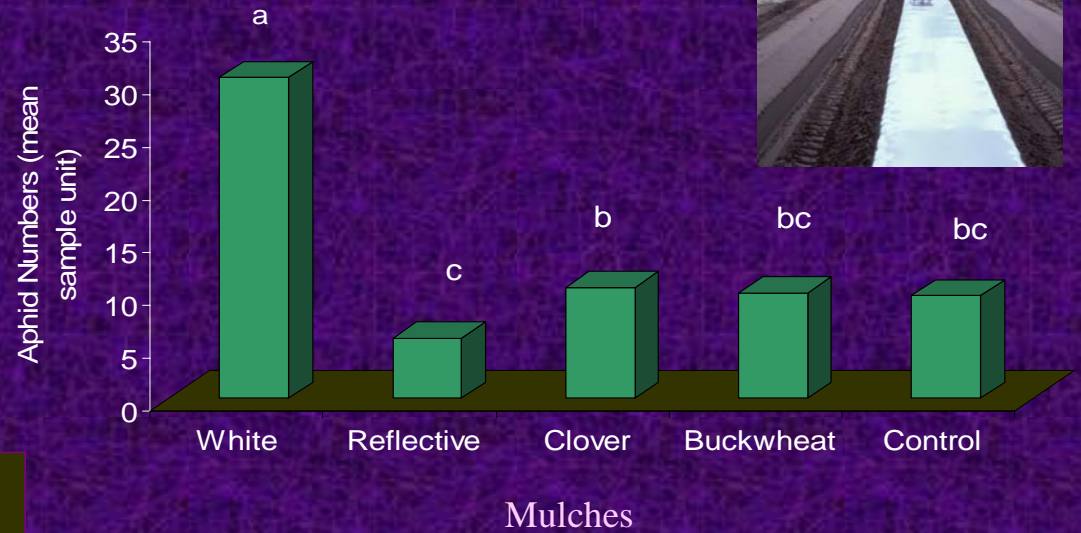




## Twospotted spidermite densities



## Aphid densities



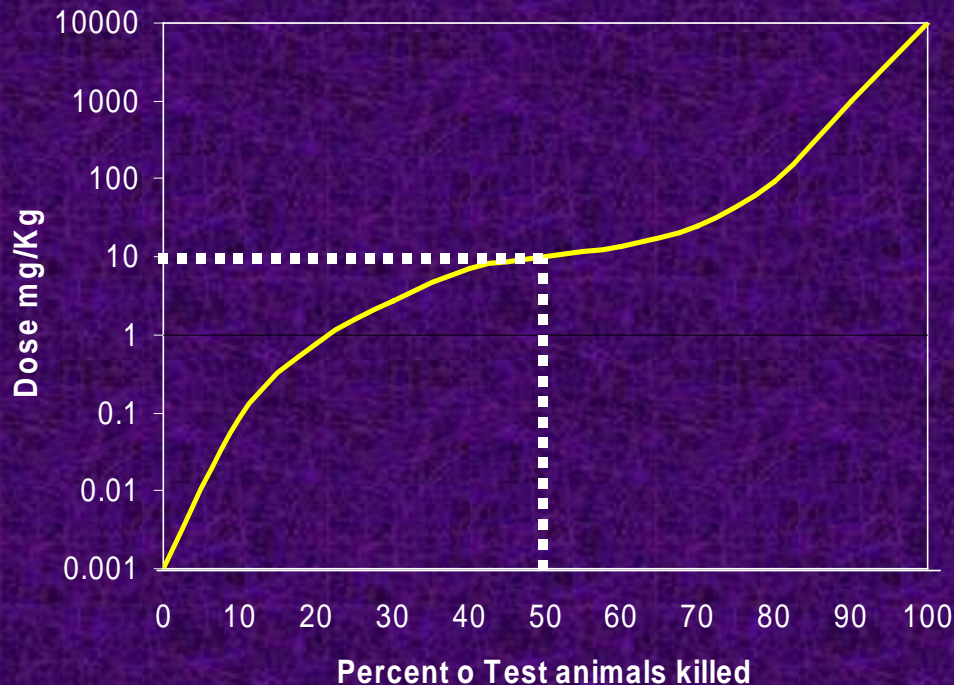
# 1996 Food Quality Protection Act (FQPA)

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**The 1996 Food Quality Protection Act (FQPA)** changed the way EPA regulates pesticides. The amended laws established safety standards that must be applied to all pesticides used on foods in the US. The new regulations included the phasing out of many conventional insecticides including the chlorinated-hydrocarbons, organophosphates and carbamates

# Pesticide Toxicity

A pesticide toxicity is measured by the lethal dose that kills 50% of the animals tested, referred to as  $LD_{50}$ . It is expressed as mg of active ingredient of pesticide per kilogram of body weight of the test animal. A pesticide with a low  $LD_{50}$  (e.g. 5 mg/kg) is very toxic.



# Conventional versus Reduced-risk Insecticides

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## Conventional Pesticides

- Broad-spectrum, killing both pest and beneficials
- Long residual activity
- Highly toxic and fast acting

## Activity on pest

- Contact
- In some cases must be ingested
- Few systemic

# Reduced-risk pesticides

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- ❖ Reduced-risk – EPA designated term referring to pesticide that meet certain criteria; 1) worker standards, 2) dietary limits and 3) environmental fate.

## Characteristics of reduced-risk pesticide

- Narrow spectrum
- Little impact on non-target organisms
- Short residual activity
- Slower acting

## Activity on pest

- Primarily ingestion
- Lethal and sub-lethal effects
- Translaminar activity

# Common reduced-risk insecticides

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**Neonicotinoids (Chloronicotinyl).** Neonicotinoids mimic acetylcholine preventing it from binding to the receptor sites (resulting in twitching and shaking).

## Formulations

*Imidacloprid*

Provado, Admire

*Thiocloprid*

Calypso

*Thiamethoxam*

Platinum

Actara

# Common reduced-risk insecticides

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## 2) **Naturalytes.** Derived from natural biological products

Spinosad a natural product of the actinomycete, *Saccharopolyspora spinosa*. Spinosad induces excitation of neurons in the central nervous system, which produces involuntary muscle contractions and tremors.

### Formulations:

SpinTor, Success (fruit and vegetables)

Precise and Conserve (ornamentals and turf)

Entrust (Organic production)

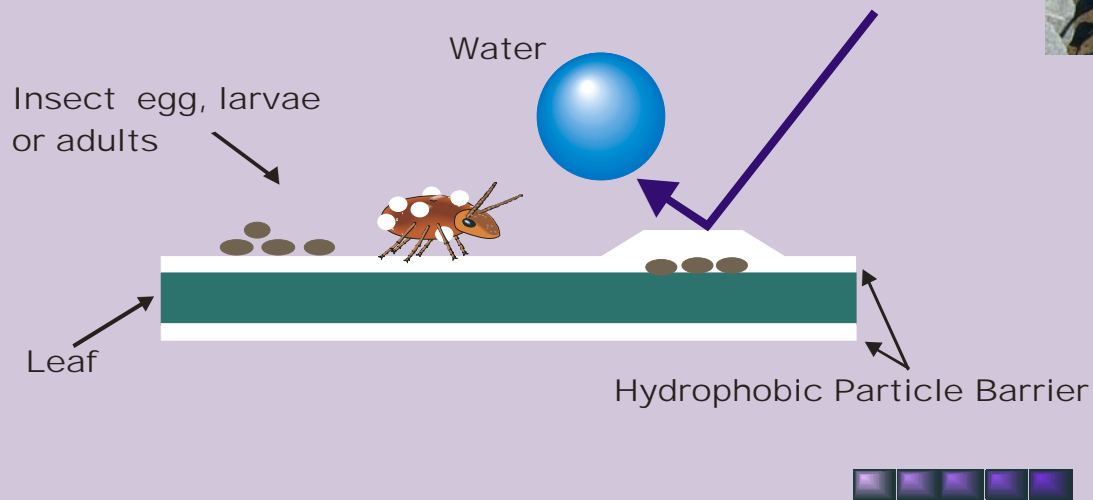
GF-120 formulated for fruitfly control

# Common reduced-risk insecticides

## 3) Particle Film Technology



### Particle Film Technology



Surround (Kaolin)

# Particle Film Technology

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- A protective barrier between the plant and pest

## Activity on pest and host

- Reduces host recognition of the pest
- Act as a oviposition barrier
- Prevents feeding in herbivores
- Inhibits normal movement of the insect

## Disadvantage

- Repeated applications are necessary in periods of high rainfall
- It can be difficult to wash off the fruit prior to processing
- There have been reports of clogged sprayers

# Common reduced-risk insecticides

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## Insect Growth Regulators

- **Molt Accelerating Compounds (MAC)** - mimics the hormone ecdysone and forces the insect into a premature molt eg. Confirm (Tebufenozide).
- **Juvenile Hormones** - the insect stays in an immature stage and never molt to the adult eg. Esteem (Pyriproxyfen) use to control codling moth in apples and pears.

# Definitions

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- **Stomach poisons** - enter the insect body through the gut and kills the insect.
- **Systemic insecticides** - are taken up and translocated within the plant or animal.
- **Contact poisons** - kills the insect upon contact. The pesticide is absorb through the body wall.
- **Fumigants** - chemicals mainly soil sterilants that become gases at temperatures above 50C