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COST BENEFIT RATIO OF INFECTED TOMATO YIELD BY FUSARIUM WILT DISEASE

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ABSTRACT

The present investigation was carried out under Bio-net house conditions in the pots in SHIATS, Allahabad, India to evaluate number of fruits per plant and five fruits per replicate (g) and cost benefit ratio of yield by using solarized and unsolarized soil, Neem cake powder and carbendazim 50 % W.P with six treatments and five replications. The results from the study showed that the treatments Carbendazim followed by Neem cake with Carbendazim were significantly increased in the number of fruits per plant (8.40, 8.15) respectively at 150 days**,** the treatments Carbendazim followed by Neem cake were significantly increased in the five fruits per replicate (g) (148.70, 143.80 g) respectively at 125 days, the treatments Carbendazim with solarized and unsolarized soil followed by Neem cake were recorded the highest cost benefit ratio and incremental cost benefit ratio with (1:4.02, 1:2.57 and 1:2.29) respectively**.**

KEYWORDS: Tomato Soil, Solarized Soil**,** Carbendazim**,** Neem Cake and Solarized

INTRODUCTION

Tomato (*lycopersicon esculentum* Mill) is one of the most important vegetables in the world, ranking second in importance to potato in many countries. It is a warm season crop. It is grown as an off-season vegetable in the hills of India and farmers fetch good income after sending their produce in the plains from June to September. Tomato supplies vitamin C and adds variety of colors and flavors to the foods. The fruits are eaten raw or cooked. Large quantities of tomatoes are used to prepare soup, juice, ketchup, puree, pickle, paste and powder **(Choudhary 2002)**. Vegetable production can be adopted as a strategy for improving livelihood and alleviating the nutritional status of the people. Tomato is one of the most important vegetable crops. It is the world's largest vegetable crop after potato and sweet potato but it tops the list of canned vegetables. It is an important condiment in most diets and a very cheap source of vitamins. Tomato is a good source of vitamins A, C and E and minerals that are very good for body and protect the body against **(Olaniyi 2010).** Fusarium wilt of tomato caused by *Fusarium oxysporum* f. sp. *lycopersici* (Sacc.) Snyder and Hansen is recognized as one of the most devastating disease in major tomato growing regions worldwide **(Walker, 1971; Beckman, 1987; Abdel-Monaim, 2012)**. The vegetable growers suffer more than 25.14 – 47.94 % crop losses due to Fusarium wilt of tomato in Uttar Pradesh **(Enespa and Dwivedi, 2014).** The neem tree (*Azadirachta indica* A. Juss.) is a tropical evergreen tree (deciduous in drier areas) native to Indian sub-continent **(Anonymous, 1985; Roxburgh, 1874).** It has been used in Ayurvedic medicine for more than 4000 years due to its medicinal properties. Neem is called arista' in Sanskrit a word that means 'perfect, complete and imperishable'. Most of the plant parts such as fruits, seeds, leaves, bark and roots contain compounds with proven antiseptic, antiviral, antipyretic, anti-inflammatory, antiulcer and antifungal uses. It is commonly called 'Indian lilac' or 'Margosa' and belongs to the family Meliaceae. The Persian name of neem is 'Azad- Darakth- E-Hind' which means 'Free tree of India'. Neem is considered to be a part of India's genetic diversity **(Anonymous, 2006; Sateesh, 1998).** Neem tree is the most researched tree in the world **(Thakkar, 1997)** and is said to be the most promising

tree of 21st century. It has great potential in the fields of pest management, environment protection and medicine. Neem is a natural source of insecticides, pesticides and agrochemicals, Azadirachtin is the main ingredient used to manufacture bio pesticides **(Brahmachari, 2004).** Soil solarization is a natural, hydrothermal process of disinfesting soil of plant pests that is accomplished through passive solar heating **(Stapleton, 2000**).The present investigation was undertaken to evaluate Cost benefit ratio of yield by using Neem cake, carbendazim and solarized soil against soil borne pathogen.

MATERIALS AND METHODS

The pots experiment was conducted during 2013-2014 in the Bio-net house, SHIATS, Allahabad, India.The experiment was laid out in CRD with six treatments and five replications, the pots soil were made sick by adding mass multiplied culture of *F. oxysporum* f. sp. *lycopersici* on sorghum before planting of susceptible local seed tomato variety (CO-3) were collected from IIVR (Indian Institute of Vegetable Research), Varanasi, Uttar Pradesh, India. Number and weight of five fruits per replicate and Cost benefit ratio of yield were measured at 150 days of intervals after germination.

Isolation and Purification of Pathogen

Infected vascular tissues from stem and root regions of tomato plants showing wilt symptoms were collected separately from farmer's field. Tissue bits were surface sterilized with mercuric chloride (0.1%) for 20-30 seconds and subsequently three washings with sterile distilled water. Then, they were placed on potato dextrose agar (PDA) medium separately and incubated at the laboratory conditions at 25 ± 3o C for five days. The fungi were purified separately by transferring the tip of the mycelia into PDA slants and maintained as stock cultures for further studies **(Raithak and Gachande, 2013).**

Inoculation Methods of Carbendazim and Neem Cake

The solarized and unsolarized soil was mixed with FYM @ 100 g / pot, carbendazim 50 % W.P was applied @ 2 kg a.i / ha, whereas Neem cake powder was applied @ 10 g/ pot**.** Seven days after germination, ten seeds of tomato variety (CO-3) were sown per pot; four seedlings per pot were maintained in each treatment.

RESULTS AND DISCUSSIONS

The result of Table 1 revealed that significantly increased in the number of fruits per plant in the treatments T_5 (3.25),T_4 (3.15),T_2 (2.80),T_3 (2.35) and T_6 (1.20) after 90 days and the treatments T_3 (7.50),T_2 (6.25),T_5 (5.75), T_4 (5.25) and T_6 (4.35) after 120 days and the treatments T_6 (8.75), T_3 (8.40), T_4 (8.15), T_2 (7.50) and T_5 (7.00) after 150 days as compared with T_1(0.00), the weight of five fruits per replicate (g) of tomato plants is significantly increased in the treatments T_6 (158.60 g), T_3(148.70 g), T_2 (143.80 g),T_4 (136.90 g)and T_5 (132.50 g) as compared with T_1(0 g). Similar results were finding by **Kimaru *et al.* (2004)** reported that Tomato plants grown in soil amended with Neem Kernel Cake Powder (NKCP) had the highest mean fruit number with significantly increased compared with control had the lowest mean fruit number. **Abed *et al.* (2013)** observed that significantly increased the yield per plant (g) of tomato plants in treatments Neem cake powder and carbendazim as compared with Control.

Table 1: Effect of Neem Cake and Carbendazim Using Solarized Soil on the Number and Weight of Fruits /Plant of Tomato

Treatments		Number of Fruits/Plant			Weight of Five Fruits/Replicate (G)
		90 DAT	120 DAT	150 DAT	125 DAT
T_1	Non solarized soil +F.	0.00	0.00	0.00	0.00
T_2	Solarized soil + Neem cake + F.o	2.80	6.25	7.50	143.80
T_3	Solarized soil + Carbendazim +F.o	2.35	7.50	8.40	148.70
T_4	Solarized soil + Neem cake + Carbendazim +F.o	3.15	5.25	8.15	136.90
T_5	Non solarized soil + Carbendazim +F.o	3.25	5.75	7.00	132.50
T6	Solarized soil + tomato plant	1.20	4.35	8.75	158.60
C. D. (P = 0.05)		1.905	2.178	2.101	26.538

CONCLUSIONS

Cost Benefit Ratio

The data in respect of agronomical practices were the same for all treatments 25161 Indian rupees / ha (Table 2) and economics of treatments was different for each treatment (Table 3). The net return and cost benefit ratio and incremental cost benefit ratio has been worked out and presented in (Table 4).Maximum net return (113329 Rs/ha) was recorded with T_6 followed by (105945 Rs/ha) with T_3, (82651 Rs/ha) with T_2, (67819 Rs/ha) with T_5, (67697 Rs/ha) with T_4. The minimum net return is observed in T_1 (0 Rs/ha). The maximum cost benefit ratio and incremental cost benefit ratio were obtained with T_6 (1:4.50), followed by T_3 (1:4.02), T_5 (1:2.57), T2 (1:2.29), T4 (1.1.86).The minimum cost benefit ratio and incremental cost benefit ratio in T_1 (0).

Table 2: Cost of Agronomical Practices of Cultivation/ha

Sr. No.	Particular	Requirement	Rate/Unit Rs.	Cost (Rs)
(A)	**Land Preparation**			
I.	Ploughing	3 Hours	500 Rs/Hours	1500
II.	Harrow	3 Hours	500 Rs/Hours	1500
III.	Layout of field	10 Labours	150 Rs/Labour	1500
(B)	**Manures and Fertilizer**			
I.	FYM	20 Tons	100 Rs /qu.	20000
II.	Urea	193 Kg	7 Rs/Kg	1351
III.	DAP	174 Kg	15 Rs/Kg	2610
IV.	Labour	6 Labours	150	900
(C)	**Seed Sowing**			
I.	Seed material	0.5 Kg	1500 Rs/Kg	750
II.	transplanting and levelin	12 Labours	150	1800
(D)	**Weed Management**	15 Labour X 3 Time	150 Rs/Labour	6750
(E)	**Harvesting**	30 Labours	150 Rs/Labour	4500
(F)	**Total Cost of Cultivation**			**25161**

Table 3: Economics of Treatments

Sr. No.	Treatment	Use of Neem Cake and Carbendazim	Cost of Neem Cake and Carbendazim	Total Cost of Neem Cake and Carbendazim(Rs)	Use of 3 Labours 2 Time Spray	Total Labours Cost (Rs)	Total Cost of Treatment (Rs)
T_1	Non solarized soil +F.o	0	0	0	0	0	0
T_2	Solarized soil + Neem cake + F.o	200 Kg/ha	50 Rs/ Kg	10000	150 Rs/Labour	900	10900
T_3	Solarized soil + Carbendazim F.o	0.5 Kg/ha	560 Rs/Kg	280	150 Rs/Labour	900	1180
T_4	Solarized soil + Neem cake + Carbendazim F.o	200+ 0.5 Kg/ha	50+ 560 Rs/ Kg	10280	150 Rs/Labour	900	11180
T_5	Non solarized soil + Carbendazim +F.o	0.5 Kg/ha	560 Rs/Kg	280	150 Rs/Labour	900	1180
T_6	Solarized soil + tomato plant	0	0	0	0	0	0

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APPENDIX

Table 4: Cost Benefit Ratio

Treatment		Quantity of Neem Cake and carbendazim /ha.	Price rate of Neem Cake and carbendazim Rs/kg	M Treatment Cost RS /ha. (M)	N Agronomical Practices Cost Rs/ha (N)	A Total Cost Rs /ha. (A)=M+N	D Yield Ton /ha.(D)=no of Plants /ha (37000) × Yield / Plant	E Increase in Yield Over Control (ton/ha)(E)=(D) of Treatments-(D) of Control	F Price of Yield Rs/Ton (F)	G Total Value of Yield Rs/ha (G)=D × F	B Value of Increased Yield RS / ha (B) = E × F	H Net Return Rs/ha (H)= G - A	O Cost Benefit Net Return/Total Cost (O)=H/A	C Incremental Benefit Rs/ha (C) = B-A	Incremental Cost Benefit Ratio (ICBR) = C/A
T_1	non S.S + *F.o*	0	0	0	25161	25161	0	0	22000	0	0	0	0	0	0
T_2	S.S + N.c + *F.o*	200 Kg/ha	50 Rs/Kg	10900	25161	36061	5.396	5.396	22000	118712	118712	82651	1:2.29	82651	1:2.29
T_3	S.S + C + *F.o*	0.5 Kg/ha	560 Rs/Kg	1180	25161	26341	6.013	6.013	22000	132286	132286	105945	1:4.02	105945	1:4.02
T_4	S.S + N.c + C + *F.o*	200+ 0.5 Kg/ha	50+ 560 Rs/Kg	11180	25161	36341	4.729	4.729	22000	104038	104038	67697	1.1.86	67697	1.1.86
T_5	non S.S + C + *F.o*	0.5 Kg/ha	560Rs/Kg	1180	25161	26341	4.280	4.280	22000	94160	94160	67819	1:2.57	67819	1:2.57
T_6	S.S + tomato plant	0	0	0	25161	25161	6.295	6.295	22000	138490	138490	113329	1:4.50	113329	1:4.50

Solarized soil = S.S

Fusarium oxysporum = F.o

Neem cake = N.c

Carbendazim = C