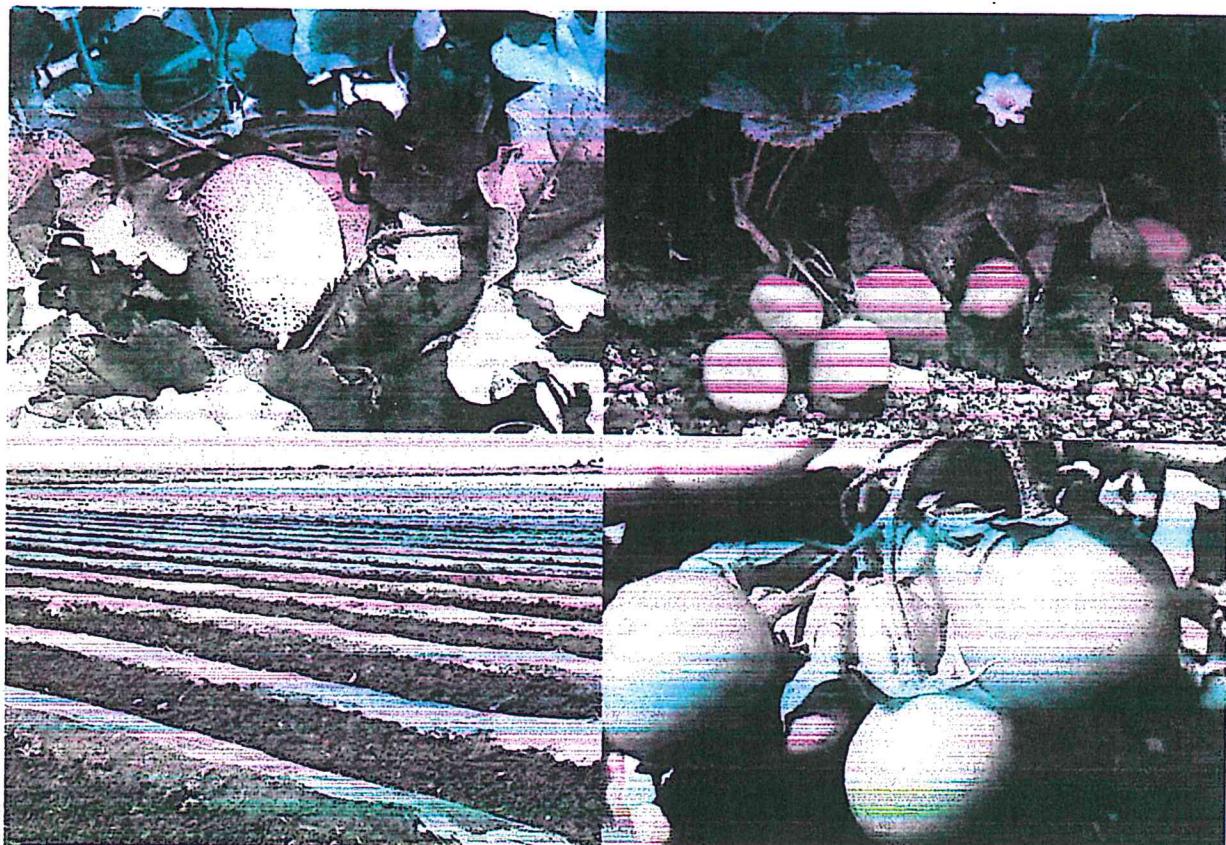




Universidad Autónoma de Sinaloa  
Facultad de Agronomía



## FINAL REPORT FIRST PART

PROJECT: "Alternatives to the use of methyl bromide in tomato, strawberry, tobacco, melon and flowers crops".  
Additional services related to Contract No. 99/075

Culiacán, Sinaloa, Mexico. April, 2004



## UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION FACULTAD DE AGRONOMIA - UAS

**FINAL PROJECT REPORT.** Demonstration Project of Alternatives to the use of Methyl Bromide in the cultivation of **Tomatoes**, (*Lycopersicon esculentum L.*). The development in "Don Juanito" Ranch in Col. Vicente Guerrero, San Quintin, Baja California, Mexico. In this field have been working MC. Francisco Javier Estrada Ramirez, coordinator in this project. And MC. Sostenes Montoya Angulo, agronomist who is implementing the tests. QFB. María de la Luz Acosta Pineda y Carlos Morales Cazarez Colaboradores.

In this month, March 2004, we are reporting performed activities from 1999 to 2004.

### INTRODUCTION

Last March, 2001, in Baja California, Mexico, we started taking some tests. We apply different treatments in soil, in order to analyze the control about soil microorganisms and in crops development also, comparing Methyl bromide. We apply this substance in muddy type soil.

Treatments: We started the experiment in agricultural season 2001. we applied 12 (twelve) treatments:

### TREATMENTS OR ALTERNATIVES:

- 1.- Control (no treatment).
- 2.- 15 gr/m<sup>2</sup> of methyl bromide (75/25 or 80/20).
- 3.- 40 gr/m<sup>2</sup> of methyl bromide (75/25 or 80/20).
- 4.- Five kg of compost incorporated into the soil, plus four weeks of solarization
- 5.- Five kg of bovine cattle manure incorporated into soil, plus four weeks of solarization.
- 6.- Five kg of fresh broccoli residue (or other cruciferous plant) incorporated into soil, plus four weeks of solarization.
- 7.- 25 ml/m<sup>2</sup> of metam-sodium ( N, methyl sodium ditiocarbamate) plus six weeks of solarization.
- 8.- 50 ml/m<sup>2</sup> of metam-sodium.
- 9.- 33 ml/m<sup>2</sup> of chloropicrin.
- 10- 40 gr/ m<sup>2</sup> of Dazomet (tetrahydro-3-5 dimethyl-2H-1.3.5-tiadizin-2 tiona).

- 11.- 1,3-dichloropropene+chloropicrin, dose recommended by the manufacturer.
- 12.- 1,3-dichloropropene, dose recommended by the manufacturer (11.2 ml/m<sup>2</sup>).

## BODY OF THE REPORT

### Land preparation

The activities in cooperative farmer land started in last February, when "Don Juanito" enterprise heavy machinery carried out double subsoil in land. They opened the soil 50 cm depth. Then they raked the soil in three rows, after that, they made the installment underground pipeline. Afterwards the beds were marked, raised and flattened. And finally we put the padded with black-silver plastic (silver side up). The bed marks were marked 1.80 m between each one.

### Experiment Design

The treatment designs were carried out in March, 2001. In a piece of land with 48 beds, 50 m length, inside the enterprise commercial land. It was traced four blocks 10 m each; we selected 12 experimental plots with 4 beds, which we applied next randomized treatments:

- 1). **Absolute control.** In this experimental unit consist on 4 rows, 10 M. length, and we didn't realized any fungicide or organic matter application.
- 2). **Methyl Bromide 80/20.** In the four rows, It was injected 15 grs M<sup>2</sup> (80% methyl bromide and 20% chloropicrin).The application was approximately 25-30 cm depth.
- 3). **Methyl Bromide 80/20.** In the four rows, It was injected 40 grs M<sup>2</sup> (80% methyl bromide and 20% chloropicrin).The application was approximately 25-30 cm depth.
- 4). **Five kg of compost** incorporated into the soil, plus four weeks of solarization
- 5). **Five kg of bovine** cattle manure incorporated into soil, plus four weeks of solarization.
- 6). **Broccoli** incorporated on the soil and solarization. In order to apply this treatment, we chopped the cabbage in small pieces: then it were distributed 5 kg per M<sup>2</sup>. It was incorporated by manual labor using hoes, after that, the rows were covered with transparent plastic.
- 7). **Metham-sodium.** In this four furrows it was applied 25 ml/m<sup>2</sup> metham sodium. The furrows were covered in black/silver plastic during 20 days.

8). **Metham-sodium.** In this four furrows it was applied 50 ml/m<sup>2</sup> metham sodium. The furrows were covered in black/silver plastic during 20 days.

9). **Chloropicrin.** On this four furrows were applied 33ml/m<sup>2</sup> chloropicrin using the same equipment which we applied methyl-bromide. The furrows were covered in black/silver plastic during 20 days.

10). **Dazomet** (tetrahidro-3-5 dimethyl-2H-1,3,5-tiadizin-2 tiona). On this furrows soil we distributed by manual labor 40 gr/m<sup>2</sup> dazomet: it was incorporated using hoes, after that, we applied water by sprinkler irrigation during 3 hrs. Finally, it was covered in black/silver plastic.

11). **1,3-dichloropropen + chloropicrin.** These furrows soil were treated using 27ml/m<sup>2</sup> mixture 1,3-dichloropropeno (65%) chloropicrin (35%). We applied this product using the same equipment used to apply the methyl-bromide, and the furrows were covered in black/silver plastic during 20 days.

12). **1,3-dichloropropen.** These furrows soil were treated using 11.2 ml/m<sup>2</sup> 1,2-dichloropropen. This application was carried out using the equipment tractor thereafter. The furrows were covered in black/silver plastic during 20 days.

The treatments were applied on damp soil.

Evaluations are taking place in the two central furrows in each experimental unit. We attached a label in 10 plants (five each row or 10 cm central bed) which were randomized, in order to take size measure.

### **Planting.**

Tomato plants used in this tests are "fat" tomato or "ball" type. This plants grew in polyethylene ashtrays in "Don Juanito" agricultural enterprise greenhouses. The plants were 50 days old. They were planting 45 cm between each plant, on furrows with damp soil, non covered with plastic.

### **Crop Management**

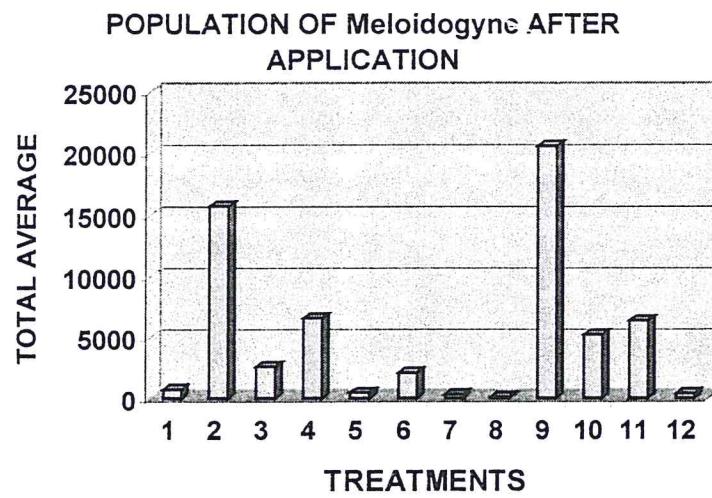
Irrigation and fertilization took place using drip irrigation, and they are controlled directly by enterprise field manager. Same people took the records about the handworks like pruning, cutting, spinning, tied the plants, diseases control and foliage pests, etc.

## **RESULTS**

### **NEMATODES**

**FACULTAD DE AGRONOMIA -UNIVERSIDAD AUTONOMA DE SINALOA**  
**SITE: RANCHO "DON JUANITO", COL. VICENTE GUERRERO (SANTA FE), B.C.**  
**CROOP: Tomato "Tequila"**  
**PLANTING DATE: April 25th, 2001**  
**EVALUATION PARAMETER: Total Population of Meloidogine after application**  
**SAMPLING DATE: August 24th, 2001**  
**ACCOUNTING DATE: August 30th, 2001**

Population of Meloidogine from 200 GR. Of soil/treatment				
TREATMENT	REPETITIONS		TOTAL	AVERAGE
	1	2		
1. Chloropicrin	820	680	1500.00	750
2. Dichloropropen+Chloropicrin	18280	13200	31480.00	15740
3. Broccoli	2720	2480	5200.00	2600
4. Metam sodium 50	7020	6160	13180.00	6590
5. Dichloropropene	420	480	900.00	450
6. Estiercol	2520	1700	4220.00	2110
7. Methyl Bromide 50	240	400	640.00	320
8. Methyl Bromide 40	60	120	180.00	90
9. Dazomet	17160	24000	41160.00	20580
10. Control	5940	4500	10440.00	5220
11. Tomato compost	6420	6340	12760.00	6380
12. Metam sodium 25	620	120	740.00	370



FACULTAD DE AGRONOMIA -UNIVERSIDAD AUTONOMA DE SINALOA  
SITE: RANCHO "DON JUANITO", COL. VICENTE GUERRERO (SANTA FE), B.C.  
CROOP: Tomato "Tequila"

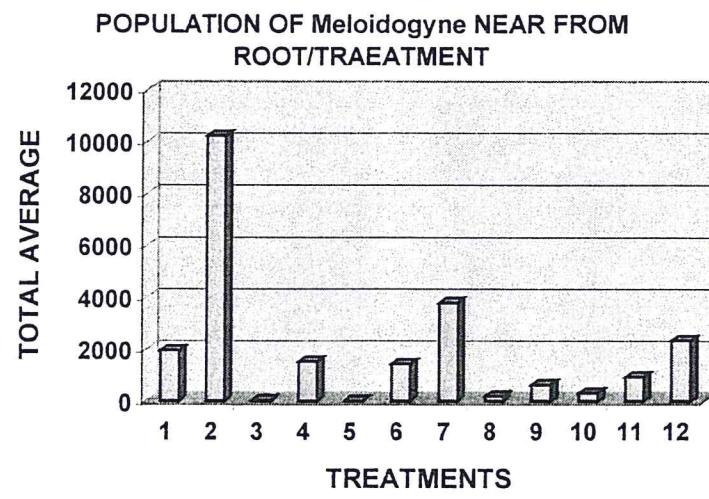
PLANTING DATE: April 25th, 2001

EVALUATION PARAMETER:: Population of **Meloidogyne near root**

SAMPLING DATE: October 30th, 2001

ACCOUNTING DATE: November 6th, 2001

TREATMENT	REPETITIONS			
	1	2	TOTAL	AVERAGE
1. Chloropicrin	2360	1540	3900.00	1950
2. Dichloropropen+Chloropicrin	10360	10100	20460.00	10230
3. Broccoli	40	20	60.00	30
4. Metam sodium 50	1740	1320	3060.00	1530
5. Dichloropropene	0	0	0.00	0
6. Estiercol	1400	1460	2860.00	1430
7. Methyl Bromide 50	3660	3920	7580.00	3790
8. Methyl Bromide 40	220	160	380.00	190
9. Dazomet	680	560	1240.00	620
10. Control	220	400	620.00	310
11. Tomato compost	1040	820	1860.00	930
12. Metam sodium 25	2620	2060	4680.00	2340



FACULTAD DE AGRONOMIA -UNIVERSIDAD AUTONOMA DE SINALOA  
SITE: RANCHO "DON JUANITO", COL. VICENTE GUERRERO (SANTA FE), B.C.

CROP: Tomato "Tequila"

PLANTING DATE: April 25th, 2001

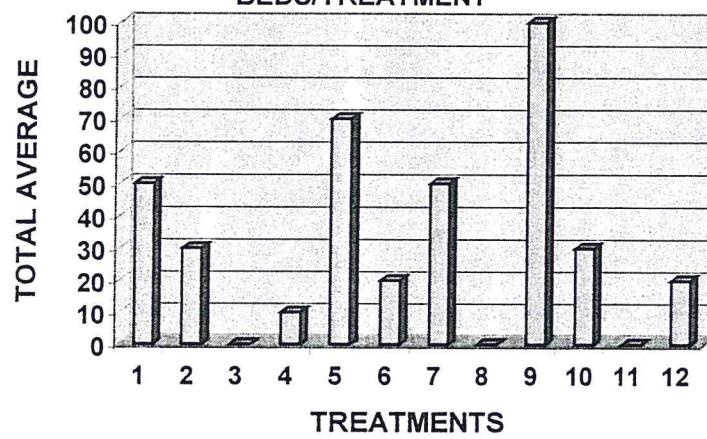
EVALUATION PARAMETER: Total Population of Meloidogyne among beds

SAMPLING DATE: October 30th, 2001

ACCOUNTING DATE: November 6th, 2001

TREATMENT	REPETITIONS		TOTAL	AVERAGE
	1	2		
1. Chloropicrin	80	20	100.00	50
2. Dichloropropen+Chloropicrin	20	40	60.00	30
3. Broccoli	0	0	0.00	0
4. Metam sodium 50	20	0	20.00	10
5. Dichloropropene	40	100	140.00	70
6. Estiercol	20	20	40.00	20
7. Methyl Bromide 50	60	40	100.00	50
8. Methyl Bromide 40	0	0	0.00	0
9. Dazomet	60	140	200.00	100
10. Control	40	20	60.00	30
11. Tomato compost	0	0	0.00	0
12. Metam sodium 25	40	0	40.00	20

POPULATION OF Meloidogyne AMONG  
BEDS/TREATMENT



CULTAD DE AGRONOMIA -UNIVERSIDAD AUTONOMA DE SINAL  
 SITE: "DON JUANITO" RANCH, COL. VICENTE GUERRERO (SA)  
 CROP: TOMATOE, VAR. TEQUILA.

PLANTING DATE: April 25th, 2001 Cycle 2001  
 EVALUATION PARAMETER: % nodulation roots rate per Meloydoge  
 EVALUATION DATE: 29/10/01 Scale 1-6 =

TREATMENT	% NODULATION RATE OF ROOTS PER Meloydogine 10 PLANTS/REPETITION																					
	REPETITION I										REPETITION II											
	PLANTS										PLANTS											
	1	2	3	4	5	6	7	8	9	10	average	1	2	3	4	5	6	7	8	9	10	average
1. Chloropicrin	0	100	40	20	40	20	100	80	60	100	56.00	60	80	100	40	100	80	0	100	100	0	66.00
2. Dichloropropene+Chlorop	0	0	0	0	0	80	20	0	0	0	10.00	100	0	0	0	100	40	60	40	80	20	44.00
3. Brocoli	40	0	20	100	60	100	100	100	100	100	72.00	100	100	100	100	100	100	100	100	100	60	96.00
4. Metam sodium 50	100	100	0	0	100	100	100	100	100	100	80.00	100	100	80	100	100	100	100	100	80	100	96.00
5. Dichloropropene	0	0	0	0	60	0	0	0	80	60	20.00	60	80	20	40	0	20	0	100	20	20	36.00
6. Cow manure	100	100	100	60	80	100	100	100	100	100	94.00	100	0	100	100	100	100	80	100	100	100	88.00
7. Methyl Bromide 50	0	0	0	0	0	0	20	20	40	100	18.00	100	100	100	20	0	0	0	0	0	0	32.00
8. Methyl Bromide 40	20	0	0	0	0	40	40	60	20	40	22.00	0	0	0	0	0	0	0	0	0	0	0.00
9. Dazomet	100	100	100	100	100	100	100	100	100	100	100.00	100	100	100	100	80	80	100	100	100	60	92.00
10. Control	0	100	100	100	100	80	80	0	0	0	56.00	100	100	100	100	100	100	100	100	100	100	100.00
11. Tomatoe compost	100	100	100	100	100	100	80	80	100	100	96.00	100	100	100	100	100	100	100	80	60	94.00	
12. Metam sodium 25	60	40	20	40	40	60	60	40	0	60	42.00	60	80	100	60	0	0	0	0	0	0	30.00

TREATMENT	REPETITION III															PLANTS									
	PLANTS										PLANTS														
	1	2	3	4	5	6	7	8	9	10	average	1	2	3	4	5	6	7	8	9	10	average			
1. Chloropicrin	100	100	100	0	0	0	0	100	0	0	40.00	60	0	100	0	60	60	0	0	0	60	34.00			
2. Dichloropropene+Chlorop	0	0	0	0	0	0	0	0	60	0	6.00	40	40	40	80	40	100	80	100	100	20	64.00			
3. Brocoli	40	60	80	40	100	100	100	80	0	40	64.00	100	100	100	100	100	100	100	100	80	100	98.00			
4. Metam sodium 50	100	100	100	100	100	100	100	100	100	100	100.00	100	100	100	100	100	100	100	100	100	100	100.00			
5. Dichloropropene	60	100	100	100	60	80	100	100	100	100	90.00	60	100	100	80	80	100	80	80	80	60	82.00			
6. Cow manure	60	100	100	100	20	0	100	100	100	80	76.00	80	100	100	100	20	80	100	100	100	100	88.00			
7. Methyl Bromide 50	40	100	80	100	100	80	40	0	0	0	54.00	40	0	0	0	0	80	0	0	0	0	12.00			
8. Methyl Bromide 40	0	20	0	0	0	0	0	0	0	0	2.00	0	0	0	0	0	0	0	0	0	0	0.00			
9. Dazomet	100	100	100	100	100	100	100	100	100	100	100.00	100	100	100	0	100	100	100	100	100	100	90.00			
10. Control	100	100	100	100	100	100	80	100	100	100	98.00	100	100	100	100	100	100	100	100	100	100	100.00			
11. Tomatoe compost	80	100	100	100	100	100	100	100	80	100	96.00	100	100	100	100	100	100	100	100	100	100	100.00			
12. Metam sodium 25	0	60	60	20	40	100	40	20	100	100	54.00	0	60	80	60	100	100	100	40	20	100	56.00			

FACULTAD DE AGRONOMIA -UNIVERSIDAD AUTONOMA DE SINALOA  
SITE: "DON JUANITO" RANCH, COL. VICENTE GUERRERO (SANTA FE), B.C.  
CROP: TOMATOE, VAR. TEQUILA.

PLANTING DATE: April 25th, 2001

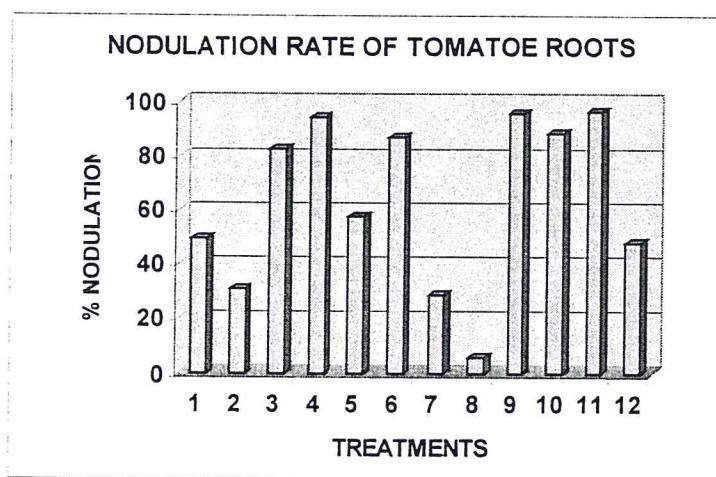
Cycle 2001

EVALUATION PARAMETER: % nodulation roots rate per Meloydogine

EVALUATION DATE: 29/10/01

Scale 1-6 = 0-100%

TREATMENT	REPETITIONS				TOTAL	AVERAGE
	1	2	3	4		
1. Chloropicrin	56.00	66.00	40.00	34.00	196.00	49
2. Dichloropropene+Chlorop	10.00	44.00	6.00	64.00	31.00	31
3. Brocoli	72.00	96.00	64.00	98.00	82.50	83
4. Metam sodium 50	80.00	96.00	100.00	100.00	94.00	94
5. Dichloropropene	20.00	36.00	90.00	82.00	57.00	57
6. Cow manure	94.00	88.00	76.00	88.00	86.50	87
7. Methyl Bromide 50	18.00	32.00	54.00	12.00	29.00	29
8. Methyl Bromide 40	22.00	0.00	2.00	0.00	6.00	6
9. Dazomet	100.00	92.00	100.00	90.00	95.50	96
10. Control	56.00	100.00	98.00	100.00	88.50	89
11. Tomatoe compost	96.00	94.00	96.00	100.00	96.50	97
12. Metam sodium 25	42.00	30.00	54.00	66.00	192.00	48



## HEIGHT OF PLANTS

FACULTAD DE AGRONOMIA -UNIVERSIDAD AUTONOMA DE SINALOA  
 SITE: RANCHO "DON JUANITO", COL. VICENTE GUERRERO (SANTA FE), B.C.

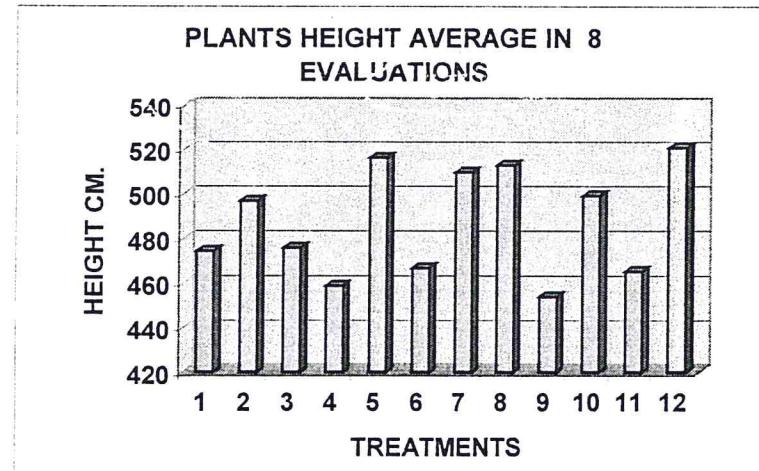
CROP: TOMATO, "TEQUILA"

PLANTING DATE: APRIL 25th, 2001

EVALUATION PARAMETER: HEIGHT OF 5 PLANTS (CM) PER REPETITION

TOTAL AVERAGE OF EIGHT HEIGHT EVALUATION DATES IN TOMATOE PLANTS

TREATMENTS	EVALUATION DATES								AVERAGE
	19/07/01	26/07/01	02/08/01	09/08/01	16/08/01	22/08/01	30/08/01	07/09/01	
1. Chloropicrin	3081	3226	3236	3373	3713	3976	3806	3796	474.5
2. Dichloroprop.+Chloro.	3187	3321	3326	3467	3740	4030	3888	3976	497
3. Broccoli	3133	3236	3336	3461	3684	3945	3810	3806	475.75
4. Metam-sodium 50	3066	3176	3235	3290	3562	3805	3640	3671	458.875
5. Dichloropropene	3194	3341	3315	3530	3872	4205	3976	4131	516.375
6. Cow manure	2980	3058	3092	3250	3458	3845	3725	3734	466.75
7. Methyl Bromide 50	3265	3410	3398	3523	3842	4270	3725	4078	509.75
8. Methyl Bromide 40	3113	3269	3315	3476	3802	4230	3725	4103	512.875
9. Dazomet	2974	3025	3043	3167	3366	3655	3725	3631	453.875
10. Control	3138	3288	3402	3484	3708	4065	3725	3994	499.25
11.Compost	3092	3145	3422	3438	3649	3935	3725	3723	465.375
12.Metam-sodium 25	3195	3268	3385	3507	3780	4165	3725	4167	520.875



DISEASED.

FACULTAD DE AGRONOMIA -UNIVERSIDAD AUTONOMA DE SINALOA  
SITE: "DON JUANITO" RANCH, COL. VICENTE GUERRERO (SANTA FE), B.C.

CROP: TOMATO, TEQUILA.VAR.

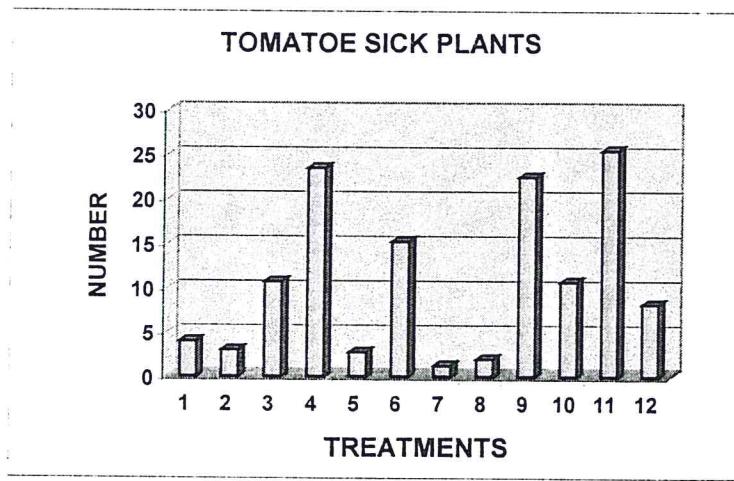
PLANTING DATE: April 25th, 2001

EVALUATION PARAMETER: NUMBER OF DISEASED PLANTS/REPETITION

EVALUATION DATE: August 2nd, 2001

# PLANTS PER REPETITION: 57 PLANTS

TREATMENT	REPETITION				TOTAL	AVERAGE
	1	2	3	4		
1. Chloropicrin	2	6	6	2	16	4.00
2. Dichloropropene+Chloropicrin	1	4	3	4	12	3.00
3. Brocoli	7	8	13	15	43	10.75
4. Metam-sodium 50	12	25	27	30	94	23.50
5. Dichloropropene	5	4	0	2	11	2.75
6. Cow manure	18	13	19	11	61	15.25
7. Methyl Bro 50	3	0	1	1	5	1.25
8. Methyl Bro 40	0	1	2	5	8	2.00
9. Dazomet	19	25	24	22	90	22.50
10. Control	8	13	12	10	43	10.75
11.Compost	20	24	30	28	102	25.50
12.Metam-sodium 25	6	8	10	9	33	8.25



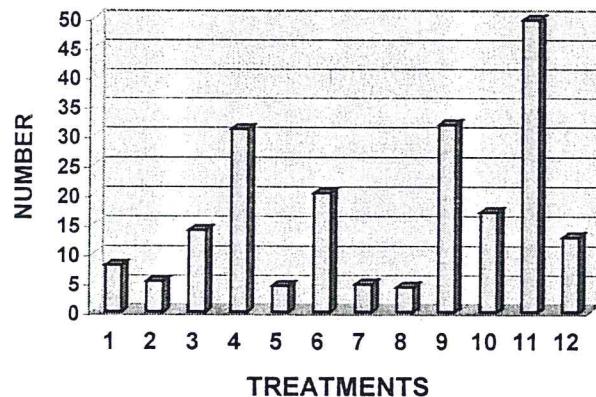
EVALUATION PARAMETER: NUMBER OF DISEASED PLANTS/REPETITION

EVALUATION DATE: AUGUST 23th, 2001

# PLANTS PER REPETITION: 57 PLANTS

TREATMENT	REPETITION				TOTAL	AVERAGE
	1	2	3	4		
1. Chloropicrin	7	12	10	3	32	8.00
2. Dichloropropene+Chloropicrin	4	6	6	5	21	5.25
3. Brocoli	9	10	18	19	56	14.00
4. Metam-sodium 50	15	35	32	42	124	31.00
5. Dichloropropene	7	5	2	4	18	4.50
6. Cow manure	22	19	26	14	81	20.25
7. Methyl Bro 50	9	3	4	3	19	4.75
8. Methyl Bro 40	2	3	4	8	17	4.25
9. Dazomet	30	32	33	32	127	31.75
10. Control	12	23	19	14	68	17.00
11.Compost	50	49	50	50	199	49.75
12.Metam-sodium 25	10	13	15	13	51	12.75

TOMATO SICK PLANTS



## DIAMETER OF STALK.

FACULTAD DE AGRONOMIA -UNIVERSIDAD AUTONOMA DE SINALOA

SITE: "DON JUANITO" RANCH, COL. VICENTE GUERRERO (SANTA FE), B.C.

CULTIVO: TOMATOE, TEQUILA VAR.

PLANTING DATE: April 25th, 2001

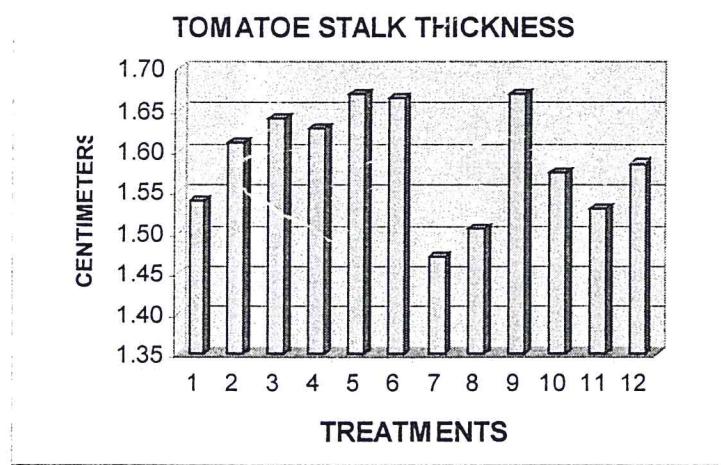
EVALUATION PARAMETER: DIAMETER OF STALK 20 CM FROM SOIL

EVALUATION DATE: August 23th, 2001

TREATMENT	REPETITION I						REPETITION II					
	PLANTS					TOTAL	AVERAGE	PLANTS				
	1	2	3	4	5			1	2	3	4	5
1. Chloropicrin	1.60	1.65	1.75	1.35	1.25	7.60	1.52	1.35	1.65	1.60	1.35	1.55
2. Dichloro+Chloropicrin	1.60	1.55	1.65	2.10	1.70	8.60	1.72	1.30	1.55	1.65	1.45	1.65
3. Brocoli	1.75	1.70	1.70	1.85	1.50	8.50	1.70	1.60	1.60	1.60	1.90	1.60
4. Metam-sodium 50	1.65	1.65	1.55	1.75	1.75	8.35	1.67	1.60	1.40	1.60	1.65	1.35
5. Dichloropropene	1.75	1.80	1.60	1.60	1.65	8.40	1.68	1.70	1.50	1.55	1.60	2.05
6. Cow manure	1.80	1.85	1.95	1.65	1.75	9.00	1.80	1.25	1.65	1.60	1.65	1.95
7. Methyl Bro 50	1.45	1.45	1.40	1.45	1.45	7.20	1.44	1.35	1.50	1.35	1.45	1.40
8. Methyl Bro 40l	1.55	1.45	1.65	1.35	1.55	7.55	1.51	1.70	1.40	1.50	1.40	1.50
9. Dazomet	1.70	1.75	1.55	2.10	1.90	9.00	1.80	1.70	1.85	1.55	1.55	1.85
10. Control	1.45	1.55	1.70	1.60	1.65	7.95	1.59	1.60	1.55	1.70	1.45	1.55
11. Compost	1.45	1.52	1.40	1.75	1.85	7.97	1.59	1.55	1.35	1.45	1.50	1.50
12. Metam-sodium 25	1.55	1.60	1.65	1.45	1.55	7.80	1.56	1.45	1.70	1.70	1.55	8.10
												1.62

TREATMENT	REPETITION III						REPETITION IV					
	PLANTS					TOTAL	AVERAGE	PLANTS				
	1	2	3	4	5			1	2	3	4	5
1. Chloropicrin	1.40	1.65	1.75	1.50	1.35	7.65	1.53	1.35	1.60	1.55	1.85	1.70
2. Dichloro+Chloropicrin	1.65	1.45	1.55	1.85	1.40	7.90	1.58	1.55	1.50	1.95	1.35	1.75
3. Brocoli	1.65	1.55	1.60	1.55	1.40	7.75	1.55	1.55	1.75	1.60	1.70	1.65
4. Metam-sodium 50	1.80	1.55	1.70	1.50	1.40	7.95	1.59	1.85	1.85	1.75	1.60	1.60
5. Dichloropropene	1.65	1.50	1.60	1.55	1.50	7.80	1.56	1.85	1.55	1.80	1.70	1.90
6. Cow manure	1.75	1.60	1.40	1.40	1.55	7.70	1.54	1.75	1.85	1.35	1.75	1.80
7. Methyl Bro 50	1.35	1.55	1.65	1.50	1.50	7.55	1.51	1.55	1.40	1.55	1.55	1.55
8. Methyl Bro 40l	1.45	1.50	1.40	1.55	1.40	7.30	1.46	1.50	1.55	1.55	1.70	1.45
9. Dazomet	1.55	1.55	1.65	1.30	1.60	7.65	1.53	1.80	1.70	1.55	1.55	1.65
10. Control	1.55	1.40	1.60	1.65	1.50	7.70	1.54	1.65	1.55	1.60	1.60	1.60
11. Compost	1.80	1.40	1.80	1.50	1.60	8.10	1.62	1.50	1.35	1.30	1.65	1.40
12. Metam-sodium 25	1.55	1.60	1.55	1.60	1.55	7.85	1.57	1.45	1.70	1.75	1.55	1.50
												1.59

TREATMENT	REPETITIONS					AVERAG
	I	II	III	IV	TOTAL	
1. Chloropicrin	1.52	1.50	1.53	1.61	6.16	1.54
2. Dichloro+Chloropicrin	1.72	1.52	1.58	1.62	6.44	1.61
3. Brocoli	1.70	1.66	1.55	1.65	6.56	1.64
4. Metam-sodium 50	1.67	1.52	1.59	1.73	6.51	1.63
5. Dichloropropene	1.68	1.68	1.56	1.76	6.68	1.67
6. Cow manure	1.80	1.62	1.54	1.70	6.66	1.67
7. Methyl Bro 50	1.44	1.41	1.51	1.52	5.88	1.47
8. Methyl Bro 40I	1.51	1.50	1.46	1.55	6.02	1.51
9. Dazomet	1.80	1.70	1.53	1.65	6.68	1.67
10. Control	1.59	1.57	1.54	1.60	6.30	1.58
11. Compost	1.59	1.47	1.62	1.44	6.12	1.53
12. Metam-sodium 25	1.56	1.62	1.57	1.59	6.34	1.59



## YIELD.

MEASUREMENT PARAMETER: Yield - Weight in pounds on 20 lineal meters/repetition  
 PLANTING DATE: April 25th, 2001  
 EVALUATION DATE: July 14th, 2001

TREATMENTS	PRODUCTION OF EXPORT TOMATOES, DOMESTIC AND REMAIN ON KG.											
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV		
	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.
1. Chloropicrin	1.4	0.1	0.05	2.65	0	0	1.75	0	0.05	3.25	0	0.05
2. Dichloropropene+Chloropicrin	1.45	0	0	1.7	0.8	0.15	0.65	0	0.15	2.05	0	0
3. Broccoli	1.1	0.25	0.15	6.65	0.55	0.25	3.8	0.55	0.45	2.4	0	0.55
4. Metam-sodium 50	1.25	0.1	0	2.4	0.35	0.35	3.35	0.25	0.1	3.95	0.6	0.05
5. Dichloropropene	5.25	1.6	0.25	9.3	1.45	0.3	4.9	2	0.8	4.6	1.35	0.15
6. Cow manure	3.9	0.4	0.15	6.1	0.55	0.25	9.75	1.5	0.65	1.45	0	0.55
7. Methyl Bromide 50	2.05	0.25	0.2	4.65	0.75	0.45	3.6	0.2	0	9.9	0.9	0.85
8. Methyl Bromide 40	6.9	1.35	0	15.25	0.75	0.75	12.95	0.55	0.75	7.45	0.55	0.75
9. Dazomet	3.5	0.2	0.9	8.4	0.7	0	7	0.7	0.95	3.35	0.7	1
10. Control	9.25	0.4	0.25	6.55	0.55	0	11.95	0.55	0.35	11	0.85	0.9
11. Compost	5.5	0	1.3	7.35	0.15	1.3	10.85	0.85	1	3.45	0	0
12. Metam-sodium 25	3.7	0.25	0.35	7.15	0.45	0.55	3.65	0.45	0.35	9	0.45	0.35

PLANTING DATE: APRIL 25th, 2001  
 EVALUATION DATE: July 19th, 2001

TREATMENTS	PRODUCTION OF EXPORT TOMATOES, DOMESTIC AND REMAIN ON KG.											
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV		
	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.
1. Chloropicrin	7.25	0.65	0.55	6.6	0.45	0.25	3.1	0.65	0	9.25	1.15	0.25
2. Dichloropropene+Chloropicrin	7.35	1.1	0.25	6.7	0	0.1	5.55	0.55	0	6.95	0.4	0.13
3. Broccoli	4.7	0.2	0.15	6.65	1.85	0.2	10.15	2.75	0.2	8.15	2.15	0.1
4. Metam-sodium 50	5.9	1	0.4	7.95	0.4	0.5	7.5	0.75	0.5	8.6	0.6	0.5
5. Dichloropropene	7.9	1.45	0.3	9.95	0.95	0.2	9.15	0.7	0.35	6.55	0.75	0.1
6. Cow manure	6.05	2.3	0.6	6	1.35	0.55	6.2	3.15	0.2	3.25	1.05	0.45
7. Methyl Bromide 50	10.75	0.75	0.2	9.4	0.8	0.35	9.85	0.7	0.35	10.2	0.45	0.35
8. Methyl Bromide 40	7.4	0.35	0.15	9.5	0.1	0.15	7.65	0.3	0.35	8.4	0.7	0.35
9. Dazomet	5.8	0.15	0.85	8.25	1.1	0.3	8	0.35	0.25	6.3	1	0.4
10. Control	11	1.5	0.25	9.65	2.5	0	10.85	2.75	0	8.65	2.6	0.75
11. Compost	8.15	1.75	0.6	10.4	1.2	0.2	9.3	0.95	0.35	6.05	0.95	0.1
12. Metam-sodium 25	7	0.5	0.25	10	0.1	0.15	11.3	0.7	0.3	8.7	1.2	0.2

PLANTING DATE: APRIL 25th, 2001  
 EVALUATION DATE: July 23th, 2001

TREATMENTS	PRODUCTION OF EXPORT TOMATOES, DOMESTIC AND REMAIN ON KG.											
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV		
	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.
1. Chloropicrin	14	2.2	0.6	10	1.65	0.35	9.4	1.55	0	11.9	1.7	0.45
2. Dichloropropene+Chloropicrin	11.75	0.5	0.25	12.25	0.45	0.3	12.25	0.7	0.1	12.65	0.9	0.5
3. Broccoli	11.1	0.45	0.35	12.1	1.3	0.45	5.55	1.05	0.75	12.15	1.2	0
4. Metam-sodium 50	13.5	0.75	0.15	10.45	0.35	0.65	10.6	0.25	0.5	14	0.8	0.7
5. Dichloropropene	12.6	0.4	0.15	12.5	0.5	0.25	12.35	0.65	0.65	11.4	0.3	0.35
6. Cow manure	9	1.05	0.35	12.1	0.9	0.05	8.25	0.9	0.05	7.85	0.8	0.35
7. Methyl Bromide 50	10.2	0.85	0	8.8	0.7	0	9.25	0.9	0	12.9	0.8	0.05
8. Methyl Bromide 40	11.2	0.3	0.2	10.3	0.7	0.1	7.65	0.15	0.3	0.2	0.65	0.2
9. Dazomet	7.75	0.9	1.15	8.2	1.7	0.4	9.8	0.7	0.5	6.85	0.8	0.7
10. Control	15	0.5	0.25	11.4	0.4	0.05	10.3	1	0.2	15.5	0.8	0.4
11. Compost	13.3	0.5	0.2	15.3	1	0.35	14.8	0.2	0.2	12.6	0.35	0.4
12. Metam-sodium 25	11.3	0.7	0.4	15.65	0.4	0.1	16.3	1.1	0.6	14.9	0.55	0.4

PLANTING DATE: April 25th, 2001  
 EVALUATION DATE: July 26th, 2001

TREATMENTS	PRODUCTION OF EXPORT TOMATOES, DOMESTIC AND REMAIN ON KG.											
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV		
	EXP.	DOM	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.
1. Chloropicrin	9.2	0.4	0.05	8.55	1	0.1	9	0.2	0.05	10	0.3	0.1
2. Dichloropropene+Chloropicrin	10.4	0.75	0.4	8.55	1.5	0.35	9.55	0.9	0.15	8.7	1.65	0.4
3. Broccoli	12.2	0.8	0.55	8.7	1.5	0.35	11	2.2	1.1	10.65	1.3	0.15
4. Metam-sodium 50	9.5	1	0.5	10.4	0.45	0.7	9.4	0.5	0.3	10.7	0.5	0.7
5. Dichloropropene	9.85	1.4	0.25	6	2.05	0.2	8.05	1.75	0.75	7.1	1.35	0.3
6. Cow manure	4.5	0.3	0.3	9.55	0.55	0.4	8	0.7	0.4	5.6	0.45	0.65
7. Methyl Bromide 50	5.2	1.25	0.35	6.2	0.2	0.05	3.7	1.1	0.2	7.2	0.75	0.25
8. Methyl Bromide 40	10.75	0.45	0.05	9.7	0.2	0.15	9.45	0	0.2	5.8	0.1	0.2
9. Dazomet	6.7	0.75	0.55	5.5	1.3	0.75	5.2	1.15	0.7	5	0.8	1
10. Control	8	0.85	0.5	7.95	0.75	0.4	8.1	1.2	0.15	8.35	0.6	0.5
11. Compost	7.9	0.35	0.6	12.1	0.35	0.8	8.35	0.4	0.15	8.2	1	0.65
12. Metam-sodium 25	9.15	0.35	0.6	10.3	0.6	0.4	12.8	0.9	0.45	11.05	0.95	0.4

PLANTING DATE: April 25th, 2001  
 EVALUATION DATE: JULY 30th, 2001

TREATMENTS	PRODUCTION OF EXPORT TOMATOES, DOMESTIC AND REMAIN ON KG.											
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV		
	EXP.	DOM	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.
1. Chloropicrin	11.9	1.1	0.3	10.9	1	0.25	11	0.2	0.05	11.3	0.5	0.4
2. Dichloropropene+Chloropicrin	10.5	0.85	0.4	8.1	2.25	0.3	7.55	1.1	0.25	10.75	0.7	0.35
3. Broccoli	11.6	0.9	0.6	12.2	0.85	0.7	12.5	0.7	1.15	11.4	1.5	0.75
4. Metam-sodium 50	11.2	1.15	0.5	9.2	0.7	1	8.15	0.9	0.65	12.5	0.45	0.5
5. Dichloropropene	12.5	1	0.35	11.9	0.7	0.4	10.85	1	0.35	11.5	1.1	0.7
6. Cow manure	8.5	0.7	0.75	9.2	0.8	0.4	7.85	0.45	0.4	9.3	0.45	0.9
7. Methyl Bromide 50	10.2	0.5	0.15	10.6	0.45	0.3	7.55	1	0.2	12.5	0.75	0.3
8. Methyl Bromide 40	13.4	1.1	0.6	12.25	0.65	0.5	13.95	1	0.3	10.65	0.35	0.8
9. Dazomet	8.9	1.15	2.15	10.35	0.4	1.8	7.7	1.2	1.2	10.1	0.5	0.7
10. Control	12.85	0.75	0.55	12.35	1.45	0.4	11	1.4	1.5	11.5	1.35	0.65
11. Compost	10.7	1.9	1.1	11.9	1.65	1.1	12	0.9	0.5	11.8	0.65	1.25
12. Metam-sodium 25	17.25	0.45	0.65	13.25	0.4	0.55	16.5	1.25	0.75	14.9	0.75	0.9

MEASUREMENT PARAMETER: Yield - Weight in pounds on 20 lineal meters/repetition

PLANTING DATE: APRIL 25th, 2001  
 EVALUATION DATE: AUGUST 2nd, 2001

TREATMENTS	PRODUCTION OF EXPORT TOMATOES, DOMESTIC AND REMAIN ON KG.											
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV		
	EXP.	DOM	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.
1. Chloropicrin	12.35	0.5	0.75	9	0.25	0.1	6.8	0.6	0.3	12.4	0.7	1.05
2. Dichloropropene+Chloropicrin	9.7	2	0.55	11.5	1.5	0.9	8.7	2.3	0.8	11.6	2.7	0.7
3. Broccoli	13.5	0.4	0.8	12.2	0.1	0.6	13.15	1.5	1.5	12.7	0.05	0.2
4. Metam-sodium 50	9.45	1	0.9	12.6	0.45	1.9	9.55	0.9	1.5	9.95	1	1.2
5. Dichloropropene	10	1.35	1.05	13.5	0.3	0.5	11.15	1	0.4	12	0.9	0.65
6. Cow manure	9.1	1.55	1.85	9.7	2.65	0.25	9.6	2.1	0.75	10.2	1.8	1.7
7. Methyl Bromide 50	11.05	0.85	0.2	10.1	1.5	0.15	9.1	1	0.2	9.2	2.05	0.35
8. Methyl Bromide 40	9.1	0.8	1.25	12.5	1	0.6	14.35	0.3	0.35	11.75	0.5	0.65
9. Dazomet	8.3	0.35	1.8	12	0.7	1.1	9.55	0.12	1.65	6.65	0.6	0.9
10. Control	10.05	1.9	0.6	13.35	2.7	0.35	11	3.2	0.4	12.3	1.85	0.2
11. Compost	9.9	3.6	0.35	11.9	3.75	0.5	9.8	2.15	0.3	10.5	2	0.5
12. Metam-sodium 25	13.25	2.85	1.05	11.5	1	0.65	12.85	2.6	0.2	15.3	2	0.55

PLANTING DATE: APRIL 25th, 2001  
EVALUATION DATE: AUGUST 6th, 2001

TREATMENTS	PRODUCTION OF EXPORT TOMATOES, DOMESTIC AND REMAIN ON KG.											
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV		
	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.
1. Chloropicrin	15	2.55	1.25	17.8	2	1.15	13.15	4.8	1.1	15.6	3	2.05
2. Dichloropropene+Chloropicrin	15.65	1.8	2	17.2	1.6	1.25	17.85	1.25	1.5	14.2	2.2	1.35
3. Broccoli	21.3	0.75	2.75	16.2	1	1.5	19.75	1.9	1.7	18.1	1.5	1
4. Metam-sodium 50	21.75	2	1.6	14.4	1.5	1.8	15.5	1.25	2.6	19	4.05	0.8
5. Dichloropropene	18.8	1.1	0.8	17.1	1.45	0.65	17.65	0.7	0.9	19.65	1.5	1
6. Cow manure	12.75	1.35	1.4	14.2	3.4	0.9	15.7	1	1.05	17.5	1.15	1.15
7. Methyl Bromide 50	21.25	1.35	1.25	18.3	2.45	0.5	17	1.6	0.7	19.3	0.85	0.75
8. Methyl Bromide 40	13.15	4.95	1.3	16	1.25	0.8	15.45	2.75	0.8	16.5	4	0.4
9. Dazomet	11.4	1.75	3.55	16.5	1.95	2.4	14.2	1.45	2.3	12.2	2.1	1.7
10. Control	15.1	0.9	1.2	19.9	1.4	0.95	17.6	1.35	1.45	18	1.4	1.25
11. Compost	17.1	1.6	0.7	15.4	3.6	0.4	17.85	2.5	1.15	17.5	2.85	0.65
12. Metam-sodium 25	20	1.5	1.15	16.65	1.2	1.2	18.1	2.6	1.1	18.5	1.05	1.37

PLANTING DATE: APRIL 25th, 2001  
EVALUATION DATE : August 9th, 2001

TREATMENTS	PRODUCTION OF EXPORT TOMATOES, DOMESTIC AND REMAIN ON KG.											
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV		
	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.
1. Chloropicrin	14.7	3.85	0.6	16.8	3.64	0.9	14	1.95	0.4	15.95	1.85	1.7
2. Dichloropropene+Chloropicrin	10.85	3.35	0.4	18.9	4.8	1.2	15.65	4.25	0.75	12.65	3.5	1
3. Broccoli	18.45	3.5	1.2	12.8	3.35	0.7	15.75	3.25	0.5	17.2	3.4	0.5
4. Metam-sodium 50	14.8	3.15	0.95	15.75	5	0.7	17.85	3.4	0.8	16.15	4.55	0.8
5. Dichloropropene	15.2	3.6	0.9	18.5	4.75	0.55	19	4.1	1	14.75	2.45	0.5
6. Cow manure	12.5	3	1.1	15.8	3.8	0.3	14.8	3.75	0.5	15.5	3.3	0.7
7. Methyl Bromide 50	18.4	5.65	0.6	15.65	2.85	0.3	12	5.4	1.1	17	4.6	0.6
8. Methyl Bromide 40	15.55	3.85	1.1	15.05	2.6	0.35	15.05	2.8	0.6	14.7	2.45	0.65
9. Dazomet	13	3.35	1.15	13.8	2.5	1.2	15.1	4.8	1.15	13.5	4.25	0.7
10. Control	17.4	3.75	1.1	19.35	2.65	0.6	15.65	3.5	0.9	16.3	2.6	0.65
11. Compost	13.85	3.1	0.4	15.4	4.1	0.4	12.5	2.8	0.3	17.5	3.85	0.2
12. Metam-sodium 25	17	3.7	1.2	16.35	1.65	1.25	20.5	3.5	0.4	17.15	5.95	0.5

PLANTING DATE: APRIL 25th, 2001  
EVALUATION DATE: AUGUST 13th, 2001

TREATMENTS	PRODUCTION OF EXPORT TOMATOES, DOMESTIC AND REMAIN ON KG.											
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV		
	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.
1. Chloropicrin	28.8	5.9	1.3	22.8	5.6	1.4	20.13	6.3	0.5	24	6	0.9
2. Dichloropropene+Chloropicrin	23.7	7.7	1.3	28.1	6.45	1.05	23.3	8.2	0.7	23	5.1	1.1
3. Broccoli	23.7	6	1	24.4	7.6	1.85	16.4	5.1	0.6	23.05	5.6	0.3
4. Metam-sodium 50	19.3	5.2	1.1	15.1	4.7	0.9	18.75	5	1.15	17.15	6.1	0.9
5. Dichloropropene	23.5	7.5	0.85	24.5	5.3	0.7	20.6	5.9	0.6	25.4	8.35	0.85
6. Cow manure	19.7	4.2	0.8	21	4.65	0.45	20.1	5.3	0.75	17.5	5.3	0.8
7. Methyl Bromide 50	22.7	8.5	0.8	23.75	6.35	0.2	20.7	7.55	0.4	24.3	6.05	0.6
8. Methyl Bromide 40	23.8	7.2	1.75	20.9	9.3	1.4	23.3	7	1.2	23.5	6.5	0.65
9. Dazomet	18.25	6.3	0.8	15.15	3.5	0.7	15.7	6.35	1.35	16.1	4.4	1.3
10. Control	19.2	3.6	0.4	19.35	5.3	0.6	21.4	6.15	0.9	19.9	2.95	0.6
11. Compost	14.85	4	0.7	15.6	2.85	0.5	16.8	4.35	0.5	13.2	5.6	0.3
12. Metam-sodium 25	16	6	1.1	20.15	4	0.35	21.05	5.7	0.65	19.6	5.35	0.5

PLANTING DATE: APRIL 25th, 2001  
 EVALUATION DATE: AUGUST 16th, 2001

TREATMENTS	PRODUCTION OF EXPORT TOMATOES, DOMESTIC AND REMAIN ON KG.											
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV		
	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.
1. Chloropicrin	20.1	4.65	0.05	15.05	2	0.5	18.4	4	0.2	20.8	4.3	0.25
2. Dichloropropene+Chloropicrin	20.8	3.25	0.3	17.5	3.45	0.6	17.5	5.4	0.35	20.3	3.5	0.5
3. Broccoli	18	5.05	0.7	13.55	5	0.6	11.45	2.7	0.4	15.1	4.3	0.05
4. Metam-sodium 50	10.6	4.9	0	7.7	2.55	0.72	10.7	2.6	0.1	9.4	2.25	0.7
5. Dichloropropene	17.5	4.72	0.35	15.4	2.7	0.4	13.3	3	0.5	14.7	2.6	0.4
6. Cow manure	12.2	2.55	0.5	12.05	2.85	0.7	11.2	3	0.4	11	2.05	0.2
7. Methyl Bromide 50	17	3.65	0.9	25.9	3.5	0.45	17.8	3.6	0	21.15	3.5	0.5
8. Methyl Bromide 40	16.4	4.8	1.2	14.2	2.6	0.5	14.15	2.8	0.85	17.4	3.5	0.7
9. Dazomet	6.8	2.9	0.7	7.5	1.6	0.8	6.5	3.25	0.8	7.35	3.9	0.5
10. Control	12.3	1.9	0.25	19.75	1.85	0.3	11.7	2.05	0.15	7.7	2.4	0.35
11. Compost	10.1	1.15	0.6	7.6	1.2	0.4	9	3	0.3	13.6	2.55	1
12. Metam-sodium 25	10.5	1.65	0.55	12.4	1.8	0.8	12.8	2.3	0.45	10.9	2.6	0.8

PLANTING DATE: APRIL 25th, 2001  
 EVALUATION DATE: AUGUST 18th, 2001

TREATMENTS	PRODUCTION OF EXPORT TOMATOES, DOMESTIC AND REMAIN ON KG.											
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV		
	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.
1. Chloropicrin	13.1	2	0.6	8.55	2.5	0.8	11.7	1.95	0.3	12.8	3.4	1.75
2. Dichloropropene+Chloropicrin	11.15	3.1	0.65	10	3.05	0.85	9	2.7	0.7	13.35	4.1	0.4
3. Broccoli	7.35	2	0.35	7.4	2.35	0.4	4.85	1.65	0	6.8	2	0.55
4. Metam-sodium 50	8.5	2.3	0	3.75	2.1	0.75	5.95	1.55	0.15	4.8	2.6	0.05
5. Dichloropropene	7.9	3.6	0.65	10.65	2.35	0.2	9.1	3.1	0.6	9.2	1.65	0.35
6. Cow manure	7.1	1.7	0.4	5.85	1.2	0.25	7	2.2	0.1	6.3	2.3	0
7. Methyl Bromide 50	8.75	2.35	0.05	6.7	0.9	0.35	6.6	1	0.2	9.3	1.6	0.35
8. Methyl Bromide 40	7.9	1.55	0.3	7	1.6	0.3	6.3	1	0.5	6.85	1.55	0.5
9. Dazomet	5.3	1.2	0.25	4.7	1.5	0.8	3.7	1.8	0.65	4.75	2.3	0.1
10. Control	4.2	1.75	0.2	5	1.95	0.05	6	2.9	0.2	5.9	1.5	0.1
11. Compost	3.5	1.05	0.2	2.4	1.3	0.1	1.2	0.5	0	3.2	1.25	0.2
12. Metam-sodium 25	3.4	1.3	0.2	5	1.05	0	5.05	0.85	0.1	3.1	1.4	0.05

PLANTING DATE: APRIL 25th, 2001  
 EVALUATION DATE: AUGUST 21st, 2001

TREATMENTS	PRODUCTION OF EXPORT TOMATOES, DOMESTIC AND REMAIN ON KG.											
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV		
	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.
1. Chloropicrin	11.7	3.1	1.35	6.4	3	0.55	8.7	3.6	0.3	10.75	3.8	1.4
2. Dichloropropene+Chloropicrin	12.35	4.45	1	9.95	2.7	0.85	9	3.1	1.3	11	5.9	1.2
3. Broccoli	11.75	2	0.35	7.4	2.35	0.4	4.85	1.65	0	6.8	2	0.55
4. Metam-sodium 50	9.5	3.8	1.5	4.2	2.5	1.4	6.8	3.55	0.8	6	3.1	1.2
5. Dichloropropene	11.2	4.2	0.8	9.45	3.55	0.7	6.9	4	0.5	12.7	3.6	0.7
6. Cow manure	9.15	3.35	1.2	5.25	2.05	0.4	7.1	3.6	0.55	7.4	3.7	0.45
7. Methyl Bromide 50	12.1	4.8	0.6	14.1	4.55	0.45	12.7	4.5	0.2	12.95	5.1	0.45
8. Methyl Bromide 40	10.4	4	1.8	10	4.5	0.6	10.9	4.45	0.65	11.7	4.55	0.65
9. Dazomet	6.4	1.8	0.9	4.9	2.3	1.7	5.65	3	1.6	6.65	3.2	0.8
10. Control	8.15	1.75	0.5	6.4	2.15	1	6.25	3.6	0.85	6.4	2.35	0.55
11. Compost	5.05	2	0.4	5.15	2.4	0.8	6.5	1.7	0.4	5.3	1.8	0.75
12. Metam-sodium 25	6.9	2.5	0.7	10.4	3.6	0.35	7.05	2.5	0.8	5.8	2.5	0.8

PLANTING DATE: APRIL 25th, 2001  
 EVALUATION DATE: AUGUST 23th, 2001

TREATMENTS	PRODUCTION OF EXPORT TOMATOES, DOMESTIC AND REMAIN ON KG.											
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV		
	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.
1. Chloropicrin	5.85	2.1	0.55	4.1	0.75	0.35	6.1	1.4	0.3	3.8	1.3	0.3
2. Dichloropropene+Chloropicrin	4.45	2.5	0.6	4.7	1.15	0.25	4.4	1.65	0.1	4.5	1.95	0.15
3. Broccoli	6.6	1.5	0	5.65	1.6	0.4	4.15	0.8	0.5	6.6	1.5	0.2
4. Metam-sodium 50	5.6	2	0.1	2.25	1.75	0.55	6.1	3.05	0.5	2.6	1.45	0.6
5. Dichloropropene	6.35	1.9	0.4	6.3	2.5	0.15	5.7	1.5	0	7.1	1	0.1
6. Cow manure	3.95	2	0.7	4.25	0.5	0.25	4.2	1.7	0.1	3.4	2.2	0.2
7. Methyl Bromide 50	6.7	1.6	0.2	6.6	1.5	0.15	8.1	0.7	0.2	7	0.8	0.15
8. Methyl Bromide 40	5.85	2	0.6	5.1	1.4	0.3	3.95	2	0.4	5.35	2.05	0.45
9. Dazomet	3	1.75	0.4	3.6	1.05	0.6	3.3	1.35	0.45	3.6	1.25	0.5
10. Control	6.55	0.5	0.05	4.7	1.4	0.35	5.2	0.7	0.1	5.4	1	0.2
11. Compost	2.5	0.45	0.45	2.3	0.6	0.1	3.6	0.6	0.05	3.35	0.6	0.15
12. Metam-sodium 25	3.6	1	0.35	3.7	0.25	0.2	3.4	0.25	0.15	4	0.5	0.2

PLANTING DATE: APRIL 25th, 2001  
 EVALUATION DATE: AUGUST 25th, 2001

TREATMENTS	PRODUCTION OF EXPORT TOMATOES, DOMESTIC AND REMAIN ON KG.											
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV		
	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.
1. Chloropicrin	4.55	2.6	0.85	3.15	1.35	0.5	5.5	3.2	0.65	4.2	2.6	0.6
2. Dichloropropene+Chloropicrin	4.7	2.8	0.7	4.5	2.5	0.8	4.4	2.5	0.85	5	2.25	0.6
3. Broccoli	5.8	2.6	0.2	3.95	2.7	0.8	2.5	2.1	0.25	5.8	2.7	0.4
4. Metam-sodium 50	3.9	3.25	0.3	1.4	1.6	0.6	2	1.8	0.2	1.9	2.45	1
5. Dichloropropene	5.5	2.5	0.4	4.6	2.55	0.3	3.35	2.1	0.45	4.8	3.05	0.2
6. Cow manure	3.5	1.25	0.2	2.4	1.4	0.05	3.2	1.55	0.05	2.1	1.8	0.35
7. Methyl Bromide 50	4.85	2.45	0.15	5.9	2.8	0.5	6.7	3.7	0.45	7	3.05	0.2
8. Methyl Bromide 40	5.75	2.05	0.6	3.05	2	0.1	5.05	2.4	0.3	4.8	4.15	0.2
9. Dazomet	1.75	2.1	0.35	0.9	1.6	0.3	2	1.85	0.55	1.4	2	0.3
10. Control	2.3	1.9	0.5	3.2	1.15	0.15	3.2	1.95	0.4	2.5	0.9	0.15
11. Compost	2.7	1.3	0.25	1.9	1.2	0.15	2.85	1.3	0.25	2.25	1.6	0.6
12. Metam-sodium 25	3.45	1.6	0.25	3.95	1.85	0.4	3.25	1.7	0	2.15	1.55	0.35

PLANTING DATE: APRIL 25th, 2001  
 EVALUATION DATE: AUGUST 28th, 2001

TREATMENTS	PRODUCTION OF EXPORT TOMATOES, DOMESTIC AND REMAIN ON KG.											
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV		
	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.
1. Chloropicrin	6.65	3.4	0.7	5.5	2.4	0.75	6.9	3.1	0.35	5.7	2.9	0.8
2. Dichloropropene+Chloropicrin	8.2	3.9	0.5	6.8	2.8	0.75	7.65	3	0.5	6.65	2.55	0.2
3. Broccoli	7.3	3.8	0.15	4.3	2	0.45	3.9	1.8	0.05	6.9	4	0.3
4. Metam-sodium 50	3.9	3	0.3	3.55	2.05	0.45	3.85	2.4	0.35	1.5	2.2	0.85
5. Dichloropropene	5.65	3.2	0.7	5.05	3	0.2	3.15	1.65	0.3	7.5	2.7	0.4
6. Cow manure	3.95	2.8	0.15	4.1	1.65	0.4	4.9	2.2	0.5	5.6	1.85	0.4
7. Methyl Bromide 50	6	4.35	0.25	6.6	3.4	0.3	7	3.65	0.3	11.25	4.9	0.35
8. Methyl Bromide 40	6.8	3.1	0.4	6.9	2.45	0.05	7.6	2.4	0.2	7.2	3.8	0.2
9. Dazomet	2.7	2.9	0.3	2	1.8	0.15	4.1	2.7	0.35	2.3	2.05	0.5
10. Control	5.5	2.2	0.1	4	2	0.25	3.9	2.15	0.3	3.25	1.9	0.5
11. Compost	3.35	1.3	0.3	2.5	2.4	0.15	3.2	1.2	0.2	2.6	1.8	0.2
12. Metam-sodium 25	2.6	1.4	0.3	3.5	1.85	0.3	3.4	1.6	0.2	2.65	1.65	0.2

PLANTING DATE: APRIL 25th, 2001  
 EVALUATION DATE: AUGUST 30th, 2001

TREATMENTS	PRODUCTION OF EXPORT TOMATOES, DOMESTIC AND REMAIN ON KG.											
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV		
EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.	
1. Chloropicrin	7	1.8	0.45	5.8	1	0.1	7.9	3.2	0.15	3.5	1.6	0.4
2. Dichloropropene+Chloropicrin	6	1.35	0.65	7.2	1.05	0.5	5.8	1.9	0.2	5.1	1.15	0.55
3. Broccoli	6.55	1.9	0.4	4.4	1.7	0.6	3.2	1.1	0.4	6.7	1.7	0.4
4. Metam-sodium 50	3.1	1.8	0.1	2.6	1.4	0.55	4.4	1.5	0.6	2.2	1.2	0.85
5. Dichloropropene	4.2	1.3	0.5	3.9	1.05	0.1	4.4	1.2	0.2	4	1.1	0.45
6. Cow manure	3.65	1.2	0.35	3.8	0.65	0.3	4.3	1.4	0.5	4.5	1.2	0.3
7. Methyl Bromide 50	6	2	0.2	7.9	1.75	0.3	4.9	1.15	0.1	7.5	2	0.2
8. Methyl Bromide 40	4.6	2.1	0.35	4.8	0.55	0.3	5.6	1.1	0.15	4.55	2.05	0.3
9. Dazomet	3.6	2.1	0.1	2.7	0.4	0.3	3.3	0.6	0.3	3.35	0.15	0.35
10. Control	3.75	0.4	0.3	3.8	1	0.3	3.05	0.45	0.35	5.6	0.8	0.1
11. Compost	4.7	1.15	0.4	4.5	0.7	0.2	4.55	1.4	0.5	4.75	0.8	0.55
12. Metam-sodium 25	3.8	0.75	0.2	3.85	1.1	0.25	2.2	1	0.05	4.25	0.5	0.1

MEASUREMENT PARAMETER: Yield - Weight in pounds on 20 lineal meters/repetition

PLANTING DATE: April 25th, 2001

EVALUATION DATE: September 1st, 2001

TREATMENTS	PRODUCTION OF EXPORT TOMATOES, DOMESTIC AND REMAIN ON KG.											
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV		
EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.	
1. Chloropicrin	7.6	3.1	0.7	4.5	3	0.2	6.7	2.1	0.35	7.15	2.55	0.8
2. Dichloropropene+Chloropicrin	8.1	2.25	0.7	6	1.5	0.05	5.9	3	0.25	5.4	2	0.05
3. Broccoli	6.1	1.2	0.2	4.9	1.05	0.2	3	1.5	0.2	5.6	1.35	0.5
4. Metam-sodium 50	3.75	0.75	0.45	1.85	0.7	0.2	3.1	1	0.5	1.8	1.15	0.6
5. Dichloropropene	5	2.05	0.25	3.45	1.45	0.25	4.3	1.05	0.45	6.5	1.4	0.35
6. Cow manure	4.3	1.05	0.15	4.5	1.5	0.15	3.5	1	0.35	4.15	1	0.2
7. Methyl Bromide 50	5.15	2.1	0.85	5.75	1.4	0.25	4.6	1.8	0.75	6	0.9	0.4
8. Methyl Bromide 40	5.2	2.45	0.5	5.35	0.9	0.4	4.65	1.4	0.3	4.25	2.1	0.45
9. Dazomet	3	1.8	0.5	2	1.2	0.4	3	1.65	0.2	2.95	0.95	0.4
10. Control	4.3	1.1	0.5	3.9	1.3	0.95	2.8	1.6	0.55	4.05	1	0.25
11. Compost	3.65	1.3	0	3.5	1.2	0	3.3	1	0	4.2	0.9	0
12. Metam-sodium 25	4.4	0.85	0.6	4.7	1.25	0.35	3.9	1.1	0.3	5.8	1.2	0.6

PLANTING DATE: APRIL 25th, 2001  
 EVALUATION DATE: SEPTEMBER 5th, 2001

TREATMENTS	PRODUCTION OF EXPORT TOMATOES, DOMESTIC AND REMAIN ON KG.											
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV		
EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.	
1. Chloropicrin	17.3	3.6	1.05	13.45	3	1.7	13.4	6.1	0.6	13.3	4.8	1.4
2. Dichloropropene+Chloropicrin	16.6	5	1.5	16.85	4.4	0.6	15.5	5.6	1.15	16.1	4.2	1
3. Broccoli	12.4	4	1.05	9.45	3.8	1.65	9.2	3	1.3	13.6	4	1.15
4. Metam-sodium 50	9.1	3.5	1.1	3.1	3.2	1.7	7.4	2.1	0.9	1.6	3.1	2.4
5. Dichloropropene	12.55	3.7	0.65	10.5	4.2	1.1	8.3	3.5	1.1	13.1	3.9	0.6
6. Cow manure	8.4	4	0.7	8.1	2.5	0.6	8.2	2.4	1.5	7.7	3.1	0.95
7. Methyl Bromide 50	13.2	3.35	0.75	16.2	4.1	0.8	13.5	2.3	0.5	22.25	5.1	0.1
8. Methyl Bromide 40	10.6	5.4	1.8	17.6	3.85	0.35	13.6	3.2	0.4	15.4	5.7	0.3
9. Dazomet	7.1	3.85	1.4	6.2	3	2.1	6.9	3.75	1.15	5	2.35	1.2
10. Control	8.65	2.8	0.8	6.5	2.7	1.7	8	3.5	1.2	7.5	1.95	1.2
11. Compost	6.1	3.85	3.85	5.35	4.7	4.7	6.6	4.5	4.5	6.1	3.1	3.1
12. Metam-sodium 25	7.2	2.1	1.2	8.6	2.4	0.95	9.9	2.9	0.8	9.5	3.05	1.2

PLANTING DATE: April 25th, 2001  
 EVALUATION DATE: SEPTEMBER 8th, 2001

TREATMENTS	PRODUCTION OF EXPORT TOMATOES, DOMESTIC AND REMAIN ON KG.											
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV		
	EXP.	DOM	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.
1. Chloropicrin	15	5.9	1.1	10.8	3	0.65	14.25	3.1	0.8	12	5	1.85
2. Dichloropropene+Chloropicrin	13.1	2.9	0	12.2	6	0	15.8	2.5	0	14.1	4	0
3. Broccoli	9	5.3	0.85	6.5	3.3	2	10	3.7	0.7	10.9	5	0.4
4. Metam-sodium 50	8.7	2.75	1.2	3.5	2.2	1.3	4.1	1.8	1.5	1.6	3.1	2.4
5. Dichloropropene	13	5.3	1.2	9.3	4.1	1.85	9.55	4.8	1.15	9.5	4.4	1.7
6. Cow manure	7.7	2.9	1	8.5	4	1.7	6.2	3	1.3	7.9	3.45	1.7
7. Methyl Bromide 50	9.1	2.55	0.5	18.4	5.8	0.7	14.3	3.8	0.3	17.2	3.25	1
8. Methyl Bromide 40	11.2	3.2	1.3	15.5	4.4	0.65	15.6	4.1	0.9	12.4	3.6	0.7
9. Dazomet	5.5	5.5	3	3.2	2.3	1.2	6	3.5	1.4	5.8	1.7	2.5
10. Control	8.35	5.25	0.7	5.4	3.3	0.9	7.7	3.3	1.7	9.5	2.9	1
11. Compost	6.6	3.9	2.3	5.1	3.4	2.2	6.5	3	1.8	6.6	2.3	0.8
12. Metam-sodium 25	6.5	3.5	1.1	11.1	3	1.2	10.6	4.2	1	1.09	3.4	1.2

PLANTING DATE: April 25th, 2001  
 EVALUATION DATE: SEPTEMBER 12th, 2001

TREATMENTS	PRODUCTION OF EXPORT TOMATOES, DOMESTIC AND REMAIN ON KG.											
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV		
	EXP.	DOM	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.	EXP.	DOM.	REM.
1. Chloropicrin	5.6	0.8	0.2	3.4	1.1	0.55	4.9	1.6	0.2	4.6	1.4	0.5
2. Dichloropropene+Chloropicrin	3.25	1.45	0.45	3.9	0.9	0.2	5.3	1.2	0.45	4.9	1.4	0.4
3. Broccoli	3.6	1.15	0.6	2.3	0.5	0.5	2.6	1	0.4	3.7	0.9	0.4
4. Metam-sodium 50	2.4	1.05	0.7	0.9	0.55	0.4	2.3	0.95	0.7	0.1	0.1	0.8
5. Dichloropropene	5.1	0.65	0.6	2.9	0.8	0.25	5.4	1.4	0.6	2.6	1	0.3
6. Cow manure	2.55	0.4	0.45	3.1	1.1	0.5	1.75	0.9	0.55	2.8	0.9	0.4
7. Methyl Bromide 50	3.8	1.2	0.45	4.6	1	0.5	3.5	1.5	0.7	4.5	1.2	0.9
8. Methyl Bromide 40	2.7	0.6	0.8	6.65	1.7	0.75	4.4	1.8	0.4	2.6	1.1	0.65
9. Dazomet	1.75	0.85	0.45	0.9	0.3	0.35	1.35	0.7	0.4	1.5	0.7	0.35
10. Control	3.9	0.8	0.45	2.1	1.6	0.6	2	0.8	0.7	3	1.35	0.5
11. Compost	1.5	0.3	0.85	1.9	1	0.5	1.35	0.4	0.6	3.1	0.9	0.85
12. Metam-sodium 25	3.3	1	0.75	3.8	1.35	0.35	4.2	1	0.9	2.8	0.8	0.6



**STATISTIC ANALYSIS OF RESULTS OBTAINED IN TOMATOES CROP IN RANCHO "DON JUANITO" SAN QUINTÍN, B.C. PLANTED on April 25th., AND HARVESTED from July 14<sup>th</sup>, to September 12<sup>th</sup>, 2001.**

Table 1. Kilograms of tomato per treatments, categories and repetitions

TREATMENTS	CATEGORIES	Rep 1	Rep 2	Rep 3	Rep 4
1. Chloropicrin	Export Domestic Remain	229.05 50.30 13.05	185.80 38.69 11.15	192.78 49.60 6.65	212.25 48.85 17.00
2. Dichloropropen + Chloropicrin	Export Domestic Remain	210.05 51.00 12.60	212.60 48.85 11.05	201.30 51.80 10.25	227.40 50.15 10.58
3. Broccoli	Export Domestic Remain	212.10 45.40 12.40	181.50 45.35 14.60	167.95 40.00 12.15	204.30 45.95 8.45
4. Metan-Sodium 50	Export Domestic Remain	175.70 44.45 11.85	133.05 34.50 17.12	157.35 35.50 14.40	145.50 41.35 14.40
5. Dichloropropen	Export Domestic Remain	209.55 52.55 11.40	204.75 45.70 9.25	187.15 45.10 11.65	204.65 44.45 10.15
6. Cow manure	Export Domestic Remain	152.45 38.05 13.10	165.55 38.05 8.85	161.80 41.70 10.90	151.00 37.85 12.40
7. Methyl Bromide 50	Export Domestic Remain	204.45 50.35 8.65	226.10 46.75 7.05	192.45 46.90 6.85	248.60 48.60 8.70
8. Methyl Bromide 40	Export Domestic Remain	198.65 51.80 16.05	217.90 42.50 9.40	201.90 41.50 9.90	199.45 49.95 9.75
9. Dazomet	Export Domestic Remain	130.50 41.65 20.63	136.75 30.90 17.35	138.05 40.97 17.90	124.70 35.70 15.90
10. Control	Export Domestic Remain	185.80 34.50 9.45	184.60 38.10 9.90	177.65 44.10 12.09	182.30 33.05 10.80
11. Compost	Export Domestic Remain	151.00 34.55 15.55	157.55 38.75 14.85	160.90 33.70 13.05	155.85 34.85 12.25
12. Metan-Sodium 25	Export Domestic Remain	170.30 33.95 12.95	192.00 29.30 10.35	198.80 38.20 9.35	181.14 35.40 11.27

Table 2. ANALYSIS OF VARIANCE OF TOMATOES' WEIGHT,  
FOR TREATMENTS AND CATEGORIES.

FV	GL	SC	CM	F	P>F
REPETITIONS	3	312.000000	104.000000	1.491	NS 0.220
TREATMENTS	11	13304.312500	1209.482910	17.336 **	0.000
CATEGORIES	2	803994.687500	401997.343750	5762.026 **	0.000
TREAT - CATEG	22	21478.437500	976.292603	13.994 **	0.000
ERROR	105	7325.500000	69.766670		
TOTAL	143	846414.937500			

C.V. = 10.55%

### TEST OF TUKEY

Table 3. COMPARISON OF AVERAGE'S TREATMENTS  
(Three categories' average)

#### TREATMENTS

2	91.4691 A
7	91.2875 A
1	87.9308 AB
8	87.3958 AB
5	86.3600 AB
3	82.5125 AB
12	76.9425 BC
10	76.8617 BC
6	69.3083 CD
4	68.7642 CD
11	68.5708 CD
9	62.5833 D

LEVEL OF SIGNIFICANCE = 0.05

TUKEY = 11.4351

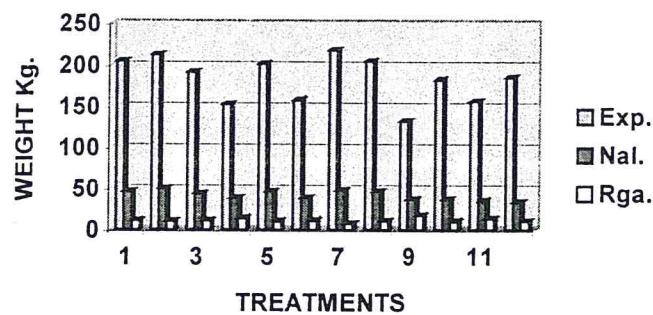
VALUES OF TABLES:

q(0.05) = 4.74    q(0.01) = 5.48

Table 4. AVERAGE OF TREATMENTS PER CATEGORIES

TREATMENTS	CATEGORIES			AVERAGE
	Exp.	Dom.	Rem.	
1. Chloropicrin	204.9700 AB	46.8600 A	11.9625 A	87.9308
2. Dichlorop+Chlorop	212.8375 A	50.4500 A	11.1200 A	91.4692
3. Broccoli	191.4625 BC	44.1750 A	11.9000 A	82.5125
4. Metan-Sodium 50	152.9000 D	38.9500 A	14.4425 A	68.7642
5. Dichloropropene	201.5250 ABC	46.9425 A	10.6125 A	86.3600
6. Cow manure	157.7000 D	38.9125 A	11.3125 A	69.3083
7. Methyl Bro 50	217.9000	48.1500 A	7.8125 A	91.2875
8. Methyl Bro 40	204.4750 AB	46.4375 A	11.2750 A	87.3958
9. Dazomet	132.5000 E	37.3050 A	17.9450 A	62.5833
10. Control	182.5875 C	37.4375 A	10.5600 A	76.8617
11. Compost	156.3250 D	35.4625 A	13.9250 A	68.5708
12. Metan-Sodium 25	185.5850 BC	34.2125 A	11.0300 A	76.9425
AVERAGE	183.3973	42.1079	11.9915	79.1655

TOMATO FRUIT WEIGHT PER CATEGORIES



#### INTERPRETATION OF RESULTS:

Analysis of tomatoes weight variance show highly significant effects for treatments and categories (Table 1)

**Export Tomato:** The highest yield were observed in treatments: 7; Methyl Bromide 50 and 2; Dichloropropene + Chloropicrin), with averages of 217.90 and 212.838 kg respectively. In descendent order, next group of significance was occupied for treatments: 1; Chloropicrin, 8; Methyl Bromide

40 and 5; Dichloropropene, with averages of 204.970, 204.470 and 201.525 kg respectively. Third place of significance was for treatments: 3; Broccoli, 12; Metan-Sodium 25 and 10; Control, with averages of 191.463, 185.585 and 182.587 kg respectively. Lowest than Control, the fourth place of significance was occupied for treatments: 6; Cow manure, 11; Compost and 4; Metan-Sodium 50, with averages of 157.700, 156.325 and 152.900 kg of tomato, respectively. Last and fifth place of significance was occupied for treatment 9; Dazomet, with average of 132.500 kg tomato (Table 4).

**Domestic Tomato** : It wasn't significant differences among treatments. In treatment 2; Dichloropropene + Chloropicrin it got the best average, 50.450 kg of tomato. In treatment 12; Metan-Sodio 25, it was found the lowest, 34.213 kg (Table 4).

**Remain tomato.** Result was similar to previous category. It wasn't observed significant differences among treatments. Treatment 9; Dazomet it was got the highest average, 17.945 kg; The lowest was treatment 7; Methyl Bromide 50. Its average was 7.813 kg of tomato (Table 4).

**YIELD OF TREATMENTS (average of Exp., Dom., and Rem):** First place of significance was occupied for treatments: 2; Dichloropropene + Chloropicrin and 7; Methyl Bromide 50, with averages of 91.469 and 91.288 kg of tomato. Second place of significance was for treatments: 1, 8, 5 and 3 1; Chloropicrin, 8; Methyl Bromide 40, 5; Dichloropropene and 3; Broccoli, which averages were 87.931, 87.396, 86.360 and 82.513 kg. Third place of significance were treatments: 12; Metan-Sodium 25 and 10; Control, with averages 76.943 and 76.862 kg. Fourth significance group was for treatments: 6; Cow manure, 4; Metan-Sodium 50 and 11; Compost, with averages of 69.308, 68.764 and 68.571 kg. Treatment 9; Dazomet, was in last place of significance, with average of 62.583 kg tomato (Table 3).

## **CONCLUSIONS.**

1. The Best treatments were: 2; Dichloropropene + Chloropicrin and 7; Methyl Bromide 50.
2. Next best treatments: 1; Chloropicrin, 8; Methyl Bromide 40 and 5; Dichloropropene.
3. Treatments 3 Broccoli and Metam Sodium 25 got same results than Control.
4. The others treatments got low results than Control.



## UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION FACULTAD DE AGRONOMIA - UAS

### INTRODUCTION

During February 2002, it was established the second test of project "Alternatives to the use of Methyl Bromide in the cultivation of Tomatoes, (*Lycopersicon esculentum* L.), we started some tests in "Don Juanito" Ranch, San Quintin, Baja California, Mexico, which consisted in the application of different treatments on soil, in order to analyze the control about soil microorganisms and in crops development, comparing Methyl bromide. We apply this substance in alluvial arenaceous land, with region characteristics (flora and fauna) half-dessert. Agricultural activities are based in the drip irrigation, using groundwater table.

Treatments: Based on before results treatments during last agricultural season 2001, we selected 8 (eight) treatments.

### TREATMENTS OR ALTERNATIVES:

- 1.- Control (no treatment).
- 2.- 40 gr/m<sup>2</sup> of methyl bromide (75/25 or 80/20).
- 3.- Five kg of fresh broccoli residue (or other cruciferous plant) incorporated into soil, plus four weeks of solarization.
- 4.- 50 ml/m<sup>2</sup> of metam-sodium.
- 5.- 33 ml/m<sup>2</sup> of chloropicrin.
- 6.- 1,3-dichloropropene+chloropicrin, dose recommended by the manufacturer.
- 7.- 1,3-dichloropropene, dose recommended by the manufacturer (11.2 ml/m<sup>2</sup>).
- 8.- Commercial control

### BODY OF THE REPORT

#### Land preparation

Activities in cooperative farmer land started in last February, when "Don Juanito" enterprise heavy machinery carried out double subsoil in land. They opened the soil 50 cm depth. Then they raked the soil in three rows, after that, they made the installment underground pipeline. Afterwards the beds were marked, raised and

flattened. And finally we put the padded with black-silver plastic (silver side up). The bed marks were marked 1.80 m between each one.

## Experiment Design

The treatment designs were carried out in February, 2002. In a piece of land with 32 beds, 50 m length, inside the enterprise commercial land. It was traced four blocks 10 m each; we selected 8 experimental plots with 4 beds, which we applied next randomized treatments:

- 1). **Absolute control.** In this experimental unit consist on 4 rows, 10 M. length, and we didn't realized any fungicide or organic matter application.
- 2). **Methyl Bromide 80/20.** In the four rows, It was injected 40 grs  $M^2$  (80% methyl bromide and 20% chloropicrin).The application was approximately 25-30 cm depth.
- 3). **Broccoli** incorporated on the soil and solarization. In order to apply this treatment, we chopped the cabbage in small pieces: then it were distributed 5 kg per  $M^2$ . It was incorporated by manual labor using hoes, after that, the rows were covered with transparent plastic.
- 4). **Metham-sodium.** In this four furrows it was applied 50 ml/ $m^2$  metham sodium. The furrows were covered in black/silver plastic during 20 days.
- 5). **Chloropicrin.** On this four furrows were applied 33ml/ $m^2$  chloropicrin using the same equipment which we applied methyl-bromide. The furrows were covered in black/silver plastic during 20 days.
- 6). **1,3-dichloropropen + chloropicrin.** These furrows soil were treated using 27ml/ $m^2$  mixture 1,3-dichloropropeno (65%) chloropicrin (35%). We applied this product using the same equipment used to apply the methyl-bromide, and the furrows were covered in black/silver plastic during 20 days.
- 7). **1,3-dichloropropen.** These furrows soil were treated using 11.2 ml/ $m^2$  1,2-dichloropropen. This application was carried out using the equipment tractor thereafter. The furrows were covered in black/silver plastic during 20 days.
- 8) **Commercial control** 1,3-dichloropropeno (75%) chloropicrin (25%). Tratamiento utilizado por el productor en el lote comercial.

The treatments were applied on damp soil.

Evaluations are taking place in the two central furrows in each experimental unit. We attached a label in 10 plants (five each row or 10 cm central bed) which were randomized, in order to take size measure.

## **Planting.**

Tomato plants used in this tests are "fat" tomato or "ball" type. This plants grew in polyethylene ashtrays in "Don Juanito" agricultural enterprise greenhouses. The plants were 50 days old. They were planting 45 cm between each plant, on furrows with damp soil, non covered with plastic.

## **Crop Management**

Irrigation and fertilization took place using drip irrigation, and they are controlled directly by enterprise field manager. Same people took the records about the handworks like pruning, cutting, spinning, tied the plants, diseases control and foliage pests, etc.

## **RESULTS:**

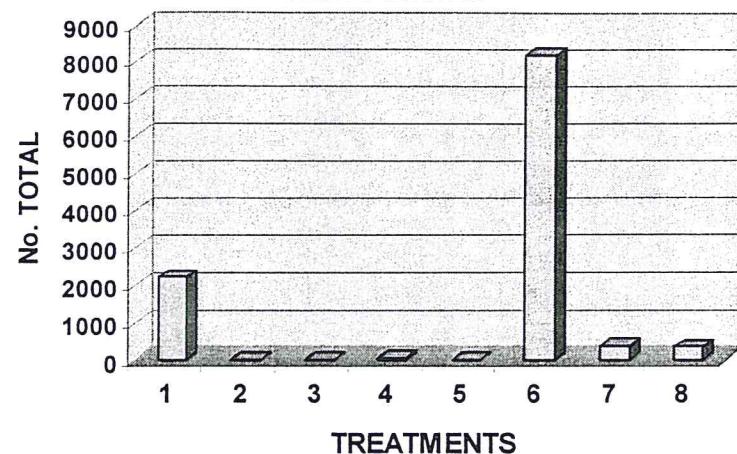
### **Nematodes population:**

**UNIVERSIDAD AUTONOMA DE SINALOA - FACULTAD DE AGRONOMIA**  
**SITE: Rancho "Don Juanito" Col. Vicente Guerrero (Santa Fe)B.C.**  
**PLANTING DATE: February 21st., 2002**      **CROP: Tomato Var. Tequila**  
**EVALUATION PARAMETER: Population of nematodes on 200 gr. soil/treatment**  
**EVALUATION DATE: 29/JULY/02**

NEMATODES	TREATMENTS							
	1	2	3	4	5	6	7	8
Free life	2580	980	220	1360	360	660	2260	800
Meloidogyne	2200	20	0	80	0	8200	380	360
Pratylenchus	1660	20	0	100	0	200	120	180
Aphelenchus	60	0	0	40	0	20	20	20
Trichodorus	20	0	0	0	140	0	180	0
Aphelenchoides	80	40	0	100	0	20	0	0
Tylenchus	0	20	0	0	0	0	0	0

1. CONTROL                5. DICHLOROPROPENE+CHLOROPICRYN  
2. DICHLOROPROPENE    6. METAM SODIUM 50  
3. METHYL BROMIDE 40    7. BROCCOLI  
4. CHLOROPICRYN          8. COMMERCIAL CONTROL

**Youthful of Meloidogyne PER TREATMENT  
TOMATO 29/07/02**



**UNIVERSIDAD AUTONOMA DE SINALOA - FACULTAD DE AGRONOMIA**  
**SITE: Rancho "Don Juanito" Col. Vicente Guerrero (Santa Fe)B.C.**

**PLANTING DATE: February 21 st., 2002**

**CROP: Tomato Var. Tequila**

**EVALUATION PARAMETER: Population of nematodes on 200 gr. soil/treatment**

**EVALUATION DATE: 16/09/02**

NEMATODES	TREATMENTS							
	1	2	3	4	5	6	7	8
Free life	1960	3760	860	860	2340	2120	740	960
Meloidogyne	240	4520	0	4600	420	6380	540	580
Pratylenchus	100	180	0	2020	180	300	20	160
Aphelenchus	0	0	0	0	40	20	0	80
Trichodorus	100	220	0	0	0	240	20	80
Longidorus	0	0	0	0	0	40	0	0
Tylenchus	0	0	0	60	0	0	0	0

1. CONTROL

5. DICHLOROPROPENE + CHLORPICRYN

2. DICHLOROPROPENE

6. METAM SODIUM 50

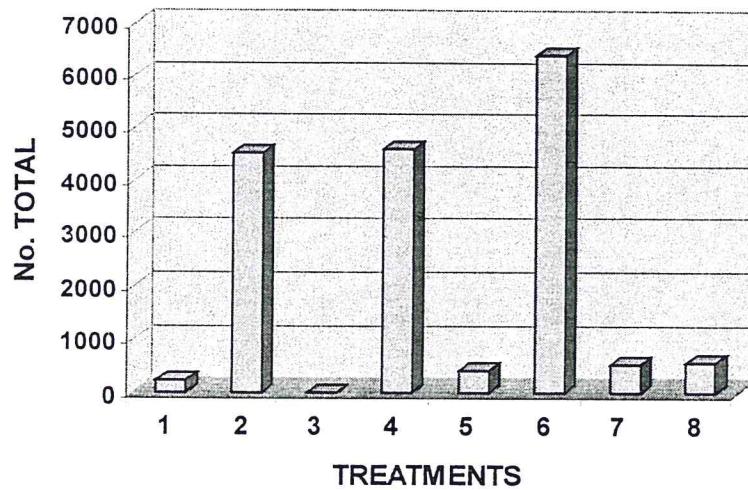
3. METHYL BROMIDE 40

7. BROCCOLI

4. CHLORPICRYN

8. COMMERCIAL CONTROL

YOUTHFUL OF *Meloidogyne* PER TREATMENT  
TOMATO 16/09/02



FACULTAD DE AGRONOMIA -UNIVERSIDAD AUTONOMA DE SINALOA

SITE: Rancho "Don Juanito" Col. Vicente Guerrero (Santa Fe)B.C.

PLANTING DATE: February 21st., 2002

CROP: Tomato, Var. Tequila.

EVALUATION PARAMETER: % nodulation of roots per *Meloidogyne*

EVALUATION DATE: 16/09/02

Escala de 1-6 = 0-100%

TREATMENTS	% NODULATION OF ROOTS PER <i>Meloidogyne</i> ON 5 PLANTS/REPETITION											
	REPETITION I					REPETITION II						
	PLANTS					PLANTS						
	1	2	3	4	5	Average	1	2	3	4	5	Average
1. Control	100	100	100	100	100	100	100	100	100	100	100	
2. Dichloropropene	0	0	60	0	0	12	0	0	0	40	0	8
3. Methyl Bromide 40	0	0	0	0	0	0	0	0	0	0	0	0
4. Chloropicryl	100	100	100	100	100	100	100	100	80	100	100	96
5. Dichloropropene+Chloropicryl	0	0	0	0	0	0	0	0	40	0	0	8
6. Metam sodium 50	100	100	100	100	80	96	100	100	100	100	100	100
7. Brócoli	100	100	100	100	100	100	100	80	100	100	100	96
8. Comercial Control	0	0	0	40	0	8	0	0	0	0	0	0

TREATMENTS	REPETITION Iii						REPETITION IV					
	PLANTS					Average	PLANTS					Average
	1	2	3	4	5		1	2	3	4	5	
1. Control	100	100	100	100	100	100	100	100	100	100	100	100
2. Dichloropropene	0	0	60	0	0	12	0	0	20	0	60	16
3. Methyl Bromide 40	0	0	0	0	0	0	0	0	0	0	0	0
4. Chloropicryl	100	100	100	60	100	92	100	60	100	100	80	88
5. Dichloropropene+Chloropicryl	0	0	0	0	20	4	0	0	0	0	0	0
6. Metam sodium 50	100	100	100	100	100	100	100	100	80	100	100	96
7. Broccoli	100	100	80	100	100	96	60	100	100	100	100	92
8. Commercial Control	0	60	0	0	0	12	0	0	0	0	0	0

## FACULTAD DE AGRONOMIA -UNIVERSIDAD AUTONOMA DE SINALOA

SITE: Rancho "Don Juanito" Col. Vicente Guerrero (Santa Fe)B.C.

PLANTING DATE: February 21st., 2002

CROP: Tomato Var. Tequila

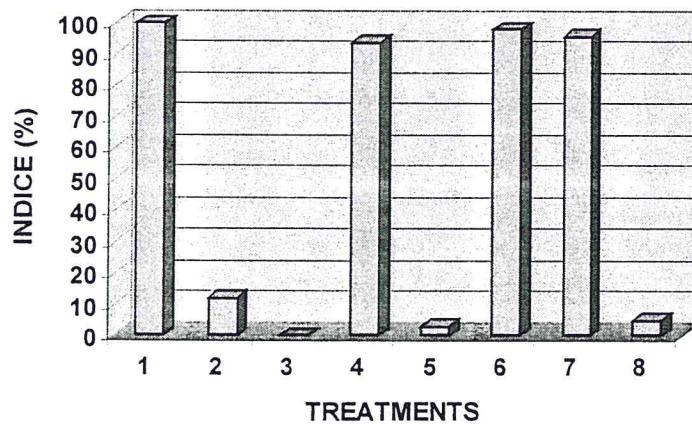
EVALUATION PARAMETER: % nodulation of roots per Meloidogyne

EVALUATION DATE: 16/09/02

TREATMENTS	TOTAL AVERAGE OF ROOTS NODULATION PER Meloidogyne					
	1	2	3	4	Total	Average
1. Control	100	100	100	100	400	100
2. Dichloropropene	12	8	12	16	48	12
3. Methyl Bromide 40	0	0	0	0	0	0
4. Chloropicryl	100	96	92	88	376	94
5. Dichloropropene+Chloropicryl	0	8	4	0	12	3
6. Metam sodium 50	96	100	100	96	392	98
7. Brócoli	100	96	96	92	384	96
8. Comercial Control	8	0	12	0	20	5

## % NODULATION of Meloidogyne TOMATO

16/09/02



## YIELD RESULTS:

### FACULTAD DE AGRONOMIA - UNIVERSIDAD AUTONOMA DE SINA.LOA

SITE: "Don Juanito" Ranch, Col. Vicente Guerrero (Santa Fe), B.C.

CROP: Tomato Var. Tequila

EVALUATION PARAMETER: Total yield on Kg. 12 m. lineal/repetition/treatment

PLANTING DATE: April 8th, 2002

EVALUATION DATE: July 3th, to August 27th, 2002

TREATMENTS	EXPORT, DOMESTIC AND REMAIN TOMATOES YIELD ON KG.												TOTAL	
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV				
	EXP.	DOM	REM	EXP.	DOM	REM	EXP.	DOM	REM	EXP.	DOM	REM		
1. Control	76.85	50.45	22.4	72.75	48.65	26.2	73.15	48.1	18.3	69.55	46.6	23.25	292.3 193.8 63.95	
2. Dichloropropen	79.75	54.2	23.35	75.1	49.7	22.15	81.8	64.1	23.15	93.55	61.1	21.55	330.2 229.1 68.05	
3. Methyl Bromide 40	74.3	54.05	25.8	90.85	53.65	22.2	103.1	55.8	22.3	106.1	55.2	20.85	374.3 218.7 68.95	
4. Chloropicrin	76.45	58.6	29.55	82.3	54.85	27.1	92.35	54.7	20.2	83.8	56.5	21.9	334.9 224.65 71.65	
5. Dichloropropen+Chloropicrin	101.2	58.4	23.3	92.15	51.85	25.7	100	54.45	20.8	85.95	50.85	23.45	379.25 215.55 67.55	
6. Metam-sodium 50	68.3	51.55	24	75.3	55.6	21.3	85.75	71.4	22.6	61.2	64.05	24.55	290.55 242.6 71.15	
7. Broccoli	73.1	46.1	17.9	82.75	50.55	19.9	89.8	48.65	20.6	77.2	51.95	21.5	322.85 197.25 60	
8. Commercial Control (Piclor 15)	96.7	53	22.5	96.3	62.05	26.15	89.35	51.35	21.1	93.95	49.4	26.8	376.3 215.8 70.4	

### FACULTAD DE AGRONOMIA - UNIVERSIDAD AUTONOMA DE SINA.LOA

SITE: "Don Juanito" Ranch, Col. Vicente Guerrero (Santa Fe), B.C.

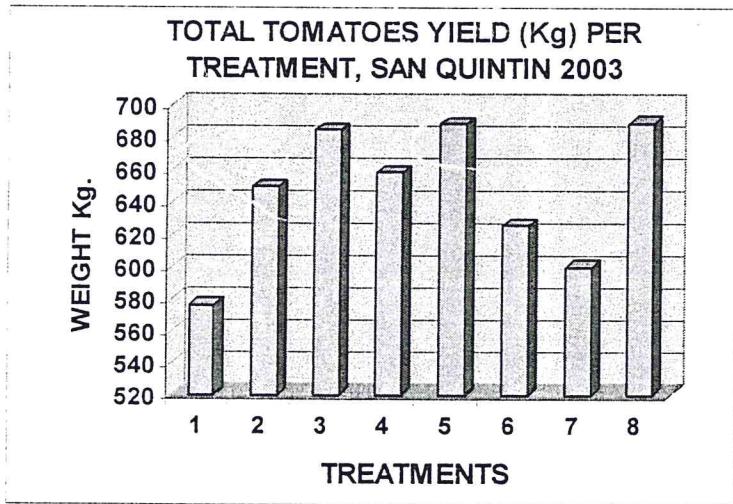
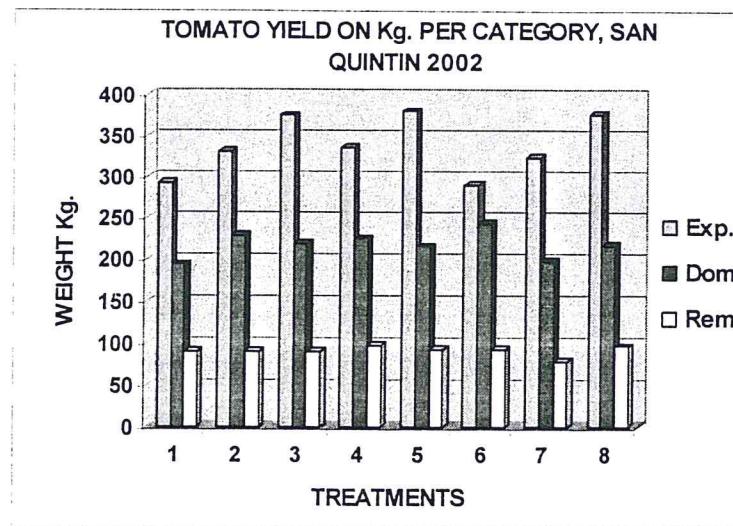
CROP: Tomato Var. Tequila

EVALUATION PARAMETER: Total yield Kg. on 48 m. lineal/treatment

PLANTING DATE: April 8th, 2002

EVALUATION DATE: July 3th, to August 27th, 2002

TREATMENTS	TOTAL TOMATOES YIELD ON Kg.			
	Export	Domestic	Remain	Total
1. Control	292.3	193.8	90.15	576.25
2. Dichloropropen	330.2	229.1	90.2	649.5
3. Methyl Bromide 40	374.3	218.7	91.15	684.15
4. Chloropicrin	334.9	224.65	98.75	658.3
5. Dichloropropen+Chloropicrin	379.25	215.55	93.25	688.05
6. Metam-sodium 50	290.55	242.6	92.45	625.6
7. Brócoli	322.85	197.25	79.9	600
8. Commercial Control (Piclor 15)	376.3	215.8	96.55	688.65



**Final conclusion.** The treatments with greater production (export and national) were: dichloropropeno + Chloropicrin, and metam sodium + solarization. These are alternatives to the use of methyl bromide for the control of pathogens of the ground in tomato, nevertheless biofumigation could be a good treatment of control that could be adopted by lower producers



## UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION FACULTAD DE AGRONOMIA - UAS

**FINAL PROJECT REPORT.** Demonstration Project of Alternatives to the use of Methyl Bromide in the cultivation of Tomatoes, (*Lycopersicon esculentum* L.). The development in empresa Agrícola El Porvenir fields in Bachigualatillo, Culiacan, Sinaloa, Mexico. In this field have been working MC. Francisco Javier Estrada Ramirez, coordinator in this project. And MC. Sostenes Montoya Angulo, agronomist who is implementing the tests. QFB. María de la Luz Acosta Pineda y MC: Carlos Morales Cazarez, Colaboradores.

In this month, March 2004, we are reporting performed activities from 1999 to 2004.

### Introduction

Last September, 1999, in Culiacan, Valley, Sinaloa, Mexico, we started taking some tests. We apply different treatments in soil, in order to analyze the control about soil microorganisms and in crops development also, comparing Methyl bromide. We apply this substance in muddy type soil.

Treatments: We started the experiment in agricultural season 1999. we applied 13(fourteen) treatments:

### treatments or alternatives:

- 1.- Control (no treatment).
- 2.- 15 gr/m<sup>2</sup> of methyl bromide (75/25 or 80/20).
- 3.- 40 gr/m<sup>2</sup> of methyl bromide (75/25 or 80/20).
- 4.- Five kg of bovine cattle manure incorporated into soil, plus four weeks of solarization.
- 5.- .- Five kg of chicken manure incorporated into soil, plus four weeks of solarization.
- 6- Five kg of fresh broccoli residue (or other cruciferous plant) incorporated into soil, plus four weeks of solarization.
- 7.- 25 ml/m<sup>2</sup> of metam-sodium ( N, methyl sodium ditiocarbamate) plus six weeks of solarization.
- 8.- 50 ml/m<sup>2</sup> of metam-sodium.
- 9.- 33 ml/m<sup>2</sup> of chloropicrin.
- 10.- 40 gr/ m<sup>2</sup> of Dazomet (tetrahydro-3-5 dimethyl-2H-1.3.5-tiadizin-2-tiona).

- 11.- 1,3-dichloropropene+chloropicrin, dose recommended by the manufacturer.
- 12- 1,3-dichloropropene, dose recommended by the manufacturer (11.2 ml/m<sup>2</sup>).
- 13.- Four weeks of solarization.

## BODY OF THE REPORT

### Land preparation

The activities in cooperative farmer land started in last August, when "El Porvenir" enterprise heavy machinery carried out double subsoil in land. They opened the soil 50 cm depth. Then they raked the soil in three rows, after that, they made the instalment underground pipeline. Afterwards the beds were marked, arised and flattened. And finally we put the padded with black-silver plastic (silver side up). The bed marks were marked 1.80 m between each one.

### Experiment Design

The treatment designs were carried out in September 13<sup>rd</sup>, 1999. In a piece of land with 56 beds, 50 m lenght, inside the enterprise commercial land. It was traced four blocks 10 m each; we selected 13 experimental plots with 4 beds, which we applied next randomized treatments:

- 1). Absolute control. In this experimental unit consist on 4 rows, 10 M. lenght, and we didn't realized any fungicide or organic matter application.
- 2). Methyl Bromide 80/20 (15 gr/m<sup>2</sup>). In soil in the 4 rows in this experimental unit it was injected 15 gr M<sup>2</sup> (80% methyl bromide and 20% chloropicrin). The application was approximattely 25-30 cm depth.
- 3). Methyl Bromide 80/20. In the four rows, It was injected 40 grs M<sup>2</sup> (80% methyl bromide and 20% cholopicrin).The application was approximattely 25-30 cm depth.
- 4). Solarization. The four rows were padded or was covered with transparent plastic from September 14<sup>th</sup> to October 15<sup>th</sup>, 1999.
- 5). Hen manure was incorporated to the soil with the solarization. It was distributed on the soil, in that 10 mts., four rows, 200 kgs hens manure, approximattely 5 kgs per M<sup>2</sup>. It was incorpored by manual labour using hoes and the rows were covered with transparent plastic from September 16<sup>th</sup> to Ocrubre 15<sup>th</sup>, 1999.
- 6). Cow Manure was incorporated to the soil with the solarization. It was distributed 200 kg. Cow manure, approximattely 5 kg. Per M<sup>2</sup>. It was incorpored by manual labour using hoes, and the rows were covered with transparent plastic from September 16<sup>th</sup> to October 15<sup>th</sup>, 1999. The cow manure was still damp.

7). Green cabbage incorporated on the soil with the solarization. In order to apply this treatment, we chopped the cabbage in small pieces: then it were distributed 5 kg per M<sup>2</sup>. It was incorporated by manual labour using hoes, after that the rows were covered with transparent plastic from September 16<sup>th</sup> to October 15<sup>th</sup>, 1999.

8). Metham-sodium (N, methyl ditiocarbamato sodium) with solarization. Using drip irrigation it was applied approximattely 25 ml/m<sup>2</sup> metham sodium. Before the application the rows were covered with transparent plastic from September 14<sup>th</sup> to October 15<sup>th</sup>, 1999.

9). Metham-sodium. In this four furrows it was applied 50 ml/m<sup>2</sup> metham sodium. The furrows were covered in black/silver plastic during 22 days.

10). Chloropicrin. On this four furrows were applied 33ml/m<sup>2</sup> chloropicrin using the same equipment which we applied methyl-bromide. The furrows were covered in black/silver plastic during 22 days.

11). Dazomet( tetrahidro-3-5 dimethyl-2H-1.3.5-tiadizin-2 tiona). On this furrows soil we distributed by manual labour 40 gr/m<sup>2</sup> dazomet: it was incorporated using hoes, after that, we applied water by sprinkler irrigation during 3 hrs.

12). 1,3-dichloropropeno + chloropicrin. These furrows soil were treated using 27ml/m<sup>2</sup> mixture 1,3-dichloropropeno (65%) chloropicrin (35%). We applied this product using the same equipment used to apply the methyl-bromide, and the furrows were covered in black/silver plastic during 22 days.

13). 1,3-dichloropropen. These furrows soil were treated using 11.2 ml/m<sup>2</sup> 1,2-dichloropropen. This application was carried out using the equipment tractor thereafter. The furrows were covered in black/silver plastic during 22 days.

The treatments were applied in damp soil.

Evaluations are taking place in the two central furrows in each experimental unit. We attached a label in 10 plants (five each row or 10 cm central bed) which were randomized, in order to take size measure.

### **Planting.**

Tomatoe plants used in this tests are "fat" tomatoe or "ball" type. This plants growed in polyethylene ashtrays in "El Porvenir" agricultural enterprise greenhouses. The plants were 50 days old. They were planting 45 cm between each plant, on furrows with damp soil, non covered with plastic.

## Crop Management

Irrigation and fertilization took place using drip irrigation, and they are controlled directly by enterprise field manager. Same people took the records about the handworks like pruning, cutting, spinning, tied the plants, diseases control and foliage pests, etc.

## RESULTS

**Root knotting diseases incidence.** We are checking the plants each two weeks, carrying out observations in plants, in order to detect symptoms, like yellow leaves, no development, withering or dead plants. However, we haven't detected any abnormality.

**Nematodes Population.** Seven weeks after central furrows transplanting, in each experimental unit, near plant roots, 0-30 cm depth. We'll take five soil subsampling, in order to obtain one kg. Sampling. Immediately after that, the soil samplers will be taken to the Phytopatology lab in Agronomy Faculty to carry out nematodes extraction.

We put into a 1,000 ml graduate test tube 400 ml of water, we stirred each soil sample perfectly homogenized. We stirred hard and we put out in a small cask containing 4 liters of water. Afterwards the soil was dissolved in water, allowed to stand for 20 seconds and this water with the soil was passed through a 60 mesh sieves and this soil with water was put into a second small cask. Subsequently it was stirred again allowing to stand for 20 seconds, then it was passed through a 325 sieve mesh. The soil retained in this sieve mesh was taken using a teaspoon and it was passed into a 100 ml flask and it was taken to the Faculty of Agronomy Phytopatology lab in order to carry out nematodes extraction. In lab the soil from the flasks was put on a piece of toilet paper which was on a wire mesh, which was on a plastic funnel. In the funnel extreme it was put a flexible plastic hose which was stopped up using a pincer; the funnel was filled up of water until this touch the sieved soil. After 24 hours, from the bottom extreme hose, we pick up a 10 ml. Sample; it was gauged again using clean water, and after 24 hours again it was taken another water sample with nematodes. This activity was repeated in all 52 samples.

Using a biological microscope we observed the nematodes and we counted which we found in 1 ml. Aliquots. Afterwards we calculated the founded populations in 20 ml of water which we obtained using the sieve funnel method. This correspond to the soil 200 ml populations.



## UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION FACULTAD DE AGRONOMIA - UAS

### INTRODUCTION

Last September, 2000, it was established the second test of project "Alternatives to the use of Methyl Bromide in the cultivation of Tomatoes, (*Lycopersicon esculentum* L.), we started taking some tests in Agrícola El Porvenir, Culiacan Valley, Sinaloa, Mexico,. We apply different treatments in soil, in order to analyze the control about soil microorganisms and in crops development also, comparing Methyl bromide. We apply this substance in muddy type soil.

Treatments: Based on before results treatments during last agricultural season 1999-2000, we selected 6 (six) treatments.

1. Dichloropropen + chloropicrin 16 ml/m<sup>2</sup>.
2. Control
3. Methyl bromide 75/25, 40 gr/m<sup>2</sup>
4. Metam-sodium 50 ml/m<sup>2</sup>
5. Chloropicrin 33ml/m<sup>2</sup>
6. Dichloropropen 12 gr/m<sup>2</sup>

### BODY OF THE REPORT

#### Land preparation

The activities in cooperative farmer land started in last August, when "El Porvenir" enterprise heavy machinery carried out double subsoil in land. They opened the soil 50 cm depth. Then they raked the soil in three rows, after that, they made the instalment underground pipeline. Afterwards the beds were marked, arised and flattened. And finally we put the padded with black-silver plastic (silver side up). The bed marks were marked 1.80 m between each one.

#### Experiment Design

The treatment designs were carried out in October 1<sup>st</sup>, 2000. In a piece of land with 24 beds, 100 m lenght, inside the enterprise commercial land. It was traced four blocks 25 m each; we selected 7 experimental plots with 4 beds, which we applied next randomized treatments:

1). 1,3-dichloropopren + chloropicrin. These furrows soil were treated using 27ml/m<sup>2</sup> mixture 1,3-dichloropropeno (65%) chloropicrin (35%). We applied this product using the same equipment used to apply the methyl-bromide, and the furrows were covered in black/silver plastic during 20 days.

2). Absolute control. In this experimental unit consist on 4 rows, 10 M. lenght, and we didn't realized any fungicide or organic matter application.

3). Methyl Bromide 80/20. In the four rows, It was injected 40 grs M<sup>2</sup> (80% methyl bromide and 20% chlopicrin).The application was approximattely 25-30 cm depth.

4). Metham-sodium. In this four furrows it was applied 50 ml/m<sup>2</sup> metham sodium. The furrows were covered in black/silver plastic during 20 days.

5). Chloropicrin. On this four furrows were applied 33ml/m<sup>2</sup> chloropicrin using the same equipment which we applied methyl-bromide. The furrows were covered in black/silver plastic during 20 days.

6). 1,3-dichloropropen. These furrows soil were treated using 11.2 ml/m<sup>2</sup> 1,2-dichloropropen. This application was carried out using the equipment tractor thereafter. The furrows were covered in black/silver plastic during 20 days.

The treatments were applied on damp soil.

Evaluations are taking place in the two central furrows in each experimental unit. We attached a label in 10 plants (five each row or 10 cm central bed) which were randomized, in order to take size measure:

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Tomatoe plants used in this tests are "fat" tomatoe or "ball" type. This plants growed in polyethylene ashtrays in "El Porvenir" agricultural enterprise greenhouses. The plants were 50 days old. They were planting 45 cm between each plant, on furrows with damp soil, non covered with plastic.

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We put into a 1,000 ml graduate test tube 400 ml of water, we stirred each soil sample perfectly homogenized. We stirred hard and we put out in a small cask containing 4 liters of water. Afterwards the soil was dissolved in water, allowed to stand for 20 seconds and this water with the soil was passed through a 60 mesh sieves and this soil with water was put into a second small cask. Subsequently it was stirred again allowing to stand for 20 seconds, then it was passed through a 325 sieve mesh. The soil retained in this sieve mesh was taken using a teaspoon and it was passed into a 100 ml flask and it was taken to the Faculty of Agronomy Phytopatology lab in order to carry out nematodes extraction. In lab the soil from the flasks was put on a piece of toilet paper which was on a wire mesh, which was on a plastic funnel. In the funnel extreme it was put a flexible plastic hose which was stopped up using a pincer; the funnel was filled up of water until this touch the sieved soil. After 24 hours, from the bottom extreme hose, we pick up a 10 ml sample; it was gauged again using clean water, and after 24 hours again it was taken another water sample with nematodes. This activity was repeated in all 52 samples.

Using a biological microscope we observed the nematodes and we counted which we found in 1 ml. Aliquots. Afterwards we calculated the founded populations in 20 ml of water which we obtained using the sieve funnel method. This correspond to the soil 200 ml populations.

## RESULTS

YIELD.

WEIGHT OF HARVESTED FRUITS (Kg)												
DIC+CLOR		TEXT		METHYL BRO		MET SOD		CHLOROP		DICHLOR		
EXP	DOM	EXP	DOM	EXP	DOM	EXP	DOM	EXP	DOM	EXP	DOM	
39.000	45.875	26.925	29.200	27.725	21.275	26.125	25.875	10.950	11.525	17.225	15.275	
160.981	134.171	188.798	137.297	204.526	132.053	215.439	136.877	161.744	201.791	149.710	168.204	
318.466	190.863	185.734	132.501	254.810	161.675	186.853	123.337	254.182	226.050	328.223	199.543	
49.333	56.080	43.962	59.869	74.115	56.676	92.961	58.251	72.261	66.063	69.187	77.117	
137.604	121.707	122.590	108.762	115.027	104.207	132.876	106.565	140.153	116.063	131.304	108.485	
705.38	548.70	568.01	467.63	676.20	475.89	654.25	450.91	639.29	621.49	695.65	568.62	
1254.080		1035.638		1152.089		1105.159		1260.782		1264.273		

### STATISTIC ANALYSIS OF EXPORT TOMATOES NUMBER ACHIEVED IN EXPERIMENT CARRIED OUT IN "EL PORVENIR" CAMP, CULIACAN, SINALOA, MEXICO, SEASON 2000-2001

VARIABLE: Export tomatoes number

TREATMENTS	REPETITIONS		
	1	2	3
4			
1.- Dichloropropen	850.0000	825.0000	878.0000
2.- Control	830.0000	755.0000	725.0000
3.- Metyl Bromide	944.0000	860.0000	794.0000
4.- Metam Sodium	826.0000	800.0000	708.0000
5.- Chloropicrin	865.0000	789.0000	775.0000
6.- Dichloropropen	862.0000	853.0000	867.0000

### ANALYSIS

FV	GL	SC	CM	F	P>F
TREATMENTS	5	38889.000000	7777.799805	6.4607**	0.002
REPETITIONS	3	18210.000000	6070.000000	5.0421	0.013
ERROR	15	18058.000000	1203.866699		
TOTAL	23	75157.000000			

C.V. = 4.25%

## COMPARISON OF AVERAGE STATISTIC ANALYSIS IN ORDER TO ACHIEVE SIGNIFICANCE LEVEL AMONG TREATMENTS, USING TUKEY TEST 0.05

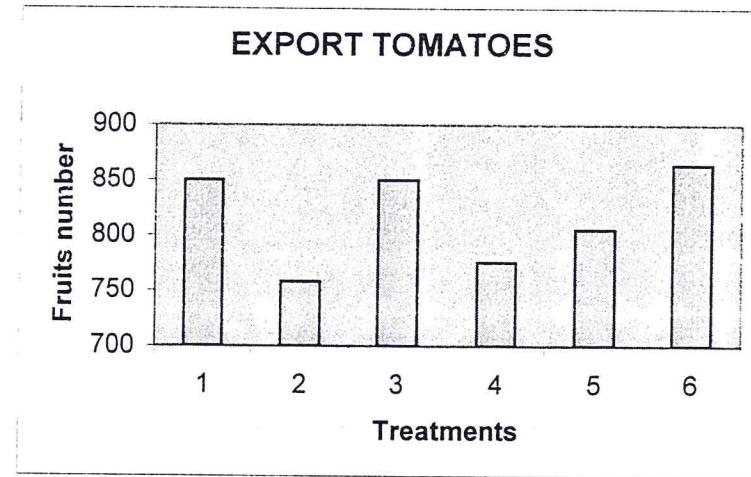
### COMPARISON OF AVERAGE TABLE TUKEY TEST

TREATMENTS	AVERAGES
6	864.0000 A
3	850.0000 AB
1	850.0000 AB
5	805.5000 ABC
4	775.5000 BC
2	758.0000 C

SIGNIFICANCE LEVEL = 0.05

TUKEY = 79.8026

TABLE'S VALUE (0.05), (0.01) = 4.60, 5.80



### INTERPRETATION OF RESULTS:

Based on achieved results in statistic analysis about harvested export tomatoes each treatment we could observed that there are high significant differences among them. Treatment 6; dichloropropen, was the best, next treatments 3; methyl bromide and 1; dichloropropen + chloropicrin, on third place we got treatment 5; chloropicrin. The worst treatments were: 4; metam sodium and 2; control.

**STATISTIC ANALYSIS OF TOMATOES NUMBER FOR DOMESTIC MARKET  
ACHIEVED IN "EL PORVENIR, CULIACÁN, SINALOA, MÉXICO. SEASON  
2000-2001**

VARIABLE: Number of Tomatoes Domestic Market

TREATMENTS	REPETITIONS		
	1	2	3
4			
1.- Dichloroprop+chlorop	762.0000	740.0000	661.0000
2.- Control	622.0000	620.0000	598.0000
3.- Methyl bromide	724.0000	670.0000	597.0000
4.- Metam sodium	618.0000	626.0000	523.0000
5.- Chloropicrin	892.0000	768.0000	696.0000
6.- Dichloropropen	713.0000	667.0000	606.0000
			732.0000

**ANALYSIS OF VARIANCE**

FV	GL	SC	CM	F	P>F
TREATMENTS	5	107592.000000	21518.400391	18.7312**	0.000
REPETITION	3	36012.000000	12004.000000	10.4492	0.001
ERROR	15	17232.000000	1148.800049		
TOTAL	23	160836.000000			

C.V. = 5.04%

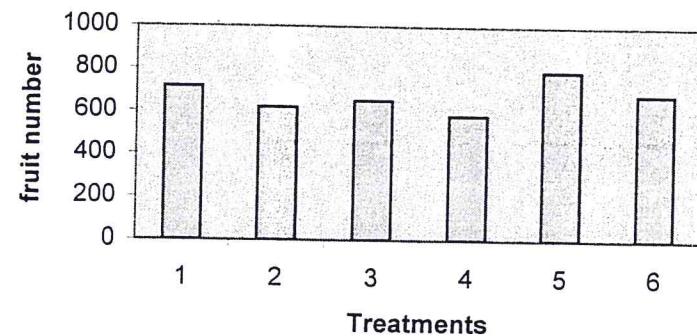
AVERAGES COMPARISON OF STATISTIC ANALYSIS IN ORDER TO ACHIEVE SIGNIFICANCE AMONG TREATMENTS, USING TUKEY TEST 0.05

**COMPARISON OF AVERAGE TABLE  
TUKEY TEST**

TREATMENTS	AVERAGE
5	788.5000 A
1	715.0000 AB
6	679.5000 BC
3	651.0000 BCD
2	618.750 CD
4	581.7500 D

SIGNIFICANCE LEVEL = 0.05  
TUKEY = 77.9561

### DOMESTIC MARKET TOMATOES



### INTERPRETATION OF RESULTS :

Based on achieved results in statistic analysis about number of tomatoes for domestic market harvested per treatments we could observed that there are high significant differences among them. Treatment 5; chloropicrin, was the best, then treatment 1; dichloropropen + chloropicrin, third place 6; dichloropropen, fourth place 4; methyl bromide, fifth place 2; control. The worst treatment was 4; metam sodium.

### STATISTIC ANALYSIS OF TOTAL NUMBER TOMATOES (EXPORT + DOMESTIC) ACHIEVED IN "EL PORVENIR", CULIACAN, SINALOA, MEXICO. SEASON 2000-2001

VARIABLE: **Total of Tomatoes (Export + Domestic market)**

TREATMENTS	REPETITIONS			
	1	2	3	4
1. Dichloro + Chloro	1612.0000	1565.0000	1539.0000	1544.0000
2. Control	1452.0000	1375.0000	1323.0000	1357.0000
3. Methyl Bromide	1668.0000	1530.0000	1391.0000	1415.0000
4. Metan Sodium	1444.0000	1426.0000	1231.0000	1328.0000
5. Chloropicrin	1757.0000	1557.0000	1471.0000	1591.0000
6. Dichloropropen	1575.0000	1520.0000	1473.0000	1606.0000

## ANALYSIS OF VARIANCE

FV	GL	SC	CM	F	P>F
TREATMENTS	5	199484.000000	39896.800781	13.6758 **	0.000
REPETITIONS	3	99272.000000	33090.667969	11.3428	0.001
ERROR	15	43760.000000	2917.333252		
TOTAL	23	342516.000000			

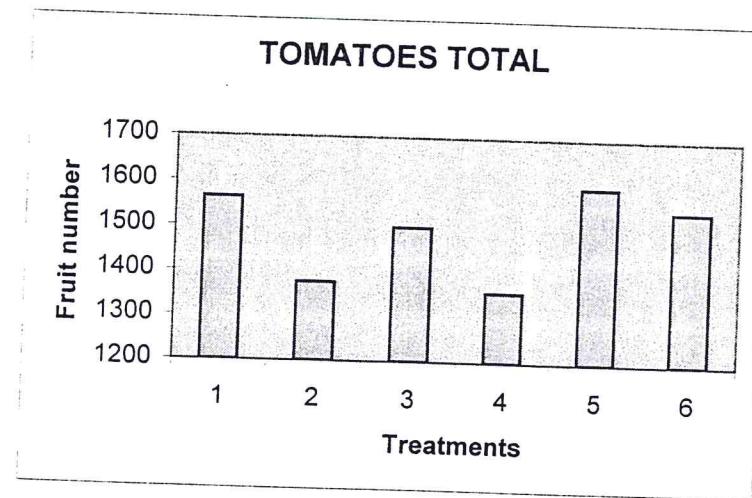
C.V. = 3.63%

AVERAGES COMPARISON OF STATISTIC ANALYSIS IN ORDER TO ACHIEVE SIGNIFICANCE AMONG TREATMENTS, USING TUKEY TEST 0.05

## COMPARISON OF AVERAGE TABLE TUKEY TEST

TREATMENTS	AVERAGE
5	1594.0000 A
1	1565.0000 A
6	1543.5000 A
3	1501.0000 A
2	1376.7500 B
4	1357.2500 B

SIGNIFICANCE LEVEL = 0.05  
TUKEY = 124.2284



## **INTERPRETATION OF RESULTS:**

Based on achieved results in statistic analysis about total number of tomatoes for export and domestic markets harvested each treatment, we could observed that there are high significant differences among them. The best treatments were: 5; chloropicrin, 1; dichloropropen+chloropicrin, 6; dichloropropen and 3; methyl bromide. There weren't significant differences among them, with a significant level 0.05%. The worst treatments were 2; control and 4; metam sodium.

## **STATISTIC ANALYSIS OF TOMATOES WEIGHT FOR EXPORT ACHIEVED IN “EL PORVENIR”, CULIACÁN, SINALOA, MÉXICO, SEASON 2000-2001**

**VARIABLE: Export Tomatoes weight (kg)**

TREATMENTS	REPETITIONS			
	1	2	3	4
1. Dichlorop + Chlorop	181.7340	175.3950	186.8530	180.7250
2. Control	173.8340	157.0190	153.6700	150.2270
3. Methyl Bromide	198.8690	182.0240	167.8590	168.5580
4. Metan Sodium	175.6210	169.3690	149.9260	160.8330
5. Chloropicrin	178.5700	164.5220	161.9660	165.8330
6. Dihchloropropen	178.6910	178.5200	149.3460	183.2640

## **ANALYSIS OF VARIANCE**

FV	GL	SC	CM	F	P>F
TREATMENTS	5	1544.125000	308.825012	4.2206 *	0.014
REPETITIONS	3	1197.375000	399.125000	5.4547	0.010
ERROR	15	1097.562500	73.170830		
TOTAL	23	3839.062500			

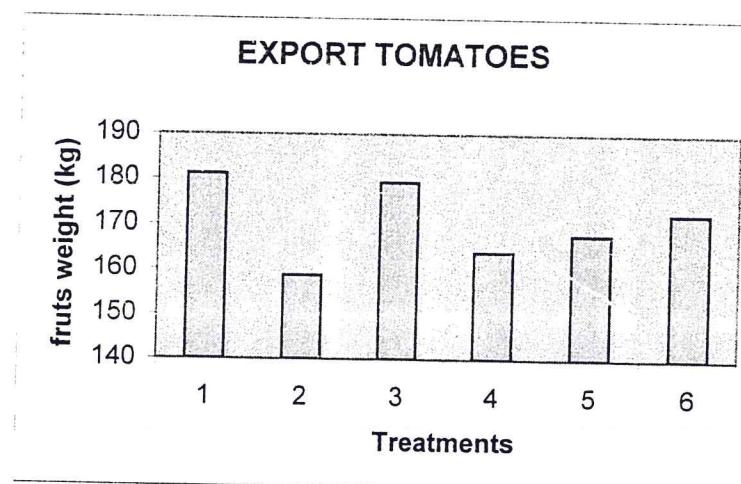
C.V. = 5.02%

**AVERAGES COMPARISON OF STATISTIC ANALYSIS IN ORDER TO ACHIEVE SIGNIFICANCE AMONG TREATMENTS, USING TUKEY TEST 0.05.**

**COMPARISON OF AVERAGE TABLE  
PRUEBA DE TUKEY**

TREATMENTS	AVERAGE
1	181.1768 A
3	179.3275 A
6	172.4553 AB
5	167.7227 AB
4	163.9372 AB
2	158.6875 B

SIGNIFICANCE LEVEL = 0.05  
TUKEY = 19.6742



**INTERPRETATION OF RESULTS:**

Based on achieved results in statistic analysis about tomatoes' weight for export market harvested each treatment. We could observed that there are high significant differences among them. The best treatments were: 1; dichloropropen + chloropicrin and 3; methyl bromide. There aren't significant differences among them with a significance level 0.05%, then treatments 6; dichloropropen, 5; chloropicrin; 4; metam sodium. The worst treatment was 2; control.

## STATISTIC ANALYSIS OF TOMATOES WEIGHT FOR DOMESTIC MARKET

VARIABLE: Tomatoes weight for Domestic Market (kg)

TREATMENTS	REPETITIONS			
	1	2	3	4
1. Dichlorop + Chlorop	147.3700	146.1540	132.6230	136.9080
2. Control	125.4940	122.3290	118.5660	126.7350
3. Methyl Bromide	145.0610	130.5820	115.6230	118.7940
4. Metan Sodium	123.1770	129.8420	106.5790	112.0800
5. Chloropicrin	184.8110	154.3720	141.9350	163.1150
6. Dichloropropen	143.3940	135.5480	124.2530	152.1400

## ANALYSIS OF VARIANCE

FV	GL	SC	CM	F	P>F
TREATMENTS	5	4847.906250	969.581238	14.0438 **	0.000
REPETITIONS	3	1425.500000	475.166656	6.8825	0.004
ERROR	15	1035.593750	69.039581		
TOTAL	23	7309.000000			

C.V. = 6.16%

AVERAGES COMPARISON OF STATISTIC ANALYSIS IN ORDER TO ACHIEVE SIGNIFICANCE AMONG TREATMENTS, USING TUKEY TEST 0.05

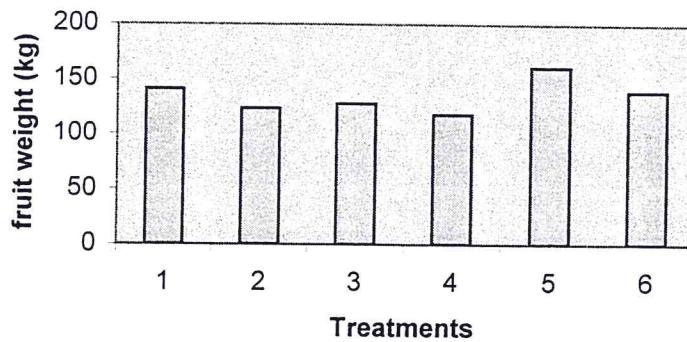
## COMPARISON OF AVERAGE TABLE TEST OF TUKEY

TREATMENTS	AVERAGE
5	161.0582 A
1	140.7637 B
6	138.8338 B
3	127.5150 BC
2	123.2810 BC
4	117.9195 C

SIGNIFICANCE LEVEL = 0.05

TUKEY = 19.1107

### TOMATOES' DOMESTIC MARKET



#### INTERPRETATION OF RESULTS:

Based on achieved results in statistic analysis about tomatoes' weight for domestic market harvested each treatment, we could observed that there are high significant differences among them. The best treatment was 5; chloropicrin, then 1; dichloropropen + chloropicrin and 6; dichloropropen, third place treatments 3; methyl bromide and 2; control. The worst treatment was 4; metam sodium.

#### STATISTIC ANALYSIS OF TOTAL WEIGHT TOMATO (EXPORT + DOMESTIC)

VARIABLE: Total weight of Tomatoes, in kg (Export + Domestic)

TREATMENTS	REPETITIONS			
	1	2	3	4
1. Dichlorop + Chlorop	329.1040	321.5490	319.4760	317.6330
2. Control	299.3280	279.3480	272.2360	276.9620
3. Methyl Bromide	343.9300	312.6060	283.4820	287.3520
4. Metam Soium	298.7980	299.2110	256.5050	272.9130
5. Chloropicrin	363.3810	318.8940	303.9010	328.9480
6. Dichloropropen	322.0850	314.0680	273.5990	335.4040

## **ANALISIS OF VARIANCE**

FV	GL	SC	CM	F	P>F
TREATMENTS	5	7841.750000	1568.349976	7.7660 **	0.001
REPETITIONS	3	5160.500000	1720.166626	8.5178	0.002
ERROR	15	3029.250000	201.949997		
TOTAL	23	16031.500000			

C.V. = 4.65%

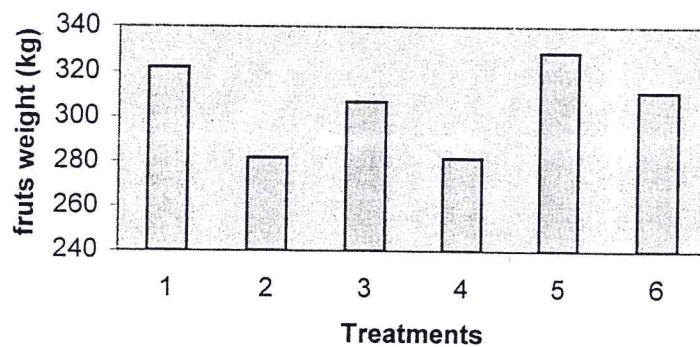
**AVERAGES COMPARISON OF STATISTIC ANALYSIS IN ORDER TO ACHIEVE SIGNIFICANCE AMONG TREATMENTS, USING TUKEY TEST 0.05**

### **AVERAGE COMPARISON TABLE TUKEY TEST**

TREATMENTS	AVERAGE
5	328.7810 A
1	321.9405 A
6	311.2890 AB
3	306.8425 AB
2	281.9685 B
4	281.8568 B

SIGNIFICANCE LEVEL = 0.05  
TUKEY = 32.6851

### **TOTAL TOMATOES**



## INTERPRETATION OF RESULTS:

Based on achieved results in statistic analysis about harvested export tomatoes each treatment we could observed that there are high significant differences among them. Treatment 6; dichloropropen, was the best, next treatments 3; methyl bromide and 1; dichloropropen + chloropicrin, on third place we got treatment 5; chloropicrin. The worst treatments were: 4; metam sodium and 2; control.

## GENERAL CONCLUSION

- a) **Export** The best treatment were: 6; dichloropropen, 1; dichloropropen+chloropicrin and 3; Methyl Bromide
- b) **Domestic market** The best treatment was number 5; chloropicrin, then 1; dichloropropen+chloropicrin and 6; dichloropropen.
- c) **Export and Domestic market** The best treatments were: 5; chloropicrin, 1; dichloropropen+chloropicrin, 6; dichloropropen and 3; methyl bromide
- d) **Export harvest**, Metam sodium was better than control; in domestic market metam sodium was lower than control, and total harvest (export + domestic market) metam sodium was the same than control.



## UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION FACULTAD DE AGRONOMIA - UAS

### INTRODUCTION.

Last June, 2001, it was established the third test of project "Alternatives to the use of Methyl Bromide in the cultivation of Tomatoes, (*Lycopersicon esculentum* L.), we started taking some tests in Agrícola El Porvenir, Culiacan Valley, Sinaloa, Mexico,. We apply different treatments in soil, in order to analyze the control about soil microorganisms and in crops development also, comparing Methyl bromide. We apply this substance in muddy type soil.

Treatments: Based on before results treatments during last agricultural season 2000-2001, we selected 7 (seven) treatments:

1. Dichloropropen + chloropicrin 16 ml/m<sup>2</sup>.
2. Control
3. Methyl bromide 75/25, 40 gr/m<sup>2</sup>
4. Metam-sodium 25 ml/m<sup>2</sup> + solarization
5. Chloropicrin 33ml/m<sup>2</sup>
6. Dichloropropen 12 gr/m<sup>2</sup>
7. Cabbage + solarization

### BODY OF THE REPORT

#### Land preparation

The activities in cooperative farmer land started in last June, when "El Porvenir" enterprise heavy machinery carried out double subsoil in land. They opened the soil 50 cm depth. Then they raked the soil in three rows, after that, they made the installment underground pipeline. Afterwards the beds were marked, raised and flattened. And finally we put the padded with black-silver plastic (silver side up). The bed marks were marked 1.80 m between each one.

#### Experiment Design

The treatment designs were carried out in June, 2001. In a piece of land with 28 beds, 100 m length, inside the enterprise commercial land. It was traced four blocks 25 m each; we selected 7 experimental plots with 4 beds, which we applied next randomized treatments:

- 1). 1,3-dichloropropen + chloropicrin. These furrows soil were treated using 27ml/m<sup>2</sup> mixture 1,3-dichloropropeno (65%) chloropicrin (35%). We applied this product using the same equipment used to apply the methyl-bromide, and the furrows were covered in black/silver plastic during 20 days.
- 2). Absolute control. In this experimental unit consist on 4 rows, 10 M. lenght, and we didn't realized any fungicide or organic matter application.
- 3). Methyl Bromide 80/20. In the four rows, It was injected 40 grs M<sup>2</sup> (80% methyl bromide and 20% chloropicrin).The application was approximately 25-30 cm depth.
- 4). Metham-sodium. In this four furrows it was applied 50 ml/m<sup>2</sup> metham sodium. The furrows were covered in black/silver plastic during 20 days.
- 5). Chloropicrin. On this four furrows were applied 33ml/m<sup>2</sup> chloropicrin using the same equipment which we applied methyl-bromide. The furrows were covered in black/silver plastic during 20 days.
- 6). 1,3-dichloropropen. These furrows soil were treated using 11.2 ml/m<sup>2</sup> 1,2-dichloropropen. This application was carried out using the equipment tractor thereafter. The furrows were covered in black/silver plastic during 20 days.

The treatments were applied on damp soil.

Evaluations are going to take place in the two central furrows in each experimental unit.

### **Planting.**

Tomato plants will be used in this tests are "fat" tomato or "ball" type. This plants grew in polyethylene ashtrays in "El Porvenir" agricultural enterprise greenhouses. The plants will be 50 days old. They will be planted 45 cm between each plant, on furrows with damp soil, on soil covered with plastic.

### **Crop Management**

Irrigation and fertilization will take place using drip irrigation, and they will be controlled directly by enterprise field manager. Same people will take the records about the handworks like pruning, cutting, spinning, tied the plants, diseases control and foliage pests, etc.

## RESULTS

### WEEDS.

UNIVERSIDAD AUTONOMA DE SINALOA - FACULTAD DE AGRONOMIA

CROP: Tomato "ball"

SITE: Agrícola El Porvenir, Culiacán, Sin.

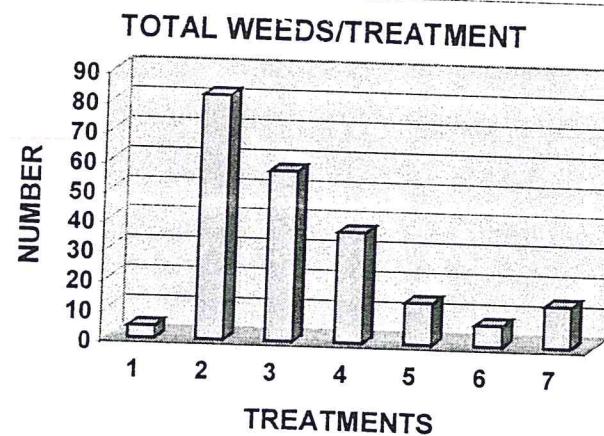
Evaluation Parameter: Weeds Population on 1meter cuadrado

Fecha de transplante: 8/11/01

Fecha de evaluación: 15/01/02

TREATMENT	REPETITION				TOTAL	AVERAGE
	1	2	3	4		
1.Dichloropropene+chloropicrin	0	4	0	0	4.00	1.00
2.Cabbage+solarization	37	28	6	11	82.00	20.50
3.Control	14	9	25	9	57.00	14.25
4.Methyl Bromide 40	7	29	1	0	37.00	9.25
5.Metam sodium+solarization	9	0	1	4	14.00	3.50
6.Chloropicrin	0	4	2	1	7.00	1.75
7.Dichloropropene	0	12	2	0	14.00	3.50

Weeds found: Chiquelite, Cardo, Chual y Zarcos



## NEMATODES.

UNIVERSIDAD AUTONOMA DE SINALOA - FACULTAD DE AGRONOMIA

CROP: Tomato

SITE: Agrícola El Porvenir, Culiacán, Si

Evaluation Parameter: Number of nematodes extracted from 200 gr. soil

Planting date: Nov/8/2001

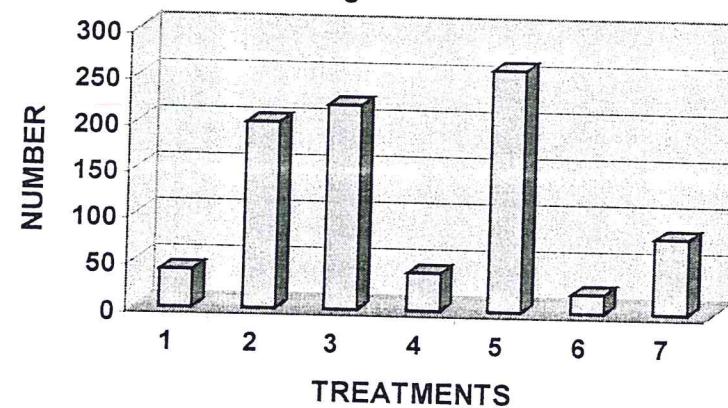
Sampling date: February 6th, 2002

GENUS	NUMBER OF NEMATODES FROM 200 GR SOIL						
	1Dichlor+chlor	2Cabbage	3Control	4Methyl40	5M-S+sol.	6Chlor.	7Dichlor.
Vida Libre	2380	2020	720	900	1120	420	2120
Aphelenchus	0	0	20	20	0	20	40
Longidorus	40	200	180	20	240	0	40
Dorylaimus	0	0	20	0	0	0	40
Tylenchus	0	0	0	0	20	0	0

Phytoparasite Nematod

40            200            220            40            260            20            80

PHYTOPARASITE NEMATODES FROM  
200gr./SOIL



## DISEASED PLANTS.

INIVERSIDAD AUTONOMA DE SINALOA - FACULTAD DE AGRONOMIA  
CROP: TOMATOE

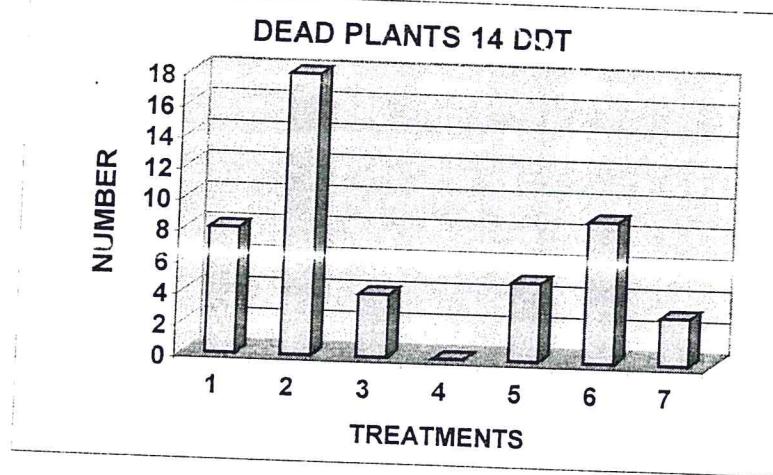
SITE: El Porvenir, Culiacán

Evaluated parameter: Dead plantas after 14 days transplanting (DDT)

Transplanting date: 11/8/01

Evaluation date: 11/22/01

TREATMENT	REPETITION				TOTAL	AVERAGE
	1	2	3	4		
1. Dichloropropene+Chlorop	0	1	5	2	8.00	2.00
2. Cabbage + solarization	3	4	8	3	18.00	4.50
3. Control	1	0	2	1	4.00	1.00
4. Methyl Bromide 40	0	0	0	0	0.00	0.00
5. Metam-sodium+ solarizati	1	2	2	0	5.00	1.25
6. Chloropicrin	2	2	4	1	9.00	2.25
7. Dichloropropen	0	3	0	0	3.00	0.75



FACULTAD DE AGRONOMIA - UNIVERSIDAD AUTONOMA DE SINALOA

SITE: El Porvenir, Culiacán, Sin.

CROP: Tomato

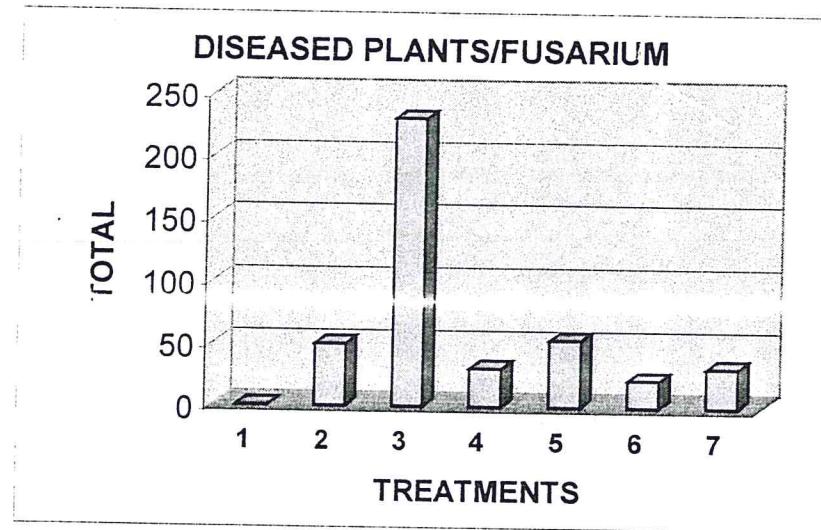
Planting date: Nov/8/2001

EVALUATION PARAMETER: Number of diseased plants/Fusarium/repetition

Evaluation date: April 16th, 2002

Number of plants / REPETITION: 120 plants

TREATMENT	REPETITION				TOTAL	AVERAGE
	I	II	III	IV		
1. Dichloropropene+Chloropicrin	0	0	0	0	0	0.00
2. Cabbage + solarization	23	16	6	5	50	12.50
3. Control	95	50	45	40	230	57.50
4. Methyl Bromide 40	3	1	1	26	31	7.75
5. Metam-sodium+ solarization	8	14	13	19	54	13.50
6. Chloropicrin	7	5	4	6	22	5.50
7. Dichloropropen	3	14	10	5	32	8.00



## YIELD.

### UNIVERSIDAD AUTONOMA DE SINALOA - FACULTAD DE AGRONOMIA

Crop: Tomato

Site: El Porvenir

evaluation parameter: Total yield Kg. from 20 lineal meters/repetition

PLANTING DATE: November 8th, 2001

EVALUATION date: February 19th, 2002

TREATMENTS	TOMATOES YIELD: EXPORT, DOMESTIC AND REMAIN												TOTAL	
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV				
	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.		
1. Dichloropropene+Chloropicrin	17.15	11.1	4	12.3	8.6	1.6	7.3	9.7	2.1	15.5	19.7	4.9	52.25	
2. Cabbage + solarization	17.6	9.7	0.7	8.7	14	1.9	9.7	18.2	2.3	12.8	16.6	1.5	48.8	
3. Control	12.15	10.2	2.9	12.5	11.2	1.9	7.1	7.3	1.1	8.8	10.2	0.3	40.55	
4. Methyl Bromide 40	8.3	17.6	1.6	8.9	16	0.8	9.6	16	2	7.4	14.3	1.8	34.2	
5. Metam-sodium+ solarization	26.25	22.1	1.2	19	18.1	2.8	13.7	16.4	2	7.4	9.3	1.4	66.35	
6. Chloropicrin	3.6	16.6	1	9.2	14.4	2	10.8	10.9	0.6	7.23	11.1	0.9	65.9	
7. Dichloropropen	10.4	19.8	2.2	8.7	17.4	1.7	6.8	12.3	1.7	11.2	15.2	2.4	37.1	
													8	

PLANTING DATE: November 8th, 2001

EVALUATION DATE: February 22nd, 2002

TREATMENTS	TOMATOES YIELD: EXPORT, DOMESTIC AND REMAIN												TOTAL	
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV				
	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.		
1. Dichloropropene+Chloropicrin	1.05	3	1.2	2.85	3.65	1.25	2.15	3.25	0.2	1.3	3.35	1.3	7.35	
2. Cabbage + solarization	1.95	1.65	1.3	1.8	3.5	1.2	2.3	4.5	2.3	4.15	8.2	2.5	10.2	
3. Control	1.15	2.95	2.7	1.95	3.175	1.9	1.8	2.15	0.95	0.75	4.95	1.35	5.65	
4. Methyl Bromide 40	3.3	3.95	1.5	3.15	4.9	2.1	1.75	3.05	1.3	1.225	4.35	1.5	9.425	
5. Metam-sodium+ solarization	1.625	5.5	1.7	1.5	4.2	2.3	1.3	2.4	1.6	0.425	1.65	0.55	4.85	
6. Chloropicrin	1.075	2.95	1.25	0.925	5	1.75	1.425	6.7	2	2.425	5.75	1.2	5.85	
7. Dichloropropen	0.775	3.15	0.9	1.25	2.95	1.3	1.05	1.25	1.4	0.825	4.125	1.55	3.9	
													11.48	
													5.15	

PLANTING DATE: November 8th, 2001

EVALUATION DATE: March 1st, 2002

TREATMENTS	TOMATOES YIELD: EXPORT, DOMESTIC AND REMAIN												TOTAL	
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV				
	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.		
1. Dichloropropene+Chloropicrin	3.5	2.9	0.975	1.2	2.8	1.2	4.375	4.65	1.5	2.725	3.2	1.9	11.8	
2. Cabbage + solarization	5.425	1.5	1	0.6	1.4	0.45	0.925	1.325	0.325	1.575	1.125	0.625	8.525	
3. Control	1.3	1.55	1.1	0.9	0.325	1.5	0.85	0.725	0.975	0.9	2.125	0.675	3.95	
4. Methyl Bromide 40	0.725	1.75	1	0.9	2.575	1.3	0.925	4.9	1.95	1.75	5.6	1.325	4.3	
5. Metam-sodium+ solarization	0.375	0.675	0	0.4	0.525	0.75	0	0.6	0	0.225	1	0.425	1	
6. Chloropicrin	0.8	4.725	1.45	0.25	3.275	1.8	0.45	2.475	1.35	1.46	2.675	0.8	2.96	
7. Dichloropropen	0.55	2.675	1.575	0.525	3.925	0.675	0.625	2.4	1.45	0.55	3	1.225	2.25	
													12	
													4.925	

PLANTING DATE: November 8th, 2001

EVALUATION DATE: March 4th, 2002

TREATMENTS	TOMATOES YIELD: EXPORT, DOMESTIC AND REMAIN												TOTAL	
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV				
	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.		
1. Dichloropropene+Chloropicrin	1.7	3.625	3.325	2.575	2.625	1.6	1.625	2.075	1.55	1.575	1.55	1.1	7.475	
2. Cabbage + solarization	1.6	1.825	1.225	0.75	1.15	0.175	0.55	0.45	0.5	0.425	0.675	0	3.325	
3. Control	2.6	2.875	2.2	1.7	2.3	3.35	1.6	1	0.55	1.125	1.025	1	7.025	
4. Methyl Bromide 40	1.9	3.275	3.925	1.175	2.725	2.35	2.575	2.55	1.85	1.75	4.35	2.1	7.4	
5. Metam-sodium+ solarization	1.45	3.325	4.325	1.775	4.1	2.1	1.05	2.45	1.25	0.65	1.825	1.35	4.925	
6. Chloropicrin	1.35	6.325	2.2	0.6	1.675	1.2	0.3	2.55	0.25	1.05	1.35	0.8	3.3	
7. Dichloropropen	0.5	1.625	2.425	1.625	2.875	1.85	1.025	2.9	1.475	1.275	1.875	1.65	4.425	
													7.4	

PLANTING DATE: November 8th, 2001  
 EVALUATION DATE: March 8th, 2002

TREATMENTS	TOMATOES YIELD: EXPORT, DOMESTIC AND REMAIN														
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV			TOTAL		
	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.
1. Dichloropropene+Chloropicrin	1.8	3.9	1.35	1.325	3.275	1.85	1.325	2.275	2.2	1.6	3.875	1	6.05	13.33	6.4
2. Cabbage + solarization	3.15	3.7	1.4	1.3	1.7	1.7	1.15	3.3	3.1	1.85	4.05	2.325	7.45	12.75	8.525
3. Control	0.95	1.8	0.9	0.825	2	0.875	0.3	2.9	1.35	1.075	1.475	1.1	3.15	8.175	4.225
4. Methyl Bromide 40	0.8	2.9	0.725	0.625	2.675	1.4	0.8	3.55	1.55	0.725	4.65	1	2.95	13.78	4.675
5. Metam-sodium+ solarization	1.3	1.8	0.825	1.15	4.15	0.3	1.225	1.5	0.8	0.525	1.2	1.15	4.2	8.65	3.075
6. Chloropicrin	0.825	2.7	1.1	0.975	2.95	0.65	1.175	2.2	1	0.85	1.65	1.1	3.825	9.5	3.85
7. Dichloropropen	1.925	1.45	1.5	0.95	3.525	2.9	0.575	2.4	1.425	1.55	2.525	1.3	5	9.9	7.125

PLANTING DATE: November 8th, 2001  
 EVALUATION DATE: March 11th, 2002

TREATMENTS	TOMATOES YIELD: EXPORT, DOMESTIC AND REMAIN														
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV			TOTAL		
	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.
1. Dichloropropene+Chloropicrin	4.75	6.75	3.25	4.8	5.05	3.2	4.1	4.8	0.35	3.55	5.325	2.3	17.2	21.93	9.1
2. Cabbage + solarization	2.825	5.675	2	2.375	3.175	1.65	1.85	4.55	1.7	0.375	2.65	0.8	7.425	16.05	6.15
3. Control	1.6	7.725	1.35	2.275	4.75	2.2	4.225	5.8	1.8	0.825	1.825	1.25	8.925	20.1	6.6
4. Methyl Bromide 40	2.25	7	3	1.65	4.225	1.75	3.325	6.4	2.65	1.925	6.075	1.8	9.15	23.7	9.2
5. Metam-sodium+ solarization	3.55	7.95	1.35	2.9	7.125	2.7	2.6	6.3	2	1.05	4.625	3.4	10.1	26	9.45
6. Chloropicrin	2.45	5.9	2.7	0.925	7.925	2.325	2.075	2.25	0.55	1.175	4.2	1.95	6.625	20.28	7.525
7. Dichloropropen	2.925	5.925	2.1	2.5	5.2	1.5	1.65	2.775	1.2	2.15	8.25	0.7	9.225	22.15	5.5

PLANTING DATE: November 8th, 2001  
 EVALUATION DATE: March 15th, 2002

TREATMENTS	TOMATOES YIELD: EXPORT, DOMESTIC AND REMAIN														
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV			TOTAL		
	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.
1. Dichloropropene+Chloropicrin	1.375	3.6	0.6	1.325	2.525	0.3	2.1	1.825	1.375	2.2	1.775	0.95	7	9.725	3.225
2. Cabbage + solarization	2.175	8.95	1.1	5.2	9	3.6	1.5	2.925	0.7	1.075	2.25	1.525	9.95	23.13	6.925
3. Control	5.675	10.25	2.45	1.85	7.25	1.3	2.375	1.3	0.25	0.6	1.25	0.6	10.5	20.05	4.6
4. Methyl Bromide 40	7.8	13.55	4.8	7.95	13.28	2.3	3.95	3.525	1.3	3.85	2.9	0.8	23.55	33.25	9.2
5. Metam-sodium+ solarization	8.8	13.63	3.95	8.95	8.95	3.1	1.825	1.7	0.9	0.975	2.475	0.5	20.55	26.75	8.45
6. Chloropicrin	7.375	14.23	3	4.025	6.075	3.8	0.475	4.3	1.2	0.825	1.325	0.45	12.7	25.93	8.45
7. Dichloropropen	4.15	13.93	3.3	4.575	9.625	2.9	2	4.675	0.7	0.85	1.125	0.7	11.58	29.35	7.6

PLANTING DATE: November 8th, 2001  
 EVALUATION DATE: March 18th, 2002

TREATMENTS	TOMATOES YIELD: EXPORT, DOMESTIC AND REMAIN														
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV			TOTAL		
	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.
1. Dichloropropene+Chloropicrin	3.7	10.8	1.875	4.425	10.03	2.35	2	10.38	1.9	3.725	8.35	2.9	13.85	39.55	9.025
2. Cabbage + solarization	3.875	11.75	1	7.775	10.25	2.45	6.525	13.6	2.45	6.9	9.25	1.05	25.08	44.85	6.95
3. Control	5.55	11.68	2.8	7.1	11.85	1.6	6.675	13.85	1.75	6.2	9.35	1.4	25.53	46.73	7.55
4. Methyl Bromide 40	8.95	12.15	2.7	5.925	17.9	2	7.95	15.6	2.4	5.45	12.45	2.3	28.28	58.1	9.4
5. Metam-sodium+ solarization	6.65	19.1	2.5	4.425	12.8	3.8	5.425	12.6	4.2	7.3	12.25	3	23.8	56.75	13.5
6. Chloropicrin	6.425	18.65	3.1	5.5	19.58	3.5	7.125	16.3	2.7	5.8	12	3.1	24.85	66.53	12.4
7. Dichloropropen	4.025	12.2	1.7	8.9	17.55	2.75	5.975	10.58	1.95	5.375	7.2	1.75	24.28	47.53	8.15

PLANTING DATE: November 8th, 2001  
 EVALUATION DATE: March 22th, 2002

TREATMENTS	TOMATOES YIELD: EXPORT, DOMESTIC AND REMAIN															
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV			TOTAL			
	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	
1. Dichloropropene+Chloropicrin	3.875	7.025	0.85	1.55	10.1	2.4	1.3	2.625	0.675	1.375	6.45	2.1	8.1	26.2	6.025	
2. Cabbage + solarization	3.725	7.7	1.25	1.5	3.3	1.325	0.8	1.075	0.55	2.175	2.5	0.75	8.2	14.58	3.875	
3. Control		1.4	4.35	1.5	1.825	4.3	1.4	0.725	1.775	1	5.675	1.35	0.8	9.625	11.78	4.7
4. Methyl Bromide 40	2.125	3.95	1.5	1.1	6.65	2.3	1.2	3.8	0.95	7.8	1.775	0.4	12.23	16.18	5.15	
5. Metam-sodium+ solarization	1.65	6.325	1.25	1.875	6.7	1.75	0.5	1.35	0.7	8.8	0.925	0.55	12.83	15.3	4.25	
6. Chloropicrin	1.575	4.1	0.95	1.725	6.475	1.7	0.925	1.4	0.5	7.375	3.2	0.85	11.6	15.18	4	
7. Dichloropropen	1.275	6.6	2.35	1.075	1.95	0.95	1.7	8.9	2.15	4.15	2.025	1.2	8.2	19.48	6.65	

PLANTING DATE: November 8th, 2001  
 EVALUATION DATE: March 25th, 2002

TREATMENTS	TOMATOES YIELD: EXPORT, DOMESTIC AND REMAIN															
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV			TOTAL			
	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	
1. Dichloropropene+Chloropicrin	3.05	9.9	1.7	1.95	9.225	3.15	2.25	5.875	1.05	1.75	3.95	1.725	9	28.95	7.625	
2. Cabbage + solarization	1.8	5.05	1.6	1.6	1.55	0.6	0.625	2.475	1.35	1.125	1.65	1.2	5.15	10.73	4.75	
3. Control	1.95	5.475	1.6	2.25	5.4	2.4	2.675	3.75	1.2	1.975	3.1	1.4	8.85	17.73	6.6	
4. Methyl Bromide 40	2.325	8.3	1.8	5.4	7.575	2.4	2.175	8.45	2.1	6.675	5.425	2.35	16.58	29.75	8.65	
5. Metam-sodium+ solarization	1.725	8.35	2.45	2.95	5.25	1.8	1.975	8.45	0.9	2.025	6.225	1.6	8.675	28.28	6.75	
6. Chloropicrin	3.7	12.98	2.775	2.825	6.65	2.9	2.45	4.3	2.775	3.975	8.425	3.2	12.95	32.35	11.65	
7. Dichloropropen	2.975	11.88	4.3	1.3	7.55	3.35	1.1	5	2.25	0.625	5.3	1.65	6	29.73	11.55	

PLANTING DATE: November 8th, 2001  
 EVALUATION DATE: March 30th, 2002

TREATMENTS	TOMATOES YIELD: EXPORT, DOMESTIC AND REMAIN															
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV			TOTAL			
	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	
1. Dichloropropene+Chloropicrin	4.2	15.23	3.45	1.625	11.65	3.5	4.25	10.88	3.95	3.125	10.18	3.7	13.2	47.93	14.6	
2. Cabbage + solarization	1.825	9.675	4.21	3.5	7.35	3.1	0.75	4.35	2.35	1.475	4.8	2.15	7.55	26.18	11.8	
3. Control	0.45	4.2	2.25	1.125	3.6	1.5	1.225	8.7	2.6	1.975	9.15	2.4	4.775	25.65	8.75	
4. Methyl Bromide 40	2.175	9.75	2.9	2.825	10.43	2.4	1.675	7.85	2	1.425	6.55	2.775	8.1	34.58	10.08	
5. Metam-sodium+ solarization	3.2	13.57	4.6	3.35	14.8	4.8	3.3	7.5	2.3	2.25	7.925	2.4	12.1	43.79	14.1	
6. Chloropicrin	2.1	7.35	2.4	1.7	6.35	2.1	2.3	8.875	3.2	1.2	10	5	7.3	32.58	12.7	
7. Dichloropropen	1.275	8.45	3.3	2.05	6.8	3.2	1.55	4.7	2.2	1.625	14.48	5	6.5	34.43	13.7	

PLANTING DATE: November 8th, 2001  
 EVALUATION DATE: April 3rd, 2002

TREATMENTS	TOMATOES YIELD: EXPORT, DOMESTIC AND REMAIN															
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV			TOTAL			
	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	
1. Dichloropropene+Chloropicrin	3.5	7.075	2	2.075	5.3	1.7	2.5	6.075	1.95	2.675	8.575	2.6	10.75	27.03	8.25	
2. Cabbage + solarization	1.225	4.5	1.6	2.075	3	1.65	2.4	2.4	1.5	1	5.075	1.6	6.7	14.98	6.35	
3. Control	0.875	2.225	1.9	1.275	4.05	2.5	2.55	6.45	2.8	1.7	5.45	1.4	6.4	18.18	8.6	
4. Methyl Bromide 40	1.425	3.2	2.1	0.775	8.075	2.3	0.55	2.05	1.95	0.975	2.6	2.9	3.725	15.93	9.25	
5. Metam-sodium+ solarization	1.6	2.575	1.6	0.225	3.05	2	1.025	3.9	1.6	1.6	4.075	2.2	4.45	13.6	7.4	
6. Chloropicrin	2.25	4.05	1.45	1.075	5.175	0.95	0.675	1.925	1	2.475	3.5	0.825	6.475	14.65	4.225	
7. Dichloropropen	2.675	4.9	1.5	0.875	1.925	1.5	0.475	2.425	0.825	2.775	5.175	2.3	6.8	14.43	6.125	

PLANTING DATE: November 8th, 2001  
 EVALUATION DATE: April 5th, 2002

TREATMENTS	TOMATOES YIELD: EXPORT, DOMESTIC AND REMAIN															
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV			TOTAL			
	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.
1. Dichloropropene+Chloropicrin	3.7	13.53	1.8	4.25	7.4	0.8	4.4	8.6	2.5	0.775	5.425	0.45	13.13	34.95	5.55	
2. Cabbage + solarization	1.8	8.05	1.7	1.175	3.75	0.95	2.95	5.25	1.9	1.925	6.7	1.5	7.85	23.75	6.05	
3. Control	1.175	6.6	3	3.3	10.33	3.25	1.45	3.6	1.35	1.05	8	2.5	6.975	28.53	10.1	
4. Methyl Bromide 40	1.6	5.55	2.2	2.65	8.95	2.5	2.525	8.45	1.9	1.675	3.8	0.9	8.45	26.75	7.5	
5. Metam-sodium+ solarization	1.725	8.05	3.45	2.95	12.05	2.2	1.6	8.05	1.6	0.875	5.15	1.2	7.15	33.3	8.45	
6. Chloropicrin	2.65	9.75	2.3	1.75	6.625	2.2	1.25	3.35	0.55	2.6	7.05	1.6	8.25	26.78	6.65	
7. Dichloropropen	3.175	15.5	3.7	2.3	10.93	2.45	0.625	5.65	1.1	1.6	11.6	2.9	7.7	43.68	10.15	

PLANTING DATE: November 8th, 2001  
 EVALUATION DATE: April 9th, 2002

TREATMENTS	TOMATOES YIELD: EXPORT, DOMESTIC AND REMAIN															
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV			TOTAL			
	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.
1. Dichloropropene+Chloropicrin	4.85	16.9	3.325	4.05	15.05	6	3.1	14.4	6.5	4.875	15.93	3.8	16.88	62.28	19.63	
2. Cabbage + solarization	5.85	16	3.6	3.35	12.2	3.8	3.05	12	2.9	4.3	13.7	4.5	16.55	53.9	14.8	
3. Control	3.2	15.35	5.3	1.65	12.5	3	1.9	8.75	2.9	1.85	13.9	5.5	8.6	50.5	16.7	
4. Methyl Bromide 40	2.475	15.18	5.8	3.6	14.75	2.9	2.2	14.5	2.75	2.825	13.95	5.3	11.1	58.38	16.75	
5. Metam-sodium+ solarization	6.55	21.1	4.5	4.35	15.8	4	4.25	17.75	4.3	5	15.15	4.8	20.15	69.8	17.6	
6. Chloropicrin	3.6	14.25	3.8	1.825	14.65	2.5	1.7	9.8	1.8	3.25	15.05	2.85	10.38	53.75	10.95	
7. Dichloropropen	3.725	24.25	4.9	3.2	14.58	2.5	2.325	13.55	3.15	2.675	20.9	4	11.93	73.28	14.55	

PLANTING DATE: November 8th, 2001  
 EVALUATION DATE: April 11th, 2002

TREATMENTS	TOMATOES YIELD: EXPORT, DOMESTIC AND REMAIN															
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV			TOTAL			
	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.
1. Dichloropropene+Chloropicrin	2.575	6.85	0.75	1.675	4.8	2	1.15	3.1	2.75	1.525	2.375	1.5	6.925	17.13	7	
2. Cabbage + solarization	2.575	6	2.25	1.35	4.425	1.75	0.75	2.175	1.275	2.175	4.8	1.85	6.35	17.4	7.125	
3. Control	1.55	4.25	1.75	2.6	5	2.4	1.7	5.45	1	1.575	4.5	1.65	7.425	19.2	6.8	
4. Methyl Bromide 40	1.225	10.8	1.85	1.325	9.225	1.45	2.1	8.2	1.3	1.025	4.375	0.65	5.675	32.6	5.25	
5. Metam-sodium+ solarization	3.675	9.25	1.45	2.75	11.75	1.5	1.425	4.275	1.4	1.45	4.15	0.7	9.3	29.43	5.05	
6. Chloropicrin	1.675	10.68	2.525	3.925	12.65	1.55	2.175	6.2	0.9	2.35	5.775	1.7	10.13	35.3	6.675	
7. Dichloropropen	2.9	9.75	2.45	1.9	7.95	1.55	1.1	5.25	1.5	0.875	3.45	1.35	6.775	26.4	6.85	

PLANTING DATE: November 8th, 2001  
 EVALUATION DATE: April 15th, 2002

TREATMENTS	TOMATOES YIELD: EXPORT, DOMESTIC AND REMAIN															
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV			TOTAL			
	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.
1. Dichloropropene+Chloropicrin	1.45	4.175	0.6	1.175	5.175	1.4	3.75	8.15	2.7	1.675	3.45	2.35	8.05	20.95	7.05	
2. Cabbage + solarization	1.325	3.05	2.2	1.15	3.175	1.25	0.15	2.1	1.8	1.375	3.9	1.05	4	12.23	6.3	
3. Control	1.5	2.15	1.1	0.85	1.325	2.7	1	4.275	1.95	0.475	4.45	1.125	3.825	12.2	6.875	
4. Methyl Bromide 40	0.3	3.575	2.3	1.85	4.05	2.4	0.775	6.825	2.4	1.825	3.725	0.95	4.75	18.18	8.05	
5. Metam-sodium+ solarization	1.45	4.65	2.2	2.075	6.8	3.1	2.475	10.08	2.8	0.875	7.575	3.3	6.875	29.1	11.4	
6. Chloropicrin	1.325	7.525	0.7	1.225	6.15	0.6	2.225	4.775	1.5	3.475	6.4	1.5	8.25	24.85	4.3	
7. Dichloropropen	2.225	5.95	2.25	2.125	5.85	1.4	1.075	2.85	1.65	1.725	5.4	2.5	7.15	20.05	7.8	

PLANTING DATE: November 8th, 2001  
 EVALUATION DATE: April 17th, 2002

TREATMENTS	TOMATOES YIELD: EXPORT, DOMESTIC AND REMAIN												TOTAL	
	REPETITION I			REPETITION II			REPETITION III			REPETITION IV				
	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.	EXP.	DOM	REM.		
1. Dichloropropene+Chloropicrin	0.925	2.2	1.2	0.875	3.95	1.75	2.575	7.075	2.3	0.95	7.1	2.15	5.325 20.33 7.4	
2. Cabbage + solarization	1.65	8.95	1.85	1.425	8.05	0.8	1.05	5.6	2	1.4	8.15	1.2	5.525 30.75 5.85	
3. Control	1.325	5.075	1.5	2.125	6.225	1.25	1.475	4.55	0.9	1.125	7.5	1.9	6.05 23.35 5.55	
4. Methyl Bromide 40	2.725	9.85	2.4	3.1	8.85	1.75	2.15	10.7	1.85	0.725	4.925	1.2	8.7 34.33 7.2	
5. Metam-sodium+ solarization	1.275	7.75	0.7	1.8	6.3	1.5	1.225	6.2	1.3	1.3	6.3	1.4	5.6 26.55 4.9	
6. Chloropicrin	2.55	6.3	0.3	3.55	6.025	1.35	1.7	4.775	0.825	2.925	4.225	1.25	10.73 21.33 3.725	
7. Dichloropropen	2.425	7.05	1.4	0.775	6.9	1.75	2.025	4.2	2.225	1.475	3.375	2.15	6.7 21.53 7.525	

### UNIVERSIDAD AUTONOMA DE SINALOA - FACULTAD DE AGRONOMIA

Crop: Tomato

Site: El Porvenir

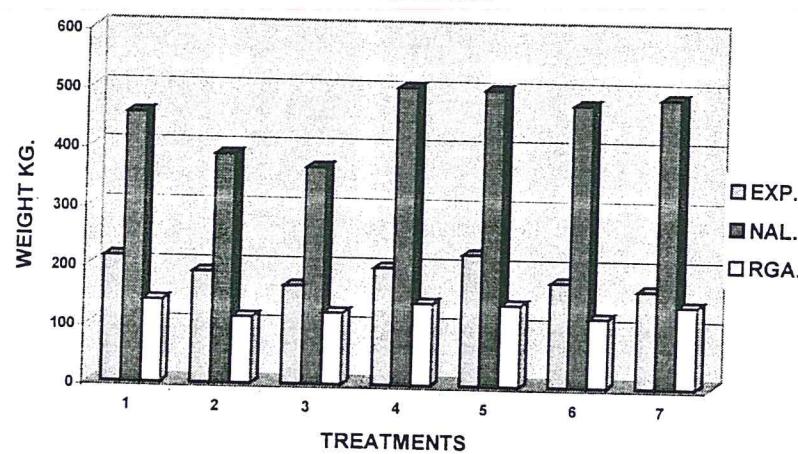
Evaluation parameter: Total Yield Kg. From 80 lineal meters/treatment

PLANTING DATE: November 8th, 2001

EVALUATION DATE: From February 19th, to April 16th, 2002

TREATMENTS	TOTAL TOMATOES YIELD KG.		
	EXPORT	DOMESTIC	REMAIN
1. Dichloropropene+Chloropicrin	214.325	456.025	140.575
2. Cabbage + solarization	189.125	387.05	113.45
3. Control	167.8	366.2	122.1
4. Methyl Bromide 40	198.55	503.35	138.75
5. Metam-sodium+ solarization	222.895	501.44	138.125
6. Chloropicrin	176.99	477.425	117.65
7. Dichloropropen	165.5	489.35	138.75

TOMATOES TOTAL YIELD: EXPORT, DOMESTIC AND REMAINS



**STATISTIC ANALYSIS ABOUT OBTAINED RESULTS IN TOMATO  
EXPERIMENT IN CAMPO EL PORVENIR, CULIACÁN, SINALOA.**

The seven initial treatments were analyzed for yield variables in tomato. Three qualities: export, domestic and remain. We used a blocks randomized design (DBCA) with divided plots and factor incomplete analysis, which constitute blocks repetitions. On Main plot took place the samplings. Four strips of land were the minor plots. We carried out comparison of averages using Tukey test, with significance ( $P<0.05$ ).

**TABLE 1. ANÁLISIS OF VARIANCE FOR EXPORT TOMATO PRODUCTION (kg) SEVEN DIFFERENT TREATMENTS.**

	F.V.	G.L.	C.M.	F Calc.	P=
TREATMENTS		6	0.41638995	3.22	0.0250
REPETITION (BLOCKS)		3	1.15901926		
TREAT*REP E(a)		18	0.12926277		
MINOR PLOT (STRIP OF LAND)		3	1.15901926		
MAIN PLOT		16	7.60889419		
REPETITION*PARCELA MAYOR		48	0.15565884		
MINOR PLOT*MAIN PLOT		48	0.15565884		
TREAT*MINOR PLOT		18	0.12926277		
TREAT*MAIN PLOT		96	0.21018639		
ERROR E(b)		219	0.4657666		
TOTAL		475			
<b>C.V.=12.77728%, R2 =94.3698%</b>					

TABLE 2.

ANÁLISIS OF VARIANCE FOR TOMATO PRODUCTION (kg).  
DOMESTIC QUALITY. SEVEN DIFFERENT TREATMENTS.

	F.V.	G.L.	C.M.	F Calc.	P=
TREATMENTS	6	45.61920508		4.78	0.0044
REPETITION (BLOCKS)	3	106.93754263			
TREAT*REP E(a)	18	9.54234357			
MINOR PLOT (STRIP OF LAND)	3	106.93754263			
MAIN PLOT	16	432.66306986			
REPETITION*MAIN PLOT	48	12.29273188			
TREAT*MINOR PLOT	18	9.54234357			
TREAT*MAIN PLOT	96	8.41876940			
ERROR E(b)	267	2.38249191			
TOTAL		475			
C.V.=23.10267%, R2 =93.7732%					

TABLE 3.

ANÁLISIS OF VARIANCE FOR TOMATO PRODUCTION (kg.).  
REMAIN QUALITY SEVEN DIFFERENT TREATMENTS.

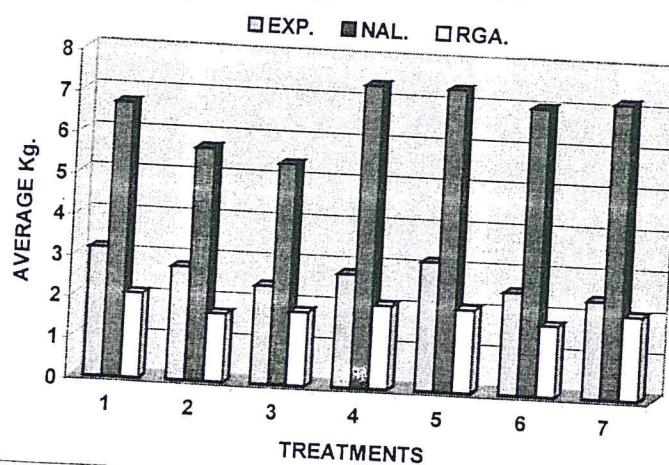
	F.V.	G.L.	C.M.	F Calc.	P=
TREATMENTS	6	2.00920299		2.85	0.0394
REPETITION (BLOCKS)	3	4.90339636			
TREAT*REP E(a)	18	0.70475972			
MINOR PLOT (STRIP OF LAND)	3	4.90339636			
MAIN PLOT	16	13.70678440			
REPETITION*MAIN PLOT	48	0.99290529			
TREAT*MINOR PLOT	18	0.70475972			
TREAT*MAIN PLOT	96	0.97444620			
ERROR E(b)	267	0.42025541			
TOTAL	475				
C.V.=33.93194%, R2 =79.2041%					

TABLE 4. TOMATO YIELD (kg) EXPORT, DOMESTIC AND REMAIN QUALITY  
SEVEN DIFFERENT TREATMENTS.

TREATMENTS	AVERAGE		
	EXPORT	DOMESTIC	REMAIN
1. Dichloropropen-Chloropicrin	3.1566 <sup>a</sup>	6.7068 <sup>ab</sup>	2.0673 <sup>b</sup>
2. Cabbage-Solarization	2.7651 <sup>ab</sup>	5.6919 <sup>ab</sup>	1.6684 <sup>a</sup>
3. Control	2.4004 <sup>b</sup>	5.3854 <sup>b</sup>	1.7956 <sup>ab</sup>
4. Methyl Bromide 40	2.7728 <sup>ab</sup>	7.3918 <sup>a</sup>	2.0404 <sup>b</sup>
5. Metam-Sodium+Solarization	3.1555 <sup>ab</sup>	7.3743 <sup>a</sup>	2.0313 <sup>b</sup>
6. Chloropicrin	2.5002 <sup>ab</sup>	7.0213 <sup>ab</sup>	1.7301 <sup>ab</sup>
7. Dichloropropene	2.3842 <sup>b</sup>	7.1968 <sup>a</sup>	2.0404 <sup>b</sup>
CV=	12.77	23.10	33.93
R2=	94.36%	93.77	79.20

Values with different literal aren't statistically equal ( $P<0.05$ )  
E.E.E. = standar Error Valued. DBCA with divided plots

GRAPH 1. TOMATO PRODUCTION OF EXPORT,  
DOMESTIC AND REMAIN



## STATISTIC INTERPRETATION

### EXPORT QUALITY.

You can observe on Table 4, Graph 1. that Treatment 1; Dichloropropene+Chloropicrin is higher ( $P<0.01$ ) than variable with production about (3.1566), even that there isn't any statistic difference with treatments 2; Cabbage+Solarization, 4; Methyl Bromide 40, 5; Metam-sodium+Solarization and 6; Chloropicrin in averages (2.7651, 2.7728, 3.1555, and 2.5002 respectively), in the meantime treatments 3; Control and 7; Chloropicrin were lower than the others with averages (2.4004 y 2.3842).

### DOMESTIC QUALITY.

On table 4, Graph 1. You can observe that treatments 4; Methyl Bromide 40, 5; Metam-sodium+Solarization and 7; Dichloropropene which got yields (7.3918, 7.3743 and 7.1968) and they were statistically better than 1; Dichloropropene+Chloropicrin with (6.7068), 2; Cabbage+Solarization (5.6919) and 6; Chloropicrin with (7.0213), were intermediate, and 3; Control took last place. It was the worst treatment with (5.3854) yield average.

### REMAIN QUALITY.

On table 4, Graph 1. treatment 2; Cabbage+Solarization it was which less remain had (1.6684), while treatments 3; Control and 6; Chloropicrin (1.7956 and 1.7301) were classified like regulars, in order to consider 1; Dichloropropene+Chloropicrin, 4; Methyl Bromide 40, 5; Metam-sodium+Soalrization and 7; Dichioropropene. Treatments which recorded more remain quantity with averages (2.0673, 2.0404, 2.0313 y 2.0404 respectively).

**FINAL CONCLUSION.** The treatments with greater production (export and national) were: dichloropropeno + Chloropicrin, and metam sodium + solarization. These are alternatives to the use of methyl bromide for the control of pathogens of the ground in tomato, nevertheless biofumigation could be a good treatment of control that could be adopted by lower producers.



## UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION FACULTAD DE AGRONOMIA - UAS

**FINAL PROJECT REPORT.** Demonstration Project of Alternatives to the use of Methyl Bromide in the cultivation of **Tomatoes**, (*Lycopersicon esculentum* L.). The development in Agronomy Faculty, Universidad Autonoma de Sinaloa, Culiacán, Sinaloa, Mexico. In this field have been working MC. Francisco Javier Estrada Ramirez, coordinator in this project. And MC. Sostenes Montoya Angulo, agronomist who is implementing the tests. QFB. María de la Luz Acosta Pineda y Carlos Morales Cazarez, Colaboradores.

In this month, March 2004, we are reporting performed activities from 1999 to 2004.

### Introduction

Last June, 2001, in Culiacán, Sinaloa, Mexico, we started taking some tests, including solarization o soil. We apply different treatments in soil, on October 25, 2001, in order to analyze the control about soil microorganisms and in crops development also, comparing Methyl bromide. We apply this substance in muddy type soil.

Treatments: We started the experiment in agricultural season 2001. we applied 14 (fourteen) treatments:

### TREATMENTS OR ALTERNATIVES:

- 1.- Control (no treatment).
- 2.- 15 gr/m<sup>2</sup> of methyl bromide (75/25 or 80/20).
- 3.- 40 gr/m<sup>2</sup> of methyl bromide (75/25 or 80/20).
- 4.- Five kg of sorghum compost, incorporated into the soil, plus four weeks of solarization
- 5.- Five kg of bovine cattle manure incorporated into soil, plus four weeks of solarization.
- 6.- Five kg of chicken manure incorporated into soil, plus four weeks of solarization.
- 7- Five kg of fresh broccoli residue (or other cruciferous plant) incorporated into soil, plus four weeks of solarization.
- 8.- 25 ml/m<sup>2</sup> of metam-sodium ( N, methyl sodium ditiocarbamate) plus six weeks of solarization.
- 9.- 50 ml/m<sup>2</sup> of metam-sodium.
- 10.- 33 ml/m<sup>2</sup> of chloropicrin.
- 11.- 40 gr/m<sup>2</sup> of Dazomet (tetrahydro3-5 dimethyl 2H-135-tiadizin-2 tiona).

- 12.- 1,3-dichloropropene+chloropicrin, dose recommended by the manufacturer.
- 13.- 1,3-dichloropropene, dose recommended by the manufacturer (11.2 ml/m<sup>2</sup>).
- 14.- Solarization

## BODY OF THE REPORT

### Land preparation

The activities in cooperative farmer land started in last June, in Agronomy Faculty heavy machinery carried out double subsoil in land. They opened the soil 50 cm depth. Then they raked the soil in four rows, after that, they made the installment underground pipeline. Afterwards the beds were marked, raised and flattened. And finally we put the padded with black-silver plastic (silver side up). The bed marks were marked 1.80 m between each one.

### Experiment Design

The treatment designs were carried out in June, 2001. In a piece of land with 56 beds, 50 m length, inside the enterprise commercial land. It was traced four blocks 10 m each; we selected 14 experimental plots with 4 beds, which we applied next randomized treatments:

- 1). **Absolute control.** In this experimental unit consist on 4 rows, 10 M. length, and we didn't realized any fungicide or organic matter application.
- 2). **Methyl Bromide 80/20.** In the four rows, It was injected 15 grs M<sup>2</sup> (80% methyl bromide and 20% chloropicrin).The application was approximately 25-30 cm depth.
- 3). **Methyl Bromide 80/20.** In the four rows, It was injected 40 grs M<sup>2</sup> (80% methyl bromide and 20% chloropicrin).The application was approximately 25-30 cm depth.
- 4). **Five kg of sorghum compost** incorporated into the soil, plus four weeks of solarization
- 5). **Five kg of bovine** cattle manure incorporated into soil, plus four weeks of solarization.
- 6). **Five kg of chicken** cattle manure incorporated into soil, plus four weeks of solarization.
- 7). **Broccoli** incorporated on the soil and solarization. In order to apply this treatment, we chopped the cabbage in small pieces: then it were distributed 5 kg per M<sup>2</sup>. It was incorporated by manual labor using hoes, after that, the rows were covered with transparent plastic.

8). **Metham-sodium.** In this four furrows it was applied  $25 \text{ ml/m}^2$  metham sodium. The furrows were covered in black/silver plastic during 20 days.

9). **Metham-sodium.** In this four furrows it was applied  $50 \text{ ml/m}^2$  metham sodium. The furrows were covered in black/silver plastic during 20 days.

10). **Chloropicrin.** On this four furrows were applied  $33 \text{ ml/m}^2$  chloropicrin using the same equipment which we applied methyl-bromide. The furrows were covered in black/silver plastic during 20 days.

11). **Dazomet** (tetrahidro-3-5 dimethyl-2H-1,3,5-tiadizin-2 tiona). On this furrows soil we distributed by manual labor  $40 \text{ gr/m}^2$  dazomet: it was incorporated using hoes, after that, we applied water by sprinkler irrigation during 3 hrs. Finally, it was covered in black/silver plastic.

12). **1,3-dichloropropen + chloropicrin.** These furrows soil were treated using  $27 \text{ ml/m}^2$  mixture 1,3-dichloropropeno (65%) chloropicrin (35%). We applied this product using the same equipment used to apply the methyl-bromide, and the furrows were covered in black/silver plastic during 20 days.

13). **1,3-dichloropropen.** These furrows soil were treated using  $11.2 \text{ ml/m}^2$  1,2-dichloropropen. This application was carried out using the equipment tractor thereafter. The furrows were covered in black/silver plastic during 20 days.

14). **Solarization.**

The treatments were applied on damp soil.

Evaluations will be taking place in the two central furrows in each experimental unit. We attached a label in 10 plants (five each row or 10 cm central bed) which were randomized, in order to take size measure.

### **Planting.**

Tomato plants used in this tests are "fat" tomato or "ball" type. This plants grew in polyethylene ashtrays in "Agronomy Faculty" in greenhouses. The plants were 50 days old. They were planting 45 cm between each plant, on furrows with damp soil, covered with plastic.

### **Crop Management**

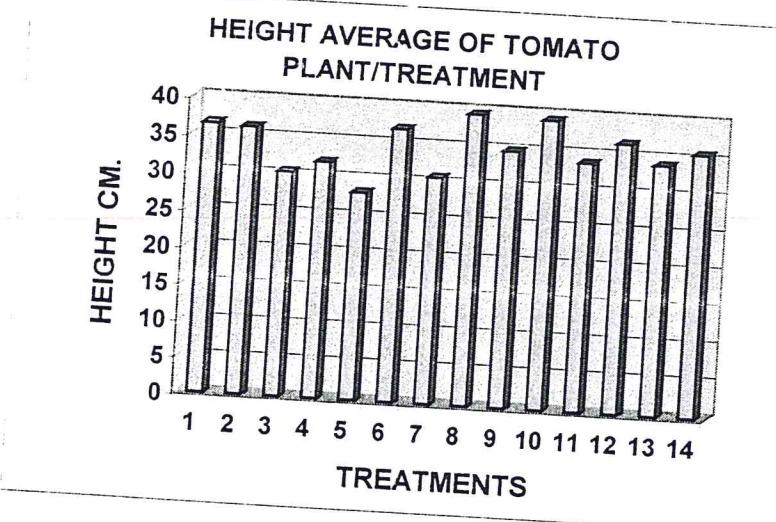
Irrigation and fertilization will take place using drip irrigation, and they are controlled directly by enterprise project responsibles. Same people took the records about the handworks like pruning, cutting, spinning, tied the plants, diseases control and foliage pests, etc.

CROP: TOMATO  
 transplanting date: November 10th, 2001  
 Evaluation date: December 24th, 2001

UNIVERSIDAD AUTONOMA DE SINALOA - FACULTAD DE AGRONOMIA  
 SITE: Facultad de Agronomia de la U.A.S.

Evaluated parameter: Stalk lenght of 5 plants/repetition

TREATMENTS	REPETITION				AVERAGE
	1	2	3	4	
1. Hen manure + solariza	37.78	34.04	41.64	32.68	36.54
2. Metam sodium + soliza	34.60	34.80	37.44	38.00	36.21
3. Control	30.18	31.84	29.92	29.96	30.48
4. Dazomet	34.70	32.60	31.28	29.58	32.04
5. Methyl Bromide (15 gr)	28.20	26.32	29.52	28.84	28.22
6. Methyl Bromide (40 gr)	32.76	35.02	36.22	43.94	36.99
7. Dichloropropene	32.06	28.54	33.40	28.98	30.75
8. Metam sodium (50 gr/n)	41.70	41.00	39.20	36.14	39.51
9. Cabbage+ solarization	36.06	35.88	33.76	33.64	34.84
10Dichloroprop+Chloropic	40.82	40.40	39.62	36.38	39.31
11Chloropicrin	34.26	35.98	34.78	30.28	33.83
12 Cow manure + solariza	31.48	40.52	38.00	36.80	36.70
13 Corn + solarization	32.06	34.68	35.26	34.10	34.03
14 Solarization	38.10	36.94	34.90	33.00	35.74

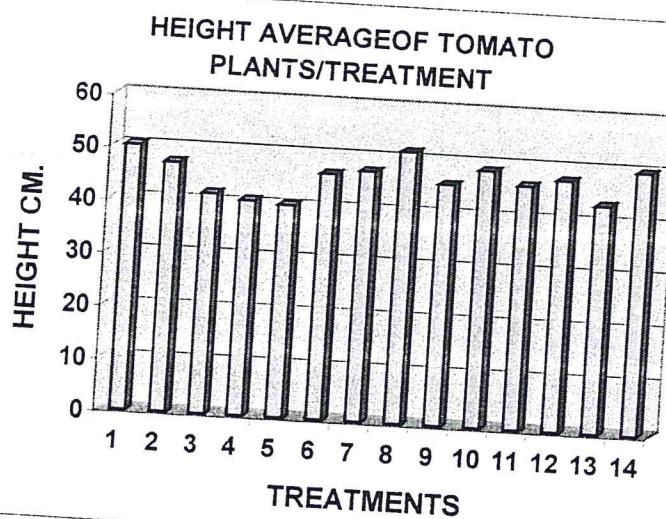


CROP: TOMATO  
transplanting date: November 10th, 2001  
Evaluation date: December 24th, 2001

UNIVERSIDAD AUTONOMA DE SINALOA - FACULTAD DE AGRONOMIA  
SITE: Facultad de Agronomía de la U.A.S.

Evaluated parameter: Stalk lenght of 5 plants/repetition

TREATMENT	REPETITION				AVERAGE
	1	2	3	4	
1. Hen manure + solariza	49.80	50.40	54.20	46.40	50.20
2. Metam sodium + soliza	49.20	46.20	46.80	46.60	47.20
3. Control	39.80	44.20	42.20	40.40	41.65
4. Dazomet	41.06	42.60	39.24	39.76	40.67
5. Methyl Bromide (15 gr/	38.90	38.36	42.40	41.16	40.21
6. Methyl Bromide (40 gr/	44.80	45.40	46.20	49.80	46.55
7. Dichloropropene	46.00	45.60	50.60	47.40	47.40
8. Metam sodium (50 gr/n	55.60	54.00	51.20	45.20	51.50
9. Cabbage+ solarization	47.16	48.60	43.94	43.16	45.72
10Dichloroprop+Chloropic	50.00	49.00	48.00	47.80	48.70
11Chloropicrin	47.00	46.20	47.80	44.00	46.25
12 Cow manure + solariza	44.20	50.80	47.80	47.80	47.65
13 Corn + solarization	41.74	46.58	42.78	41.74	43.21
14 Solarization	52.64	48.00	49.80	48.60	49.76

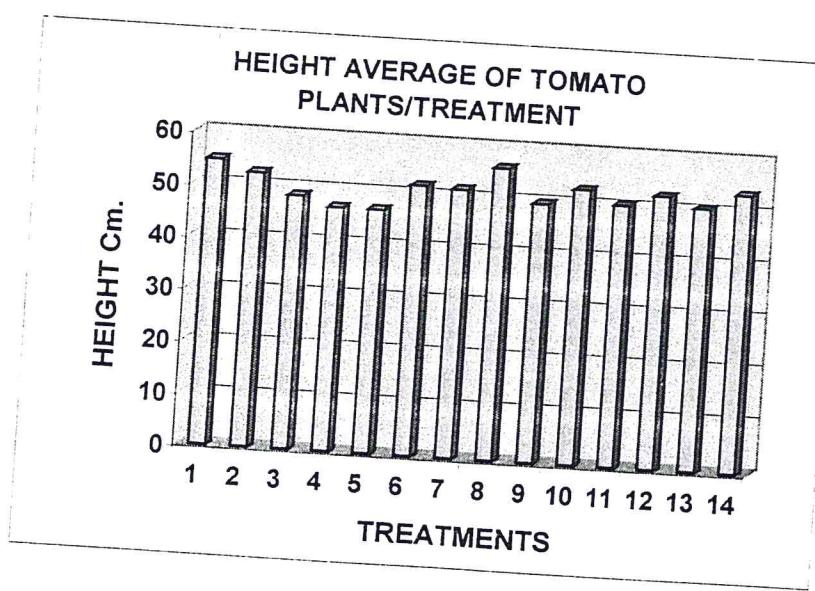


CROP: TOMATO  
Transplanting date: November 10th, 2001  
Evaluation date: January 17th, 2002

UNIVERSIDAD AUTONOMA DE SINALOA - FACULTAD DE AGRONOMIA  
SITE: Facultad de Agronomia de la U.A.S.

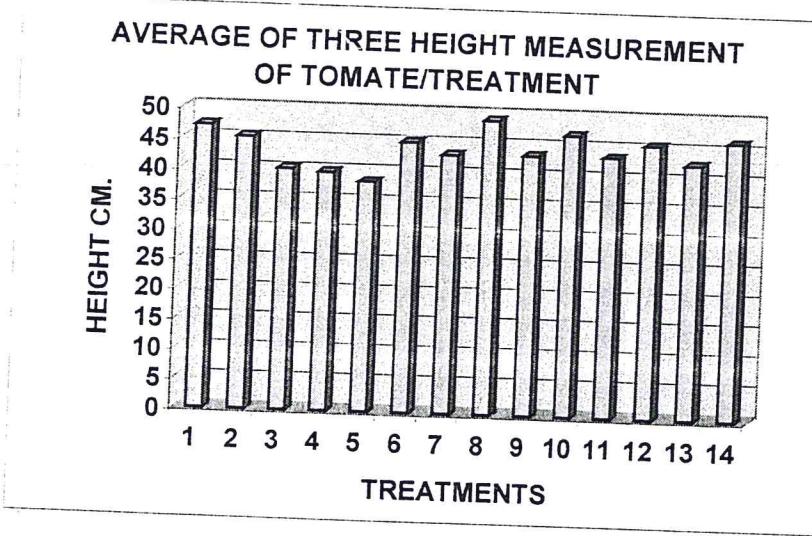
Evaluated parameter: Stalk lenght of 5 plants/repetition

TREATMENT	REPETITION				AVERAGE
	1	2	3	4	
1. Hen manure + solarization	53.60	54.00	59.00	52.00	54.65
2. Metam sodium + solizati	53.40	52.40	51.00	53.00	52.45
3. Control	48.40	50.60	48.40	46.60	48.50
4. Dazomet	49.00	46.60	46.20	44.80	46.65
5. Methyl Bromide (15 gr/m)	47.60	44.40	47.60	47.20	46.70
6. Methyl Bromide (40 gr/m)	50.40	49.60	51.60	55.60	51.80
7. Dichloropropene	50.80	50.60	53.60	51.00	51.50
8. Metam sodium (50 gr/m)	61.00	56.40	58.60	48.00	56.00
9. Cabbage+ solarization	49.80	52.40	49.00	47.40	49.65
10Dichloroprop+Chloropicr	52.80	53.00	53.20	52.00	52.75
11Chloropicrin	52.20	50.00	49.80	49.00	50.25
12 Cow manure + solarizat	51.00	55.80	50.60	52.20	52.40
13 Corn + solarization	50.40	51.40	49.80	50.20	50.45
14 Solarization	57.00	51.40	53.20	52.20	53.45



**SITE:** Facultad de Agronomía  
**transplanting date:** November 10th, 2001  
**Evaluation date:** 12/17/01 to 01/17/02  
**evaluated parameter:** Stalk Length

TREATMENT	SAMPLINGS			AVERAGE
	17/12/01	24/12/01	17/01/02	
1. Hen manure + solarizati	36.54	50.20	54.65	47.13
2. Metam sodium + solizat	36.21	47.20	52.45	45.29
3. Control	30.48	41.65	48.50	40.21
4. Dazomet	32.04	40.67	46.65	39.79
5. Methyl Bromide (15 gr/m	28.22	40.21	46.70	38.38
6. Methyl Bromide (40 gr/m	36.99	46.55	51.80	45.11
7. Dichloropropene	30.75	47.40	51.50	43.22
8. Metam sodium (50 gr/m	39.51	51.50	56.00	49.00
9. Cabbage+ solarization	34.84	45.72	49.65	43.40
10Dichloroprop+Chloropic	39.31	48.70	52.75	46.92
11Chloropicrin	33.83	46.25	50.25	43.44
12 Cow manure + solariza	36.70	47.65	52.40	45.58
13 Corn + solarization	34.03	43.21	50.45	42.56
14 Solarization	35.74	49.76	53.45	46.32



Crop: Tomato  
 Site: Facultad de Agronomía  
 Planting date: Nov/10/2001

Evaluation: First extraction of nematodes from soil samples  
 Sampling date: February 4th, 2002  
 Accounting date: 02/13/02

GENUS	NUMBER AND TYPE OF EXTRACTED NEMATODES/TREATMENT													
	TREATMENTS													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Free life	2920	1160	1400	1120	1220	1700	1040	1180	1500	1200	620	1080	1840	920
Phytoparasites	600	120	1000	20	20	180	240	160	160	320	100	140	60	0
<i>Meloidogyne</i>	0	0	40	0	0	0	80	0	0	0	20	0	0	0
<i>Aphelenchoides</i>	140	20	20	0	0	0	0	0	0	60	0	0	0	0
<i>Pratylenchus</i>	40	0	40	0	0	0	0	40	0	100	0	0	0	0
<i>Aphelenchus</i>	40	80	180	20	0	120	80	20	60	20	40	20	20	0
<i>Trichodorus</i>	0	0	100	0	0	0	0	0	20	0	0	100	20	0
<i>Dorylaimus</i>	0	0	0	0	0	0	0	0	0	80	0	0	0	0
<i>Helicotylenchus</i>	200	0	600	0	20	20	0	60	60	0	40	0	0	0
<i>Tylenchorhynchus</i>	0	0	0	0	0	20	0	40	0	0	0	0	0	0
<i>Trophurus</i>	0	20	20	0	0	20	0	40	0	0	0	0	0	0
<i>Paratylenchus</i>	0	0	0	0	0	0	20	0	20	40	0	20	20	0
<i>Tylenchus</i>	180	0	0	0	0	0	20	0	0	0	0	0	0	0

1=Control

2=Chloropicrin

3=Dichloropropen+Chloropicrina

4=Methyl Bromide 40

5=Cabbage+Solarization

6= Metam sodium 25+Solarizatio

7= Cpw manure+Solarizal

8= Dazomet

9= Solarization

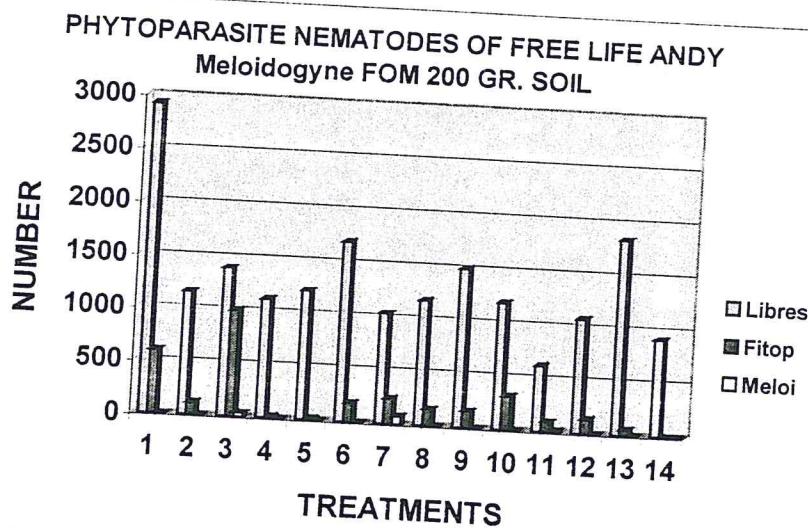
10=Metam sodium 50

11=Methyl Bromide 15

12=Corn+Solarization

13=Heri manure+Solarization

14=Dichloropropene



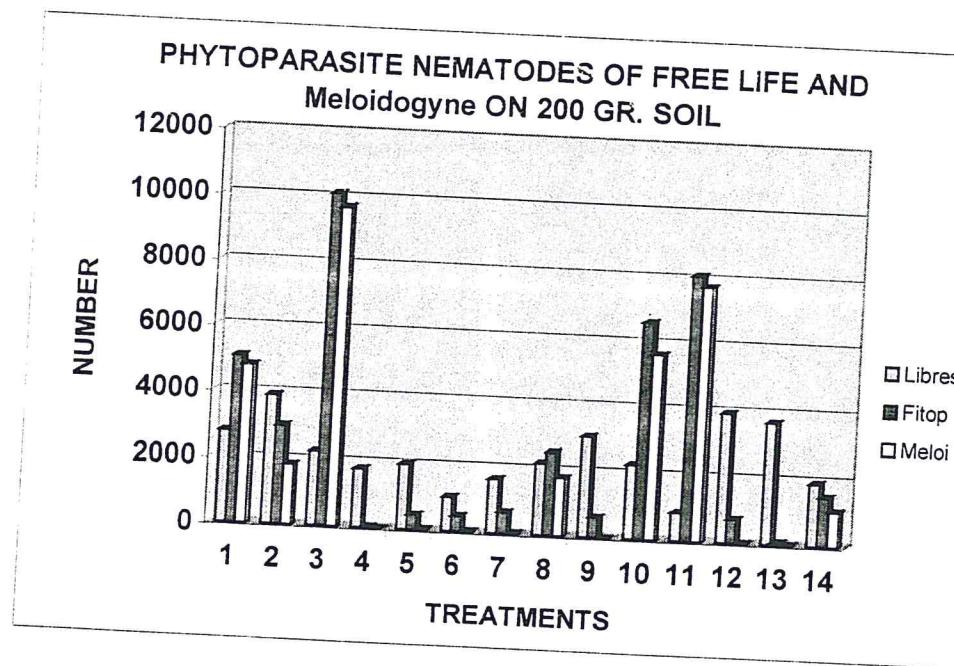
Crop: Tomato  
 Site: Facultad de Agronomía  
 Planting date: Nov/10/2001  
 Evaluation: Second extraction of sampling nematodes from soil  
 Sampling date: May 6th, 2002  
 Accounting date: 05/16/02

GENUS	NUMBER AND TYPE OF EXTRACTED NEMATODES/TREATMENT													
	TREATMENTS													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Free life	2770	3885	2240	1775	1965	1050	1645	2170	3045	2255	880	3920	3695	1905
Phytoparasited	5065	2980	10110	35	475	495	665	2510	625	6600	8080	735	90	1505
Meloidogyne	4785	1825	9685	0	40	45	35	1755	5	5635	7745	10	10	1065
Aphelenchoides	30	170	40	0	5	0	0	35	0	5	15	90	10	30
Pratylenchus	45	25	45	5	0	0	20	15	0	30	30	0	0	15
Aphelenchus	120	835	115	25	215	80	240	245	430	630	80	210	35	115
Trichodorus	0	0	35	0	5	0	0	0	0	10	5	20	0	5
Dorylaimus	5	20	80	0	25	5	15	45	40	20	35	45	0	20
Helicotylenchus	0	20	0	0	0	0	0	5	0	10	0	5	0	40
Tylenchorhynchus	0	55	60	0	145	335	330	395	120	225	125	270	5	140
Trophurus	60	5	15	0	5	5	0	5	5	10	0	5	5	0
Paratylenchus	15	25	5	0	0	0	0	0	0	25	40	55	0	65
Tylenchus	5	0	30	5	35	25	25	10	25	0	5	25	25	10

1=control  
 2=Chloropicrin  
 3=Dichloropropen+Chloropicrin  
 4=Methyl Bromide 40  
 5=Cabbage+Solarization

6= Metam sodium 25+Solarization  
 7=Cow manure+Solarization  
 8=Dazomet  
 9=Solarization  
 10=Metam sodium 50

11=Methyl Bromide 15  
 12=Corn+Solarization  
 13=Hen manure+Solarization  
 14=Dichloropropene



**UNIVERSIDAD AUTONOMA DE SINALOA - FACULTAD DE AGRONOMÍA**

Crop: Tomato

Site: Facultad de Agronomía

Transplanting date: November 10th, 2001

Measurement parameter: Weeds

Evaluation date: March 8th, 2002

TREATMENT	NUMBER AND TYPE OF WEED									TOTAL
	Que.	Zac.	Ver.	Tom.	Tro.	Gol.	Coq.	Col.	Mal.	
1. Hen manure + solarization	1	8		0	1	0	0	0	0	10
2. Metam sodium + solization	0	0		0	0	0	0	1	0	1
3. Control	0	8		0	1	0	4	0	0	13
4. Dazomet	0	0		0	0	0	0	0	0	0
5. Methyl Bromide (15 gr/m <sup>2</sup> )	0	8		0	0	0	0	0	0	0
6. Methyl Bromide (40 gr/m <sup>2</sup> )	0	2		1	2	0	0	0	0	8
7. Dichloropropene	0	0		0	0	0	0	0	0	0
8. Metam sodium (50 gr/m <sup>2</sup> )	2	3		1	1	9	5	0	0	21
9. Cabbage+ solarization	0	0		0	0	0	0	0	0	0
10Dichloroprop+Chloropicrin	0	1		0	0	0	0	0	0	1
11Chloropicrin	0	0		0	0	0	0	0	0	0
12 Cow manure + solarization	0	0		0	0	0	0	0	0	0
13 Corn + solarization	0	1		0	0	0	0	0	1	1
14 Solarization	0	1		0	0	0	0	0	0	1

TREATMENT	NUMBER AND TYPE OF WEED									TOTAL
	Que.	Zac.	Ver.	Tom.	Tro.	Gol.	Coq.	Col.	Mal.	
1. Hen manure + solarization	0	14		0	0	0	2	1	0	17
2. Metam sodium + solization	0	0		1	0	1	0	0	0	2
3. Control	0	1		0	0	0	1	0	0	2
4. Dazomet	0	0		1	4	1	0	0	0	6
5. Methyl Bromide (15 gr/m <sup>2</sup> )	0	0		0	1	0	0	0	0	1
6. Methyl Bromide (40 gr/m <sup>2</sup> )	0	0		0	0	0	2	0	0	2
7. Dichloropropene	0	4		0	0	0	1	0	0	5
8. Metam sodium (50 gr/m <sup>2</sup> )	0	1		0	2	0	4	0	0	7
9. Cabbage+ solarization	0	0		0	0	0	0	0	0	0
10Dichloroprop+Chloropicrin	0	0		0	2	0	0	0	1	3
11Chloropicrin	0	0		0	1	0	0	0	0	1
12 Cow manure + solarization	0	0		0	0	0	0	0	0	0
13 Corn + solarization	0	0		0	0	3	1	0	0	4
14 Solarization	0	2		0	1	0	0	0	0	3

Block III	NUMBER AND TYPE OF WEED									TOTAL
	TREATMENT	Que.	Zac.	Ver.	Tom.	Tro.	Gol.	Coq.	Col.	
1. Hen manure + solarization	0	18	0	0	1	0	0	0	0	1 20
2. Metam sodium + solization	0	0	0	0	0	0	0	0	0	0
3. Control	0	0	0	1	1	0	0	0	0	2
4. Dazomet	0	9	0	1	0	0	0	0	0	10
5. Methyl Bromide (15 gr/m <sup>2</sup> )	0	4	0	0	0	0	0	0	0	4
6. Methyl Bromide (40 gr/m <sup>2</sup> )	0	8	0	1	2	0	0	1	0	12
7. Dichloropropene	0	0	0	0	0	0	1	0	0	1
8. Metam sodium (50 gr/m <sup>2</sup> )	0	3	0	0	.4	0	0	0	0	7
9. Cabbage+ solarization	0	0	0	0	0	1	0	0	0	1
10Dichloroprop+Chloropicrin	0	19	0	0	0	0	0	0	0	19
11Chloropicrin	0	0	0	0	0	0	0	0	0	0
12 Cow manure + solarization	0	0	0	0	0	0	0	0	0	0
13 Corn + solarization	1	2	0	0	0	0	0	0	0	3
14 Solarization	0	0	0	0	1	0	0	0	0	1

Block IV	NUMBER AND TYPE OF WEED									TOTAL
	TREATMENT	Que.	Zac.	Ver.	Tom.	Tro.	Gol.	Coq.	Col.	
1. Hen manure + solarization	0	11	0	1	1	0	0	0	0	13
2. Metam sodium + solization	1	0	0	0	0	4	0	0	0	5
3. Control	1	1	0	0	1	0	3	1	0	7
4. Dazomet	0	3	0	0	0	0	0	1	0	4
5. Methyl Bromide (15 gr/m <sup>2</sup> )	0	0	0	0	0	0	0	0	0	0
6. Methyl Bromide (40 gr/m <sup>2</sup> )	0	2	0	1	0	0	0	3	0	6
7. Dichloropropene	0	3	0	0	1	0	0	0	0	4
8. Metam sodium (50 gr/m <sup>2</sup> )	0	2	0	0	0	0	0	1	0	3
9. Cabbage+ solarization	0	0	0	0	0	4	0	0	0	4
10Dichloroprop+Chloropicrin	0	0	0	0	0	0	0	0	0	0
11Chloropicrin	0	1	0	0	0	0	0	0	0	1
12 Cow manure + solarization	0	13	0	0	0	0	0	2	0	15
13 Corn + solarization	0	1	0	0	0	0	0	0	0	1
14 Solarization	0	2	1	0	0	0	0	1	0	4

Que = Quelite

Gol = Golondrina

Z.ag = Zácate de aguas

Coq = Coquillo

Ver = Verdolaga

Col = Coliflorcillo

Tom = Tomate

Mal = Malva

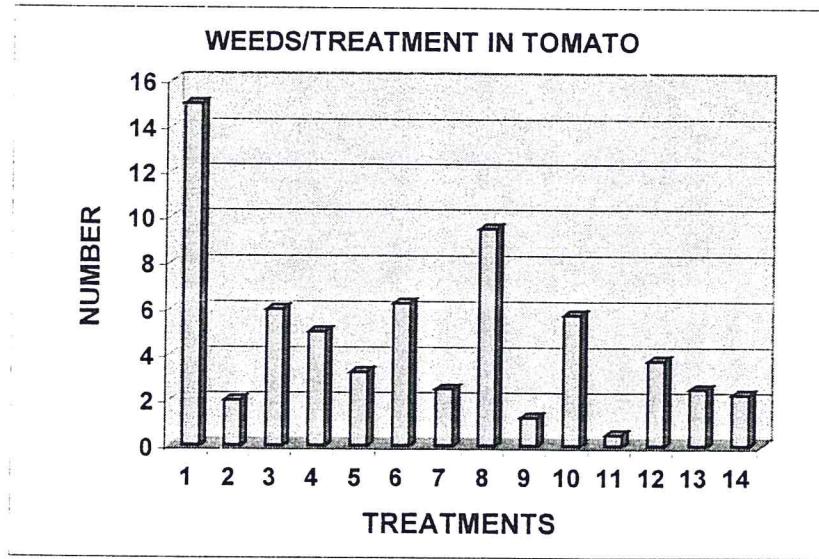
Tro = Trompillo

Transplanting date: November 10th, 2001

Measurement parameter: Weeds

Evaluation date: March 8th, 2002

TREATMENTS	TOTAL AVERAGE OF WEEDS NUMBER/TREATMENT					
	REPETITIONS				TOTAL	AVERAGE
	I	II	III	IV		
1. Hen manure + solarization	10	17	20	13	60	15
2. Metam sodium + solization	1	2	0	5	8	2
3. Control	13	2	2	7	24	6
4. Dazomet	0	6	10	4	20	5
5. Methyl Bromide (15 gr/m <sup>2</sup> )	8	1	4	0	13	3.25
6. Methyl Bromide (40 gr/m <sup>2</sup> )	5	2	12	6	25	6.25
7. Dichloropropene	0	5	1	4	10	2.5
8. Metam sodium (50 gr/m <sup>2</sup> )	21	7	7	3	38	9.5
9. Cabbage+ solarization	0	0	1	4	5	1.25
10Dichloroprop+Chloropicrin	1	3	19	0	23	5.75
11Chloropicrin	0	1	0	1	2	0.5
12 Cow manure + solarization	0	0	0	15	15	3.75
13 Corn + solarization	2	4	3	1	10	2.5
14 Solarization	1	3	1	4	9	2.25



**UNIVERSIDAD AUTONOMA DE SINALOA - FACULTAD DE AGRONOMIA**

**CROP:** Tomato

**Site:** Facultad de Agronomía

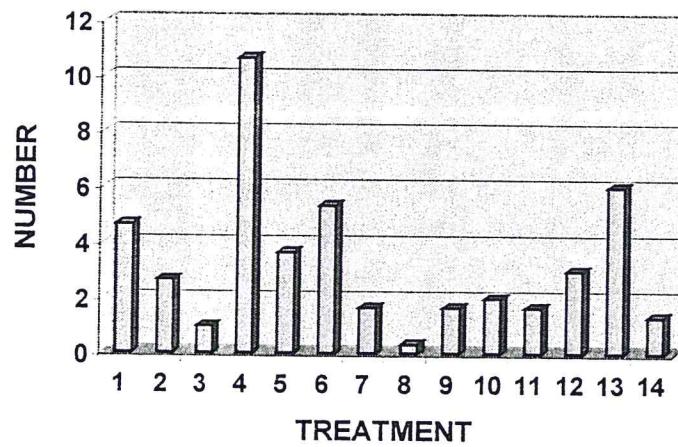
**Transplanting date:** 11/10/01

**Evaluated parameter:** dead plants after 18 days from transplanting/repetition

**Fecha de evaluación:** 28/11/01

TREATMENT	REPETITION				TOTAL	AVERAGE
	1	2	3	4		
1. Hen manure + solarization	2	2	10	6	20	<b>4.67</b>
2. Metam sodium + solization	4	2	2	2	10	<b>2.67</b>
3. Control	0	1	2	1	4	<b>1.00</b>
4. Dazomet	12	7	13	10	42	<b>10.67</b>
5. Methyl Bromide (15 gr/m <sup>2</sup> )	7	4	0	2	13	<b>3.67</b>
6. Methyl Bromide (40 gr/m <sup>2</sup> )	4	10	2	1	17	<b>5.33</b>
7. Dichloropropene	2	3	0	3	8	<b>1.67</b>
8. Metam sodium (50 gr/m <sup>2</sup> )	0	1	0	1	2	<b>0.33</b>
9. Cabbage+ solarization	2	1	2	3	8	<b>1.67</b>
10Dichloroprop+Chloropicrin	0	1	5	2	8	<b>2.00</b>
11Chloropicrin	0	1	4	1	6	<b>1.67</b>
12 Cow manure + solarization	2	1	6	2	11	<b>3.00</b>
13 Corn + solarization	13	2	3	7	25	<b>6.00</b>
14 Solarization	1	3	0	2	6	<b>1.33</b>

**TOMATO DEAD PLANTS AFTER 18 DAYS FROM  
TRANSPLANTING**



**UNIVERSIDAD AUTONOMA DE SINALOA - FACULTAD DE AGRONOMIA**

**CROP:** Tomato

**Site:** Facultad de Agronomía

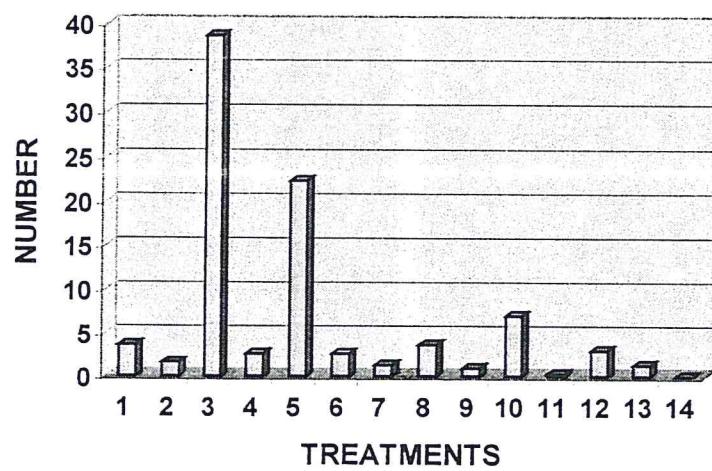
**Transplanting date:** 11/10/01

**Evaluated parameter:** Dead plants when crop finished/repetition

**Evaluation date:** 04/11/02

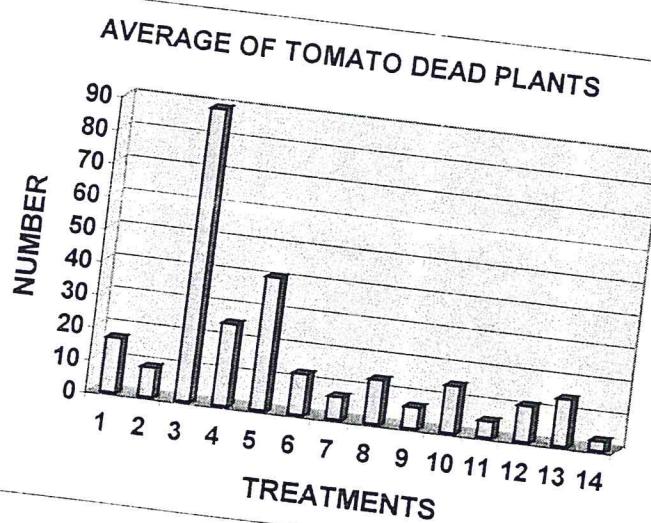
TREATMENT	REPETITION				TOTAL	AVERAGE
	1	2	3	4		
1. Hen manure + solarization	10	1	0	2	13	<b>3.67</b>
2. Metam sodium + solization	4	0	1	3	8	<b>1.67</b>
3. Control	22	42	52	58	174	<b>38.67</b>
4. Dazomet	0	7	1	0	8	<b>2.67</b>
5. Methyl Bromide (15 gr/m <sup>2</sup> )	42	2	23	1	68	<b>22.33</b>
6. Methyl Bromide (40 gr/m <sup>2</sup> )	8	0	0	0	8	<b>2.67</b>
7. Dichloropropene	0	4	0	2	6	<b>1.33</b>
8. Metam sodium (50 gr/m <sup>2</sup> )	7	2	2	14	25	<b>3.67</b>
9. Cabbage+ solarization	2	1	0	2	5	<b>1.00</b>
10Dichloroprop+Chloropicrin	10	10	1	0	21	<b>7.00</b>
11Chloropicrin	1	0	0	3	4	<b>0.33</b>
12 Cow manure + solarization	2	1	6	2	11	<b>3.00</b>
13 Corn + solarization	3	0	1	0	4	<b>1.33</b>
14 Solarization	0	0	0	0	0	<b>0.00</b>

**TOMATO DEAD PLANTS WHEN CROP FINISHED**



**UNIVERSIDAD AUTONOMA DE SINALOA - FACULTAD DE AGRONOMIA**  
 CROP: Tomato  
 Site: Facultad de Agronomía.  
 Transplanting date: 11/10/01  
 Evaluated parameter: Total of dead plants/treatment  
 Evaluation date: 11/28/01 and 04/11/02

TREATMENT	EVALUATION			TOTAL	AVERAGE
	1	2			
1. Hen manure + solarization	20	13		33	17
2. Metam sodium + solization	10	8		18	9
3. Control	4	174		178	89
4. Dazomet	42	8		50	25
5. Methyl Bromide (15 gr/m <sup>2</sup> )	13	68		81	41
6. Methyl Bromide (40 gr/m <sup>2</sup> )	17	8		25	13
7. Dichloropropene	8	6		14	7
8. Metam sodium (50 gr/m <sup>2</sup> )	2	25		27	14
9. Cabbage+ solarization	8	5		13	7
10Dichloroprop+Chloropicrin	8	21		29	15
11Chloropicrin	6	4		10	5
12 Cow manure + solarization	11	11		22	11
13 Corn + solarization	25	4		29	15
14 Solarization	6	0		6	3



**UNIVERSIDAD AUTONOMA DE SINALOA - FACULTAD DE AGRONOMIA**

**Crop:** Tomato

Planting date: Nov/10/2001

**Site:** Facultad de Agronomía

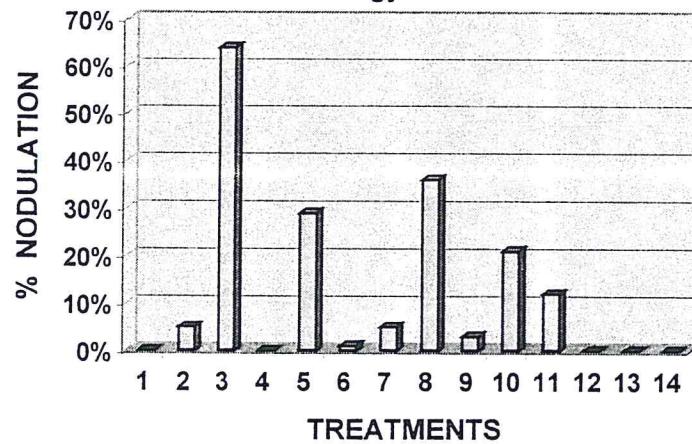
**Evaluation parameter:**% of root nodulation per **Meloidogyne**/repetition

**Sampling date:** 04/29/02 to 05/08/02

SCALE 1-6

TOTAL AVERAGE OF NODULATION PER <i>Meloidogyne</i> /treatment					
TREATMENT	R I	R II	R III	R IV	AVERAGE
1. Hen manure + solarization	0.00%	0.00%	0.00%	0.00%	0.00%
2. Metam sodium + solization	8.00%	12.00%	0.00%	0.00%	5.00%
3. Control	28.00%	84.00%	76.00%	68.00%	64.00%
4. Dazomet	0.00%	0.00%	0.00%	0.00%	0.00%
5. Methyl Bromide (15 gr/m <sup>2</sup> )	20.00%	96.00%	0.00%	0.00%	29.00%
6. Methyl Bromide (40 gr/m <sup>2</sup> )	0.00%	4.00%	0.00%	0.00%	1.00%
7. Dichloropropene	0.00%	0.00%	8.00%	12.00%	5.00%
8. Metam sodium (50 gr/m <sup>2</sup> )	48.00%	64.00%	32.00%	0.00%	36.00%
9. Cabbage+ solarization	4.00%	4.00%	0.00%	4.00%	3.00%
10Dichloroprop+Chloropicrin	28.00%	56.00%	0.00%	0.00%	21.00%
11Chloropicrin	12.00%	8.00%	24.00%	4.00%	12.00%
12 Cow manure + solarization	0.00%	0.00%	0.00%	0.00%	0.00%
13 Corn + solarization	0.00%	0.00%	0.00%	0.00%	0.00%
14 Solarization	0.00%	0.00%	0.00%	0.00%	0.00%

**INDEX OF TOMATOE ROOT NODULATION PER  
*Meloidogyne***



**UNIVERSIDAD AUTONOMA DE SINALOA - FACULTAD DE AGRONOMIA**

**SITE:** Campo el porvenir

**CROP:** Tomato

**PLANTING DATE:** November 10th, 2001

**EVALUATION DATE:** March 5th, 2002

**TABLE OF WEIGHT AVERAGES, PERCENTAGE OF FRUITS SIZES**

**(150g; 125g; 100g; Y -100g.) AND REMAIN/TREATMENT/HARVEST.**

TREATMENTS	weight	% OF FRUIT SIZES				
		150 g	125 g	100 g	'- 100 g	Rem
Control	15.838	17.00	18.00	17.50	20.50	27.00
Chloropicrin	20.663	15.00	19.00	12.50	24.50	29.00
Dichloropropene+Chloropicrin	18.550	8.50	11.50	27.50	29.00	23.50
Methyl Bromide 40	15.300	18.50	14.00	20.00	25.00	22.50
Cabbage+Solarization	20.575	28.50	19.00	20.00	22.00	10.50
Metam sod. 25+Solarization	14.038	18.50	20.00	19.50	22.50	19.50
Cow manure+Solarization	20.563	25.00	21.50	18.00	24.00	11.50
Dazomet	18.675	25.00	18.00	21.00	21.00	15.00
Solarization	10.500	15.50	18.00	21.00	19.50	26.00
Metam sodium 50	8.225	16.50	20.00	23.00	22.00	18.50
Methyl Bromide15	6.050	14.37	16.79	17.08	20.67	31.09
Corn+Solarization	13.050	5.50	10.00	16.50	35.00	33.00
Hen manure+Solarization	15.413	4.00	9.50	19.50	36.00	31.00
Dichloropropene	8.000	6.00	9.50	16.50	45.50	22.50

**EVALUATION DATE:** March 19th, 2002

**TABLE OF TOTALWEIGHT AVERAGES, PERCENTAGE OF FRUITS SIZES**

**(150g; 125g; 100g; Y -100g.) AND REMAIN/TREATMENT/HARVEST.**

TREATMENTS	weight	% OF FRUIT SIZES				
		150 g	125 g	100 g	'- 100 g	Rem
Control	11.650	9.00	18.00	20.50	29.50	23.00
Chloropicrin	14.094	10.00	22.00	18.00	23.50	26.50
Dichloropropene+Chloropicrin	12.550	13.50	18.00	25.00	22.00	21.50
Methyl Bromide 40	13.288	10.00	16.00	27.50	22.00	24.50
Cabbage+Solarization	10.438	10.00	18.50	30.50	20.50	20.50
Metam sod. 25+Solarization	13.038	15.50	22.00	26.00	21.00	15.50
Cow manure+Solarization	15.006	11.50	20.50	30.00	18.50	19.50
Dazomet	8.788	14.00	21.50	23.00	17.00	24.50
Solarization	9.088	13.50	25.00	20.00	17.50	24.00
Metam sodium 50	14.313	13.00	23.00	26.00	18.50	19.50
Methyl Bromide15	12.275	12.00	20.50	26.50	21.00	20.00
Corn+Solarization	14.925	15.50	21.50	23.50	18.50	21.00
Hen manure+Solarization	18.588	10.50	14.50	22.00	23.50	29.50
Dichloropropene	16.213	8.50	15.00	24.50	25.50	26.50

EVALUATION DATE: April 8th, 2002

TABLE OF WEIGHT AVERAGES, PERCENTAGE OF FRUITS SIZE  
(150g; 125g; 100g; Y -100g.) AND REMAIN/TREATMENT/HARVEST.

TREATMENTS	weight	% OF FRUIT SIZES				
		150 g	125 g	100 g	- 100 g	Rem
Control	47.750	1.00	4.50	10.50	27.00	57.00
Chloropicrin	68.656	3.50	11.50	29.00	27.50	28.50
Dichloropropene+Chloropicrin	37.375	2.00	16.50	29.50	29.00	23.00
Methyl Bromide 40	54.688	3.00	13.00	34.00	19.00	31.00
Cabbage+Solarization	65.625	4.50	16.50	26.00	18.50	34.50
Metam sod. 25+Solarization	47.750	2.00	13.50	28.00	21.00	35.50
Cow manure+Solarization	49.250	2.00	7.50	32.50	27.50	30.50
Dazomet	37.688	1.50	13.00	15.50	42.00	28.00
Solarization	38.219	3.50	11.50	28.50	28.00	28.50
Metam sodium 50	50.188	3.00	9.50	31.50	34.50	21.50
Methyl Bromide15	55.938	3.00	15.50	37.50	22.00	22.00
Corn+Solarization	43.719	5.00	28.00	27.00	20.50	19.50
Hen manure+Solarization	60.563	1.50	13.50	37.50	17.50	30.00
Dichloropropene	46.719	3.00	19.00	29.00	19.00	30.00

EVALUATION DATE: April 22nd, 2002

TABLE OF WEIGHT AVERAGES, PERCENTAGE OF FRUITS SIZE  
(150g; 125g; 100g; Y -100g.) AND REMAIN/TREATMENT/HARVEST.

TREATMENTS	weight	% OF FRUIT SIZES				
		150 g	125 g	100 g	- 100 g	Rem
Control	13.150	1.50	4.50	12.00	16.50	65.50
Chloropicrin	39.663	4.00	8.50	30.50	27.50	29.50
Dichloropropene+Chloropicrin	39.375	4.00	10.50	25.00	28.50	32.00
Methyl Bromide 40	57.663	2.50	12.00	24.00	26.00	35.50
Cabbage+Solarization	34.425	2.00	6.00	32.00	30.00	30.00
Metam sod. 25+Solarization	46.213	4.00	10.00	28.00	28.00	30.00
Cow manure+Solarization	43.000	2.50	11.50	26.00	28.00	32.00
Dazomet	46.575	4.00	12.50	22.00	18.00	43.50
Solarization	67.125	2.50	16.00	29.50	22.50	29.50
Metam sodium 50	64.163	2.50	10.00	40.00	22.00	25.50
Methyl Bromide15	48.213	4.00	14.50	31.50	22.00	28.00
Corn+Solarization	60.625	2.50	12.00	28.00	25.50	32.00
Hen manure+Solarization	69.388	2.50	19.50	20.00	26.00	32.00
Dichloropropene	89.138	4.50	14.00	30.50	21.50	29.50

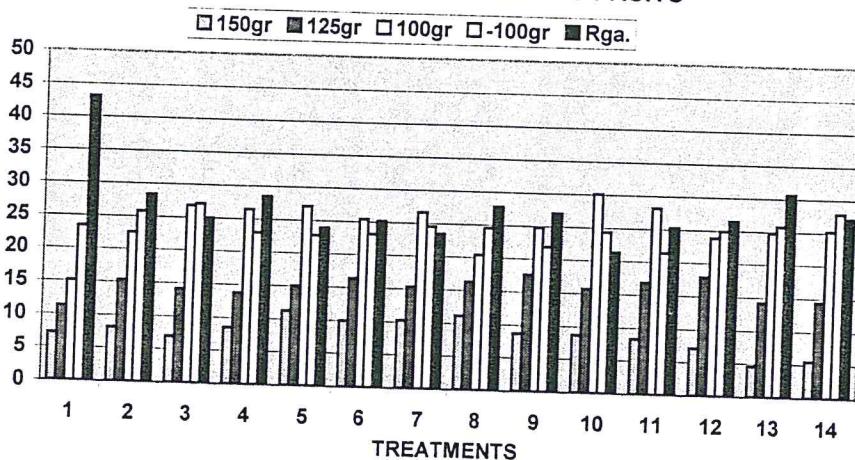
CROP: Tomato

PLANTING DATE: November 10th, 2001

TABLE OF WEIGHT AVERAGES, PERCENTAGE OF FRUITS SIZE  
(150g; 125g; 100g; Y -100g.) AND REMAIN/TREATMENT/HARVEST.

TREATMENTS	weight	% OF FRUIT SIZES				
		150 g	125 g	100 g	- 100 g	Rem
Control	22.097	7.13	11.25	15.13	23.38	43.13
Chloropicrin	35.769	8.13	15.25	22.50	25.75	28.38
Dichloropropene+Chloropicrin	26.963	7.00	14.13	26.75	27.13	25.00
Methyl Bromide 40	35.234	8.50	13.75	26.38	22.94	28.44
Cabbage+Solarization	32.766	11.25	15.00	27.13	22.75	23.88
Metam sod. 25+Solarization	30.259	10.00	16.38	25.38	23.13	25.13
Cow manure+Solarization	31.955	10.25	15.25	26.63	24.50	23.38
Dazomet	27.931	11.13	16.25	20.38	24.50	27.75
Solarization	31.233	8.75	17.63	24.75	21.88	27.00
Metam sodium 50	34.222	8.75	15.63	30.13	24.25	21.25
Methyl Bromide15	30.619	8.34	16.82	28.14	21.42	25.27
Corn+Solarization	33.080	7.13	17.88	23.75	24.88	26.38
Hen manure+Solarization	40.988	4.63	14.25	24.75	25.75	30.63
Dichloropropene	40.017	5.50	14.38	25.13	27.88	27.13

TOTAL PERCENTAGE OF TOMATO FRUITS

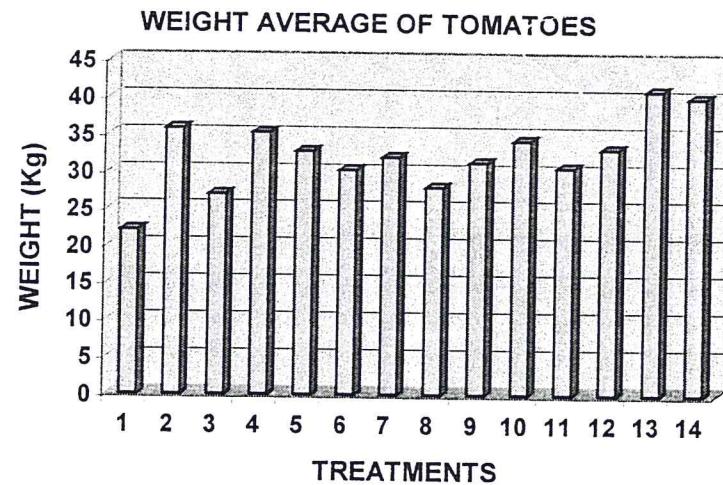


CROP: Tomato

PLANTING DATE: November 10th, 2001

yield total average in KGS. per treatment 4 harvests

TREATMENTS	YIELD TOTAL AVERAGE (KGS.)					
	1	2	3	4	TOTAL	AVERAGE
Control	15.838	11.65	47.75	13.15	88.39	22.10
Chloropicrin	20.663	14.09	68.66	39.66	143.08	35.77
Dichloropropene+Chloropicrin	18.550	12.55	37.38	39.38	107.85	26.96
Methyl Bromide 40	15.300	13.29	54.69	57.66	140.94	35.23
Cabbage+Solarization	20.575	10.44	65.63	34.43	131.06	32.77
Metam sod. 25+Solarization	14.038	13.04	47.75	46.21	121.04	30.26
Cow manure+Solarization	20.563	15.01	49.25	43.00	127.82	31.95
Dazomet	18.675	8.79	37.69	46.58	111.73	27.93
Solarization	10.500	9.09	38.22	67.13	124.93	31.23
Metam sodium 50	8.225	14.31	50.19	64.16	136.89	34.22
Methyl Bromide15	6.050	12.28	55.94	48.21	122.48	30.62
Corn+Solarization	13.050	14.93	43.72	60.63	132.32	33.08
Hen manure+Solarization	15.413	18.59	60.56	69.39	163.95	40.99
Dichloropropene	8.000	16.21	46.72	89.14	160.07	40.02



**STATISTIC ANALYSIS ABOUT OBTAINED RESULTS IN TOMATO EXPERIMENT IN FACULTAD DE AGRONOMIA, CULIACÁN, SINALOA.**

**Number of fruits percentage.** Initial 14 treatments were analyzed for percentage variables about number of fruits for different weights. (150, 125, 100, <100 and remain). With a randomized blocks design (DBCA). We carried out comparison of averages using the Tukey test. We used a significance level ( $P<0.05$ ).

**Weight in kilograms.** Fourteen treatments were analyzed for a weight variable in kilograms with a randomized design (DCA), with arrangement for treatments in divided plots. Repetitions took place in the main plot and samplings in minor plot, with an incomplete factor analysis of  $14 \times 4$ . It was carried out comparison of averages using the Tukey test. With a significance level ( $P<0.05$ ).

**TABLE 1.** ANÁLISIS OF VARIANCE FOR NUMBER FRUIT PERCENTAGE OF 150 GRAMES WEIGHT USING FOURTEEN DIFFERENT TREATMENTS.

TREATMENTS	F.V.	G.L.	C.M.	F Calc.	P=
		13	0.32263010	0.92	0.5427
REPETITION (BLOCKS)		3	17.92650901		
ERROR		39	0.35108782		
TOTAL		55			

C.V.=22.25382%, R2 =80.8942%

TABLE 2.

ANÁLYSIS OF VARIANCE FOR NUMBER FRUIT PERCENTAGE  
OF 125 GRAMES WEIGHT USING FOURTEEN DIFFERENT  
TREATMENTS.

F.V.	G.L.	C.M.	F Calc.	P=
TREATMENTS	13	0.24132631	0.65	0.7930
REPETITION (BLOCKS)	3	2.98467511		
ERROR	39	0.36887476		
TOTAL	55			

C.V.=15.76061%, R2 =45.6664%

TABLE 3.

ANÁLYSIS OF VARIANCE FOR NUMBER FRUIT PERCENTAGE  
OF 100 GRAMES WEIGHT USING FOURTEEN DIFFERENT  
TREATMENTS.

F.V.	G.L.	C.M.	F Calc.	P=
TREATMENTS	13	0.61608149	2.48	0.0144
REPETITION (BLOCKS)	3	2.22509005		
ERROR	39	0.24864871		
TOTAL	55			

C.V.=10.09629%, R2 =60.2270%

**TABLE 4.**

**ANÁLYSIS OF VARIANCE FOR NUMBER FRUIT PERCENTAGE  
OF <100 GRAMES WEIGHT USING FOURTEEN DIFFERENT  
TREATMENTS.**

F.V.	G.L.	C.M.	F Calc.	P=
TREATMENTS	13	0.12838019	0.35	0.9778
REPETITION (BLOCKS)	3	0.58741780		
ERROR	39	0.36772619		
<b>TOTAL</b>	<b>55</b>			

C.V.=12.37037%, R2 =19.3062%

**TABLE 5.**

**ANÁLYSIS OF VARIANCE FOR NUMBER FRUIT PERCENTAGE  
OF REMAIN USING FOURTEEN DIFFERENT TREATMENTS.**

F.V.	G.L.	C.M.	F Calc.	P=
TREATMENTS	13	0.76206549	1.94	0.050
REPETITION (BLOCKS)	3	3.81582711		
ERROR	39	0.39291550		
<b>TOTAL</b>	<b>55</b>			

C.V.=12.12480%, R2 =58.2210%

TABLE 6.

ANÁLYSIS OF VARIANCE FOR NUMBER FRUIT PERCENTAGE. DIFFERENT WEIGHTS (150, 125, 100, <100 AND REMAIN IN GRAMES). USING FOURTEEN DIFFERENT TREATMENTS.

TREATMENTS	AVERAGE				
	<u>150</u>	<u>125</u>	<u>100</u>	<u>&lt;100</u>	<u>REZAGA</u>
1. Control	7.125 <sup>a</sup>	11.250 <sup>a</sup>	15.125 <sup>b</sup>	23.375 <sup>a</sup>	43.125 <sup>b</sup>
2. Chloropicrin	8.125 <sup>a</sup>	15.250 <sup>a</sup>	22.500 <sup>ab</sup>	25.750 <sup>a</sup>	28.375 <sup>ab</sup>
3. Dichlo+Chloropi	7.000 <sup>a</sup>	14.125 <sup>a</sup>	26.750 <sup>a</sup>	27.125 <sup>a</sup>	25.000 <sup>a</sup>
4. M. Bromide 40	7.125 <sup>a</sup>	13.750 <sup>a</sup>	26.375 <sup>ab</sup>	23.000 <sup>a</sup>	28.375 <sup>ab</sup>
5. Cabbage+Sol	11.250 <sup>a</sup>	15.000 <sup>a</sup>	27.125 <sup>a</sup>	22.750 <sup>a</sup>	23.875 <sup>a</sup>
6. M. Sodium 25+Sol	10.000 <sup>a</sup>	16.375 <sup>a</sup>	25.375 <sup>ab</sup>	23.125 <sup>a</sup>	25.125 <sup>a</sup>
7. Cow manure+Sol	10.250 <sup>a</sup>	15.250 <sup>a</sup>	26.625 <sup>a</sup>	24.500 <sup>a</sup>	23.375 <sup>a</sup>
8. Dazomet	11.125 <sup>a</sup>	16.250 <sup>a</sup>	20.375 <sup>ab</sup>	24.500 <sup>a</sup>	27.750 <sup>ab</sup>
9. Solarization	8.750 <sup>a</sup>	17.625 <sup>a</sup>	24.750 <sup>ab</sup>	21.875 <sup>a</sup>	27.000 <sup>ab</sup>
10. M. Sodium 50	8.750 <sup>a</sup>	15.625 <sup>a</sup>	30.125 <sup>a</sup>	24.250 <sup>a</sup>	21.250 <sup>a</sup>
11. M. Bromide 15	8.343 <sup>a</sup>	16.823 <sup>a</sup>	28.145 <sup>a</sup>	21.418 <sup>a</sup>	25.273 <sup>a</sup>
12. Corn + Sol	7.125 <sup>a</sup>	17.875 <sup>a</sup>	23.750 <sup>ab</sup>	24.875 <sup>a</sup>	26.375 <sup>ab</sup>
13. Hen manure+Sol	4.625 <sup>a</sup>	14.250 <sup>a</sup>	24.750 <sup>ab</sup>	25.750 <sup>a</sup>	30.625 <sup>ab</sup>
14. Dichloropropen	5.500 <sup>a</sup>	14.375 <sup>a</sup>	25.125 <sup>ab</sup>	27.875 <sup>a</sup>	27.125 <sup>ab</sup>
CV=	22.25	15.76	10.09	12.37	12.12
R2=	80.89	45.66	60.22	19.30	58.22

Values with literal difference aren't equal statistically (P<0.05)  
DBCA divided plots.

GRAPH 1. FRUIT SIZE PERCENTAGE OF HARVESTED  
TOMATOES

□ 150gr ■ 125gr □ 100gr □ -100gr ■ Rga.

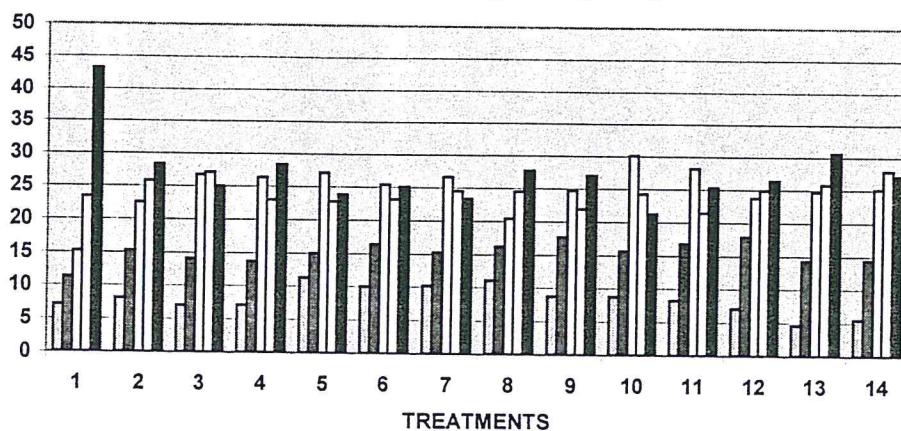


TABLE 7. ANÁLISIS OF VARIANCE FOR NUMBER FRUIT PERCENTAGE.  
DIFFERENT WEIGHTS IN KILOGRAMES. USING FOURTEEN  
DIFFERENT TREATMENTS.

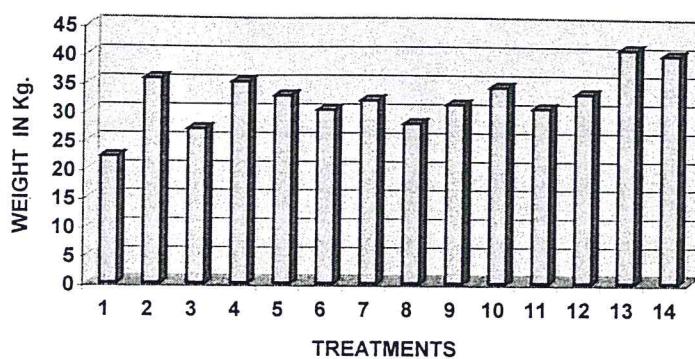
F.V.	G.L.	C.M.	F Calc.	P=
TREATMENTS	13	393.91301511	19.27	0.0001
REPETITION (MAIN PLOT)	3	85.05591518		
TREAT*REP E(a)	39	20.44299050		
SAMPLING (MINOR PLOT)	3	25445.76983631		
TREAT*SAMPLING	39	497.49764080		
REPETITION*SAMPLING	9	138.99398065		
ERROR E(b)	117	14.03507040		
TOTAL	223			

C.V.=11.57474%, R2 =98.4332%

TABLE 8. YIELD IN KILOGRAMES OF TOMATO. USING FOURTEEN DIFFERENT TREATMENTS.

TREATMENTS	AVERAGE WEIGHT	
1. Control	22.097 <sup>f</sup>	(10)
2. Chloropicrin	35.769 <sup>abc</sup>	(4)
3. Dichlo+Chloropicrin	26.963 <sup>ef</sup>	(9)
4. Methyl Bromide 40	35.234 <sup>bc</sup>	(3)
5. Cabbage+sol.	32.766 <sup>cd</sup>	(6)
6. Metam Sodium 25+sol.	30.259 <sup>cde</sup>	(7)
7. Cow manure+sol.	31.955 <sup>cde</sup>	(7)
8. Dazomet	27.931 <sup>de</sup>	(8)
9. Sclarization	31.233 <sup>cde</sup>	(7)
10. Metam Sodium 50	34.222 <sup>c</sup>	(5)
11. Methyl Bro. 15	30.619 <sup>cde</sup>	(7)
12. Corn + Sol.	33.080 <sup>cd</sup>	(6)
13. Hen manure+Sol.	40.988 <sup>a</sup>	(1)
14. Dichloropropeno	40.017 <sup>ab</sup>	(2)
CV=	11.57474%	
R2=	98.4332%	

GRAPH 2. TOTAL AVERAGE YIELD OF SALADETTE  
TOMATO



### STATISTIC INTERPRETATION.

**Percentage of fruit number.** On table 6, Graph 1. we observe that it wasn't any significative difference ( $P>0.05$ ) among treatments in percentage variables about fruit sizes 150g., 125g. y <100g. In the meantime in percentage variable of fruits 100 g. We could observe some differences ( $P<0.05$ ). Treatments 3; Dichloropropene+Chloropicrin, 5; Cabbage+Solarization, 7; Cow manre+Solarization, 10; Metam sodium 50 and 11; Methyl Bromide 15 are superiors than ( $P<0.05$ ) the other treatments. Second statistic important group were: 2; Chloropicrin, 4; Methyl Bromide 40, 6; Metam sodium 25 + solarization, 8; Dazomet, 9; Solarization, 12; Corn + Solarization, 13; Hen manure + Solarization and 14; Dichloropropene and finally the lowest group ( $P<0.05$ ) is only control..

We found significant differences in percentage variable about number of fruits in remain weight ( $P<0.05$ ), treatments 3; Dichloropropene+Chloropicrin, 5; Cabbage+Solarization, 6; Metam sodium 25+Solarization, 7; Cow manure + Solarization, 10; Metam sodium 50 and 11; Methyl Bromide 15, which displayed a minor percentage of remain fruits. In second group are treatments 2; Chloropicrin, 4; Methyl Bromide 40, 8; Dazomet, 9; Solarization, 12; Corn + Solarization, 13; Hen manure + Solarization and 14; Dichloropropene, and finally 1; control was the worst treatment with the main percentage of remain fruits.

**Yield in kilograms (weight).** On table 8, Graph 2. We found marked differences ( $P<0.05$ ) among treatments. The best was 13; Hen manure + Solarization. Second place statistically was treatment 14; Dichloropropen, then tirad place 4; Methyl Bromide 40, Fourth place was 2; Chloropicrin, fifth place 10; Metam sodium 50, sixth place was 5; Cabbage + Solarization and 12; Corn + Solarization, number seven place were treatments 6; Metam sodium 25 + Solarization, 7; Cow manure + Solarization, 9; Solarization and 11; Methyl Bromide 15, eighth place 8; Dazomet and ninth place 3; Dichloropropen + Chloropicrin and finally 1; Control with a lower yield than the other treatments.



## UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION FACULTAD DE AGRONOMIA - UAS

### INTRODUCTION

Last June, 2002, it was established the second test of project "Alternatives to the use of Methyl Bromide in the cultivation of Tomatoes, (*Lycopersicon esculentum* L.), we started some tests, in Agronomy Faculty, Universidad Autónoma de Sinaloa, Culiacán, Sinaloa, Mexico, we started taking some tests, including solarization o soil. We apply different treatments in soil, on November, 2002, in order to analyze the control about soil microorganisms and in crops development also, comparing Methyl bromide. We apply this substance in muddy type soil. Agricultural activities are based in the drip irrigation, using groundwater table.

Treatments: We started the experiment in agricultural season 2002. we applied 14 (fourteen) treatments:

### TREATMENTS OR ALTERNATIVES:

- 1.- Control (no treatment).
- 2.- 15 gr/m<sup>2</sup> of methyl bromide (75/25 or 80/20).
- 3.- 40 gr/m<sup>2</sup> of methyl bromide (75/25 or 80/20).
- 4.- Five kg of sorghum compost, incorporated into the soil, plus four weeks of solarization
- 5.- Five kg of bovine cattle manure incorporated into soil, plus four weeks of solarization.
- 6.- Five kg of chicken manure incorporated into soil, plus four weeks of solarization.
- 7- Five kg of fresh broccoli residue (or other cruciferous plant) incorporated into soil, plus four weeks of solarization.
- 8.- 25 ml/m<sup>2</sup> of metam-sodium ( N, methyl sodium ditiocarbamate) plus six weeks of solarization.
- 9.- 50 ml/m<sup>2</sup> of metam-sodium.
- 10.- 33 ml/m<sup>2</sup> of chloropicrin.
- 11.- 40 gr/ m<sup>2</sup> of Dazomet (tetrahydro-3-5 dimethyl-2H-1.3.5-tiadizin-2 tiona).
- 12.- 1,3-dichloropropene+chloropicrin,dose recommended by the manufacturer.
- 13.- 1,3-dichloropropene, dose recommended by the manufacturer (11.2 ml/m<sup>2</sup>).
- 14.- Solarization

## BODY OF THE REPORT

### Land preparation

The activities in cooperative farmer land started in last June, in Agronomy Faculty heavy machinery carried out double subsoil in land. They opened the soil 50 cm depth. Then they raked the soil in four rows, after that, they made the installment underground pipeline. Afterwards the beds were marked, raised and flattened. And finally we put the padded with black-silver plastic (silver side up). The bed marks were marked 1.80 m between each one.

### Experiment Design

The treatment designs were carried out in June, 2002. In a piece of land with 56 beds, 50 m length, inside the enterprise commercial land. It was traced four blocks 10 m each; we selected 14 experimental plots with 4 beds, which we applied next randomized treatments:

- 1). **Absolute control.** In this experimental unit consist on 4 rows, 10 M. length, and we didn't realized any fungicide or organic matter application.
- 2). **Methyl Bromide 80/20.** In the four rows, It was injected 15 grs  $M^2$  (80% methyl bromide and 20% chloropicrin).The application was approximately 25-30 cm depth.
- 3). **Methyl Bromide 80/20.** In the four rows, It was injected 40 grs  $M^2$  (80% methyl bromide and 20% chloropicrin).The application was approximately 25-30 cm depth.
- 4). **Five kg of sorghum compost** incorporated into the soil, plus four weeks of solarization
- 5). **Five kg of bovine** cattle manure incorporated into soil, plus four weeks of solarization.
- 6). **Five kg of chicken** cattle manure incorporated into soil, plus four weeks of solarization.
- 7). **Broccoli** incorporated on the soil and solarization. In order to apply this treatment, we chopped the cabbage in small pieces: then it were distributed 5 kg per  $M^2$ . It was incorporated by manual labor using hoes, after that, the rows were covered with transparent plastic.
- 8). **Metham-sodium.** In this four furrows it was applied 25 ml/ $m^2$  metham sodium. The furrows were covered in black/silver plastic during 20 days.
- 9). **Metham-sodium.** In this four furrows it was applied 50 ml/ $m^2$  metham sodium. The furrows were covered in black/silver plastic during 20 days.

10). **Chloropicrin.** On this four furrows were applied 33ml/m<sup>2</sup> chloropicrin using the same equipment which we applied methyl-bromide. The furrows were covered in black/silver plastic during 20 days.

11). **Dazomet** (tetrahidro-3-5 dimethyl-2H-1,3,5-tiadizin-2 tiona). On this furrows soil we distributed by manual labor 40 gr/m<sup>2</sup> dazomet: it was incorporated using hoes, after that, we applied water by sprinkler irrigation during 3 hrs. Finally, it was covered in black/silver plastic.

12). **1,3-dichloropropen + chloropicrin.** These furrows soil were treated using 27ml/m<sup>2</sup> mixture 1,3-dichloropropeno (65%) chloropicrin (35%). We applied this product using the same equipment used to apply the methyl-bromide, and the furrows were covered in black/silver plastic during 20 days.

13). **1,3-dichloropropen.** These furrows soil were treated using 11.2 ml/m<sup>2</sup> 1,2-dichloropropen. This application was carried out using the equipment tractor thereafter. The furrows were covered in black/silver plastic during 20 days.

#### 14). **Solarization.**

The treatments were applied on damp soil.

Evaluations will be taking place in the two central furrows in each experimental unit. We attached a label in 10 plants (five each row or 10 cm central bed) which were randomized, in order to take size measure.

#### **Planting.**

Tomato plants used in this tests are saladette tomato type. This plants grew in polyethylene ashtrays in "Agronomy Faculty" in greenhouses. The plants were 50 days old. They were planting 45 cm between each plant, on furrows with damp soil, covered with plastic.

#### **Crop Management**

Irrigation and fertilization will take place using drip irrigation, and they are controlled directly by enterprise project responsible. Same people took the records about the handworks like pruning, cutting, spinning, tied the plants, diseases control and foliage pests, etc.