

# Management strategies for Bacterial Diseases on Strawberry: Approaches for controlling *Xanthomonas fragariae* and the new *Pseudomonas fragariae*

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## Summary

**Actigard® applied weekly and preventively controlled *Xanthomonas fragariae* and *Pseudomonas fragariae*. No freeze events occurred in the past season and thus the trial will be repeated this upcoming season to evaluate applications before such events. ‘Medusa’ was highly susceptible to *Pseudomonas fragariae*, whereas Sensation® ‘Florida 127’, ‘Florida Brilliance’, Medallion™ ‘FL 16.30-128’, and Pearl™ ‘18.52-66’ showed different levels of resistance.**

## Methods

**Objective 1. To evaluate the effectiveness of chemical application before freezing events to control angular leaf spot (ALS) caused by *Xanthomonas fragariae***

‘Florida Brilliance’ plants were transplanted into raised beds on 10 Oct 2023 and inoculated with a mixture of *X. fragariae* isolates on 25 Oct 2023. The trial consisted of fourteen plant plots replicated four times. The standard treatment consisted of weekly applications of Actigard (0.375 oz), Badge SC (1 pt), Nordox 75 WG (2 lb), and Kocide 3000 (1.25 lb) were planned to be applied before a freeze event. Yield and angular leaf spot (ALS) incidence on fruit were calculated from twice-weekly harvests, and disease severity was evaluated on leaves. Non-inoculated and inoculated controls were included in the trial.

**Objective 2. To screen cultivars and commonly used chemicals to control bacterial diseases on strawberry against the new *Pseudomonas fragariae*.** For cultivar screening, Pearl™ ‘18.52-66’, Medallion™ ‘FL 16.30-128’, Sensation® ‘Florida 127’,

and ‘Florida Brilliance’ were compared to the cultivar ‘Medusa’, which is known to be susceptible to this pathogen. ‘Medusa’ was also used to evaluate the efficacy of Actigard and copper, commonly used chemicals against bacteria. Plants were transplanted onto fumigated raised beds and inoculated with a mixture of *P. fragariae* isolates. Overhead irrigation was used for a few days to promote disease development. Trials were harvested twice weekly, and fruit was graded to assess disease incidence and calculate yield. Disease severity on leaves was evaluated based on visual observations.

## Results

### Objective 1

A total of 18 Actigard applications were conducted. On January 10, 2024, all treatments were sprayed due to a forecast of freezing temperatures, which did not occur. Consequently, the remaining treatments were not assessed at the end of the experiment. Actigard reduced ALS on leaves compared to the inoculated control, but fruit symptoms were not significantly different from the inoculated control. Disease in the non-inoculated control plots suggests natural inoculum pressure and/or pathogen dispersal. There was no yield difference among Actigard, non-inoculated, and inoculated control treatments. We plan to repeat this trial during the upcoming season in the hopes of having a freeze event so all the proposed treatments can be evaluated.

Table 1. Efficacy of applications of Actigard on controlling ALS on fruit and leaves and its impact on yield.

Treatment/product	%ALS (fruit/calyx)		ALS severity (leaves)		Yield (lb/A)
Non-inoculated	8.7	b	15.5	a	9648
Inoculated	20.5	a	15.2	a	9028
Actigard 50WDG	7.0	b	8.7	b	10483
<i>P-value</i>	0.01		0.03		0.5

Values in a column followed by the same letter are not significantly different. *P-value* ≥ 0.05 indicates no differences in treatments.

## Objective 2

Cultivar Medusa was considered highly susceptible to *P. fragariae*, with the highest incidences on both leaves (65%) and fruit (46%). Pearl™ '18.52-66' and Medallion™ 'FL 16.30-128' were moderately susceptible due to symptom development on leaves (~35-40%). By contrast, only about 1% incidence was observed on fruit. Sensation® 'Florida 127' and 'Florida Brilliance' were considered resistant, with an incidence of <20% on leaves and no symptoms on fruit (Table 2).

Table 2. Susceptibility of strawberry cultivars against *Pseudomonas fragariae* symptoms on leaves and fruit (calyx).

Cultivar	Leaf incidence (%)		Fruit/calyx incidence (%)	
Medusa	65	a	46	a
Pearl™ '18.52-66'	38	b	0.9	b
Medallion™ 'FL 16.30-128'	33	b	0.6	b
Sensation® 'Florida 127'	18	c	0	b
Florida Brilliance	12	c	0	b
<i>P-value</i>	0.01		0.03	

Values in a column followed by the same letter are not significantly different. *P-value* ≥ 0.05 indicates no differences of treatments.

Weekly applications of Actigard reduced disease incidence to 16% on fruit/calyx, compared to 34% in the inoculated control, but the yield was similar between these treatments. However, weekly applications of Badge had the lowest yield (3802

lb/A) and 27% fruit/calyx incidence, which was similar to the inoculated control (Table 3).

Table 3. Efficacy of commonly used chemicals against *Pseudomonas fragariae* causing diseases on leaves and fruit (calyx).

Treatment/product	Fruit/calyx incidence (%)		Yield (lb/A)	
Non-inoculated control	1.2	c	6596	a
Actigard 50WDG (0.375 oz) weekly	16	b	4838	b
Badge SC (1.0 pt) weekly	27	ab	3802	c
Inoculated control	34	a	4048	bc
<i>P-value</i>	<0.0001		<0.0001	

Values in a column followed by the same letter are not significantly different. *P-value* ≥ 0.05 indicates no differences of treatments.

## Summary and recommendations

Actigard®, a plant-resistance activator, has been shown to suppress *Xanthomonas fragariae* and *Pseudomonas fragariae* in our trials. Like copper, Actigard® should be applied weekly and preventively at the lowest label rate, as previous trials have found that higher rates can reduce yields. Florida strawberry cultivars, particularly Sensation® 'Florida 127' and Florida Brilliance, exhibit resistance to *Pseudomonas fragariae*. However, due to limited knowledge about this pathogen and the potential confusion of its leaf symptoms with other fungal leaf spots, we strongly recommend sending samples for diagnosis.

## Disclaimer

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