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Management of Root-Knot Nematode Meloidogyne incognita in Tomato (Solanum lycopersicum L.)

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ABSTRACT
Data collected from different On Farm Trial locations of Sheohar District, selected for the assessment & refinement technology for the management of RKN in tomato with five treatments & five replications during the year 2019-2020. Among all the treatment T_3 i.e. carbofuran @ 10g/plant was found best and recorded lowest number of galls compared to others and disease incidence percentage was merely 2 per cent in (0-5 scale). Maximum yield (2.84 kg /plant) was recorded under carbofuran treated plots /plants. The treatment T_5 i.e. soil solarization 15 days + pseudomonas 1% WP @ 50 g/m^2 showed at par with carbofuran treated plots. Thus bio-agent treated plants showed good response to reduce the population of nematode and the performance was better than use of pseudomonas fluorescens alone (Treatment T_4 i.e. use P. fluorescens 1% WP @ 50 g/ m^2). Hence, use of bio-agent is another alternative to suppress the nematode in case of organic farming. It is safer for consumer also. Statistical data analysis revealed all the treatments were significant in nature and superior over the existing farmers practice i.e. T_1 (improper use of pesticide). Thus, treatment T_3 i.e. use of carbofuran @ 10g /plant recommended for the management of nematode in tomato (cv. Himshikhar indeterminate type).

Key words: carbofuran, Himshikhar, Meloidogyne incognita, *Pseudomonas fluorescens*

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I. INTRODUCTION

Tomato which is main component of vegetable grown in Bihar. Tomato has become one of the most important crops of the farmers of Bihar for improving their income. The area under tomato is 4600 ha with total production of 7.36 lakh tones with a productivity of 16 tones/ha .The low productivity is due to use of traditional verities and soil harboring pests. Intervention of technology like use of improved verities and integrated management of disease and pests may double the production of tomato in Bihar; various biological stressors are substantially hindering tomato productivity, presenting a major obstacle to forecasting future expectations of something like the developing world. Root-knot nematodes (RKN) are a significant threat to agricultural productivity among many biotic challenges. Beyond inflicting physical harm, it contributes as an exacerbating agent for the introduction of bacterial and fungal pathogens, compounding the situation and attributed to the creation of disease structures. The yield of okra, tomato and brinjal suffered 90.9, 46.2 and 27.3 per cent loss, respectively; due to *Meloidogyne incognita* infestation@ 3-4 larvae per g soil under field condition (Bhatti & Jain, 1977).Reddy (1981) reported 39.7 per cent loss in tomato yield at pre- plant nematode population density of 20 M. incognita larvae per g soil. Considering the threat of nematode in tomato following set of experiments have been designed for the management of RKN in tomato crop

II. MATERIALS AND METHODS

Indeterminate variety of tomato Himshikhar had been purchased from local market to raise nursery of said variety. Nursery had been raised at the premises of KVK, Sheohar under the guidance of subject matter specialist. In nursery plots 10 kg FYM, 1 kg neem cake & 100 g of DAP were incorporated and nursery plots of 1 $m^{2.}$ The desired plants were ready by 15th of October 2019.The experiments were carried for two years. Five different locations of district had been identified where large acreage of vegetables were grown specially tomato crop. These areas were identified through field visit and diagnostic services where there was occurrence of nematode problem. During awareness campaign of pests carried out at village, blocks and district level, farmers were bringing samples of infected roots of crops for their remedies. Initially farmers were ignorant about this pests and do not use any preventive or curative measures. The prevailing problem of stunting, day time wilting and hampering quality and quantity of tomato of farmers were redressed by KVK experts .To redress such problem of farmers On Farm Trials were conducted at farmers field in the villages of Kama Piprahi Block, Rajadih of SheoharbBock,Kushar of Sheohar Minapur Balaha of Purnehiya Narwara of Taryani block of

Sheohar district. Healthy seedlings of tomato were supplied to the selected farmers of respective villages for planting at their own field with set guidance. Saplings of 0.02 ha had been supplied to each of selected farmers. Regular monitoring was done to for watering as well as inters culturing. Planting of tomato saplings were done in the selected field with spacing of 0.6 x 0 .45 m^2. In main fields RDF 50:250:100 –N: P: K were applied. Micronutrient of 10kg Boron and 50 kg of Zinc sulfate were applied .Planting were done in five sets as per requirement of treatment in first set no chemicals were used .This will serves as check. In second sets neem cakes @250 kg/ha. In third set use of carbofuran @ 1kg a.i /ha.in forth set use of *Pseudomonas fluorescens* 2.5 kg /ha In fifth set soil solarization 15 days + *P.fluorescens* @ 2.5 kg/ha. Since Himshikhar cultivar is in determinant type so staking facility were raised .After maturity of plant Shoot length, Yield per plant, No of galls and Disease incidence % were recorded & data were analyzed as per O.P Sheoran et.al. 2020 CCS HAU, Hisar &ANOVA table prepared

III. RESULTS AND DISCUSSION

Use of neem cakes hinders the nematode population & resulted better crop stand in OFT trial the recorded shoot length was 243cm and yield was 2.05 kg. The total number of galls was 446.20 with disease incidence was 4 in 0-5 scale. The yield recorded per plant was significantly different in comparison to check i.e. farmers practice. The suggested cause may be due to production of large number of predators and parasites; during the decomposition of soil amendments it has been observed which may attack the nematode causing reduction in their population (Linford et al., 1938 Singh & Sitaramaiah, 1969). Sitaramaiah & Singh, 1974 have reported about decomposed products may be directly toxic to nematode .They have also reported that the change in soil P^H which may be unfavorable for nematode multiplication. Production of volatile fatty acids, phenols, ammonia, and amino acids etc .during decomposition of organic soil amendments may cause inhibitory effect to the nematodes. Sayre et.al. (1965) and Toussoun et.al.(1968) reported the presence of prop ionic, n-butyric, and iso-butyric and phenyl prop ionic acids during decomposition of crop residue. Khan et al. (1974) also reported about the release of ammonia due to decomposition oil cakes that was toxic to varying degrees to several species of plant parasitic nematodes.

Analysis of Variance (No. of Galls)

Source of Variation	DF	Sum of Square	Mean Square	F-Calculated	Significance
Replication	4	3,389.440			
Treatment	4	502,764.240	125,691.060	90.961	0.00000
Error	16	22,108.960	1381.810		
Total	24	528,262.640			

Table: 1 Effect of organic amendment on number of galls in Tomato crop.

Treatment	No. of Galls
T1	532.4
T2	446.2
T3	132.4
T4	317
T5	246.4

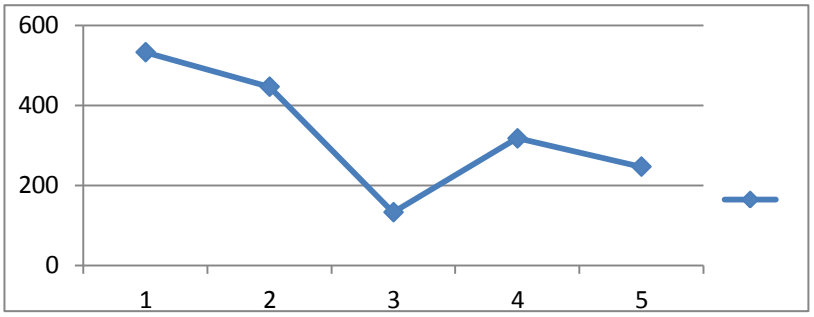


Fig.01

The maximum no of galls 532.40 was recorded in check followed by treatment T_2 (446.20), least no of root galls were recorded in treatment T_3 (132.40) that was significantly superior over other treatments.

Analysis of Variance, Shoot Length (cm)

Source of Variation	DF	Sum of Square	Mean Square	F-Calculated	Significance
Replication	4	533.80			
Treatment	4	30,322.640	7,580.660	14.000	0.00004
Error	16	8,663.360	541.460		
Total	24	39,519.840			

Table: 2 Effect of chemical on nematode population and shoot length

Treatments	Shoot Length (cm)
T_1	211.6
T_2	243
T_3	313
T_4	284
T_5	273

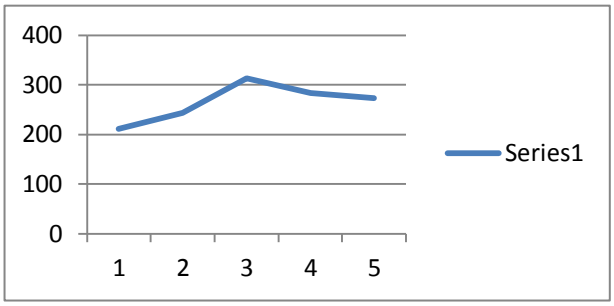


Fig.02

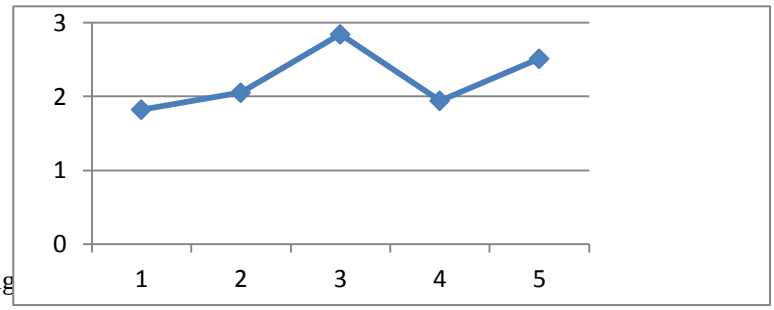
Maximum shoot length has been recorded in treatment T_3 (313.00 cm), followed by T_4 284.00 cm& T_5 (273.00cm) in descending order. The minimum shoot length has been recorded in the treatment T_1 i.e. (211.60 cm).The treatment T_3 has been found significantly superior over the check & significantly at par with treatments T_2 and T5. The result of this work shows that while nematodes affect plant growth, the application of carbofuran improved the growth of Tomato crop pending on the time of application and the variety. This agrees with the findings of other workers who recorded increased growth parameters with application of carbofuran Atkinson et al.(1982)The applications of carbofuran in this work were effective in controlling root knot nematodes (*M. spp.)*, with application at the time of planting being the most effective. Coating of nematicide on seed surface has been found to provide sufficient protection against phyto nematodes, Vegetables like tomato, okra peas can be profitably grown in nematode infested soil by seed dressing (Sivakumar et al., 1973)

Analysis of Variance, Yield/plant (kg)

Source of Variation	DF	Sum of Square	Mean Square	F-Calculated	Significance
Replication	4	0.462			
Treatment	4	3.675	0.919	6.913	0.00198
Error	16	2.127	0.133		
Total	24	6.264			

Table: Effect of different intervention on the management of RKN in tomato (Yield)

Treatments	**Yield /plant**
T1	1.82
T2	2.05
T3	2.84
T4	1.94
T5	2.51



Fig

The yield per plant has been recorded & maximum 2.84 kg was collected in the treatmentT_3 followed by T_5 and least yield has been obtained in treatment T_1 i.e. check. The yield data of treatment T_3 were significantly superior over the check and significantly different over the treatment T5and treatment T2.

The data collected from different OFT sites revealed that treatment T_3

Treatment	No of Galls		Shoot Length(cm)		Yield/plant (kg)	
	Mean	S.E	Mean	S.E	Mean	S.E
T1	532.40	20.44	211.60	6.66	1.82	0.131
T2	446.20	15.84	243.00	13.28	2.05	0.184
T3	132.40	5.50	313.00	7.84	2.84	0.151
T4	317.00	22.39	284.00	10.77	1.94	0.158
T5	246.40	8.62	273.00	7.84	2.51	0.175
C.D	**50.268**				**0.493**	

Use of carbofuran @ 10g/plant showed less number of galls, in comparison with T_2(Neem cake@ 45g/plant).Maximum yield was recorded under carbofuran treated plants. The treatment T_5 i.e. use of *Pseudomonas fluorescens* yielded at par to carbofuran treated plant. *Pseudomonas fluorescens* improves the soil properties by improving soil permeability and oxygen availability to the root**s**. Proper oxygen supply will prevent root diseases, fungal formations and root rots. Siddiqui, et.al, 2006 have reported suppression of RKN, Improves the uptake of nutrients by roots. *Pseudomonas fluorescens* strain CHA0 produces hydrogen cyanide (HCN), a secondary metabolite that accounts largely for the bio-control ability of this strain. Unsterilized sandy-loam soil as drench caused marked suppression of root-knot disease development incited by *M. javanica* in tomato seedlings. However, efficacy of CHA77 was noticeably lower compared to its wild type counterpart CHA0 Soil infestation with *M. javanica* eggs resulted in significantly lower nematode population densities and root-knot disease compared to the juveniles used as root-knot disease-inducing agents. Strain CHA0 significantly suppressed nematode populations and inhibited galling in tomato roots grown in soil inoculated with eggs or juveniles and treated with or without EDTA. Strain CHA0 exhibited greater bio-control potential in soil inoculated with eggs and treated with EDTA.In the root section where both nematode and the bacterium were present, strain CHA0 reduced nematode penetration to a greater extent than CHA77, suggesting that for effective control of *M.javanica*, a direct contact between HCN-producing CHA0 and the nematode is essential. Thus bio-agent treated plants showed good response to reduce the population of nematode and the performance was better than alone use of *P.fluorescens*. Hence, use of bio-agent has been another alternative to suppress the nematode in case of recent trend of organic farming. It is safer for the consumer. Statistical data analysis shows all the treatments are significant in nature and superior over the existing farmers practice i.e. T_1.Thus treatment T_3 i.e. use of carbofuran @10g/plant has been recommended for the management of nematodes in tomato cultivar Himshikhar indeterminate type.

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REFERENCES CITED

[1]. Akin lade E.A & Adesiyan S .O.1982 Nigerian Journal of pesticides& Agricultural chemical, 1 pp-22-27
[2]. Bhatti, D.S & Jain, R .K.1977.Indian J.Nematol.7: 37-41
[3]. Khan, A.M., Alam, M.M & Ahmad, R. 1974. Indian J. Nematol.4:93-96
[4]. Kumar, Vinay, Sarita Rani, Ramniwas, O. P. Sheoran, and Komal Malik. (2020)." *Journal of Extension Systems* 36, (2): 28-32.
[5]. Linford, M. B.; YAP, F.; Olivira, J. M.1938.Soil Science: 1938; 45. 127-142
[6]. Reddy, D.D.R.1981.Nematol.Soc.IndiaSymp.Coimbatore.p.60
[7]. Sayre, R.M., Patrick, Z.A & Thope, H.J.1965 Nematologica 11: 263-268
[8]. Siddiqui, Imran A. (Siddiqui, Imran A.) ; Shaukat, S. Shahid (Shaukat, S. Shahid) ; Sheikh, Imtiaz Hussain (Sheikh, Imtiaz Hussain) ; Khan, Aly (Khan, Aly) ,2006, World Journal of Microbiology,22:641-650
[9]. Singh, R.S & Sitaraaiah, K.1969. First All India Nematological Sump. New Delhi
[10]. Sitaramaiah, K& Singh, R.S .1974. J.Nematol.6: 152
[11]. Sivakumar, C.V., Kuppnsamy, S. Meerzainuddin, M.1973. Indian .J.Nematol.3:71-72
[12]. Toussoun, T. A., Weinhold, A. R., Linderman, R. G., & Patrick, Z. A. (1968). . *Phytopathology*, *58*(1), 41-45.

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