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 Biological Sciences 3 (12): 2109-2111, 2000

Integrated Management of Root-knot Disease of Tomato

Hafeez Ullah Khan[1], Riaz Ahmad[2], M. Aslam Khan[2] and Ahmad Saleem Akhtar[3]
[1]Department of Plant Virology, AARI, Faisalabad, Pakistan
[2]Department of Plant Pathology, University of Agriculture, Faisalabad, Pakistan
[3]Plant Protection Institute, Faisalabad, Pakistan

Abstract: Integrated disease control experiments, revealed that with the increase in disease control operations, the disease incidence decreased gradually. The best control of root knot disease was achieved 85.34% over control in treatments of combination of sterilized soil with formalise, organic soil amendments, planting of nursery plants after dipping in 0.1% solution of Tenekil and use of antagonists in soil. All other treatments applied separately showed less effective results, than the integrated treatment application.

Key words: Integrated management, root-knot, *Meloidogyne incognita*, antagonist, tomato

Introduction

There are number of reasons for the low tomato production in Pakistan, the nematode and other diseases constituting the most important factor. The crop is subject to many nematode diseases but the root-knot disease caused by *Meloidogyne incognita* (Kofoid and White, 1919; Chitwood, 1949) is the most destructive. The control of *M. incognita* can be obtained through management, cultural practices, resistant hosts, biocontrol agents, physical factors and by using nemuticides. Each method of pathogens management has its own importance and none of them is completely successful alone for pathogen control. This calls for an integration of management measures. Integrated management is an ecological approach of pathogen control, by the utilization of all the suitable techniques to reduce and maintain pathogen populations below economic injury level in such a way that it is in the most benefit of mankind and plants and the most destructive for the pathogen. Some work on integrated control of root-knot disease alongwith significant increase in yield of tomato was reported by Ruelo (1983) and Poveda (1990).

Materials and Methods

Tomato variety "Roma" is moderately susceptible to root-knot nematode infection. Therefore, for the evaluation of the effects of integrated management practices on population levels of *M. incognita* and the root-knot disease, this variety was selected. Nursery of this variety was raised in plastic trays. Seedlings of three-week-old tomato cultivar Roma were transplanted into earthen pots (20×22 cm) containing sandy loam soil. The weight of the soil per pot was 6.5 kg. One tomato seedling was planted per pot. In this trial effect of formalin sterilized soil, addition of organic soil amendments, nursery dipping in a chemical and antagonists application was observed, alone and incombination with other treatments on root-knot nematode of tomato. Treatments were as following:

M. incognita alone (Control).
M. incognita + Formalin sterilized soil.
M. incognita + Combination of soil amendments (Datura leaves + Ak leaves + Sawdust + Neem leaves).
M. incognita + Nursery dip treatments.
M. incognita + *P. lilacinus* + *T. harzianum.*
M. incognita + Formalin sterilized soil + Combination of soil amendments.
M. incognita + Formalin sterilized soil + Nursery dip treatment.
M. incognita + Formalin sterilized soil + *P. lilacinus* + *T. harzianum.*
M. incognita + Combination of soil amendments + Nursery dip treatment.
M. incognita + Combination of soil amendments + *P. lilacinus* + *T. harzianum.*
M. incognita + Formalin sterilized soil + Combination of soil amendments
Soil amendments + Nursery dip treatment + *P. lilacinus* + *T. harzianum.*

When and where needed, soil was sterilized with formalin as a first step. This formalin sterilized soil was used for filling up of pots. Secondly, before transplanting the nursery, the earthen pots were prepared by using the combination of organic soil amendments such as Datura leaves, Neem leaves,Ak leaves and Sawdust at the rate of 25 gm/kg of soil. Thirdly, at the time of transplantation, nursery was dipped in 0.1% Tenekil solution for five minutes. Fourthly, after nursery transplantation, culture of *Paecilomyces lilacinus* and *Trichoderma harzianum* at 6 g/kg. of soil, after being mixed with organic substrate (wheat bhoosa) at 1% of the soil weight was used. Two weeks after transplanting approximately 6000 freshly hatched second stage juveniles of *M. incognita* were pipetted around each plant through holes. Five replications were maintained for each treatment. The pots with only nematode inoculum were considered as control. The pots were arranged in a completely randomized block design in a glass house. Plants were properly irrigated throughout the period of studies. Daily temperature ranged between 2532°C. Growth of plants was observed time to time and symptoms if any, were recorded. After eight week, plants with soil were gently removed from pots and their roots were carefully washed in running water. Data recorded on the basis of galls formed per plant were statistically analysed (completely randomized design).

Results and Discussion

All the treatments reduced the disease incidence as compared to control (Table 1, 2). The best control 85.34% of disease was achieved where formalin sterilized soil, organic soil amendments, nursery dip treatment and addition of antagonistic organisms were applied

Table 1: Integrated management of root-knot disease of tomato

Treatments	Mean number of galls developed on each seedling	Percentage decrease in the number of galls over inoculated control
M. incognita alone (Control).	23.20a	
Formalin sterilized soil.	19.60b	15.52
Combination of soil amendments (Datum leaves + Ak leaves + Sawdust + Neem leaves).	15.80c	31.90
Nursery dip treatment	15.20c	34.48
P. lilacinus + *T. harzianum*.	11.80de	49.14
Formalin sterilized soil + Combination of soil amendments.	13.60cd	41.38
Formalin sterilized soil + Nursery dip treatment.	12.40de	46.55
Formalin sterilized soil + *P. lifacinus* + *T. harzianum*.	9.80ef	57.76
Combination of soil amendments + Nursery dip treatment.	8.20fg	64.66
Combination of soil amendments + *P. lilacinus* + *T. harzianum*.	6.40g	72.41
Formalin sterilized soil + Combination of soil amendments + Nursery dip treatment + *P. lilacinus* + *T. harzianum*.	3.40h	85.34

*Mean showing same letters in a column do not differ significantly at 5 % level of significance

Table 2: Analysis of variance and comparison of treatment means for integrated management of root-knot disease of tomato ANOVA

	ANOVA				
SOV	DF	SS	MSS	FR	SE
R	4	19.20	4.80	-	-
Tr	10	1651.31	165.13	41.39**	0.89
E	40	1.59.60	3.99	-	-

*Significant, **Highly significant, NS Non-significant

Comparison of treatment means

Treatments	Mean
Formalin sterilized soil + Combination of soil amendments + Nursery dip treatment + *P. lilacinus* + *T. harzianum.* Combination of soils amendments + *P. lilacinus* + *T. harzianum.*	3.40h
	6.40g
Combination of soil amendments + Nursery dip treatment.	8.20fg
Formalin sterilized soil + *P. lilacinus* + *T. harzianum.*	9.80ef
P. lilacinus + *T. harzianum.* Formalin sterilized soil + Nursery dip treatment.	11.80de
	12.40de
Formalin sterilized soil + Combination of soil amendments.	13.60cd
Nursery dip treatment.	15.20c
Combination of soil amendments (Datura leaves + Ak leaves + Sawdust + Neem leaves) Formalin sterilized soil.	15.80c
	19.60b
M. incognita alone(Control).	23.20a

Separation of means by Duncan's Multiple Range Test at 5% level of significance

* Means sharing same letteris) do not differ significantly

combinedly. The results were statistically analysed and presented in Table 2. The treatment where Organic soil amendments + Antagonists were applied ranked statistically second in performance as it gave 72.41% disease control followed by Soil amendment + Nursery dip treatment which gave 64.66% disease control. The formalin sterilized soil proved least effective as it gave, only 15.52% disease control. The treatments Organic soil amendments, Nursery dip treatment, Addition of antagonists, Formalin sterilized soil + Soil amendments, Formalin sterilized soil + Nursery dip treatment and Formalin sterilized soil + Antagonists showed 31.90, 34.48, 49.14, 41.38, 46.55 and 57.76% disease control, respectively, as compared to inoculated plants (control). The results of experiment revealed that the addition of antagonists (*P. lilacinus* and *T. harzianum)* amended with wheat straw in soil, chemical and organic soil amendments reduced the incidence of the disease. Consequently studies were undertaken to see their integrated effect on control of root-knot disease of tomato. Of the 11 treatments evaluated, it was found that the disease incidence went on decreasing with the addition of control operations one by one. The best control of the disease was obtained in treatment where all the control operations i.e. sterilization

of soil with formalin, organic soil amendments, planting of nursery plants after dipping in 0.1% solution of Tenekil and finally addition of antagonists in soil, were undertaken. Ruelo (1983) revealed that combination of chemicals and biological methods to control *Meloidogyne incognita* on susceptible variety of tomato gave better control than either method alone. Use of Dibromochloropropane, resistant varieties and crop rotation, suppressed nematodes population with increased yield. Poveda (1990) evaluated incorporation of organic residues, granular nematicides, black and clear plastic mulches and solarization for the control of *Meloidogyne incognita* in muskmelon. The greatest gall reduction was noticed with 10 tonnes sugarcane residues, black plastic and 2 kg Terbufos/ha. Black plastic gave the highest melon yields, followed by black plastic + poultry manure and clear plastic.

References

Chitwood, B.G., 1949. Root-knot nematodes. Part 1. A revision of the genus *Meloidogyne* Goeldi, 1887. Proc. Helminthol. Soc. Washington, 16: 90-104.

Kofoid, C.A. and A.W. White, 1919. A new nematode infection of man. J. Am. Med. Assoc., 72: 567-569.

Poveda, J.M., 1990. Assessment of the distribution and frequency of phytonematodes associated with melon (*Cucumis melo* L.) and of tactics for controlling *Meloidogyne incognita* (Kofoid and White) Chitwood in the Azuero region, Panama. Centro Agronomico Tropical de Investigation y Ensenanza, Turrialba Costa Rica, pp: 79.

Ruelo, J.S., 1983. Integrated control of *Meloidogyne incognita* on tomato using organic amendments, marigolds and a nematicide. Plant Dis., 67: 671-673.