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Antifungal Effect of Some Oils and Antagonists Against *R. bataticola* in Bottle-Gourd Seeds

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Abstract: Eight vegetable oils were screened for controlling infection of *Rhizoctonia bataticola* in bottle gourd seed. Out of eight oils sesame and mustard oil were found most effective against seed infection of *R.bataticola*. Seed germination and seedling vigour were also increased in seed treated with sesame and mustard oil at 70°C for 5 min.

Keywords: Bottle gourd, *Rhizoctonia bataticola*, Vegetable oils, Seedling vigour

Introduction

Uses of chemicals leads to health and environmental hazards. About half a million tones of pesticides are used annually, yet one third of all crops production is still lost. A more dangerous effect is that the pathogen acquire resistance against fungicides particularly the systemic fungicides, therefore the disparity in the production of crop can be removed by managing the disease through ecofriendly approaches.

Aim of study

Keeping in view of above problems, efforts are underway to search economically viable phytochemicals or bioagents which could be utilized for disease control. Biological control, one of the various component of Integrated Disease Management (IDMs) is an ecofriendly and sustainable answer to disease management which holds promise. Therefore, the present study was undertaken to widen the spectrum of different vegetable oils and bioagents (antagonists) having antifungal activity.

Review of Literature

Pyndji, Sinclair and Singh (1987) observed that oils of refined maize, palm, soybean, sunflower heated at 90°C for 10 minutes were effective to control seed-borne infection of *Cercospora kikuchii*.

Singh *et al.* (1989) used six oils (neem, eucalyptus, ocimum, citrus, pine and oil from *Cymbopogon nardus*) against *Sclerotium* (*Corticium rolfsii*) Sacc. and some soil mycoflora, and found neem oil as a most effective against the pathogen. Mustard seed oil and *Anethum graveolens* were inhibitory to growth of *Alternaria alternata*, *A. flavus*, *A. fumigatus* and *A. wentii* (Kazmi *et al.*, 1993). Atanda *et al. (2007)* and Dhingra *et al. (2009)* reported that various natural plant products are known to be effective against seed associated pathogen. Tian *et al.(2011)* found that conidial production was inversely proportional to the concentration of essential oils applied.

Various fungal antagonists have been tried for control of pathogenic fungi on different crops (Bedlan, 1988; Mukhopadhaya, 1996; Elad *et al.*, 1986; Maiti and Sen, 1987; Dubey and Dwivedi, 1988; Aly *et al.*, 2007; Chaube *et al.*, 2003; Mishra and Sinha 1997). Desai and Kulkarni (2002) tried *Trichoderma* sp., *Gliocladium*, *Penicillium*, *Straptomyces*, *Pseudomonas* as biocontrol agents to control *M. phaseolina*. Dennis and Webster (1971), Mukhopadhyay (1996) have reported that the culture filtrate of *Trichoderma* sp. produces volatile and nonvolatile antibiotics and was effective in checking the growth of *S. rolfsii* and *R. solani*.

Tapwal *et al.* (2004) studied effect of volatile compound released by *Gliocladium virens* and *Trichoderma* sp. on the growth of *Dermato phoranecatix* and found significant result of the antagonist. *Trichoderma harzianum* and *Arachniotus* spp. applied as seed coating in the form of paste and with or without certain chemical amendments in the pot soil gave significant control of disease (Iqbal and Khalid, 2002). Kakde *et al.*(2011) and Singh *et al.(2011)* studied the antagonistic activity of *T.viride* and *T.harzianum* against storage fungi and found that growth of *Curvularia lunata*, *Rhizopus stolonifera*, *Fusarium oxysporium* and *Macrophomina phaseolina* was retarded due to *Trichoderma sps.*

Material and Methods

Eight vegetable oils *viz.* mustard, coconut, groundnut, sesame, mahua, neem, linseed and castor oil and five replicates of 10 seeds for each treatment and for each sample were used. The seed tied in cheese cloth were kept in beaker containing oil heated at 50

and 70°C on a temperature controlled hot plate for 5 min and 10 min. The seeds were allowed to cool at room temperature and washed in 70% ethanol to remove excess of oil. These were air dried and plated on blotter (10 seeds/plate). Untreated seeds served as control. Observations on seed germination, incidence of pathogen and seedling infection were taken on 8th day of incubation.

Trichoderma viride, *T. harzianum* and *Gliocladium virens* were used as biological agents for the control of *Rhizoctonia bataticola* in bottle gourd. Pure culture of these antagonists were obtained from Agriculture Research Station, Durgapura, Jaipur and raised on PDA for seed treatment. For treating the seeds, 5 ml of distilled water was added to 15 days old culture plate and the suspension was diluted to 10 ml. Considering 10 ml as stock solution (1:1 solution), 1 : 2, 1 : 4 and 1 : 8 dilutions were made by adding distilled water.

50 seeds/dilution for pathogen were taken randomly surface sterilized with 2% NaOCl, soaked in suspension of antagonists for 24 hr and sown in sterilized moistened blotter in petriplates for 8th days.

Results and discussion

Activity of vegetable oils and antagonists against the seed-borne fungus *Rhizoctonia bataticola* is presented in table 1 and 2.

It is commonly observed that out of 8 oils, sesame oils and mustard oil

were found best to control pathogen incidence (94.59%). Castor oil (91.89%), coconut oil (86.48%), linseed oil (81.08%) were next to it for the control of pathogen in 5 minute treatment. In 10 minute treatment maximum pathogen control was also observed in sesame oil (86.48%) followed by mustard and coconut oil (81.08%), castor and linseed oil (78.37%).(Fig. 2)

Similarly maximum control of seedling infection was observed in 5 min. treatment of sesame and mustard oil (90%) followed by castor oil (85%), coconut oil (75%), linseed and neem oil (65%). Groundnut oil showed minimum seedling infection control.

50°C Temperature was not found significant to control seedling infection and pathogen.

Out of 3 antagonists, *Gliocladium virens* showed maximum antagonistic effect against *R. bataticola*. Highest germination (96%) was observed in seed treated with 1:1 dilution of antagonists followed by 1:2 (94%) and 1:4 (92%). Maximum (100%) seedling infection control and pathogen incidence control was observed in seeds treated with 1:1 dilution of *G. virens*.(Fig. 1) Similar effects were shown by Kakde *et al.(2011)*

Results obtained are indicative of the differential activities of different vegetable oils and antagonists on mycelial growth of *R. bataticola* because many of these oils and antagonist have shown very strong inhibition against mycelial growth of fungi.

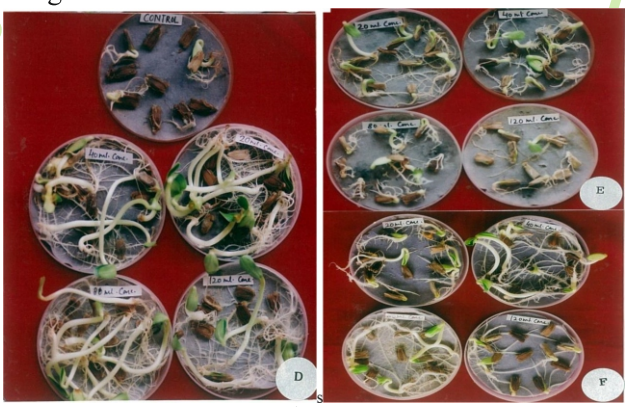

Fig 1

D- Seeds treated with *G. virens* showed maximum antagonistic effect

E-Seeds treated with *T. viride*

F-Seeds treated with *T.harzianum*

Fig. 2 A,B,C,D,E,FG,H - Different vegetables oils used for controlling seed infection due to *R. bataticola*

TABLE 1 : CONTROL OF SEED-BORNE INFECTION OF *Rhizoctonia bataticola* IN BOTTLE GOURD SEEDS BY HEATED OIL AT 50° AND 70°C.

Oil	Temp.	Germination(%)				Seedling infection control (%)				Pathogen control (%)			
		5 min		10 min		5 min		10 min		5 min		10 min	
Caster oil	50°C	66	(6.6)	54	(5.4)	75	(1)	65	(1.4)	89.18	(0.8)	72.97	(2)
	70°C	80	(8.0)	52	(5.2)	85	(0.6)	65	(1.4)	91.89	(0.6)	78.37	(1.6)
Coconut oil	50°C	64	(6.4)	46	(4.6)	65	(1.4)	60	(1.6)	78.37	(1.6)	78.37	(1.6)
	70°C	76	(7.6)	70	(7.0)	75	(1)	65	(1)	86.48	(1)	81.08	(1.4)
Ground nut oil	50°C	64	(6.4)	58	(5.8)	40	(2.4)	35	(2.6)	48.64	(3.8)	43.24	(4.2)
	70°C	66	(6.6)	66	(6.6)	50	(2)	35	(2.6)	59.45	(3)	48.64	(3.8)
Linseed oil	50°C	66	(6.6)	60	(6.0)	60	(1.6)	50	(2)	78.37	(1.6)	75.67	(1.8)
	70°C	70	(7.0)	66	(6.6)	65	(1.4)	60	(1.6)	81.08	(1.4)	78.37	(1.6)
Mahua oil	50°C	66	(6.6)	56	(5.6)	50	(2)	50	(2)	67.56	(2.4)	64.86	(2.6)
	70°C	74	(7.4)	60	(6.0)	60	(1.6)	50	(2)	72.97	(2)	67.56	(2.4)
Mustard oil	50°C	64	(6.4)	56	(5.6)	85	(0.6)	60	(1.6)	94.59	(0.4)	78.37	(1.6)
	70°C	86	(8.6)	72	(7.2)	90	(0.4)	85	(0.6)	94.59	(0.4)	81.08	(1.4)
Neem oil	50°C	66	(6.6)	52	(5.2)	50	(2)	60	(1.6)	67.56	(2.4)	67.56	(2.4)
	70°C	74	(7.4)	66	(6.6)	65	(1.4)	60	(1.6)	72.97	(2)	67.56	(2.4)
Sesame oil	50°C	54	(5.4)	40	(4.0)	85	(0.6)	65	(1.4)	91.89	(0.6)	81.08	(1.4)
	70°C	88	(8.8)	44	(4.4)	90	(0.4)	85	(0.6)	94.59	(0.4)	86.48	(1)
Control		54(5.4)				(4)				(7.4)			

Figures in parenthesis are mean value of 5 replicates.

TABLE 2 : CONTROL OF SEED-BORNE INFECTION OF *Rhizoctonia bataticola* IN BOTTLE GOURD SEEDS BY BIOLOGICAL ANTAGONISTS

Dilutions	Germination (%)			Seedling infection control (%)			Incidence control (%)		
	T.v.	*T.h.*	*G.v.*	*T.v.*	*T.h.*	*G.v.*	*T.v.*	*T.h.*	*G.v.*
1:1	90 (9.0)	86 (8.6)	96 (9.6)	86.86 (0.8)	76.66 (1.4)	100 (0)	78.78 (1.4)	78.78 (1.4)	100 (0)
1:2	74 (7.4)	84 (8.4)	94 (9.4)	76.66 (1.4)	73.33 (1.6)	96.66(0.2)	69.69 (2)	69.69 (2)	93.93 (0.4)
1:4	64 (6.4)	66 (6.6)	92 (9.2)	66.66 (2)	66.66 (2)	96.66(0.2)	63.63 (2.4)	63.63 (2.4)	93.93 (0.4)
1:8	62 (6.2)	64 (6.4)	92 (9.2)	66.66 (2)	66.66 (2)	93.33(0.4)	69.69 (2)	63.63 (2.4)	90.90 (0.6)
Control		62 (6.2)			– (6)			– (6.6)	
CD at 5%		0.1828			0.2123			0.1771	

Figures in parenthesis are mean value of 5 replicates.

T.v. = Trichoderma viride, T.h. = Trichoderma harzianium, G.v. = Gliocladium virens

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