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EFFECT OF FUNGICIDES AGAINST *FUSARIUM SOLANI* AND *RHIZOCTONIA SOLANI* INFECTING ASHWAGANDHA

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ABSTRACT

This disease was observed for the first time at Rajasthan College of Agriculture and adjoining areas. The fungal pathogens were isolated, purified and identified as *Fusarium solani* and *Rhizoctonia solani* and their pathogenicity was confirmed on ashwagandha diseased roots.All fungicides inhibited mycelial growth of the fungus over when controlled at three concentrations (0.05, 0.1 and 0.2 % a.*i.*) while testing in the laboratory. The fungicides, SAAF, Carbendazim, Propiconazole and Hexaconazole were found most effective to inhibit the growth of the pathogen. For both *F. solani* and *R. solani* in saponin mycelial growth was inhibited at 0.05, 0.1 and 0.2% concentrations and the maximum growth inhibition at 0.2% followed by 0.1% concentrations. These fungicides showed better results and provided effective protection against *F. solani* and *R. solani* also under field condition.

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INTRODUCTION

Ashwagandha (*Withania somnifera*) belongs to the family of Solanaceae.In the wild, Ashwagandha grows profusely in most areas of South Asia and many closely related Withania species occur as far away as Northern Africa. Ashwagandha, an exotic Indian herb, has remarkable stress-relieving properties comparable to those of powerful drugs used to treat depression and anxiety.Ashwagandha has also been shown to lower blood pressure and is highly effective in stopping the formation of stress induced ulcers. Ashwagandha increases hemoglobin (red blood count) and hair melanin. It stabilizes blood sugar and lowers cholesterol. Light red soils are suitable for this herb. As a commercial crop Ashwagandha cultivation is carried out mostly in Utter Pradesh and Madhya Pradesh in India. It is generally grown in fields characterized by slightly basic soils that have good drainage. *Withania somnifera* is prone to several pests and diseases. *Rhizoctonia solani* is a wide spread and destructive fungal pathogen of many plant species. Different types of disease symptoms like damping off, root, crown and stem rot, sheath blight etc. are caused by the pathogen *Fusarium solani* is a widely distributed soil-borne fungus.It causes root rot diseases on a wide variety of crops. Among the major constraints for growing this crop, diseases like root rot caused by species of *Fusarium, Rhizoctonia*. Ashwagandha growing area of Southern Rajasthan, since then the severity of incidence of the disease increased year by year in the area.It has been reported to be involved in causing mix infection along with other soil borne pathogens and show synergistic effect in causing diseases with *Botryodiplodi theobromae*, *Pythium myriotylum* and *Fusarium solani* (Jatav and Mathur, 2005, Tetarwal, 2011). The results obtained from the present study suggested that PDA medium at 25ºC temperature, *p*H 7, carbon source dextrose and nitrogen source asparagines showed maximum growth of mycelium and sclerotia formation of *Rhizoctonia solani* (Kumar *et al.,* 2014). In the present study some efforts have been made in controlling the pathogens with tested *in vitro* by different fungicide for minimize the crop loss apply in proper quantity. Effective fungicide use for further study in field condition batter way.

MATERIALS AND METHODS

Isolation and purification

The culture of *F. solani* and *R. solani* were isolated from the diseased plant of ashwagandha collected from RCA Farm, Udaipur. Purification of the culture was made by adopting single spore and single hyphal tip culture techniques, respectively, for the two pathogens. Single spore culture established in this way was maintain by periodically transferring on PDA slants and stored at 4 ± 1°C in a refrigerator. For *R. solani* single hyphal tips was cut with the help of the dummy objective were picked with the help of inoculation needle and transferred on the PDA slants. This was subsequently allowed to grow and form sclerotia.

Efficiency of fungicides

Relative efficacies of different systemic and non-systemic fungicides were evaluated

by using poison food technique. Eleven fungicides *viz.*, Bavistin 50% WP [Carbendazim, methyl-2-benzamidizole carbamate (MBC)] BASF India Ltd., Mumbai, Haxaconazole 5% EC [2- (2,4-dichlophenyl)- 1-(1H-1,2,4-trizol-1-yl) hexan-2-ol], crop life science Ltd., Gujarat, Tebuconazole 25.9 w/w [1-(4-chlorophenyl)-4,4-dimethyl-3-(1,2,4-trizol-1-methyl), Propiconazole 25 EC 1-[[2-(2,4-dichlorophenyl)-4-propyl-1,3-dioxolan-2-yl]methyl]-1,2,4-triazole, SAAF [Carbendazim - methyl benzimidazole 2-ylcarbamate 63 % + Mancozeb - Manganese ethylene bisdithiocarbamate 12 %] United Phosphorus Ltd., Mancozeb [Manganese ethylene bisdithiocarbamate} manganese zinc salt], Captan 50 WP [*N*-(tri-chloromethylthio) cyclohex-4-ene-1,2-dicarboximide], Trifloxystrobin 50WG methyl (*E*)-methoxyimino-{(*E*)-á- [1-(á,á,á-trifluoro-*m*-tolyl)ethylideneaminooxy]-*o*-tolyl}acetate, Thiophanate methyl 70WP [dimethyl 4,4'-(o-phenylene)bis(3-thioallophanate)], Chlorothalonil 75WP [2,4,5,6-tetrachloro-1,3-benzenedicarbonitrile] United phosphorus Ltd. Three concentration *i.e.* 0.05, 0.10, 0.2%.Desired quantity of each fungicide was added separately to sterilized medium, mixed thoroughly and poured in sterilized Petri plates and allowed to solidify. Each plate was inoculated with 5 mm disc of fungal culture and incubated at 28 ± 1ºC. The linear growth after 7 days was recorded and per cent inhibition was calculated.

$$\text{Per cent inhibition} = \frac{(C\text{-}T) \times 100}{C}$$

Where,

C = Diameter of the colony in control.

T = Diameter of colony in treatment.

A check was also maintained where medium was not supplemented with any fungicide.

RESULTS AND DISCUSSION

Effect of fungicides on mycelial growth, dry weight and sporulation of the *F. solani* and sclerotial formation in *R. solani* infecting ashwagandha:

All the fungicides inhibited mycelial growth of *F.solani* at all concentrations (0.05, 0.1 & 0.2%) as compared to control. However, complete inhibition of mycelial growth was recorded with 0.05% SAAF (100%) at all the tested doses. Topsin-M (50.0%), Tilt (47.7%), Contaf (43.6%) Bavistin (38.9%), Mancozeb (32.6%), Super Excel (29.7%) followed by Captan (27.8%) was also highly effective whereas, least inhibition was noticed in Pencycuron (1.9%) [Table 1].

At 0.1% SAAF (100%), and Bavistin (100%) caused complete growth inhibition of *F. solani* followed by Topsin-M (91.1%), super Excel (83.3%) Tilt (80.0%), Contaf (78.1%) and Captan (72.2%). Mancozeb caused (55.6%) reduction of growth, followed by and was also highly effective whereas, low inhibition was noticed with in Flint (53.0%), Pencycuron (52.7%) and Kavach (40.0%).

At 0.2% all the fungicides showed better efficacy. SAAF (100%), Bavistin (100%), Mancozeb (100%), Topsin-M (100%), Contaf (90.0%) followed by Tilt (88.9%), Super Excel (87.3%) and Captan (87.8%) were highly effective whereas, lesser inhibition was noticed in Pencycuron (68.5%), Flint

Table 1: Effect of fungicides on mycelial growth of *Fusariumsolani*and *Rhizoctoniasolani*

Fungicides	*Fusariumsolani*							*Rhizoctoniasolani*							
Conc. %(a.i.)	Mycelial growth* (mm)				Inhibition over control (%)			Sporulation	Mycelial growth* (mm)			Inhibition over control (%)			Sclerotia formation
	0.05	0.10	0.2	Mean	0.05	0.10	0.2	Mean		0.05	0.10	0.2	Mean	0.05	0.10	0.2	Mean	
Bavistin 50 WP	55.0	0.0	0.0	18.3	38.9	100	100	79.6	–	14.7	0.0	0.0	4.9	83.7	100	100	94.6	–
Mancozeb 75	60.7	40.0	0.0	33.6	32.6	55.6	100	62.7	–	12.7	4.7	4.7	5.8	85.9	94.8	100	93.6	–
Topsin-M	45.0	8.0	0.0	17.7	50.0	91.1	100	80.4	–	44.0	12.0	12.0	21.0	51.1	86.7	92.1	76.6	+ + +
Super Excel 75WP	63.3	22.0	15.0	33.4	29.7	75.6	83.3	62.9	+	5.0	0.0	0.0	13.1	94.4	100	61.9	85.4	+
SAAF	0.0	0.0	0.0	0.0	100	100	100	100	-	0.0	0.0	0.0	0.0	100	100	100	100	-
Captan 50 WP	65.0	25.0	11.0	33.7	27.8	72.2	87.8	62.6		23.0	0.0	0.0	11.7	74.4	100	86.5	87.0	
Kavach	90.0	54.0	38.0	60.7	0.0	40.0	57.8	32.6		72.3	39.0	39.0	45.1	19.6	56.7	73.3	49.9	
Tilt-25	47.3	18.0	10.0	25.1	47.4	80.0	88.9	72.1	+ +	46.3	13.0	13.0	21.8	48.5	85.6	93.1	75.7	+
Contaf-5EC	50.8	19.7	9.0	26.5	43.6	78.1	90.0	70.6	+ +	33.6	10.5	10.5	14.7	62.7	88.3	100	83.7	+
Tebuconazole-250EC	27.5	0.0	0.0	9.2	69.4	100	100	89.8	–	8.3	0.0	0.0	2.8	90.7	100	100	96.9	+
Pencycuron	88.3	42.6	28.3	53.1	1.9	52.7	68.5	41.0	+ + +	90.0	90.0	90.0	70.1	0.0	0.0	66.3	22.1	-
Control	90.0	90.0	90.0	90.0	0.0	0.0	0.0	0.0	+ + +	90.0	90.0	90.0	90.0	0.0	0.0	0.0	0.0	+ + +
Mean	59.5	27.8	17.8	59.5	33.9	69.1	80.2	61.1		40.8	26.9	17.6	28.4	54.7	70.2	80.4	68.4	
	SEm ±	CD 5%	CD 1%	CV%	SEm ±	CD 5%	CD 1%	CV%		SEm ±	CD 5%	CD 1%	CV%	SEm ±	CD 5%	CD 1%	CV%	
Fungicides (F)	0.70	1.99	2.67	0.15	0.77	2.21	2.96	0.10		0.48	1.37	1.84	0.13	0.53	1.53	2.04	0.11	
Conc.(C)	0.33	0.96	1.25		0.37	1.06	1.42			0.23	0.66	0.88		0.26	0.73	0.98		
F x C	1.21	3.45	4.62		1.34	3.84	5.13			0.83	2.38	3.19		0.93	2.65	3.54		

* Average of three replications, ** + + + = Abundant, + + = Good, + = Poor, - = Nil

(65.9%) and Kavach (57.8%).

In case of *R. solani* complete inhibition of mycelial growth was noticed due to 0.05% SAAF (100%), Super Excel (94.4%), Tebuconazole (90.7%) Mancozeb (85.9%), Bavistin (83.7%), Captan (74.4%) Contaf (62.7%) Topsin-M (51.1%), and followed by, Tilt (48.5%), and least inhibition noticed in Kavch (19.6%).

At 0.1% SAAF, Bavistin, Tebuconazole, Captan and Super Excel, caused complete growth inhibition of *R.solani* followed by Mancozeb, Contaf (88.3%) Topsin-M (86.7%), followed by Tilt (85.6%) and least inhibition was noticed in Kavch (56.7%),

At 0.2% SAAF, Bavistin, Mancozeb, Contaf and Tebuconazole caused complete inhibition of growth of *R.solani* followed by, Tilt (93.1%), Topsin-M (92.1%), Captan (86.5%) Kavch (73.3%), Flint (72.2%) and least by Pencyuron (66.3%) and Super Excel (61.9%).

Of the fungicides tested for inhibition growth of the two pathogen on *F. solani* at 0.05, 0.1 and 0.2 percent concentrations, Maximum growth inhibition control by SAAF, Carbendazim, Tebuconazole, Mancozeb, Captan followed by Propiconazole, Super Excel, Topsin-M, Thiophanate methyl respectively in all concentrations. Reported that Carbendazim and thiabendazole totally inhibited the mycelial growth of *F. solani* (Ranganathan, 2008). Pathogen on *R. solani* at 0.05, 0.1 and 0.2 percent concentrations, Maximum growth inhibition was caused by SAAF, Carbendazim, followed by Tebuconazole, Mancozeb, Captan, Propiconazole, Super Excel and Topsin-M, respectively in all the concentrations.Mancozeb effective against *Fusarium solani* observed (Seetharamulu *et al.*, 2012). Observed completely inhibition *F. solani*, the incitant of wilt disease in Kagzi lime under *in-vitro* condition by carbendazim (0.1%) (Singh *et al.*, 1988). These results are in accordance with kapadiya *et al.* (2013) who reported that cymoxanil + mancozeb, carbendazim + mancozeb were most effective against *F. solani*. The studies indicate that, the fungicides are very much effective in controlling the disease.However further evaluation is need to confirm these findings.

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