TOMATO PRODUCTION AS AFFECTED BY BED WIDTH AND FUMIGANT

S. J. Locascio*, M. R. Alligood, and D. W. Dickson, Horticultural Sciences and Entomology and Nematology Departments, University of Florida, Gainesville, FL 32611-0690.

Fresh market tomatoes (*Lycopersicon esculentum* Mill.) in Florida are typically grown on beds 90 cm wide space 1.8 m apart. A reduction in bed width without a reduction in tomato yield would allow reduced amounts of in-row pesticide application. With the in-row application of 1,3- dichloropropene (1,3-D) +17% and 35% chloropicrin (Pic) at 336 $L \cdot ha^{-1}$, considered the best alternative for methyl bromide-Pic (MBr-Pic) for polyethylene mulched tomato, a reduction in bed width from 90 cm to 60 cm would result in a 33% reduction in fumigant used. The objectives of these studies were to determine if fumigants quantity could be reduced by a reduction in bed-width without a loss in crop production and pest control.

Tomatoes were grown during the spring and fall of 2002 to evaluate the effect of four fumigants and three row width with low-density polyethylene (LDPE) mulches black in spring and white in the fall on tomato production and pest control. Spring studies were conducted on a Millhopper fine sand site near Gainesville, FL that was naturally infested with purple and yellow nutsedge (*Cyperus rotundus* L. and *Cyperus esculentus* L.), root-knot nematode *[Meloidogyne incognita* (Kofoid &White) Chitwood], and soil pathogenic fungi. Fall studies were conducted on a Sparr fine sand site near Citra, FL that was naturally infested with root-knot nematode.

Treatments were factorial combinations of four fumigant treatments and three bed widths on single row plots 10 m long and 1.8 m wide with four replications. Fumigant treatments were the check, injected MBr-Pic (67-33%) at 390 $kg \cdot ha^{-1}$, injected 1,3-D + 35% Pic at 336 $L \cdot ha^{-1}$ (C-35), and drip applied 1,3-D + 35% Pic (C-35/Drip) at 243 $L \cdot ha^{-1}$ on beds 30, 60, or 90 cm wide. Injected fumigants were applied with 1, 2, or 3 chisels placed 30 cm deep or for drip applications in 1, 2, or 3 lines for the 30, 60, and 90 cm wide bed, respectively. A complete fertilizer at 84-38-70 N-P-K $kg \cdot ha^{-1}$ was applied preplant and additional N-K fertilizer was applied at 14-0-12 $kg \cdot ha^{-1}$ through the drip-irrigation system weekly for 10 applications. One drip tubing line and 38.1µm (1.5 mil) polyethylene (PE) mulches were applied on 11 Feb. and on 24 July, 2002 to all plots. Drip applied 1,3-D + 35% Pic was applied in a 2 hours application (151 $L \cdot 30.5\ m^{-1}$) followed by one-half hr of irrigation on 25 Feb. and 30 July. 'Florida 47' tomato seedlings were transplanted 0.45 m apart on 13 Mar. and 'SolarSet' on 26 Aug, 2002. Fruits were harvested at the mature green stage and graded into marketable size categories. Nutsedge counts and root-galling ratings were made at the end of each season.

Main effects of fumigants on tomato total marketable fruit yields in spring and fall seasons are shown in Table 1. In the spring season, fruit yields were highest with all fumigant treatments than the check. In the fall season, fruit yields were significantly higher and the same with injected C-35 and MBr-Pic treatment and lower and similar with the check and C-35/Drip. In the spring study, fruit yields were significantly higher with 90 cm beds than with 30 or 60 cm beds. In the fall study, yields were lower with 30 cm beds highest with 60 cm beds and intermediate with the 90 cm beds.

Root gall ratings were affected by an interaction between fumigant and row spacing in the spring. The major source of the interaction was that with all fumigants, root gall ratings were significantly higher with 30 cm beds than with the wider beds. With the control treatment, root gall ratings were high and similar with all row spacings. In the fall study, the main effects of fumigants were that root gall ratings were significantly higher and similar with the control and C-35/Drip than with the injected C-35 and MBr-Pic treatment. Root gall ratings were significantly higher with the 90cm beds. Counts made at the end of the spring season indicate a low population of nutsedge present and treatment interacted in their effects. Bed width had no effect on nutsedge population except that with C-35/Drip, w ere counts were significantly lower with 30 and 90 cm beds than with 60 cm beds. With the accompanying 2-drip lines with the 60cm bed application, fumigant was not applied in the bed center and this may have resulted in the higher population of nutsedge on 60 cm beds. In contrast, with the 30 and 90 cm treatments, fumigant was applied with a drip tubing in the bed center and provided more nutsedge control.

In these studies, fruit yields were similar and higher with injected MBr-Pic and C-35 than with no fumigant. In the spring season, C-35/Drip provided a higher yield than with no fumigant but in the second season, yields and root gall ratings were similar to that with no fumigant. These data would indicate that yield and pest control with beds widths of 60 and 90 cm were better than with 30 cm beds with MBr-Pic and C-35.

Table 1. Main effects and interactions of fumigant and bed width on tomato yield, nutsedge growth and tomato root galling in Spring and Fall 2002.

	Spring 2002				Fall 2002			
	Bed-width (cm)				Bed-width (cm)			
Fumigant	30	60	90	Mean	30	60	90	Mean
	Marketable yield (mt•ha^{-1})							
Check	32.75	35.97	34.99	34.57b[z]	25.67	32.98	31.71	30.12b[z]
MBr-Pic	42.40	47.84	50.97	47.07a	29.50	39.61	36.97	35.36a
C-35	50.39	43.37	57.59	50.45a	31.34	37.28	30.31	32.98ab
C-35/Drip	44.53	41.43	51.28	45.75a	29.38	32.87	30.14	30.80b
Mean	42.52b	42.15b	48.71a		28.97c	35.68a	32.28b	
	Interaction NS				Interaction NS			
	Root gall (rating)							
Check	66.67a[y]	92.33a	80.83a	79.94	28.54	41.88	38.75	36.39a[z]
MBr-Pic	37.50a	4.66b	2.67b	14.94	17.08	9.38	11.04	12.50b
C-35	11.33a	7.00b	1.83b	6.72	14.38	10.63	32.29	19.10b
C-35/Drip	33.50a	1.33b	4.00b	12.61	34.59	37.92	60.63	44.38a
Mean	37.00	26.33	22.33		23.65b	24.95b	35.68a	
	Interaction **				Interaction NS			
	Nutsedge (no•m^2)							
Check	3.4a[y]	3.6a	6.0a	4.33				
MBr-Pic	2.6a	1.2ab	0.0a	1.27				
C-35	0.8a	3.0a	0.8a	1.53				
C-35/Drip	3.6b	19.4a	2.6b	8.53				
Mean	2.6	6.8	2.4					
	Interaction **							

[z] Main effect separated by Duncans' multiple range test, 5% level.
[Y] Where interactions were significant, mean separation within a fumigant by Duncans' multiple range test, 5% level.