Alternatives to Pesticides

- Pheromone pest management
- Attract-and-kill systems
- Host plant resistance
- Cultural control techniques

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

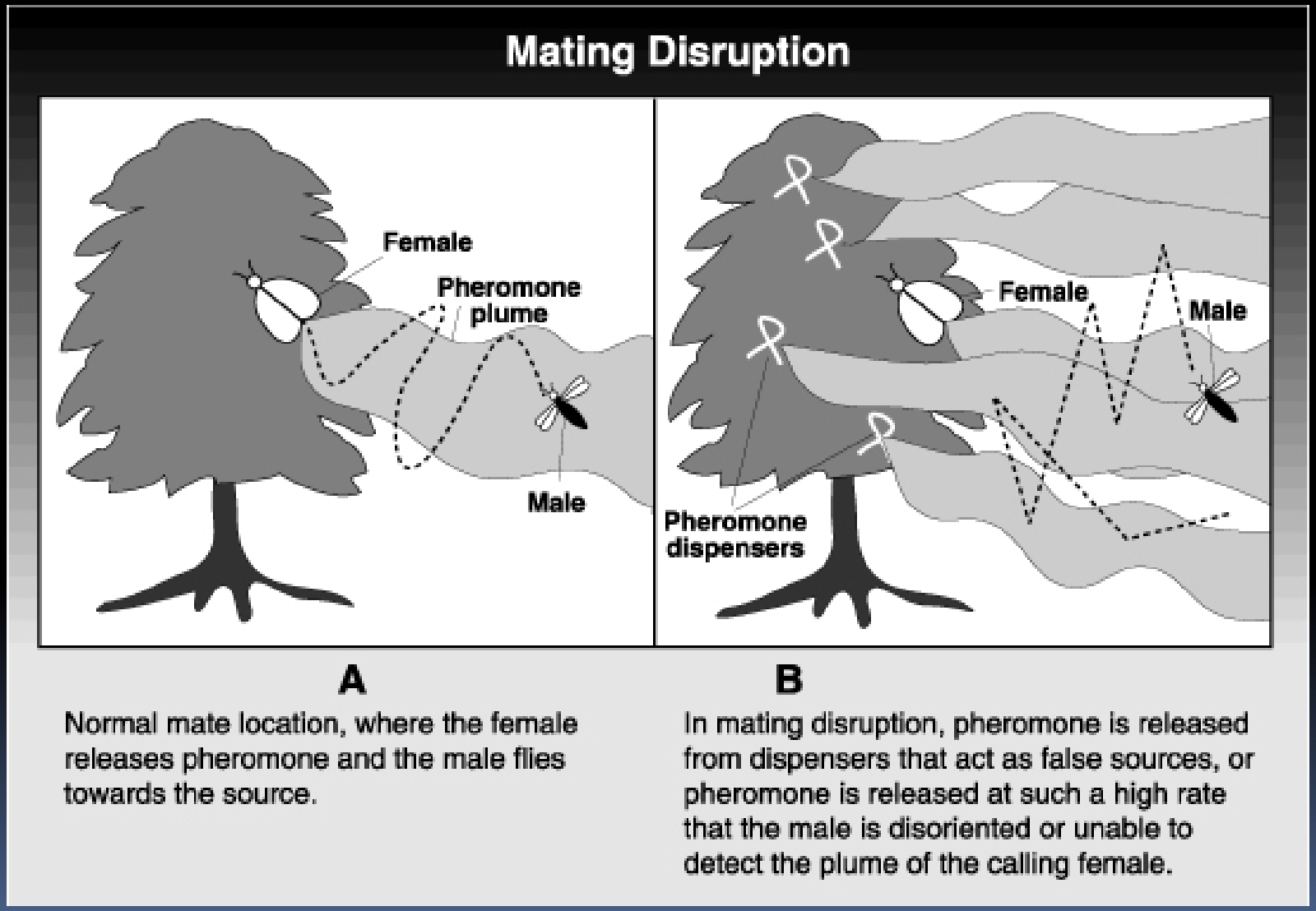
Aggregation pheromones – Is responsible for the aggregation / congregation of insects at food sites or reproductive habitats. They are very common in bark beetles

Trail-marking pheromones – These chemicals are produced by ants and termites which allow other members of the colony to follow or locate their position

Uses of pheromones in pest management

1) To monitor populations of insect pests
2) They are used in attract-kill-programs
3) To prevent mating in orchards

How does mating disruption works?

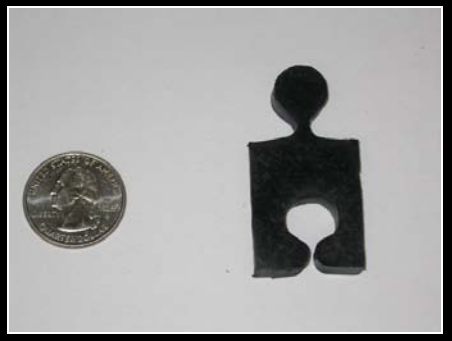


Commercially available disruption techniques

1) Hand-applied dispensers

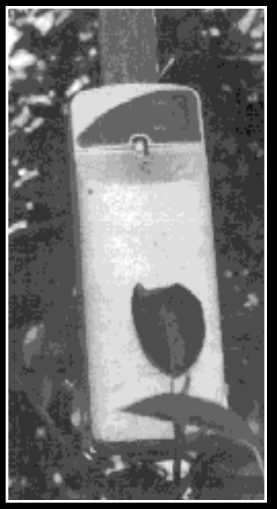
Rate: 200-500 / acre

Photo credit: ISCA Tech.



2) Aerosol emitters

Rate: 1-2 / acre



3) Sprayable microencapsulated formulations

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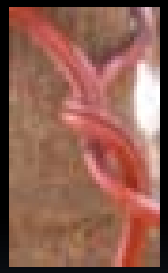
Mating disruption

Codling moth
Cydia pomonella



Penetration

Mating disruption

Advantages

- Specific
- Long Lasting
- Difficult for insects to develop resistance
- Non-toxic

Disadvantages

- Mostly effective for low to moderate pest populations
- Can be costly
- Does not kill pest (immigration)
- Not a stand alone control method

Methods to evaluate pheromone efficacy

Rubber septum release device

Baited sticky trap

- ✓ Trap-shut down
- ✓ Fruit injury counts
- ✓ Counting of pupal skins
- ✓ Dissecting females to determine whether or not they have mated

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Mechanisms in mating disruption

- Sensory fatigue → unresponsive receptors on antennae
- Sensory fatigue → 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 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

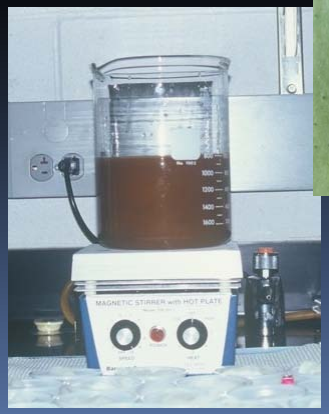
Contained 0.16% of the GRB pheromone and 6% Pyrocide

3 droplets per vine

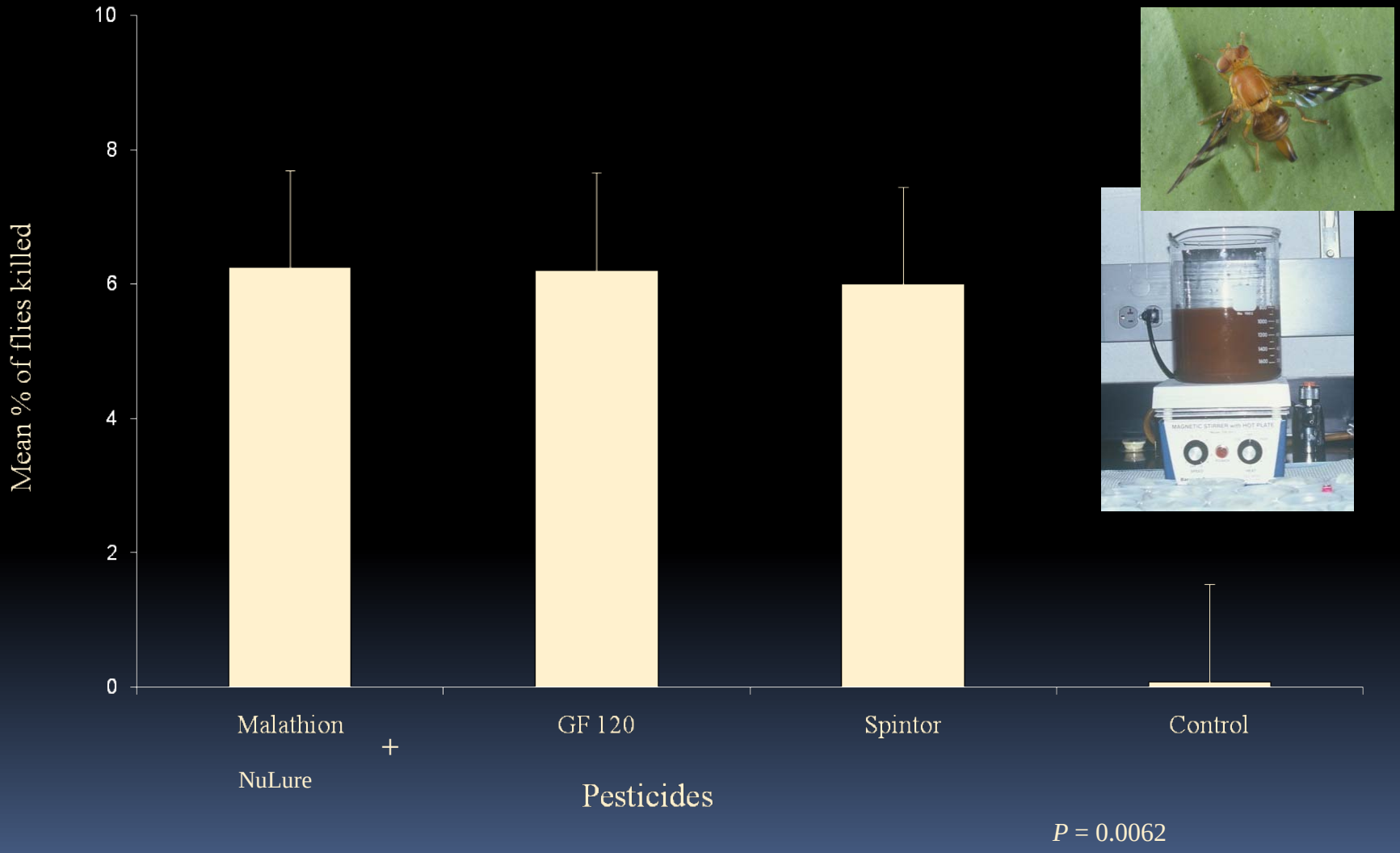
Kairomone baited trap

Experimental trial - Attract & kill

- Malathion
- GF 120
- SpinTor
- Control



Effects of conventional and reduced-risk insecticides on *A. suspensa* Laboratory Experiments



Captures of GRB in Florida Vineyards

Host plant resistance

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

Genetic Control

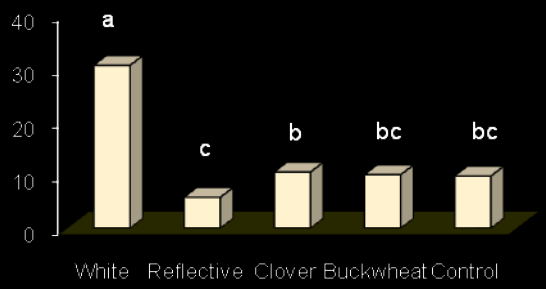
- Non-preference (Antixenosis)
  - Allelochemic nonpreference
    Diabrotica spp. avoiding cultivars that lacks cucurbitacins
  - Morphological non-preference
    Corn earworm, *Helicoverpa zea* avoid ovipositing in cotton that lacks hair

- 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

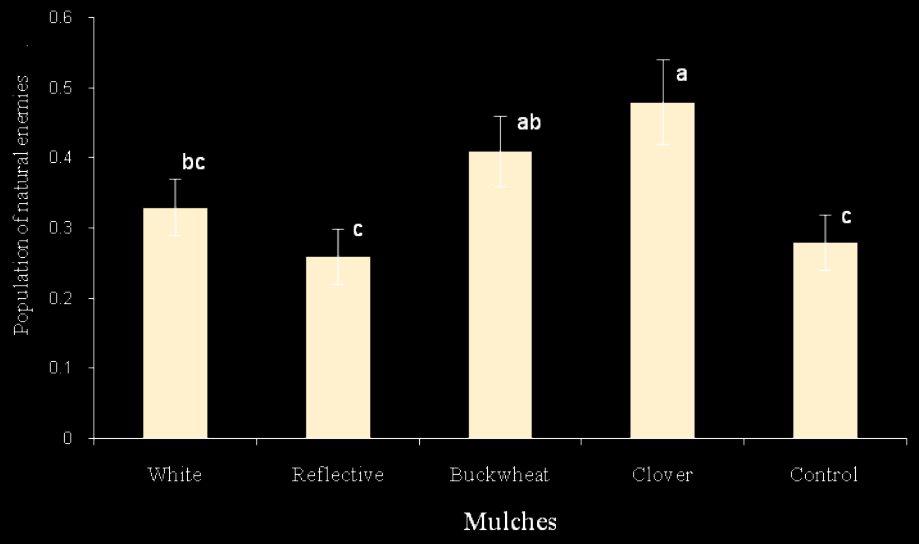
- Tolerance – The plant has the ability to give satisfactory yields in spite of fairly high injury levels

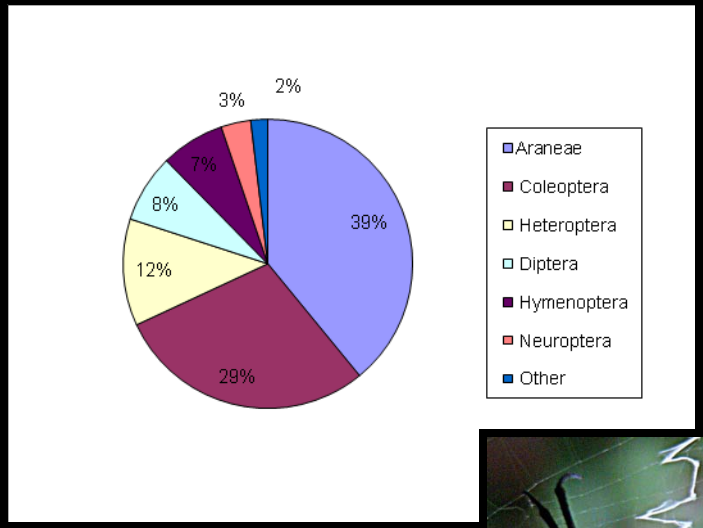
Cultural techniques

- ✓ The use of mulches (reflective and living mulch)



Population of natural enemies in cucurbits treated with different mulches

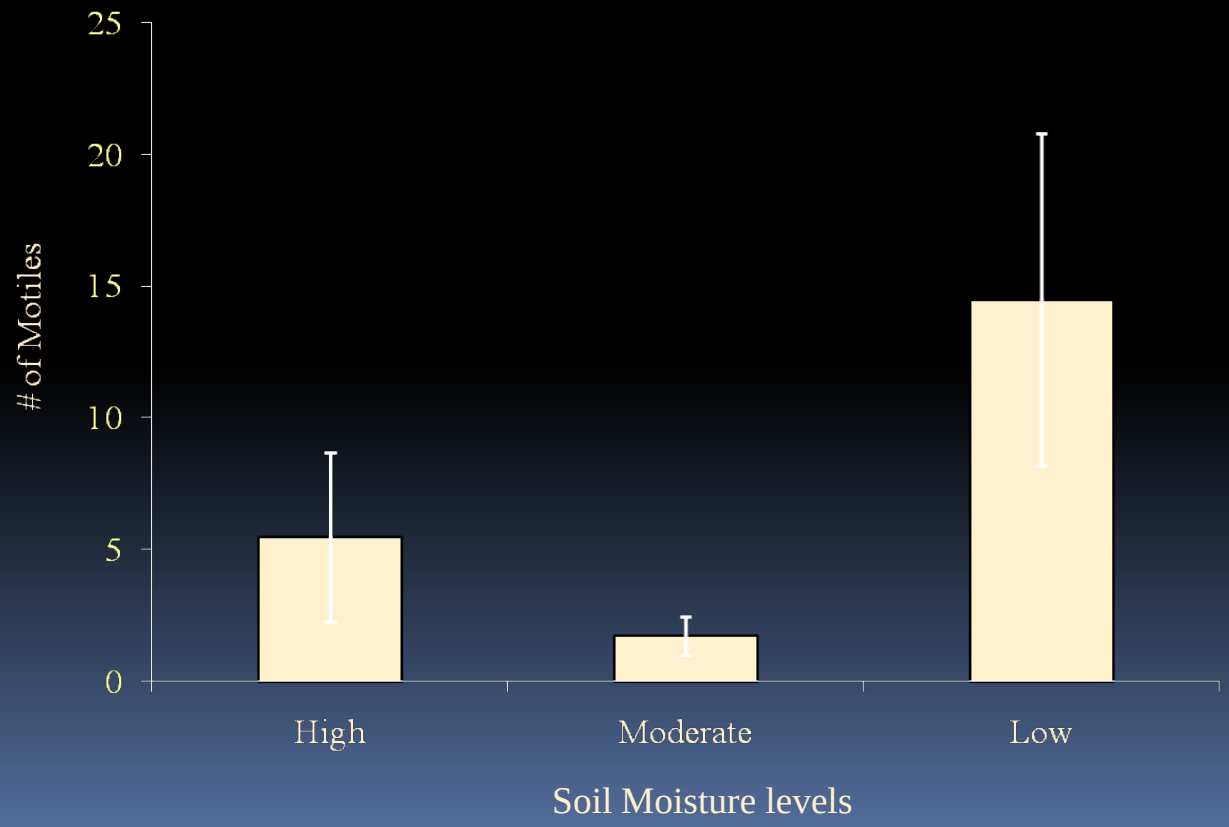




Cultural techniques

Managing field moisture/irrigation

Population of twospotted spider mites in strawberries



Cultural techniques

- Trap crops
- Adjust planting dates
- Clean cultivation
- Pruning