EFFECTIVENESS OF DIFFERENT BIOAGENTS AGAINST ROOT KNOT NEMATODE INFESTING POMEGRANATE SAPLINGS UNDER NURSERY

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ABSTRACT

The investigations on effectiveness of different bioagents against root-knot nematode infesting pomegranate saplings were carried out in glasshouse nursery and in laboratory of AICRP on Nematodes, Department of Agricultural Entomology M.P.K.V., Rahuri, during 2014-15. The experiment was carried out with eight treatments including untreated control. All the treatments were found to be significantly superior over an untreated control in reducing root-knot nematode population. It was observed that the treatment with application of carbofuran 3G @ 30 g/sapling was found to be significantly effective up to 30 days after application and bioagents were found effective on 60 to 90 days after their application. Thereafter, root-knot nematode population gradually increased towards termination of the experiment.

KEY WORDS: Bioagents, Pomegranate, Root knot nematode, Sapling

INTRODUCTION

Pomegranate (*Punica granatum* L.) belonging to family Punicaceae. It is a native of Iran even earlier to 2000 BC and one of the favourite edible table fruits of tropical and subtropical regions (De candolle, 1967). In Maharashtra and in adjoining states like Gujarat, Karnataka, Madhya Pradesh and Rajasthan, the area under pomegranate is continuously increasing. Therefore, there is huge demand by farmers for the pomegranate saplings from Maharashtra. In Maharashtra state, nearly 100 governmental and about 1000 private nurseries registered under horticultural crops which are engaged in supplying healthy, quality and disease free pomegranate saplings to the farmers. The local private nursery holders and farmers at their own grew the saplings by using local available soil from their field which might be source of nematode inoculums. Such saplings in nursery get attacked by several insect and non-insect pests as well as diseases. Diseases like wilt complex caused by nematodes are of economic importance as light soil favours the buildup of nematode population as compared to medium to heavy soils. The root-knot nematode, *Meloidogyne incognita* causing serious damaged to the pomegranate in field (Walunj and Mhase, 2015).

The various bioagents play an important role in management of root-knot nematode due to its versatile mode of action like antibiosis, competition, tolerance to stress at sapling stage in nursery, with increasing in the sapling growth parameters.

The *Pseudomonas fluorescens* and *Trichoderma harzianum* were observed to reduce the egg masses of *M. incognita* and increase the growth of the papaya saplings in nursery (Rao, 2007). The soil application of various bioagents for the management of root-knot nematodes persist in soil for a few months. The soil application of *Phule trichoderma plus* for the management of root-knot nematodes in pomegranate was reported to persist in soil up to 90 days after its application in soil and it was more effective in nematode management at 30 to 60 days after application in soil under field condition. (Walunj and Mhase, 2015). The *Trichoderma spp.* managed the root-knot nematode population through two mechanism of action. First mechanisms of action is direct parasitism of eggs and larva through the increase in chitinase and protease activities, which would be indicators of eggs infection capability and second mechanisms of action is inducing plant defense mechanism leading to systemic resistance through different biochemical (Sharon *et al*., 2001).

MATERIAL AND METHODS

Pomegranate saplings *cv*. Bhagwa was obtained from the nursery, Department of Horticulture, M.P.K.V., Rahuri. These pomegranate saplings were grown in large size polythene bags. The soil population of nematodes for inoculation from field were taken from the infested soil around root zone of pomegranate and processed by Cobb's Decanting and Sieving Method (Cobb, 1918). A statistically designed experiment (RBD) was conducted with eight treatments and three replications during October 2014 to March 2015 in glasshouse nursery with artificial inoculation of root-knot nematodes culture (1000 J_2/bag) in pomegranate sapling bags. The granular nematicide, carbofuron 3 G was applied at the rate of 30 g/sapling. The soil application of talc based product of *Trichoderma viride* (2 x 10^6 cfu/g), *Paecilomyces lilacinus* (2 x 10^6 cfu/g), *Pseudomonas fluorescens* (2 x 10^6 cfu/g), *Phule Trichoderma plus* (2 x 10^6 cfu/g), *Pochonia chlamydosporium* (2 x 10^6 cfu/g), and VAM (100 spores/g) were incorporated into the soil near the root zone of sapling at the rate of 10 g/sapling. All the bioagents were applied with FYM and soil.

The initial as (initial inoculated culture) and monthly interval up to termination of the experiment, sampling of the soil (i.e. 30, 60, 90, and 120 days after treatments) was done from the bags of pomegranate saplings treated with different treatments to count the root-knot nematode population. About 200 g of composite soil and root samples were collected at the time of each observation. The soil samples were processed by Cobb's Decanting and Sieving Method (Cobb, 1918). The residues of 200 and 350 mesh sieves were collected in plastic beaker and volume of beaker was adjusted to 200 ml by adding tap water. For the nematode count, the average of 10 counts of 1 ml suspension was recorded and from it was calculated to 200 ml of suspension, from these observations percent decrease in nematode population was worked out. The data obtained were subjected to statistical analysis in RBD design to find out the significance difference between different treatments.

RESULTS AND DISCUSSION

The initial root-knot nematode culture with 1000 J_2 treatment was used for the inoculation of root-knot nematode population in the bag of pomegranate sapling and grown for one month so as to buildup the population. It could be seen from the Table 1, the application of carbofuran 3 G @ 30 g/sapling was found to be significantly superior over the rest of the treatments at 30 days after treatment and recorded 86.66 per cent reduction in root-knot nematode population. Among the bioagents, phule *Trichoderma* plus @ 10 g/sapling was also found to be effective as next best treatment at 30 days after the treatment and recorded 68.00 per cent reduction in root-knot nematode population. This was followed by the treatment of *Pochonia chlamydosporium*, *Trichoderma viride* and VAM @ 10 g/sapling. The reduction in root-knot nematode population recorded in these treatments ranged from 58.66 to 57.33 per cent at 30 days after treatment. However, the treatment of the phule *Trichoderma* plus @ 10 g/sapling showed significant reduction i.e. 72.00 per cent of root-knot nematode population at 60 days after treatment. At this stage, the treatments of *Pochonia chlamydosporium* were also found at par with this treatment and recorded 68.00 per cent reduction in root-knot nematode population. At 90 days after treatment, Phule *Trichoderma* plus @ 10 g/sapling was found significantly superior over control but at par with all other bioagents and showed 56 per cent reduction in root-knot nematode population. However, rest of the biological treatments recorded 50.66 to 53.33 per cent reduction of root-knot nematode population. Similarly, significant differences were not noticed on 120 days after treatment among the various treatments in reducing root-knot population.

These results clearly indicated that the nematicide carbofuran 3 G @ 30 g/sapling gave better control of root-knot nematode infecting the pomegranate saplings only up to 30 days after treatment. Thereafter, the population of root-knot nematode increased towards the termination of the experiment. The effectiveness of carbofuran 3 G @ 30 g/saplings is in conformity with those of Anonymous (1993) and Darekar and Mhase (1989)

The effectiveness of bioagent, *Phule Trichoderma* plus is in agreement with those of Olubnmi and Rajani (2004), who also reported 100 per cent mortality of J_2 of root-knot nematode on banana in Nigeria with prevention of development of giant cells and formation of root galls. The inhibitory effect on egg hatch of root-knot nematode due to the application of *Trichoderma viride* and *Paecilomyces lilacinus* is also reported by Goswami and Singh (2004) and Reddy (1989) in the laboratory studies.

CONCLUSION

The six bioagents *viz*., *Trichoderma viride, Paecilomyces lilacinus, Psuedomonas flurosences, Phule Trichoderma plus, pochonia chlamydosporium and* VAM were applied @ 10 g/sapling and nematicide carbofuran 3G @ 30 g/sapling. Generally, all the treatments were significantly superior over an untreated control in reducing root-knot nematode population. The soil application treatment of *Phule Trichoderma* plus at the rate 10 g/saplings was found significantly effective and recorded the decline root knot nematode population 68 to 72 per cent over the initial inoculated culture of nematode over the untreated control, respectively at 30 to 60 days after treatment. The treatment of *Pochonia chlamydosporium and Trichoderma viride* also found at par with this treatment up to 60 days. Whereas, the treatment of *Phule Trichoderma* plus (2 x 10^6/g) of soil at the rate 10 g/sapling was found significantly superior in reduction of root-knot nematode population at 90 days after treatments. The treatment of carbofuran 3 G at the rate 30 g/sapling at 30 days after application was found to be most effective in reducing the root-knot nematode population (86.66 %) over the initial inoculated culture of nematodes over the untreated control. Among the bioagent treatments, no significant differences were recorded at 120 days after treatments.

REFERENCES

Anonymous, (1993). Management of root-knot nematode, *M. incognita* infesting pomegranate. Consolidated report (1989-93) for IIIrd QRT OF

AICRP on Project on Plant Parasitic Nematodes with Integrated Approach for Their Control M.P.K.V., Rahuri. pp. 29-30.

Cobb, N. A. (1918). Estimating the nematode population of soil. Agric. Tech. Circ. Bur. Pl. Ind. U.S. Dep. Agric. No.1, 48 pp.

Darekar, K. S. and Mhase, N. L. (1989). Relative efficacy of two carbamates against grapevine nematodes and their effect on yield. *Maharashtra J. Hort*., **4**(1): 82-84.

De candolle, A. (1967). *Origin of Cultivated Plants*. Hafner Publication, Co. New York and London, Distribution Co. Lucknow (UP). p. 237-240.

Goswami, B. K. and Singh, S. (2004). Fungal bio agents for management of root-knot nematodes in tomato. *Pesticide Res. J.*, **16**(1): 9-12.

Olubnmi, O. F. and Rajani, S. N. (2004). Biological control of root-knot nematodes *(Meloidogyne spp*.) on tissue culture banana (Dwarf Cavendish var. Basarai). *Acta Hort*., **635**: 183-186.

Rao, M. S. (2007). Saplings colonized by the bioagents *Trichoderma harzianum* and *Pseudomonas fluorescens* to control root-knot nematode. *Nematol. Medit*., **35**: 199-203.

Reddy, C. M. (1989). Fungi as biological control agent of root-knot nematode. Ph. D thesis submitted to HAU, Hissar, Haryana.

Sharon, E.; Bar-eyal, M.; Chet, I.; Herrera-Estrella, A.; Kleifeld, O. and Spiegel, Y. (2001). Biological control of the rootknot nematode Meloidogyne javanica by *Trichoderma harzianum*. *Phytopath*., **91**(7): 687-693.

Walunj, A. R. and Mhase, N. L. (2015). Bioagents for biological management of rootknot nematode, *Meloidogyne incognita* infesting pomegranate. *Bioinfolet*, **12**(1A): 30-34.

Table 1: Effect of different treatments on root-knot nematode, *M. incognita* population infesting pomegranate saplings in nursery

Tr. No.	Treatment Details	Root-knot Nematode Population (J_2/200 cm^3) of Soil and Decline Percentage Over the Initial Count								
		Initial	30 DAT	Decline %	60 DAT	Decline %	90 DAT	Decline %	120 DAT	Decline %
T_1	Soil application of *Trichoderma viride* (2 x 10^6/g) of soil @ 10 g/sapling	1000	426.66	57.33	373.93	62.60	466.66	53.33	613.33	38.66
T_2	Soil application of *Paecilomyces lilacinus* (2 x 10^6/g) of soil @ 10 g/sapling	1000	493.33	50.66	400.00	60.00	506.66	49.33	626.66	37.33
T_3	Soil application of *Pseudomonas fluorescens* (2 x 10^6/g) of soil @10 g/sapling	1000	440.00	56.00	373.33	62.66	480.00	52.00	640.00	36.00
T_4	Soil application of phule *Trichoderma* plus (2 x 10^6/g) of soil @ 10 g/sapling	1000	320.00	68.00	280.00	72.00	440.00	56.00	600.00	40.00
T_5	Soil application of *Pochonia chlamydosporium* (2 x 10^6/g) of soil @10 g/sapling	1000	413.33	58.66	320.00	68.00	493.33	50.66	666.00	33.40
T_6	Soil application of VAM (100 spores/g) of soil @ 10 g/sapling	1000	426.66	57.33	386.66	61.33	480.00	52.00	666.00	33.40
T_7	Soil application of Carbofuran 3 G @ 30g/ sapling	1000	133.33	86.66	453.33	54.66	546.66	45.33	680.00	32.00
T_8	Untreated control	1000	773.33	-	880.00	-	786.66	-	773.33	-
S.E. ±		-	20.39	-	21.89	-	26.24	-	57.12	-
C.D at 5 %		-	61.85	-	66.40	-	79.61	-	NS	-

DAT- Days After Treatment

[MS received : June 24, 2018] *[MS accepted : June 28, 2018]*