

Evaluation of Serenade Max to Control Fruit Rot of Grapes

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Received: May 12, 2016

Accepted: July 1, 2016

Online Published: October 15, 2016

doi:10.5539/jas.v8n11p212

URL: <http://dx.doi.org/10.5539/jas.v8n11p212>

Abstract

The effectiveness of the biopesticide Serenade Max to control fruit rot in grape was investigated. The experiments were conducted in commercial vineyard (cv Xinomavro Naousa). The results showed that this product was relatively effective to control fruit rots on grapes. No significant difference was observed between Serenade Max and Switch25/37.5 WG in both years of experiment. It was found that the fungus *Botrytis cinerea* commonly caused fruit rots (at a percentage of 96%) on the control grape fruits.

Generally, Serenade Max could be an alternative method against fruit rots of grape in biological fruit production system.

Keywords: *Bacillus subtilis*, biological control, *Botrytis cinerea*, fruit rot, vineyard

1. Introduction

Bunch rot of grapes is a very important disease occurring in vineyards worldwide. *Botrytis* has been found as the main pathogen causing fruit rot on grapes (Thomidis et al., 2015). Several other genera and species such as *Colletotrichum*, *Rhizopus*, *Aspergillus* and *Alternaria* have been reported to cause fruit rots on grape fruits, but in low percentage (Latinovic et al., 2012). The disease is most severe during prolonged rainy and cloudy periods just before or during harvest. Use of effective fungicides at appropriate times during the growing season can provide significant control. The use of biological products reduces potential risk to farm workers and the environment and to promote public confidence in food safety. Previous works showed the antagonistic bacterial strains *Bacillus* C6, *Brevibacterium* MFD-47, *Enterobacter* MFD-81 and *Pantoea* MFD-232 were effective against *B. cinerea* (Donmez et al., 2011). Serenade Max is a bio-fungicide/bactericide (contains a unique strain of *Bacillus subtilis* (QST 713 strain)) to aid in the control and suppression of many plant pathogens. This product is suitable for use in organic production systems and has BioGro certification (Anonymous, 2011). The main mode of action of Serenade is based on the production of lipopeptides disrupt pathogen cell membranes. These modes of action are different from other fungicides and therefore represent an opportunity for resistance management and synergy with single-site fungicides (Sereno et al., 2013). In addition, lipopeptides induce systemic acquired resistance (SAR) and other defence responses against a number of pathogens in host plants (Niu et al., 2011; Ongena & Jacques, 2008).

The main objective of this study was the evaluation of the biopesticide Serenade Max (BAYER Hellas, Sorou 18-22, 15125, Marousi Athens) to control fruit rots on grape.

2. Method

Field experiments were conducted in a commercial vineyard (cv. Xinimavro Naoussas, 8-yr-old) located in Strantzia Naoussas, the Prefecture of Imathia, Greece, for two consecutive years (2014, 2015). Plants were grown under commercial cultural practices and no fungicide was applied against fruit rots. A back pack sprayer (Boom ID-GR T19cr) was used with a spray volume 1000 l/ha. The date of applications was at 29th August and 15th September 2014 and again 2015. Necrotic tissues from the margin of the diseased portion of the unsprayed fruit were aseptically removed and placed on potato dextrose agar plates. In 2014, one concentration (2.5 mg Serenade Max/ml) was evaluated, while, in 2015, two concentrations were evaluated (2.5 mg Serenade Max/ml and 4 mg Serenade Max/ml). The experiment was laid out in randomized complete block design. There were 5

replicates, each with three plants. Plants sprayed with the fungicide fludioxonil/cyprodinil (1 g/l) recommended by producer (Switch 25/37.5 WG-Syngenta Hellas) and untreated plants were used as control. Thirty fruits/bunches were randomly collected from each treatment at harvesting period and the percentage of rotted fruits was recorded by using a rate: 0 = healthy, 100 = totally rotted.

Data for fruit rots expressed in percentages were analysed after angular transformation to active normality (data presented in the tables are back-transformed). For testing of differences, the Duncan's Multiple Range Test was applied at the significant level $\alpha = 0.05$.

3. Results and Discussion

The results showed that this product was relatively effective to control fruit rots on grapes (Table 1). No significant difference was observed between Serenade Max and Switch 25/37.5 WG in both years of experiment. Also, there is no significant difference between the two concentrations of Serenade Max used. Previous works showed that the *B. subtilis* strains B-3 and B-16 were effective against *B. cinerea* in apple (Peighami-Ashnaei et al., 2009). In other study, the *B. subtilis* strain B-28 inhibited *B. cinerea* of tomato at a rate of 71.1% *in vitro* and 52.4% *in vivo* (Wang et al., 2009). However, Anonymous (2011) reported that the symptoms of Botrytis bunch rot were evident in both treatments of Serenade Max (incidence 21.5% and 24.5% respectively) under high disease pressure.

Isolation of pathogens from the control grape fruits showed that the fungus *B. cinerea* was mainly responsible at a percentage of 96%. Fungi of genus *Colletotrichum*, *Alternaria*, *Aspergillus* were also isolated from rotted fruits. Similarly, Latinovic et al. (2012) isolated the fungi *Colletotrichum*, *Rhizopus*, *Aspergillus* and *Alternaria* from grape fruit with symptoms of rot.

Generally, Serenade Max could be an alternative method against fruit rots of grape in biological fruit production system. In addition, a spray programme including Serenade Max and fungicide application is recommended in integrated fruit production system to reduce the percentage of fruit rots.

Table 1. Effectiveness of Serenade Max to control fruit rot of grapes

2014			
Treatment	Rate (mg/ml)	Percentage of Fruit rots	
Serenade Max	2.5	1.40	a ^z
Switch 25/37.5 WG	7.5	0.70	a
Control	-	5.55	b
2015			
Treatments	Rate (mg/ml)	Percentage of Fruit rots	
Serenade Max	2.5	3.71	a
	4	2.75	a
Switch 25/37.5 WG	7.5	1.63	a
Control	-	14.20	b

Note. ^zValues in the same column followed by the same letter are not significantly different according to Duncan's Multiple Range Test ($P < 0.05$).

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