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

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Evaluation of products for charcoal rot management in annual strawberry, 2021-22.

During the 2021-22 strawberry-growing season, the efficacy of products for the management of charcoal rot was evaluated in a replicated experiment conducted at the University of Florida Gulf Coast Research and Education Center in Wimauma, FL. Raised beds were fumigated with Telone II (150 lb/A), covered with new black plastic mulch, and measured 32 in. wide at the base on 4 ft centers. On 8 Dec 21, bare-root, cut-top plants ('Strawberry Festival') from a nursery in California were transplanted and overhead irrigated during the day in 15-min intermittent intervals for 7 consecutive days to enhance plant establishment and then irrigated and fertilized for the remainder of the trial through a central drip tape. Treatments were arranged in a randomized complete block design consisting of four blocks in adjacent beds. Plots were 10-ft long and contained 20 plants in two staggered rows spaced 12 in. within and between rows. On 17 Feb 22, plants were inoculated by placing two toothpicks, each colonized with microsclerotia of one of the two *Macrophomina phaseolina* isolates into the soil on opposite sides of each plant approximately 0.5 in. from the crown. Inoculum was grown at 86ºF for 38 days on sterile V-8 juice-impregnated toothpicks on corn meal agar plates. Inoculated and non-inoculated controls were included in the experiment. Treatments were applied one to three times between 15 Feb to 7 Apr 22 through dedicated drip tapes. Applications were made in 0.4-gal water per foot of bed (4,356 gal/A) through two drip tapes per plot (one next to each plant row) with 10 emitters at 12-in. intervals each. Fruit were harvested from 15 Mar to 1 Apr (six harvests) to determine yield of marketable fruit (> 10 g), which were counted and weighed. Charcoal rot incidence was evaluated weekly from 11 Mar to 20 Apr 22 (seven evaluations) and expressed as the percentage of the total number of wilted, partially collapsed, and dead plants in relation to the total number of plants. Area under the disease progress curve (AUDPC) was calculated based on weekly disease incidences. Throughout the trial, a few symptomatic plants were removed, and isolations confirmed *M. phaseolina* as the causal agent. Data were analyzed by fitting a generalized linear mixed model using the GLIMMIX procedure in SAS and means were separated by Fisher's Protected LSD test ($\alpha = 0.05$).

Initial charcoal rot symptoms were observed three weeks after inoculation. Average daily air and soil temperatures ranged from 53.1 to 78.7 and 67.2 to 79 °F, respectively, during this period. Symptoms started once temperatures were above 78 °F, which are conducive for pathogen infection and disease development. Average disease incidence at the end of the trial was 66% in the inoculated control, with the most effective treatments reducing incidence to 3%. Disease was also observed in non-inoculated plots due to inoculum pressure built by doing Macrophomina experiments in the same field over the years and the reduced rate of fumigation used. Single applications of Exp 300 SC (A23156) at both rates one week after inoculation were highly effective in reducing disease incidence and AUDPC compared to the non-treated inoculated control. Velum Prime and Howler + Induce applied at 1, 4, and 7 weeks after inoculation also suppressed disease development. None of the other treatments significantly reduced disease incidence or AUDPC. In addition, none of the tested treatments differed in marketable yield over the non-treated control during the short harvest interval for this experiment. No phytotoxicity was observed.

Treatment and amount/A[z]	Application timing (WAI)[y]	Yield (lb/A)[x]	Charcoal Rot[w]			
			Incidence (%)		AUDPC	
Experimental 300SC (A23156) 22.6 fl oz	1	16752.3	3.0	e	395.8	d[v]
Experimental 300SC (A23156) 11.41 fl oz	1	17558.3	10.0	de	1956.5	dc
Velum Prime 6.5 fl oz	1, 4, 7	19095.6	21.0	cde	5360.7	bcd
Non-inoculated control	-	16521.9	28.0	bcde	9861.9	abcd
Howler 3 lb + Induce 2 pt	1, 4, 7	18962.6	29.0	bcde	6265.5	bcd
DPH-101A 1.5 lb + OBS 2 gal alt Rhyme 7 fl oz	2 days before inoculation, then 3, 7 1, 5	14692.8	37.0	abcd	12033.3	abc
DPH-101A 1.5 lb + OBS 2 gal + SP-1 5 gal + Practi-Cal 3 gal alt Rhyme 7 fl oz	2 days before inoculation, then 3, 7 1, 5	16052.7	38.0	abcd	13899.4	ab
DPH-101A 0.5 lb + OBS 2 gal alt Rhyme 7 fl oz	2 days before inoculation, then 3, 7 1, 5	16451.2	42.0	abc	15641.1	ab
Theia 3 lb + Induce 2 pt	1, 4, 7	17641.4	49.0	abc	13164.3	abc
Rhyme 7 fl oz	1, 4, 7	17281.6	51.0	ab	15471.4	ab
Howler 2.5 lb + Theia 1.5 lb + Induce 2 pt	1, 4, 7	17448.1	61.0	a	14815.5	ab
Inoculated control	-	16942.4	66.0	a	20425.0	a
Probability of a greater F value		0.23	0.0015		0.0267	

[z] Broadcast rates (as shown on the label) are given. However, drip treatments were considered banded applications and adjusted accordingly. In the experimental field, the beds covered 67% of the total surface area.
[y] WAI = week of treatment application after pathogen inoculation (17 Feb 22, toothpick inoculation) over 7 weeks from 15 Feb to 7 Apr 22. Planting date: 8 Dec 21.
[x] Yield based on harvest data from 15 Mar to 1 Apr 22 (6 harvests).
[w] Charcoal rot incidence data collected weekly from 11 Mar to 20 Apr 22. Disease incidence based on percent wilted, partially collapsed, and dead plants on the last evaluation date. AUDPC = area under disease progress curve calculated based on weekly disease incidences (seven evaluations).
[v] Values in a column followed by the same letter are not significantly different by Fisher's Protected LSD test ($\alpha = 0.05$).