

Protection of Subtropical and Tropical Agriculture Commodities and Ornamentals from Exotic Insects

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California Avocado Commission
California Dept. of Agric.
Florida and California Citrus Growers Assocs.
FDACS-DPI
UN/IAEA/FAO (14 country CRP)
Fairchild Tropical Garden
Florida Nursery Growers Association
Friends of Chapman Field
Montgomery Botanical Center
Miami-Dade Metro Parks
Miami-Dade Metro Zoo

Pests: Points of Entry



Tourism



Plant, Food, Fiber and Wood Shipments



Private Collections



Nursery Industry



Frank, J.H. and E. D. McCoy. 1995. Introduction to Insect Behavioral Ecology : the Good, the Bad, and the Beautiful: Non-Indigenous Species in Florida. Invasive Adventive insects and Other Organisms in Florida. Florida Entomologist, 78: 1-15.

TABLE 1. A COMPARISON OF THE FLORIDA FLORA AND FAUNA

Type	Plants	Insects
Indigenous species	2,525 ^a	11,512 ^c
Adventive species		
Species immigrant to Florida and established in nature	0 ^f	946 ^c
Species introduced to Florida and established in nature	925 ^{a,f}	42 ^d
Species now cultivated, but not established in nature	25,000 ^b	5 ^e

Frank, J.H. and E. D. McCoy. 1992. The Behavioral Ecology of Immigration. The Immigration of Insects to Florida, With a Tabulation of Records Published Since 1970. Florida Entomologist, 75: 1-28.

Table lists 271 known immigrant species from 1970 - 1990

Calculated mean rates of 7.7 and 12.0 exotic pest introductions per year in the 1970's and 1980's, respectively. About 20 recent immigrants are, or could become, major pests in Florida.

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Of Current Interest:



Fruit Flies

Silky Cane Weevil

Amaryllis Weevil

Sri Lanka Weevil

Citrus Root Weevil

Bromeliad Weevil

Yucca Weevil

Cactus Moth

Banana Moth

Cycad Scale

Hibiscus Gall Midge

Greenhouse Orthezia



Myllocerus undatus

- **Discovered 1990 in Broward Co.**
- **From Sri Lanka**
- **Nothing known about it**





Cycad Aulacaspis Scale

***Aulacaspis yasumatsui* Takagi**



- **Accidentally introduced into southern Miami area from southeast Asia (~1995)...has recently moved into central Florida**
- **Has only been observed on cycads**
- **Is an armored scale**
- **Attacks most cycads**







Silky Cane Weevil:

- **Reported from Dade County 1984**
- **Economic pest of palms, sugarcane and other tropical plants**
- **From West Indies, Central and South America**



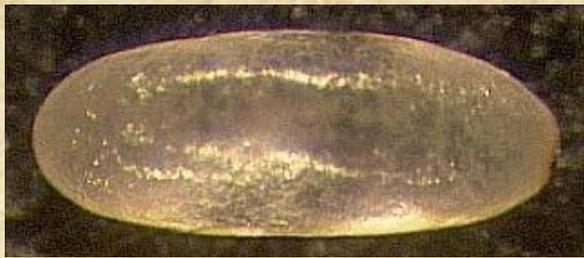
UF



UF



UF





UF



UF



Metamasius callizona

**Found in Broward County
In 1989**

From Mexico

Attacks bromeliads





JH Photo



UF



UF

Amaryllis Weevil

- **Known for last 10 years**
- **Determined by Charles O'Brien to be undescribed genus**
- **Attacks only amaryllis**
- **Unknown origin**





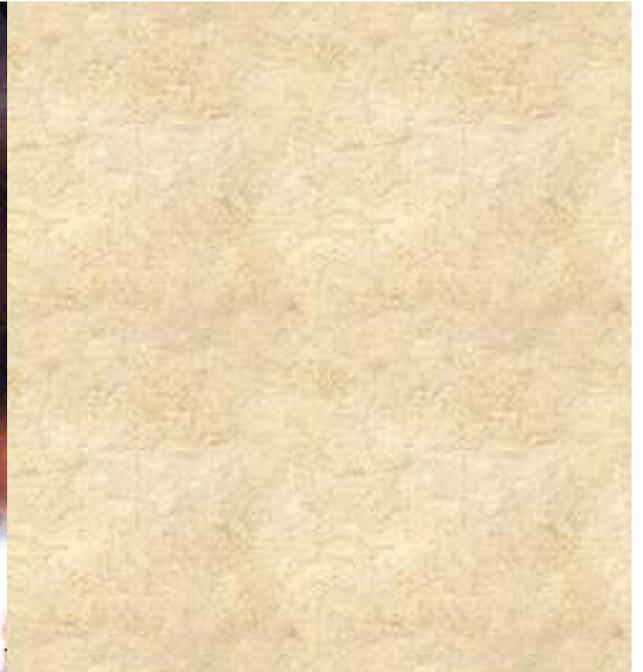
Agave Weevil (*Scyphophorus acupunctatus*)



Banana moth (*Opogona sacchari* Bojer)

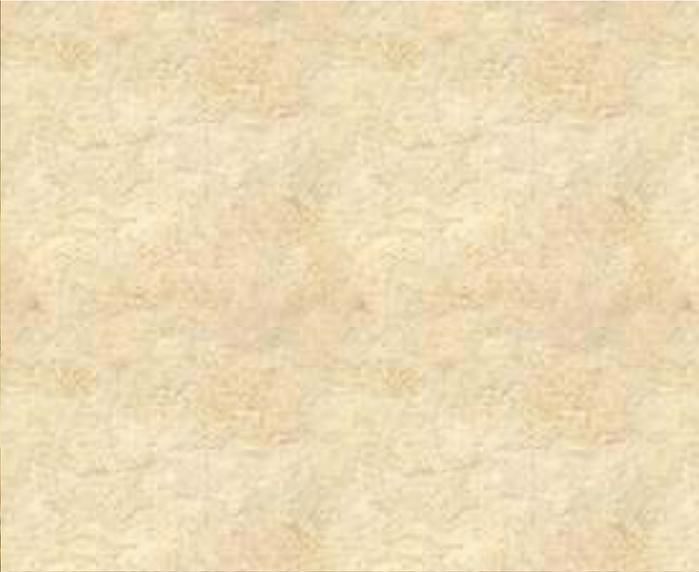
Originally reported from the Mascarene Islands





Cactus Moth
Cactoblastis cactorum







Research Objectives

- Determine biology, behavior and chemical ecology of exotic insect pests
- Identify semiochemicals of exotic insects and their biocontrol organisms
- Develop attractant-based systems for detection, delineation and monitoring
- Develop systems for pest management programs of exotic insects

Basic Biology



Studies conducted to determine:

Fertility

Fecundity

Temperature and humidity requirements

Host range

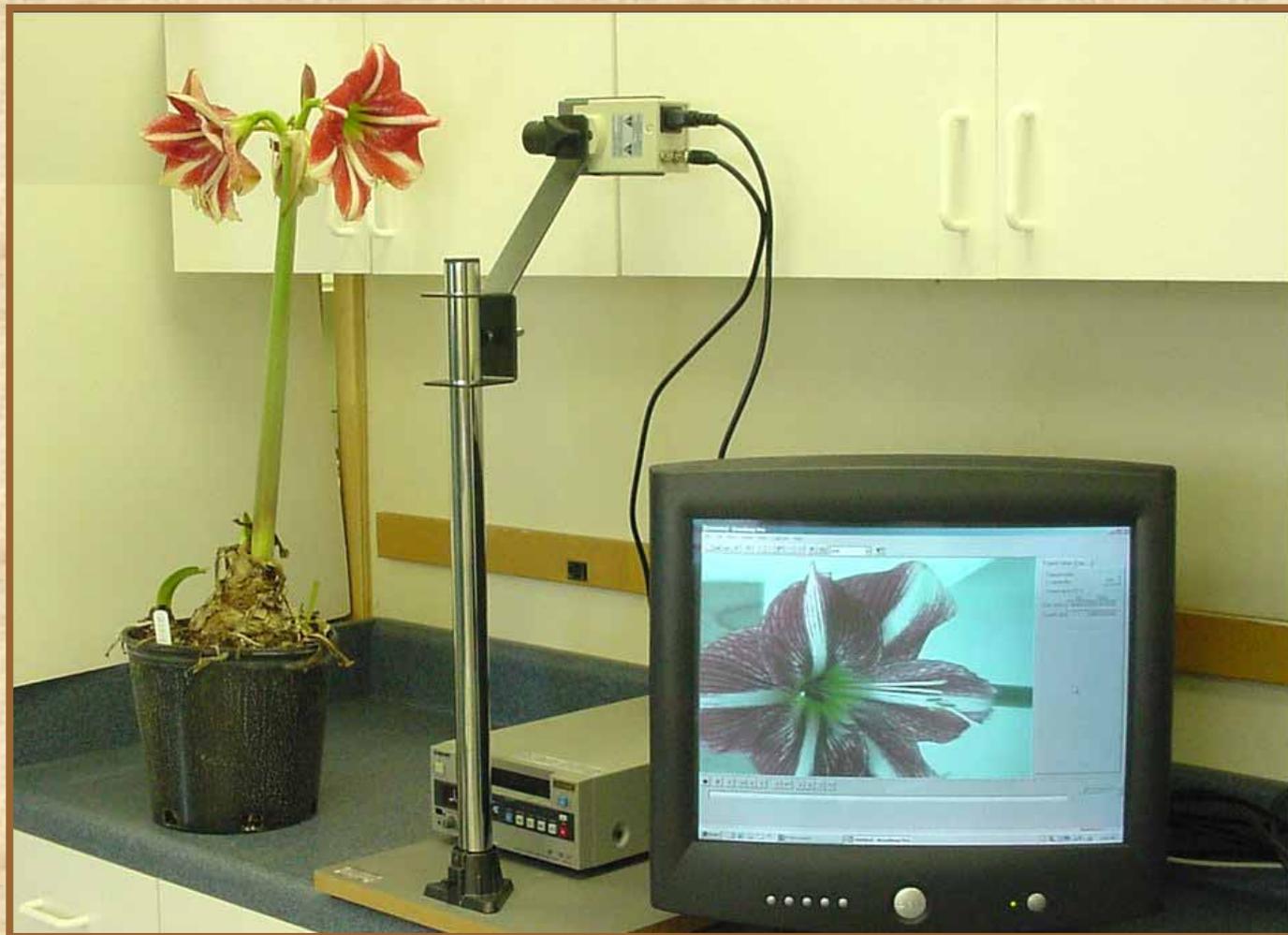
Activity patterns

Host finding behavior

Feeding behavior

Mating behavior

Video analysis is used to document insect behavior, using Noldus EthoVision and VideoPro



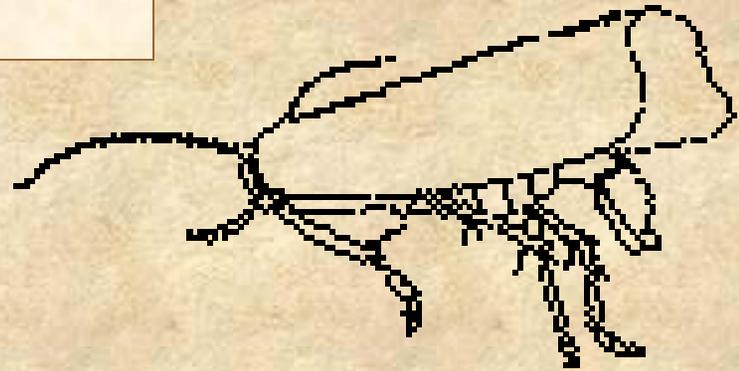
Chemical Ecology, Identification of Semiochemicals:

- **Naturally occurring, message-bearing chemicals**
- **Used by insects for communication and perception of their environment**
- **These chemicals may have behavioral or physiological effects on insects**

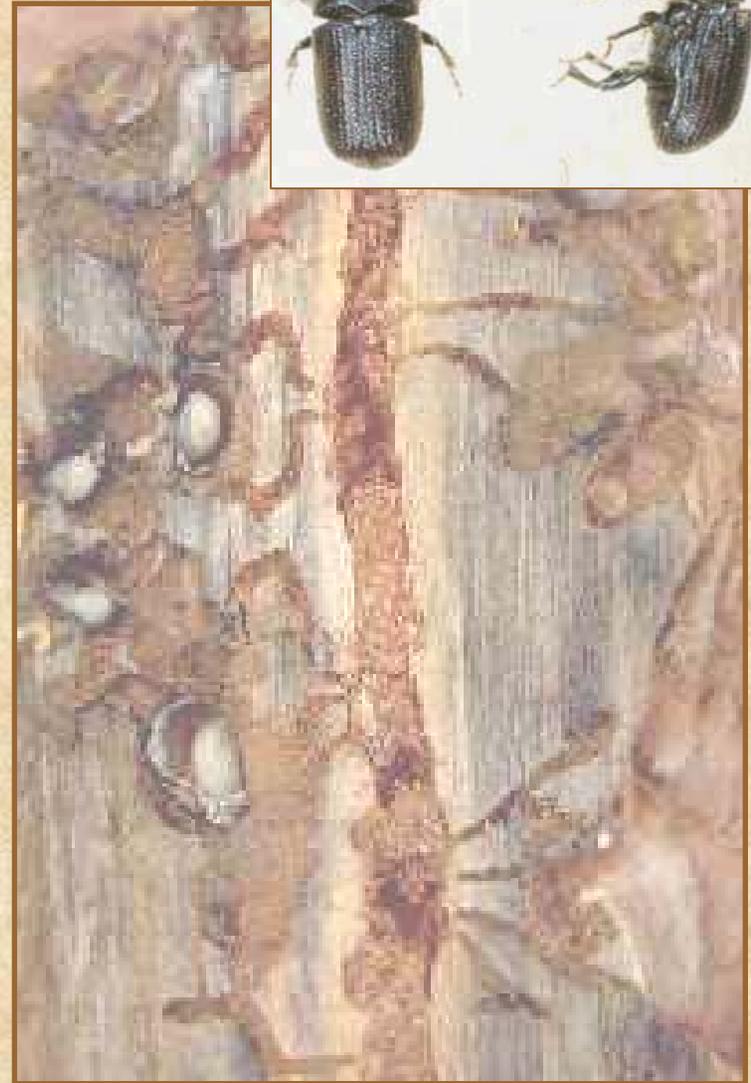


Sex Pheromones:

produced by one sex to attract the opposite sex



Aggregation pheromones -
produced by one sex to bring
both sexes to a common
location



First step

Determine through bioassays if pheromone produced



or olfactometer bioassays...



or field trapping

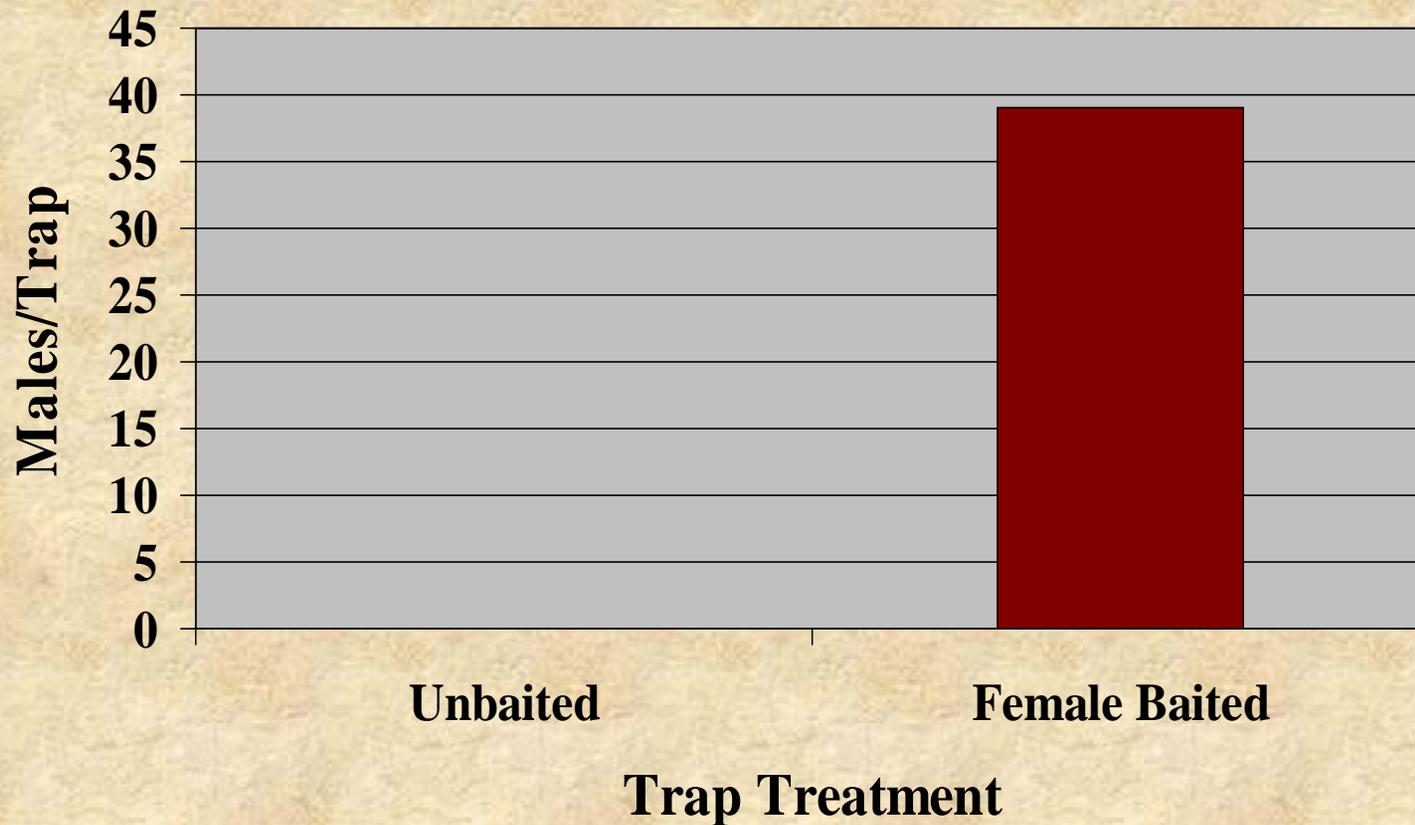


UC Statewide IPM Project
© Regents, University of California

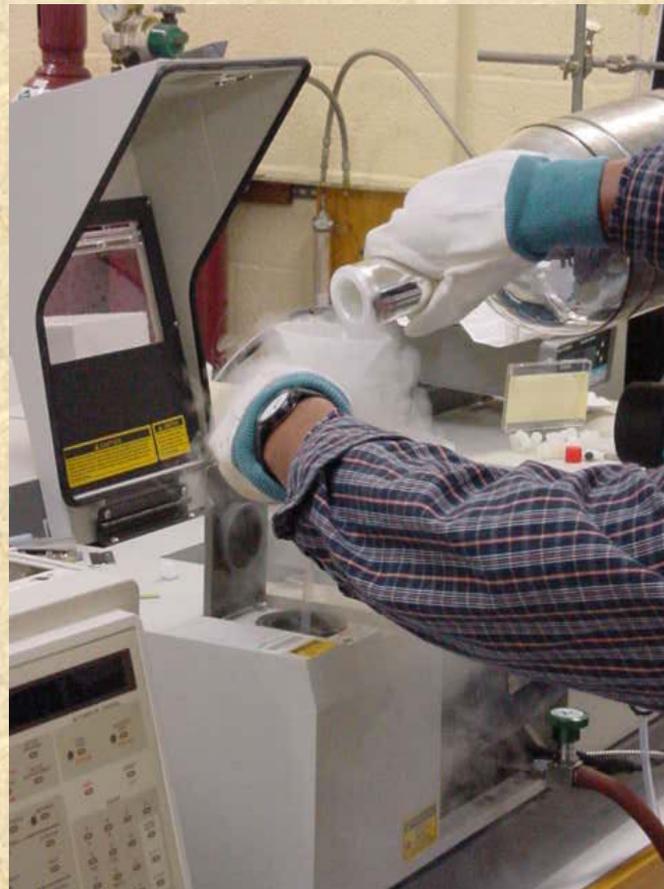
92.3 % of cactus moth males flying in flight tunnel responded to caged virgin females vs. cactus



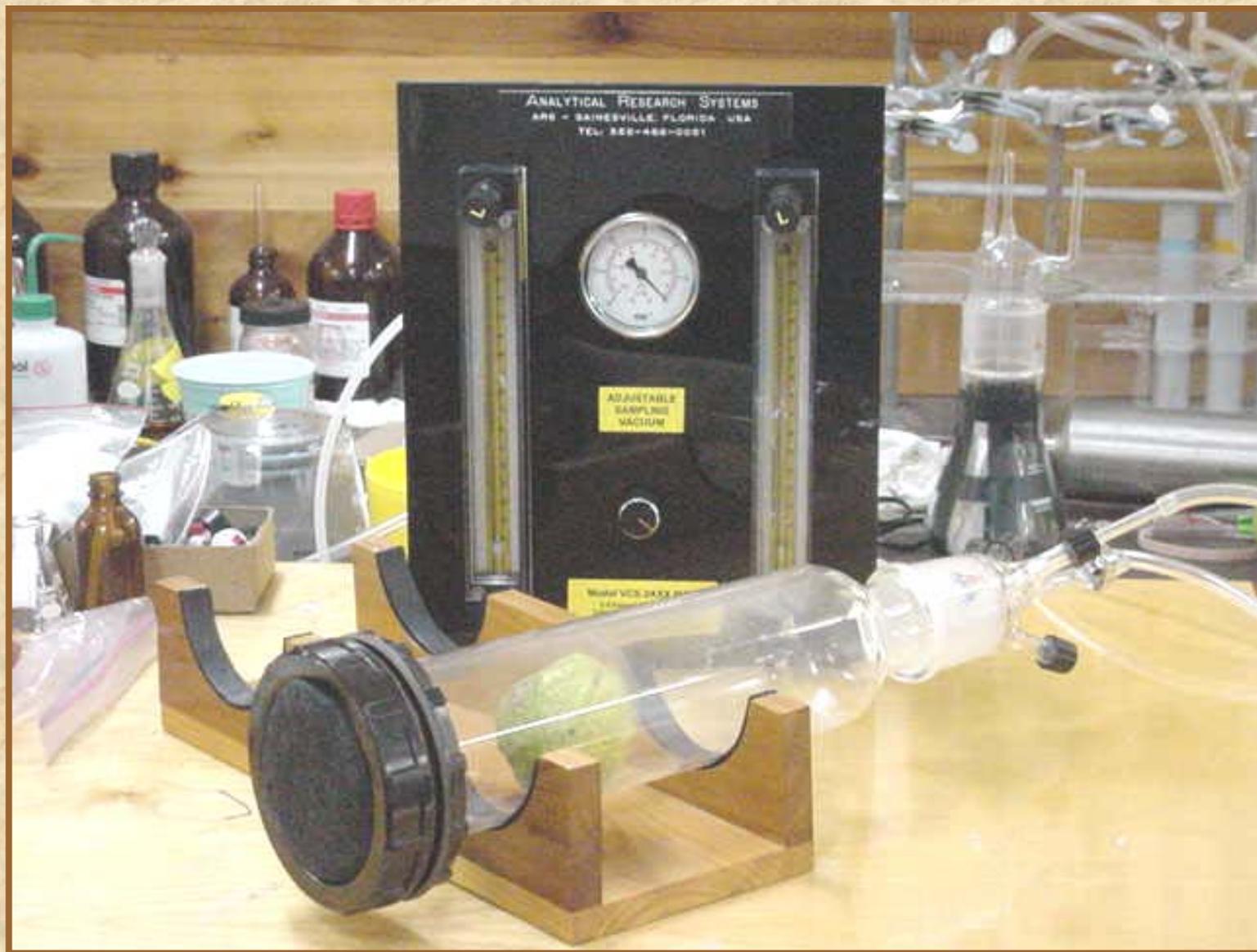
***Cactoblastis cactorum* males trapped in unbaited and virgin female baited traps, Jekyll Island causeway, April 12 – May 16, 2002.
(Carpenter, Bloem)**



If preliminary assays demonstrate presence of pheromone, then insects are either put into volatile collection system(s) for volatile isolation or pheromone glands are extracted



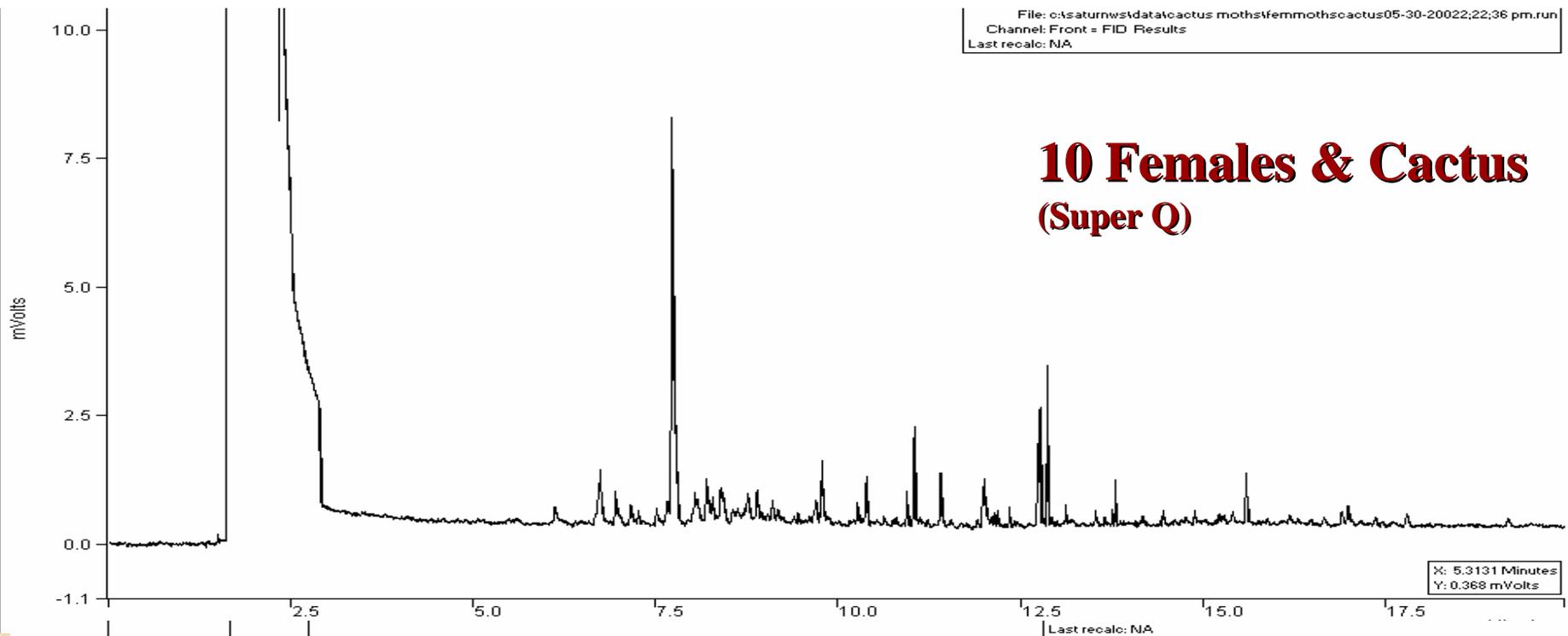
Porapak, Super Q System



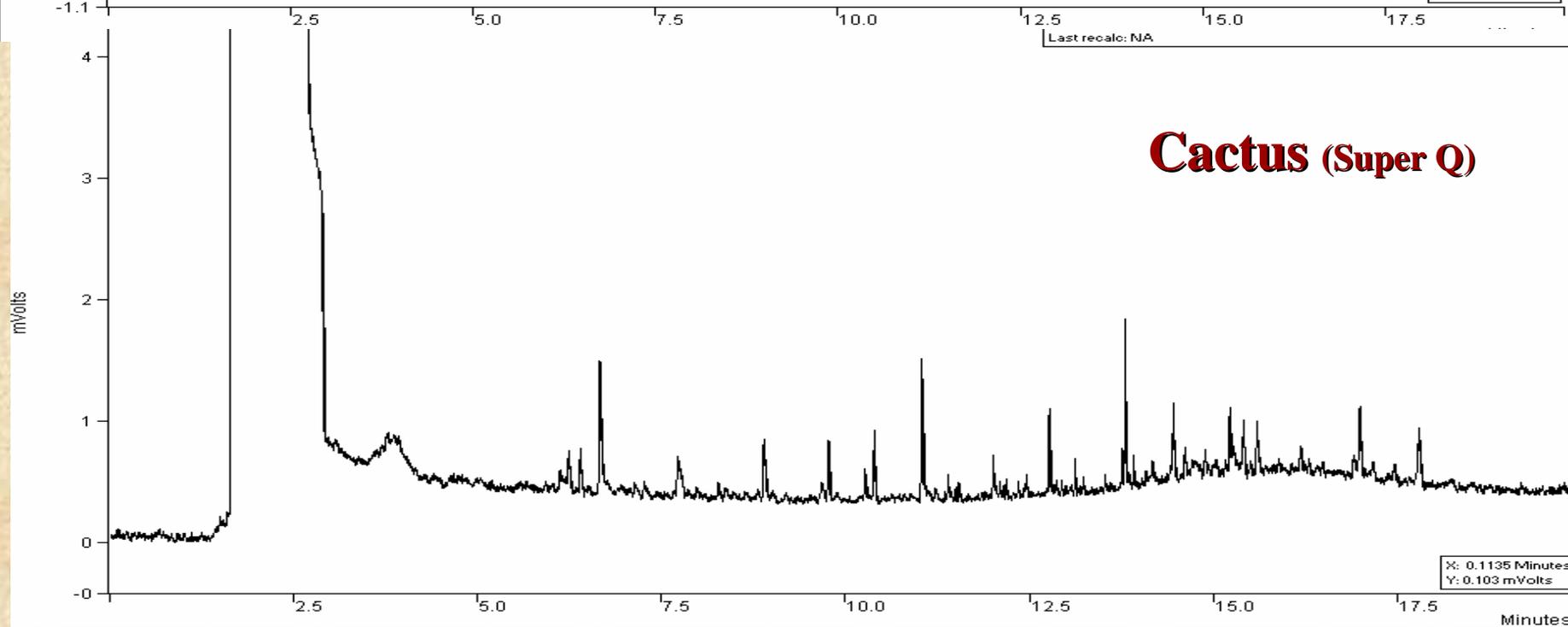


SPME
(Solid Phase
MicroExtraction)

10 Females & Cactus (Super Q)



Cactus (Super Q)

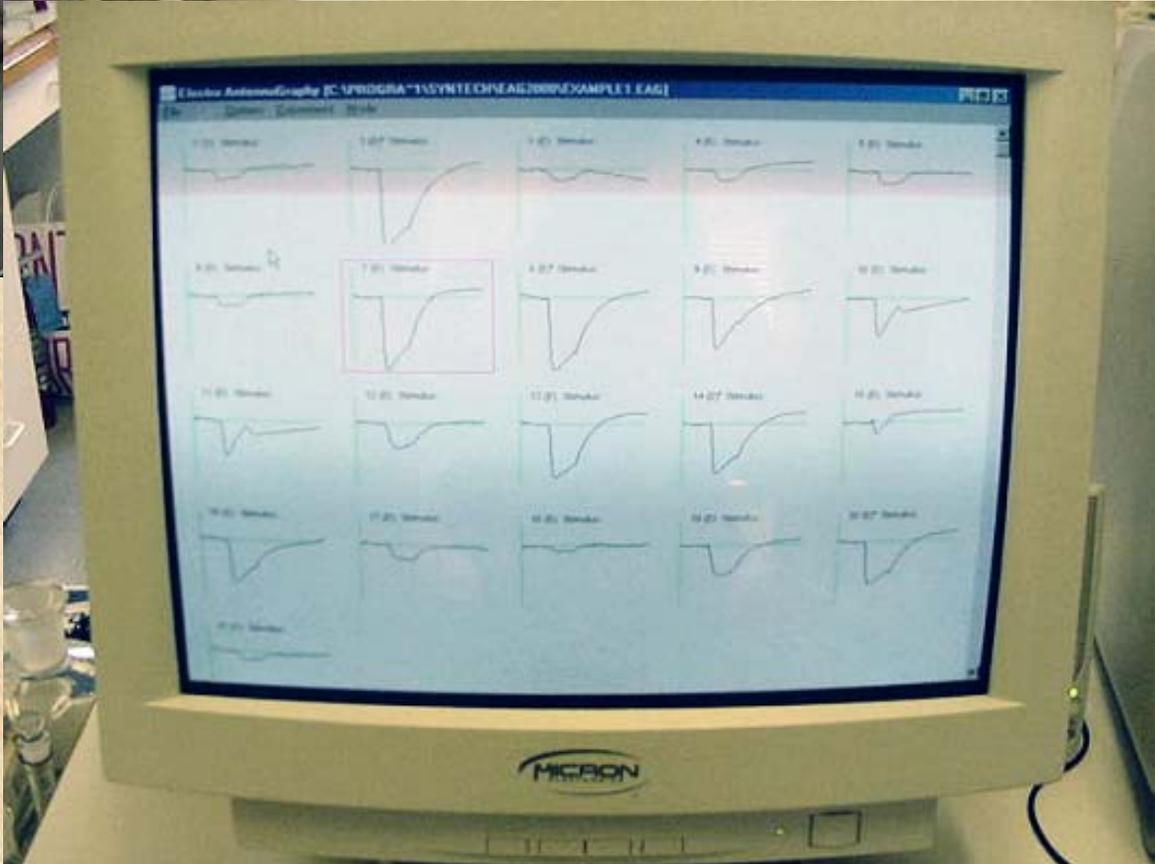
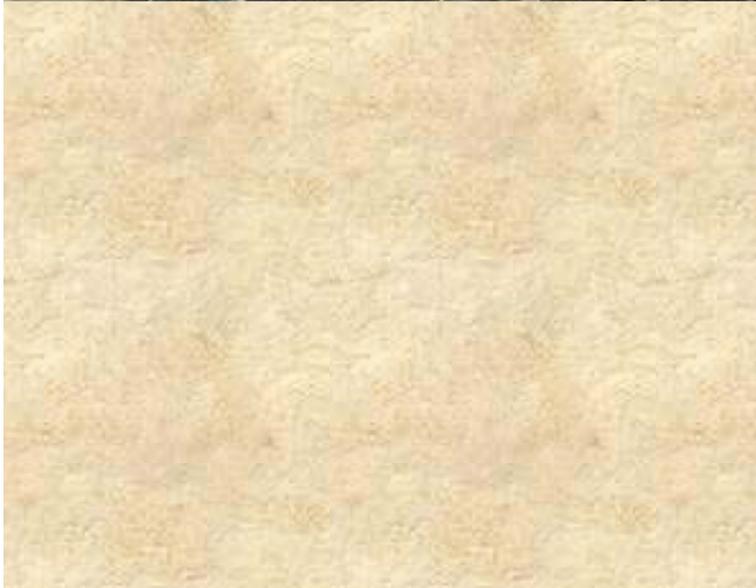
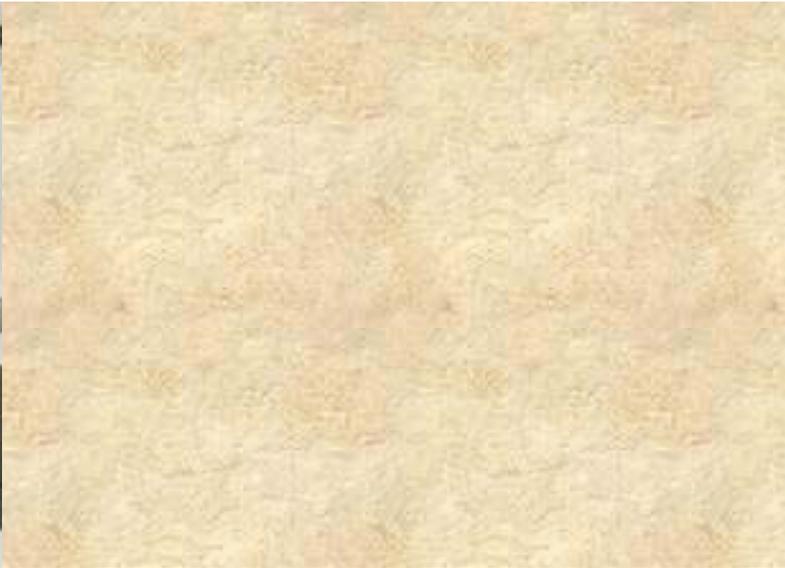


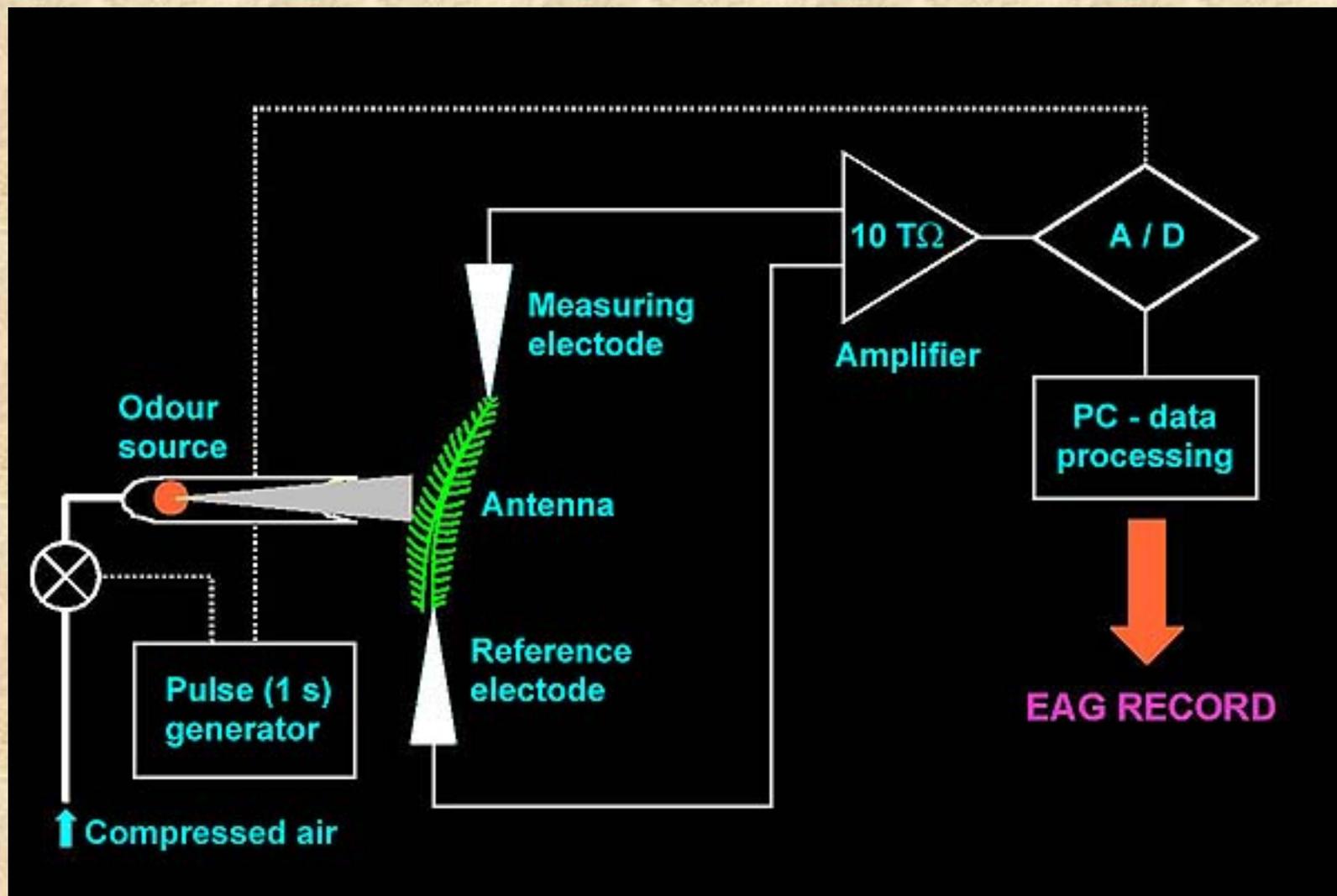
Chemical identification includes electron impact, mass spec-mass spec, and chemical ionization techniques



Electroantennogram-GC analysis is used to evaluate neural response of insect to chemicals







Insect response to conspecifics/host plants is confirmed in flight-tunnel...



or olfactometer bioassays, or field tests



Develop Attractant-Based Detection/Monitoring Systems



Optimize trap design and volatile release rates



Lure pests to baits or bait stations

- palatable baits with a minute quantity of toxin
- pesticide is localized, targeted for pest insect
- used for rangeland grasshopper control
- new formulations are under development



Conclusions/Comments:

