BLUEBERRY (*Vaccinium corymbosum*)

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Compatibility of Actinovate with commonly used organic products used in blueberry production, 2016.

Actinovate AG (*Streptomyces lydicus* WYEC 108) and many other products are used in the management of organic blueberries. Tank mixing more than one product is both economical and time saving but tank mix compatibilities with biological control products such as Actinovate have not been analyzed. This study reports on the tank mix compatibility of Actinovate AG with commonly used organic products used in blueberry production.

Actinovate AG was prepared at a concentration of 0.1g/ml. A 300 ml solution of Actinovate was prepared in a 500 ml beaker then mixed with each material and allowed to stand for 30 minutes. The mixture was then plated onto water agar, nutrient agar (for bacterial products), or potato dextrose agar (for fungal products) depending on the tank mix component, and incubated for 7 days at ambient room temperature (65 to 80^{o}F). Each treatment was plated onto 3 petri dishes and all mixes were repeated once for a total of 6 plates per test. Experiments were done from Jan to Mar 2016. The number of colony forming units (CFU) of *S. lydicus* exposed in each mix was assessed daily and compared to an Actinovate plus water only control. Data from 7 days after plating was used to assess significant differences. The percentage of *S. lydicus* CFU in each tank mix compared to the CFU in the Actinovate control was also calculated.

An average of $3.2x10^5$ *S. lydicus* CFU developed after 7 days incubation on the various media when Actinovate was just mixed with water. Several products inhibited growth of *Streptomyces lydicus* when prepared in as a mixture in the laboratory. No growth of *S. lydicus* was observed on plates when Actinovate was mixed with Horticultural Vinegar, the high rate of Regalia, Rex Lime Sulfur, Serenade Optimum, or Solubor DF. Less than 10% of the *S. lydicus* CFU grew when Actinovate was mixed with Biomin Calcium, Botector, Neptune's Harvest 2-4-1 fish fertilizer, or Thuricide. Significantly fewer *S. lydicus* CFU grew when Double Nickel, the low rate of Regalia, Serenade Max, the high rate of Stimplex or Toggle were mix with Actinovate. There was no significant difference in the number of *S. lydicus* CFU that grew when Zen-O-Spore was mixed with Actinovate. The number of *S. lydicus* CFU was greater than double (219%) or quadruple (482%) that of the Actinovate control when mixed with Nitrozyme or the low rate of Stimplex, respectively.

Many of the biological products in this study grew quicker than *S. lydicus* under laboratory conditions. These fungi or bacteria generally outcompeted *S. lydicus* for space and resources on the agar plates. The fungus found in Zen-O-Spore was slower to grow and did not outcompete *S. lydicus* during the 7 day incubation. This data does not imply lack of or enhanced disease control. To fully understand the tank mix compatibilities in this study it will be necessary to conduct efficacy tests in the field.

Product mixed with Actinovate	Active Ingredient	Rate of product per 10 gal water	Media**	Colony Forming Units after 7 days (%)***
Actinovate AG with water alone	*Streptomyces lydicus* WYEC 108	1.3 oz	WA, NA or PDA	**100**
Biomin Calcium	Calcium as amino acid chelate	20 oz	WA	3*
Botector	*Aureobasidium pullulans* strains DSM 14940 & 14941	1.3 oz	PDA	8*
Double Nickel	*Bacillus amyloliquefaciens* strain D747	25.6 oz	NA	50*
Horticultural Vinegar	Acetic Acid (20%)	as is	WA	0*
Neptune's Harvest 2-4-1 Fish Fertilizer	Hydrolyzed North Atlantic Fish	10 oz	WA	6*
Nitrozyme (Seaweed extract)	Cytokinin, as kinetin from *Ascophyllum nodosum*	10 oz	WA	219*
Regalia	Giant Knotweed extract	3.2 fl oz	WA	59*
Regalia	Giant Knotweed extract	12.8 fl oz	WA	0*
Rex Lime Sulfur (29%)	Lime Sulfur	3.2 qt	WA	0*
Serenade Max	*Bacillus subtilus* QST 713	1.3 oz	NA	32*
Serenade Optimum	*Bacillus subtilus* QST 713	1.3	NA	0*
Solubor DF	Sodium Borate (17.2%)	5 lb	WA	0*
Stimplex (Seaweed extract)	*Ascophyllum nodosum* extract	4.8 oz	WA	482*
Stimplex (Seaweed extract)	*Ascophyllum nodosum* extract	9.6 oz	WA	40*
Thuricide	*Bacillus thuringiensis* subsp. *kurstaki* SA-12	1 gal	NA	9*
Toggle (Seaweed extract)	*Ascophyllum nodosum* extract – soluble potash	4.8 oz	WA	35*
Zen-O-Spore	*Ulocladium oudemansii* U3	1.3 oz	PDA	**85**

* Means differ significantly based on Tukey's HSD (*P=0.05*).

** WA = water agar, NA = nutrient agar, or PDA = potato dextrose agar.

*** Colony forming units of *Streptomyces lydicus* after 7 days incubation on media. Value is relative to growth on control plates where Actinovate was only mixed with water.