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Efficacy of Different Fungicides and Organic Amendments against Basal Rot of Onion Caused by *Fusarium oxysporum in vitro*

[1]S.L. Yadav, [1]R.R. Ahir, [2]B.S. Rathore and [3]S.M. Yadav
[1]Department of Plant Pathology, Sri Karan Narendra College of Agricultural, Jobner, Jaipur, 303329, India
[2]Agricultural Research Station, Mandor, Jodhpur, 342304, India
[3]Department of Mycology and Plant Pathology, Institute of Agricultural Sciences,
Banaras Hindu University, Varanasi, 221005, India

Abstract: Onion (*Allium cepa* L.) is one of the most important vegetable cum condiment crop of family *Alliaceae,* grown in all the parts of India. Onion bulbs and green onions both are rich in minerals, proteins and ascorbic acid. Onion is used throughout the year in the form of salad or condiment or for cooking with other vegetables. Onion is also used for making pickles in vinegar or brine. Its use in soups and souce is very common. Onion has several medicinal uses, its use in the case of sun strokes is known world over. Basal rot of onion caused by *Fusarium oxysporum* is a wide spread disease observed in nurseries as well as in field in the vicinity of Jobner, which causes losses at all the stages of crop growth right from germination to till harvest and also in storage. The efficacy of different fungicide, Benlate, Bavistin, Blitox, Captan and Thiram of different concentrations (50, 100, 200 and 300 ppm) and organic amendments neem cake, mustard cake, groundnut cake, vermicompost and goat and sheep manure of different concentrations (10, 20, 30%). Benlate was found most effective with complete inhibition of mycelial growth of the fungus at 200 and 300 ppm concentrations followed by Bavistin and Blitox. In organic amendements neem cake was found most effective in inhibiting the mycelial growth of *Fusarium oxysporum* and it was followed by mustasrd cake.

Key words: Fungicide, organic amenendments, mycelial growth, sporulation, *Fusarium oxysporum*

INTRODUCTION

Onion (*Allium cepa* L.) is an unique vegetable among Alliums grown in India, which is consumed by almost all the sections of society throughout the year, not only at maturity, but also at different stages of growth. It is an underground bulbous vegetable grown on commercial scale due to its wide adaptability and comparatively high production potentiality. Onion bulb and greens both are rich in minerals, proteins and ascorbic acid. The pungency in onion is due to sulphur bearing compound in the volatile oil allyl propyl disulphide. The red colour of the outer skin of onion bulbs is due to protocatechoic and catechoic a phenolic factor present in red onions which has antifungal properties also (Singh, 1985; Singh, 1998). Onion is used throughout the year in the form of salad or condiment or for cooking with other vegetables (Katyal, 1985). Onion is also used for making pickles in vinegar or brine. It's use in soups and sauce is very common. It has several medicinal uses, it's is very useful to ward-off sunstroke in summer (Salunkhe *et al*., 1987). Among biotic factors, diseases are the major cause of loss to onion crop throughout the world. Disease not only cause serious damage to onion in field, but onion bulbs do not keep well in storage leading to post harvest losses as well. Disease, basal rot caused by *Fusarium oxysporum* is a wide spread disease observed in nurseries as well as in field in the vicinity of Jobner, which causes losses at all the stages of crop growth right from germination to till harvest and also in storage.

MATERIALS AND METHODS

The experiments were conduct in the 2010-2011 in completely randomized design with five replications to see the effect of different fungicide and organic amenemdments of different concentrations effect on mycelial growth and sporulation of *Fusarium oxysporum in vitro*.

Efficacy of fungicides: Efficacy of five systemic and non-systemic fungicides against mycelial growth of *Fusarium oxysporum* was tested by Poisoned Food Technique (PFT) suggested by Nane and Thapliyal (1979). Four different concentrations viz., 50, 100, 200 and 300 ppm of each fungicide were tested. Required quantity of each fungicide was added separately to sterilized medium mixed thoroughly and poured in sterilized 10 cm

Corresponding Author: S.L. Yadav, Department of Plant Pathology, Sri Karan Narendra College of Agriculture, Jobner, Jaipur, 303329, India

diameter of glass petri plates and allowed to solidify for 12 h. Each plate was inoculated with 2 mm disc of 7 days old culture of *Fusarium oxysporum* with the help of sterilized cork borer and incubated at 25+1°C for 7 days. A control was also maintained where medium was not supplemented with any fungicides. The mycelial growth of the test fungus was recorded and per cent growth inhibition was calculated by Vincent (1947) formula given below. The experiment was conducted in completely randomized design with five replications:

$$\text{Percent growth inhibition (PGI)} = \frac{C\text{-}T}{C} \times 100$$

where, C is diameter of colony in check (Average of both diagonals) and T is diameter of colony in treatment (Average of both diagonals).

Efficacy of organic amendments: The effect of each organic amendments was tested at three different concentrations i.e., 10, 20 and 30%. To get these, the required organic amendments quantity were sterilized in autoclave at 1.045 kg cm^{-2} for 20 min and grinded separately in thoroughly washed with sterilized water electric grinder using equal amount of sterilized distilled water. The mixture was squeezed with double layered sterilized cheese cloth. The amendments thus obtained were considered as of 100% concentration. Required amount of stock solution was added to oat meal agar to get desired concentration.

The effect of organic amendments against mycelial growth of *Fusarium oxysporum* were tested by PFT. Required quantity of each organic amendments were mixed thoroughly in melted oat meal agar, to get desired concentration, just before pouring in sterilized 10 cm diameter glass petri plates and was allowed to solidify for 12 h. Each plate was inoculated with 2 mm disc of 7 days old culture of *Fusarium oxypsorum* with the help of sterilized cork borer. The inoculated petri plates were incubated at 25+1°C for 7 days. A control was also maintained where medium was not supplemented with any organic amendments. The experiment was conducted in completely randomized design with five replications. Colony diameter (Two diagonals) was measured after 7 days of incubation. The percent growth inhibition was calculated by Vincent (1947) formula as cited above under.

RESULT AND DISCUSSION

The efficacy of different fungicides against *F. oxysporum* at four concentrations viz., 50, 100, 200 and 300 ppm were assayed *in vitro*. Results presented in

Table 1: Efficacy of different fungicides against mycelial growth of *Fusarium oxysporum* on 7th day of incubation at 25±1°C *in vitro*

	Percent inhibition of mycelial growth*				Mean
Fungicides	50	100	200	300	Concentration (ppm)
Benlate	90.40	95.60	100.00	100.00	96.50
	(71.95)	(77.90)	(90.00)	(90.00)	(79.21)
Bavistin	85.80	90.60	95.20	100.00	92.90
	(67.86)	(72.14)	(77.34)	(90.00)	(74.54)
Captan	61.20	66.80	76.60	85.20	72.45
	(51.47)	(54.81)	(61.07)	(67.37)	(58.33)
Blitox	70.00	78.60	85.60	90.50	81.18
	(56.79)	(62.44)	(67.70)	(72.04)	(64.29)
Thiram	58.60	64.20	70.40	74.10	66.83
	(49.96)	(53.24)	(57.03)	(59.40)	(54.83)
Check	0.00	0.00	0.00	0.00	0.00
Mean	61.00	65.97	71.30	74.97	
	(49.67)	(53.42)	(58.86)	(63.14)	
		SEM+	CD at 5%		
Fungicide (F)		0.73	2.04		
Concentration (C)		0.59	1.67		
F×C		1.45	4.08		

*Average of five replications, Figures given in parenthesis are angular transformed value

Table 2: Efficacy of different organic amendments against mycelial growth of *Fusarium oxysporum* on 7th days of incubation at 25+1°C *in vitro*

	Percent inhibition of mycelial growth*			Mean
Name of organic amendments	10	20	30	Concentration (%)
Neem cake	70.00	77.00	85.70	77.57
	(56.79)	(61.34)	(67.79)	(61.73)
Groundnut cake	60.00	66.00	75.75	67.25
	(50.77)	(54.33)	(60.50)	(55.09)
Mustard cake	64.00	75.80	80.80	73.53
	(53.13)	(60.53)	(64.00)	(59.03)
Vermicompost	55.40	60.00	64.95	60.11
	(48.10)	(50.77)	(53.70)	(50.83)
Goat and sheep manure	48.80	54.00	60.60	54.47
	(44.31)	(47.29)	(51.11)	(47.56)
Check	0.00	0.00	0.00	0.00
Mean	49.70	55.47	61.30	
	(42.18)	(45.71)	(49.52)	
	SEM+		CD at 5%	
Organic amendements extracts (OAE)	0.412		1.165	
Concentration (C)	0.336		0.951	
OAE×C	0.824		2.330	

*Average of five replications. Figures given in parenthesis are angular transformed values

Table 1, 2 indicate that all the chemicals at all the concentration inhibited the fungal growth and the data also revealed that the all the fungicides were significantly superior over check at all the concentrations. Benlate gave complete growth inhibition of *F. oxysporum* at 200 and 300 ppm concentrations, except at 50 ppm (90.40) and 100 ppm (95.60%) and it was followed by Bavistin which gave complete mycelial growth inhibition of *F. oxysporum* at 300 ppm concentration. Blitox and Captan were observed as moderate inhibitors of the mycelial growth of

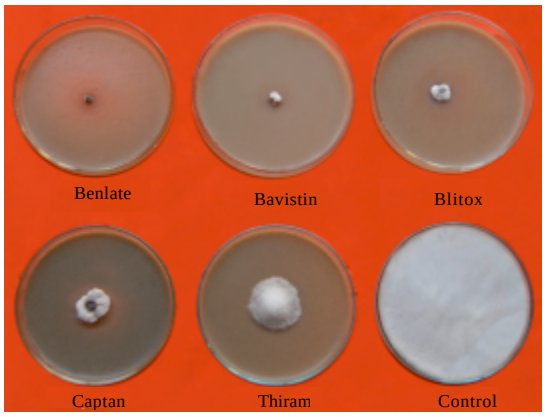

Fig. 1: Efficacy of different fungicides against mycelial growth of *Fusarium oxysporum* at 300 ppm concentration (*in vitro*)

Fig. 2: Efficacy of different organic amendments against mycelial growth of *Fusarium oxysporum* at 30% concentration (*in vitro*)

F. oxysporum at 50, 100, 200 and 300 ppm. Minimum inhibition was recorded in Thiram at 50 ppm (58.60%) followed by Captan (61.20%) Fig. 1.

Similar results were observed by Gupta *et al.* (1983). They tested efficacy of seven fungicides against *Fusarium oxysporum f.sp. cepae* the incitent of basal rot of onion *in vitro* and found that Benlate (Benomy) performed best (250 ppm), followed by Bavistin (carbendazim), Thiram and Vitavax (carboxin) (2000 ppm). Efficacy of five organic amendments was tested *in vitro* at different concentration by poisoned food technique against the mycelial growth of *Fusarium oxysporum.* A perusal of data revealed that all organic amendments were significantly superior in inhibiting the mycelial growth of the fungus over control. Irrespective of the concentration, neem cake extract was found most effective in inhibiting mycelial growth (77.57%) closely followed by mustard cake (73.53) and groundnut cake (67.25) extracts. Vermicompost and goat and sheep manure extracts were found least effective in inhibiting the mycelial growth of *Fusarium oxysporum.* The maximum inhibition of mycelial growth (85.70%) was observed at 30% concentration of neem cake extract followed by mustard cake extract (80.80%) and groundnut cake (75.75), Fig. 2.

Haseeb and Kumar (2007) observed that neem seed powder, neem cake and mint manure were moderately effective against *Fusarium oxysporum* causing wilt of brinjal under field conditions.

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