

Original Research Article

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## Effect of Fungicides and Neem Oil on the Rhizoctonia Root Rot of Soybean (*Glycine max* L.)

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### ABSTRACT

#### Keywords

Management, Neem oil, Rhizoctonia root rot, Soybean

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The efficacy of different fungicides (carbendazim, mancozeb, carboxin, thiophanate methyl, propiconazole) and neem oil were tested at 100, 200 and 400 ppm *in vitro* and concentrations 2g/kg seed treatment and 2ml/lit. foliar spray against *Rhizoctonia* sp., the causal organism of Rhizoctonia root rot of soybean *in vivo*. Among all the treatments, except neem oil showed 100% inhibition of radial growth of fungus *in vitro*. Seed treatment with carbendazim found to be most effective against Rhizoctonia root rot of soybean showing minimum disease incidence and producing maximum yield followed by mancozeb 75 % WP. It was observed that carbendazim 50% WP was statistically significant as compared to other treatments.

### Introduction

Soybean [*Glycine max* (L.), Merrill] is known as “Golden Bean” of the 20<sup>th</sup> century (Hymowitz and Harlan, 1983) and it is most important pulse as well as oil seed crop. It contains 20% oil and 40% high-quality protein. Soybean protein is rich in the valuable amino acid and lysine 5% in which most of the cereals are deficient. It is one of the most important crops of the world cultivated over an area of 19.2 million ha<sup>-1</sup> with a production of 206.5 million tones. The area under soybean in India is 9.21 million ha<sup>-1</sup> and production is 9.81 million tones along with yield of 1065 kg/ha<sup>-1</sup> (Anonymous, 2011). *Rhizoctonia solani* is a fungal pathogen that

affects many agricultural plants. It is a soil-borne fungus. It causes various plant diseases like collar-rot, root-rot and damping-off. *Rhizoctonia bataticola* (Pycnidial stage – *Macrophomina phaseolina*) is the important soil-borne pathogen causes root rot/ charcoal rot disease in soybean. The infection is seen in seedlings and proves to be fatal in most cases. Damping-off is the most common seedling problem caused by the fungus that leads to death of the seedlings (Mehrotra, 1990). *Rhizoctonia* damage may occur at any time during the growing season, but it is more severe on young seedlings. *Rhizoctonia solani* can cause seed-rot, root-rot, and lesions on hypocotyls (Anne and Mills, 2010).

Keeping in view, the above mentioned facts an investigation was undertaken to assess the efficiency of fungicides, and neem oil at different concentrations against *Rhizoctonia sp.*

### Materials and Methods

The field experiment was conducted at SHIATS, Allahabad during *kharif* season of 2012 to observe the effect of mancozeb 75% WP, propiconazole, carbendazim 50% WP, thiophanate methyl, neem oil, and carboxinat different concentrations as compared to control in the form of seed treatment and foliar spray for the management of the *Rhizoctonia* root rot of soybean (*Glycine max* L.). The experiment was laid out in R.B.D. (Randomized Block Design) having seven treatments with three replications in a plot size of 2x1m<sup>2</sup> and observations were recorded disease incidence and yield. The requisite quantity of seed was treated with fungicide before sowing in the field and treatments were sprayed thrice. The first spray was given as

soon as symptoms of disease appeared. Second and third spray was given at 10 and 20 days after first spray. The experiment done using poisoned food technique on effect of radial growth (mm) of *Rhizoctonia solani* at different concentration (Each 100,200 and 400 ppm treatment was replicated three times *in-vitro*) (Nene and Thapliyal, 1979). The experiment was conducted in Completely Randomized Design.

### Results and Discussion

#### Efficacy of different fungicides and neem oil on the growth of *Rhizoctonia solani in-vitro*

It was done by poisoned food technique. Perusal of data in Table 1 indicate that all the treatments mancozeb 75% WP, propiconazole, carbendazim 50% WP, thiophanate methyl and carboxin were found highly effective while neem oil was less effective in managing the mycelial growth of *Rhizoctonia solani*.

**Table.1** Effect of different treatments on the growth of *R. solani* at different concentrations due to poison food technique

Treatments	Concentration (ppm)	Radial growth (Average diameter)	% inhibition over control
<b>Control</b>	-	<b>450.00</b>	
<b>Mancozeb</b>	100	0.00	100
	200	0.00	100
	400	0.00	100
<b>Propiconazole</b>	100	0.00	100
	200	0.00	100
	400	0.00	100
<b>Carbandazim</b>	100	0.00	100
	200	0.00	100
	400	0.00	100
<b>Thiophanate methyl</b>	100	0.00	100
	200	0.00	100
	400	0.00	100
<b>Neem oil</b>	100	22.33	50.37
	200	14.66	67.42
	400	2.33	94.82
<b>Vitavax</b>	100	0.00	100
	200	0.00	100
	400	0.00	100

**Table.2** Effect of various treatments on disease incidence

Treatment	45 DAS	60 DAS	75 DAS
Control	20.00	32.666	49.33
Mancozeb	10.0	15.333	25.33
Propiconazole	17.33	24.666	32.66
Carbandazim	6.66	11.333	22.66
thiophanate methyl	18.00	25.333	34.66
Neem oil	18.66	26.666	35.33
Vitavax	10.66	16.000	28.0

**Table.3** Yield q/ha

TREATMENTS	R <sub>1</sub> (q/ha <sup>-1</sup> )	R <sub>2</sub> (q/ha <sup>-1</sup> )	R <sub>3</sub> (q/ha <sup>-1</sup> )	Average production (q/ha <sup>-1</sup> )
T <sub>0</sub> Control	7.10	8.05	8.78	7.97
T <sub>1</sub> Dithane M-45	8.90	11.74	12.18	10.94
T <sub>2</sub> propiconazole	8.14	8.30	11.08	9.17
T <sub>3</sub> carbandazim	10.28	11.23	11.54	11.21
T <sub>4</sub> thiophenate Methyl	8.50	9.27	10.40	9.36
T <sub>5</sub> Neem oil	7.86	8.40	11.13	9.13
T <sub>6</sub> Vitavax	9.40	10.32	11.30	10.34

Similar findings have been observed by Kazmi *et al.*, (1995), Nasir *et al.*, (2003), Singh and Varma (2005), Konde *et al.*, (2008), Ray and Kumar (2008), Shovan *et al.*, (2008), Mallesh *et al.*, (2008), Ramesh *et al.*, (2009) and EL-Habbaa *et al.*, (2002) found Vitavax-T (25-200ppm) most effective against *Rhizoctonia* sp.

**Efficacy of different fungicides and neem oil on the growth of *R. solani* causing root rot of Soybean *in-vivo***

The experiment was laid out in randomized block design (R.B.D.). All the treatments were found effective against *Rhizoctonia* root rot of soybean (*Glycine max* L.) in

comparison to control. Seed treatment with mancozeb 75% WP, carbendazim 50% WP and carboxin (2 gm/kg seed and foliar spray with propiconazole, thiophanate methyl, neem oil (2 ml/ lit.). Carbendazim found to be most effective against *Rhizoctonia* root rot of soybean (*Glycine max* L.) (Table 2) showing minimum disease intensity at 45, 60 and 75 DAS (6.66, 11.33 and 22.66% respectively) and producing maximum yield (11.21 q/ha) followed by mancozeb 75% WP minimum disease intensity at 45, 60 and 75 DAS (10.0, 15.33 and 25.33% respectively) and producing maximum yield (10.94 q/ha) as compared to 49.33% disease intensity and 7.97 q/ha<sup>-1</sup> yield in control (Table 3). It was observed that carbendazim 50% WP was statistically

significant as compared to other treatments. Among carbendazim 50% WP was found best (Table 1) showing 22.66% disease intensity as compared to control. The results of the present study are in accordance to the findings of Abou-Zeid *et al.*, (1987), Jatav and Mathur (2005), Ray *et al.*, (2007), Konde *et al.*, (2008), Niaz *et al.*, (2008). Shovan *et al* (2008) reported the complete inhibition of radial growth of *Colletotrichum dematium* with Tilt-250EC Mallesh *et al.*, (2009) found propiconazole most effective against *Rhizoctonia* sp. at all stages. and Andrabi *et al.*, (2011) conducted an experiment under field conditions on the effect of fungicides and neem oil on the *Rhizoctonia* root rot of soybean (*Glycine max* L.) and reported that carbendazim 50% WP was more effective @ 2 gm/ kg seed treatment showing least disease intensity of 22.66% as against 49.33% in control. In the present studies, all the treatments tested statistically gave significant results against *Rhizoctonia* root rot of soybean (*Glycine max* L.).

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