Project title: Efficacy and crop safety of various fungicides for control of Bipolars bud and fruit rot of dragon fruit (pitaya) (PR. no. P10611)

Investigators: Aaron Palmateer and Jonathan Crane, UF/IFAS, TREC, Homestead

Justification and objectives

Pitaya acreage in Florida is estimated at over 500 acres and more plantings appear likely (J. Crane, personal communication). A number of fungal pathogens have now been identified on pitaya in Florida and fruit and stem rot caused by *Bipolaris cactivora* may result in significant reductions in plant growth, flowering, and fruit set and crop yields. Fruit quality may be totally destroyed by this fungal pathogen, especially during the wet season (May-September). IR-4 has received a request for the evaluation of various fungicides to control Bipolaris bud and fruit rot of dragon fruit (pitaya). The purpose of this research is to collect efficacy and crop safety data to determine which fungicides should be further developed into a registration for control of Bipolaris bud and fruit rot of dragon fruit (pitaya).

IR-4 Research Coordinator

Kathryn Homa, IR-4 Project Headquarters, 500 College Road East, Suite 201 W, Princeton, NJ 08540, (732) 932-9575 X 4604 FAX# (609) 514-2612, E-mail: homa@aesop.rutgers.edu

Field Research Director

Drs. Aaron Palmateer and Jonathan Crane, UF/IFAS TREC, Homestead, FL

Test crop and system

Linear trellised 'Natural Mistic' red-pulped pitaya (*Hylocereus undatus*). Vines along the 300 ft. trellis were spaced 10 ft. in-row and 13 ft. between-rows.

Test/control substances tested[z]

Trt #/ color	Product	Active ingredient (AI)	AI rates	Formula rates
1	Non-treated, non-inoculated	NA	NA	NA
2	Non-treated, inoculated	NA	NA	NA
3	Switch 62.5WG	Cyprodinil+ fludioxonil	0.328 lb ai/A cyprodinil 0.219 lb ai/A fludioxonil	14 oz product/A (396.9 grams)
4	Abound	Azoxystrobin	0.25 lb ai/A	15.5 fl. oz product/A (273m1)
5	Bravo Weather Stik	Chlorothalonil	1.5 lb ai/A	946 ml product/A
6	Quadris Top	Azoxystrobin+ difenoconazole	0.15 lb ai/A azoxystrobin 0.09 lb ai/A difenoconazole	11.5 fl oz product/A
7	Quadris Top	Azoxystrobin+ difenoconazole	0.18 lb ai/A azoxystrobin 0.115 lb ai/A difenoconazole	14 fl oz product/A
8	Dithane F-45	Mancozeb	2.4 lb ai/A	2.4 qt product/A
z, All test substances were mixed with BondMax adjuvant.				

Methods: The stems of 19 fruiting 'Natural Mistic' pitaya vines were divided into 1 to 4 areas assigned 1 to 4 treatments per vine during June 2014. Each treatment was replicated five times (Map). Test substances were applied at a 7 to 14 day interval (Table 1). All treatments were applied preventatively with a minimum of one to two

applications before the vines were inoculated with a concentration of 1 x 10^6 spores/ml of *Bipolaris cactivora* on 6-23-14.Disease ratings were taken on 6-13-14, 6-30-14, 7-10-14, 7-17-14, 7-31-14 and 8-7-14. All treatments were rated for phytotoxicity eight times: 6-11-14 (prior to fungicide treatment applications), 6-19-14, 6-26-14, 7-8-14, 7-22-14, 8-8-14, 8-21-14, and 9-12-14. Vine and fruit were rated for phytotoxicity and the rating was from 0 (no phytotoxicity), 1 (slight epidermal discoloration), 2 (moderate epidermal discoloration), 3 (pronounced epidermal discoloration), 4 (severe epidermal discoloration) and 5 (necrotic lesions).

Results and discussion

Disease Efficacy

Disease pressure was moderate to severe throughout the duration of the trial. There was no statistical difference in disease rating values for stem and foliage among all treated vines (Table 2). Fruit disease rating values for all treated vines were statistically lower than the non-treated, inoculated vines. Fruit disease ratings for pitaya vines treated with Dithane F-45 were statistically lower than those vines treated with Switch 62.5 WG and the low rate of Quadris Top. Dithane M-45 provided the best protection from *Bipolaris* bud and fruit rot and Abound or the high rate of Quadris Top would be the best options for a spray rotation.

Phytotoxicity

There was no significant difference in phytotoxicity to the fruit and stems among any treatments (Table 3). Ratings were generally 1.0 or below. The highest fruit phytotoxicity rating was for the non-treated-inoculated control on one occasion was 2.2 on 7-22-14 but this was a non-treated-inoculated control and this may be attributed to the disease symptoms. Similarly, there was no significant differences in stem phytotoxicity ratings among treatments and the low ratings indicate that at the rates tested all materials caused no phytotoxicity (Table 3).

Table 1. Treatment application dates.

Trt #/ color	Product	No. of applications	Spray dates
1	Non-treated, non-inoculated	0	NA
2	Non-treated, inoculated	0	NA
3	Switch 62.5WG	4	6-13-14; 6-20-14; 6-27-14; 7-4-24
4	Abound	6	6-13-14; 6-27-14; 7-11-14; 7-25-14; 8-8-14; 8-22-14
5	Bravo Weather Stik	4	6-13-14; 6-20-14; 6-27-14; 7-4-14
6	Quadris Top	4	6-13-14; 6-20-14; 6-27-14; 7-4-24
7	Quadris Top	4	6-13-14; 6-20-14; 6-27-14; 7-4-24
8	Dithane F-45	4	6-13-14; 6-20-14; 6-27-14; 7-4-24

Table 2. Disease levels for six treatments to control Bipolaris bud and fruit rot

Trt #	Treatment and Rate	Stem [x]	Fruit [x]
1	Non-treated Non-inoculated.....	1.6 a [w]	3.2 ab
2	Non-treated Inoculated……....	2.6 a	4.4 a
3	Switch 62.5 WG 14 oz….....	2.2 a	2.8 bc
4	Abound 15.5 oz…….....	2.0 a	1.8 cd
5	Bravo Weather Stik 2 oz……..	2.0 a	2.2 bcd
6	Quadris Top 11.5 fl oz..……....	2.2 a	2.8 bc
7	Quadris Top 14 fl oz.....	2.2 a	1.6 cd
8	Dithane F-45 77 fl oz..….....	2.6 a	1.4 d

[w] Column means indicated with the same letters are not significantly different ($P \leq 0.05$) based on Student Newman Keuls test.

[x] Percentage of symptoms occurring on columnar stems and fruit on a 0-5 scale: 0= no damage, 1= 1-25%, 2= 26-50%, 3= 51-75%, 4= 76-90 and 5= 91-100%

Table 3. Mean phytotoxicity rating of pitaya fruit and stems prior to treatment (6-11-14) and after treatment (6-19-14 to 9-12-14).[z]

Fruit/date	Non-trt Non-inoc	Non-trt Inoc	Switch	Abound	Bravo	Quad-T-1	Quat-T-2	Dithane
6-11-14	0	0	1.4	0	0	0	0	0
6-19-14	0	0.4	1.4	0	0.2	0.6	0.4	0
6-26-14	0	0.4	1.4	0	0	0.6	0.2	0
7-8-14	0	0.5	0	0	0	0	0	0
7-22-14	1.2	2.2	1.3	0	0.6	1.0	0.5	0
8-8-14	0	0.5	0	0	0	0	0	0
8-21-14	0	0	0	0.3	0.3	0	0	1.2
9-12-14	1.0	1.0	0.5	1.3	0	1.0	1.5	1.7
Stem/date	Non-trt Non-inoc	Non-trt Inoc	Switch	Abound	Bravo	Quad-T-1	Quat-T-2	Dithane
6-11-14	0	0	0	0.2	0	0	0	0
6-19-14	0	0	0	0	0	0	0	0
6-26-14	0	0	0	0	0	0	0	0
7-8-14	0	0.2	0.6	0	0	0.2	0.2	0
7-22-14	0	0	0	0	0	0	0	0
8-8-14	0	0	0.6	0.2	0.6	0.2	0.2	0.4
8-21-14	0	0.2	0.4	0.2	0.8	0	0	0.4
9-12-14	0.6	0.4	0.4	0.6	0.2	0.6	0.6	0.4

z, Vine and fruit were rated for phytotoxicity and the rating was from 0 (no phytotoxicity), 1 (slight epidermal discoloration), 2 (moderate epidermal discoloration), 3 (pronounced epidermal discoloration), 4 (severe epidermal discoloration) and 5 (necrotic lesions).

(c://ir4/efficacy/2014/fungicide efficacy pitaya 2014 PR number P10611 final 9-25-15.doc)