



Science For A Better Life

# BCS Biologics Product Overviews

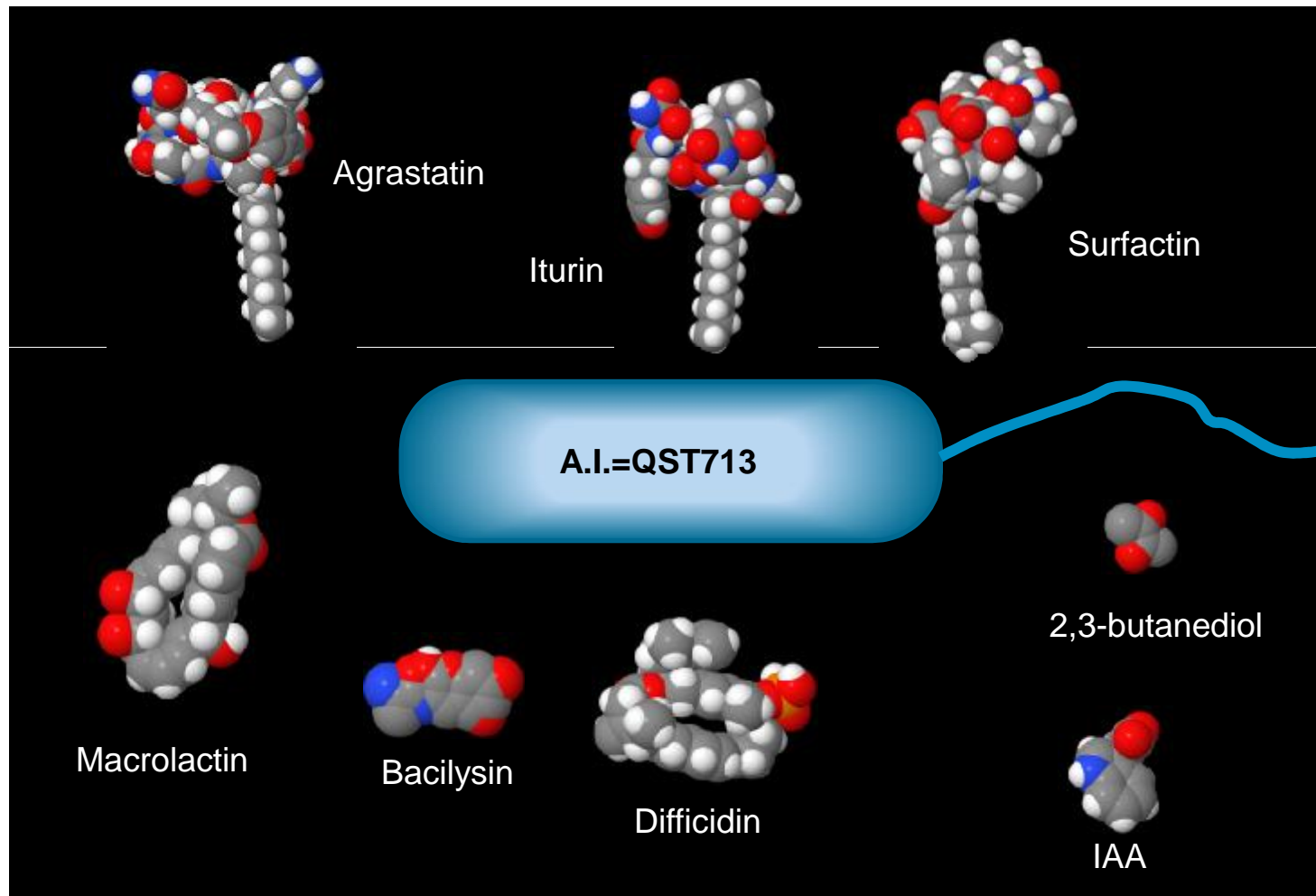
Glen Crowe  
Technical Sales Specialist



## Why Biologics?

- Resistance Management Benefits
- Residue management benefits
- Enhanced yield and crop quality
- Labor management benefits
- Enhanced control with conventional chemistry

# Understanding natural products chemistry





# Serenade Performance Drivers - Foliar

		Foliar Products
Chemistry delivered in the jug	Anti-fungal lipopeptide chemistry	XXX
	Anti-bacterial chemistry	XXX
	Chemistry-mediated induced response	XXX
Physical barrier to pests		X



# Mode of action of Lipopeptide chemistry



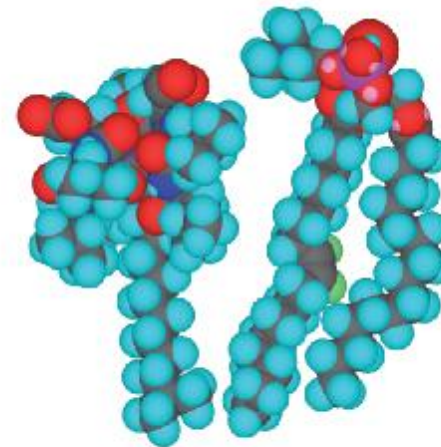
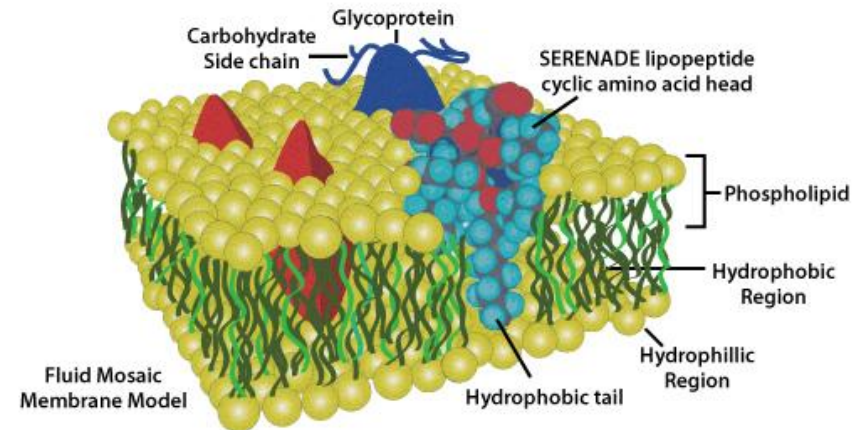
Cell membrane is a sandwich with water soluble outside and greasy middle

Lipopeptides are small protein rings with a lipid (fat) attached

One end is negatively charged, the other is “greasy”

Lipopeptides insert into membrane and create small holes

## Lipopeptides in SERENADE physically disrupt the membrane

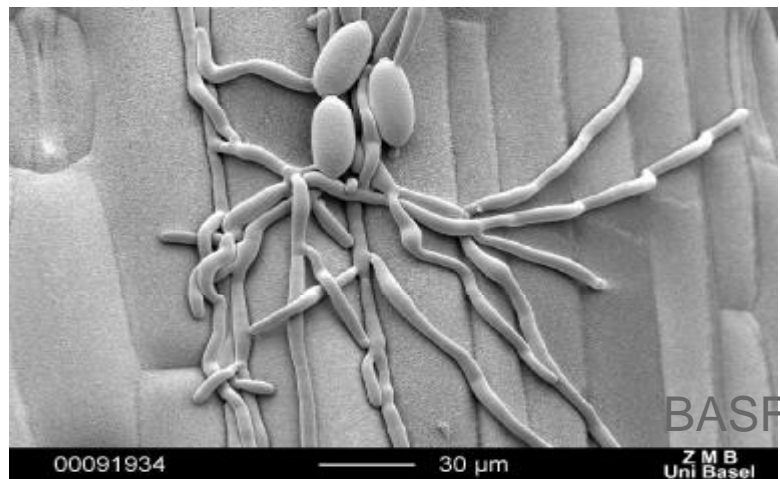


Schematical illustration of the lipopeptide surfactin (left) and the lipid POPC (right).



# Lipopeptides Disrupt Cell Membranes

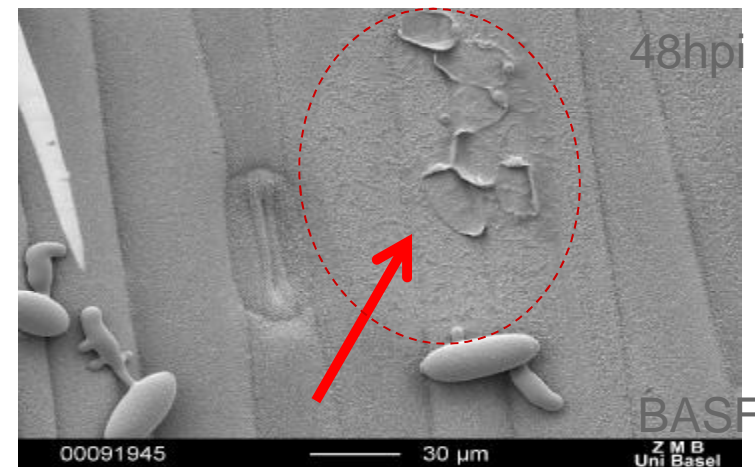
Untreated control 48 hpi with *Blumeria graminis*



Germination and massive proliferation of *B. Graminis* after 48H.

BASF pictures

Inoculation of *B. graminis* 12h after application with Serenade®



Spores in contact with the Serenade® film do not germinate



# Foliar Products – Next Generation



Concentrated wettable powder

26.2% ai

$1.31 \times 10^{10}$  CFU/g

shelf stable for 5 years

widely tank mix and rotation compatible

**Improvements over previous formulations:**

- New formulation makes anti-fungal and anti-bacterial chemistry more bio-available
- Improved spectrum and levels of control
- Reduced dustiness and deposit



# Serenade Performance Drivers - Soil

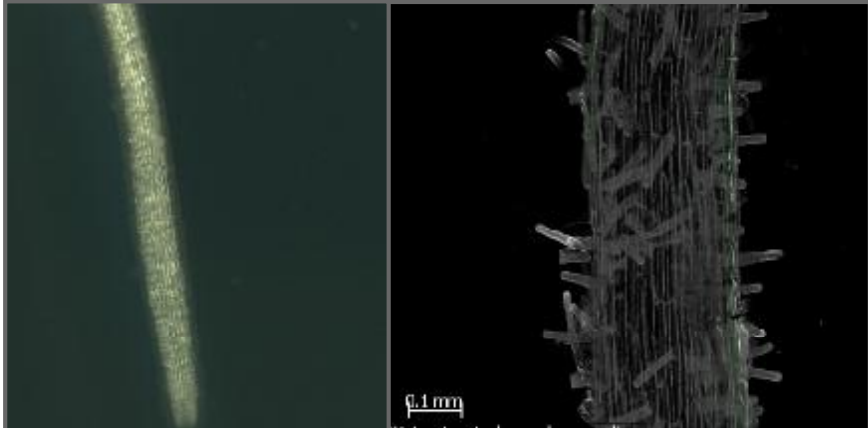
		Foliar Products	Soil Products
Chemistry delivered in the jug	Anti-fungal lipopeptide chemistry	XXX	Contact control of pathogens in a treated volume of soil
	Anti-bacterial chemistry	XXX	
	Chemistry-mediated induced response	XXX	XXX
Physical barrier to pests		X	XXX
Chemistry resulting from root colonization	Chemistries driving stress resistance		XXX
	Chemistries impacting nutrient solubilization		XXX
	Chemistries regulating efficiency of plant processes like photosynthesis		XXX



As SERENADE SOIL colonizes the root, it builds a dense barrier protecting it



Untreated water control

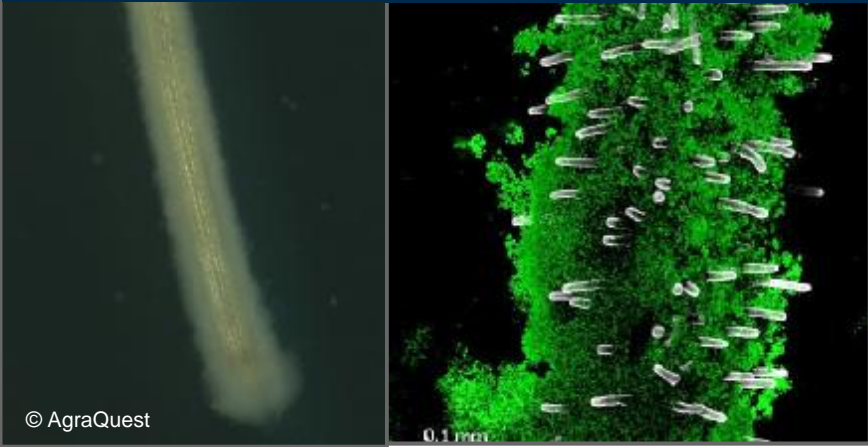


Untreated roots stand "naked" to potential attack by soil diseases

Digital Microscopy

Fluorescence Microscopy

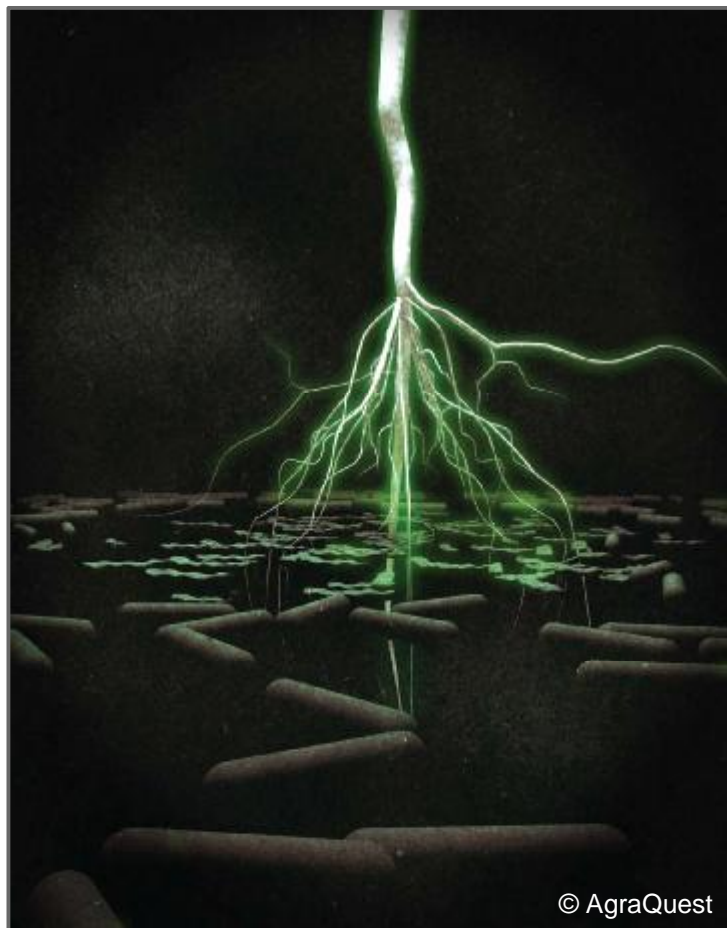
SERENADE SOIL



SERENADE SOIL builds a dense barrier around the root, including the tip, and grows with the plant as the plant grows

© AgraQuest

# SERENADE SOIL protection grows as the roots grow



SERENADE SOIL treats the soil area, but in addition it colonizes the roots, developing a protective armor that protects roots from soil diseases – even at the tip.

***As the root grows, SERENADE SOIL grows with it providing protection against pathogens beyond the treated soil area***

# Effects of Serenade SOIL are broad-spectrum



Crop	Rhizoctonia	Pythium	Fusarium	Verticillium	Phytophthora	Sclerotinia	Streptomyces scabies	Sclerotium rolfsii	Phoma	Likely Expansion
Cucurbits	I	I	I	I	I					
Fruiting Vegetables	I	I	I	I	I			I		
Legumes	I	I	I	I	I	I				
Peanuts	I	I	I	I	I	I		I		Cylindrocladium black rot
Root and tubers	I	I	I	I	I		I			Storage disease claims
Cereals	I	I	I	I	I					
Brassicas	I					p				
Leafy Vegetables	I			I		I				
Citrus		I			I					
Strawberries			p	I						
Bulb vegetables			p	p	p				I	

I Proven Use

p Future Expansion



# SONATA Fungicide

Based on the active ingredient *Bacillus pumilus* QST 2808

Foliar fungicide for the management of Rust, Mildew, Blight, *Alternaria* and *Cercospora*

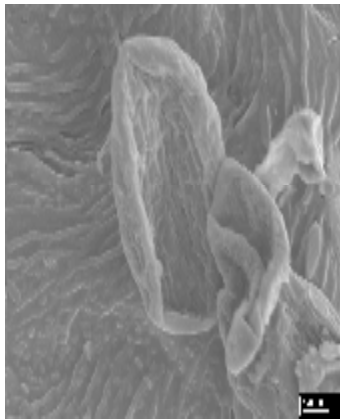
## GROWER BENEFITS

- MRL exemption
- Short REI (4 hours) and PHI (0 days)
- Beneficials safety
- Novel Mode of Action
- Can be applied through Chemigation and Aerial application
- Compatible with wide range of other pesticides and fertilizers
- Contact disease control, growth promotion, induced resistance and yield enhancement
- Compatibility with Strobilurins at low rates.
- Aqueous formulation with 2 year storage stability



# SONATA - Modes of Action

1. Antifungal amino sugars present in SONATA compete with the enzyme that uses glucose to build new pathogen cell walls.



Results in:

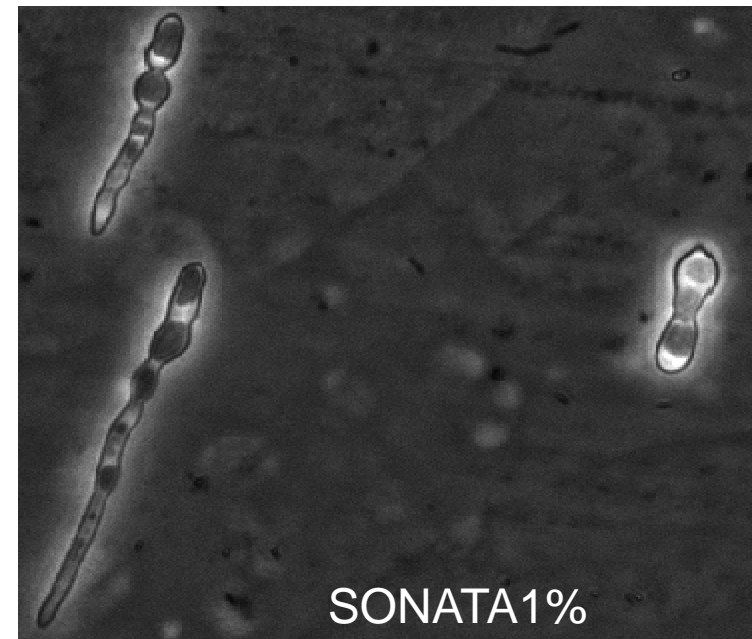
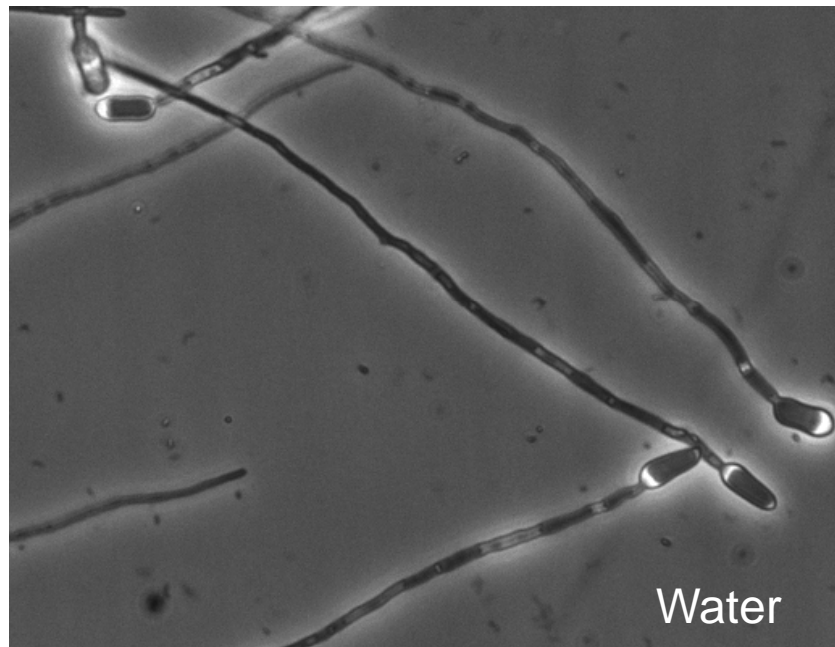
- Inhibition of septum formation
- Inhibition of cell wall formation
- Destruction of cell integrity
- Cell death

2. Activate the plant's defenses
3. Promotes plant growth





# SONATA - Kills Germinating Spores



Morphological changes in early growth of *Colletotrichum* spores (anthracnose) in liquid culture.