EFFECTS OF FUMIGANTS AND A COVER CROP ON PEST POPULATIONS OVER TIME IN TOMATO PLASTICULTURE PRODUCTION SYSTEMS

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Florida is the second largest producer of fresh market tomatoes in the United States. Tomato growers throughout the state rely on soil fumigation for control of soil-borne pathogens, nematodes and weeds. They predominately use combinations of chloropicrin (Pic) and 1,3-dichloropropene (1,3-D) but also use other fumigants such as dimethyl disulfide (DMDS) and metam potassium. Previous research conducted at the University of Florida found that nutsedge control varies with the fumigant selected but populations tend to increase over time no matter which fumigant is applied (Jacoby 2012). This is especially true of purple nutsedge which tends to be more tolerant of herbicides and fumigants. Fumigation can reduce nutsedge density but control levels tend to be erratic and vary across seasons and years.

Experiments were conducted in two separate fields at the Gulf Coast Research and Education Center in 2015, 2016 and 2017 to evaluate the effect of fumigation and the presence or absence of a cover crop on weed population dynamics and tomato growth and production. All experiments were a split-plot design organized as a randomized complete block with four blocks. The main plot was the fumigant treatments which were a non-treated control, 70 kg ha^{-1} of Paladin Pic-21, 51 kg ha^{-1} of Pic-Clor 60 or 65 kg ha^{-1} of Paladin plus 78 kg ha^{-1} of K-Pam. All fumigants except K-Pam were applied with a standard fumigation rig equipped with three shanks. The fumigants were applied at the bottom of the bed. K-Pam was applied with six shanks at a 10 cm depth. . All beds were covered with TIF plastic mulch (Berry Plastics) immediately after fumigation. Fumigants were applied to the same plots each year in January and tomatoes were transplanted in early March. After the final tomato harvest, the plastic was removed and the field was disked. One half of each plot was plant with a sorghum-sudangrass hybrid and the other half was kept weed-free with repeated applications of glyphosate. Weed density, disease incidence, crop growth, and crop yield were measured each year of the tiral.

Fumigation tended to reduce nutsedge density at both sites at all years compared to the non-treated control (Table 1). Paladin plus K-Pam tended to be the most effective fumigant for nutsedge control across years and sites. At site 1, Paladin plus K-Pam reduced nutsedge density more than any other fumigant where a cover crop was grown (Table 2). Nutsedge density tended to be lower where no cover crop was grown and there were no differences between fumigant treatments. This likely occurred because repeated glyphosate applications reduce

nutsedge density more effectively than cover crops. The same trend was not observed at site 2 where the nutsedge population was lower.

Tomato growth, tomato yield, disease incidence, and broadleaf weed control will be discussed during the presentation.

Literature Cited

Jacoby, T.P. 2012. Evaluation of the long term sustainability of methyl bromide alternatives in tomato (Solanum lycopersicum Mill.) and pepper (Capsicum annuum L.). M.S. Thesis, University of Florida, Gainesville, Florida.

Table 1. Effect of fumigation on nutsedge density emerging through the plastic mulch at two sites located at the Gulf Coast Research and Education Center. Nutsedge counts are averages of multiple counts taken over the cropping period.

Fumigant	Rate	Site 1			Site 2		
		2015	2016	2017	2015	2016	2017
	kg ha^{-1}	----------# m^{-2}----------					
Nontreated	-	43 a	194 a	3 a	47 a	5 bc	2 a
Paladin Pic-21	70	6 b	57 b	2 ab	7 b	7 ab	1 b
Pic-Clor 60	51	6 b	190 a	3 a	1 c	10 a	1 b
Paladin + K-Pam	65+78	3 c	9 b	1 b	0 c	0 c	0 b

Means within columns with the same letter are not significantly different based on Tukey adjusted means comparisons at $p<0.05$.

Table 2. Effect of the presence or absence of a sorghum-sudangrass cover crop during the fallow period and fumigation prior to transplant on nutsedge densities emerging through the plastic much at two sites at the Gulf Coast Research and Education Center in 2017

Cover Crop	Fumigant	Rate	Site 1	Site 2
		kg ha^{-1}	----------# m^{-2}----------	
Yes	Nontreated	-	5 a	2 a
	Paladin Pic-21	70	5 ab	2 a
	Pic-Clor 60	51	8 a	1 ab
	Paladin + K-Pam	65+78	2 c	1 b
No	Nontreated	-	2 bc	3 a
	Paladin Pic-21	70	1 c	1 ab
	Pic-Clor 60	51	1 c	1 ab
	Paladin + K-Pam	65+78	0 c	1 b

Means within columns with the same letter are not significantly different based on Tukey adjusted means comparisons at $p<0.05$.