

AN ECO - FRIENDLY APPROACH FOR THE MANAGEMENT OF NEMATODES ASSOCIATED WITH CHILLI

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This investigation focuses on the effects of three organic amendments namely Fertinmakil and sugarcane bagasse alone or in combination on the population density of three nematode species and yield of chilli. For the purpose of comparison, a chemical nematicide carbofuran was also used. Population densities of *Helicotylenchus indicus*, *Tylenchorhynchus curvus* and *Meloidogyne* spp. (J2) were markedly reduced by the treatments. Yield of chilli was increased significantly over the control by all treatments except sugarcane bagasse alone. However, highest yield was obtained in carbofuran treatment.

Key words: Nematodes, Fertinmakil, Sugarcane bagasse, Control, Chilli, *Capsicum annum*.

Introduction

Chilli (*Capsicum annum* L.) a cash crop grown in all the four provinces of Pakistan is affected by a number of diseases caused by fungi, bacteria, virus and nematodes.

Yield loss can be substantial in fields heavily infested with nematodes and in warmer region damage can be amplified by secondary pathogens.

Nematicides that are being used for the control of plant parasitic nematodes are costly and can cause environmental pollution. Organic amendments such as plant materials are safe to use and also effective against plant nematodes (Akhtar and Yadav 1990; Gupta and Kumar 1997; Ramakrishnan *et al* 1997; Khan *et al* 2001; Shaukat and Siddiqui 2001). Therefore, efforts are being made to study different organic amendments for the control of nematodes associated with various crops. Recently, Khan *et al* (2001) reported the efficacy of three organic amendments including pigeon manure, poultry manure and saw dust on the populations of *Tylenchorhynchus curvus*, *Helicotylenchus indicus* and *Meloidogyne* spp.

Khan and Shaukat (2001) studied effect of castor, neem and mustard oil - cakes on nematodes associated with chilli namely *Helicotylenchus indicus*, *Pratylenchus thornei* and *Meloidogyne* spp. Population densities of the nematodes were effected by the organic amendments to varied extent. Comparatively, castor oil - cake caused greatest reduction in nematode population. The present investigation deals with

the nematicidal effect of Fertinmakil (a pesticide containing neem cake and a fungicide produced by PCSIR Laboratories Complex, Karachi), sugarcane bagasse alone or in combination for the control of nematodes associated with chilli. For comparison a systematic nematicide Carbofuran was used.

Materials and Methods

The experiment was conducted in a field of Crop Diseases Research Institute, PARC, University of Karachi, Karachi.

This experiment was conducted using a randomized complete block design with four replications. The microplot size was 1 m². The initial populations of *Helicotylenchus indicus*, *Tylenchorhynchus curvus* and *Meloidogyne* spp. (J2) larvae were 140, 76 and 18/100 ml soil, respectively. These three species constituted 90.0% of the total nematode population. The soil was tilled three times within a month so as to facilitate the release of any residual effect prior to treatments. Six weeks old seedlings were transplanted in the third week of March 2001 in microplots. The treatments applied in this study were: Fertinmakil 800 kg/ha, sugarcane bagasse 800 kg/ha, Carbofuran 10 kg/ha, Fertinmakil + sugarcane bagasse and control. All treatments were applied in accordance with the recommendations of Plant Protection, Pakistan. The harvest of chilli was done from June to September 2001. Initial nematode population was determined one week before treatment and final at the time of last harvest in accordance with Cobb's (1918) method using a composite root and soil sample from each microplot.

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Table 1
Effect of nematicidal treatments on dynamics of *Helicotylenchus indicus*, *Tylenchorhynchus curvus* and *Meloidogyne* spp. associated with chilli

Treatment	Nematodes / 100 ml soil			% of nematodes with respect to initial population density		
	<i>H. indicus</i>	<i>T. curvus</i>	<i>Meloidogyne</i> spp.	<i>H. indicus</i>	<i>T. curvus</i>	<i>Meloidogyne</i> spp.
Fertinemakil (FE)	36.5	18.0	9.0	26.1	23.7	50.0
Sugarcane bagasse (SB)	99.5	56.7	11.2	71.7	74.6	62.5
Fertinemakil + SB	12.2	24.0	4.7	8.7	31.6	26.1
Carbofuran	10.0	26.5	2.2	7.1	34.9	12.5
Control	99.0	45.5	20.0	70.7	59.9	111.1
Initial population density	140.0	76.0	18.0	-	-	-
LDS P=0.01	V7.3	V6.6	V5.4	V6.2	V6.7	V9.2
P=0.05	V10.2	V9.3	V7.6	V8.7	V9.4	V10.8

The data were analysed using two - way analysis of variance (ANOVA) followed by least significant difference (LSD) and Duncan's multiple range test (Zar 1994). Some specimens of *Helicotylenchus indicus*, *Tylenchorhynchus curvus* and *Meloidogyne* spp. (J2) second stage juveniles isolated from this study have been deposited in the Nematode Laboratory, USDA, Beltsville, Maryland, USA.

Results and Discussion

Yield was significantly ($p < 0.001$) increased over the non-treated plots by all treatments except sugarcane bagasse when applied alone. Highest yield of chilli was obtained in plots treated with carbofuran treatment (Fig 1). Fertinemakil in combination with sugarcane bagasse also gave considerably higher yield.

Final population densities of the nematodes were also significantly affected by treatments. The population density of *Helicotylenchus indicus* was drastically reduced by Carbofuran and Fertinemakil in combination with sugarcane bagasse (Table 1).

The population density of *T. curvus* was also greatly reduced by Fertinemakil and Carbofuran.

Meloidogyne spp. second stage juveniles density was decreased by Carbofuran followed by Fertinemakil + sugarcane bagasse and Fertinemakil. The reduction of population density of nematodes by using application of Fertinemakil was similar to that observed on nematodes associated with onion and rice (Khan *et al* 2000a & b). Organic amendment, sugarcane bagasse was suggested for nematode control as it has been effective in controlling nematode population (Khan *et al* 1997; Khan and Shaukat 2000), thereby, improving yield and at the same time

its availability is easy. This effective control in population could be due to biochemical composition of nematicidal products released by Fertinemakil in soil.

From the present study it can be inferred that Fertinemakil along with soil amendments not only controls nematode population but also improves the yield.

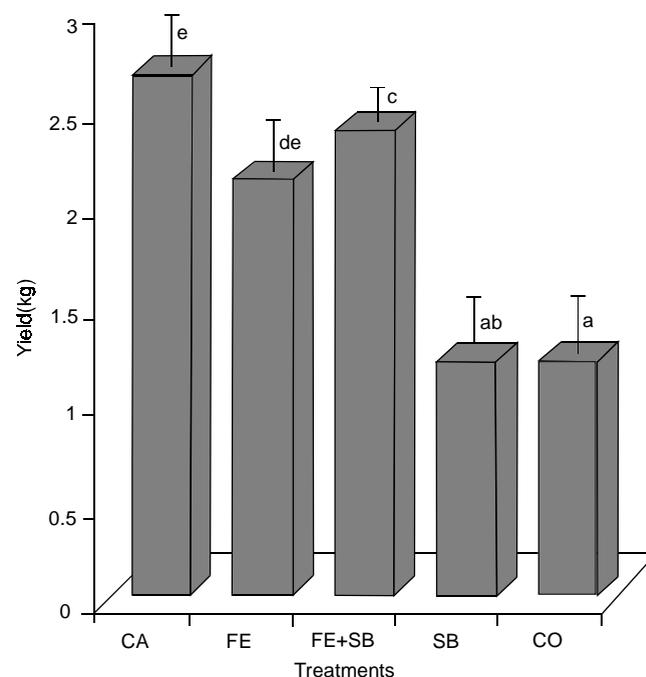


Fig 1. Yield of chilli in different nematicidal treatments (CA = Carbofuran, FE = Fertinemakil, SB = Sugarcane bagasse, CO = Control). Error bars indicate + 1 standard error of the means. Treatments and control not sharing a common letter on the bars are significantly different at $P = 0.05$ (Duncan's multiple range test).

References

- Akhtar M, Yadav A 1990 Effect of organic amendments to soil as nematode suppressants. *Int Nematol Netw News* **7** 21 - 22.
- Cobb N A 1918 Estimating the nematode population of the soil. *Agric Tech Cir Bur Pl Ind US Dept Agr* No 1.
- Gupta M C, Kumar S 1997 Efficacy of certain organic amendments and nematicides against *Tylenchorhynchus* spp. and *Helicotylenchus* spp. in soil. *Indian J Nematol* **27**(2) 139 - 142.
- Khan A, Shaukat S S, Aslam M 1997 Effect of organic amendments on population of *Helicotylenchus dihystrera* and *Pratylenchus thornei* in soil and growth parameters of wheat var. ZA - 77. *Sarhad J Agric* **8**(4) 419 - 423.
- Khan A, Qamar F, Shaukat S S 2000a Influence of Fertinmakil and Carbofuran on nematodes associated with onion (*Allium cepa* L.). *Egyptian J Agronematol* **4**(1 - 2) 111 - 116.
- Khan A, Shaukat S S, Bilqees F M 2000b Comparative efficacy of Fertinmakil and Carbofuran against nematodes associated with Rice. *Proc Parasitol* **30**(1) 15 - 20.
- Khan A, Shaukat S S 2000 Effect of organic amendments and Carbofuran on population density of four nematodes and growth and yield parameters of rice (*Oryza sativa* L.) var. IRRI - 6. *Pakistan J Zool* **32**(2) 145 - 150.
- Khan A, Shaukat S S 2001 Management of plant parasitic nematodes associated with chilli using oil cakes. *Bio Sci Res Bull* **17**(1) 43 - 46.
- Khan A, Shaukat S S, Qamar F, Islam S, Hakro A A, Jaffry A H 2001 Management of plant parasitic nematodes associated with chilli through organic soil amendments. *Pak J Biol Res* **4**(4) 417 - 418.
- Ramakrishnan S, Gunasekaran C R, Vadiveli S 1997 Efficacy of organics on *Meloidogyne incognita* of okra. *Indian J Nematol* **27**(1) 74 - 78.
- Shaukat S S, Siddiqui I A 2001 Nematicidal activity of some weed extracts against *Meloidogyne javanica* (Treub.) Chitwood. *Pak J Biol Sci* **4** 1251 - 1252.
- Zar J H 1994 *Biostatistical Analysis*. 3rd ed. Prentice-Hall, Englewood Cliffs, New Jersey, USA.