J. Mycopathol. Res. **43**(2) : 255-257 (2005)

In vitro evaluation of plant extracts, oilcakes and agrochemicals against Web blight of green gram caused by *Rhizoctonia solani*

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Green gram (*Vigna radiata*) is one of the main pulse crops of Orissa. Web blight caused by *Rhizoctonia solani* is one of the major diseases of green gram. Thirty different formulations are screened *in vitro* against *R. solani*. Out of the nine aqueous plant extracts, ginger (rhizome) was found to cause maximum inhibition of 86.11 per cent. Inhibition by *Tricoderma viride* was 80.70 per cent. Among the six oil cake extracts evaluated, mustard exhibited 48.42 per cent inhibition. Among the four insecticides, Dicofol showed only 28.23 per cent inhibitions. Similarly out of five weedicides, paraquat and butachlor resulted 88.23 per cent inhibition. Out of the five fungicides, propiconazole caused 100.00 per cent inhibition at 250 ppm but copper hydroxide recorded only 36.88 per cent inhibition even at 1,000 ppm.

Key Words : *Vigna radiata, Rhizoctonia solani, in-vitro* screening, plant extract, oilcakes, agrochemicals

INTRODUCTION

Green gram or mung bean, (*Vigna radiata*), is one of the major pulse crops of India. Orissa ranks second in India with production of 1.71 lakh tones but average productivity of the state (325 kg per ha) is very low. One of the main reasons for such low productivity of the crop is due to the damage caused by the pests and diseases. Web blight caused by *Rhizoctonia solani* is one of the major diseases, which causes extensive damage to green gram in Northern India (Agarwal, 1993). The disease is found to be predominant in almost all the green gram growing districts of Orissa.

Chaumont and Jolivet (1978) have reported that eight plant extracts of vegetable origin exhibited inhibitory effect on *R. solani* in France. Evaluating organic amendments with four oil seed cakes, against nematodes and soil fungi, Tyagi and Alam (1995) have found that the population of nematodes and *R. solani* was significantly reduced by mustard oil cake. Tatsuyama and Jikhara (1970) have observed that four weedicides, such as disoneb, pentachloro-phenol, linuron and chloropropham, could effectively inhibit the fungus. Many workers have reported effectiveness of various fungicides both *in vitro* and *in vivo* against *R. solani*. In a recent study, Jamaria and Sharma (2002) have obtained highest yield of green gram in the plots sprayed with 0.1 per cent carbendazim. Keeping this in view, an attempt is made to screen 30 different formulations against *R. solani* causing web blight of green gram in Orissa. Formulations included are nine plant extracts, one bio-agent, six oil cakes, four insecticides, five weedicides and five fungicides.

MATERIALS AND METHODS

Web blight affected leaves and pods of susceptible green gram variety, PDM-54, were collected during July 2002, and the casual organism, *Rhizoctonia solani* was isolated. Culture was purified by single spore inoculation technique, tested for pathogenecity and maintained in potato dextrose

agar (PDA) slants. Nine plant extracts (Table 1) were prepared by crushing 200 g fresh leaves, bulbs or rhizomes, as the case may be, using sterilized water. Solutions were filtered and centrifuged at 5,000 r.p.m for five minutes. Clear supernatant solutions thus obtained were used to prepare poison food PDA media. Equal sized core disc (5.0 mm) of seven days old culture of *Trichoderma viride* was used (placed in two corners) to study the growth inhibition of test fungus (placed in the centre) by dual culture method. Six oil cakes (Table 2) were soaked for 24 hrs mixed well and filtered. This stock solution was used for making poison food media. Poison food media were also prepared using selected concentrations of 14 different agro-chemicals *i.e.* four insecticides (Table 3), five weedicides (Table 4) and five fungicides (Table 5).

Efficacy of the formulations was measured as percentage of growth inhibition (PGI) using the formula, PGI = dc-dt/dc × 100, where 'dc' is equal to the mean colony diameter of test fungi in control plates, and 'dt' in treated plates. Three replications were maintained for each treatment. Inoculated plates were incubated at room temperature (28 ± 2°C). Observation of colony diameter were taken at an interval of 24 hrs till there was full growth in control plates.

RESULTS AND DISCUSSION

The PGI of 10 per cent aqueous extract of nine plants were assayed *in vitro* against *R solani* and presented in Table 1. The rhizome extract of ginger exhibited mamimum PGI (86.11%) of the test fungus. Effect of *Lantana camera* (46.66%) *Eucalyptus citridora* (45.00%), *Vinca rosea* (43.88%) and *Calotropis gigantia* (43.33%), was found low as compared to ginger and almost at par with each other, followed by *Pongamia glabra* (33.33%). Onion bulb, neem and tulsi were not found effective. Effect of *T. viride* against *R. solani* was found to be 80.70 per cent.

Extracts of six commonly agailable oil cakes were evaluated against *R solani* and except mustard cake (48.42%), none other cakes showed any significant effect (Table 2). Out of the four insecticides, only Dicofol showed marginal inhibition of 28.23 per cent (Table 3). Among the five weedicides tested, four were effective to different extent but oxyfluorfen could not inhibit the growth of *R. solani.* Paraquat dichloride and butachlor showed highest inhibition 88.23 per cent, followed by quizalofop ethyl and alachlor at 74.52 per cent and 42.75 per cent respectively (Table 4). Propiconazole exhibited total inhibition (100.00%) at 250 ppm. Hexaconazole, epoxyconazole and tricyclazole exhibited total inhibition at 500 ppm but copper hydroxide could inhibit the growth of *R. solani* only up to 36.88 per cent even at 1,000 ppm (Table 5). Sterol biosynthesis inhibitors (SBI) group of fungicides were found to be better inhibitor of *R. solani* than the traditional copper fungicide.

Table 1 : Percentage growth inhibition (PGI) of *R. solani* due to plant extracts (10% concentration).

Extract of plants	Scientific name	PGI over control
Araka	*Calotropis gigantia*	43.33
Sadavihari	*Vinca rosea*	43.88
Tulsi	*Ocimum sanctum*	0.00
Neem	*Azadirachta indica*	1.00
Karanja	*Pongamia glabra*	33.33
Nagaairy	*Lantana camera*	46.66
Nilagini	*Eucalyptus citridora*	45.00
Onion (bulb)	*Allium cepa*	1.66
Ginger (rhizome)	*Zingiber officianale*	86.11
Control (sterile water)		0.00
CD (0.05%)		4.32

Table 2 : Percentage growth inhibition (PGI) of *R. solani* due to oil cakes (5% concentration).

Extract of oil cakes	Colony diameter (in mm)	PGI over control
Ground nuts	95.0	0.00
Mustard	49.0	48.42
Sunflower	69.5	26.84
Neem	89.0	6.31
Niger	95.0	0.00
Linseed	78.5	17.36
Control (sterile water)	95.0	0.00
CD (0.05%)	6.74	

Table 3 : Percentage growth inhibition (PGI) of *R. solani* due to insecticides (0.2% concentration).

Insecticides	Chemical name	Colony dia.(mm)	PGI over control
Guru (10EC)	Cypermethrin	85.0	0.00
Colonel S (18.50EC)	Dicofol	61.0	28.23
Metasystox (25EC)	Oxydemeton methyl	85.0	0.00
Marshal (25EC)	Carbosulfan	85.0	0.00
Control (sterile water)		85.0	0.00
CD (0.05%)		0.24	

Table 4 : Percentage growth inhibition (PGI) of *R. solani* due to weedicides (0.2% concentration).

Weedicides	Chemical name	Colony dia.(mm)	PGI over control
Uniquat (24SL)	Paraquat dichloride	10.0	88.23
Targa supar (5EC)	Quizalofop ethyl	21.66	74.52
Teer (50EC)	Butachlor	10.0	88.23
Lasso (50EC)	Alachlor	48.66	42.75
Goal (23.5EC)	Oxyfluorfen	85.0	0.00
Control (sterile water)		85.0	0.00
CD (0.05%)		3.49	

Table 5 : Percentage growth inhibition (PGI) of *R. solani* due to fungicides at different concentrations.

Fungicides	Chemical name	PGI over Control at 250 ppm	500 ppm	1000 ppm
Contaf(5EC)	Hexaconazole	81.11	100.00	100.00
Tilt(25EC)	Propiconzole	100.00	100.00	100.00
Opus(12.5EC)	Epoxyconazole	97.11	100.00	100.00
Kocide(77WP)	Copper hydroxide	9.55	27.33	36.88
Trooper(75WP)	Tricyclazole	78.72	11.32	100.00
Control(sterile water)		0.0	0.0	0.0
CD(0.05%)		2.37	11.32	10.54

The results indicated that, soil amendment with mustard oil cake, seed treatment with *T. viride*, spraying with ginger rhizome extract at seedling stage and later with propeiconazole could be an effective IDM strategy. In Orissa mung bean is generally grown in rain fed marginal lands in input starved conditions where high weed infestation is often observed. In such situation spraying with either with paraquat dichloride or butachlor could suppress both the weeds and the test fungus and could be included in IDM against web blight of mung bean. However, further multilocational trials needs to be undertaken before finalising field recommendations.

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(Accepted for publication August 4, 2005)