Integrated Management of Root Knot of Tomato Disease by Fungal Bioagent

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Abstract- The present investigations were carried out to study the eco friendly integrated management of disease complex caused by root knot nematode, M. incognita and root wilt fungus, *F. oxysporum f. sp. Lycopersici* on tomato prevalent in vegetable growing areas referred as 'hot spots'. Subsequent to the development of disease management package through non-chemical natural resources particularly using antagonistic fungal bioagents (*T. viride- mycotoxic and P. lilacinus-nematicidal*) in integration with non-edible oilseed cake of karanj (*Pongamia glabra)* Which is known to possess both fungicidal and nematicidal properties.In addition to proposing an ideal eco-friendly treatment for the management of this disease complex also proposed an excellent medium for the proliferation of obligate bio-protectant management of root knot nematode disease infecting tomato, by the use of fungal bioagent isolate from egg masses of *M.incognita* infecting tomato has been carried out.Thus with the mission of attempting ecofriendly management of disease complex incidence caused by soil born root knot nematode, *M. incognita* and pathogenic root wilt fungus, *F. oxysporum F. sp Lycopersici* on tomato and with some non chemical method of plant disease management including the fungal bioagent accruing in some natural ecosystem which have also been reported as potential fungal bioagents against above diseases .After that we do the Cataloguing of the fungi associated with the diseased material and maintain each separately on Potato Dextrose Agar (PDA) for the experimental studies of in vitro, glass house also micro plat trial will be conducted for the present investigation.

Key Word *– Toxic, egg parasitic, root knot nematode, bioagent, farmyard manure, karanj, oil seed cake*

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I. Introduction –

Out of a number of fields surveyed, selectedexperimental ones or hot spots showed extremely highincidence of disease showing the plants with yellowing and wilting symptoms. The infested hot spots exhibitedpatchy growth of tomato crops from which the roots of affected plants from closer observation on uprooting clealy showed heavy galling with egg masses of root knot nematode on the surface of which the fungus infection was also apparent. The fungus on isolation after surface sterilization or root pices on PDA showed characteristics micro, macro and chlamydosporesof wilt fungus emerging from vascular bundles which was identified as *Fusarium oxysporum f. sp.lycopersici.* The root knot nematode infecting tomato roots with galls was identified *as Meloidogyne incogni*ta (Kofoid and White) chitwood on the basis of perennial pattern and larval characters.Since the record of disease complex above survey of vegetable crops particularly tomato on Farmers'fields showing heavy infestation several beneficial (saprophytic) fungi were also isolated and identified out of which two fungal bioagents viz. *Paecilomyces Lilacinus and Trichoderma viride* after isolation and identification from the rhizophere and rhizoplane of root knot affected plants were maintained as management components of present study. These two isolates of each of the above fungal bioagents collected from the fields along with other two isolates from already existing ones procured from IARI, New Delhi were subjected to in-vitro test for selecting the most potential isolate of each. For achieving the target to minimize the incidence of disease complex caused by M. incognita and F. oxysporum f. sp. Lycopersici most potential isolates of each of fungal bioagents viz. P. lilacinus and T. viride were proved to be very important management components for the present integrated package. For selecting the most potential isolate of *P. lilacinus* against *M. incognita* out of above four test isolates in-vitro test including larvicidal, ovicidal and egg parasitization were performed while in case *of T. viride* (mycotoxic) fungicidal trials were carried out

II. Material and Method-

Recent methodology used for the plant pathological and nematological research would be used for carrying out the above experiments proposed work will include the following steps first of all we do the Survey of vegetables crops, particularly tomato in farmers field for the incidence of disease complex caused by root knot nematode and wilt causing fungi. Collection of diseased materials and wilt causing other soil borne fungi and root knot nematode from both rhizosphere of, sub culturing, Purification and identification of all the associated fungi including wilt causing ones along with root knot nematode from diseased material. Root knot nematode spices through larval and perennial pattern characters to be identified and maintain in

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tomato (lycopersiocon ecutentum) autoclaved sandy loam soil for the entire experimental work.Pathogenicity test of the wilt fungus and root knot nematode on host plant ie. Tomato will be conducted as prescribed by Reddy 1985. In vitro evolution of saprophytic fungi collected from above survey through larvicidal in which freshly hatched larvae of meloidogyne incognita are exposed to the culture filtrates of fungi by followed by ovicidal or egg hatching inhibition test for confirmation of the larviciadal test as above. This would be followed by egg parasitizing capacity test. Both larvicidal and ovicidal tests shall be carried out with the culture filtrate of all above isolated fungi while for the egg parasitisation test mycelia of each fungus are to be used (Goswami et. al, 2005) Laboratory test of wilt fungus against both are fungal bioagents tested above for studying the interelationship between beneficial and pathogenic fungi under dual culture or mycotoxicity test will be undertaken in this inhibition zone is to be investigated (pandey et. Al; 2005) Pathogenicity of root knot nematode meloidogyne sp. And wilt fungus, fusarium spices separately and in combination in tomato (Abawai and Barker, 1984).For penetration and development studies with the objective of establish the disease complex on common host tomato following treatments were planted in 2 phases i.e. penetration and development in which treatments will be given as: 1)Nematode alone 2).Nematode + fungus 3.)Replications would be maintained for each treatment and observations would be recorded at the intervals of 2,4,8,12,16,20,24 and 28 Interaction studies would be conducted with Meloidogyne incongnita and fusarium oxysporum both singly as well as in combination for which following treatmentwould be uncertaken on tomato. 1)Nematode alone 2)Fungus alone 3)Nematode + fungus simultaneously 4)Nematode followed by fungus after

Table 1.Effect on growth of tomato plant due to different inoculums level of M. *incognita.*

S. No.	Treatments	Shoot Length	Shoot weight (g)		Root weight (g)	
			Fresh	Dry	Fresh	Dry
1	Uninocuted Check	45.25	6.21	1.96	3.25	1.92
2	A/c	45.86	8.10	1.94	3.01	1.16
3	10	43.25	6.23	1.90	3.15	1.12
4	100	41.36	4.25	1.72	4.96	2.01
5	1000	36.23	3.63	1.74	5.01	2.15
6	10,000	23.91	2.28	0.72	5.82	2.92
S. Em ±		3.74	1.96	0.73	0.59	0.35
Mean of three replication.						

10 days. 5)Fungus followed by nematode after 10 days.6)Uninoculated check Five replicated would be maintained for each treatment. Fungus would be in Inoculated at the rate of 2g mycelia/kg soil and nematode would be inoculated taken for disease expression in different treatments. Whenever fungus is involved along with nematode, following observation would be recorded after 60 days of incubation.

1) Plant growth character 2) Reproduction of nematode.

Table 2- Tomato inoculated either with *F. oxysporum f. sp. Lycopersici* or in presence of *M. Incognita* appered as wilt symptoms

S\no	Treatment	Days after Inoculation (DIA)					
		10	20	30	40	50	60
1	F alone	-	-	-	++	++	++
2	N+F	-	++	++	+++	+++	+++
3	N+F10	-	++	++	+++	+++	+++
4	F+N10	-	-	-	++	++	+++
5	Control	-	-	-	-	-	-
Mean of three replications							

III. Observation and Result-

With the objective to integrate an ecofriendly and sustainable component with above tested fungal bioagents for the management of disease complex on tomato karanj oilseed cake having been already reported to be both nematicidal and fungicidal, was selected for the present integrated disease management study.For the management of disease complex caused by root knot nematode, M. incognita and root wilt fungus, F. oxysporum f. sp. lycopersici through the talc based abioformulation of both fungal bioagents (T. viride and P. lilacinus) alone and in integration with karanj cake (P. glabra) were applied through soil (nursery bed) and seeding (bare root dip) treatments. Among eight treatments for both pot and nursery

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bed experiments fungal bioagents in integration with karanj oilseed cake was found most effective in reducing the disease with improving plant growth. In pot experiment carrid out for the management of diseases complex caused by M. icognita and F. oxysporum f. sp. lycopersici talc based treatment ofT. viride and P. lilacinus in integration with karanj oilseed cake was found to be most effective in improving the plant growth with suppressing of disease complex incidences on tomato. Maximum yield of tomato was recorded in the above treatment with minimum
population of root knot nematode and incidence of root wilt causing fungus. Management of disease complex caused by M. icognita and F. oxysporum f. sp. lycopersici on tomato nursery bed with soil treatment through application with fungal bioagents and karanj oilseed cake alone and together were investigated which showed maximum seed germination percent in the treatment comprising of fungal bioagents (T. viride and P. lilacinus) and karanj oilseed cake with very high emergence of healthy seedlings. Minimum mortality of seedlings and root galls were also encountered in this treatment as recorded after 4 weeks and root galls were also encountered in this treatment as recorded after 4 weeks i. e. at the time of transplantation of seedlings.The same 4 weeks old seedlings of tomato
were transplanted after bare root dip treatment in slurry containing fungal bioagents and karanj oil seed cake both alone and together in respective beds at microplot already developed in identified hot spot with initial nematode population between 3 and larvae/g soil and wilt spore load of 3x1010 /gram soil. For microplot or experiement on main field, oilseed cake was applied @200kg/ha two weeks prior to transplantation while talc based fungal bioagents were used @ 1kg/ha at the time of transplantation. Corresponding seedling of tomato from nursery beds were transplanted into main field as above prior to which bare root dip treatment (as mentioned above) with fungal bioagents both alone and together with oilseed cake in a slurry containing jaggery (T. viride and P. lilacinus) separately in accordance
was done for 30 minutes with same design of experiments.

IV. Discussion and Conclusion –

Maximum yield with minimum disease complex incidences were recorded in integrated treatment of fungal bioagents with karanj oilseed cake. In same
treatment, minimum number of gall/plant, number of egg masses/plant, number of eggs/ eggmass and nematode population with high egg parasitisation of egg mass through fungal bioagents were recorded. Minimum colony forming unit (CFU) of root wilt, *F. oxysporum f. sp. lycopersici* was also recorded in same treatment.The outstanding performance of fungal bioagents in integration with karanj oilseed cake is attributed to the strong fungicidal and nematicidal property against both disease in integration with karanj oilseed cake provided maximum defence and nutritional value which improved the general plant vigour as well. It may be due to its manural value of karanj oilseed cake which is enriched with NPK and other constituents. Out of fungal bioagents, *T. viride* having been reported to be a natural source of enzymes and plant hormones, provide additional support to plants for its better growth, development and immunity. In addition, it is also known for minimizing the disease incidence on plants through establishing rhizospheric network of mycelium Through the entire investigations of ecofriendly management of disease complex caused by root knot nematode and root wilt fungus by the integration of fungal bioagentsT. *viride and P. lilacinus* with karanj oilseed cake causing more effective
performance on plant growth and minimizing disease incidences on tomato plants. In this integration each sustainable management component being much compatible to each other would make ideal ecofriendly cost effective management package against the soil borne disease leaving no residual effect to the soil.

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