LARGE-SCALE EVALUATION OF SUPPLEMENTAL CHLOROPICRIN APPLICATIONS TO MANAGE FUSARIUM WILT IN COMMERCIAL TOMATO PRODUCTION

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Since the transition away from methyl bromide to alternative fumigant systems, Florida tomato growers have observed an increase in crop losses associated with soilborne diseases, such as Fusarium wilt. Our research has indicated that the increase in soilborne diseases is linked to the lower vapor pressure and boiling point properties of the alternative fumigants, compared to methyl bromide, which translates to reduced lateral movement to the outer edges of the raised bed. A supplemental strategy has been tested, whereby an additional application of chloropicrin to under fumigated regions below the outer edges of the raised bed was shown to improve fumigant coverage. The goal of the research was to further evaluate this supplemental strategy at a commercial tomato production site.

A series of large scale on-farm trials in Myakka City were conducted in Spring 2014 and repeated in Spring 2015 in fields with a known history of Fusarium wilt. Initial trials were designed to validate the benefit of the supplemental chloropicrin application on the incidence of Fusarium wilt, plant vigor and yield. The entire field was prepared by the grower, with a standard application of PicClor 60 at 300 lbs/A to the raised beds (32 inch bottom width, 28 inch top width, and 8 inches tall). A Yetter Avenger coulter system (set with two 30 inch coulters straddling each bed) applied additional Pic100 at 200 lbs/A, approximately 8 inches below the final soil surface to replicated sets of 3 beds. The Pic100 was applied to beds prior to the initial in-bed fumigation and the application of VIF mulch. The control treatment consisted of the grower standard with the Yetter Avenger coulter, but without any supplemental chloropicrin.

In Fall 2014, a second series of trials were initiated to assess the supplemental rate of chloropicrin. Similar to the previous trial, all raised beds were fumigated with a standard rate of PicClor 60 (300 lbs/A). The supplemental Pic100 rates of 0, 50, 100, and 150 lbs/A were applied using the Yetter Avenger coulter system to replicated sets of 3 beds. In Spring 2015, the rate study was repeated with supplemental Pic100 rates of 0, 75, 100, 150, and 200 lbs/A.

For all trials, plots consisted of three adjacent 600-700 ft long beds (depending on location) on 6 ft center to center row spacing. Beds were 32 inches wide on top, 34 inches wide at the base, and 8 inches tall. Beds were covered with VIF film, fertilized, and maintained per grower standard practice. All trials were arranged as a randomized complete block design with four to six replications per treatment. Plant height, disease incidence, and yield data were assessed over the three seasons. In addition, root density samples were taken in both Spring 2014 and 2015 to quantify root density from the edge of the bed to the row middle using a turf "cup cutter."

Results

Results from trials showed that the supplemental chloropicrin application reduced incidence of Fusarium wilt in four out of the six trials. Also, there was a significant increase in marketable yield in four out of the six trials with the addition of the supplemental chloropicrin application (Data not shown). Field conditions and environment in Spring 2014 field site A was the most favorable for development of Fusarium wilt. The supplemental chloropicrin treatment reduced disease incidence by 77% compared to the grower standard (Figure 1). In Spring 2015, a similar trend was observed with a 37.5% relative reduction in incidence in field site A compared to the grower standard (Figure 2). Similarly, in the same season in field site B, the total incidence was numerically reduced by 26%. (P=.0946). Although not statistically different, this reduction is still beneficial to the grower.

In the Fall 2014 study, disease incidence among plots ranged from 3 to 16 % (Figure 3). The supplemental chloropicrin had a significant effect on disease incidence. All chloropicrin rates numerically reduced disease incidence compared to the grower standard. However, only the 100 and 150 lbs/A rates were statistically significant, reducing Fusarium wilt incidence by an average of 78% relative to the grower PicClor 60 standard.

In the spring 2015 rate study, disease incidence ranged from 11-18% (Figure 4). The supplemental chloropicrin application at 200 lbs/A significantly reduced incidence the greatest by 39% relative to the grower standard of PicClor 60 alone at 300 lbs/A (Figure 4). The remaining three rates of 75, 100, and 150 lbs/A were statistically similar, reducing disease incidence an average of 26 % relative to the grower standard.

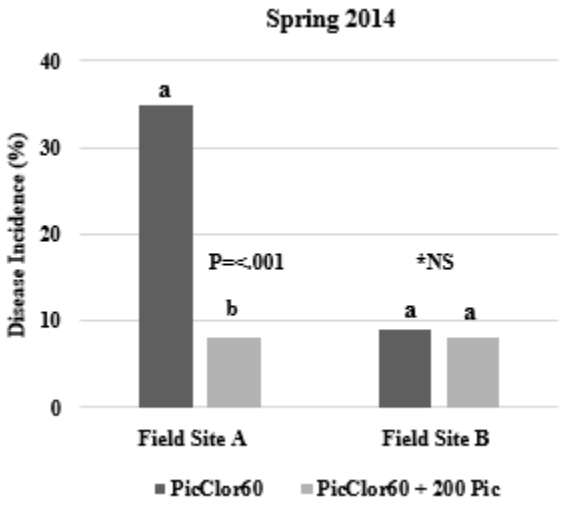

Figure 1. Effect of supplemental chloropicrin application on the Spring 2014 Fusarium wilt incidence. Letters above bars indicate statistical significance (α = 0.05). NS=Not Significant.

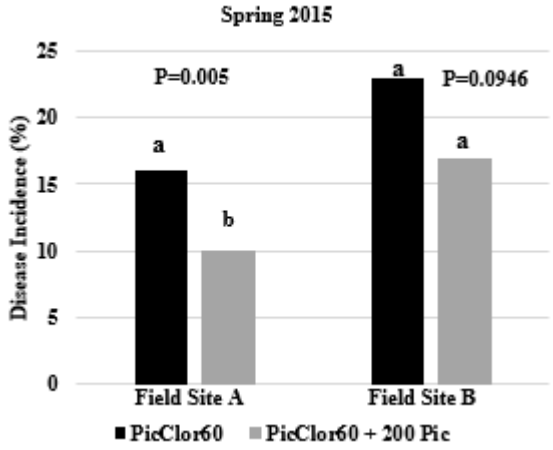

Figure 2. Effect of supplemental chloropicrin application on the Spring 2015 Fusarium wilt incidence. Letters above bars indicate statistical significance (α = 0.05).

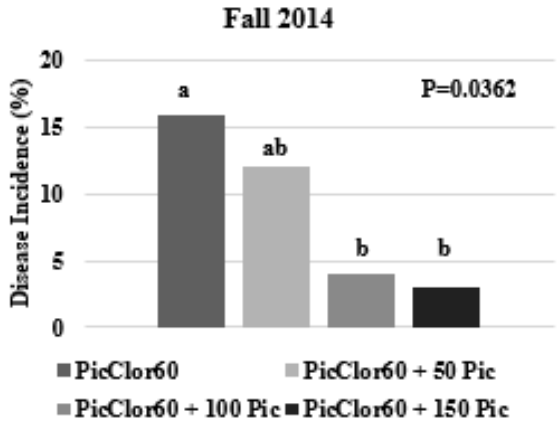

Figure 3. Effect of different rates of supplemental chloropicrin application on the Fall 2014 Fusarium wilt incidence. Letters above bars indicate statistical significance (α = 0.05).

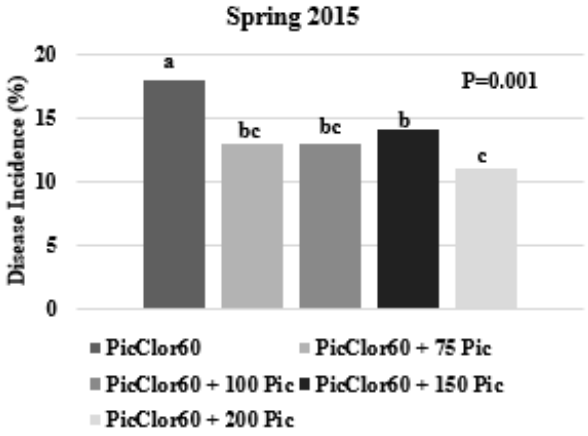

Figure 4. Effect of different rates of supplemental chloropicrin application on the Spring 2015 Fusarium wilt incidence. Letters above bars indicate statistical significance (α = 0.05).