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Evaluation of Different Control Practices on Damping off Disease of Tomato (*Lycopersicon esculentum Mill.)* Var. Novaday in Pots Condition

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A B S T R A C T

A Pots experiment was conducted for two years (2001-2002) to evaluate the response of different control practices on damping off disease of Tomato (*Lycopersicon esculentum* Mill.) var. Novaday in Pots condition during Ph.D (Plant Pathology) in the Department of Plant Protection, Allahabad Agricultural Institute – Deemed University, Allahabad. The observations recorded at successive stages of plant growth were statistically analyzed for interpretation of results. The effect of seed rates on incidence of damping-off was studied at three seed rates and found that the incidence of damping-off increased progressively with increase in the seed rates but dry neem leaves checked the decrease in disease incidence. The effect of different treatments on incidence of damping-off of seedlings was studied. Of these, soil application of Dry Neem Leaves showed better results in managing damping-off in pots- condition.

Introduction

Tomato (*Lycopersicon esculentum* Mill.) is one of the important sources among all the vegetables throughout the world. It originated in tropical America and cultivated for thousands of years in Mexico and Peru before invasion of the Europeans. Tomato is also popular vegetable crop of India and is a good source of vitamins A, B and C (Khoso, 1994) (1). Tomatoes are the major dietary source of the antioxidant lycopene; Lycopene is a carotenoid that is present in tomatoes, processed tomato products and other fruits.

It is one of the most potent antioxidants among dietary carotenoids. Dietary intake of tomatoes and tomato products containing lycopene has been shown to be associated with a decreased risk of chronic diseases, such as cancer and cardiovascular disease.

Serum and tissue lycopene levels have been found to be inversely related to the incidence of several types of cancer, including breast cancer and prostate cancer. Although the antioxidant properties of lycopene are thought to be primarily responsible for its beneficial effects, evidence is accumulating to suggest that other mechanisms may also be involved.

In this article we outline the possible mechanisms of action of lycopene and review the current understanding of its role in human health and disease prevention. Chronic diseases, including cancer and cardiovascular disease, are the main causes of death in the Western world. Along with genetic factors and age, lifestyle and diet are also considered important risk factors (2, 3).

About 50% of all cancers have been attributed to diet (4). The yield per hectare is low as compared to other parts of the country due to attack of several viral and soil borne diseases, that are responsible for damaging the quantity and quality of the crop every year.

Among the soil borne fungal diseases, damping-off of seedlings and wilt of adult plants are caused by several species of Fusarium, Pythium, Rhizoctonia and Verticillium (Kaprashvili, 1996; Lucas *et al.*, 1997) (5) (6), and is widely distributed throughout the world.

Therefore we evaluated numbers of different seed rates & control practices for the management of damping off disease of tomato *(Lycopersicon esculentum* Mill.) var. Novaday" in pots condition.

Materials and Methods

The present investigation was conducted in the Department of Plant Protection, Allahabad Agricultural Institute – Deemed University, Allahabad During kharif season of 2001-2002 to evaluate the effectiveness of various seed rate and control practices against damping off disease of tomato .Three seed rate S1 (50 No. of seeds/ pot) S2 (40 No. of seeds/pot) & S3(30seeds/pot) and Seven treatments including control were tried in the experiment, 3 x 7 Factorial Randomized Block Design (R. B. D.) was adopted and the analysis of variance (ANOVA) technique was applied.

For drawing conclusion from the data, the calculated values were compared to the tabulated values at 5% level of significance (Fisher, 1955) (7). The research plots size 1mx1m tomato var. Navoday was planted during 27.06.2001and 25.06.2002. Three seed rate and seven treatments including control were tested as fallow.

Seed rate

S_1	-	50 No. of seeds/pot
S_2	-	40 No. of seeds/pot
S_3	-	30 No. of seeds/pot

Treatments

T_0	-	Control
T_1	-	Thiram @ 250 g a.i. g/q seed treatments.
T_2	-	Bavistin (a.i. 50%) @ 1 k a.i./ha at the time of sowing0
T_3	-	Dithane Z-78- @ 0.25% a.i. at 15 and 25 DAS foliar application.
T_4	-	Dry neem leaves @ 600g/m^2
T_5	-	*Beauveriabassiana*@4.0g/m^2
T_6	-	Soil solarization used white polythene of thickness 50 um size (1.5m x1.5m).

Treatment combinations

S_1T_0	S_2T_0	S_3T_0
S_1T_1	S_2T_1	S_3T_1
S_1T_2	S_2T_2	S_3T_2
S_1T_3	S_2T_3	S_3T_3
S_1T_4	S_2T_4	S_3T_4
S_1T_5	S_2T_5	S_3T_5
S_1T_6	S_2T_6	S_3T_6

The treatments thiram used for seed treatment, Dithane Z-78 for foliar application at 15 and 25 days after sowing, carbendazim, *Beauveria bassiana* and dry neem leaves for soil treatment. Finally the leaves were graded according to the percent leaf area affected by damping-off. The infection index was calculated by using the formula suggested by James *et al.*, (1971) (8), Singh R. S. (1972) (9), Introduction of Principles of Plant Pathology, Oxford and IBH Publishing Company, New Delhi).

Results and Discussion

Effect of different treatment on incidence of damping off disease on differed seed rates viz., S_1 (50 seeds/pot), S_2 (40 seeds/pot) and S_3 (30 seeds/pot). Maximum damping-off was observed after 15 days of sowing in S_1 (2.14), S_2 (1.83) and S_3 (1.59), in year 2001 and year 2002 maximum damping-off was observed in S_1 (2.33) followed by S_2 (2.75) and S_3 (1.59), respectively (Table 1 and Fig.1). Effect of different seed rates on incidence of damping of disease in pots at 20 days after sowing damping-off significantly differed among all the seed rates viz., S_1 (50 seeds/pot), S_2 (40 seeds/pot) and S_3 (30 seeds/pot) from one another.

Maximum damping-off was observed in S_1 (3.40) followed by S_2 (3.28) and S_3 (3.15)in year 2001, Year 2002 damping-off significantly differed amongst all the seed rates viz., S_1 (50 seeds/pot), S_2 (40 seeds/pot) and S_3 (30 seeds/pot) from one another. Maximum damping-off was observed in S_1 (2.44) followed by S_2 (2.42) and S_3 (2.33), respectively (Table 2 and Fig. 2). The general effect of seed rates of tomato was found to be significant in respect of disease incidence of damping-off.

The treatments and the interaction in respect of incidence of damping-off were significant. Disease incidence in treatments T_4 (Dry Neem Leaves @ 600 g/m^2), T_1 (seed treatment with Thiram @ 250 g/q) and T_6 (soil solarization) at seed rate of S_1 (50 seeds/Pot) and S_2 (40 seeds/pot) whereas incidence of damping-off in treatment T_4 (0.00) and T_1 (0.96) and S_3 (1.17) only at seed rate of S_3 (30 seeds/pot) was found significant when compared with different combinations at seed rate of S_2 (40 seeds/pot) and S_3 (30 seeds/pot).in year2001 and 2002disease incidence of damping-off in treatments T_4 (Dry Neem Leaves @ 600 g/m^2) and T_1 (seed treatment by Thiram @ 250 g/q) and T_6 (soil Solarization) at the seed rate of S_3 (30 seeds/Pot) were found significant when compared with other combination at the seed rate.

The use of conventional pesticides, including fungicides, has come under increasing public scrutiny in many countries especially in the European Union (Bourguet and Guillemaud 2016; Lamichhane *et al.*, 2016) (10) (11). In addition, increasing reports of pest resistance development to pesticides have become an issue, thereby increasing risks of pest management failure with potential threats of economic losses for farmers (Onstad 2013; Bourguet and Guillemaud 2016) (12) (13).

Table.1 Disease incidence of damping-off at 15 DAS in Pot conditions (A) Interaction Effect

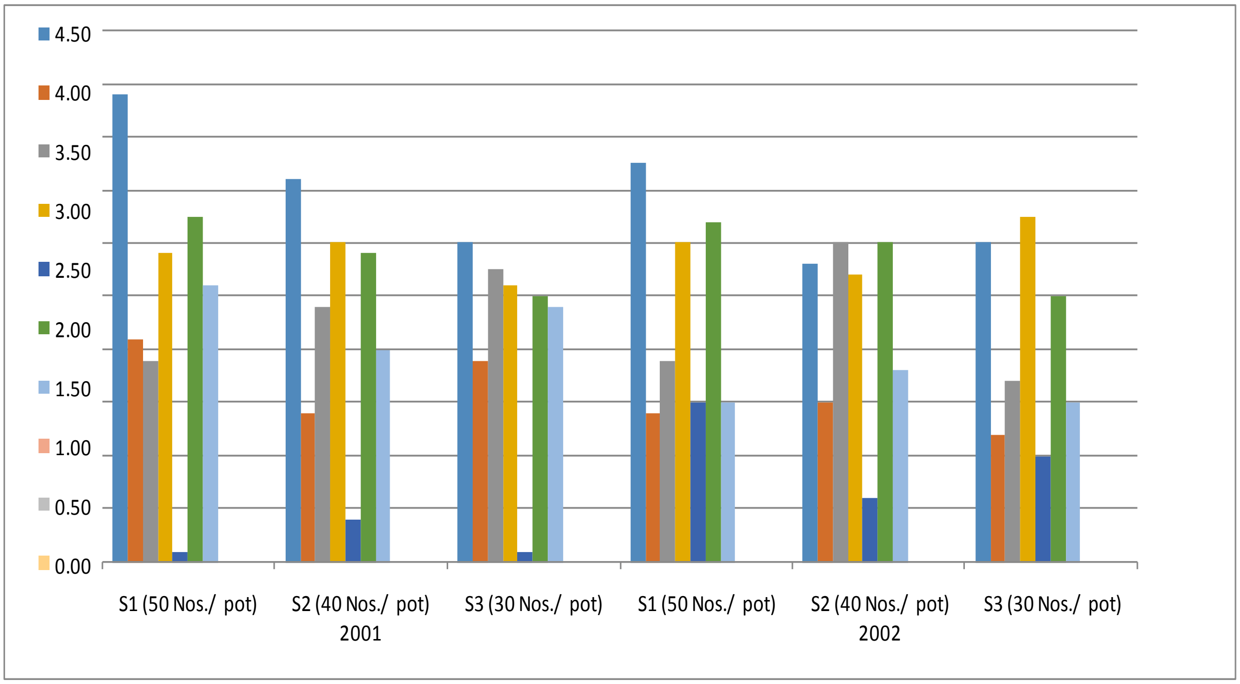
Treatment		2001			2002		
		Seed Rate			Seed Rate		
		S_1 (50Nos./ pot)	S_2 (40Nos./ pot)	S_3 (30 Nos./ pot)	S_1 (50 Nos./ pot)	S_2 (40Nos./ pot)	S_3 (30Nos./ pot)
T_0	Control	3.47	2.73	2.97	3.71	2.83	3.04
T_1	Thiram	1.22	1.06	0.96	1.04	0.68	0.79
T_2	Bavistin	2.18	1.71	1.28	2.35	1.16	1.30
T_3	Dithane Z-78	3.24	2.20	2.77	3.13	2.08	2.74
T_4	Dry Neem Leaves	0.34	0.46	0.00	0.56	0.56	0.00
T_5	*Beauveria bassiana*	2.30	2.55	2.01	3.32	2.68	2.11
T_6	Soil Solarization	2.26	2.09	1.17	2.19	2.28	1.59
		at 5% level = 1.70			C. D. at 5% level = 1.78		

(B) Individual Effect

		2001				2002			
		S_1	2.14	T_0	3.06	S_1	2.33	T_0	3.19
		S_2	1.83	T_1	1.08	S_2	2.75	T_1	0.84
		S_3	1.59	T_2	1.72	S_3	1.65	T_2	1.60
				T_3	2.73			T_3	2.65
				T_4	0.27			T_4	0.37
				T_5	2.29			T_5	2.70
				T_6	1.84			T_6	2.20
	C. D. at 5% Level	S = 0.64	T = 0.98			S = 0.67	T = 1.02		
	C. D. at 5% Level	(2001 - 2002)	0.92						

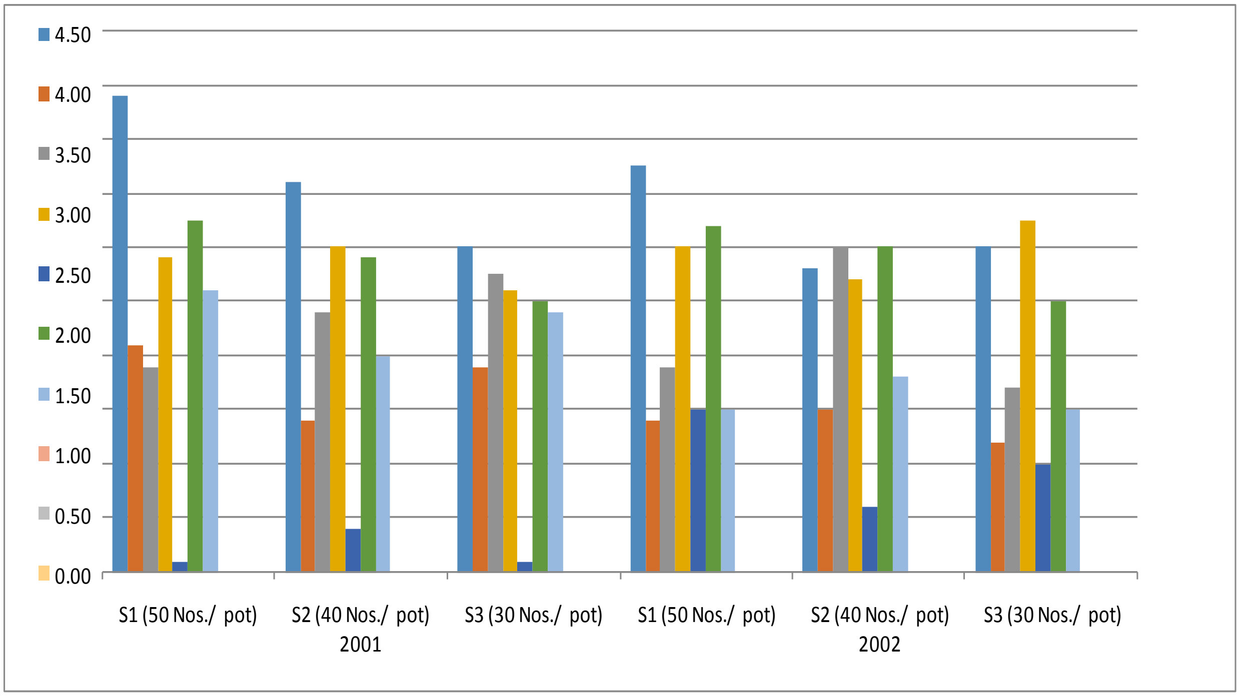
Table.2 Disease incidence of damping-off at 20 DAS in Pot conditions (A) Interaction Effect

Treatment			**2001**			**2002**			
			Seed Rate			**Seed Rate**			
			S_1 (50Nos./ pot)	**S_2 (40Nos./ pot)**	**S_3 (30 Nos./ pot)**		**S_1 (50 Nos./ pot)**	**S_2 (40Nos./ pot)**	**S_3 (30Nos./pot)**
T_0	Control		4.96	5.81	5.40		3.63	3.12	3.01
T_1	Thiram		2.27	1.31	1.59		1.93	1.58	2.07
T_2	Bavistin		3.29	2.31	3.25		2.86	2.77	2.84
T_3	Dithane Z-78		4.22	5.10	4.32		3.53	3.33	2.96
T_4	Dry Neem Leaves		1.43	0.56	0.71		0.71	0.79	0.00
T_5	*Beauveria bassiana*		4.17	4.29	3.50		2.49	2.88	2.50
T_6	Soil Solarization		3.49	3.60	3.26		1.92	2.46	2.38
				at 5% level = 1.92			**C. D. at 5% level = 1.07**		
(B) Individual Effect									
		S_1	3.40	T_0	5.39	S_1	2.44	T_0	3.45
		S_2	3.28	T_1	1.72	S_2	2.42	T_1	1.86
		S_3	3.15	T_2	2.95	S_3	2.33	T_2	2.82
				T_3	4.55			T_3	3.27
				T_4	0.90			T_4	0.50
				T_5	3.90			T_5	2.62
				T_6	3.45			T_6	2.25
	C. D. at 5% Level		S = 0.72	T = 1.11			S = 0.40	T = 0.61	
	C. D. at 5% Level		(2001 - 2002)	1.13					



T0 (Control) T1 (Thiram) T2 (Bavistin)
T3 (Dithane Z-78) T4 (Dry Neem Leaves) T5 (*Beauveria bassiana)*
T6 (Soil Solarization)

Fig.1 Disease incidence of damping-off at 15 DAS in Pot condition



T0 (Control) T1 (Thiram) T2 (Bavistin)
T3 (Dithane Z-78) T4 (Dry Neem Leaves) T5 (*Beauveria bassiana)*
T6 (Soil Solarization)

Fig.2 Disease incidence of damping-off at 20 DAS in Pot conditions

Chemical fungicides can also cause phytotoxicity on crops and foliage plants, which is another drawback of their use (Dias 2012) (14). Then present findings corroborated with the result of the Singh and Singh (1982) (15) recorded that neem cakes when applied in soil reduced the wilt of pigeon pea. This amendment was found to affect bacterial and fungal population in rhizosphere of wheat and also the behavior of pathogen. Singh *et al.,* (1983)(16) reported the effect of green manure plant residues on the population of *Pythium aphanidermatum* in soil samples.

When plated by using selective medium, reduced the population of *Pythium aphanidermatum* in the soil. Shenoi *et al.,* (1993) (17) reported ten botanicals were evaluated *in vitro* by paper disc and aqueous leaf extracts methods against *Pythium aphanidermatum, Alternaria alternata, Azadirachta indica* and *Lawsonia inermis,* effectively inhibited the radial growth of mycelia sporulation and germination of species, indication broad spectrum fungicidal potentiality in sick microplots. All the five neem products tested, controlled damping off caused by *Pythium aphanidermatum* upto 25 - 30 days.

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