Welcome and agenda - Pam Marrone (AgraQuest/BPIA)

BPIA mission/vision/accomplishments - Bill Foster (BPIA Chair; Bioworks)

Why Use Biopesticides? - Mike Braverman (IR-4)

Examples of successful biopesticides in insect and nematode control programs - Jim Chambers (Valent Biosciences)

Examples of successful adoption of biopesticides in disease control programs - Pam Marrone

Examples of successful adoption in structural pest IPM - Steve Bessette (EcoSmart)
From last IPM symposium, Barriers to Adoption Workshop

- Grower demos required for adoption (in real-world programs, not just stand alone)
  - Company funded; increase IR-4/EPA funding

- Show profit and value of biopesticides (yield/quality)

- Promote biopesticides as solutions not just as “bio”

- Promote biopesticides for resistance and residue management and IPM programs (to preserve beneficials)

- Educate growers about biopesticides and how to use them

- BPIA move forward with certification/standards to weed out “snake oils”

- More research on basic biology of pests
Benefits of Biological Pesticides

- Reduce pest resistance through novel, multiple modes of action - can extend life of conventional products
- Better yields and quality when incorporated into pest or disease management program
- Can be sprayed up until harvest - leave no chemical residues (ideal for export markets)
- Short re-entry - safe to workers, saves labor
- Have an accelerated time to market (~3 yrs)
Examples of Successful Adoption of Biological Fungicides

- **Rootshield®** and **PlantShield®** (Bioworks, Inc.)
  - *Trichoderma harzianum* strain T-22
  - Ornamental penetration 12.5% (horticulture soil fungicides)
  - Thoroughly tested and recommended by Chase Research Gardens, among others
  - As good as chemical fungicides on several root pathogens; has become a standard
Examples of Successful Adoption of Biological Fungicides

JMS Stylet Oil®

- Eradicant for powdery mildew in grapes, cherries and other crops
- Recommended use early in season
- WFS sells $2 million of Stylet Oil (CA) and sales are growing quickly
- Efficacy validated by Dr. Doug Gubler (UCD)
- OMRI listed
Examples of Successful Adoption of Biological Fungicides

Kaligreen®

- Eradicant for powdery mildew in grapes, cherries and other crops
- OMRI listed
- Widely used on grapes - tens of thousands of acres
Examples of Successful Adoption of Biological Fungicides

- Serenade® (AgraQuest), *Bacillus subtilis* strain 713 (has unique combination of lipopeptides)
- Premium Wine grapes - 15% CA
- Lettuce - 17% CA/AZ for *Sclerotinia* leaf drop
- Tomatoes - 80% FL fresh mkt acres, 10% of all sprays (bacterial spot and fungal diseases)
  - Tank mixed with 1/2 rate of Serenade+Copper rotated with Maneb+Copper
Serenade synergizes many classes of synthetic chemistry: EBDCs (e.g., dithane, maneb), Topsin, and strobilurin chemistry.

- Combining Serenade in tank mix or rotation with lower rates of chemicals provides better results than chemical-only programs.

Proven examples:
- Florida tomatoes: 2lbs + 2 lbs copper
- Bananas: Serenade + 1/2 rate EBDC
- Beans: 2lbs Serenade + 1-2 lbs Topsin
- Apples: replace/reduce Captan in scab program
- Lower rate of sulfur on all crops
- Turf: Low rate of Chlorothalonil + Serenade
Synergistic Inhibition of *Mycosphaerella fijiensis* ascospores collected from farms resistant to Propiconazole

Monreri Project, Teresa Arroyo, Costa Rica
Synergistic Inhibition of *Mycosphaerella fijiensis* with Serenade and Trifloxystrobin in a single leaf test

![Bar chart showing disease severity](image)

- **Serenade 1L/Ha**
- **Tega 1L/Ha**
- **Ser 1L/Ha + Tega 1L/Ha**
- **Untreated**

*Tega = trifloxystrobin*
In Costa Rica, commercial farms that applied Serenade 12 times a year in a program for sigatoka control had higher susceptibility of *Mycosphaerella* to systemics than farms that did not use Serenade in their program.
Examples of Successful Adoption of Biological Fungicides

- **Contans® (Prophyta), Coniothyrium minitans**

- Lettuce - for *Sclerotinia sclerotiorum* leaf drop, applied at planting

- 100 tons per year (2-8 kilos/hectare) sold in rape, sunflower, lettuce, beans, and other crops in 18 countries

- Better than Endura alone; looked great in rotation with Serenade or Endura (at thinning) - (Mike Matheron, Univ. of AZ)
There are many successful examples of biofungicides that have good market penetration and continue to grow rapidly.

While they all can stand alone, growers use multiple products, thus biofungicides shine in disease control programs in rotations and tank mixes.

Synergistic efficacy and modes of action allowing lower chemical usage and resistance management is an area for focus.