

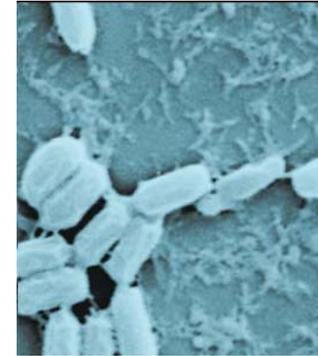
SERENADE®: **Pre-harvest Applications for Post-harvest Disease Control in Fruit Crops**

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- ***SERENADE*** is a Bio Fungicide/Bactericide based on *Bacillus subtilis* **Strain QST 713**
- Naturally Occurring Rod-shaped, Gram Positive, Aerobic, Motile Bacterium
- No Genetic Modifications
- Unique – Patented *Bacillus* Strain
- US - EPA Registration – July 2000
- **EU Annex 1 Inclusion – July 2006**
- Now Registered > 20 Countries

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Positioning

- Effective “Non-Chemical” Option for Disease Control Programs
- Broad Spectrum Disease Control – Fungal and Bacterial Pathogens
- Tank mix and Rotation with Chemicals
- Resistance Management tool
- Exempt From Tolerance: no residues
- Not toxic to Non-target Organisms - (*Honeybees, Lady Beetles, Lacewings, Parasitic Wasps and Earthworms*)
- Safe to Workers / Environment
- 0-Day PHI
- Late Season, Pre-Harvest Option / No Residues

Features

- Integrated Pest Management
- “Less Chem” / Sustainable / Organic Production
- Pre Harvest Application for Post Harvest Disease control

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Pre-Harvest / Post-Harvest Disease Control

- *In-vitro* activity against key post-harvest pathogens
- Post-harvest efficacy from pre-harvest applications
observed by growers in commercial use
- Exempt from tolerance / 0-Day PHI
- Minimal risk for resistance development
- Late season, pre-harvest option / no residues

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Post-Harvest Disease Control

Few Synthetic Post-Harvest Tools Available

- Pathogen resistance to existing products
- Loss to re-registration and regulatory actions
- Not a priority for conventional pesticide manufacturers
- Increased consumer demand for pesticide-free fruit and vegetables
- Retail initiatives to eliminate synthetic post-harvest treatments, the largest contributor to residues

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Pre-Harvest / Post-Harvest Disease Control

Field Program

Studies in **grapes**, **peaches** and **blueberries** to evaluate pre-harvest applications for post-harvest disease control

- Small-plot / semi-commercial trials
- Applications at or immediately prior to harvest
- Fruit sampled, stored and evaluated at various intervals
- Assessments: % infected fruit, quality parameters

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TABLE GRAPE

Target pathogen – *Botrytis cinerea*

B. subtilis, 2 doses, applied at maturity, fruit sampled 1 day after treatment, stored at 0 °C

At each interval, fruit placed at 6 °C for 2 days, evaluated for % infected berries and quality

Commercial standard - SO₂ generator pad placed in box

Evaluation Interval	Treatment	Grape Cluster		Botrytis Rot
		% Removed Berries	% Rachis Browning	# Infected Berries
30	SO ₂	0 a	16 b	1 b
	B.s. 1 kg/ha	0 a	50 ab	2 a
	B.s. 2 kg/ha	0 a	84 a	2 ab
60	SO ₂	0 a	34 a	1 b
	B.s. 1 kg/ha	1 a	34 a	6 a
	B.s. 2 kg/ha	0 a	50 a	2 b

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PEACHES

Target pathogen – *Monolinia fruticola*

B. subtilis, 9.35 liters (AS) and 2.24 kg/ha (WP) applied at fruit maturity

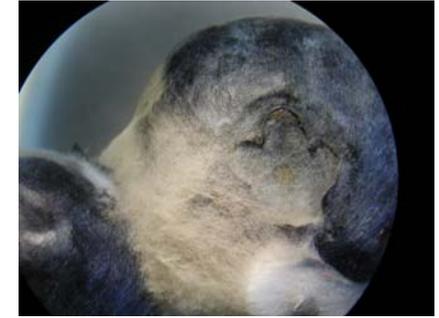
Fruit sampled after treatment dried, inoculated with *M. fruticola* spores, stored at RT

Evaluated at intervals over 7 days

Commercial standard – tebuconazole

		Peaches					
		Cumulative No. of Infected Fruit / Days After Harvest					
Treatment		2	3	4	5	6	7
<i>B. subtilis</i>	WP	2.5 b	7.8 b	11.0 ab	12.8 a	14.8 a	15.0 a
<i>B. subtilis</i>	AS	3.0 b	5.8 b	8.3 b	10.5 a	12.3 a	12.8 a
Tebuconazole		2.5 b	5.5 b	7.5 b	9.3 a	11.5 a	13.0 a
Untreated		6.3 a	11.5 a	14.3 a	15.0 a	16.8 a	17.0 a

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BLUEBERRIES

Target pathogen – *Alternaria tenuissima*

0.30 % solution applied at fruit maturity

Fruit sampled 2 hours after treatment, stored at 0 °C

At each interval, fruits placed at RT for 7 days, evaluated for % infected berries

Commercial standard – SO₂ fumigation

Treatment	Blueberries			
	% Infected Fruit / Days after Harvest (<i>A. tenuissima</i>)			
	10	20	30	40
Water Control	36 a	31 a	66 a	66 a
SO ₂ Fumigation	28 b	29 a	45 b	36 b
<i>B. subtilis</i> QST 713 0.30 %	18 c	11 b	27 c	16 c

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Pre-Harvest / Post-Harvest Disease Control

Field Program Summary

- Documented efficacy for pre-harvest applications against post-harvest pathogens of
 - Grapes (*Botrytis cinerea*)
 - Peaches (*Monilinia fructicola*)
 - Blueberries (*Alternaria tenuissima*)
- No adverse effects observed on fruits
- *SERENADE* has demonstrated potential as a tool in post-harvest disease control programs

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THANKS FOR YOUR ATTENTION

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