**October 29, 2015**

# Final Report: National Watermelon Association

MANAGEMENT OF FUSARIUM WILT AND FOLIAR DISEASES OF WATERMELON THROUGH APPLICATION OF FUNGICIDES THROUGH DRIP IRRIGATION.

**Summary of Results:**

- The most effective treatment application for reducing Fusarium wilt was the first Proline drip application which was applied four days after transplant.
- Differences in Fusarium wilt incidence on 29 June were marginally significant ($P$=0.092), and plants that received two drip applications or one drip and one foliar application of Proline had 51 to 64% less wilt incidence than plants in non-treated plots.
- Topsin applied through the drip did not reduce wilt nor improve vine length of watermelon plants.
- Proline applied three times through the drip reduced Fusarium wilt severity on July 22 compared to both the nontreated plots and plots treated with Topsin. The plots where Proline was applied three times through the drip ranked the lowest in wilt mid-season. However the three other Proline treatments also performed well.
- Phytotoxicity occurred, but only in one treatment and at a very low level.

Taken together our results indicate that application of Proline through the drip results in the greatest reduction in Fusarium wilt season long. However, several application timings that are in compliance with label requirements also were beneficial. For example, Proline applied once through the drip soon after planting, or two weeks after planting and then applied twice as a foliar spray, also reduced Fusarium wilt.

*In Fusarium wilt infested fields, growers are advised to apply Proline once through the drip at, or up to 4 days after transplanting and to apply foliar sprays of Proline three and five weeks later.*

**Project Details:**

**Background:** In previous research, Proline applied through the drip irrigation system three times during watermelon transplant establishment, reduced Fusarium wilt, increased vine length and improved yield. Recently Bayer CropScience LP, Research Triangle Park, NC, received a Supplemental Label for drip irrigation application of Proline (prothioconazole) on watermelon in some states within the U.S. However the label limits drip applications to one per season, although additional foliar applications are permitted.

Proline also has efficacy on foliar disease of watermelon, and could have the dual benefit of reducing gummy stem blight and anthracnose. Foliar application of Proline was evaluated in 2014 in Maryland and reduced overall foliar disease (several diseases were present, including Cercospora leaf spot, gummy stem blight, and downy mildew). However phytotoxicity was observed where Proline was used weekly, but not on a 14-day schedule alternated with chlorothalonil.

**Objective outcomes:** Our research results answer the following objective questions.

1) How effective is management of Fusarium wilt when Proline is applied once through the drip, but additional foliar applications are used?

Proline can be effectively used as a single drip application, followed by foliar sprays. Early in the season differences in Fusarium wilt incidence were marginally significant ($P$=0.092), and plants that received two drip applications or one drip and one foliar application had 51 to 64% less wilt incidence than plants in non-treated plots. The most effective application for reducing Fusarium wilt was the *first* Proline drip application.

By mid-season, the plots where Proline was applied three times through the drip had the least Fusarium wilt. However wilt was not significantly lower than in the three other Proline treatments.

Topsin through the drip did not reduce wilt nor improve vine length over that in non-treated plots.

2) Under what programs does phytotoxicity to watermelon plants occur – especially when applications through the drip are followed by foliar applications?

Very little phytotoxicity occurred in our trial. Less than 2%, was observed in plots where Proline was applied once through drip and on 24 June and 15 July to the foliage. Our results confirm previous results where phytotoxicity was high when Proline was applied weekly but not when it was applied at 14-day intervals.

3) Do foliar applications of Proline for Fusarium wilt result in foliar disease management under field conditions?

Gummy stem blight remained low throughout the season and there were no differences among our treatments. In a previous trial in 2014, Proline reduced gummy stem blight, Cercospora leaf spot and overall leaf necrosis due to disease compared to the nontreated plots.

**Work Completed: T**he experiment was conducted at the University of Maryland's Lower Eastern Shore Research and Education Center, Salisbury. The field at this location has a high level of *Fusarium oxysporum* f. sp. *niveum* inoculum that includes races 0, 1, and 2. The experiment was conducted as a randomized complete block design with six fungicide treatments and four replications. Plots consisted of one raised bed, 80 ft long, on 7-ft centers using 1.25-mil plastic and one line of 8-in. emitter spaced drip tape. The beds were shaped and covered with plastic in a one pass operation on 13 May. Four-week-old seedlings were removed from the greenhouse to begin hardening off on 24 May. They were transplanted into the field 36 in. apart with a 20-20-20 (N-P-K) (2.5 lb/150 gal water) starter solution on 29 May. Soil moisture was maintained by drip irrigation as needed. Fungicide applications began on 2 June, four days after transplanting and were applied until 22 July. Fungicides were applied through the drip irrigation or by a tractor-mounted sprayer that delivered 45 gal/A at 43 psi through six D4-45 hollow-cone nozzles mounted in a directed pattern. Vines length of 4 plants from each plot were measured on 19 June. The percent of foliage that had phytotoxicity symptoms of leaf margin necrosis was

rated on a whole plot basis on 1 August, and gummy stem blight severity was evaluated on the whole plot. Percentage of vine wilt was evaluated on 29 June, 7 and 22 July. All mature and marketable fruits from each plot were harvested, counted, and weighed on 4 August. In order to determine if there were differences in vegetative growth that might provide information on potential yield loss, a total of 5 vines were collected from each plot and both fresh weights and dry weight taken on 4 and 11 August.

As discussed previously, Proline but not Topsin reduced Fusarium wilt and improved vine length compared to nontreated plots. Proline applied three times through the drip reduced Fusarium wilt severity on July 22 compared to both the nontreated plots and plots treated with Topsin. The three other Proline treatments also performed well.

| Treatment and rate/A | Application dates[z] | | % Wilt[y] | | | Vine Length (m) | Stunt |
|---|---|---|---|---|---|---|---|
| | Drip | Foliar | 29 June | July 7 | July 22 | 19 June | 7 July |
| Proline 480SC 5.7 fl. oz | 1,2,4 | | 11.4 a[x] | 27.0 a | 60.0 c | 43.6 a | 43.6 a |
| Topsin 4.5FL 10 fl. oz | 1,2,4 | | 32.2 a | 48.8 a | 77.5 ab | 33.1 c | 61.3 a |
| Proline 480SC 5.7 fl. oz | 1 | 3,6 | 15.7 a | 23.8 a | 66.3 bc | 43.9 a | 35.0 a |
| Proline 480SC 5.7 fl. oz | 1 | 5,6 | 26.6 a | 43.8 a | 72.5 abc | 42.0 ab | 52.5 a |
| Proline 480SC 5.7 fl. oz | 2 | 5,7 | 21.6 a | 32.0 a | 66.3 bc | 33.6 c | 60.3 a |
| Nontreated | - | - | 32.3 a | 42.0 a | 88.8 a | 34.9 bc | 57.5 a |
| *P* value[w] | | | 0.0962 | 0.1174 | 0.0252 | 0.0183 | 0.3746 |

[z]Application dates were 1=2 June; 2=17 June; 3=24 June; 4=1 July; 5=2 July; 6=15 July; 7=22 July.
[y]Percent wilt incidence on 29 June was evaluated as the percent of plants within a row that were wilted; on 7 and 22 July the severity of wilt was determined as the percent of wilted or stunted foliage.
[x]Mean values within each column followed by the same letter are not significantly different at $P=0.005$ according to Fisher's protected LSD.
[w]*P* values $\leq 0.05$ indicate significant differences are likely to exist among treatments.

Gummy stem blight remained low throughout the season and there were no differences among treatments. Likewise, due to high Fusarium wilt, which caused plant stunting, wilting and death, yield was extremely low in the field. There were no differences in total fruit weight or fruit number among treatments. In addition, no differences were observed in fresh or dry vine weight. A low level of phytotoxicity, less than 2%, was observed in plots where Proline was applied once through drip and on 24 June and 15 July to the foliage.

**Submitted by:**

Kathryne L. Everts, Professor & Extension Specialist, Vegetable Plant Pathology
University of Maryland, Lower Eastern Shore Research & Education Center
27664 Nanticoke Road, Salisbury, MD 21801-8437
keverts@umd.edu
Phone: 410-742-1178 x305
Fax: 410-742-1922