Organic Pest Management in Strawberries and Caneberries: Available Materials from Biosafe Systems

Presented by:
Vijay Kumar Choppakatla
Technical Services Manager, Biosafe Systems

BioSafe Systems

- Established in 1996
- Based in East Hartford, CT
- Environmentally Responsible Plant Pest Control Products
- Domestic & International Sales

Markets

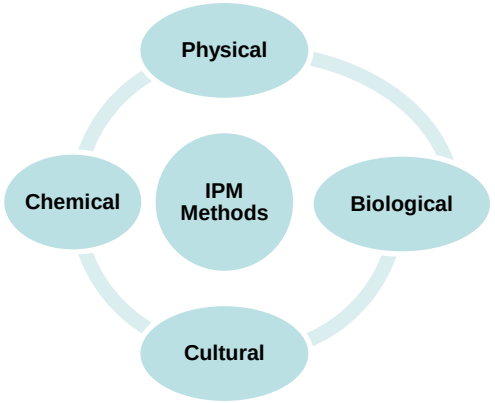
- Agriculture
- Aquatics
- Animal Health
- Home & Garden
- Home & Ranch
- Greenhouse / Nursery
- Post Harvest/Food Safety
- Sanitation
- Turf

Integrated Pest Management (IPM)

IPM – Integration of methods for successful management of pests.

Features of IPM Methods:

- Effective
- Economical
- Environmentally Safe



Organic/Biorational Chemical Control

When chemical methods have to be employed, there is growing interest in use of organic/Biorational based chemsitries in Strawberry and Caneberry Pest management.

Features of Organic/Biorational based Pest control Products–

- Natural (Not synthetic) in origin
- Non-residual in nature
- Can be safely integrated with other methods in the IPM program
- Safe to workers and environment

BioSafe Systems Product Line

- **Peroxycompounds**: (Bactericide/Fungicide)
  OxiDate 2.0- Organic Bactericide/Fungicide
  TerraClean 5.0-Organic Soil Bactericide/Fungicide

- **Azadirachtin:** (Botanical Insecticide)
  AzaGuard-Organic Insect Growth Regulator/Insecticide

- **Ammonium Nonanoate**: (Herbicide)
  AXXE-Organic Herbicide

What are Peroxycompounds (POC)?

Hydrogen Peroxide (H_2O_2):

- Powerful Oxidizer
- $2H_2O_2 = 2H_2O$ (water) + O_2 (oxygen)
- Oxidation Potential: - 1.8

Hydrogen Peroxide (HP) **Peroxy Acetic Acid (PAA)**

Peracetic Acid (PAA):

- Produced by mixing H_2O_2 and Acetic Acid
- More stable than H_2O_2
- During degradation, releases OH (hydroxyl radicals) – Very powerful oxidizers

(OP~2.8) $H_2O_2 = OH + OH$

Mode of Action

- Forms free hydoxyl radicals which oxidize thiol groups in enzymes and proteins of the target cell.
- Leads to increased cell permeability and collapse.
- Risk for fungicide resistance – Not present/unidentified.

BioSafe Systems POC's

27.0% H202
+
2.0% PAA

OxiDate 2.0
Foliar Bactericide/Fungicide
OMRI Approved

27.0% H202
+
5.0% PAA

TerraClean 5.0
Soil Bactericide/Fungicide
OMRI Approved

OxiDate 2.0

Broad Spectrum Bactericide/Fungicide

BioSafe Systems L.L.C.
The BioSecurity Company

Use in curative and preventative programs to ensure complete disease control. Approved for use on over 150 varieties of fruits, vegetables and nuts.

- EPA Registered
- Zero-Hour REI (Four-Hour in CA) & Zero-Days to Harvest
- Exempt from Pesticide Residue
- No Mutational Resistance
- OMRI Listed for Organic Production

OMRI Listed

BioSafe Systems L.L.C.
The BioSecurity Company

OxiDate 2.0-Application Program

Application Type	Rate (per application)	Spray Interval and volume	Application Timing
Curative	1.0% v/v (1:100)	5-7 days; 30-100 GPA	At early signs of disease
Preventative	0.50-0.25% v/v (1:200-1:400)	5-7 days; 30-100 GPA	When weather conditions are congenial for disease development
Tank-mix/ Rotation with Conventionals/ Biologicals	0.5-1.0% v/v (1:200-1:100)	7-14 days; 30-100 GPA	When disease pressure is high and/or for diseases that require residual chemistries

OxiDate 2.0

Broad Spectrum Bactericide/Fungicide

BioSafe Systems L.L.C.
The BioSecurity Company

Evaluation of OxiDate 2.0 for Control of Powdery Mildew in Strawberries, 2012

Researcher: UCCE, CA
Crop: Strawberry
Disease: Powdery Mildew (*Sphaerotheca macularis*)
Trial Location: Santa Maria, CA

OxiDate 2.0

Powdery Mildew in Strawberry, 2012

BioSafe Systems LLC
The BioSecurity Company

2 Treatments:

Trt # 1-
1:100 OxiDate 2.0 + 0.125% yucca surfactant as a stand alone.

Trt# 2-
1:200 OxiDate 2.0 + Procure (6.0 fl. oz)
followed by
1:200 OxiDate 2.0 + Pristine (18.5 fl. oz)

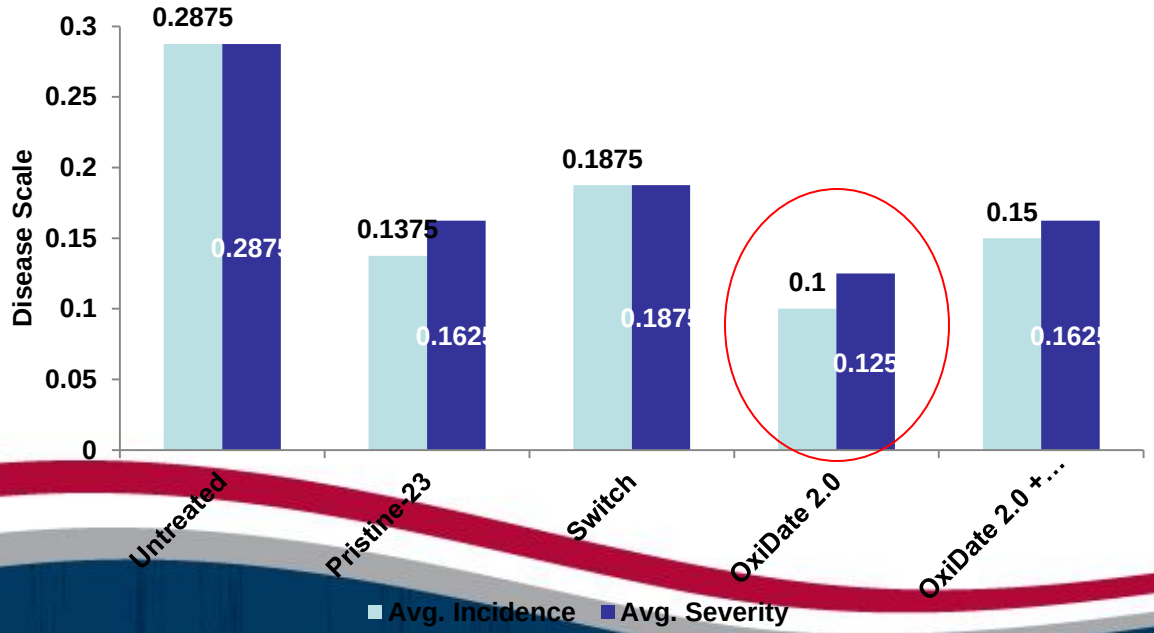
Applications:

- Spray interval- 7-13 days
- Total # of applications- 5
  (May 23-June 27, 2012)
- Spray Volume: 100 GPA

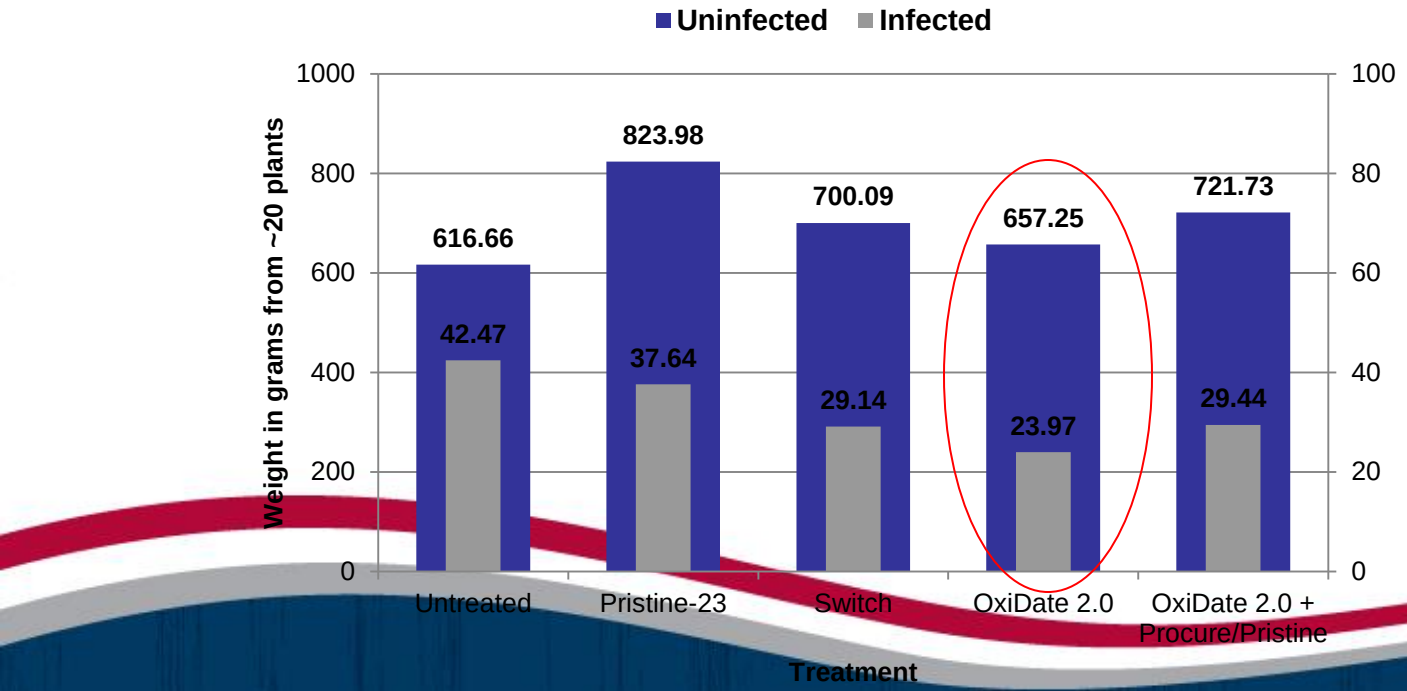
8 other treatments Included

OxiDate 2.0 and Powdery Mildew in Strawberry

BioSafe Systems LLC
The BioSecurity Company



OxiDate 2.0 and Strawberry Average Yield



OxiDate 2.0

Broad Spectrum Bactericide/Fungicide

BioSafe Systems L.L.C.
The BioSecurity Company

Evaluation of OxiDate 2.0 for Control of Botrytis Fruit in Annual Strawberry, 2012

Researchers: Univ. of Florida, Wimauma, FL
Crop: Strawberry
Diseases: Botrytis Fruit Rot; (*Botrytis cinerea);* Strawberry Leak; (*Rhizopus* and *Mucor* spp)
Trial Location: Research Site, Wimauma, FL

OxiDate 2.0
Botrytis Fruit Rot in Strawberry, 2012

BioSafe Systems L.L.C.
The BioSecurity Company

Treatment:

1:100 OxiDate 2.0 + 0.125% non-ionic surfactant (Kinetic).

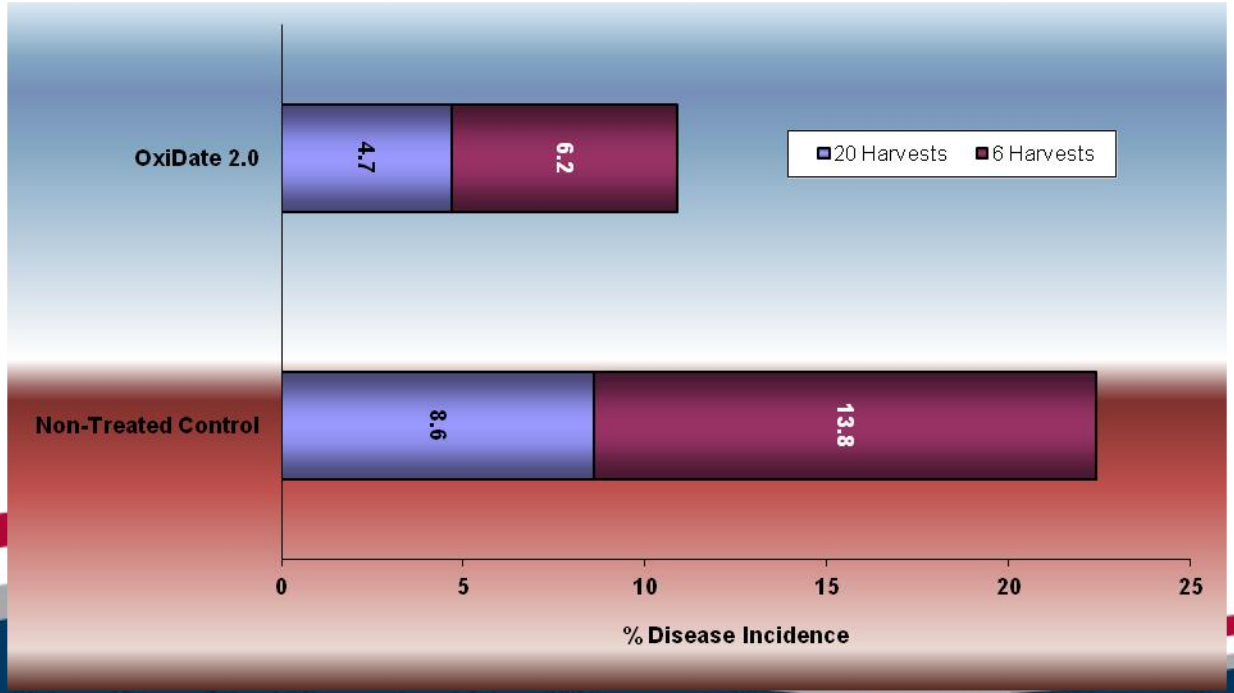
Applications:

- Spray interval- 7-28 days
- Total # of applications- 5 (Dec. 28, 2011-March 09, 2012)
- Spray Volume: 100 GPA

20 other treatments Included

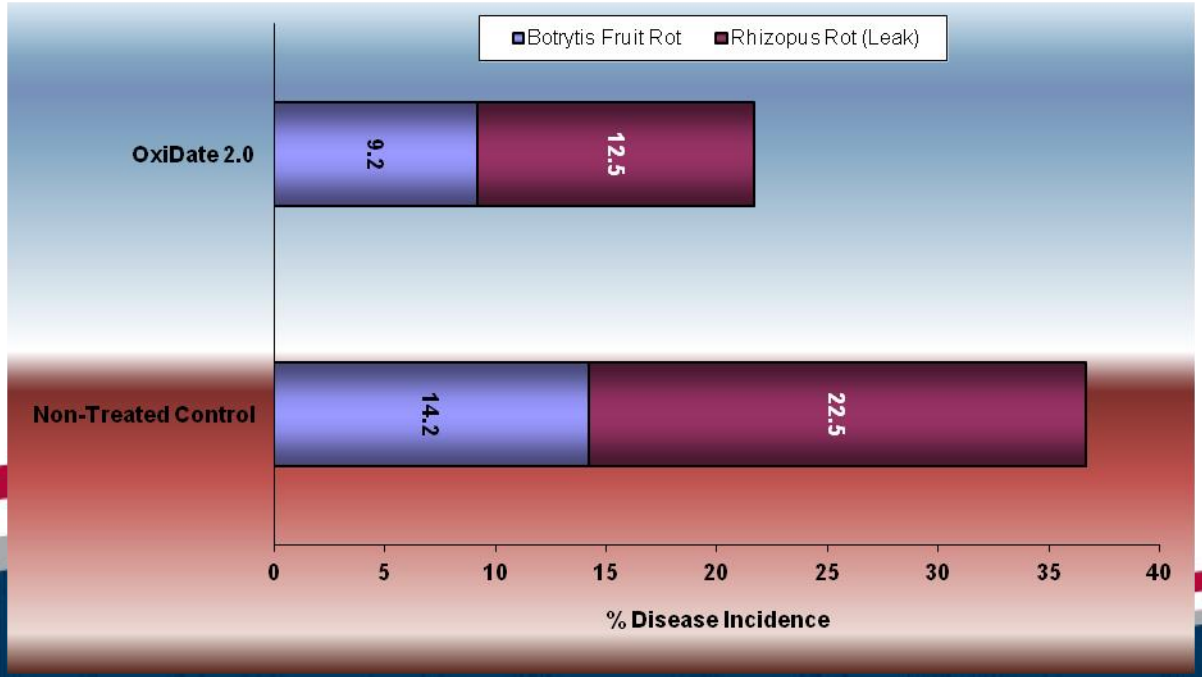
OxiDate 2.0 and Botrytis Fruit Rot

Pre-Harvest Botrytis Incidence



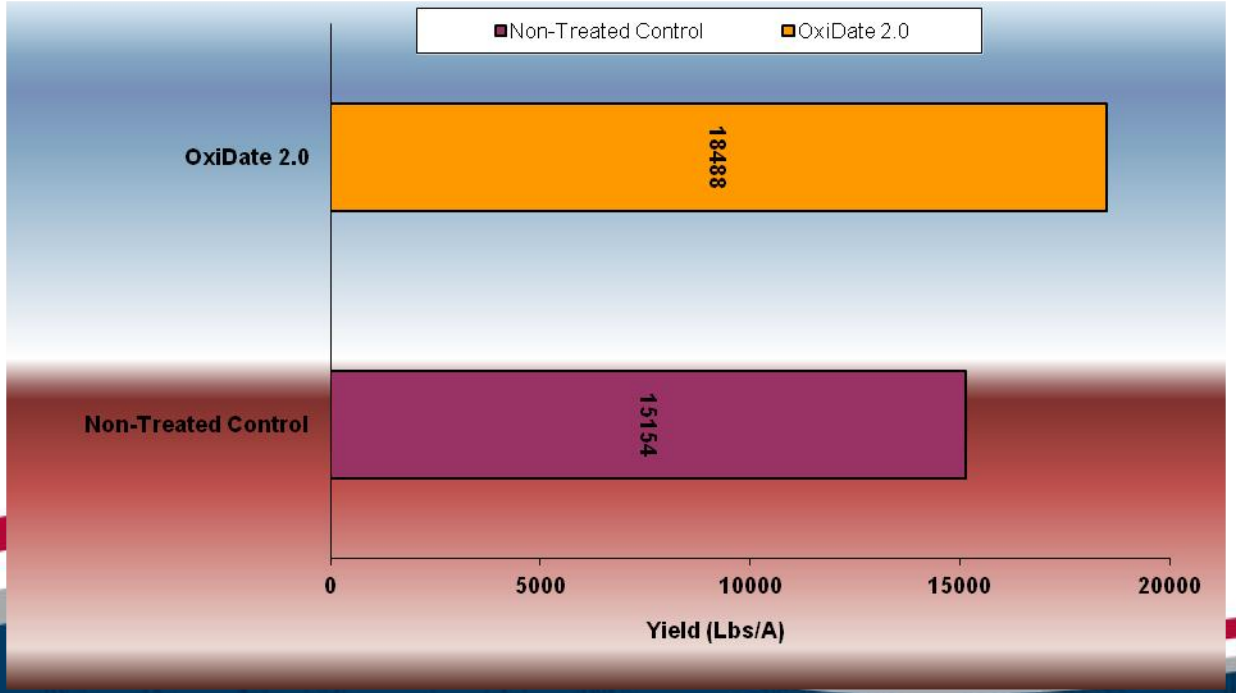
OxiDate 2.0 and Botrytis Fruit Rot

Post-Harvest Botrytis Fruit Rot and Rhizopus Leak Incidence



OxiDate 2.0 and Botrytis Fruit Rot

Total Marketable Yield



TerraClean 5.0

Broad Spectrum Bactericide/Fungicide

Penetrates soil and control pathogens such as *Pythium*, *Phytophthora*, *Fusarium*, *Verticillium* and *Rhizoctonia* on contact.

- EPA Registered
- Zero-Hour REI
- Easily Apply through drip tape for control of soil borne pathogens
- Apply at planting and during growing season to treat root zone
- Oxygenates root zone

BioSafe Systems L.L.C.
The BioSecurity Company

TerraClean 5.0-Application Program

Application Type	Rate (per application)	Application Timing
Drip	1.0-2.0 Gal/A	At planting/transplanting followed by application post-plant at 1-2 week interval up to 6-8 applications as needed

TerraClean 5.0

Broad Spectrum Bactericide/Fungicide

BioSafe Systems L.L.C.
The BioSecurity Company

Evaluation of TerraClean 5.0 for control of Phytophthora Crown Rot in Strawberries, 2010-11

Researcher: Univ. of Florida, Wimauma, FL.
Crop: Strawberry (*Fragaria* x *ananassa) var.* 'Florida Radiance'
Disease: Crown Rot (*Phytophthora cactorum)*
Trial Location: University of Florida, GCREC

TerraClean 5.0
Phytophthora Crown Rot in Strawberry, 2011

BioSafe Systems LLC
The BioSecurity Company

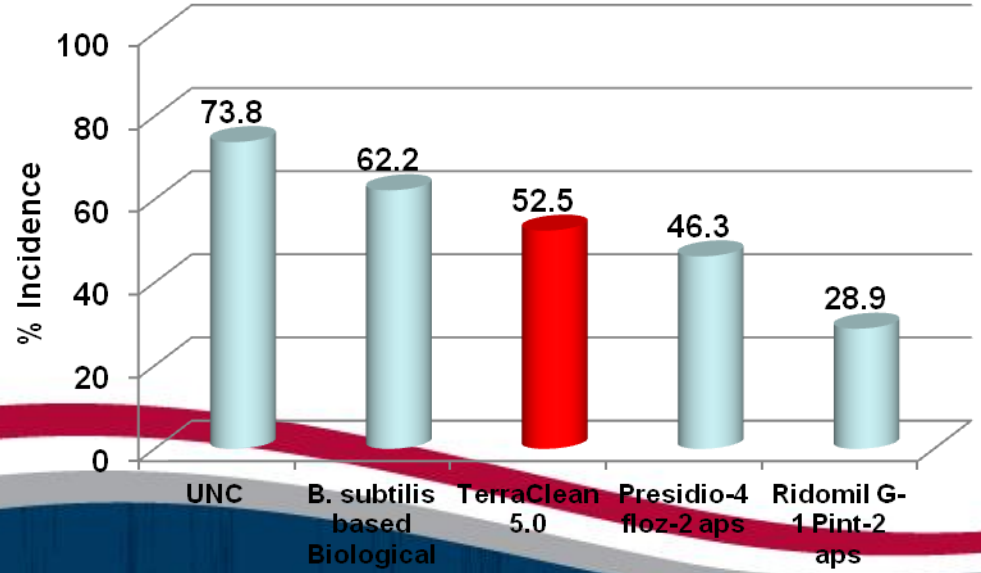
Treatments and Application

TerraClean 5.0 @1.0 and 2.0 Gal/A
# of applications-3

First application as post-planting drip at 14 DAP using 2 Gal/A followed by two applications at 38 and 52 DAP using 1 gal/A

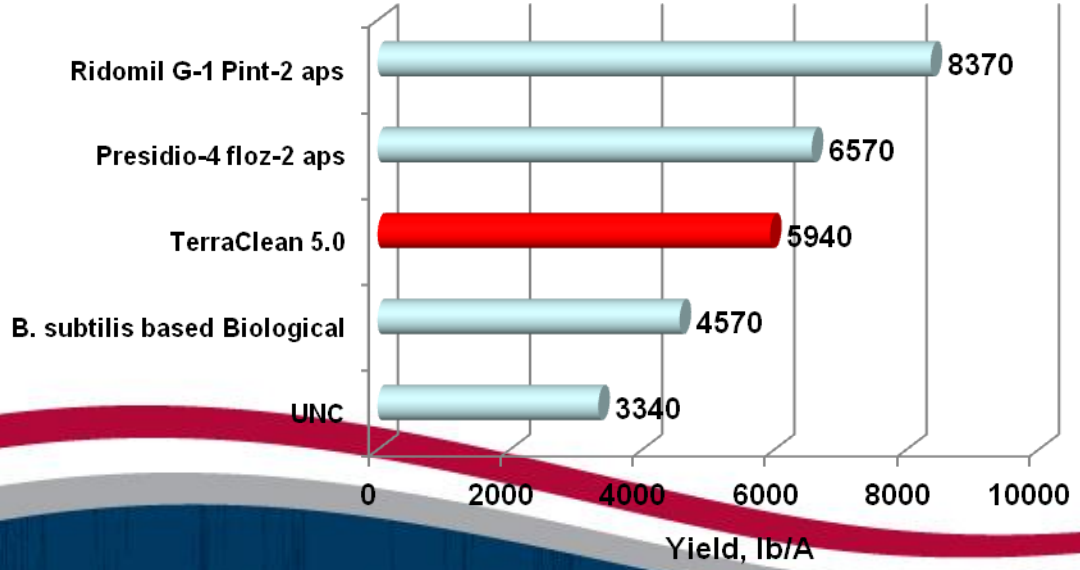
BioSafe Systems LLC
The BioSecurity Company

TerraClean 5.0
Phytophthora Crown Rot in Strawberry, 2011



TerraClean 5.0
Phytophthora Crown Rot in Strawberry, 2011

BioSafe Systems LLC
The BioSecurity Company



TerraClean 5.0

Broad Spectrum Bactericide/Fungicide

BioSafe Systems L.L.C.
The BioSecurity Company

Evaluation of TerraClean 5.0 for Charcoal Rot Control in Strawberries, 2012

Researcher: Univ. of Florida, Wimauma, FL.
Crop: Strawberry (*Fragaria* x *ananassa) var.* 'Strawberry Festival'
Disease: Charcoal Rot (*Macrophomina phaseolina*)
Trial Location: University of Florida, GCREC

TerraClean 5.0
Charcoal Rot in Strawberry, 2012

BioSafe Systems LLC
The BioSecurity Company

Treatments and Application

1. **Trt.1: TerraClean 5.0- 2 Gal/A (1 Application) followed by TerraClean 5.0- 1 Gal/A (5 Applications)**

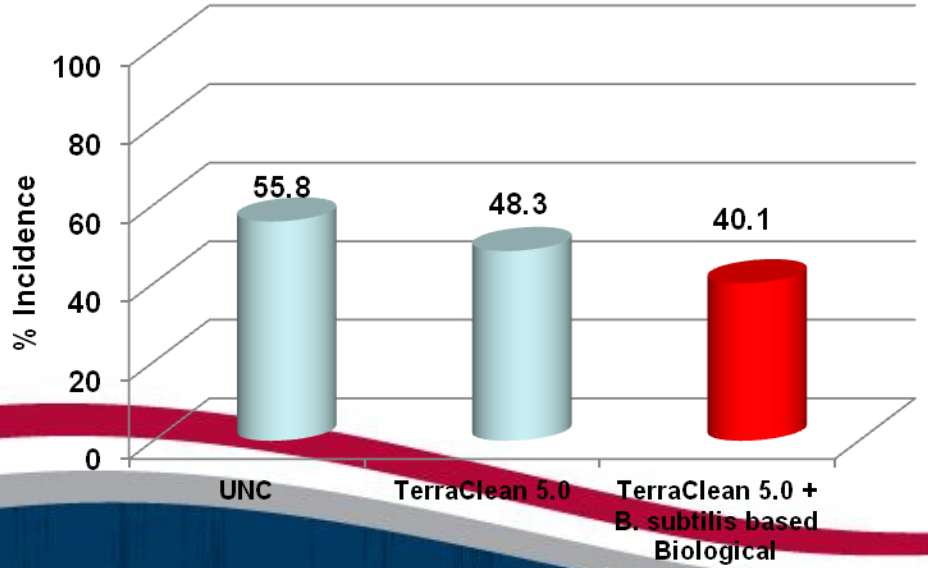
2. **Trt.2: TerraClean 5.0- 1-2 Gal/A + B. subtilis based Biological Fungicide- 4.0 qt/A (6 applications)**

Total 6 applications from Oct. 30, 2011-Mar.2, 2012

Products injected into drip irrigation in the last 25% of total water applied

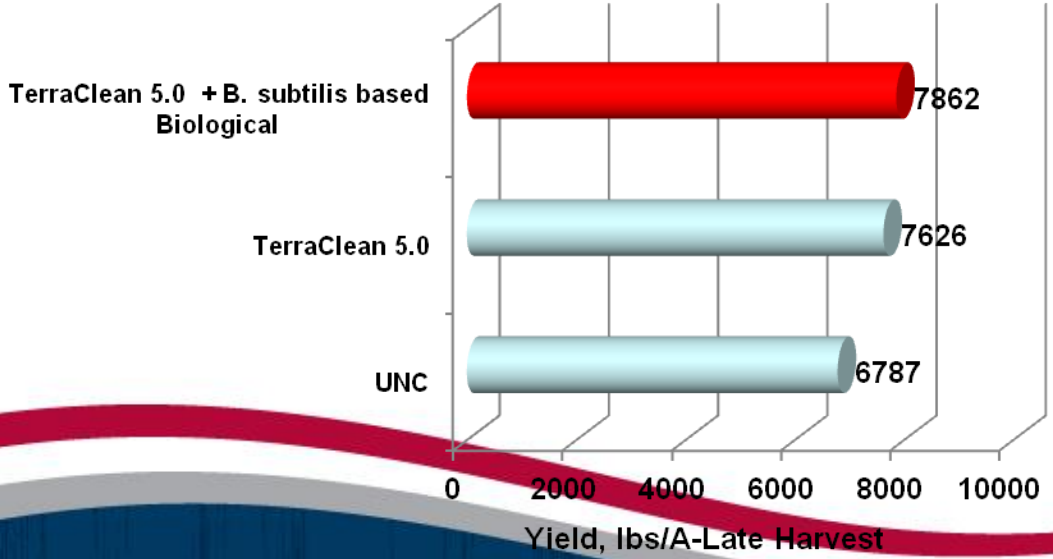
TerraClean 5.0
Charcoal Rot in Strawberry, 2012

Systems LLC
The BioSecurity Company



TerraClean 5.0
Charcoal Rot in Strawberry, 2012

BioSafe Systems LLC
The BioSecurity Company



AzaGuard

- Botanical Insecticide/Nematicide
- 3.0% Azadirachtin EC Formulation
- OMRI Approved
- Effective on a Variety of Insect Pests
- Indoor and Outdoor Uses (Field and Packing Houses)
- Environmentally Safe

AzaGuard

Insect Pests		
Aphids	Beetles	Worms (Bud, Cut, Army)
Fungus Gnats	Leaf Hoppers	Leaf Miners
Lepidopterans	Loopers	Mushroom flies
Saw Flies	Thrips	Whiteflies

Nematodes		
Root-Knot	Dagger	Golden

And more…

Azadirachtin-Mode of Action

- First Isolated in 1968
- Considered most bioactive ingredient in Neem
- Acts mainly as an insect growth regulator, anti-feedant and ovi-position (egg-laying) deterrent properties

AzaGuard

Botanical Insecticide/Nematicide

BioSafe Systems L.L.C.
The BioSecurity Company

AzaGuard for Lygus Bug Control in Strawberries, 2012

Researcher: UCCE, CA
Crop: Strawberries
Insect Pest: Lygus Bugs (*Lygus hesperus*)
Trial Location: Commercial Farm

AzaGuard
Lygus Bug Control in Strawberries, 2012

BioSafe Systems L.L.C.
The BioSecurity Company

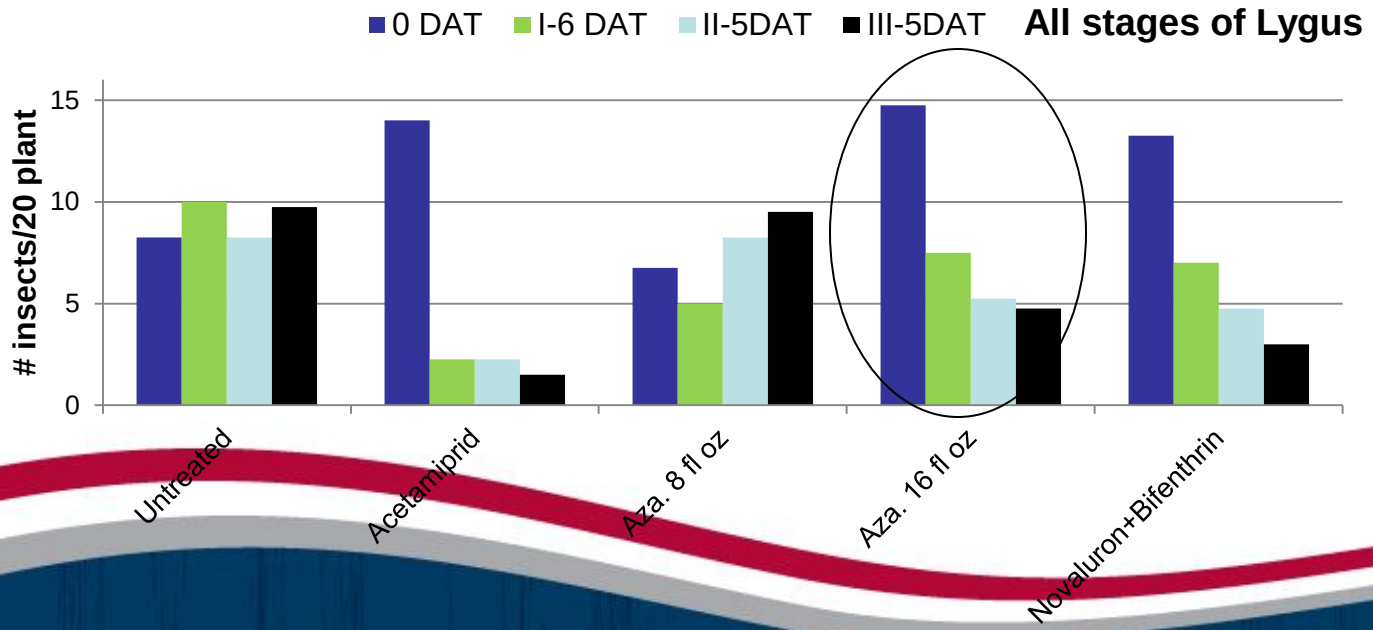
Treatments and Application

AzaGuard- 8.0 and 16.0 fl.oz per 100 gallons

Applications once a week
Total 3 applications
Spray to run off

2 other insecticide formulations evaluated in the trial

AzaGuard
Lygus Bug Control in Strawberries, 2012



AzaGuard

Botanical Insecticide/Nematicide

BioSafe Systems L.L.C.
The BioSecurity Company

IR-4 Trial with AzaGuard for Western Flower Thrip Control, 2012

Researcher: Michigan State University
Crop: Marigold; *Tagetes patula* L. 'Yellow Bonanza'
Insect Pest: Western Flower Thrips; *Frankliniella occidentalis (Pergande)*
Trial Location: Commercial Greenhouse

AzaGuard
Western Flower Thrips Control, 2012

BioSafe Systems L.L.C.
The BioSecurity Company

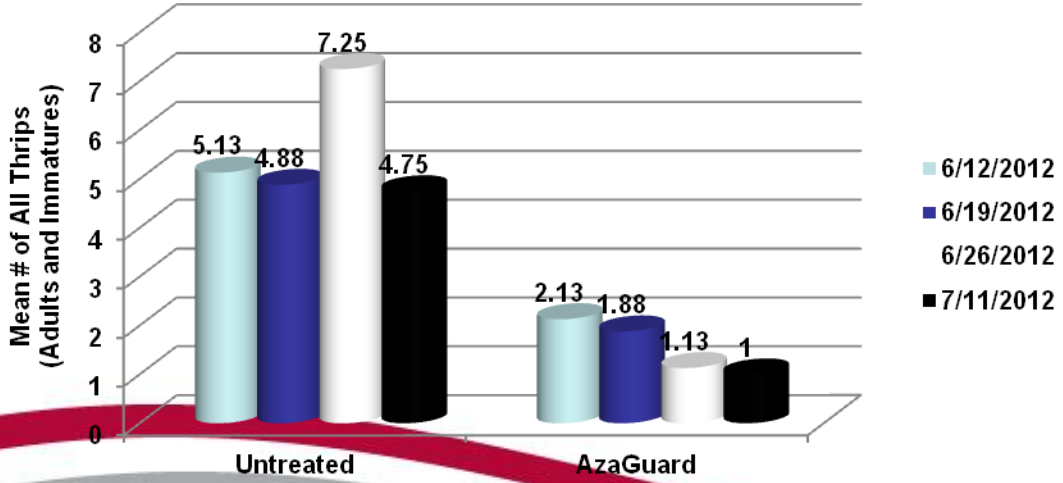
Treatments and Application

AzaGuard- 16.0 fl.oz per 100 gallons

Applications once a week
Total 4 applications (06/06/12-06/26/12)
Spray on foliage to run off

8 other insecticide formulations evaluated in the trial

AzaGuard on Western Flower Thrips Control, 2012



AXXE
Broad Spectrum Herbicide

BioSafe Systems L.L.C.
The BioSecurity Company

New Biorational Herbicide from BiosafeSystems

(**OMRI Approved for use in Non-Food Crops**)

AXXE

Broad Spectrum Herbicide

BioSafe Systems L.L.C.
The BioSecurity Company

- **Non –selective herbicide for Ag., commercial and residential use**
- **A.I. Ammonium Nonanoate- 40.0% (35% Pelargonic Acid)**

- **A contact spray control or burn down of annual and perennial weeds and grasses, moss and liverworts.**
- **Mode of Action: Disrupts plant tissue through cell wall penetration, resulting in cease of plant growth and brown necrosis.**
- **Non-volatile and water soluble**

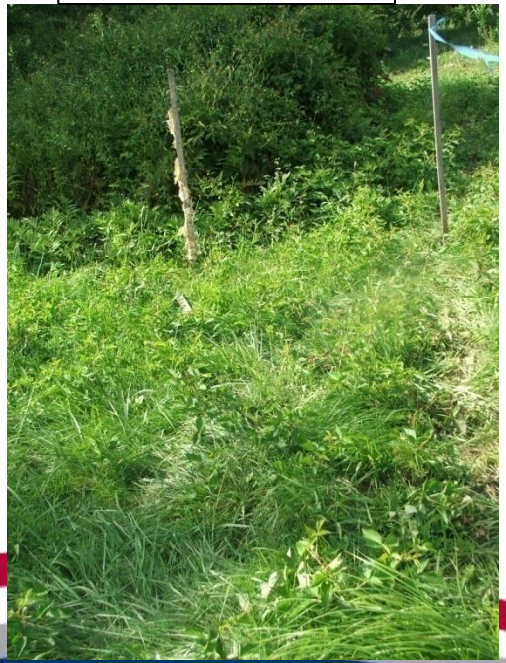
AXXE

Broad Spectrum Herbicide

BioSafe Systems L.L.C.
The BioSecurity Company

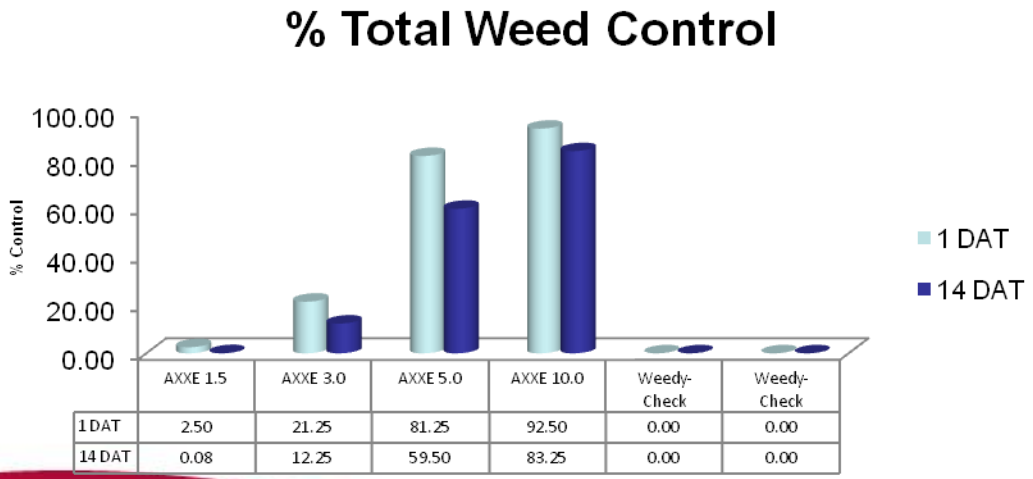
- **Application Rates- 3.0%-15.0% v/v**
- **6.0%-10.0% v/v commonly used**
- **Spray Volume- 30-125 Gallons per Acre**
- **45-75 GPA commonly used**
- **Rate and spray volume depend on weed species, height, leaf shape and weed density.**
- **Use method- Vegetative burn down, directed and shielded spray, pre-emergence spray and dormant/post-harvest sprays.**
- **Broad number of crop and non-crop groups.**
- **No aquatic applications**

Before AXXE



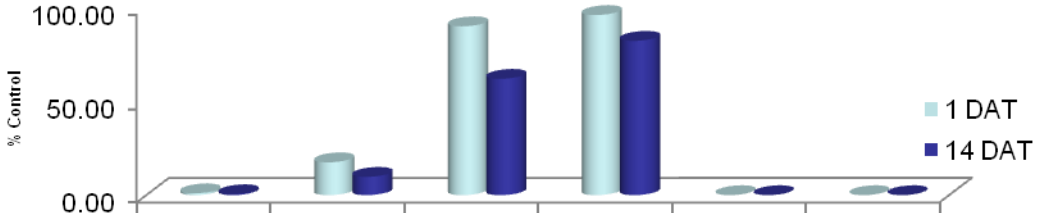
After AXXE

AXXE Weed Control, USDA-ARS-2011-12



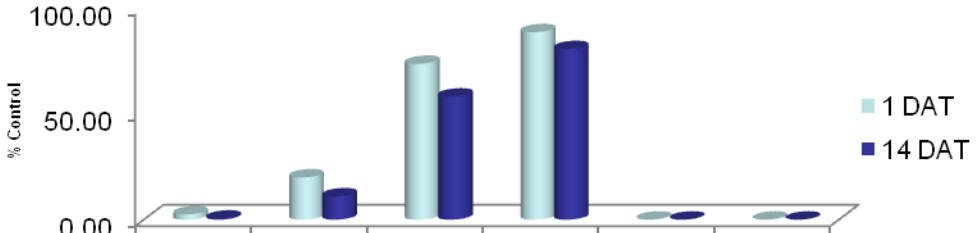
	AXXE 1.5	AXXE 3.0	AXXE 5.0	AXXE 10.0	Weedy-Check	Weedy-Check
1 DAT	2.50	21.25	81.25	92.50	0.00	0.00
14 DAT	0.08	12.25	59.50	83.25	0.00	0.00

% Broadleaf Weed Control



	AXXE 1.5	AXXE 3.0	AXXE 5.0	AXXE 10.0	Weedy-Check	Weedy-Check
1 DAT	1.00	17.50	90.00	96.00	0.00	0.00
14 DAT	0.50	9.75	62.00	82.25	0.00	0.00

% Grass Weed Control



	AXXE1.5	AXXE3.0	AXXE5.0	AXXE10.0	Weedy-Check	Weedy-Check
1 DAT	2.50	20.00	73.75	88.75	0.00	0.00
14 DAT	0.50	11.00	58.25	80.75	0.00	0.00

BioSafe Systems LLC
The BioSecurity Company

Thank You

From BioSafe Systems, LLC

Disease and Insect Pictures in the Presentation Courtesy: Online-Used for Educational Purpose Only

22 Meadow Street East Hartford, CT 06109
1.888.273.3088 (toll-free) • www.biosafesystems.com