SUPPLEMENTAL CHLOROPICRIN APPLICATION: EVALUATION OF IN_BED FUMIGATION RATE

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Since the transition from methyl bromide to alternative fumigants, vegetable growers have experienced a resurgence of several soilborne pests and pathogens, particularly *Fusarium oxysporum* f. sp. *lycopersici* (FOL) the causal agent of Fusarium Wilt on tomato. Several studies attributed this resurgence to the inability of the alternative fumigants to effectively disperse through the soil to the edge of beds and below the mulch tuck. Conventional fumigation practices leave roots exposed to pathogens in these under-treated areas of the bed. Protecting those scavenging roots, which typically grow out of the bed around mid-season, is imperative when trying to manage Fusarium wilt. Supplemental chloropicrin (Pic) applied along the bed edges at an 8 inch depth with a Yetter Avenger Coulter (yetter) system immediately before laying plastic was shown to treat soil along bed edges and into the row middle. The goal was to conduct large-scale demonstration trials to evaluate the supplemental Pic approach on disease, plant vigor (based on plant height) and yield in conjunction with a standard in-bed application of chloropicrin + 1,3-dichloropropene.

The first trial in Wimauma, FL was conducted in Spring 2016 in a commercial field with two large drainage tiles running perpendicular to plant beds, creating zones with low and high soil moisture levels during fumigation and throughout the growing season. Standard raised beds (32 inch bottom width and 8 inches tall) were treated with the grower standard Pic-Clor 60 at 300 lb/A . Supplemental Pic (Tri-Pic 100, 150 lb/A) was applied along the edge of the bed prior to laying a virtually impermeable plastic film (VIF). Plots (approx. 0.6 A/plot) were arranged in randomized complete block design with groups of 6 beds receiving the supplemental Pic treatment alternated with 6 beds of the grower standard; each treatment was replicated four times.

A second trial, conducted at a commercial field site in Myakka City, FL, evaluated whether the in-bed rates of Pic-Clor 80 could be reduced when using the supplemental Pic treatment. Treatments consisted of three different rates of Pic-Clor 80 ranging from 175, 200, and 225 lbs/A applied to standard raised beds in combination with the supplemental Pic (Tri-Pic 100, 150 lbs/A) along the edges of the bed. Plots (approx. 0.3 A/plot) were arranged in randomized complete block design with 6 reps per a treatment. For all trials, plant height, disease incidence, and yields were taken throughout the growing season.

At the field trial in Wimauma, the supplemental Pic treatment increased yields by 21% over the grower standard, regardless of soil moisture, based on the number and pounds of fruit harvested per an acre ($P = 0.0007$ and 0.0008, respectively). Although the effect of soil moisture on yield was not significant, the interaction between fumigant treatment and soil moisture was of marginal significance based on fruit number ($P = 0.0317$) and total fruit weight ($P = 0.0728$). Similar trends were observed for both interactions. The effect of the supplemental Pic treatment on yield was nullified in soils with higher moisture content, as there were no differences between the grower standard and supplemental Pic treatments in wet soil (Figure 1 & 2). However, in dry sections of the field near the drainage tiles, the supplemental Pic treatment increased harvested fruit weight by 39% and the number of fruit by 44% over the grower standard. The supplemental Pic treatment was more effective at increasing yields in drier soils that were affected by the drainage tiles.

Early season results from the trial in Myakka City indicated that a reduced Pic-Clor 80 rate of 160 lbs/A with the supplemental treatment was statistically equivalent in regards to plant vigor to the standard in bed rate of 180 lbs/A rate without the supplemental treatment (Figure 3), while vigor was statistically reduced at the Pic-Clor 80 rate of 140 lbs compared to the grower standard. Disease incidence ratings were taken at 49 and 56 days after planting, and in both cases the supplemental Pic treatment reduced Fusarium wilt incidence compared to the grower standard (Figure 4). The first incidence ratings of the supplemental Pic treatments were reduced, on average, by 51% and the second ratings were reduced by 43% compared to the grower standard. The initial disease incidence ratings taken showed that the lowest rate of 140 lb/A + 150 lb/A of Pic significantly reduced disease by 52% compared with the higher rate of 180 lbs/A +150 lbs/A. However, as the season progressed statistical differences among in-bed treatments with the supplemental Pic application were not seen, although disease incidence trends tended to be lower in the lower in-bed rates. There was no statistical effect of treatment on yield at harvest ($P = 0.3110$). In the future Pic-Clor 80 could be partially reduced to offset the supplemental Pic treatment without compromising plant vigor, disease control or yield.

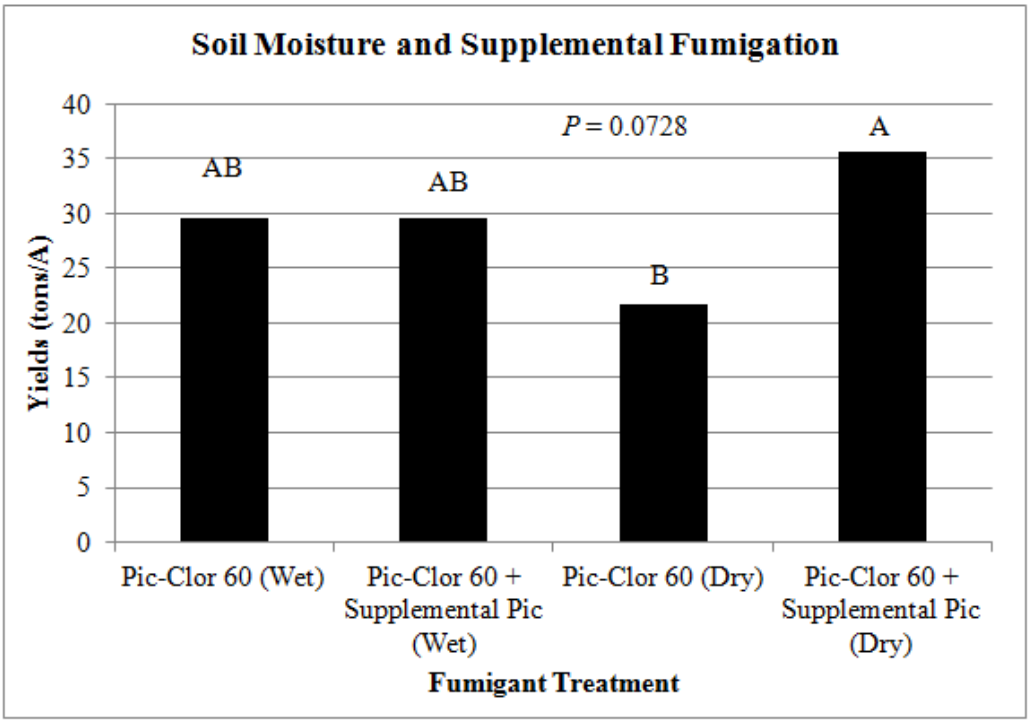

Figure 1. Effect of the supplemental chloropicrin (Pic) treatment and soil moisture on tomato yield, as the average weight per an acre. Columns followed by the same letter are not significantly different (α = 0.05).

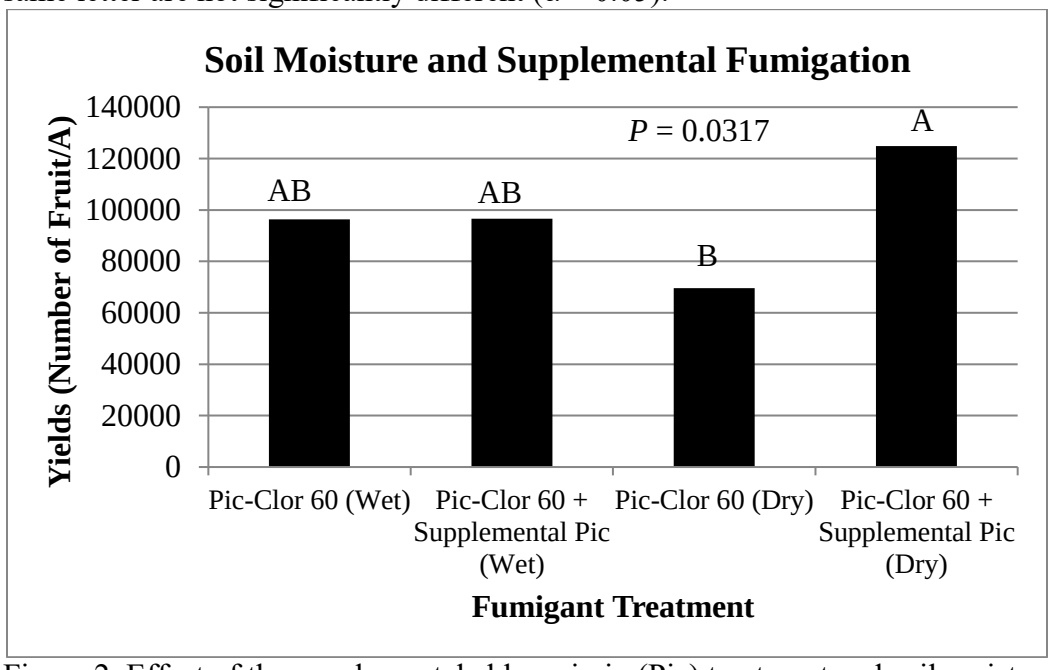

Figure 2. Effect of the supplemental chloropicrin (Pic) treatment and soil moisture on tomato yield, as the average number of fruit per an acre. Columns followed by the same letter are not significantly different (α = 0.05).

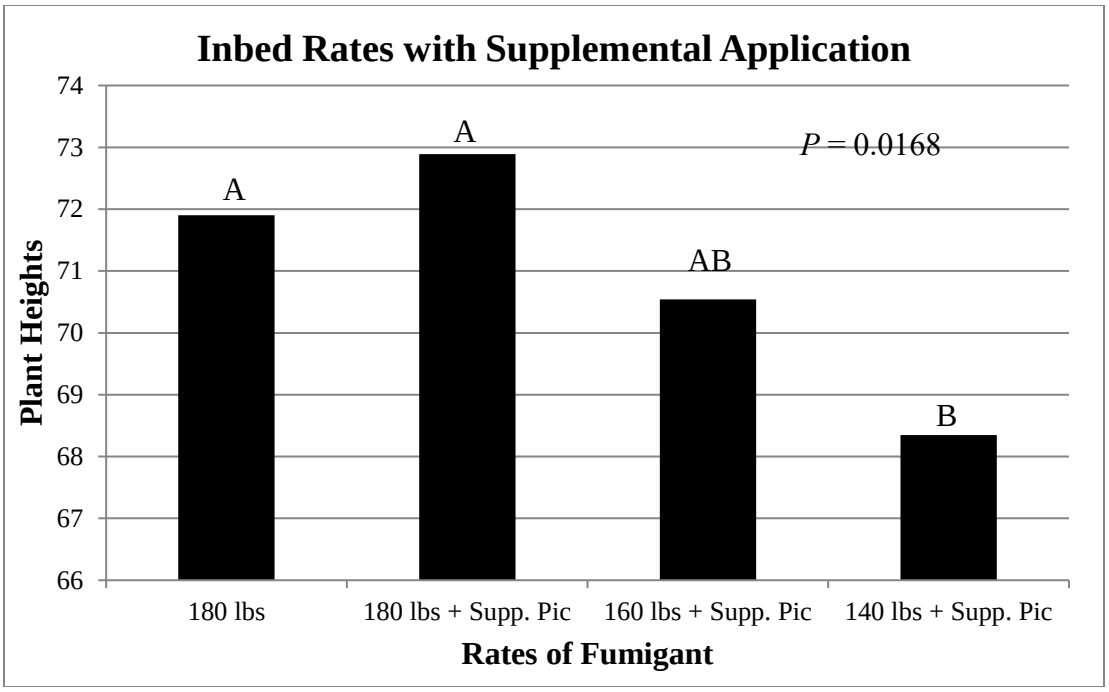

Figure 3. Effect of varying in-bed rates of chloropicrin with the supplemental Yetter application on plant heights. Columns followed by the same letter are not significantly different (α = 0.05).

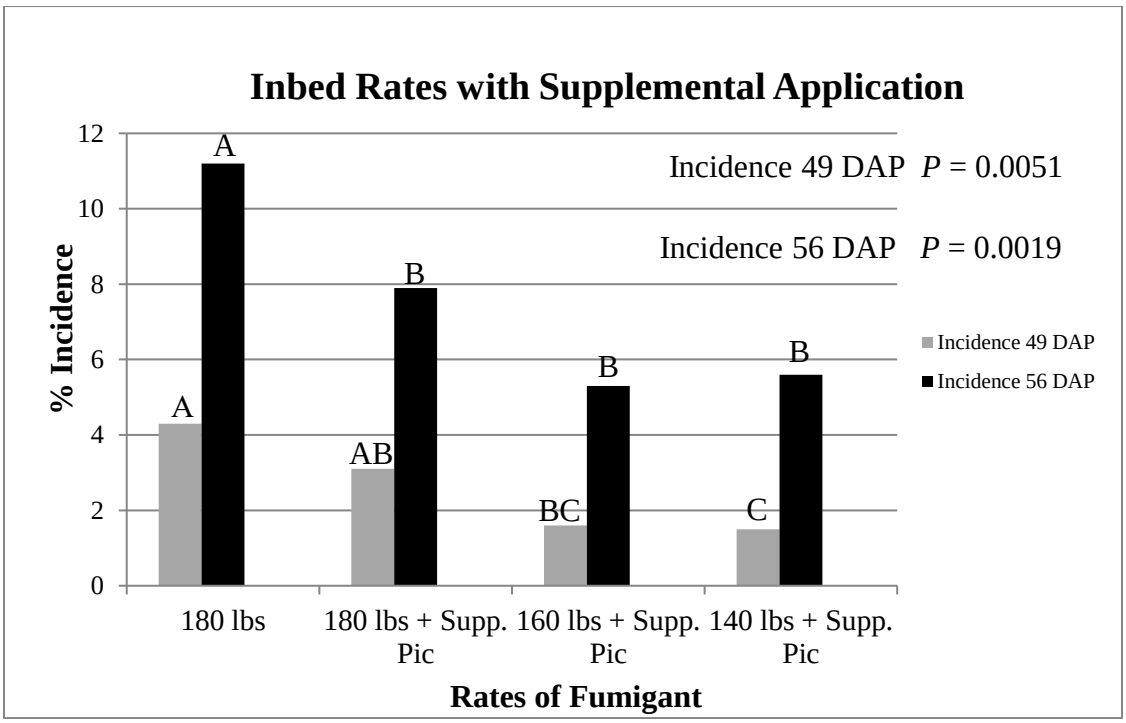

Figure 4. Effect of varying in-bed rates of chloropicrin with the supplemental Yetter application on disease incidence of Fusarium wilt. Columns followed by the same letter are not significantly different (α = 0.05).