THE UNIVERSITY OF ARIZONA
Yuma Center of Excellence for Desert Agriculture

THE UNIVERSITY OF ARIZONA
COLLEGE OF AGRICULTURE & LIFE SCIENCES
Cooperative Extension

2018 Fusarium Wilt of Lettuce Research Report

2018 Lettuce Fusarium Wilt Variety and Crop Protection Product Evaluation Trials

In 2018, lettuce Fusarium wilt research trials were conducted at two Yuma County, Arizona locations, one near Yuma and the other near Wellton. Two studies were conducted at each location; 1) evaluation of lettuce varieties currently available or in development for their relative resistance to Fusarium wilt, and 2) assessment of crop protection products (conventional as well as biologically based materials) for their potential in reducing disease severity. The soil at each site was a silty clay loam. Lettuce was seeded in double rows 12 inches apart on beds with 42 inches between bed centers, then sprinkler-irrigated to germinate seed on 14 and 24 Sep for the Yuma and Wellton sites, respectively. Plants were thinned 14 and 24 Oct in Yuma and Wellton, respectively, to an approximate spacing of 11 inches. Symptoms of Fusarium wilt, including stunting and chlorotic leaves, began to be observed after thinning at both locations. Mean soil temperature (°F) at the 4-inch depth recorded at nearby University of Arizona AZMET (Arizona Meteorological Network) weather stations were as follows – for the Yuma site: 94 during Sep 14-30; 78 during Oct; 67 for Nov; and 62 for 1-3 Dec; and for the Wellton site: 91 during Sep 24-30; 77 during Oct; 66 during Nov; and 58 during 1-17 Dec. Total rainfall during the trial period was 1.63 and 1.82 inches for the Yuma and Wellton locations, respectively. Disease severity was recorded at crop maturity on 3 and 17 Dec for Yuma and Wellton trials, respectively, by counting the number of lettuce plants in each test plot that were dead, chlorotic, or stunted. Disease severity data were subjected to analysis of variance (ANOVA), then compared for significance using Fisher's Protected LSD test. Research plots at both locations were managed using customary commercial fertilization, insect management, and irrigation practices.

Evaluation of lettuce varieties. For the Yuma and Wellton locations, respectively, 16 (12 crisphead, 4 romaine) and 19 lettuce varieties (14 crisphead, 5 romaine) were planted in 75-ft-long plots, with four replicate plots per lettuce variety. Each plot contained about 180 plants in both locations. Plots were arranged in a randomized complete block design to facilitate statistical analysis of data collected. The percentage of lettuce plants of each variety rated as diseased at crop maturity is found in **Table 1**. The lowest percentage of diseased plants was recorded with the romaine varieties Del Sol, Duquesne, PX1337, PX497 and Valley Heart, with values ranging from 0 to 4.3% in both trials, and the four crisphead varieties Meridian, Oracle, 16C648 and 16C650, with values ranging from 2.6 to 5.3 in at least one of the two field trials. The severity of Fusarium wilt for these romaine and specific crisphead varieties was significantly lower than that recorded for other crisphead varieties, which ranged from 16.0 to 100%. Considering the 10 crisphead varieties present in both trials, the severity of Fusarium wilt at the Wellton site (60.9%) was significantly higher than at the Yuma site (35.3%).

Assessment of crop protection product efficacy. The crop protection studies at each location were conducted in plots seeded with the crisphead variety Raider. At both locations, each treatment was applied to four 75-ft-long plots, arranged in a randomized complete block design. At the Yuma and Wellton locations, 10 and four treatments were evaluated, respectively. Treatments were applied with

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a CO_2 backpack sprayer that delivered 50/gal per acre at 40 psi to flat-fan nozzles. Treatments were applied in a 4-inch band over each seed line. The first application of products was made right after seeding and before the germination sprinkler irrigation. Specific timing and rates of application for each treatment are listed in **Table 2**. Each plot contained about 180 plants in both locations. Treatments containing Experimental #1 and Experimental #2 significantly reduced the severity of lettuce Fusarium wilt compared to nontreated plants in both trials. Two seed treatments with the lettuce variety Raider also were evaluated at both trial locations. These treatments, Optimum and Optimum Plus, did not significantly reduce the final severity of Fusarium wilt compared to nontreated seed.

Table 1. 2018 Lettuce Fusarium wilt field trials – evaluation of varieties

Variety [y]	Percentage of plants diseased [z]	
	Yuma site	Wellton site
Valley Heart (R)	0.8 d	0.3 g
PX 1337 (R)	-------	0.1 g
Del Sol (R)	1.4 d	0 g
16c648	2.6 d	49.2 def
Oracle	3.5 d	31.1 f
Duquesne (R)	3.8 d	0 g
PX 497 (R)	4.3 d	0.3 g
16c650	5.3 d	49.4 de
3SX2033	16.0 c	71.9 bc
PX 1637	17.6 c	82.4 ab
Meridian	22.4 c	4.7 g
1117	35.0 b	-------
Raider	40.4 b	53.9 cd
009-02	45.0 b	-------
16c647	48.2 b	66.0 bcd
16c350	97.5 a	100 a
3SX2034	99.6 a	100 a
Icepalace	-------	32.5 ef
Icecastle	-------	54.4 cd
LS15537	-------	69.4 bc
LS16527	-------	95.8 a

[y] (R) denotes romaine varieties. All other entries are crisphead varieties.

[z] Disease severity was recorded at plant maturity at both locations, as described earlier. Any dead, chlorotic, or stunted plant at crop maturity was considered to be diseased. Values in each column followed by a different letter are significantly different from each other according to Fisher's Protected LSD test ($P = 0.05$).

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Table 2. 2018 Lettuce Fusarium wilt trials – evaluation of crop protection products

Product name	Rate/acre	Active ingredient	Yuma trial		Wellton trial	
			Treatment dates	Percent diseased plants[y]	Treatment dates	Percent diseased plants[y]
Experimental #2	4.56 fl oz	-------[z]	Sep 14	17.2 d	Sep 24	44.9 ab
Experimental #2	3.04 fl oz	-------[z]	Sep 14	21.1 d	Sep 24	41.9 ab
Experimental #1	13.7 fl oz	-------[z]	Sep 14	21.7 d	Sep 24	38.3 b
Timorex ACT	27.0 fl oz 27.0 fl oz 27.0 fl oz	Tea tree extract	Sep 14 Sep 26 Oct 10	27.8 c	-------	-------
Timorex ACT	18.0 fl oz 18.0 fl oz 18.0 fl oz	Tea tree extract	Sep 14 Sep 26 Oct 10	27.8 c	-------	-------
Experimental #1	10.3 fl oz	-------[z]	Sep 14	28.3 bc	Sep 24	34.0 b
Serifel Endura Merivon	16.0 fl oz 11.0 fl oz 11.0 fl oz	*B. amyloliquefacians* Boscalid Fluxapyroxad+pyraclostrobin	Sep 14 Sep 26 Oct 10	30.0 abc	-------	-------
Nontreated control	-------		-------	**31.1 abc**	-------	**53.4 a**
AVIV	28.0 fl oz 28.0 fl oz 28.0 fl oz	*Bacillus subtilis*	Sep 14 Sep 26 Oct 10	33.3 ab	-------	-------
AVIV	42.0 fl oz 42.0 fl oz 42.0 fl oz	*Bacillus subtilis*	Sep 14 Sep 26 Oct 10	34.4 a	-------	-------
Serifel	16.0 fl oz 8.0 fl oz 8.0 fl oz	*Bacillus amyloliquefacians*	Sep 14 Sep 26 Oct 10	35.0 a	-------	-------

y	Disease severity was recorded at plant maturity at both locations, as described earlier. Any dead, chlorotic, or stunted plant at crop maturity was considered to be diseased. Values in each column followed by a different letter are significantly different from each other according to Fisher's Protected LSD test (P = 0.05).
z	Active ingredient not known.

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