



Efficacy of SERENADE® on Grape (Chardonnay) Powdery Mildew, Bunch Rot, Sour Rot (Yolo County, CA - 1999)



Untreated

Serenade

- Selling in US, Chile, Mexico, Costa Rica, Japan, Philippines, Guatemala, Honduras, New Zealand, Israel, Switzerland; Pending EU, Argentina
- No performance failures after >2 million pounds sold
- No significant grower complaints
- +80% conversion from demo to sale

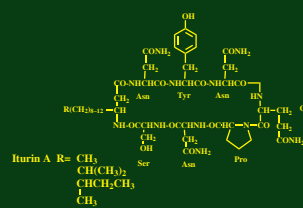
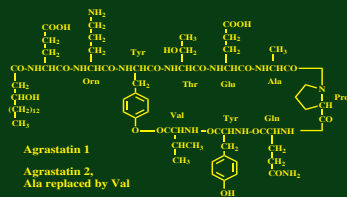
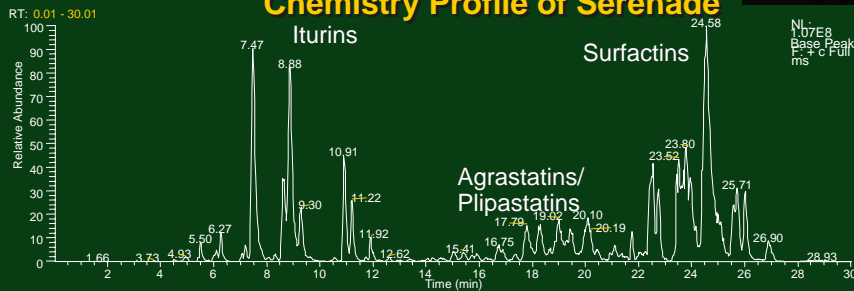


## Unique Combination of Lipopeptides

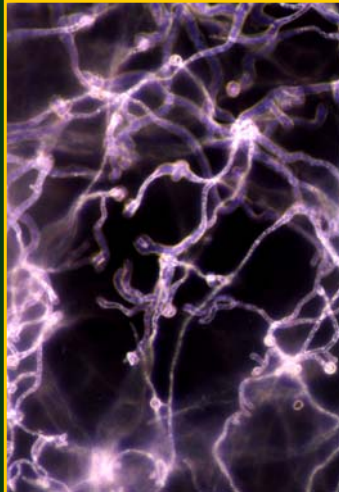


2003 Presidential Green Chemistry Award Winner

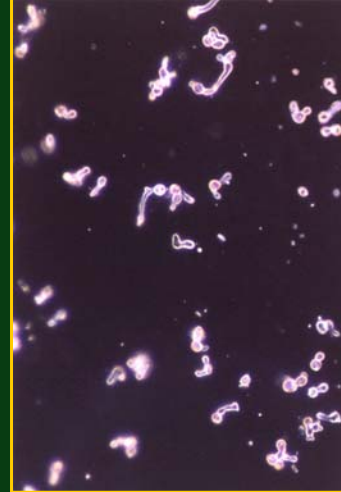
### Chemistry Profile of Serenade



**Botrytis Gray Mold 0% inhibition: Iturins 10ppm or Agrastatins 50ppm**



**Botrytis Gray Mold 90% inhibition Iturins 10ppm + Agrastatins 2.5ppm**



The lipopeptide compounds in Serenade synergize each other but are not active alone



## Serenade Makes Chemical Programs Better

- 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 mancozeb
- Beans: 2lbs Serenade + 1-2 lbs Topsin
- Apples: reduce Captan in scab program
- Lower rate of sulfur on all crops



## Serenade as a resistance management tool

A major banana company has observed that farms that applied Serenade 20 times a year in a program for sigatoka control had higher strobilurin susceptibility than farms that applied Serenade only 6-8 times in a year.



## Product Line Extensions



- Rhapsody® for disease control of ornamentals: commercial growers of flowers, foliage and bedding plants, trees
- Great for resistance management



- 'Serenade Garden' 24 oz Ready to Use in ~800 stores 2004
- New category - first certified organic pesticide in Wal-Mart
- Small revenue for W-M but growth rate higher than conventional products



## Arabesque™ BioFumigant

***Muscodor albus***,  
a new fungal species

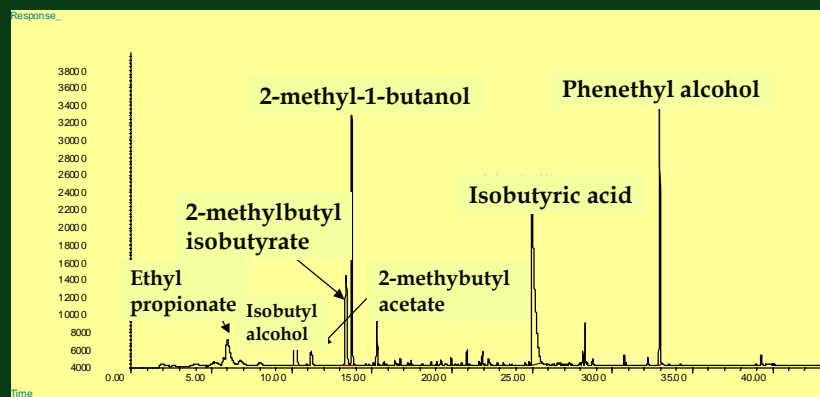
Fungus isolated from  
cinnamon tree bark,  
Honduras

Stops and kills a range of  
molds, bacteria, insects,  
nematodes

Produces a mixture of >20  
volatile (gaseous)  
compounds



## GC trace of volatile natural products produced by *Muscodor albus*



### Arabesque™ BioFumigant Controls Fruit Rots (and many other molds and bacteria, including human pathogens *E.coli*, *Salmonella* and others)

Untreated



Treated

*Muscodor  
albus*

Untreated



Treated



### Control of Tomato and Pepper Soil Diseases

- L: Soil mixed with *M. albus* and *Rhizoctonia*
- R: Soil mixed with *Rhizoctonia* only
- 40 days after transplanting



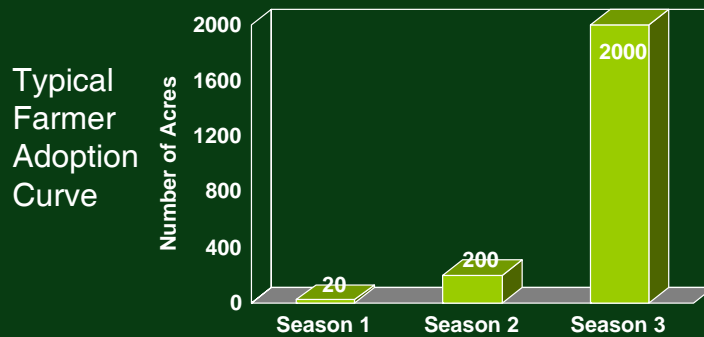
## AgraQuest's Pipeline

Approval Timeline	Serenade®	Rhapsody® Biotune® Serenade® Garden	Sonata®	Ballad™ Arabesque™ Virtuoso™
	2000	2003	2004	2005
■ Serenade Biofungicide:		Fruit, nut, veg diseases		
■ Serenade Garden:		Garden plant diseases		
■ Rhapsody Biofungicide:		Ornamental diseases		
■ Biotune Adjuvant:		Enhances biopesticides		
■ Sonata Biofungicide:		Downy & powdery mildews		
■ Ballad Biofungicide:		Rusts in soybeans, cereals, legumes		
■ Arabesque Biofumigant:		Molds, insects, nematodes		
■ Virtuoso Bioinsecticide:		Caterpillars, flies, mites		



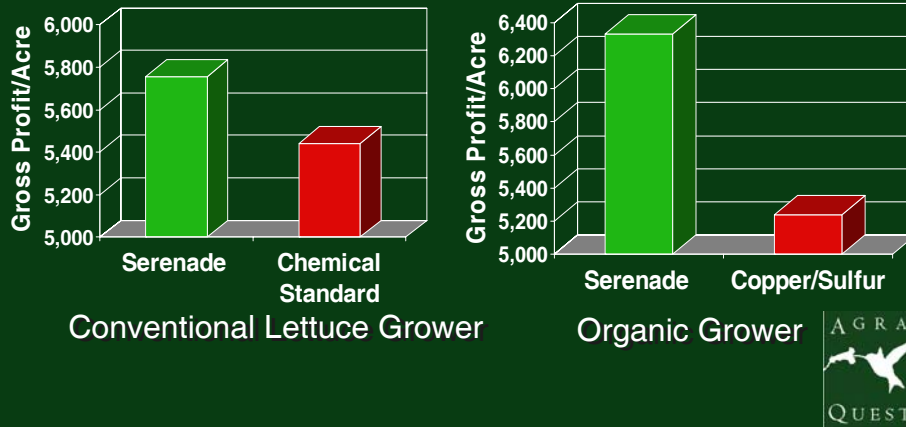
## Criteria for Successful Product Adoption

- Number 1 - Does it work? (as well or better than existing chemical pesticides)
- Number 2 - What does it cost?
- Number 3 - What other benefits are there? Is it safer?



## The Value Proposition

- Growers can increase profits while increasing food and worker safety, reducing environmental impact, with protection right up until harvest



## Main Reasons Biopesticides Used (from 2003 BPIA Market Survey)

<u>Reason</u>	<u>CA PCA</u>	<u>FL Distributor</u>	<u>CA Grower</u>	<u>FL Grower</u>	<u>Golf Supt.</u>
<u>Volunteered</u>					
Environmentally Safe:	30%	46%	43%	30%	75%
Operator Safety:	23%	29%	20%	23%	15%
Product Efficacy:	17%	29%	17%	13%	5%
More Natural/Safe:	10%	11%	10%	13%	15%
Public Perception:	9%	--	3%	7%	13%
Organic Farming:	13%	--	--	3%	--



### Main Reasons Biopesticides **Not** Used (from 2003 BPIA Market Survey)

<u>Reason</u> <u>Volunteered</u>	<u>CA PCA</u>	<u>FL</u> <u>Distributor</u>	<u>CA</u> <u>Grower</u>	<u>FL</u> <u>Grower</u>	<u>Golf</u> <u>Supt.</u>
Not as Effective:	44%	50%	27%	13%	30%
Higher Cost:	46%	36%	23%	23%	30%
Lack of Awareness:	14%	29%	47%	47%	43%
Old Habits:	4%	--	13%	10%	10%
Lack of Research:	6%	7%	--	7%	15%



### Biopesticides will play a role in the Future of California Agriculture

- Consumers and global trade are driving agriculture to more benign products
- Adoption may be faster outside the US
- There are many more new biopesticide AIs waiting approval than traditional products
- There is a gap between land grant university research and on-farm usage [researchers test stand-alone; farmers use tank mixes and rotational programs]
- On-farm demos with emphasis on IPM programs can bridge the gap
- Farmers need more information about these new products

