STRAWBERRY (*Fragaria x ananassa* 'Florida Brilliance')
Botrytis fruit rot; *Botrytis cinerea*

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Evaluation of fungicide products for control of Botrytis fruit rot in annual strawberry, 2019-20.

The effectiveness of products for management of Botrytis fruit rot (BFR) of strawberry was evaluated on a commercial farm in Plant City, FL. On 8 Oct 2019, bare-root strawberry transplants from a nursery in California were transplanted into black plastic-mulched, raised beds treated with Pic-Clor 80 (200 lb/A). Beds were 28 in. wide on 4-ft centers and contained two staggered rows of plants that were 15 in. apart within and between rows on each bed. Plants were overhead irrigated during the day for 10 consecutive days after planting to aid plant establishment. Further irrigation and fertilization were delivered using a drip system until the end of the season. The experiment was arranged in a randomized complete block design with 28 treatments on four adjacent beds serving as blocks. Plots were 9.5-ft long and contained 12 plants each and were separated by a 4-ft gap. Treatments were applied using a CO_2 back-pack sprayer calibrated to deliver 100 gal/A at 60 psi through a boom fitted with two hollow-cone T-Jet 8002 nozzles. Treatments were applied weekly from 26 Nov 2019 to 25 Feb 2020 (14 applications). Primary test products were applied when weather parameters (17 to 25˚C and ≥ 12 h leaf wetness) favored disease development as indicated by the Strawberry Advisory System (StAS, http://agroclimate.org/tools/sas/). Applications based on StAS were made on 3 Dec (week 2), 17 Dec (week 4), 26 Dec 2019 (week 5), 4 Feb (week 11), and 25 Feb 2020 (week 14). Fruit were harvested twice weekly from 3 Dec 2019 to 4 Mar 2020 (25 harvests) to evaluate BFR incidence and fruit yield. Harvested fruit were separated into marketable, unmarketable, and diseased categories. Healthy ripe fruit greater than 1/3 oz were used to determine marketable yield. BFR incidence was expressed as the percentage of symptomatic fruit compared to total number of fruit harvested. Data were analyzed by fitting a generalized linear mixed model using the statistical software SAS and means were separated according to Fisher's Protected LSD test ($\alpha = 0.05$).

According to the StAS, weather conditions were conducive for BFR development during the 2019-20 strawberry season. The most suitable periods for infection were 1 Dec through 29 Dec 2019, 15 Jan, and 1 and 5 Feb 2020. During these periods, the StAS indicated that seven days were highly favorable while six days were moderately favorable. Consequently, severe epidemics were observed during the second part of Dec and Jan, and throughout Feb. Thus, BFR incidence in the non-treated control (NTC) reached 31.9% in the late season and 28.1% over the entire season. During these periods, all treatments reduced BFR incidence except programs involving Luna Tranquility and Luna Tranquility + Captan alt. Serenade Opti, Howler + Mazolin, and Switch when rotated with Stargus alone or with Stargus + Captan. The most effective treatments included STK 2A, Luna Tranquility at 20 oz + Induce, EXP 22 at 8 fl oz + Induce, Kenja, Kenja + NanoPro, Switch alone or in combination with Howler or NanoPro, and weekly applications of Thiram SC at 2.5 qt, and Thiram at 1.5 qt in combination with Captan Gold 1.5 qt. The efficacy of the treatments was similar during the whole or late season, which included harvests made after 15 Jan. During early season harvests from 3 Dec to 15 Jan BFR incidence was reduced by EXP 22 at 10 fl oz + Induce, Excalia at 2 fl oz, BCS-AR83685 + Laguna + Induce, Kenja and Switch alone or in combination with NanoPro, and weekly applications of Thiram at 2.5 qt, Thiram at 1.5 qt in combination with Captan Gold 1.5 qt. Over the whole season, all treatments increased yield compared to the non-treated control except Luna Tranquility at 16 oz, Luna Tranquility + Captan, EXP 22 at 10 fl oz + Induce, and Switch applied alone during StAS alerts or when rotated with Stargus alone and in combination with Captan. Treatments with Kenja, Switch, and weekly applications of Thiram SC at 2.6 pt/A were associated with the highest yields during the growing season.

Treatment (products and rates/A)	Application timing[z]	Yield (lb/A)[y]	BFR incidence (%)[x] Early Season	Late Season	Whole Season
Switch 62.5WG 14 oz	2, 4, 5, 11, 14	40393 ab	1.9 ef	16.8 hi	14.0 g[w]
Captan Gold 80WDG 1.9 lb	1, 3, 6, 7, 8, 9, 10, 12, 13				
Kenja 400SC 15 fl oz	2, 4, 5, 11, 14	37684 b-e	5.5 a-d	16.1 i	14.3 g
Thiram SC 1.5 qt + Captan Gold 4L 1.5 qt	1, 3, 6, 7, 8, 9, 10, 12, 13				
Thiram SC 2.5 qt	weekly	43645 a	0.4 f	16.8 hi	14.4 g
Thiram SC 1.5 qt + Captan Gold 4L 1.5 qt	weekly	38112 b-e	4.3 cde	17.5 ghi	15.2 fg
Switch 62.5WG 14 oz	4, 11	38598 bcd	5.1 bcd	18.1 f-i	15.7 efg
Howler 5 lb	2, 5, 14				
Captan Gold 80WDG 1.9 lb	1, 3, 6, 7, 8, 9, 10, 12, 13				
Kenja 400SC 15 fl oz + NanoPro 4 oz	2, 4, 5, 11, 14	37013 b-e	2.9 de	18.6 f-i	16.2 efg
Captan Gold 80WDG 1.9 lb + NanoPro 4 oz	1, 3, 6, 7, 8, 9, 10, 12, 13				
Kenja 400SC 13.5 fl oz	2, 4, 5, 11, 14	38883 bcd	3.5 cde	19.2 e-i	16.5 efg
Captan Gold 80WDG 1.9 lb	1, 3, 6, 7, 8, 9, 10, 12, 13				
EXP 22 8 fl oz + Induce 1 pt	2, 4, 5, 11, 14	36635 b-e	4.9 b-e	19.9 d-i	17.3 d-g
Captan Gold 80WDG 1.9 lb	1, 3, 6, 7, 8, 9, 10, 12, 13				
Switch 62.5WG 14 oz + NanoPro 4 oz	2, 4, 5, 11, 14	37866 b-e	3.6 cde	20.5 b-i	17.8 d-g
Captan Gold 80WDG 1.9 lb + NanoPro 4 oz	1, 3, 6, 7, 8, 9, 10, 12, 13				
BCS-AR83685 4 oz + Laguna 4 oz + Induce 1 pt	2, 4, 5, 11, 14	37435 b-e	3.8 cde	20.4 c-i	17.8 d-g
Captan Gold 80WDG 1.9 lb	1, 3, 6, 7, 8, 9, 10, 12, 13				
STK 2A 13.7 fl oz	2, 4, 5, 11, 14	39138 bc	4.5 b-e	20.2 c-i	17.8 d-g
Captan Gold 80WDG 1.9 lb	1, 3, 6, 7, 8, 9, 10, 12, 13				
Kenja 400SC 15 fl oz	2, 4, 5, 11, 14	38389 b-e	3.5 cde	21.4 b-h	18.1 d-g
Captan Gold 80WDG 1.9 lb	1, 3, 6, 7, 8, 9, 10, 12, 13				
Luna Tranquility 20 oz + Induce 1 pt	2, 4, 5, 11, 14	37009 b-e	4.8 b-e	21.1 b-i	18.2 c-g
Captan Gold 80WDG 1.9 lb	1, 3, 6, 7, 8, 9, 10, 12, 13				
STK 2A 20.5 fl oz	2, 4, 5, 11, 14	36859 b-e	6.7 a-d	20.6 b-i	18.2 c-g
Captan Gold 80WDG 1.9 lb	1, 3, 6, 7, 8, 9, 10, 12, 13				
EXP 22 10 fl oz + Induce 1 pt	2, 4, 5, 11, 14	34892 def	3.0 de	22.0 b-h	19.1 b-f
Captan Gold 80WDG 1.9 lb	1, 3, 6, 7, 8, 9, 10, 12, 13				
Switch 62.5WG 14 oz	2, 4, 5, 11, 14	34836 def	5.9 a-d	21.8 b-h	19.2 b-f
Switch 62.5WG 14 oz	2, 4, 5, 11, 14	37423 b-e	3.6 cde	22.7 b-g	19.5 b-f
MBI-121 1 qt + Captan 80 WDG 1.9 lb	1, 3, 6, 7, 8, 9, 10, 12, 13				
Luna Tranquility 16 oz	2, 4, 5, 11, 14	36100 c-f	5.8 a-d	22.6 b-g	19.7 b-f
Captan Gold 80WDG 1.9 lb	1, 3, 6, 7, 8, 9, 10, 12, 13				
Aprovia Top 13.5 fl oz	2, 4, 5, 11, 14	38293 b-e	7.0 a-d	22.8 b-h	20.0 b-f
Captan Gold 80WDG 1.9 lb	1, 3, 6, 7, 8, 9, 10, 12, 13				
Excalia 4 fl oz[v]	2, 4, 5, 11	36656 b-e	4.2 b-e	23.6 b-f	20.0 b-f
Thiram SC 2.5 qt	14				
Captan Gold 80WDG 1.9 lb	1, 3, 6, 7, 8, 9, 10, 12, 13				
Fontelis 24 oz	2, 4, 5, 11, 14	36543 b-e	5.0 bcd	23.6 b-f	20.6 b-e
Captan Gold 80WDG 1.9 lb	1, 3, 6, 7, 8, 9, 10, 12, 13				
Excalia 2 fl oz	2, 4, 5, 11	38111 b-e	4.1 cde	24.1 b-f	20.7 b-e
Thiram SC 2.5 qt	14				
Captan Gold 80WDG 1.9 lb	1, 3, 6, 7, 8, 9, 10, 12, 13				
Luna Tranquility 16 oz + Captan Gold 80WDG 1.9 lb	2, 4, 5, 11, 14	34305 ef	4.8 bcd	25.2 a-e	22.2 a-d
Serenade Opti 16 oz	1, 3, 6, 7, 8, 9, 10, 12, 13				
Switch 62.5WG 14 oz	2, 4, 5, 11, 14	36010 c-f	4.1 cde	25.9 a-d	22.3 a-d
Stargus 1 qt	1, 3, 6, 7, 8, 9, 10, 12, 13				
Switch 62.5WG 14 oz	2, 4, 5, 11, 14	35105 c-f	3.5 cde	26.1 a-d	22.4 a-d

Stargus 1 qt + Captan Gold 80WDG 1.9 lb	1, 3, 6, 7, 8, 9, 10, 12, 13				
Howler 5 lb + Mazolin 50WDG 5.2 oz	2, 4, 5, 11, 14	39232 bc	10.4 a	26.4 abc	23.7 abc
Captan Gold 80WDG 1.9 lb	1, 3, 6, 7, 8, 9, 10, 12, 13				
Luna Tranquility 16 oz	2, 4, 5, 11, 14	36983 b-e	7.4 abc	26.9 ab	23.9 ab
Serenade Opti 16 oz	1, 3, 6, 7, 8, 9, 10, 12, 13				
Non-treated control	-	32266 f	9.1 ab	31.9 a	28.1 a
Probability of a greater F value		0.0092	0.0190	0.0004	0.0001

[z] Week of product application over the 14 weeks from 26 Nov 2019 to 25 Feb 2020.
[y] Yield from 25 harvests made from 3 Dec 2019 to 4 Mar 2020 (whole season).
[x] Average incidence of BFR during the early (3 Dec to 15 Jan), late (16 Jan to 4 Mar), and whole season harvest periods (3 Dec 2019 to 4 Mar 2020).
[w] Means in a column with the same letter are not significantly different based on least significant difference (LSD) test ($\alpha = 0.05$).
[v] Excalia was applied four times during the whole season and Thiram SC 2.5 qt was used for additional applications.