STRAWBERRY (*Fragaria* x *ananassa* 'Camarosa')
Anthracnose fruit rot; *Colletotrichum acutatum*

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Evaluation of fungicide products and programs for anthracnose fruit rot in annual strawberry, 2018-2019.

On 4 Oct 2018, bare-root strawberry plants from Canada were transplanted into plastic-mulched raised beds fumigated with Telone C-35 (300 lb/A). The beds were 28 in. wide on 4-ft centers and contained two rows of plants spaced 15 in. apart within rows and 12 in. between rows. Transplants were irrigated by overhead sprinklers for 10 days to aid establishment, then irrigated and fertilized through a central drip tape. Plants were removed 14 Dec to create 17 plots per bed in four adjacent beds which served as replicates in a randomized complete block design. Each plot contained 12 to 14 plants in a staggered arrangement. Fungicides were applied at weekly intervals from 19 Dec 2018 to 27 Feb 2019 using a CO_2 backpack sprayer calibrated to deliver 100 gal/A at 60 psi through two TeeJet disc-core hollow cone nozzles spaced 12 in. apart on the wand. During that period, Captan Gold 80WDG, Thiram SC, Captan Gold 4L + Thiram SC, Timorex ACT, and Cueva + Double Nickel + LifeGard were applied weekly for a total of 11 applications. Other products were applied when weather conditions favored disease development as indicated by the Strawberry Advisory System StAS (http://agroclimate.org/tools/sas/). StAS applications were made 19 Dec 2018, 3 Jan, and 13, 20, and 27 Feb 2019 corresponding to weeks 1, 3, and 9 – 11 of the 11-week spray period. During intervening weeks, Captan Gold 80WDG, Thiram SC, or Sporan EC were applied as a maintenance treatments. Ripe and diseased fruit were harvested 15 times at 3 to 4-day intervals from 3 Jan to 4 Mar. However, only data from the last five harvests (12 Feb to 4 Mar) are presented. Healthy fruit weighing more than 10 g were counted and weighed to determine marketable yield. Fruit weighing less than 10 g, diseased fruit, and other unmarketable fruit were also enumerated. Anthracnose fruit rot (AFR) incidence was expressed as a percentage of the total number of marketable and unmarketable fruit. Data were analyzed by ANOVA using the proc GLM procedure in SAS. Multiple means comparisons were made by the Fisher Protected LSD test ($\alpha = 0.05$).

The cultivar Camarosa is highly susceptible to *C. acutatum*. Stunting, irregular growth, and some mortality occurred during establishment, indicating that the transplants were already infected or infested by the pathogen. Flower blight and fruit rot symptoms quickly followed and were not adequately controlled by experimental applications. AFR was suppressed by some treatments only after the onset of cool, dry weather in Jan. Thus results from late season fruit production provided the data set shown below. AFR incidence during the last five harvests ranged from 60-70% in the most effective treatments (i.e., Captan Gold 80WDG, Captan Gold 4L + Thiram, and StAS directed applications of Aprovia/Captan, Aprovia Top/Captan, and Abound + Thiram/Thiram) to 75-85% in ineffective treatments (Thiram, Timorex Act, Cueva + Double Nickel + LifeGard, and Abound/Sporan). Disease incidence in the non-treated control was 83.8%. In general, treatments which suppressed AFR produced higher yields of marketable fruit. Those which provided little or no control produced the lowest yields. Treatments involving EXP 22 and Thiram were exceptions, since they provided relatively poor disease control, but produced relatively high yields. General plant appearance was evaluated after the last harvest. Surprisingly, the biorational treatment Cueva + Double Nickel + LifeGard produced noticeably healthier, more robust plants than other treatments (data not shown), even though the mixture did not improve yield or control AFR. Phytotoxicity symptoms were not observed in this trial.

Products and Rates/A	Application timing (wk)[z]	Marketable yield (lb/A)[y]	Anthracnose fruit rot incidence (%)[y]
Captan Gold 4L 1.5 qt + Thiram SC 1.5 qt	1-11	4247 a	60.5 a[x]
Aprovia Top 13.5 fl oz	1, 3, 9, 10, 11		
Captan Gold 80WDG 3 lb	2, 4, 5, 6, 7, 8	3625 ab	61.7 ab
Captan Gold 80WDG 3.0 lb	1-11	3552 ab	63.8 abc
Aprovia 10.5 fl oz	1, 3, 9, 10, 11		
Captan Gold 80WDG 3 lb	2, 4, 5, 6, 7, 8	3434 ab	66.5 a-d
Abound 15.5 fl oz + Thiram SC 2 qt	1, 3, 9, 10, 11		
Thiram SC 2.0 qt	2, 4, 5, 6, 7, 8	3269 ab	68.4 a-d
Abound 15.5 fl oz + Thiram SC 2.6 qt	1, 3, 9, 10, 11		
Thiram SC 2.6 qt	2, 4, 5, 6, 7, 8	2862 bc	69.5 a-d
EXP 22 10 fl oz + Induce 16 fl oz	1, 3, 9, 10, 11		
Captan Gold 80WDG 3 lb	2, 4, 5, 6, 7, 8	2958 bc	71.2 bcd
Rhyme 7 fl oz	1, 3, 9, 10, 11		
Captan Gold 80WDG 3 lb	2, 4, 5, 6, 7, 8	2766 bc	71.5 cd
Topguard EQ 8 fl oz	1, 3, 9, 10, 11		
Captan Gold 80WDG 3 lb	2, 4, 5, 6, 7, 8	2942 bc	72.4 cde
EXP 22 8 fl oz + Induce 16 fl oz	1, 3, 9, 10, 11		
Captan Gold 80WDG 3 lb	2, 4, 5, 6, 7, 8	3569 ab	72.7 cde
Abound 15.5 fl oz	1, 3, 9, 10, 11		
Captan Gold 80WDG 3 lb	2, 4, 5, 6, 7, 8	2643 bcd	73.8 de
Thiram SC 2.6 qt weekly	1-11	3075 ab	74.5 def
Cueva 2 qt + Double Nickel 1.5 lb + LifeGard 1.5 oz	1-11	1890 cd	81.4 efg
Timorex ACT 28 fl oz weekly	1-11	1552 d	83.6 fg
Timorex ACT 18 fl oz weekly	1-11	1530 d	84.4 g
Abound 15.5 fl oz	1, 3, 9, 10, 11		
Sporan EC (1% = 1 gal/A)	2, 4, 5, 6, 7, 8	1548 d	85.5 g
Control	n.a.	1474 d	83.8 fg

[z] Applications were made weekly for 11 consecutive weeks beginning 19 Dec. Application week is indicated by the numbers 1 – 11.
[y] Anthracnose fruit rot incidence and marketable yield are provided for the last five harvests made from 12 Feb to 4 Mar, 2019.
[x] Means in a column followed by the same letter are not significantly different by Fisher's protected LSD test ($\alpha = 0.05$).