



# The Use of Serenade MAX® to Control Summer Diseases of Apples in the Eastern U. S.

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## Introduction

Serenade (*Bacillus subtilis*, strain 713) which was discovered, developed and marketed by AgraQuest, is a broad spectrum fungicide/bactericide that controls or suppresses a wide array of fungal and bacterial pathogens. The active organism in Serenade produces a number of different secondary metabolites that control plant pathogens by attacking the cell wall. Serenade is non-phytotoxic, and is very safe for beneficial and non-target organisms. The proven efficacy of Serenade, along with its safety to crops, humans and the environment provide growers with a tool to address many production and food export issues. The use of Serenade complies with both OMRI and NOP standards.

Serenade has been shown to control a number of different foliar pathogens of apples, most notably the bloom and shoot phases of fire blight (*Erwinia amylovora*) and powdery mildew (*Podosphaera leucotricha*). Extensive collaborative research with University and private researchers continues to define the role of Serenade in integrated disease management programs in apples. It can be used with a number of other fungicides in programs to control various apple disease pathogens.

This poster will discuss results of trials using Serenade MAX to control different summer apple diseases when used either alone or in programs with other fungicides during the cover spray period. All trials were conducted under commercially accepted agronomic practices of the trial growing area.



Figures from left to right- Fire blight, flyspeck, bitter rot, sooty blotch, apple scab. (Pictures by permission Norman Lalancette, Rutgers University)

Figure 1-Serenade MAX  
Against Cedar Apple Rust in Apples (K. Yoder, Virginia Tech, Winchester, VA - 2005)

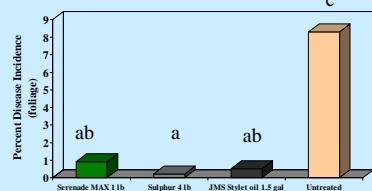
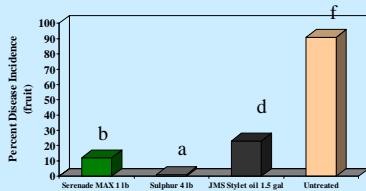


Figure 2-Serenade MAX  
Against Flyspeck in Apples (K. Yoder, Virginia Tech, Winchester, VA - 2005)



## Materials and Methods

**Yoder Virginia Trial-** Six year old Jonagold trees were treated with a handgun starting at pink until 7<sup>th</sup> cover for a total of 10 applications at 14 day intervals. Biotume surfactant at 12 oz/acre was added to all Serenade treatments. Means followed by the same letter are NSD (P=0.05, Waller-Duncan K ratio).

**Palmer New York Trial-** Twelve year old Cortland trees were treated with a handgun starting at petal fall until 3<sup>rd</sup> cover for a total of 4 applications at 14-21 day intervals. Biotume surfactant at 13 oz/acre was added to all Serenade treatments and Captan at 2.5 lb/acre was added to all treatments and all timings. Means followed by the same letter are NSD (P=0.1, Student-Newman-Keuls).

**Turecheck New York Trial-** Nine year old Empire trees were treated with a handgun starting at bloom through fifth cover for a total of 6 applications. Biotume surfactant at 1 pt/acre was added to all Serenade treatments and Captan 0.8 lb/acre was added to all treatments and all timings. Means followed by the same letter are NSD (P=0.05).

Diseases were evaluated through the season and at harvest on the foliage and fruit.

## Disease Spectrum

Powdery mildew	<i>Podosphaera leucotricha</i>
Apple scab	<i>Venturia inaequalis</i>
Cedar-apple rust	<i>Gymnosporangium juniperi-virginianae</i>
Sooty blotch	(Various organisms, disease complex)
Flyspeck	<i>Zygomphala jamaicensis</i>
Bitter rot	<i>Colletotrichum spp.</i>
Bot rot	<i>Botryosphaeria dothidea</i>
Brooks spot	<i>Mycosphaerella pomi</i>

## Results and Discussion

**Yoder Virginia trial-** Serenade MAX at 12 ounces per acre with Biotume when used in continuous cover sprays provided excellent control of cedar-apple rust, flyspeck, sooty blotch, Brooks spot, and powdery mildew, under lower to high disease pressure (disease dependent), and results were comparable to other organic and reduced input biocontrol agents. Growers should be encouraged to use Serenade in a program with other fungicides during the cover spray period to reduce resistance development and increase the product array effectiveness.

**Palmer New York trial-** Serenade MAX at 3 lbs per acre with Biotume when alternated with one application of Flint during the cover spray period provided excellent control of flyspeck and sooty blotch. Results were comparable to the conventional grower standard program.

**Turecheck New York trial-** Serenade WPO at 2 lbs per acre with Biotume three applications when alternated with one application of Flint during the cover spray period provided excellent control of apple scab under high disease pressure. Results were comparable to the conventional grower standard program.

AgraQuest's Serenade MAX, based on unique strain of *Bacillus subtilis*, has utility well beyond organic apple production. When used in conjunction with synthetic fungicides and other biologically based pesticides, whether in tank-mixes or in rotations, it provides growers with an effective tool not only for fire blight in the bloom period, but also for summer cover spray disease management. Serenade has the added benefits of high levels of crop, human and environmental safety, a unique mode of action for resistance management, and plant and beneficial organism safety for use in IPM systems.



Figure 4-Serenade MAX  
Against Brooks Spot in Apples (K. Yoder, Virginia Tech, Winchester, VA - 2005)

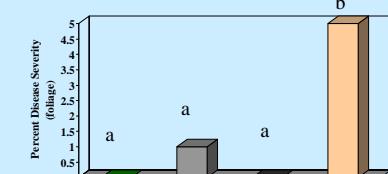


Figure 3-Serenade MAX  
Against Sooty Blotch in Apples (K. Yoder, Virginia Tech, Winchester, VA - 2005)

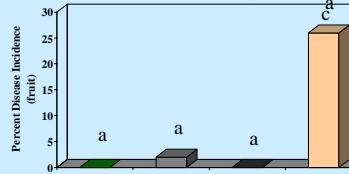


Figure 5-Serenade MAX  
Against Powdery Mildew in Apples (K. Yoder, Virginia Tech, Winchester, VA - 2005)

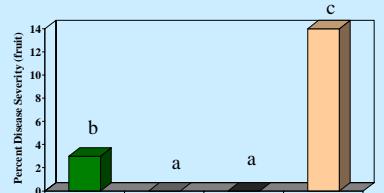


Figure 6-Serenade MAX  
Against Flyspeck in Cortland Apples (B. Palmer, Reality Research, NY - 2004)

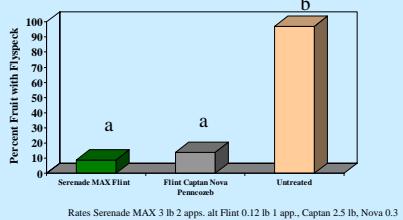


Figure 7-Serenade MAX  
Against Sooty Mold in Cortland Apples (B. Palmer, Reality Research, NY - 2004)      Against Scab in Empire Apples (B. Turecheck, Cornell University, Geneva, NY - 2004)

