

Evaluation of programs combining host resistance with fungicides for control of Fusarium wilt of watermelon in Clayton, North Carolina, 2018

This experiment was conducted at the Central Crops Research Station in Clayton, NC, in a field nursery of *Fusarium oxysporum* f. sp. *niveum* FON. The trial site was planted with watermelon the previous year. Experimental plots were in single, raised beds on 10-ft centers covered with white plastic mulch. Plots were 16 ft long with 9-ft fallow borders on each end, with plants spaced at 1 plant per 2-ft in row. Irrigation and fertilization (4-0-8, N-P-K) were applied via drip tape. Experimental treatments were randomized in a complete block design with four replications per treatment. Three commercially available watermelon cultivars were used: 'Black Diamond' as a universally susceptible cultivar (diploid), 'Captivation' as an intermediately resistant cultivar (triploid), and 'SSX8585' as a highly resistant cultivar (diploid) to FON-1. 'SP-6', which has intermediate resistance to FON races 1 and 2, was planted as one plant on either side of triploid plots. Transplants were grown in a greenhouse for seven weeks and hardened for two days. On 9 May, transplants were inoculated by dipping transplant trays in a conidial spore suspension of FON at a concentration of 10^7 conidia/mL for 20 min, immediately followed by transplanting eight plants per plot. On 16 May, a second inoculation was applied as a 50 mL drench of a 10^6 conidia/mL suspension at the base of the plant. The fungicide drench treatments were applied in 100 mL solution on 9 May, two hr post-inoculation. Foliar fungicide treatments were applied using a CO₂-powered backpack sprayer at 40 gal/A. Applications were made on 24 May and 7 Jun. Disease incidence was assessed as the percentage of wilting plants per plot and rated twice weekly between 14 May and 21 Jun. All plots were harvested on 3 Jul, and number of watermelons, average watermelon weight, and total harvested weight per plot was recorded. Data were analyzed in the software ARM (Gylling Data Management, Brookings, SD) using analysis of variance and Fisher's protected least significant difference (LSD) test to separate means.

Low levels of Fusarium wilt were first observed on 21 May in the three non-treated plots and three treated plots. The remaining eight treatments had no disease incidence on 21 May. Disease progressed throughout the trial reaching up to 74.10 % incidence in non-treated, susceptible cultivars, four weeks after transplant (the first inoculation date). The highly resistant cultivar 'SSX8585' consistently had lower Fusarium wilt incidence across treatments when compared to cultivars 'Black Diamond' and 'Captivation' and statistically, during the final rating, when compared with one another when no treatments were applied. The fungicide Proline performed best when applied alone or as the initial drench followed by Adepidyn foliar sprays. The Proline only and Proline drench, Adepidyn foliar spray treatments when combined with SSX8585 had the greatest reduction in Fusarium wilt incidence and resulted in the most total fruit and total fruit weight as well as the highest average fruit weight. Four treatments (one 'Captivation' treatment, two 'SSX8585' treatments, and the non-treated 'SSX8585') displayed less wilting than previously recorded on the 11 Jun rating, leading to an overall reduction in disease incidence, indicating that these programs could allow for some degree of plant recovery over time. Phytotoxicity was not observed. In the table, treatments are sorted by level of disease incidence on the last disease rating date: 11 Jun.

Treatment and rate of product per acre	Spray Application ^y	Disease incidence (%) ^z					Total fruit count	Total fruit weight (lbs.)	Avg. fruit weight (lbs.)
		21 May	29 May	4 Jun	11 Jun	3 Jul	3 Jul	3 Jul	
Proline (drench) 5.7 fl oz Adepidyn (spray) 10.3 fl oz SSX8585	1,2	0.00 a ^x	3.13 cd	3.13 e	0.00 d	10.3 ab	157.63 a	15.50 a	
Adepidyn (drench) 10.3 fl oz Adepidyn (spray) 10.3 fl oz SSX8585	1,2	0.00 a	3.13 cd	3.13 e	0.00 d	10.8 a	145.39 ab	13.45 a	
Proline (drench) 5.7 fl oz Proline (spray) 5.7 fl oz SSX8585	1,2	0.00 a	0.00 d	0.00 e	0.00 d	9.8 ab	132.89 ab	13.51 a	
Proline (drench) 5.7 fl oz Proline (spray) 5.7 fl oz Black Diamond	1,2	0.00 a	0.00 d	0.00 e	0.00 d	9.5 abc	65.32 cde	6.90 bcd	
Proline (drench) 5.7 fl oz Adepidyn (spray) 10.3 fl oz Black Diamond	1,2	0.00 a	0.00 d	0.00 e	0.00 d	8.5 abcd	51.32 cdef	6.06 bcd	
Adepidyn (drench) 10.3 fl oz Proline (spray) 5.7 fl oz SSX8585	1,2	0.00 a	0.00 d	0.00 e	3.13 cd	10.5 ab	146.38 ab	13.85 a	
Proline (drench) 5.7 fl oz Proline (spray) 5.7 fl oz Captivation	1,2	0.00 a	6.25 cd	6.25 de	3.13 cd	10.3 ab	81.75 c	7.94 bc	
Proline (drench) 5.7 fl oz Adepidyn (spray) 10.3 fl oz Captivation	1,2	0.00 a	9.38 cd	3.13 e	6.25 bcd	10.0 ab	82.89 c	8.49 b	
Non-treated SSX8585	N/A	12.50 a	25.00 bc	28.13 cd	21.88 bc	8.8 abcd	121.21b	14.22 a	
Adepidyn (drench) 10.3 fl oz Adepidyn (spray) 10.3 fl oz Captivation	1,2	3.13 a	18.75 bcd	18.75 de	25.00 b	9.8 ab	68.12 cd	6.68 bcd	
Adepidyn (drench) 10.3 fl oz Proline (spray) 5.7 fl oz Black Diamond	1,2	0.00 a	9.38 cd	46.88 bc	58.03 a	7.0 cd	30.86 ef	4.63 d	
Non-treated Captivation	N/A	12.50 a	56.25 a	59.38 ab	59.38 a	8.0 bcd	56.33 cdef	7.12 bcd	
Adepidyn (drench) 10.3 fl oz Proline (spray) 5.7 fl oz Captivation	1,2	3.13 a	25.00 bc	50.00 abc	59.38 a	8.0 bcd	40.08 def	5.03 cd	
Non-treated Black Diamond	N/A	9.38 a	56.25 a	71.88 a	74.10 a	3.0 e	23.10 f	8.71 b	
Adepidyn (drench) 10.3 fl oz Adepidyn (spray) 10.3 fl oz Black Diamond	1,2	6.25 a	34.38 ab	62.50 ab	75.00 a	6.5 d	38.14 def	5.73bcd	

^zPercent disease incidence was calculated for each treatment based on the percentage of wilting plants per plot

^yApplication dates were: 1=24 May and 2=7 Jun

^xMeans followed by the same letter(s) within a column are not statistically different (P=0.05, Fisher's Protected LSD)