Growth of Insect Rearing in the 21st Century

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Blueprint for the Future of Arthropod Rearing and Quality Assurance
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Golden Age of Insect Rearing!

- Insect rearing programs around the world are expanding, some rapidly.
- This expansion is in both existing and new species.
- Insect products are needed for research and development, biological control, sterile insect technique, human and pet food, displays and events, pharmaceuticals, conservation, fish bait, and many other important purposes.
- Expansion is in both the public and private sectors, small and large companies.

Representative Expanding Research and Production Units

Location	Species	Contact
Clearwater Butterfly- FL, USA	Painted ladies	Gary Cousins
Monsanto- TN & Illinois, USA	Corn, soybean & cotton pests	Nancy Adams
Pioneer Hi-Bred- Iowa, USA	European corn borer & corn rootworm	Laura Higgins
BioNostrum- Spain	Beneficials	Christina Verdu
Fruit Research Institute- S. Africa	Mediterranean, Natal & marula fruit flies	Brian Barnes
Biological Control of Insects Research Lab.- Missouri, USA	Stink bugs, spined soldier bug, & coccinellids	Tom Coudron
National Biological Control Laboratory- Mississippi, USA	Coccinellids. Lacewings, lygus bugs, tenebrionids	Walker Jones
Bio-Serve- New Jersey, USA	Lepidoptera	Tim Fisher

Clearwater Butterfly Company Chuluota, Florida

Painted Lady

Insectary #1- "Humble Beginning"


Chris's Diet Room


Garry's Larval Room

Insect Rearing Facilities

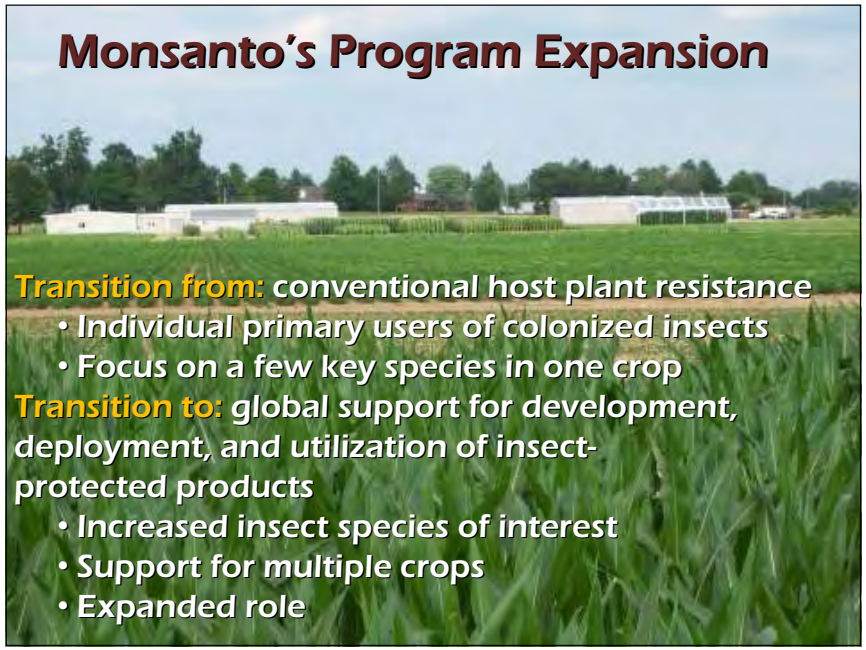

Diet Preparation Building


General Rearing Building

New Modern Facilities & Diet

New Modern Greenhouse

Monsanto's Program Expansion



Transition from: conventional host plant resistance
- Individual primary users of colonized insects
- Focus on a few key species in one crop

Transition to: global support for development, deployment, and utilization of insect-protected products
- Increased insect species of interest
- Support for multiple crops
- Expanded role

Monsanto - Union City, Tennessee

- Moved into new 10,010 sq. ft. insectary December 2008
- New office and diet preparation areas, clean laboratory, larval development rooms, adult oviposition rooms, process laboratory, field and special project laboratories, and a maintenance area
- Rear 7 lepitoperan species
- Insect efficacy evaluations, 9,000 plus rows

Monsanto Union City - Entomology Wing

Larval Development Rooms

Monsanto Union City - Entomology Wing

Adult Handling Rooms

Monsanto - Waterman, Illinois

- Entomology facility more than 12,000 sq. feet
- Major investment to convert large scale rearing rooms into smaller staging rooms
- Increased demand for corn rootworm, *Dibrotica* spp.
- Rear a large variety of corn, soybean, and cotton pests

Efficacy Testing

Thousands of plants are infested, dug, and rated for corn rootworm protection

PIONEER. A DuPont Business | Science with Service Delivering Success™

European corn borer, *Ostrinia nubilalis*

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Pioneer Rearing Team

ECB cages

ECB Rings

PIONEER. A DuPont Business | Science with Service Delivering Success™

European corn borer

BioNostrum - Spain

BioNostrum Team

Torretes Experiment Station Alicante, Spain

- CIBIO facilities: Centro Iberoamericano de la Biodiversidad, University de Alicante, (http://carn.ua.es/).
- This Center partners with the Institute of Agricultural Sciences (ICA) of the Spanish Council of Scientific research.
- One of the main research interests of the Biology and Biological Pest Control Unit is to find native beneficials from the Mediterranean Basin.

BioNostrum - Spain

BioNostrum - Spain

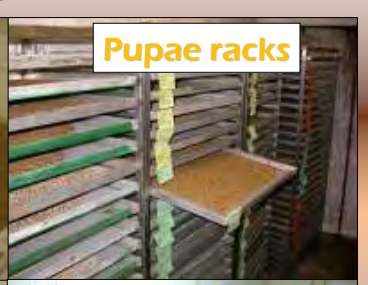
QUALITY CONTROL

Medfly Rearing - South Africa

Medfly Rearing Facility
Stellenbosch, SA

Medfly Rearing - South Africa

Medfly Rearing - South Africa



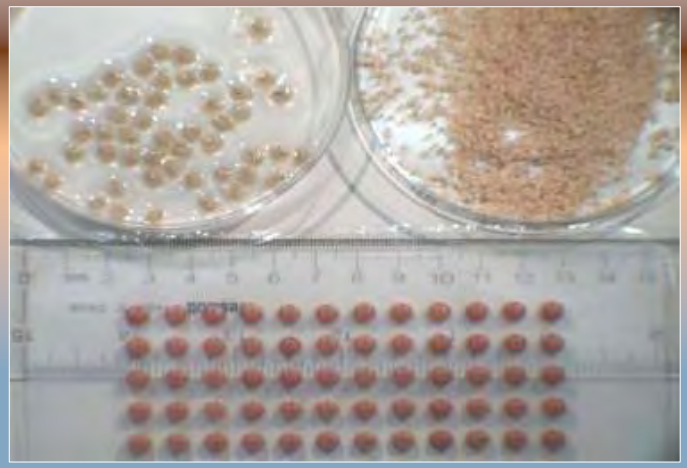
Medfly Rearing - South Africa

Rearing Predators on Artificial Diets

Two spotted stink bug
Perillus bioculatus

Spined soldier bug
Podisus maculiventris

Diet Presentation



Rearing Predators on Artificial Diets

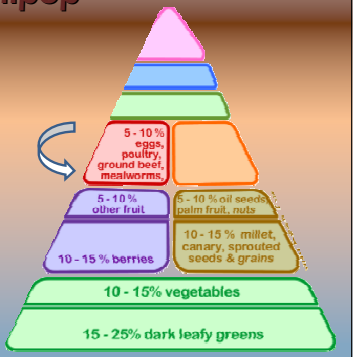
Lady beetles
Coccinellidae

National Biological Control Laboratory USDA, ARS – Stoneville, Mississippi

Mealworm beetle
Tenebrio molitor

Tequilalix lollipop

Pet food



Food Pyramid for Parrots

Lepidoptera eggs and larvae, insect diets, rearing supplies

BIO-SERV
Your One Source for Rearing Supplies

Insect products will not reach their overall potential for growth within the foreseeable future.