

Ditylenchus were recovered. Extraction of dorylaimoids and mononchoides was increased 33 %/o, and number of miscellaneous saprophytes was 35 %/o higher with molasses. These data indicate that molasses is a superior extracting medium when compared to sucrose solution.

EFFECTS OF FUMIGANTS ON NEMATODE POPULATIONS, WEEDS, AND YIELD OF TOMATO [EFECTO DE FUMIGANTES EN EL CONTROL DE NEMATODOS FITOPARASITOS Y MALEZAS EN RELACION AL RENDIMIENTO DEL TOMATE]. N. D. Singh. Department of Crop Science, The University of the West Indies, St. Augustine, Trinidad, W. I.

ABSTRACT

Investigations were conducted to evaluate the efficiency of the chemicals, Di-Trapex, Dowfume, Nemagon 75 %/o EC and Kerosene for the control of the plant parasitic nematodes *Helicotylenchus* sp., *Meloidogyne incognita*, Chitwood 1949, *Rotylenchus* sp., *Rotylenchulus reniformis* Linford and Oliveira 1940 and *Tylenchorhynchus* sp., weeds and on yield of tomato (*Lycopersicon esculentum* Mill.). Soil samples were taken from each experimental plot at 2 and 4 months after the chemicals were applied. Weed counts were made 2 months after chemical application. All chemical treatments except Kerosene yielded from 13.3 to 26.5 per cent more tomato compared with the control. Dowfume one lb. per 72 square feet and Di-Trapex at 27, 36 and 45 gal. per acre were significantly more effective in controlling the nematode populations and reducing the weed density. No evidence of phytotoxicity was observed with any of the compounds.

INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.) is a high cash-income crop cultivated intensely in the West Indies. Soils to be planted with vegetable crops are infested with plant parasitic nematodes and other soil-borne disease organisms that adversely affect the growth and yield of plants. The conventional practice of vegetable crop rotation does not seem to be effective in preventing the build up of nematodes. The need for an effective and economical soil fumigant is therefore highly desirable in this region.

The use of Dowfume in greenhouses and nursery beds as a soil disinfectant is well recognized. Nemagon has also been used with varying degrees of success for the control of plant parasitic nematodes. The chemical Di-Trapex has been reported to possess broad activity in different soil conditions. Several workers (6, 7, 9) found that Di-Trapex effectively reduced the nematode populations and increased the yield of tomato. However, Thanassouloupoulos (8) reported no significant increase in tomato yield among soil treatments comprising Dowfume and Di-Trapex. On the other hand, Duncan and Barker (2) found that Di-Trapex caused a significant reduction in tomato yield. There are also inconsistencies concerning the herbicidal activity of Di-Trapex (1, 7, 8, 10).

The purpose of this investigation was to evaluate the effects of the different chemical compounds for the control of plant parasitic nematodes, weeds and on yield of tomato.

MATERIALS AND METHODS

The compounds were tested on River Estate sandy loam soil located at the University Field Station. A site was selected where tomato was grown previously and where the soils were infested predominantly with *Tylenchorhynchus* sp., *Helicotylenchus* sp., *Rotylenchus* sp., *Meloidogyne incognita* (Kofoid and White, 1919) Chitwood, 1949, and *Rotylenchulus reniformis* Linford and Oliveira, 1940. Less abundant nematodes were *Tylenchus* sp. and *Pratylenchus* sp. Di-Trapex (1,3-dichloropropene + 1,2-dichloropropane + sodium methyl isothiocyanate), Nemagon (1,2-dibromo-3-chloropropane), and Kerosene were injected 6 to 7 inches below the soil surface at loci eight inches apart in a diamond-shaped pattern. A Shell

hand gun was used to apply the liquid and the holes were sealed immediately with the shoe heel. Kerosene was used as a solvent for diluting Di-Trapex. Methyl bromide (Dowfume) was released under a polyethylene cover which was removed after 72 hours.

A randomized block design consisting of four replicates was used. Each plot was twelve by six feet in size with a buffer row between each treatment plot. Approximately one month old tomato plants (Floradel var.) were transplanted at spacing three by two feet apart two months after soil treatments. Soil samples were taken from each plot (4) two and four months after chemical application for determination of the nematode population densities. Each sample (200 cc) was processed by modified Cobb's decanting and sieving method (3). Weed counts were made to determine the herbicidal activity of the chemicals two months after application. The number and kind of weeds were recorded from two quadrats (3' x 3') of each plot (5).

Yield data were recorded for each plot. After the last harvest each test plant was dug up from every treatment and each was assigned a root knot index based on the percentage of the root system with root galls.

RESULTS AND DISCUSSION

There were significant differences in tomato yield in response to the various treatments (Table 1). All chemical treatments except Kerosene yielded from 13.3 to 26.5 per cent more when compared with control. Using Duncan's Multiple Range Test the most significant increase was obtained from plots treated with Di-Trapex at 27 gal. per acre.

When the nematode population counts were analyzed by Friedman's Non-Parametric Analysis of Variance, *Helicotylenchus* sp., *Tylenchorhynchus* sp., *Meloidogyne incognita* and *Rotylenchulus reniformis* were significantly reduced at the two and four month samplings. *Rotylenchus* sp. was significantly reduced at the two month sampling but completely disappeared from all plots at the final sampling. Dowfume and the three Di-Trapex treatments were significantly more effective in controlling the nematode populations compared with Nemagon, the standard treatment in the region. The three Di-Trapex treatments were equally effective in controlling the nematode populations. This work agrees with several workers (6, 7, 9) in that a reduction in the nematode populations in plots treated with either Di-Trapex, Dowfume or Nemagon was associated with an increase in the tomato yield.

Significant reduction in the weed density occurred in response to the chemical compounds (Table 1). Dowfume and the three Di-Trapex treatments significantly reduced the weed density but treatments with Nemagon and Kerosene were not effective. Consequently, repeated weedings were necessary in plots treated with Nemagon and Kerosene compared with light weeding in plots treated with Dowfume and Di-Trapex. Similar results were obtained with Di-Trapex by Cox (1), Thanassouloupoulos (8) and Young (10).

All the chemicals except Kerosene reduced root-galling significantly compared with the control (Table 1).

Bacterial wilt caused by *Pseudomonas solanacearum* E.F. Sm., was also observed to affect tomato plants on the Kerosene treated and control plots. The damage to tomato plants in these plots was greater suggesting that there may be an interrelationship between nematodes and the bacteria, *P. solanacearum*.

No evidence of phytotoxicity was observed with any of the compounds. Cox (1), Duncan and Barker (2) also reported no phytotoxic damage of tomato with Di-Trapex but Young (10) found prominent epinastic curling of tomato leaves with Di-Trapex. This difference may be due to insufficient time for proper soil aeration to allow the gas to escape before the crop was planted. However, it is essential that a "crest test" with cress seeds, *Lepidium sativum* L., be performed to check for possible phytotoxic effects before planting in soil treated with Di-Trapex (Di-Trapex Tech. Inf. Sheet, Schering, Berlin).

TABLE 1. EFFECTS OF CHEMICAL TREATMENTS ON REDUCTION OF NEMATODES, WEEDS¹ AND YIELD OF TOMATO.

Chemical treatment	Rate per acre	Yield lbs./plot ³	MONTHS AFTER TREATMENT												Average root, knot index ⁷	Weed stand ⁹		
			Helicotylenchus sp.		Rotylenchus sp.		Tylenchorhynchus sp.		Meloidogyne incognita		Rotylenchulus reniformis		4	5			6	7
			2	4	2	4	2	4	2	4	2	4						
Di-Trapex	27 gal.	21.9 c ⁴	93	32	100	-	98	82	95	86	50	86	0.5* ⁸	58				
Di-Trapex	36 gal.	20.4 bc	97	64	96	-	97	82	97	88	50	87	0.3*	76				
Di-Trapex	45 gal.	20.3 bc	97	43	100	-	99	59	99	58	52	85	0.3*	88				
Nemagon 75%EC	1 gal.	20.1 abc	39	71	36	-	46	2+	50	50	45	26	0.2*	9+				
Dowfume	1 lb/72 sq ft.	19.6 abc	94	39	98	-	97	77	96	54	50	86	0.2*	80				
Kerosene	100 gal.	17.1 a	17+ ⁵	22	27	-	23	57+	30+	15	27+	64+	3.7	21+				
Control	-	17.3 ab	485 ⁶	450	110	0	1092	212	202	15	27	945	4.2	849				

1. Per cent reduction or increase in nematode population or weed stand based on non-treated controls.

2. Chemical composition of the materials are as follows: Di-Trapex, methyl-isothiocyanate (20%) and C₃ hydrocarbons (80%); Nemagon, 1, 2 - dibromo - 3 - chloropropane; Dowfume MC-2, methyl bromide (98%) and chloropicrin (2%); Kerosene, hydrocarbons.

3. Mean of four replicates.

4. The small letters indicate Duncan's multiple range groupings which do not differ significantly.

5. + = Per cent increase over controls.

6. Number of nematodes per 200 cc soil sample for controls.

7. 0 - 5 rating with 0 representing no galls and 5 maximum galling.

8. * = Significant reduction at 5% level.

9. Dominant weeds include Cynodon dactylon, Cyperus rotundus, Eleusine indica, Paspalum conjugatum, Fimbristylis miliacea.

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RESUMEN

Se llevaron a cabo investigaciones para evaluar la eficacia de los productos Di-Trapex, Dowfume, Nemagon 75 0/o EC y Kerosene en el control de nematodos fitoparásitos (*Helicotylenchus* sp., *Meloidogyne incognita* Chitwood, 1949, *Rotylenchus* sp., *Rotylenchulus reniformis* Linford and Oliveira, 1940 y *Tylenchorhynchus* sp.) y malezas en relación al rendimiento del tomate (*Lycopersicon esculentum* Mill.). Muestras de suelo fueron recolectadas de cada parcela a los 2 y a los 4 meses después de aplicados los productos. Los contajes de malezas fueron efectuados 2 meses después de la aplicación de los productos. Todos los tratamientos, con excepción del Kerosene, dieron incrementos en el rendimiento del tomate de un 13.3 al 26.50/o. Dowfume y Di-Trapex a 27, 36 y 45 gal/Ha fueron significativamente más efectivos en controlar las poblaciones de nematodos y en reducir la densidad de las malezas. No se observó ninguna evidencia de fitotoxicidad de los productos.