



EFFECT OF BIOAGENTS ON AERIAL DISEASES OF CUMIN

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ABSTRACT

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Experimental was conducted on cumin with 30 cultural filtrate of *Trichoderma* isolates proved effective against the spore germination inhibition of the fungi. Minimum spore germination of *Alternaria burnsii* was observed with the cultural filtrate of *Trichoderma* isolate-11 followed by *Trichoderma* isolate-19. In case of powdery mildew fungus (*Erysiphe polygoni*), minimum spore germination was found with *Trichoderma* isolate-5 followed by *Trichoderma* isolate-14. Under field condition in *rabi* season blight as well as powdery mildew managed satisfactorily with four sprays of mancozeb (0.25 %) as well as two sprays of mancozeb + two sprays of *Trichoderma harzianum*, starting at thirty days after emergence keeping 10 days interval. Two sprays of mancozeb (0.25 %) followed by two sprays of *P.fluorescence* were also performed well in blight and powdery mildew management.

INTRODUCTION

Cumin (*Cuminum cyminum* L.) locally known as *Jeera* and is an annual herb of the family *Apiaceous*. Moderately cool and dry climate is best for cumin crop. Cumin does not stand under high humidity and heavy rainfall conditions. The seed content essential oil between 2.5 to 4.5% (Pruthi, 1996). In India, the major cumin growing states are Gujarat and Rajasthan, together accounts for more than 70 per cent of total country's cumin production (Anonymous, 2010-11). The area under cumin cultivation in India is about 593980 ha with annual production of 394328 tonnes (Anonymous, 2011-12). Cumin crop is affected mainly with three important diseases viz., blight (*Alternaria burnsii*), wilt (*Fusarium oxysporum* f.sp. *cumini*) and powdery mildew (*Erysiphe polygoni*) Dange, 1995. Wilt and blight are dominant factors for yield loss in cumin and in some cases powdery mildew also. It is a routine practice for farmers to spray fungicides onward from one month crop age to maturity, for blight control. Fungicidal applications are also mandatory for powdery mildew management after its initiation. To reduce the risk of fungicidal residue some modification/alternation to be find out. To change the

situation a better eco-friendly alternatives to be tried, so total number of fungicides spray can be reduced. Hence laboratory and field evaluation of biocontrol agents along with fungicides against blight and powdery mildew pathogens will be very much useful as eco-friendly management with acceptable quality product at all the level.

MATERIALS AND METHODS

The fungicide viz. mancozeb, bioagents *T. harzianum* were tested under field condition during the *rabi* 2012-13 at Department of Plant Pathology, College of Agriculture, Junagadh. The treatment either alone or in combination with their number of sprays are shown in Table 1. The treatments were replicated thrice in randomized block design. The gross and net plot sizes were 3.0 × 2.5 m and 2.5 × 2.0 m, respectively. Cumin variety Gujarat cumin-4 was used in the experiment. The experiment with five single and two combined treatments were tested by their foliar application carried out at ten days intervals. First spraying was started at thirty days after emergence.

Table 1 Treatment details of bioagents and a recommended fungicide tested under field condition

Treatment	Treatment details
T ₁	Four spray of <i>Trichoderma harzianum</i> (0.2%) at 30, 40,50 and 60 DAE
T ₂	Four spray of <i>Pseudomonas fluorescens</i> (0.2%) at 30, 40, 50 and 60 DAE
T ₃	Five spray of <i>Trichoderma harzianum</i> (0.2%) at 30, 40,50, 60 and 70 DAE
T ₄	Five spray of <i>P. fluorescens</i> (0.2%) at 30, 40,50, 60 and 70 DAE
T ₅	Two spray of mancozeb 75% WP (0.25%) at 30 and 40 DAE followed by two sprays of <i>T. harzianum</i> (0.2%) at 50 & 60 DAE
T ₆	Two spray of mancozeb 75% WP (0.25%) at 30 and 40 DAE followed by two sprays of <i>P. fluorescens</i> (0.2%) at 50 & 60 DAE
T ₇	Four spray applications of mancozeb 75% WP (0.25%) at 30, 40, 50 and 60 DAE
T ₈	Control

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RESULTS AND DISCUSSION**Effect of cultural filtrate**

An effect of cultural filtrate of thirty different *Trichoderma* isolates (Table 2) on the spore germination of *A. burnsii* was evaluated at 40 % concentrations by slide spore germination technique. All the isolates significantly reduced spore germination of tested fungus with variation in their efficacy. Minimum spore germination (29.29 %) of *A. burnsii* was observed with the culture filtrate of *Trichoderma* isolate-11 which was closely followed by *Trichoderma* isolate-19 with 29.84 % and *Trichoderma*

isolates-12 (30.92 %) as against 81.33 per cent in control. Similarly results also reported by Odebo (2006).

Minimum spore germination (19.88 %) of *E. polygona* was observed with the culture filtrate of *Trichoderma* isolate-5 which was closely followed by *Trichoderma* isolate- 14 with 21.92 per cent, 22.89 per cent in *Trichoderma* isolate -25, 22.92 % in *Trichoderma* isolate -13, 23.70 in *Trichoderma* isolate -24 and 23.81 in *Trichoderma* isolate -15 as against 49.33 per cent spore germination in control (Ravikumar, 1998).

Table 2 Spore germination of *A. burnsii* and *E. polygona* under cultural filtrate of different *Trichoderma* isolates

<i>Trichoderma</i> isolates	Concentration (%)	<i>Alternaria burnsii</i> (% spore germination)			<i>Erysiphe polygona</i> (% spore germination)		
		24 hrs	48 hrs	72hrs	24 hrs	48hrs	72hrs
<i>Trichoderma</i> -1	40	43.44	44.89	46.11	36.63	37.7	38.51
<i>Trichoderma</i> -2	40	39.44	40.11	41.99	34.33	35.88	35.93
<i>Trichoderma</i> -3	40	33.55	34.22	35.89	29.66	30.55	31.22
<i>Trichoderma</i> -4	40	41.33	42.55	43.22	36.55	36.89	37.66
<i>Trichoderma</i> -5	40	37.44	38.55	39.11	19.10	19.99	20.55
<i>Trichoderma</i> -6	40	38.66	39.77	40.89	29.66	30.44	31.33
<i>Trichoderma</i> -7	40	32.99	33.55	34.44	27.99	28.66	29.11
<i>Trichoderma</i> -8	40	35.11	36.44	37.77	30.77	30.44	31.44
<i>Trichoderma</i> -9	40	38.77	39.44	40.66	24.78	25.00	25.22
<i>Trichoderma</i> -10	40	40.89	42.22	43.44	25.89	26.55	26.89
<i>Trichoderma</i> -11	40	28.11	29.00	30.78	31.11	31.89	32.33
<i>Trichoderma</i> -12	40	29.66	31.22	31.89	23.11	22.66	23.33
<i>Trichoderma</i> -13	40	35.22	36.66	37.88	22.66	22.88	23.22
<i>Trichoderma</i> -14	40	30.11	31.33	32.21	20.66	22.44	22.66
<i>Trichoderma</i> -15	40	44.22	45.11	46.11	23.11	23.77	24.57
<i>Trichoderma</i> -16	40	41.22	42.55	43.55	29.44	29.89	30.55
<i>Trichoderma</i> -17	40	33.22	34.66	35.89	24.55	25.00	25.22
<i>Trichoderma</i> -18	40	33.44	35.18	36.51	29.44	30.55	30.66
<i>Trichoderma</i> -19	40	28.77	29.55	31.22	28.66	28.77	29.00
<i>Trichoderma</i> -20	40	36.55	37.32	38.55	33.55	34.11	34.44
<i>Trichoderma</i> -21	40	36.44	37.77	39.00	38.11	38.22	38.66
<i>Trichoderma</i> -22	40	32.00	33.11	34.33	34.22	34.11	34.67
<i>Trichoderma</i> -23	40	39.77	40.89	41.55	35.78	36.33	36.67
<i>Trichoderma</i> -24	40	31.89	33.77	35.55	23.33	23.66	24.11
<i>Trichoderma</i> -25	40	33.77	35.27	36.55	22.33	22.89	23.44
<i>Trichoderma</i> -26	40	36.77	38.11	39.21	25.55	26.11	26.99
<i>Trichoderma</i> -27	40	39.66	40.33	41.11	37.11	37.78	38.33
<i>Trichoderma</i> -28	40	37.66	38.66	39.44	29.88	30.77	31.55
<i>Trichoderma</i> -29	40	41.66	42.66	44.00	27.44	28.33	28.66
<i>Trichoderma</i> -30	40	31.55	32.66	33.44	28.88	29.55	30.22
Control	-	74.00	82.00	88.00	45.00	50.00	53.00
CD (P= 0.05)		2.06	2.19	2.11	1.59	1.29	1.40

* Mean of three replications

Field evaluation of bioagents

Results of the experiment significantly reduced the diseases intensity as compared to the control. Application of mancozeb 0.25 % (four sprays) was found most effective and recorded 20.00 and 30.83 % diseases intensity of blight and powdery mildew, respectively, as against 54.67 and 71.83 % in control. The second most effective treatment was two applications of mancozeb 0.25 % followed by *T. harzianum* 0.20 % (two sprays). The blight and powdery mildew intensity in this treatment were 23.33 and 33.33 per cent respectively. It was followed by 30.83 and 35.16 per cent in the treatment of mancozeb (two sprays) followed by *Pseudomonas fluorescens* (two sprays) for both diseases, respectively. The blight and powdery mildew intensity in the remaining treatments was above 34.00 per cent. The sole treatment of *T. harzianum* (five sprays) (34.45 %) was statistically at par with *T. harzianum* (four sprays) (38.67 %) for blight intensity and similar trend also found for powdery mildew, Treatment of *T. harzianum* (five sprays) (38.50 %) which was statistically at par with *T. harzianum* (four

sprays) (42.50 %). Similarly blight and powdery mildew intensity in single treatment of *Pseudomonas fluorescens* (five sprays) and *Pseudomonas fluorescens* (four sprays) were at par.

All the treatments in the field trial significantly increased the seed yield as compared to control. Highest seed yield of 950 kg/ha was obtained in the treatment of mancozeb 0.25 % (four sprays) and remained significantly superior to all treatments. The seed yield increase in this treatment was 216.67 per cent higher than control. The combination of fungicide and bioagents viz. mancozeb 0.25 % (two sprays) and *T. harzianum* (two sprays) (828 kg/ha) as well as mancozeb 0.25 % (two sprays) and *P. fluorescens* (two sprays) (825 kg/ha) also produced higher seed yield. The sole treatment of both the bioagents also increased seed yield. Although higher yield was recorded in five spray i.e. 600 kg/ha and 506 kg/ha in *T. harzianum* and *P. fluorescens* respectively. These field results were confirms the reports of Pipliya and Jadeja (2008) and Anand et al. (2009).

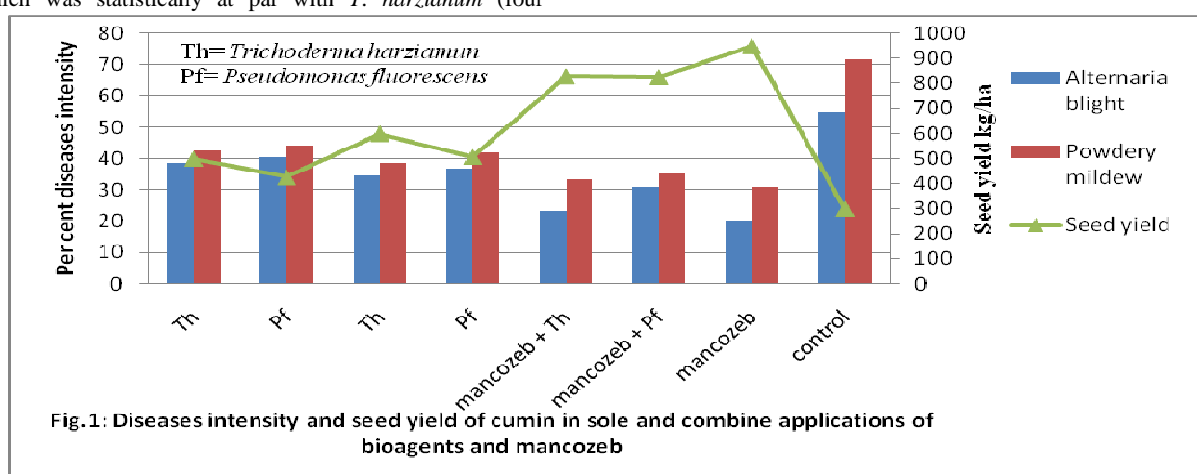


Fig.1: Diseases intensity and seed yield of cumin in sole and combine applications of bioagents and mancozeb

Table 3: Effect of bioagents and selective fungicide as sole and alternate application for the management of foliar diseases and seed yield of cumin

Treatment	Alternaria blight		Powdery mildew		Seed yield (kg/ha)*
	Disease intensity (%)*	Disease Control (%)	Disease intensity (%)*	Disease Control (%)	
<i>Trichoderma harzianum</i> (four spray)	38.67	29.27	42.50	40.83	498
<i>Pseudomonas fluorescens</i> (four spray)	40.55	25.82	44.16	38.52	426
<i>Trichoderma harzianum</i> (five spray)	34.45	36.98	38.50	46.40	600
<i>Pseudomonas fluorescens</i> (five spray)	37.00	32.32	41.67	42.00	506
Mancozeb (two spray) <i>T. harzianum</i> (two spray)	23.33	57.32	33.33	53.59	828
Mancozeb (two spray) + <i>P. fluorescens</i> (two spray)	30.83	54.67	35.16	51.05	825
Mancozeb (four spray)	20.00	63.41	30.83	57.07	950
Control	54.67	-	71.83	-	300
CD (P= 0.05)	4.70	-	8.56	-	76

* Mean of three replications

CONCLUSION

The antifungal properties of cultural filtrate of *Trichoderma* isolates proved effective against the spore germination of both the fungi. Minimum spore germination of *A. burnsii* was observed with the cultural filtrate of *Trichoderma* isolate-11 followed by *Trichoderma* isolate-19. In case of powdery mildew fungus (*E. polygoni*), minimum spore germination was found with *Trichoderma* isolate-5 which closely followed by *Trichoderma* isolate-14. The field results showed that mancozeb 0.25% (four sprays) was the most effective treatment with minimum diseases intensity blight and powdery mildew and highest seed yield. The next effective treatment was first two sprays of mancozeb 0.25 % followed by two spray of *T. harzianum* with respect to reduce the diseases intensity and higher yield.

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