EVALUATION OF SELECTED FUNGICIDES AND ACTIGARD (ACEBENZOLAR-S-METHYL) FOR THE CONTROL OF FUSARIUM WILT OF WATERMELON

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Introduction: *Fusarium* wilt (FW), caused by the fungus *Fusarium oxysporum* f.sp. *niveum* (FON), is a soil borne disease of watermelon that causes significant losses to United States watermelon growers every year. FW resistance is available in some watermelon cultivars, however, resistance has not been bred into most of the seedless watermelons planted by growers at this time. Also, there is no known resistance to FON race 3. Seven years is the recommended crop rotation for fields where FON is severe, but lengthy rotations are not economically feasible for most watermelon growers. Grafted transplants have been used with some success, where a seedless watermelon transplant is grafted onto a FON resistant root stock, but grafted transplants are expensive and are not commonly used by watermelon growers. The purpose of this research is to determine if adequate suppression of *Fusarium* wilt of watermelon can be achieved by using fungicides or a plant defense activator as soil drenches.

Material an Methods: Two field trials were conducted; one at the at our FW nursery at the Vidalia Onion and Vegetable Research Center (VOVRC) in Tattnall County, Georgia (Trial 1), and one in a grower's field in Berrien County, Georgia with a history of severe FW (Trial 2).

Trial 1. Watermelons (cv. 'Black Diamond') were transplanted onto single row beds covered with 18 in black plastic mulch on 17 Mar. Beds were on 6-ft centers with 3-ft plant spacing within rows. Plots were 20-ft long with 6 plants per plot and 10-ft unplanted borders between plot ends. The test design was randomized complete block with six replications. Plots were inoculated prior to transplanting by adding 50 ml of a $1x10^3$ conidial suspension of *Fusarium oxysporum* f.sp. *niveum* to each hole that watermelons were planted into. Drench fungicide treatments were applied after transplanting by pouring 150 ml of fungicide solution onto the roots of each plant. The crop was grown according

to University of Georgia Extension production guidelines, and overhead irrigation was applied as needed.

Trial 2. Seedless watermelons (cv. 'Tri X 313') and pollinator watermelons (cv. 'SP-5') were transplanted onto single row beds covered with 18 in black plastic mulch on 14 Mar. Beds were on 6-ft centers with 3-ft plant spacing within rows. Plots were 20-ft long with 6 seedless watermelon plants and 2 pollinator watermelon plants per plot. There was a 10-ft unplanted border between plot ends. The test design was randomized complete block with six replications. Drench fungicide treatments were applied to seedless watermelons after transplanting by pouring 150 ml of fungicide solution onto the roots of each plant. Only seedless watermelons were rated for vigor and FW incidence. The crop was grown according to University of Georgia Extension production guidelines, and the field was not irrigated.

Results Trial 1 Fusarium wilt symptoms were first noticed on 1 Apr and the disease progressed until 1 May when soil temperatures were too warm for the disease to develop any further. On 1 Apr, none of the treatments adversely affected plant vigor when compared to the inoculated check, however all of the plants in the trial showed some stunting due to either disease or treatment (Table 1). On 7 Apr, all Actigard treatments and all of the fungicide treatments except Inspire Super significantly reduced FW incidence when compared to the inoculated check. On 27 Apr, only the treatments 0.75 oz Actigard, 0.5 oz Actigard, 5.7 fl oz Proline, 3 fl oz Proline, 13.69 fl oz Propulse, and 6.84 fl oz Propulse had significantly less disease incidence than the untreated plots. Also on 27 Apr, there was significant stand loss in the untreated plots and plots treated with Inspire Super when compared to all other treatments. Watermelon plots were harvested twice (31 May and 8 June) there was no significant difference in the yield for either harvest date or the combined yield due to the variability in the trial.

Table1 (Trial 1)

Treatment, application rate and application (timing)[Z]	Plant Vigor[Y] 1 Apr	Fusarium Wilt[X] % incidence 7 Apr	Fusarium Wilt % incidence 27 Apr	%Stand Loss[W] 27 Apr	Yield Lb/Acre
Actigard 50 WG, 0.75 oz/100gal……	4.5 a[V]	11.7 d	58.3 b-d	28.3 ab	13491 a
Actigard 50 WG, 0.5 oz/100gal……..	4.3 a	21.7 cd	58.3 b-d	30.0 ab	13249 a
Actigard 50 WG, 0.25 oz/100gal.....	4.5 a	38.3 c	83.3 a-c	78.3 de	8954 a
Proline 4 SC, 5.7 fl oz/ 100gal.....	5.0 a	38.3 c	58.3 b-d	38.3 ab	14641 a
Proline 4 SC, 3 fl oz/ 100gal……...	4.7 a	30.0 cd	55.0 cd	33.3 ab	10829 a
Propulse 400 SC, 13.69 floz/100gal……..	4.3 a	25.0 cd	53.3 d	25.0 a	11132 a
Propulse 4 SC, 6.84 floz/100gal…….	5.8 a	36.7 cd	70.0 b-d	50.0 bc	6171 a
Luna Privilege 500 SC, 6.84 floz/100gal …….	5.0 a	41.7 c	78.3 a-d	66.7 cd	9014 a
Quadris 2.08 SC, 15.4 fl oz/100gal	5.0 a	36.7 cd	86.6 ab	70.0 cd	10406 a

Inspire Super 336 SC, 20 floz/100gal.....	5.0 a	86.7 ab	100 a	100 e	0 a
Inoculated check……	5.3 a	100 a	100 a	100 e	0 a

[Z] Application date : all treatments were applied as at plant drenches on 17 Mar.
[Y] Plant vigor was rated on 1-10 scale where 1= a dead or dying plant, 5 = moderately stunted plant and 10 = a healthy non-stunted plant
[X] Fusarium wilt %incidence was rated by counting the number of plants in each plant that showed signs of wilting and dividing that number by the total number of plants in each plot x100. n=6
[W] %Stand loss was calculated by counting the number of dead plants per plot and dividing that number by the total number of plants in each plot x100. n=6
[V] Means followed by the same letter(s) are not significantly different according to Fisher's protected LSD test at $P \leq 0.05$.

Results Trial 2 Fusarium wilt symptoms were first noticed on 1 Apr and the disease progressed until 1 May when all the plants in the trial were either dead or showing Fusarium wilt symptoms. On 8 Apr, the treatments 0.75 oz Actigard, 0.5 oz Actigard, and 13.69 fl oz Propulse adversely affected plant vigor when compared to the untreated check (Table 2). Also on 8 Apr, all Actigard treatments, 5.7 fl oz Proline, 13.69 fl oz Propulse, 6.84 fl oz Propulse, and 6.84 fl oz Luna Privilege showed significantly less FW incidence than the untreated check. On 13 Apr, only plots treated with Actigard, 13.69 fl oz Propulse, or 6.84 fl oz Luna Privilege showed significantly less disease incidence than the untreated plots. There was no difference in stand count on 13 Apr between treated plots and the untreated control. There were no harvestable watermelons produced in this trial due to severe Fusarium wilt symptoms and/or stand loss in all of the plots by the end of the trial.

Table2 (Trial 2)

Treatment, application rate and application (timing)[Z]	Plant Vigor[y] 8 Apr	Fusarium Wilt[x] % incidence 8 Apr	Fusarium Wilt % incidence 13 Apr	%Stand Loss[W] 13 Apr
Actigard 50 WG, 0.75 oz/100gal……	4.3 e[V]	0.0 d	41.7 d	5.0 a
Actigard 50 WG, 0.5 oz/100gal.....	4.7 c-e	3.3 d	33.3 d	16.6 a
Actigard 50 WG, 0.25 oz/100gal.....	5.0 b-e	3.3 d	33.3 d	8.3 a
Proline 4 SC, 5.7 fl oz/ 100gal.....	5.2 b-e	8.3 b-d	45.0 cd	8.3 a
Proline 4 SC, 3 fl oz/ 100gal.....	6.5 a	25.0 a-c	70.0 a-c	21.7 a
Propulse 400 SC, 13.69 floz/100gal.....	4.5 de	3.3 d	36.7 d	3.3 a
Propulse 4 SC, 6.84 floz/100gal…….	5.7 a-c	5.0 cd	50.0 b-d	11.7 a
Luna Privilege 500 SC, 6.84 floz/100gal …….	5.0 b-e	5.0 cd	38.3 d	11.7 a
Quadris 2.08 SC, 15.4 fl oz/100gal	6.0 ab	23.3 a-d	75.0 ab	25.0 a
Inspire Super 336 SC, 20 floz/100gal.....	5.5 a-d	28.3 ab	80.0 a	38.3 a
Inoculated check……	5.8 ab	36.7 a	70.0 a-c	25.0 a

[Z] Application date : all treatments were applied as at plant drenches on 14 Mar.
[Y] Plant vigor was rated on 1-10 scale where 1= a dead or dying plant, 5 = moderately stunted plant and 10 = a healthy non-stunted plant
[X] Fusarium wilt %incidence was rated by counting the number of plants in each plant that showed signs of

wilting and dividing that number by the total number of plants in each plot x100. n=6
[W]%Stand loss was calculated by counting the number of dead plants per plot and dividing that number by the total number of plants in each plot x100. n=6
[V]Means followed by the same letter(s) are not significantly different according to Fisher's protected LSD test at $P \leq 0.05$.

Discussion. Actigard drench applications and drench applications of the fungicides Proline, Propulse, and Luna Privilege were successful in reducing Fusarium wilt incidence in both trials. These products may help growers manage Fusarium wilt in the future. The ability of theses products to be applied once at planting and show efficacy against FW for at least 30 days makes each of them worth evaluating further for FW control. The treatments, 0.75 oz Actigard and 0.5 oz Actigard and 13.69 floz Propulse stunted plants in Trial 2, and these products need to be evaluated further for crop safety.