http://www.pjbs.org

PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biogical Sciences 4 (3): 319-320, 2001

Effects of Organic Manures and Carbofuran on Nematodes Associated with Garlic (*Allium sativum* L.)

Aly Khan, S. Shahid Shaukat[1] and Iftikhar Ahmad
Crop Diseases Research institute (PARC), University of Karachi, Karachi-75270
[1]Department of Botany, University of Karachi, Karachi-75270, Pakistan

Abstract: The effect of horse and donkey manure and carbofuran on the population densities of three phytonematodes viz., *Helicotylenchus indicus*, *Meloidogyne* sp. (larvae) and *Merlinius brevidens* associated with garlic crop and garlic yield was investigated. Population densities of all three nematode species were markedly reduced by the manures but more prominently by carbofuran. Yield was substantially increased by the manures and the chemical nernaticide carbofuran.

Key words: Garlic, nematode, carbofuran, animal manures

Introduction

Work on the use of non-persistent pesticides for controlling plant parasitic nematodes is being conducted the world over (Rakesh and Sharma, 1991). Among the many applications, addition of animal manures to soil is known to have beneficial effects on soil nutrients, soil physical condition, soil biological activity and crop performance (Wade and Sanchez, 1983). In addition manuring have also been investigated as an alternative method of nematode control (Akhtar and Mahmood, 1994). In the findings on management of nematodes associated with garlic Khan *et al*. (1998) suggested that neem seed coat and neem cake were suitable for controlling nematodes associated with garlic, resulting in significant increase in yield over controls. Similarly, Khan and Shaukat (1998) reported the efficacy of pigeon manure, sawdust and poultry manure on population of *Helicotylenchus indicus*, *Hoplolaimus seinhorsti* and *Merlinius brevidens* associated with garlic and reported both pigeon and poultry manure more suitable in controlling the nematodes and increasing yield as compared to sawdust. Present studies were conducted to find out the nematicidal properties of horse and donkey manures against nematodes associated with garlic and the effect of these manures or yield.

Materials and Methods

The experiment was conducted in the experimental fields of Crop Diseases Research Institute, PARC, University of Karachi. The fields had a history of wheat cultivation from the last 20 years. Garlic (*Allium sativum* L.) was planted in the first week of November 1998 and harvest in the third week of April 1999. The selected fields were naturally infected with *Helicotylenchus indicus* (Siddiqi, 1963), *Meloidogyne* sp. (Goeldi, 1892) larvae and *Merlinius brevidens* (Allen, 1955; Siddiqi, 1970) which comprised 80% of the total stylet bearing nematodes population between the free living nematodes. The soil was sandy loam with pH ranging from 7.8 to 8.0. The following organic amendments were applied at the rate of 500 kg/hectare.

1. Horse manure (C/N ratio 32.6 ± 2.86)
2. Donkey manure (C/N ratio 34.4 ± .62)

Carbofuran was used for comparison at the rate of 15 kg/ha. Organic carbon was estimated by a modified Walkley-Black method (Walkley and Black, 1934) and available nitrogen by method of Subbiah and Asija (1956). All the amendment materials were thoroughly mixed in soil. The treatments were arranged in randomized complete block design and each treatment was replicated four times. Each plot was 1 sq. m in size. The initial (7 days prior to applying amendments) and final (at the time of harvest) populations were determined by Baermann funnel technique. Yield was recorded for each treatment.

Data on density of nematodes were analysed by a factorial analysis of variance (FANOVA) following Zar (1984). As a follow-up of FANOVA Duncan's multiple range test was .employed. The yield data were analysed by analysis of variance (ANOVA).

Results and Discussion

Population densities of nematodes differed significantly with treatments ($p<0.001$) (Table 1). Population of *Helicotylenchus indicus* was significantly reduced by the treatments (p at the most 0.05). Greatest reduction was caused by carbofuran followed by donkey manure.

Meloidogyne sp. larval population was also significantly abated by the treatments ($p<0.001$). Donkey manure caused greatest reduction of *Meloidogyne* larval density. Similarly, population density of *Merlinius brevidens* was also significantly ($p<0.001$) reduced by all the treatments with donkey manure causing the highest reduction in population size. Yield of garlic was significantly elevated in all the treatments (p at the most 0.05). Increase in yield was maximum in carbofuran over the controls (Fig. 1).

The control of nematodes is important as both *Merlinius* and *Helicotylenchus* are ectoparasites which feed on root hair and epidermal cells, while *Meloidogyrre* is an endoparasite which cause damage largely due to disruption of vascular tissue and extensive hypertrophy and hyperplasia of root cells (Siddiqi, 1985). The present work revealed that highest increase in the yield was produced by carbofuran followed by horse manure and donkey manure. It is evident from the foregoing results that animal manures are effective in increasing the yields as compared to control at the same time these amendments reduce the

Table 1: Mean nematode population density followed by standard error in different treatments

Nematode	Initial	Control	Horse manure	Donkey manure	Carbofuran
Helicotylenchus indicus	86.50 ± 6.70	97.25 ± 5.38	72.50 ± 5.07	53.50 ± 7.80	44.25 ± 3.92
Meloidlogyne sp. *larvae*	60.75 ± 5.90	55.00 ± 4.50	33.25 ± 2.49	7.00 ± 2.49	21.60 ± 2.58
Merlinius brevidens	46.25 ± 7.46	55.00 ± 4.50	28.50 ± 4.33	17.00 ± 2.58	20.50 ± 3.86

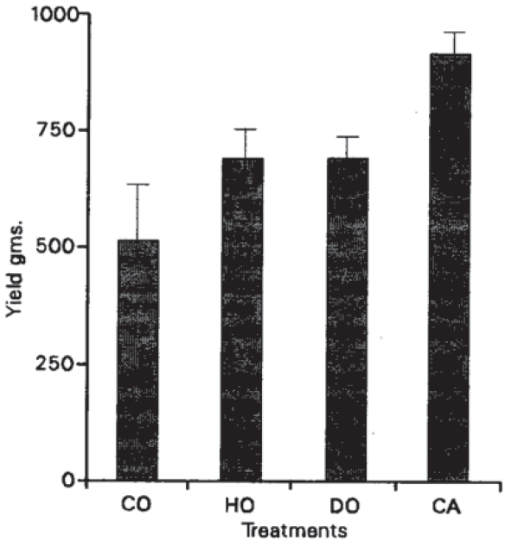

Fig. 1: Yield in different treatments (CO = Control; HO = Horse manure; DO = Donkey manure; CA = Carbofuran)

cost of treatment substantially and still be environmentally acceptable with no residual effects.

References

Akhtar, M. and I. Mahmood, 1994. Nematode populations and short-term tomato growth in response to neem-based products and other soil amendments. Nematropica, 24: 169-173.

Allen, M.W., 1955. A review of the nematode genus Tylenchorhynchus. Univ. California Publ. Zool., 61: 129-165.

Goeldi, E.A., 1892. Relative sobre a molestia do cafeerio na provincia do Rio de Juneiro. Archos. Mus. Nac. Rio de Juneiro, 8: 1-121.

Khan, A. and S.S. Shaukat, 1998. Effect of some organic amendments on the density of nematodes associated with garlic (*Allium sativum* L.). Applied Entomol. Phytopath., 66: 13-19.

Khan, A., F. Qamar and S.S. Shaukat, 1998. Relative nematicidal activity of neem seed coat and neem cake against nematodes associated with garlic. Bull. Pure Applied Sci., 17: 5-7.

Rakesh, G. and N.K. Sharma, 1991. Nematicidal properties of garlic, *Allium sativum* L. Indian J. Nematol., 21: 14-18.

Siddiqi, M.R., 1963. Two new species of the genus *Helicotylenchus* Steiner, 1945 (Nematoda: Hoplolaiminae). J. Parasitol. Res., 23: 239-244.

Siddiqi, M.R., 1970. On the plant-parasitic nematode genera *Merlinius* gen. n. and *Tylenchorhynchus cob* and the classification of the families dolichodoridae and *Belonolaimidae* n. rank. Proc. Helminth. Soc. Wash, 37: 68-77.

Siddiqi, M.R., 1985. Tylenchida, Parasites of Plants and Insects. Commonwealth Institute of Parasitology, UK., pp: 644.

Subbiah, B.V. and G.L. Asija, 1956. A rapid procedure for the estimation of available nitrogen in soils. Curr. Sci., 25: 259-260.

Wade, W.K. and P.A. Sanchez, 1983. Mulching and green manure applications for continuous crop production in the Amazon basin. Agron. J., 75: 39-45.

Walkley, A. and C.A. Black, 1934. An examination of Degtjareff method for determining soil organic matter and a proposed modification of the chromic acid titration method. Soil Sci., 37: 29-37.

Zar, J.H., 1984. Biostatistical Analysis. Prentice Hall, Englewood Cliffs, New Jersey, USA., Pages: 620.