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Evaluation of New and Experimental Fungicides, Biologicals, and Natural Products for Botrytis Fruit Rot Management on Strawberry in San Luis Obispo, California, Late Season 2024

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Botrytis fruit rot, caused by *Botrytis cinerea*, is among the most devasting strawberry fruit rots. Infection first appears as a small brown lesion, often under the calyx, and following prolonged wetness (>13 h). Sporulation appears as a velvety gray mold with susceptibility increasing with fruit ripeness. This report evaluates the efficacy of 19 fungicides for the management of Botrytis fruit rot on strawberry 'Fronteras' in San Luis Obispo, CA, in 2024. Results from this study will help inform strawberry growers in developing effective management programs for this disease.

The trial was conducted in field 35b at the Cal Poly State University campus in San Luis Obispo, CA (35°18′20″N 120°40′22″W). Bare root strawberry transplants of 'Fronteras' were transplanted into raised beds on 1 November 2023. The experimental area consisted of eight beds that were 160 ft. long. Industry standard beds were used: 64 in. between bed centers, four lines of plants spaced 12 in. between plant lines, and 15.5 in. between plants within a line. Beds were covered with black non-totally impermeable film (TIF) polyethylene mulch (1.5 ml) (Ginegar, Santa Maria, CA, U.S.A.). Plots were 20 ft. long (62 plants per plot), replicated four times, and arranged in a randomized complete block design. A 23-in. planted buffer (four plants) was used on both ends of each plot. Plants were irrigated and fertilized via three lines of Aqua-Traxx drip tape (EAXxx0867) (Toro, Bloomington, MN, U.S.A.) per bed. Treatments were applied using a backpack sprayer equipped with a custom 48-in. handheld boom (R&D Sprayers, Opelousas, LA, U.S.A.). The boom consisted of eight nozzles (ALBUZ ATR 80 blue hollow cone) (Spray Depot, Apopka, FL, U.S.A.) spaced 12-in. apart that were calibrated to deliver 150 gal./acre using compressed CO_2 at 60 psi. The two outer nozzles were angled inward at 45 degrees, and the six inner nozzles facing left or right were arranged in pairs with each nozzle at opposing 45-degree angles. Four days prior to the first application, all fruit were removed from the plants, leaving only blooms and flower buds (19 April 2024). The first application was made on 23 April and continued for five applications at approximately 7-day intervals: 23 and 30 April and 7, 14, and 20 May. Miravis Prime rotated with Captan was used as a positive control. The biological fungicides included Bacix, YSY, and AC203. Products with naturally occurring active ingredients were Oso, Fosphite, Epidgard, Azolyte, and KaDoZan. Botrytis fruit rot (BFR) incidence was evaluated at-harvest and postharvest. For the at-harvest evaluation on 21 May (1 day after the final application) all ripe fruit were harvested from each plot and were recorded as diseased or sound. Sound fruit were used for a postharvest evaluation consisting of 32 fruit stored at room temperature (70°F) in plastic stone fruit liners. BFR incidence was evaluated at 2-day intervals for 10 days. Fruit with visible fungal growth were recorded as decayed and were discarded from the tray to avoid fruit-to-fruit spread of disease. Postharvest decay over time was used to calculate area under the disease progress curve (AUDPC). Data were subjected to analysis of variance (ANOVA), and Fisher's mean separation provided the greatest differences among treatments. All analyses were calculated using ARM version 2025.1.

The season consisted of above average rainfall from July 2023 through June 2024 (22.4 in. vs. 36-year average rainfall of 19.0 in.), but there was no rainfall during the trial from 23 April to 21 May, and average maximum air temperature was below average (67.7°F vs. 36-year average 70.0°F). BFR incidence at-harvest in the nontreated control was 1.3%, and no treatments statistically separated from this. BFR incidence in the at-harvest evaluation and the postharvest evaluations for the nontreated plots were typical for trials conducted with no rain events during fruit development. The postharvest evaluation at 6 days after harvest (DAH) offered the most separation among treatments, with Miravis Prime rotated with Captan (21.1% BFR incidence) being the only treatment to significantly separate from the nontreated control (52.3%). No phytotoxicity was observed in any treatment (Supplementary Table S1).

Keywords: AC203, Azolyte, Bacix, Captan, Elisys, Epidgard, Fosphite, KaDoZan, Luna Sensation, Mevalone, Miravis Prime, Oso, Pristine, SA-0130310, SA-0650004, Switch, YSY Yeast, Zivion

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e-Xtra: Supplementary material is available online.

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Supplementary Table S1. Evaluation of fungicides, biologicals, and natural products for Botrytis fruit rot management on strawberries.

		Botrytis fruit rot incidence (%)					
			Postharvest				
Treatment (amount)	Application sequence[v]	At-harvest	6 DAH[w,x,y]		AUDPC[z]	
Nontreated control		1.3	52.3	bcd	128.5	bc
Miravis Prime 34.2 SC (13.4 fl. oz./acre)	ACE					
Captan 80 WDG (3 lbs./acre)	BD	0.0	21.1	e	45.7	d
Elisys 34.9 SC (10 fl. oz./acre)	ABCDE	0.8	32.4	de	87.9	cd
SA-0130310 SC (10.5 fl. oz./acre)	BCDE					
Dyne-Amic 99% (6.25% v/v)	BCDE	0.5	39.8	cde	96.9	cd
Oso 5 SC (13.5 fl. oz./acre)	ABCDE	1.3	39.8	cde	102.7	cd
AC203 SC (24 fl. oz./acre)	ABCDE	0.5	45.3	cde	111.7	bc
Switch 62.5 WG (14 fl. oz./acre)	AD					
Captan 80 WDG (3 lbs./acre)	BE					
Pristine 38 WG (18.5 oz./acre)	C					
Dyne-Amic 99% (6.25% v/v)	ABCDE	0.3	52.3	bcd	121.5	bc
YSY Yeast 3.5 B CFU/g WG (1.5 lbs./acre)	ABCDE					
Oso 5 SC (13.5 fl. oz./acre)	ABCDE	0.6	56.3	a–d	137.5	bc
Epidgard 6%SC (1.5 qts./100 gal.)	ABCDE	2.1	56.3	a–d	140.6	bc
Bacix 2 WP (1 lb./100 gal.)	ABCDE	0.0	57.0	a–d	141.8	bc
SA-0650004 SC (28 fl. oz./acre)	BCDE					
Dyne-Amic 99% (6.25% v/v)	BCDE	1.0	57.8	abc	135.2	bc
Captan 80 WDG (3 lbs./acre)	ABCDE	1.5	58.6	abc	135.9	bc
Azolyte SC (12.8 fl. oz./acre)	ABCDE					
KaDoZan SC (12.8 fl. oz./acre)	ABCDE	0.7	59.4	abc	130.9	bc
Fosphite 53 SC (1.5 qts./100 gal.)	ABCDE	1.3	59.4	abc	137.9	bc
YSY Yeast 3.5 B CFU/g WG (1.5 lbs./acre)	ABCDE	0.9	60.2	abc	144.3	bc
Oso 5SC (6.5 fl. oz./acre)	ABCDE					
Zivion 10.34SC (1 gal./100 gal.)	ABCDE	1.6	61.7	abc	150.8	abc
Mevalone 16.1SC (55 fl. oz./acre)	ABCDE					
Dyne-Amic 99% (6.25% v/v)	ABCDE	1.6	71.1	ab	172.7	ab
Luna Sensation 42.8SC (7.6 fl. oz./acre)	ABCDE	1.7	78.1	a	208.6	a
LSD		1.9	24.9		64.0	

[v] Application sequence: A, 23 April; B, 30 April; C, 7 May; D, 14 May; E, 20 May.

[w] Numbers within a column followed by the same letter are not significantly different ($\alpha = 0.05$) per Fisher's least significant difference (LSD) simultaneous comparison calculated using ARM version 2025.1 (Gylling Data Management, Brookings, SD, U.S.A.).

[x] DAH, days after harvest.

[y] Except for the nontreated control, treatments are ordered in ascending order by Botrytis fruit rot incidence.

[z] Area under the disease progress curve (AUDPC) calculated for percent postharvest Botrytis fruit rot using ARM version 2025.1.