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In vivo evaluation of bioagents on leaf blotch of turmeric caused by *Taphrina maculans*

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Abstract

Turmeric (*Curcuma longa*) is a native of Indian sub-continent and Southeast Asia. It is a well-known herb commonly known as 'national heritage', 'Golden spice' and also called nature's precious gift. Effect of different bioagents/ consortia (Biomix) on *T. maculans* revealed that, after three successive spraying of bioagents disease incidence and intensity reduced significantly over the control. Among the treatments minimum disease incidence (10%) and disease intensity (9.26%) was recorded in consorcial treatment followed by *T. viride* (10.00%) and (12.20%) respectively. *M. anisopaliae* recorded percent disease incidence 15.33 per cent and disease intensity 14.11 per cent, *T. koningi* recorded percent disease incidence 16.00 per cent and disease intensity 14.11 per cent. Maximum disease incidence of leaf blotch control plot was 30.00 per cent and disease intensity 24.15 per cent followed by *P. floescens* and *Bacillus subtilis*.

Keywords: turmeric, leaf blotch, *T. maculans*

Introduction

Turmeric (*Curcuma longa*) is a native of Indian Turmeric is one of the major spices cultivated for its underground rhizome. It is an herbaceous perennial plant belongs to the family Zingiberaceae, Genus: *Curcuma*, Species: *longa*.

Several biotic factor affecting yield and quality of turmeric. Foliar diseases affect photosynthesis and rhizome quality. Several bio agent and its consorcial combination proved significantly controlling leaf blotch incited by *T. maculans*.

Biocontrol agents are usually inherently less toxic than conventional fungicides. They generally affect only the target pathogenic organisms, in contrast to broad spectrum, conventional fungicides that may affect organisms as different as birds, insects and mammals. Also they are effective in very small quantities and often decompose quickly, thereby resulting in lower exposures and largely avoiding the pollution problems caused by conventional fungicides (Singh, 1998).

Material and Methods

A field experiment was conducted during *kharif* 2018, at Breeder seed production unit (BSP, Shendra), VNMKV, Parbhani, to evaluate the effects of different and one consortia bioagents for the management of leaf blotch disease of turmeric (Table No.1)

Details of experiment

Design : RBD
 Replications : 3
 Treatments : 11
 Variety : Selum
 Spacing : 45 x 150 cm²
 Plot size : 15 x 30 m²

Treatment details

T₁ : *Trichoderma viride*
 T₂ : *Trichoderma harzianum*
 T₃ : *T. hamatum*
 T₄ : *T. koningi*
 T₅ : *Metarhizium anisopliae*
 T₆ : *Aspergillus niger*

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- T₇ : *Pseudomonas fluoerescens*
- T₈ : *Bacillus subtilis*
- T₉ : *pink pigmented facultative Methylobacterium*
- T₁₀ : Consortia
- T₁₁ : Control

$$\% \text{ Disease Incidence} = \frac{\text{No. of plants showing disease symptoms/plot}}{\text{Total No. of plants/plot}} \times 100$$

Per cent disease intensity/index was calculated by applying the formula (Mc Kinney, 1923)

No. of Sprays

Spraying of bioagents were starting at first appearance of disease symptoms and subsequent two spraying were undertaken at 15 days interval. Observations were recorded on *Taphrina maculans* incidence and intensity applying 0-9 grade disease rating scale

$$\% \text{ Disease Intensity (PDI)} = \frac{\text{Summation of all numerical ratings}}{\text{Total No. of leaves/plant observed} \times \text{Maximum rating}} \times 100$$

Disease severity recorded by following grade scale given by Mayee and Datar (1986) [8] which is as follows

Scale	Per cent area infection
0	No infection (Free)
1	01 to 10% (Very Light)
3	11 to 25% (Light)
5	26 to 50% (Medium)
7	51 to 75% (Heavy)
9	>75% (Very heavy)

Table 1: Effects of biocontrol agents on percent disease incidence and disease intensity of leaf blotch of turmeric under field condition

Tr. No	Bioagents	% Disease incidence and Disease Intensity*										
		Before Spraying		At 1st Spraying		At 2nd Spraying		At 3rd Spraying		Yield (kg) * / Plot	% increase over control	Yield (qt)/ ha
		Incidence	Intensity	Incidence	Intensity	Incidence	Intensity	Incidence	Intensity			
T ₁	<i>Trichoderma viride</i>	6.00 (14.18)	9.84 (18.28)	11.33 (19.67)	11.16 (19.52)	16.67 (24.09)	12.38 (20.60)	10.00 (18.43)	12.20 (20.44)	25.32 (30.21)	35.75 (36.72)	168.77
T ₂	<i>T. harzianum</i>	5.33 (13.35)	9.26 (17.71)	14.67 (22.52)	11.70 (20.00)	19.33 (26.08)	13.39 (21.46)	16.67 (24.09)	12.62 (20.81)	27.30 (31.50)	52.01 (46.15)	181.90
T ₃	<i>T. hamatum</i>	4.67 (12.48)	11.29 (19.63)	18.00 (25.10)	13.84 (21.84)	22.67 (28.43)	15.87 (23.47)	20.00 (26.57)	14.93 (22.73)	21.37 (27.53)	14.57 (22.44)	142.44
T ₄	<i>T. koningii</i>	6.00 (14.18)	10.15 (18.58)	15.33 (23.05)	13.76 (21.78)	19.33 (26.08)	15.20 (22.94)	16.00 (23.58)	14.11 (22.06)	21.03 (27.30)	12.78 (20.95)	140.22
T ₅	<i>Metarhizium anisopaliae</i>	5.33 (13.35)	10.67 (19.06)	12.00 (20.27)	13.48 (21.54)	18.00 (25.10)	15.47 (23.16)	15.3 (23.05)	14.11 (22.07)	20.47 (26.90)	9.74 (18.19)	136.44
T ₆	<i>Aspergillus niger</i>	6.00 (14.18)	10.71 (19.11)	18.00 (25.10)	15.21 (22.96)	23.33 (28.88)	17.25 (24.54)	19.33 (26.08)	16.72 (24.13)	19.53 (26.23)	4.74 (12.57)	130.22
T ₇	<i>Pseudomonas floescens</i>	4.67 (12.48)	10.57 (18.97)	16.67 (24.09)	15.23 (22.97)	26.00(30.6 6)	17.07 (24.40)	22.00 (27.97)	15.71 (23.35)	20.00 (26.57)	7.24 (15.61)	133.33
T ₈	<i>Bacillus subtilis</i>	6.00 (14.18)	10.26 (18.68)	16.67 (24.09)	15.03 (22.81)	24.67 (29.78)	17.20 (24.50)	22.00 (27.97)	15.88 (23.48)	20.00 (26.57)	7.24 (15.61)	133.33
T ₉	<i>Pink pigmented facultative metylobacterium</i>	4.67 (12.48)	11.17 (19.53)	14.00 (21.97)	14.88 (22.69)	24.67 (29.78)	16.38 (23.87)	21.33 (27.97)	14.83 (22.65)	20.60 (26.99)	10.46 (18.87)	137.33
T ₁₀	Consortia	6.00 (14.18)	10.26 (18.68)	11.33 (19.67)	13.48 (21.54)	16.67 (24.09)	14.70 (22.54)	10.00 (18.43)	9.26 (17.71)	30.00 (33.21)	60.68 (51.27)	199.99
T ₁₁	Control	10.00 (18.43)	9.79 (18.23)	16.67 (24.09)	14.70 (22.54)	28.00 (31.95)	18.76 (25.66)	30.00 (33.21)	24.15 (29.43)	18.65 (25.59)	0.00 (0.00)	124.33
SE(m)±		1.35	0.79	1.64	0.96	3.01	1.41	3.31	1.02	1.89		
CD at 5%		NS	NS	NS	NS	NS	NS	9.83	3.03	5.62	-	-

*Mean of three replications,

Figures in parenthesis are angular transformed value

Result and Discussion

Result revealed (Table 1) that after three spraing of bioagents disease incidence and intensity significantly reduced over the control. Among all this minimum disease incidence (10%) and disease intensity (9.26%) was recorded in Consortial plot, followed by *T. viride* (10.00% and 12.20%), *M. anisopaliae* (15.33% and 14.11%), *T. koningi* (16.00% and 14.11%) with percent disease incidence 16.00 per cent and intensity 14.11 per cent. Maximum disease incidence and intensity were recorded in control plot 30.00 per cent and 24.15 per cent

respectively followed by *P. floescens* (15.71% and 20.00%) and *A. niger* was (16.72% and 19.00%), *Bacilus subtilis* (15.88% and 20.00%). All treatment excluding control treatment in per cent disease incidence were at par with better treatment i.e. Consortia.

None of treatment in per cent disease intensity found at par with better treatment i.e. consortia.

Yield

Highest fresh rhizome yield was obtained in Biomix plot

(199.99q/ha) followed by *T. harzianum* (181.77 q/ha) and then *T. viride* with yield of 168.77 q/ha and *T. hamatum* recording an yield of 142.44 q/ha when compared with control (124.33 q/ha)

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