IR4 Support of Biopesticides in Tropical Agriculture

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Area-Wide Programs in the Pacific Basin
Bactrocera: Background

- Genus of at least 500 species
- Attack a wide range of fruits in the tropical and warm temperate regions of the Old World.
- Most species are found in tropical Asia, Australia, and the South Pacific
- Spreading throughout the world at an alarming rate.

B. cucurbitae
B. dorsalis
B. latifrons
## Recent Invasions

<table>
<thead>
<tr>
<th>Date</th>
<th>Invasive species</th>
<th>Area Invaded</th>
</tr>
</thead>
<tbody>
<tr>
<td>1895</td>
<td><em>Bactrocera cucurbitae</em></td>
<td>Hawaii</td>
</tr>
<tr>
<td>1928</td>
<td><em>Bactrocera kirki</em></td>
<td>Tahiti</td>
</tr>
<tr>
<td>1942</td>
<td><em>Bactrocera cucurbitae</em></td>
<td>Mauritius</td>
</tr>
<tr>
<td>1945</td>
<td><em>Bactrocera dorsalis</em></td>
<td>Hawaii</td>
</tr>
<tr>
<td>1969</td>
<td><em>Bactrocera tryoni</em></td>
<td>New Caledonia</td>
</tr>
<tr>
<td>1975</td>
<td><em>Bactrocera carambola</em></td>
<td>French Guyana, Guyana</td>
</tr>
<tr>
<td>1970s</td>
<td><em>Bactrocera tryoni</em></td>
<td>French Polynesia</td>
</tr>
<tr>
<td>1970s</td>
<td><em>Bactrocera xanthodes</em></td>
<td>Cook Islands</td>
</tr>
<tr>
<td>1983</td>
<td><em>Bactrocera latifrons</em></td>
<td>Hawaii</td>
</tr>
<tr>
<td>1987-1991</td>
<td><em>Bactrocera zonata</em></td>
<td>Mauritius, Reunion</td>
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<tr>
<td>1993</td>
<td><em>Bactrocera carambola</em></td>
<td>Surinam</td>
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<tr>
<td>1995</td>
<td><em>Bactrocera papayae</em></td>
<td>northern Australia</td>
</tr>
<tr>
<td>1996</td>
<td><em>Bactrocera dorsalis</em></td>
<td>Tahiti</td>
</tr>
<tr>
<td>1997</td>
<td><em>Bactrocera oleae</em></td>
<td>Reunion</td>
</tr>
<tr>
<td>1998</td>
<td><em>Bactrocera oleae</em></td>
<td>USA</td>
</tr>
<tr>
<td>1998</td>
<td><em>Bactrocera xanthodes</em></td>
<td>French Polynesia</td>
</tr>
<tr>
<td>1998</td>
<td><em>Bactrocera zonata</em></td>
<td>Egypt</td>
</tr>
<tr>
<td>1999</td>
<td><em>Bactrocera cucurbitae</em></td>
<td>Seychelles</td>
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<tr>
<td>2003</td>
<td><em>Bactrocera invadens</em></td>
<td>East Africa</td>
</tr>
<tr>
<td>2006</td>
<td><em>Bactrocera latifrons</em></td>
<td>East Africa</td>
</tr>
</tbody>
</table>

Since 1990

Slide from DeMeyer (2010) Valencia, SPN
Brief History of Hawaii Area-Wide Pest Management Project

- Hawaii program initiated by ARS in 1999.
- Partnership with UH and HDOA.
- Included research, education, and assessment components
- Goal was to transfer environmentally sound sustainable technology to farmers
- Reduce the use of OP insecticides
- Funded for 10 yrs, and then carried on by cooperators and growers.
Host Range

Fruit flies attack over 400 species of fruit and vegetables

Peach

Citrus

Pumpkin

Loquat

Cantaloupe

Persimmon
Area Wide Integrated Pest Management Components

- Research
- Education
- Assessment

- Soil Drenches
- Population Monitoring
- Sterile Insects
- Field Sanitation (1)
- Male Annihilation (3)
- Protein Bait (2)
Area-Wide IPM Approach

- Monitor Traps Deployed
- Field Sanitation Begins
- Male Annihilation Begins
- GF-120 Distributed to Farmers
- SIT Releases Begin
- *P. fletcheri* Releases Begin
Major Technical Accomplishments

• Multi-agency collaboration

• International collaboration

• Transfer of IPM approaches to farmers.

• Transfer of New Technologies to Farmers:
  
  1) New monitoring methods.
  
  2) Replacement of cover sprays with spot GF-120 NF Naturalyte Fruit Fly Bait applications.
  
  3) New male annihilation approaches.

http://www.fruitfly.hawaii.edu
State and Federal EPA Registrations

- Prior to this program, no chemicals were registered in the United States specifically for the suppression of fruit flies.

- The AWPM program was instrumental in obtaining the first Hawaii research permits and then assisted in the registration process with state and federal authorities.
<table>
<thead>
<tr>
<th>Date of Reg.</th>
<th>EPA Reg. No.</th>
<th>Hawaii Licensing No.</th>
<th>Product</th>
<th>Source</th>
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<tbody>
<tr>
<td>Aug. 22, 2000</td>
<td>HI SLN Reg. HI-000003</td>
<td>9786.135</td>
<td>GF-120 Fruit Fly Bait</td>
<td>Dow AgroSciences LLC.</td>
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<tr>
<td>Dec 18, 2002</td>
<td>62719-498</td>
<td>9786.234</td>
<td>GF-120 Naturalyte Fruit Fly Bait supplemental label</td>
<td>Dow AgroSciences LLC</td>
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<tr>
<td>May 23, 2003</td>
<td>8730-50</td>
<td>9628.6</td>
<td>Vaportape II™</td>
<td>Hercon Environmental Inc.</td>
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<td>June 5, 2006</td>
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<td>9786.234</td>
<td>GF120 Naturalyte Fruit Fly Bait all crops supplemental label</td>
<td>Dow AgroSciences LLC</td>
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<tr>
<td>Sep. 20, 2007</td>
<td>7969-253</td>
<td>9131.131</td>
<td>Amulet™ C-L w/fipronil stations</td>
<td>BASF</td>
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<tr>
<td>Oct. 3, 2007</td>
<td>36638-42</td>
<td>9721.4</td>
<td>Cue-lure plug in plastic matrix w/o toxicant</td>
<td>Scentry Biologicals Inc.</td>
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<tr>
<td>Oct. 26, 2007</td>
<td>81325-3</td>
<td>8637.1</td>
<td>Methyl eugenol short lure in plastic matrix</td>
<td>Farma Tech International Corp</td>
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<td>Dec. 11, 2007</td>
<td>36638-41</td>
<td>9721.3</td>
<td>Methyl eugenol cone in plastic matrix w/o toxicant</td>
<td>Scentry Biologicals Inc.</td>
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<td>June 2008</td>
<td>62719-42</td>
<td>9786.282</td>
<td>Sprayable SPLAT-MAT with methyl eugenol and spinosad</td>
<td>Dow AgroSciences LLC/ISCA Technologies</td>
</tr>
</tbody>
</table>
• STATIC™-Spinosad-ME
• (aka SPLAT-MAT-Spinosad ME)
More Benefits than Costs

• AWPM program impacted almost 700 farms on all the major islands with 2500 cooperators

• Program made major economic contributions to agriculture in Hawaii and instigated the growing of a greater diversity of crops.

• By allowing farmers to make significant cuts in pesticide use, the program helped improve Hawaii’s environment and sustain open space, which contributed to maintain the islands’ tourism.

• The program also led to a significant increase in the number of commercial farms.

• In addition, existing farms added crops or revived some previously phased out due to fruit fly problems.
Regional Impact

- Suppression of fruit flies in Hawaii also had benefits in other parts of the United States.

- Most of the technologies used to combat fruit flies on the U.S. mainland were developed in Hawaii. New technologies have direct application to eradication programs in California and Florida.
Current Research in California & Florida:

- STATIC-Spinosad-ME (aka Splat-Mat-ME Spinosad)
- Solid Trilure Detection Dispensers
- Reduced Risk Soil Drenches
- Foliar Insecticide Treatments
Since 1960 *B. dorsalis* has been detected in California in 44 of the last 50 years with over 90 eradication programs.

Currently, liquid lures and naled are the standard for eradication programs.

Over the last 5 years we have developed a reduced risk replacement for liquid lure/insecticide mixtures and Min-u-gel-naled-ME/C-L treatments in California and Florida.
Min-U-Gel ME MAT Treatments
Spinosad is an aerobic fermentation product of the soil bacterium *Saccharopolyspora spinosa*. It uniquely combines the efficacy of synthetic products with the benefits of biological insect pest control products.
SPLAT Formulated for Sprayable MAT Applications
STATIC™-Spinosad-ME
(aka SPLAT-MAT-Spinosad ME)
Acknowledgements

- IR-4 Program
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- Hawaii Department of Agriculture
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- Florida Department of Agriculture
- Dow AgroSciences LLC
- ISCA Technologies
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Questions??