Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(3): 1861-1863
Received: 21-03-2018
Accepted: 25-04-2018

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Inhibtory effect of commercial fungicides against virulent isolate of *Rhizoctonia Solani*

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Abstract
Effect of nine tested fungicides on the linear mycelia growth of virulent isolate of *Rhizoctonia solani* were evaluated *in vitro* test at concentration 50, 100, 150, 200 and 250 ppm. *In vitro*, the highest reduction of mycelia growth of *R. solani* pathogen was found with fungicide Monceren and Chlorothalonil. The fungicide Monceren and Chlorothalonil at concentration of 150 ppm and above showed complete reduction in mycelial growth of *R. solani* and recorded significantly highest level of hundred per cent growth reduction. These two fungicides were closely followed by Topsin M-70, Bavistin, Benlate, Antracol, Monocut, Boric acid and Matco where total mean per cent growth reductions were 76.75, 63.03, 58.78, 31.79, 51.25, 31.43 and 18.33 respectively.

Keywords: concentration, fungicide, mycelial growth, virulent

Introduction
Rhizoctonia solani has often been associated with root rot and yield decline in field crops and is predominantly a plant pathogenic, soil inhabiting pathogen (Carling *et al*., 1990). The fungus occurs worldwide and very plurivorous and it is a common pathogen of 250 plant species including commercially grown crops (Mordue 1974, Bolkan 1980) [5, 3]. This fungus causes damping-off of seedling, root rot as well as stem canker of growing plant and black scurf of potato tubers (Weinhold and Bowman 1977) . The pathogen is multifaceted in nature and attacks almost all parts of crop plants. Over the years, important changes in management of *R.solani* have been established. These include farmer's dependence on chemical inputs such as insecticide and fungicide as the pathogenic fungus had developed resistant levels against bio control agents and chemicals. The present research work was aimed to study the inhibitory effect of commercial fungicides against *R.solani* under *in vitro* conditions.

Materials Methods
Nine commercial fungicides viz.; Monceren, Benlate, Topsin M-70, Chlorothalonil, Bavistin, Monocut, Antracol, Matco and Boric acid were used in this study and their effect on linear growth of *Rhizoctonia* fungus was evaluated *in vitro* at concentrations 50, 100 and 150 ppm. Petri dishes (9 cm diameter) containing 15 ml of fungicides free PDA medium were used as control. In total three Petri dishes per fungicides treatment (1.0 ml fungicide in 15 ml of medium) were used as three replicates. Each Petri dish was inoculated in the centre with 1.0 cm disc of 4 days old fungal culture. All the inoculated plates were incubated at 30°c for 72 h. The percentage reduction of linear mycelial growth of the *Rhizoctonia* isolate was calculated using the fallowing formula:

$$\text{Fungal mycelial growth reduction (\%)} = \frac{(C-T)}{C} \times 100$$

Where; C: Mycelial diameter in control, T: Mycelial diameter in treatment

Statistical analysis
Data were subjected to proper statistical analysis of variance by transforming the values into square root transformation by using √X+0.50 formula and means of treatments were compared by calucating critical difference (C.D) at 0.05.

Results and Discussion
Effect of nine tested fungicides on the linear mycelia growth of virulent isolate of *R. solani* were evaluated *in vitro* test at concentrations 50, 100, 150, 200 and 250 ppm. Results revealed that tested fungicides namely; Monceren, Benlate, Topsin M-70, Chlorothalonil, Bavistin,

Monocut, Antracol, Matco and Boric acid were effective in reducing mycelial growth of *R. solani* specially at higher concentration starting from 100 ppm and above except Matco which showed very little inhibition even at higher concentration of 250 ppm. The inhibitory effect of fungicides increased with increasing of the fungicide concentrations. The mean per cent inhibition of fungicides were in the range of 80.26 to 100.00 (Monceren), 30.67 to 81.25 (Benlate), 56.25 to 90.00 (Topsin M-70), 42.33 to 100.00 (Chlorothalonil), 29.48 to 88.75(Bavistin), 25.00 to 81.25 (Monocut), 7.06 to 74.03 (Antracol), 5.26 to 31.25 (Matco) and 7.69 to 57.50 (boric acid) respectively (table. 1).

The fungicide Monceren and Chlorothalonil at concentration 150 ppm and above showed complete elimination of mycelial growth of *R. solani* and recorded significantly highest level of hundred per cent growth reduction. These two fungicides were closely followed by Topsin M-70, Bavistin, Benlate, Antracol, Monocut, Boric acid and Matco where total mean per cent growth reduction were 76.75, 63.03, 58.78, 31.79, 51.25, 31.43 and 18.33 respectively (table 2 & fig.1)

These results are in agreement with those recorded by Karima *et al. (*2012) [4]. They suggested that tested fungicides namely Aracur Hymexate and Monceren proved to be the most effective against *Rhizoctonia* spp. pathogen. These fungicides showed the greatest effectiveness in inhibiting mycelial growth of *R. solani* isolate under *in vitro* as well as on per cent germination of seedling under artificial condition (Amini and Sidovick, 2010 and Kimar *et al*, 2011) [7].

Table 1: In-vitro effect of commercial fungicides in reducing mycelial growth of *R.solani*.

Fungicides	Conc. (ppm)	Mycelial radial growth in cm		Growth reduction (%)
		Control	Treatment	
		Mycelial growth (cm)	Radial growth (cm)	
Moncerene	50	7.60 (2.85)	1.50 (1.41)	80.26 (8.99)
	100	7.80 (2.88)	0.50 (1.00)	93.59 (9.70)
	150	7.60 (2.85)	0.00 (0.71)	100.00 (10.02)
	200	7.80 (2.88)	0.00 (0.71)	100.00 (10.02)
	250	7.40 (2.81)	0.00 (0.71)	100.00 (10.02)
B0enlate	50	7.50 (2.83)	5.20 (2.39)	30.66 (5.58)
	100	7.50 (2.83)	4.50 (2.84)	42.85 (6.36)
	150	8.00 (2.92)	2.50 (1.73)	68.75 (8.32)
	200	7.50 (2.83)	2.50 (1.73)	66.66 (8.19)
	250	8.00 (2.92)	1.50 (1.41)	85.00 (9.04)
Topsin M-70	50	8.00 (2.91)	3.50 (2.00)	56.25 (7.53)
	100	8.00 (2.91)	2.50 (1,73)	68.75 (8.32)
	150	8.00 (2.92)	1.00 (1.22)	87.50 (9.38)
	200	8.00 (2.92)	1.50 (1.41)	81.25 (9.04)
	250	8.00 (2.92)	0.80 (1.14)	90.00 (9.51)
Chlorothalonil	50	7.80 (2.88)	4.50 (1.41)	42.33 (6.51)
	100	7.80 (2.88)	1.50 (1.41)	80.76 (9.01)
	150	7.70 (2.86)	0.00 (0.71)	100.00 (10.02)
	200	7.50 (2.83)	0.00 (0.71)	100.00 (10.02)
	250	7.70 (2.86)	0.00 (0.71)	100.00 (10.02)
Bavistin	50	7.80 (2.88)	5.50 (2.45)	29.48 (5.46)
	100	7.80 (2.88)	3.00 (1.87)	61.53 (7.87)
	150	7.50 (2.83)	2.50 (1.73)	66.66 (8.19)
	200	8.00 (2.92)	2.50 (1.71)	68.75 (8.71)
	250	8.00 (2.92)	0.90 (1.18)	88.75 (9.45)
Monocut	50	8.00 (2.92)	6.60 (2.66)	25.00 (4.24)
	100	8.00 (2.92)	5.00 (2.34)	37.50 (6.16)
	150	8.00 (2.92)	3.50 (2.00)	56.25 (7.53)
	200	8.50 (2.92)	4.00 (2.1)	56.26 (7.11)
	250	8.00 (2.92)	1.50 (1.41)	81.25 (9.04)
Antracol	50	8.50 (3.00)	7.90 (2.90)	7.05 (2.75)
	100	7.50 (2.83)	6.40 (2.63)	13.33 (3.89)
	150	7.70 (2.86)	5.50 (2.45)	28.57 (5.39)
	200	7.50 (2.83)	4.80 (2.30)	36.00 (6.04)
	250	7.70 (2.86)	2.00 (1.58)	74.02 (8.63)
Matco	50	7.60 (2.85)	7.20 (2.77)	6.50 (2.49)
	100	7.90 (2.90)	6.90 (2.72)	12.00 (3.62)
	150	8.00 (2.92)	6.60 (2.66)	17.50 (4.24)
	200	8.20 (2.95)	6.20 (2.59)	24.39 (4.98)
	250	8.00 (2.92)	5.50 (2.45)	31.25 (5.62)
Boric acid	50	7.80 (2.88)	7.20 (2.77)	7.60 (2.65)
	100	8.00 (2.92)	6.40 (2.63)	20.00 (4.52)
	150	8.00 (2.91)	6.00 (2.55)	25.00 (5.02)
	200	8.50 (3.00)	4.50 (2.24)	47.05 (6.90)
	250	8.00 (2.92)	3.40 (1.97)	57.50 (7.62)
S.E±	-	0.021	0.025	0.154
C.D (0.05)	-	0.060	0.072	0.437

Values within parenthesis are transformed values

Table 2: Impact of commercial fungicide on mycelial growth of *R. solani* before treatment and after treatment

Fungicide	Mycelial radial growth (cm)		Mycelial Growth reduction (%)
	Control	Treatment	
Moncerene	7.64 (2.85)	0.40 (0.90)	94.77 (9.75)
Benlate	7.70 (2.86)	3.24 (1.90)	58.78 (7.49)
Topsin M-70	8.00 (2.91)	1.86 (1.50)	76.75 (8.75)
Antracol	7.78 (2.87)	5.32 (2.37)	31.79 (5.34)
Matco	7.94 (2.90)	6.48 (2.63)	18.33 (4.18)
Boric acid	8.06 (2.92)	5.50 (2.43)	31.43 (5.33)
Chlorothalonil	7.70 (2.86)	1.20 (1.15)	84.62 (9.12)
Bavistin	7.82 (2.88)	2. 88 (1.78)	63.03 (7.87)
Monocut	8.10 (2.91)	4.12 (2.10)	51.25 (6.81)
SE $_{(N=15)}$	0.00961	0.0114	0.0692
C.D. $_{(0.05)}$ at 64df	0.0271	0.0323	0.1955

Values within parenthesis are transformed values

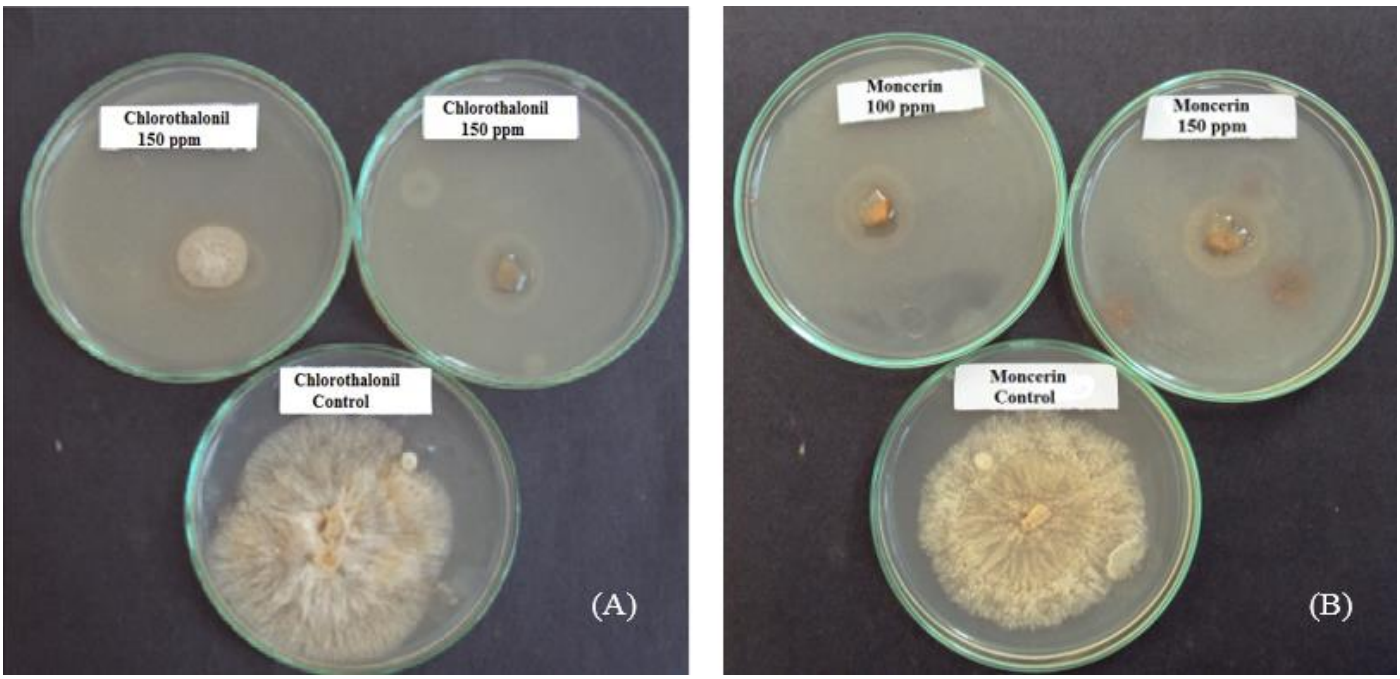

Fig 1: Inhibitory effect of different concentrations of fungicides on growth of *R. solani*. (A) Growth reduction by Chlorothalonil (B) Growth reduction by Moncerene

Acknowledgements
The authors are grateful to Dr. V. Sunaina, Ex. Principal Scientist, ICAR for guiding and helping in writing the manuscript.

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