

STRAWBERRY (*Fragaria x ananassa* 'Strawberry Festival')  
Charcoal rot; *Macrophomina phaseolina*

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### **Evaluation of products for charcoal rot management in annual strawberry, 2017-2018.**

The biological fungicides AVIV, EXP33, Prestop, and Serifel, plus synthetic fungicides Kenja, Rhyme, Topsin, and Velum Prime were tested for charcoal rot control in annual strawberry. The trial was initiated on 10 Oct, 2017 when bare root, green top plants from Canada were transplanted into plastic-mulched raised beds previously fumigated with Telone II (150 lb/A) to control nematodes. The beds were 32 in. wide at the base on 4-ft centers. Transplants were irrigated by overhead sprinklers during the day for 10 days to facilitate establishment, then irrigated and fertilized through a central drip tape in each bed. Treatments were arranged in a randomized complete block design with four blocks in adjacent beds. Plots were 9 ft long and contained 20 plants in two staggered rows with 12-in. spacing between rows and plants within rows. *M. phaseolina* inoculum was grown in the dark at 29° C on sterile V-8 juice-impregnated toothpicks on corn meal agar plates. On 3 Nov (24 d after planting), two toothpicks, each with a different isolate, were placed on opposite sides of the plants 0.5 in. from the crown and pressed vertically into the soil. A control with sterile toothpicks and a control with no toothpicks were included in the experimental design. Treatments were applied in 4,350 gal water/A (0.4 gal/bed ft) through twin dedicated drip tapes installed in each plot. Each tape was placed close to a plant row and was 10 ft long with 12-in. emitter spacing. All treatments were applied on 6 and 20 Nov. Biological products only were applied a third time on 11 Dec. To suppress fruit diseases in the experimental area, Captan 80WDG was applied weekly by a tractor-mounted hydraulic sprayer (200 psi, 100 gal/A). Plots were harvested 7 times from 18 Dec 2017 to 12 Jan 2018 to determine yields of healthy marketable fruit weighing more than 10 g each. Disease incidence was evaluated by recording the number of dead and diseased plants/plot at 2-wk intervals from 20 Nov 2017 to 16 Jan 2018. Diseased plants were still partially green, but had one or more permanently wilted or dead crowns. Disease incidence was expressed as the combined percentage of all dead and diseased plants/plot on 16 Jan. Data were analyzed by ANOVA using the GLM procedure in SAS software. Multiple mean comparisons were by Fischer's protected LSD ( $\alpha = 0.05$ ).

Warm temperatures contributed to rapid disease progress. On 4 Dec (8 wk after planting), 49 dead and diseased plants were found in all 44 plots. This cumulative total increased to 230, 301, and 348 plants 10, 12, and 14 weeks after planting (WAP), respectively. Few newly diseased plants were found 16 WAP due to unusually cold weather during Jan 2018. Disease incidence (DI) in the inoculated control reached 50% by 14 WAP and was significantly reduced by Kenja (13.5 fl oz) and EXP33. DI was not reduced by the higher rate of Kenja nor by any other treatment. Prestop, Topsin, and Velum Prime reduced DI in one or more previous trials, but not this one. DI in the non-inoculated control was 8.8%, indicating relatively low levels of natural inoculum. An ANOVA of marketable yield was significant overall ( $P = 0.0267$ ), but not significant for treatment sums of squares ( $P = 0.2624$ ). Therefore, statistical treatment comparisons are not presented. Nevertheless, the yield data show the expected negative correlation with DI. That is, treatments with lower disease incidences tended to produce higher yields. Phytotoxicity symptoms were not observed in this experiment.

Treatments (Products and rates/A) <sup>z</sup>	Application timing (weeks after planting)	Yield (lb/A)	Disease incidence <sup>y</sup> (14 WAP)
Kenja 400SC 13.5 fl oz	4, 6	9135	28.8 b <sup>x</sup>
EXP33 15.9 fl oz	4, 6, 9	9820	30.0 b
Kenja 400SC 15.5 fl oz	4, 6	8996	31.9 bc
Topsin 4.5FL 20 fl oz	4, 6	8901	38.7 bcd
AVIV 30 fl oz	4, 6, 9	7562	45.5 bcd
Prestop WG 0.88 oz/1000 plants	4, 6, 9	7761	47.5 bcd
Velum Prime 6.8 fl oz	4, 6	7961	51.3 cd
Serifel Biofungicide 10WP 8 oz	4, 6, 9	7384	52.1 d
Rhyme 7 fl oz	4, 6	7795	56.3 d
Control (non-inoculated)	na	10962	8.8 a
Control (inoculated) <sup>w</sup>	na	8012 ns	50.0 cd

<sup>z</sup> Broadcast rates (as shown on the labels) are presented. However, drip treatments were considered banded applications and adjusted accordingly. In the experimental field, the beds covered 67% of the total surface area.

<sup>y</sup> Percentage of diseased and dead plants on 16 Jan, 2018 (14 weeks after planting).

<sup>x</sup> Values followed by the same letter are not significantly different ( $\alpha = 0.05$ ) by Fisher's Protected LSD test.

<sup>w</sup> Because all treated plots were inoculated, comparisons should be made to the inoculated control at the bottom of the table.