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YIELD RESPONSE OF TOMATO TO NEMATICIDAL TREATMENTS IN SOIL INFESTED BY *MELOIDOGYNE JAVANICA* IN SRI LANKA

by

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Tomato, *Lycopersicon esculentum* Mill., is often found infested and stunted by root-knot nematodes, *Meloidogyne* spp., in Sri Lanka. Trials were therefore undertaken to investigate the control of *Meloidogyne javanica* (Treub) Chitw. with different nematicides and the effect on plant growth and yield.

Materials and methods

The experiment was done in a sandy loam at Pallekelle, near Kandy, in the camp of the State open prison. The field was divided in 114 plots, each measuring 15 m² (3 x 5m), distributed at random in six blocks. A space of 50 cm was left between plots to avoid interactions between the different treatments.

Four treatments were compared:

- i. The liquid fumigant D-D (50% of 1,3 dichloropropene + 50% of 1,2 dichloropropane) applied by injector gun at the rates indicated in Tab. I.
- ii. The systemic granular nematicides carbofuran (Furadan, 3% a.i.) a carbamate, and phenamiphos (Nemacur, 5% a.i.) an organo-phosphate, at single or split doses;

- iii. The contact granular nematicide prophos (Mocap, 10% a.i.), an organophosphate, also applied at single or split doses;
- iv. A combination of the fumigant D-D, and the granular nematicides carbofuran, phenamiphos or prophos.

D-D was applied into the soil at the depth of 15 to 18 cm in a grid spacing of 30 x 30 cm. The soil temperature was 30-32 °C at 10 cm depth when the treatment was performed. The granular nematicides were broadcast and incorporated into the soil when applied before transplanting, or as a top dressing distributed along the plant rows when applied to the established crop.

Four week old seedlings of the local variety Katugastota, raised in D-D treated bed, were transplanted 60/plot at a spacing of 50 x 50 cm on 22 June 1979.

During the course of the experiment all the plots received the normal cultural practices, such as irrigation, hand weed control and chemical fertilizers.

Two weeks after transplanting the numbers of plants surviving in each plot were recorded and the missing ones replaced. Starting one month after transplanting, every two weeks 12 plants were selected randomly from the centre of each plot and their heights measured. Fruits were harvested as they became ripe between 22 August and 28 September.

On 4 October the plants were dug from the plots and the root systems of 12 plants from the centre of each plot were graded for the degree of galling on a scale 0 to 5, with 0 representing no galling and 5 severe galling (Lamberti, 1971).

All the data were analyzed by Duncan's multiple range test.

Results

Generally an average of 5 transplants/plot had to be replaced but there were no significant differences between any of the treatments.

Plant development was retarded in the untreated plots, compared to the treated ones. However, the differences were not remarkable at the beginning of the experiment but became more evident as the plants reached maturity (Tab. I).

Although most of the nematicide treatments almost doubled yields, in comparison with the control, in the treated plots there were no statistical differences between treatments (Tab. I). All of them gave a very effective control of the root-knot nematodes. In fact, the root systems of all plants grown in treated soil, independently of the chemical applied, were without galls, while the degree of galling of the control plants averaged 3.3.

Table I - Effect of the nematicidal treatments on the yield and growth of tomato.

Chemicals	Treatments			Average Yields		Average plant height at maturity (3 Sept) cm (1)
	Rate a.i. and time of application			kg/15m ²	% increase with respect to control	
	1 month before transplanting (18 May)	1 day before transplanting (21 June)	3 weeks after transplanting (12 July)			
D-D	150 l			43.7 A	95	46.1 A
D-D	200 l			38.4 A	71	47.1 A
D-D	250 l			40.5 A	81	47.8 A
D-D	300 l			43.3 A	93	47.5 A
D-D	400 l			40.5 A	81	47.7 A
D-D	500 l			42.4 A	90	47.6 A
Carbofuran		9 kg		38.9 A	74	47.6 A
Carbofuran		6 kg	3 kg	35.8 A	60	48.2 A
Carbofuran			9 kg	36.3 A	62	48.8 A
Phenamiphos	40 kg			37.3 A	66	48.6 A
Phenamiphos	20 kg	20 kg		40.4 A	81	48.5 A
Phenamiphos		40 kg		43.6 A	94	47.6 A
Prophos		10 kg		37.3 A	77	47.9 A
Prophos		5 kg	5 kg	36.4 A	62	47.7 A
Prophos			10 kg	42.2 A	88	47.5 A
D-D + Carbofuran	200 l		6 kg	43.0 A	92	47.7 A
D-D + Phenamiphos	200 l		30 kg	41.0 A	83	47.9 A
D-D + Prophos	200 l		6 kg	41.1 A	83	48.0 A
C o n t r o l				22.3 B	—	42.3 B

(1) Data flanked by the same letters are not statistically different (P = 0.01).

Discussion

All the chemicals tested increased the growth and yield of plants with respect to the control. The combination of a fumigant, one month before transplanting, and a granular nematicide applied later to the growing crop, was probably effective in controlling those nematodes that had escaped fumigation, but did not significantly increase yields.

The fumigant D-D gave the highest yield increase at the lowest rate of application, suggesting that higher dosages may have been phytotoxic. However, the dose suggested to the farmers is 250-300 l/ha. The risk of failure will be much reduced if the soil is ploughed to a depth of 35-40 cm and surface tilled to a seed bed condition prior to injecting the chemical. During the injection operation the soil temperature should not exceed 30°C and soil moisture should be sufficient to allow easy cultivation, without the soil sticking to the implements. It is advisable to compact the soil surface after the treatment, to avoid rapid dispersion of the fumigant in the atmosphere.

The application of granular chemicals do not require particular preparation of the soil, but the granules must be thoroughly incorporated into the top 10-15 cm. Irrigation or rainfall will subsequently disperse them in the soil solution.

Among the granular nematicides tested, phenamiphos and carbofuran seem to give the best results when applied at planting time, in a single more concentrated dose, while prophos is more effective as a top dressing along the rows, three weeks after planting.

S U M M A R Y

Trials of chemical control of the root-knot nematode, *Meloidogyne javanica* (Treub) Chitw., on tomato were carried out from May-October 1979, near Kandy, in Sri Lanka. All the chemicals tested, namely the fumigant D-D and granular carbofuran, phenamiphos and prophos, significantly increased the yields with respect to the control and prevented gall formation on the roots. D-D was equally effective at all the rates compared (from 150 to 500 l/ha) when injected into a properly prepared soil one month before planting. Phenamiphos and carbofuran performed better when incorporated into the soil at planting time, while prophos was more effective when distributed as a top dressing along the rows three weeks after planting.

R I A S S U N T O

Effetto dei trattamenti nematocidi sulle produzioni di Pomodoro in terreno infestato da Meloidogyne javanica in Sri Lanka.

Sono state condotte a Kandy, in Sri Lanka, nel periodo maggio-ottobre 1979, delle prove di lotta contro *Meloidogyne javanica* su Pomodoro. Tutti i prodotti saggati, D-D, Carbofuran, Fenamifos e Profos, hanno aumentato le produzioni, in maniera statisticamente significativa, nei confronti del testimone ed hanno prevenuto la formazione di galle sulle radici. Il D-D è stato ugualmente efficace a tutte le dosi di somministrazione confrontate (da 150 a 500 l/ha). Fenamifos e Carbofuran hanno dato migliori risultati quando sono stati incorporati al terreno all'epoca del trapianto, mentre il Profos è stato più efficace quando è stato distribuito in copertura lungo le file tre settimane dopo il trapianto.

L I T E R A T U R E C I T E D

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