Effects of Anaerobic Soil Disinfestation on Weed Control, Fruit Yield and Quality of Fresh-market Tomato

Submitted by
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Table 1. Summary of cultural practices used on tomato grown with drip/seepage irrigation in Immokalee, FL during spring 2015.

Location	Immokalee FL (SWFREC).
Number of treatments	3 (CSF, ASD1, ASD2) [z]
Experimental design	RCBD (4 replications)
Irrigation	Hybrid drip/seepage
Plot size	50 ft × 1 bed = 50 ft
Harvest unit	10 plants
Total area	150 ft × 4 reps = 600 ft/0.09 acres
Plastic laying and fertilization	2 February 2015
Plastic mulch	TIF Black/White (top/underneath)
Planting date	24 February 2015
Variety	Skyway 687
Linear ft per acre	7,260
Bed spacing (center to center)	6 ft
Plant population	4.840 plants
Bed height	8 inches
Plant spacing	18 inches
Bed width	36 inches
Row run	East-West
Bottom mix	1,000 lb/acre 3-10-4
Fertigation	160 lb/acre of N and 235 lb/acre of K
Harvest date	
1st	29 April 2015
2nd	13 May 2015
3rd	26 May 2015
Planting to 3rd harvest	91days

[z] CSF: chemical soil fumigation, ASD: anaerobic soil disinfestation.

Table 2. Soil disinfestation treatments applied to tomato grown under drip/seepage irrigation in Immokalee, FL during spring 2015.

Treatment [z]	Applied products	Application rate	Application mode
CSF (control)	Pic-Clor 60	200 lb/acre	Bed fumigation
	Initial water	none	
ASD1	Composted poultry litter	9 ton/acre	Incorporated in the bed
	Molasses	1,482 gal/acre	Incorporated in the bed
	Initial water	2 inches	By drip (about 4 hours)
ASD2	Composted poultry litter	9 ton/acre	Incorporated in the bed
	Molasses	2,962 gal/acre	Incorporated in the bed
	Initial water	2 inches	By drip (about 4 hours)

[z] CSF: chemical soil fumigation, ASD: anaerobic soil disinfestation.

Table 3. Summary of mean, minimum (Min.) and maximum (Max.) temperature and total rainfall in Immokalee, FL during spring 2015.[z]

Period	Temperature (°F)			Total rainfall
	Mean	Min.	Max.	(inches)
February	62.5	30.4	85.6	1.8
March	72.6	46.8	90.1	2.0
April	76.9	56.3	94.2	3.3
May	76.7	56.4	93.5	5.6
Average/Total	72.3	30.4	94.2	12.7

[z] Weather data obtained from Florida Automated Weather Network (FAWN) from University of Florida/Institute of Food and Agriculture Science (IFAS), South West Research & Education Center in Immokalee, FL.

Table 4. First harvest marketable and unmarketable yield by size categories for tomato grown with drip/seepage irrigation in Immokalee, FL during spring 2015.

Treatments	Marketable yield				Unmarketable yield
	Extra-large (5/6)	Large (6/6)	Medium (6/7)	Total	
	---------- (25-lb boxes/acre) ----------				
CSF	549	163	0	712	44
ASD1	817	121	0	938	53
ASD2	691	138	0	829	34
P-value	0.25	0.46	-	0.44	0.65
Significance [z]	NS	NS	NS	NS	NS

[z] NS, Nonsignificant.

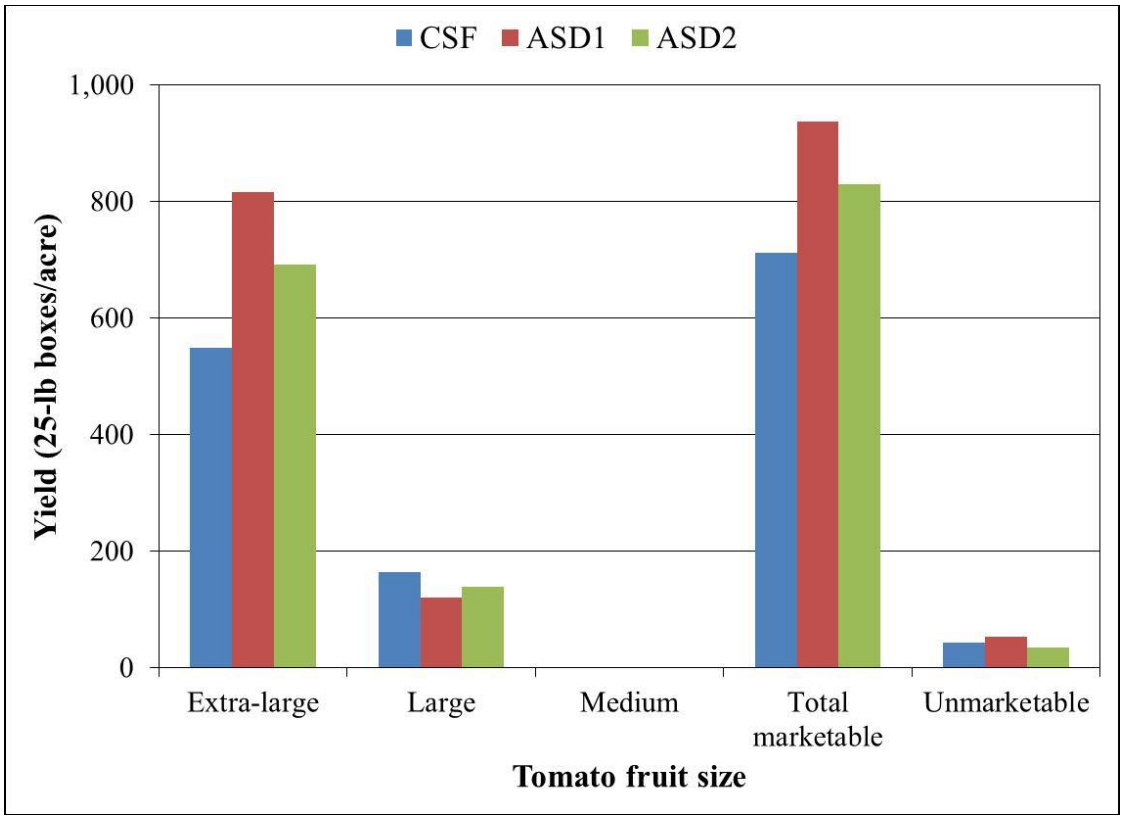

Figure 1. First harvest marketable and unmarketable yield by size categories for tomato grown with drip/seepage irrigation in Immokalee, FL during spring 2015.

Table 5. Second harvest marketable and unmarketable yield by size categories for tomato grown with drip/seepage irrigation in Immokalee, FL during spring 2015.

Treatments	Marketable yield				Unmarketable yield
	Extra-large (5/6)	Large (6/6)	Medium (6/7)	Total	
	---------- (25-lb boxes/acre) ----------				
CSF	457	98	12	567	53 a
ASD1	404	98	7	508	22 b
ASD2	523	127	16	666	22 b
P-value	0.30	0.45	0.75	0.18	0.002
Significance [z]	NS	NS	NS	NS	**

[z] NS, **, Nonsignificant or significant at $P \leq 0.01$, respectively. Within columns, means followed by different letters are significantly different according to Duncan's multiple range test at 5%.

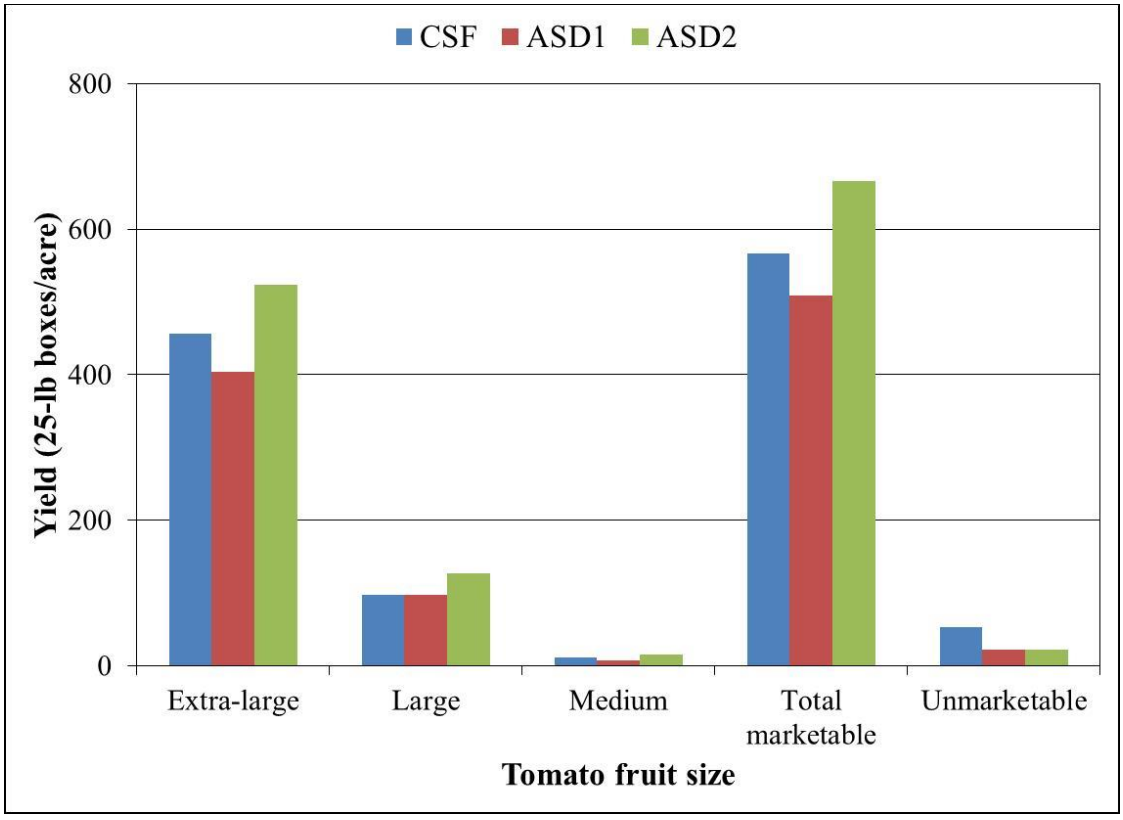

Figure 2. Second harvest marketable and unmarketable yield by size categories for tomato grown with drip/seepage irrigation in Immokalee, FL during spring 2015

Table 6. First and second harvest marketable and unmarketable yield by size categories for tomato grown with drip/seepage irrigation in Immokalee, FL during spring 2015.

Treatments	Marketable yield				Unmarketable yield
	Extra-large (5/6)	Large (6/6)	Medium (6/7)	Total	
	---------- (25-lb boxes/acre) ----------				
CSF	1,006	261	12	1,279	96
ASD1	1,221	219	7	1,446	75
ASD2	1,214	265	16	1,495	56
P-value	0.39	0.40	0.75	0.46	0.28
Significance [z]	NS	NS	NS	NS	NS

[z] NS, Nonsignificant.

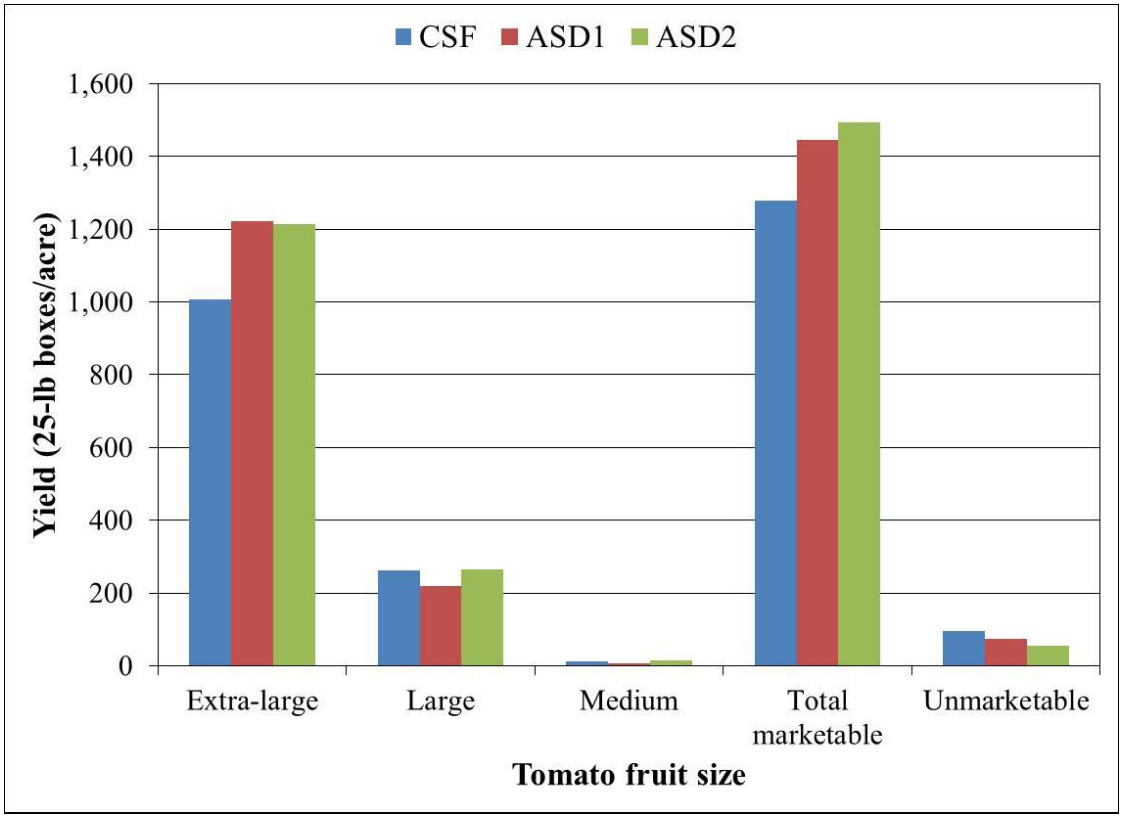

Figure 3. First and second harvest marketable and unmarketable yield by size categories for tomato grown with drip/seepage irrigation in Immokalee, FL during spring 2015.

Table 7. Third harvest marketable and unmarketable yield by size categories for tomato grown with drip/seepage irrigation in Immokalee, FL during spring 2015.

Treatments	Marketable yield				Unmarketable yield
	Extra-large (5/6)	Large (6/6)	Medium (6/7)	Total	
	---------- (25-lb boxes/acre) ----------				
CSF	183	113	173	469	78
ASD1	303	162	182	646	85
ASD2	335	184	202	721	98
P-value	0.09	0.27	0.48	0.15	0.34
Significance [z]	NS	NS	NS	NS	NS

[z] NS, Nonsignificant.

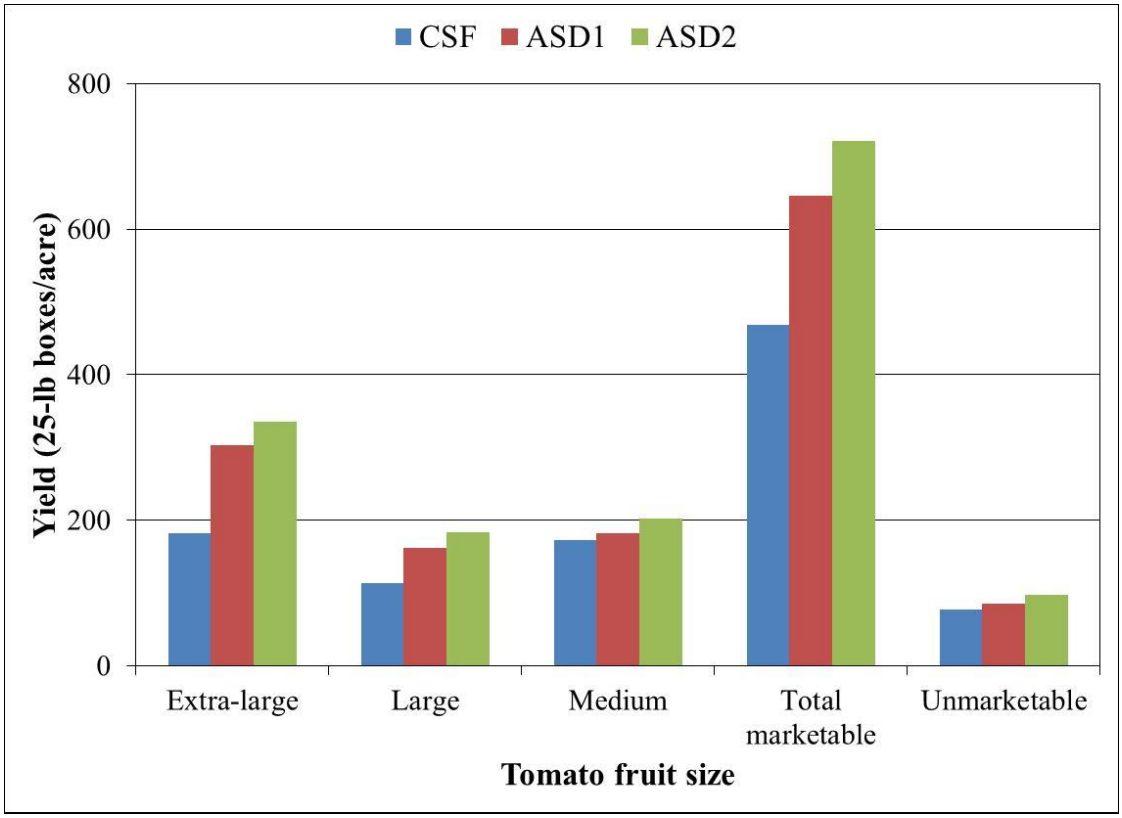

Figure 4. Third harvest marketable and unmarketable yield by size categories for tomato grown with drip/seepage irrigation in Immokalee, FL during spring 2015.

Table 8. Total harvest marketable and unmarketable yield by size categories for tomato grown with drip/seepage irrigation in Immokalee, FL during spring 2015.

Treatments	Marketable yield				Unmarketable yield
	Extra-large (5/6)	Large (6/6)	Medium (6/7)	Total	
	---------- (25-lb boxes/acre) ----------				
CSF	1,188	375	185	1,748 b	174
ASD1	1,524	380	189	2,092 a	160
ASD2	1,550	448	218	2,216 a	153
P-value	0.06	0.49	0.51	0.03	0.60
Significance [z]	NS	NS	NS	*	NS

[z] NS, *, Nonsignificant or significant at $P \leq 0.05$, respectively. Within columns, means followed by different letters are significantly different according to Duncan's multiple range test at 5%.

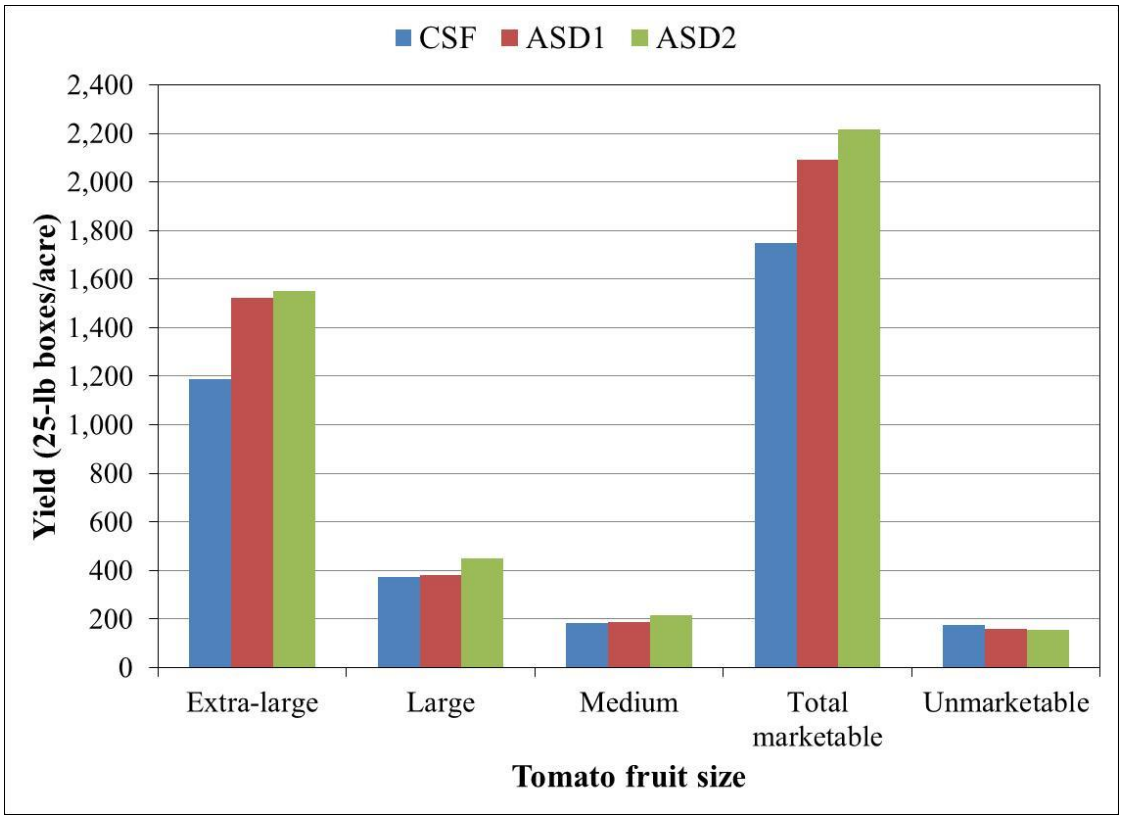

Figure 5. Total harvest marketable and unmarketable yield by size categories for tomato grown with drip/seepage irrigation in Immokalee, FL during spring 2015.

Table 9. Soil treatment effects on tomato fruit firmness (expressed as fruit deformation), skin color, Brix°, pH and dry matter content at first harvest on tomato grown with drip/seepage irrigation in Immokalee, FL during spring 2015.

Treatments	Deformation (mm)	Color stage (1-6 scale)	Brix°	pH	Dry matter (%)
CSF	2.42 a	5.8	4.09	4.09	3.41
ASD1	2.01 b	5.6	4.08	4.12	3.27
ASD2	1.91 b	5.4	4.11	4.15	3.54
P-value	0.02	0.17	0.93	0.42	0.40
Significance [z]	*	NS	NS	NS	NS

[z] NS, *, Nonsignificant or significant at $P \leq 0.05$, respectively. Within columns, means followed by different letters are significantly different according to Duncan's multiple range test at 5%.

Table 10. Soil treatment effects on weed coverage on tomato grown on beds mulched with totally impermeable film using drip/seepage irrigation in Immokalee, FL during spring 2015.

Days after planting	Weed coverage (%)			P-value	Significance [z]
	CSF	ASD1	ASD2		
9	0.0	0.0	0.0	0.42	NS
22	0.0	0.3	0.1	0.24	NS
37	0.1 b	4.5 a	3.0 a	0.02	*
50	0.1 b	6.3 a	6.8 a	0.04	*
69	0.1 b	12.5 a	10.5 a	0.02	*
80	0.1 b	16.3 a	13.0 a	0.04	*

[z] NS, *, Nonsignificant or significant at $P \leq 0.05$, respectively. Within row, means followed by different letters are significantly different according to Duncan's multiple range test at 5%.