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CONTROL OF WILT INCIDENCE USING FUNGICIDES AND BIOAGENTS IN CHICKPEA

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ABSTRACT

Chick pea is the most important pulse crop grown all over India in *rabi* season. Wilt caused by *Fusarium oxysporum* f. sp. *ciceri* is the most serious disease of chickpea in Vidharbha region, which is soil and seed borne. Heavy inoculum in soil and favorable environment condition results in the death of infected plant and leads to total yield loss. In this study, seed treatment with three fungicide, (carboxin , thiram and carbendazim) and two bioagents (*Trichoderma viride, Trichoderma harzianum*) in different combinations were tried to manage *Fusarium oxysporum* f. sp. *ciceri* causing chickpea wilt at Plant Pathology section, College of Agriculture, Nagpur during 2014-2015. The results on wilt incidence recorded at 30, 45 and 60 DAS due to seed treatment with fungicides and bioagents indicated that all the treatments were significantly superior over control. Average incidence of wilt was recorded to be low in (T3) seed treatment with Carboxin + thiram + *T. viride* @ 2.5 g + 6 g kg^{-1} (13.13%), followed by (T4) seed treatment with carbendazim + thiram @ 3g kg^{-1} (13.41%) and (T2) seed treatment with carbendazim @ 1 g kg^{-1} (14.38 %) and were found superior over the control (40.67 %). Seed treatment with bioagents *T. viride* recorded low incidence of wilt over control but were higher over fungicide treatments. Per cent wilt reduction over control was found to be highest in T3 (62.23 %) followed by T4 (61.36 %) and T2 (60.17 %). It is inferred from this study that seeds treated with Carboxin + Thiram + *T.viridie* @ 2.5 g + 6 g kg^{-1} can be used for controlling the wilt in chickpea.

(Key words: Wilt managment, chickpea, fungicide, bioagents)

INTRODUCTION

Chick pea (*Cicer arirtinum* L.) is one of the most important pulse crop comes under leguminosae family. Chickpea is a source of human food and animal feed, it also helps in the management of soil fertility, particularly in dry lands and conserve natural resources which are essential for sustainable agriculture. Chickpea crop is associated with various diseases, *viz.,* wilt (*Fusarium oxysporum* f. sp. *ciceri*), root and stem rot (*Rhizoctonia solani*, *Sclerotium rolfsi*), and blight (*Ascochyta rabie*). Out of these diseases, *Fusarium* wilt is causing a serious problem in chickpea production. Soil borne fungal pathogen are major threats to cereals and pulses which are responsible for heavy losses annually. Chickpea wilt caused by *Fusarium oxysporum* f. sp. *ciceri* account for 10 to 100 per cent yield losses annually in India depending on varietal susceptibility and agro climatic condition (Chand and Khirbat, 2009). Chickpea wilt disease is seed and soil borne and persist for long years in soil. Management of disease by single approaches is difficult and uneconomic. Hence, adequate attention needs to be paid on management of chickpea wilt. Considering the above facts and seriousness of disease, the present study was undertaken to integrate different methods involving use of fungicides and bioagents for management of chickpea wilt.

MATERIALS AND METHODS

The study on "Control of wilt incidence using fungicides and bioagents in chickpea" was conducted at Plant Pathology Section, College of Agriculture, Nagpur during 2014-15. The culture of *Fusarium oxysporum* f. sp. *ciceri* used in this study was isolated from infected Chickpea field by the method given below.

Isolation and purification of *Fusarium oxysporum* f. sp. *Ciceri* : Chickpea plants showing yellowing, drooping of leaves, was collected from *fusarium* wilt sick plot, Plant Pathology research field, College of Agriculture, Nagpur. Test pathogen was identified as *Fusarium oxysporum* f. sp. *Ciceri* on the basis of its microscopic observation. Pathogenicity test was carried on Chaffa 816 in sick pot and Koch's postulates were proved.

Preparation of mass inoculum of *Fusarium oxysporum* f. sp. *ciceri.* :The sorghum grains were soaked partially for one hour in warm water and then spread on the clean blotting paper for air drying. About 300 g were then filled in each 1000 ml flask with 10 ml water and autoclaved for 30 minutes at 15 ibs psi pressure. The mycelium bit of pure culture of *Fusarium oxysporum* f. sp. *Ciceri* were inoculated under aseptic condition in those flask containing grains to facilitate early growth of the fungus. The grains

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turn whitish due to mycelial growth of the test fungus. These mass inoculums were spread in the experimental sick plot before two weeks of sowing.

Seed treatments: The bioagents *i.e. Trichoderma viride* and *Trichoderma harzianum* were obtained from Department of plant pathology, College of Agriculture, Nagpur and fungicides *i.e.* Carboxin, thiram and Carbendazim were used for seed treatments. Seeds were treated with fungicides and bioagents as per the doses and combinations given below.

Treatments	Fungicides / bioagents	Fungicide (Dose kg^{-1})
T_1	Seed treatment with carboxin + thiram	2.5 g
T_2	Seed treatment with carbendazim	1 g
T_3	Seed treatment with carboxin + thiram + *T. viride*	2.5 g + 6 g
T_4	Seed treatment with carbendazim + thiram (1+2)	3 g
T_5	Seed treatment with *Trichoderma viride*	4 g
T_6	Seed treatment with *Trichoderma harzianum*	4 g
T_7	Control	

Experiment was carried out in RBD with three replications and periodic observations for wilting incidence were recorded at 30, 45 and 60 DAS. Per cent disease incidence was then calculated using the following formula.

$$\text{Per cent disease incidence} = \frac{\text{Number of infected plants}}{\text{Total number of plants observed}} \times 100$$

The data were then subjected to statistical analysis as per method described by Panse and Sukhatme (1967) after arcsine transformation.

RESULTS AND DISCUSSION

Three fungicides and two bioagents were evaluated for their efficacy against seed germination. The data so obtained are presented in table 1 and fig. 1. It is evident from data that maximum germination (92.66 %) was observed in seed treatment of carboxin + thiram + *Trichoderma viride*, followed by carbendazim + thiram (90.66 %) and carbendazim (89.33). The above results are in agreement with the findings of Shahid *et al.* (2011). They performed that *T. viride* + vitavax was found to be significantly superior and effective seed treatment in increasing 14.47 per cent more germination of chickpea over control followed by vitavax (97.66 %). *Trichoderma viride* increased (96 %) seed germination. Kiran Singh *et al.* (2004) found that carbendazim and thiram in combination greatly increased the germination of gram seed. Dubey *et al.* (2007) found that integration of *Trichoderma harzianum* (10^6spore ml^{-1} 10 g seed) and carboxin (2 g kg^{-1}) seed treatment was best to enhance seed germination by 12 to 14 per cent and reduced wilt incidence by 44.1 to 60.3 per cent during experimentation. Rehman *et al.* (2013) also found that chickpea treated with carbendazim increased 6.73 per cent and *Trichoderma viride* increased 7.20 per cent seed germination.

The data on incidence of wilt recorded in all treatments at 30, 45 and 60 DAS are presented in table 1. The data on wilt incidence recorded at 30 DAS (Fig.2) among all treatments, revealed that the disease incidence ranged from 5.93 % to 26.23 %. Among all the treatments (T3) seed treatment with carboxin + thiram + *Trichoderma viride* showed less disease incidence i.e. (5.93%) followed by (T4) seed treatment with carbendazim + thiram (6.04%), and (T2) seed treatment with carbendazim (7.26 %). Among bioagent (T5) seed treatment with *Trichoderma viride* (9.07%) followed by (T6) seed treatment with *Trichoderma harzianum* (10.86 %) showed less incidence of disease. Maximum disease incidence occured in control (26.23 %). The above results are in agreement with Kamdi *et al.* (2012) who found that chickpea seed treated with carbendazim showed minimum wilt incidence (6.02 %) followed by seed treated with *Trichoderma viride* (7.05 %) over the control (20.40 %). Rajput *et al.* (2010) also reported that carbendazim + thiram @ 2 + 1 g kg^{-1} controlled wilt (47.22 %). Nikam *et al.* (2007) observed that *Trichoderma viride* controlled wilt (66.67 %).

At 45 DAS, the wilt incidence recorded among treatments varied from 11.86 per cent to 38.59 per cent (Fig.3). The lowest incidence was observed in (T3) seed treatment with carboxin + thiram + *Trichoderma viride* (11.86 %), (T4) seed treatment with carbendazim + thiram (12.10 %) and (T2) seed treatment with carbendazim (13.10%) and these treatments were at par with each other and significantly superior over the control (38.59 %). Similar to these results, Kamdi *et al.* (2012) reported that lowest disease incidence occured when chickpea seeds were treated with carbendazim (10.40 %) followed by seeds treated with *Trichoderma viride* (13.15%) over the control (28.20%). Shabir *et al.* (2013) also reported minimum wilt incidence (8 %) when chickpea seeds were treated with carbendazim over the control.

At 60 DAS, the wilt incidence (Fig.4) recorded among treatment varied from 21.60 per cent to 57.20 per cent. The lowest incidence was recorded in (T3) seed treatment with Carboxin + thiram + *T. viride* (21.60%), followed by (T4) seed treatment with carbendazim + thiram (22.10%) and (T2) seed treatment with carbendazim (22.78 %) and these treatments were at par with each other and significantly superior over the control (57.20 %). Among bioagent (T5) seed treatment with *T. viride* recorded low

Table 1. Effect of fungicides and bioagents on germination per cent and wilt incidence of chickpea at 30, 45 and 60 DAS

Sr. No.	Treatments	Germination per cent	Wilt incidence (%)				%Wilt reduction over control
			30 DAS	45 DAS	60 DAS	Average	
1	Carboxin + thiram	84.33 (66.95)	8.50 (2.91)	14.33 (22.24)	23.79 (29.19)	15.54	58.40
2	Cabendazim	89.33 (70.95)	7.26 (2.69)	13.10 (21.20)	22.78 (28.50)	14.38	60.17
3	Carboxin + thiram + *T.viride*	92.66 (74.32)	5.93 (2.43)	11.86 (20.14)	21.60 (27.69)	13.13	62.23
4	Cabendazim + thiram	90.66 (72.33)	6.04 (2.45))	12.10 (20.34)	22.10 (28.04)	13.41	61.36
5	*Trichoderma viride*	84.00 (66.44)	9.73 (3.11)	15.03 (22.80)	24.11 (29.40)	16.29	57.84
6	*Trichoderma harzianum*	82.00 (64.91)	10.86 (3.29)	15.76 (23.39)	25.16 (30.10)	17.26	56.01
7	Control	74.66 (59.78)	26.23 (5.12)	38.59 (39.40)	57.20 (49.14)	40.67	—
	'F' test	Sig.	Sig	Sig	Sig		
	S.E. (m) ±	0.84	0.07	0.32	0.32		
	C.D. (P= 0.01)	3.51	0.25	1.27	1.21		

**Figures in parenthesis arscine transformed values.*

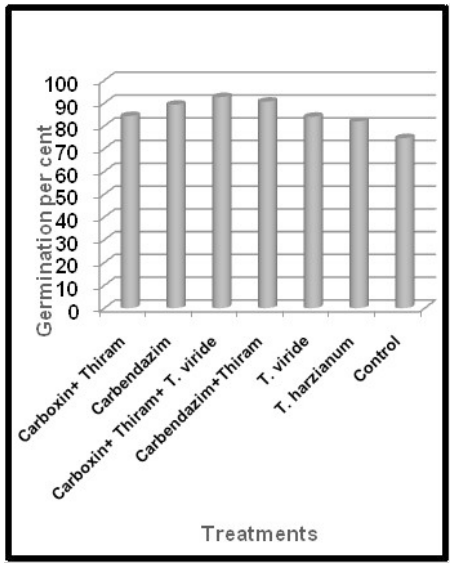

Fig 1. Effect of different fungicides and bioagents on seed germination

Plate 1. Experimental view

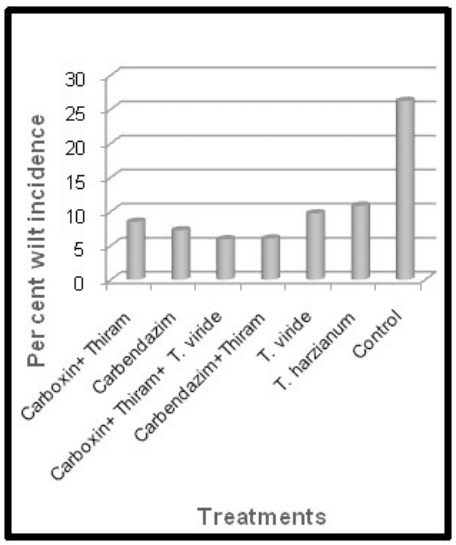

Fig 2. Effect of fungicides and bioagents on wilt of chickpea at 30 DAS

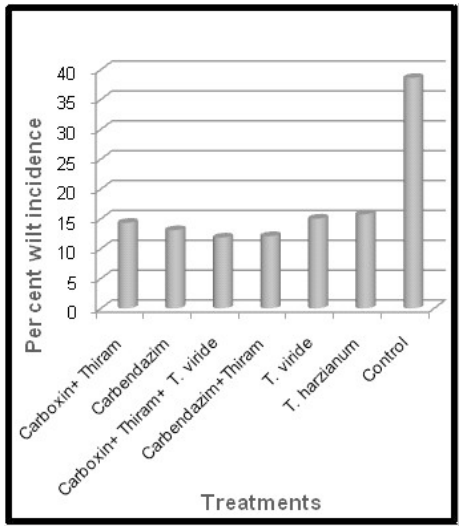

Fig 3. Effect of fungicides and bioagents on wilt of chickpea at 45 DAS

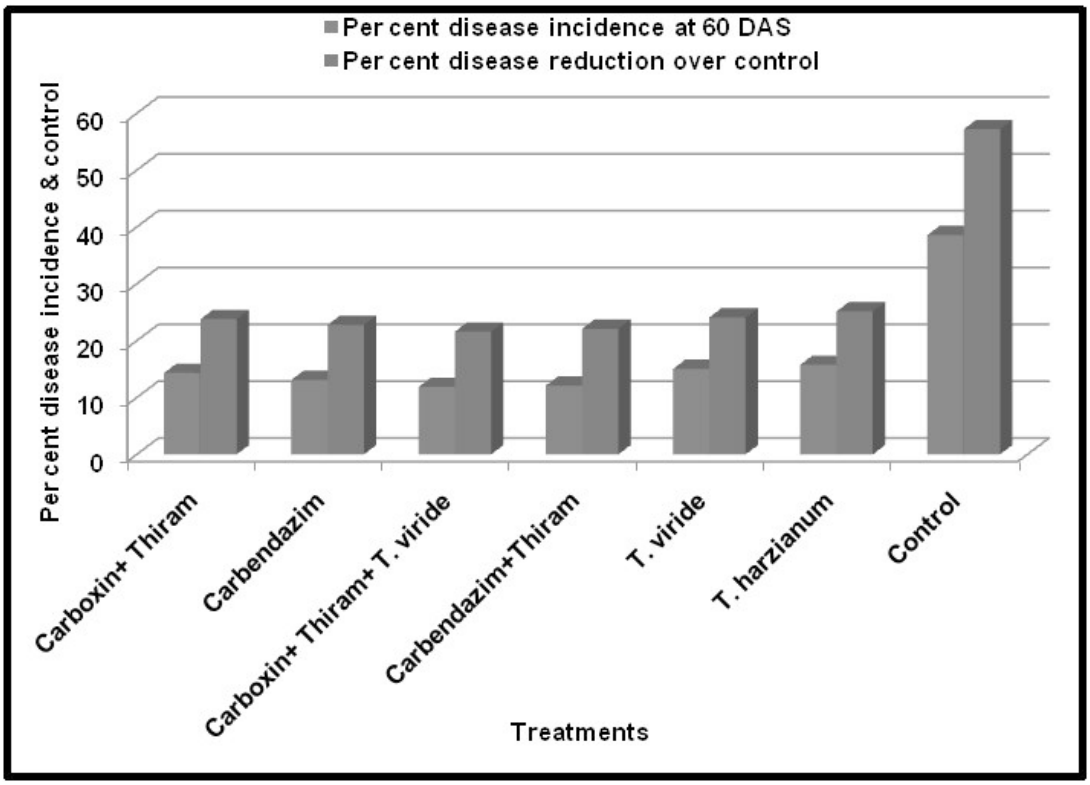

Fig 4. Effect of fungicides and bioagents on wilt of chickpea at 60 DAS

wilt incidence (24.11%). These results are in agreement with findings of Nikam *et al.* (2007), who reported that seed treatment with carbendazim resulted in minimum wilt incidence (38.10) over the control. Rajput *et al.* (2010) reported that seed treatment with thiram + carbendazim @ 2 g+ 1 g kg^{-1} recorded minimum wilt disease incidence (17.78 %) over the control (33.69 %). Kamdi *et al.* (2012). reported that seed treatment with carbendazim showed minimum wilt disease incidence (26.38%) followed by *Trichoderma viride* (28.19 %) and showed reduced wilting per cent over control (60.01 %). Shabir *et al.* (2013) also reported that seed treatment with carbrndazim showed minimum wilt disease incidence over the control.

The data on wilt incidence recorded at 30, 45 and 60 DAS due to seed treatment with fungicides and bioagents indicated that all the treatments were significantly superior over control. Average incidence of wilt was recorded to be low in (T3) seed treatment with Carboxin + thiram + *T. viride* (13.13%), followed by (T4) seed treatment with carbendazim + thiram (13.41%) and (T2) seed treatment with carbendazim (14.38 %) and these treatments were superior over the control (40.67 %). Among bioagents seed treatment with *T. viride* recorded low incidence of wilt (16.29 %) and was also superior over control. Per cent wilt reduction over control was found to be highest in T3 (62.23 %) followed by T4 (61.36 %) and T2 (60.17 %).

In the present investigation seed treatment with Carboxin + Thiram + *T.viridie* @ 2.5 g + 6 g kg^{-1} was found most effective in reducing the incidence of wilt at different intervals like 15, 30 and 45 DAS. The highest per cent wilt reduction over control was also recorded in treatment (T3) i.e. seed treatment with Carboxin + Thiram + *T.viridie* @ 2.5 g + 6 g kg^{-1}. Thus, it is inferred from the present study that seeds treated with Carboxin + Thiram + *T.viridie* @ 2.5 g + 6 g kg^{-1} can be used for controlling the wilt in chickpea.

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