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Evaluation of botanicals and bioagents against spore germination of *Leveillula taurica* causing powdery mildew in guar

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ABSTRACT: *In vitro evaluation of botanicals and bio agents were carried out with respect to inhibition of conidial germination of L. taurica at different concentrations. The result clearly indicated that among the botanicals nimbicidin was found to be most effective with inhibition percentage of 59.71 percent at 5 percent concentration followed by neem seed kernel extract (55.11%). While in bioagents maximum inhibition of conidial germination was observed in Pseudomonas fluorescens (86%) followed by Trichoderma viridae (75.69%) at various concentrations tested. In general, the botanicals and bioagents were found to be most effective, eco-friendly and low cost technology in controlling the disease and enhances yield.*

INTRODUCTION

Guar (*Cyamopsis tetragonoloba*) is one of the important annual legume crop majorly grown in India in an area of 5.60 million ha with the production of 2.72 million tonnes with an average yield of 485 kg/ha. In India, Rajasthan is the largest guar producing state, recorded 2.2 million tonnes of guar bean production in an area of 4.9 m ha in 2013 -2014 [1]. The crop is recently introduced in Karnataka state and farmers of north eastern Karnataka are cultivating the crop since two years. The productivity of guar crop has been very low because it is highly susceptible to the diseases. The important diseases are powdery mildew, alternaria blight, cercospora leaf spot and bacterial blight. The powdery mildew is one of the important yield loss causing disease results in severe defoliation and poor pod formation. So in order to overcome this problem some ecofriendly management practices should be practiced like, usage of bioagents and botanical spray in order to over come the disease without adverse effect to the environment.

Use of botanicals and bioagents in the management of plant diseases is recently gaining impotance. These products will help in reducing cost, environmental hazards and development of resistance by pathogen to fungicides. Keeping this in view some botanicals and bioagents have been evaluated against spore germination of *Leveillula taurica* a causal agent of powdery mildew of guar.

MATERIALS AND METHOD

An *invitro* evaluation of botanicals and bioagents were studied during 2013-14 in college of agriculture, Raichur. Efficacy of different fungicides, botanicals and bioagents were tested under *in vitro* conditions in order to know the effectivity in spore inhibition which helps in effective management of powdery mildew disease in field.

Preparation of plant extracts

Ten grams of leaves of corresponding plant material were rinsed in water and cut in to small pieces and macerated using sterilized pestle and mortar with 50 ml of distilled water. The contents were filtered through a clean double-layered muslin cloth. Then, the volume was made up to 100 ml to get ten per cent concentration. Further, it was diluted with distilled water to get five per cent concentration. These extracts were centrifuged for 5 min at 3000 rpm to get a clear plant extract. This supernatant extract was used for evaluation.

Preparation of neem seed kernel extract

Ten grams of crushed neem seed kernels were soaked overnight in 50 ml of water crushed in sterilized pestle

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and mortar and squeezed through muslin cloth and then the volume was made up to 100 ml to get ten per cent concentration. Further, it was diluted to get five per cent concentration. The extracts were strained through two layers of muslin cloth and finally made up to required concentration *viz*., 5.00, 7.50 and 10.00 per cent by adding distilled water separately under aseptic conditions. Thus obtained extracts of different concentrations of each plant species were tested *in vitro* for the germination of spores. In each treatment three replications were maintained. Slides were then incubated at a room temperature (27 ± 1°C) for 24 hours.

In vitro evaluation of bio agents

Six bioagents *Trichoderma harizanium*, *Trichoderma viridae Pseudomonas fluorescens*, *Bacillus subtilis*, *Ampelomyces quisqualis* and *Paeceilomyces lilacinus* each at three concentrations 5.00, 7.50 and 10.00 per cent of commercial talc based formulation were tested by spore germination technique. Three replications were maintained with only distilled water as control. The slides were incubated at (27 ± 1° C) for 24 hours. The per cent inhibition was calculated by the following formula [2].

$$\text{Per cent inhibition of spore germination} = \frac{C-T}{C} \times 100$$

Where;

C = Germination of conidia in control

T = Germination of conidia in treatment

RESULTS AND DISCUSSION

The concept of organic farming and eco-friendly management encouraged the plant protection specialists to go for the use of plant extracts for the management of insect pests and diseases. This can also avoid the pollution of air, water and soil. Use of chemicals has been discouraged. Plant extracts which are previously known for their antifungal and antibacterial nature were evaluated against *L. taurica* following spore germination technique. Results were encouraging so as to use the plant extracts as one of the component in development of IDM strategies against powdery mildew. The plant extracts such as Neem Seed Kernel Extract (NSKE), Nimbicidin, Onion leaf extract, Garlic leaf extract, Ginger leaf extract, Ballari Jali leaf extract and to some extent Tulasi leaf extract were reported to be effective against plant diseases.

In vitro evaluation of botanicals (Plant products and extracts)

In the present study, under *in vitro* evaluation of botanicals, nimbicidin was superior (59.71%) in inhibiting the spore germination at 5 per cent concentration followed by neem seed kernel extract (55.11%) and least inhibition of conidial germination was observed in bellary Jali leaf extract (34.07%) and tulasi leaf extract (32.23%) (Table 1). As the concentration of the extracts increased, the effectiveness was also increased. Similar results were

Table 1
Effect of botanicals on per cent inhibition of conidial germination of *Leveillula taurica*

Sl. No	*Botanical*	*Per cent inhibition at different concentrations*			
		5	*7.5*	*10*	*Mean*
1.	Nimbicidin	59.71 (50.59)*	72.57 (58.42)	77.48 (61.67)	69.92 (56.89)
2.	Neem seed kernel extract	55.11 (47.07)	53.62 (47.93)	72.21 (58.19)	60.05 (51.06)
3.	Onion bulb extract	55.08 (46.76)	53.08 (47.91)	70.97 (57.40)	59.71 (50.69)
4.	Garlic bulb extract	46.97 (43.26)	55.65 (48.24)	56.00 (48.45)	52.98 (46.65)
5.	Ginger rhizome extract	36.02 (36.87)	45.11 (42.19)	56.82 (48.92)	45.98 (42.66)
6.	Tulasi leaf extract	32.23 (35.70)	38.16 (39.22)	48.30 (45.55)	39.56 (40.16)
7.	Ballari jali leaf extract	34.07 (34.58)	40.00 (38.30)	50.95 (44.02)	41.67 (38.97)
	Mean	45.59 (42.12)	51.17 (46.03)	61.81 (52.03)	52.83 (46.73)
		S. Em±		CD at 1 %	CV
Botanicals (B)		0.29		1.13	1.90
Concentration(C)		0.19		0.74	
B x C		0.51		1.95	

reported by [3,4,5 and 6] in mulberry, rose, sunflower powdery and okra powdery mildew, respectively.

The fungicidal spectrum of neem based products nimbicidin and neem seed kernel extract had been investigated by [4] against the powdery mildew of rose by suppressing the disease effectively. Among plant products tested, least per cent disease index was observed in nimbicidin extract treated plots.

In vitro evaluation of bio agents

In general, the bio agents are found to be most effective, eco friendly and low cost technology in controlling the disease and enhance the yield.

In vitro evaluation of bio agents revealed that, maximum inhibition of conidial germination was observed in *Pseudomonas fluorescens* (86%) followed by *Trichoderma viridae* (75.69%) at concentrations tested (Table 2). The present findings are in accordance with [7] who reported that the bio agent *Ampelomyces quisqualis* tested against powdery mildew of peas were less effective as compared to *Pseudomonas fluorescens,* nimbicidin and other neem-based products. [5] reported maximum inhibition of conidial germination in *Pseudomonas fluorescens* and *Ampelomyces quisquqlis* at 10 per cent concentration.

Table 2
Effect of bioagents on per cent inhibition of conidial germination of *Leveillula taurica*

Sl. No.	*Bioagent*	*Per cent inhibition at different concentrations*			
		5	*7.5*	*10*	*Mean*
1	*Trichoderma harzianum*	54.07	64.96	72.91	63.98
		(47.34)*	(55.36)	(62.34)	(55.01)
2	*Trichoderma viridae*	63.97	70.46	75.69	70.04
		(53.11)	(57.08)	(62.27)	(57.49)
3	*Pseudomonas fluorescens*	56.68	74.20	86.00	72.29
		(48.80)	(59.48)	(68.06)	(58.78)
4	*Bacillus subtilis*	56.37	64.70	72.62	64.56
		(48.67)	(53.55)	(58.46)	(53.56)
5	*Ampelomyces quisqualis*	66.97	72.80	70.92	70.86
		(56.09)	(58.57)	(57.37)	(57.34)
6	*Paecilomyces lilacinus*	53.12	58.04	59.49	56.88
		(46.79)	(49.63)	(50.47)	(48.96)
	Mean	58.53	67.52	72.93	66.43
		(50.13)	(55.61)	(59.83)	(55.19)
		S.Em±		CD at 1 %	CV
Bio gents (B)		0.43		1.66	0.13
Concentration (C)		0.30		1.17	
B x C		0.74		2.87	

*Figures in parentheses are arc sine transformed values

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