



BIOEFFICACY OF PLANT EXTRACTS IN THE CONTROL OF ROOT ROT DISEASE OF SPONGE GOURD

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The efficacy of 13 plant extracts viz- leaf extracts of *Azadirachta indica*, *Catharanthus roseus*, *Lantana camara*, *Ocimum sanctum*, *Ricinus communis*, *Saraca indica* and *Thuja occidentalis*, latex yielding plants *Calotropis procera*, *Nerium indicum*, *Datura*, *Ficus religiosa* and bulbs of *Allium cepa* and *Allium sativum* were tried to control root rot pathogen in vitro in sponge gourd seeds using Standard blotter method (SBM). They were evaluated for their antifungal activity over *Rhizoctonia solani*. All the plant extracts showed significant reduction in the growth of the pathogen compared with control. Among the different extracts leaf extract of *Ricinus communis* and *Allium sativum* bulb extract gave better result to control *R. solani*. Application of plant extracts is non pollutive, cost effective and ecofriendly method for controlling the plant diseases.

KEYWORDS: Antifungal activity, Bulbs, Latex yielding, Leaf extracts, *Rhizoctonia solani*.

Sponge gourd is an important horticultural vegetable crop, widely grown throughout India. It is being grown from March to November for vegetable purpose. The fruit of the vegetable contain easily digestible nutrients as well as have several medicinal values. The dried fruits have immense domestic value.

A large number of diseases affect the production of sponge gourd, but Belly rot caused by *Rhizoctonia solani*, have become a major problem in cucurbit crops in Kota district of Rajasthan. It is the most devastating disease, which causes more than 50% losses in seed yield. *Rhizoctonia solani* is a soil borne fungus. *Rhizoctonia* spp. may infect a seedling prior to emergence or after emergence and cause various kinds of stem lesions usually near the soil surface and result in some shade of brown, red or orange discoloration. Older lesions will appear sunken with less red color and may eventually rot the entire outer portion of the stem, thus causing the plant to fall over (Kucharek 2000).

Effective and efficient management of crop disease is generally achieved by use of synthetic pesticides (Kiran *et al.* 2006). Due to increased awareness about the risks involved in the use of pesticides much attention is being focused on the alternative methods of pathogen control. The recurrent and indiscriminate use of fungicides have posed a serious threat to human health and to the existing human

ecogeographical conditions as some of them have already proved to be either mutagenic, carcinogenic or tetretogenic. Keeping in mind the drawback of chemical fungicides for the control of plant diseases, the use of plant extracts in the management of plant diseases is gaining importance.

MATERIALS AND METHODS

Thirteen plant extracts viz. Leaf extract of *Azadirachta indica*, *Catharanthus roseus*, *Lantana camara*, *Ocimum sanctum*, *Ricinus communis*, *Saraca indica*, *Thuja occidentalis* latex yielding plant *Calotropis procera*, *Datura strominium*, *Ficus religiosa*, *Nerium indicum* and bulb extract of *Allium cepa* and *Allium sativum* were tried against *Rhizoctonia solani*. 10gm fresh leaves/bulb of each plant were taken, washed thoroughly and crushed in 10ml of sterilized distilled water (1: 1 v/v) in pestle and mortar. The extracts were filtered with double layered cheese cloth. This formed stock aqueous extracts. For the treatment seed samples ac. no. Sg-56, Sg-68 carrying natural infection were used. Dry seed examination of symptomatic seeds showed various kinds of disorders like seeds with brown, black and white discolouration, small seeds, shrivelled seeds and insect damaged seeds. 99 samples out of 120 samples of sponge gourd showed brown discolouration with black pin head like minute spots (microsclerotia) of *Rhizoctonia solani* covering the seed surface. Incubation of these

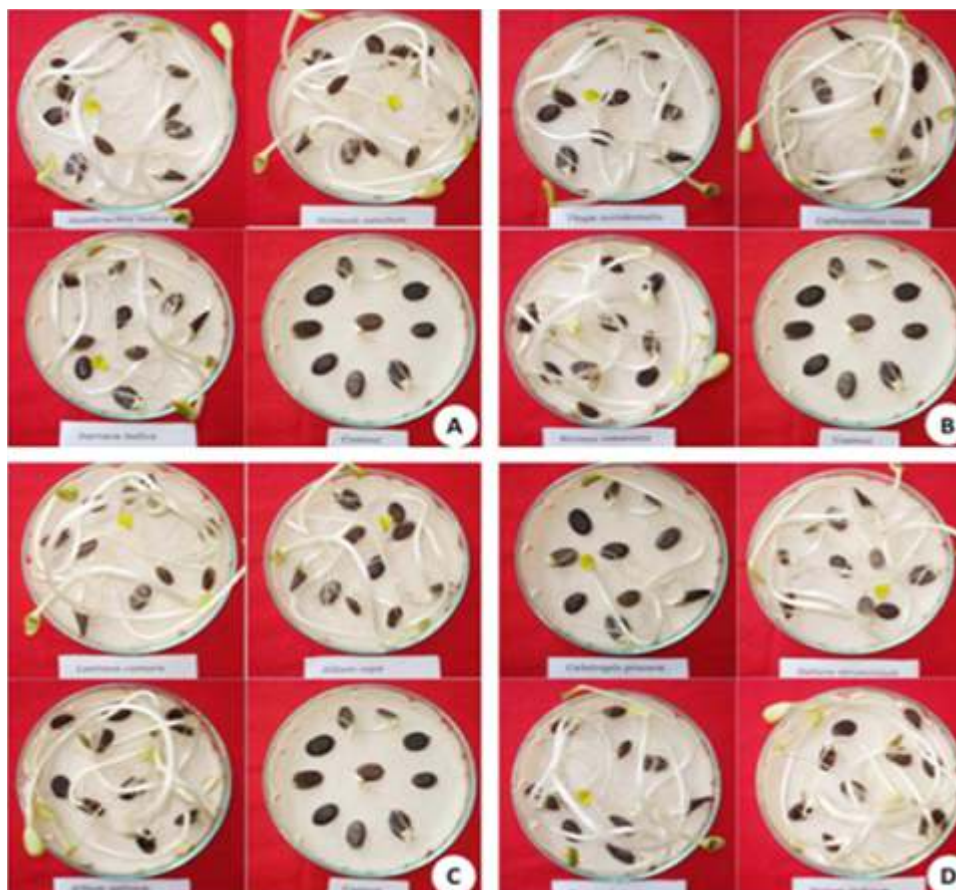


Figure-1 (A-D): Control of seed borne infection of *Rhizoctonia solani* by seed treatment with plant extracts in sponge gourd. **A-D.** Petriplate showing effect of plant extracts , bulb extracts and latex yielding plants, extracts of *Azadirachta indica*, *Ocimum sanctum*, *Saraca indica*, *Thuja occidentalis*, *Catharanthus roseus*, *Ricinus communis*, *Lantana camara*, *Allium cepa*, *Allium sativum*, *Calotropis procera*, *Datura strominum*, *Ficus religiosa*, *Nerium indicum* and their control.

symptomatic seeds yielded pure growth of the pathogen. 5 replicates of 10 seeds each naturally infected seeds with *R. solani* were surface sterilized with 2% chlorine solution and then soaked separately in each aqueous extracts for 4h. The seeds soaked in distilled water were used as control. The seed were incubated on moistened blotters. The observations on seed germination, incidence of pathogen and infected seedling were recorded every 24 hour interval upto 8th day and the following formula was applied for the calculation of percent seed germination and percent reduction.

$$\text{Percent seed germination} = \frac{\text{Number of germinated seeds}}{\text{Total number of seeds}} \times 100$$

$$\text{Percent reduction} = \frac{\text{Incidence in control} - \text{Incidence in treatment}}{\text{Incidence in control}} \times 100$$

RESULT AND DISCUSSION

All the plant extracts showed inhibitory effect on the growth of the pathogen. Out of thirteen plant extracts *Allium sativum* showed maximum germination (82%) followed by *Ricinus communis* (80%), *Nerium indicum* (78%), *Catharanthus roseus* (72%), *Ocimum sanctum* (70%), *Azadirachta indica* (68%) , *Lantana camara* and *Ficus religiosa* (66%), *Saraca indica* and *Datura* (64%), *Thuja* (58%) and *Allium cepa* (56%). Minimum germination (52%) was observed in seeds treated with leaf extract of *Calotropis procera*.

The pathogen incidence of *R.solani* was significantly controlled by extract of *Allium sativum* (90.77%) followed by *Ricinus communis* and *Nerium indicum* (87.69%), *Ocimum sanctum* (84.62%), *Catharanthus*

Table 1. Control Of Seed Borne Infection of *Rhizoctonia solani* in Sponge Gourd Seeds By Leaf Extracts, Bulb Extracts And Latex Yielding Plants.

SOURCE	Name of plants	Germination				Control of seedling infection				Control of pathogen incidence			
		Percentage	Mean	Mode	SD	Percentage	Mean	Mode	SD	Percentage	Mean	Mode	SD
Leaf	<i>Azadirachta indica</i>	68	6.8	8	1.304	73.07	1.4	1	0.5477	75.38	1.6	1	0.8944
	<i>Ocinum sanctum</i>	70	7	7	0.7071	84.61	0.8	0,1	0.8367	84.62	1	2,0	1
	<i>Saracca indica</i>	64	6.4	6	1.114	73.07	1.4	2	0.8944	75.38	1.6	1	0.8944
	<i>Thuja occidentalis</i>	58	5.8	7	1.304	76.92	1.2	2,1	0.8367	78.46	1.4	1	1.14
	<i>Catharanthus roseus</i>	72	7.2	7,8	0.8367	80.76	1	2,0	1	81.54	1.2	1	0.4472
	<i>Ricinus communis</i>	80	8	8	0.7071	88.46	0.6	1	0.5477	87.69	0.8	1	0.4472
	<i>Lantana camara</i>	66	6.6	7	0.5477	69.23	1.6	1	0.8944	72.3	1.8	3	1.304
	<i>Allium cepa</i>	56	5.6	5	0.8944	65.38	1.8	2,1	0.8367	69.23	2	3,1	1
Bulb	<i>Allium sativum</i>	82	8.2	8,9	0.8367	88.46	0.6	1	0.5477	87.69	0.8	0	1.095
Latex	<i>Calotropis procera</i>	52	5.2	5,6	0.8367	61.5	2	2	0.7071	69.23	2	3,2	1.225
	<i>Datura innoxia</i>	64	6.4	6	1.14	76.92	1.2	2,1	0.8367	78.46	1.4	1	0.5477
	<i>Ficus religiosa</i>	66	6.6	7	1.14	73.07	1.4	2	0.8944	75.38	1.6	1	0.8944
	<i>Nerium indicum</i>	78	7.8	8	0.4472	88.46	0.6	0	0.8944	90.77	0.6	0	0.8944
Control		4.4				5.2				6.5			

Statistical analysis shows values of Mean, Mode and SD= Standard deviation of 5 replicates.

roseus (81.54%), *Thuja* and *Datura* (78.46%), *Azadirachta indica*, *Saraca indica* and *Ficus religiosa* (75.38%), *Lantana* (72.30%). *Allium cepa* and *Calotropis procera* (69.23%) showed minimal control of pathogen incidence.

Seedling infection of *Rhizoctonia solani* was very low due to treatment of *Allium sativum*, *Ricinus communis* and *Nerium indicum* (percent control of seedling infection 88.46%), *Ocimum sanctum* (84.66%) and *Catharanthus* (80.76%). In other plants it ranged from (61.5-76.92%) (Table-1; Fig.1).

Although all leaf extracts proved better but best control of *R. solani* in Sponge gourd was obtained by extract of *Allium sativum* followed by *Ricinus communis*, *Nerium indicum*, *Ocimum sanctum* and *Catharanthus roseus*.

Sehajpal *et al.* (2009) Thirty-six plant extracts showed fungitoxic potentiality against *R. solani*, out of which *Allium sativum* show strong fungitoxicity against the test pathogen even at low concentration. Antifungal property of *Allium sativum* may be due to the presence of sulphur compounds and allicin.

The fungicidal property of *Allium cepa* may also be attributed to the presence of sulphur compounds (Dubey and Dwivedi 1991). *Lantana camara* has shown moderate fungicidal response to the test pathogen. Thymol present in *Lantana camara* is responsible (Srivastava and Lal 1997). Yadav *et al.* (2005) found *Datura stramonium* inhibited the growth of *Rhizoctonia solani*.

Zainab *et al.* (2009) studied the effect of seed powder of some local trees against *Macrophomina phaseolina*, *R. solani* and *Fusarium solani* causing root rot disease in mung bean (*Vigna radiata* L.) and chick pea (*Cicer arietinum* L.) plants.

Emanuel *et al.* (2010) showed enhanced plant growth parameter and reduced infection of *Fusarium* spp., *Rhizoctonia solani*, *Macrophomina phaseolina* on mash bean and okra.

Askar and Rashad (2010) studied the antifungal activity of ethanol-water extracts of four

medicinal plants, cinnamon (*Cinnamomum verum* Presl.), anise (*Pimpinella anisum* L.), and black seed (*Nigella sativa* L.) and clove (*Syzygium aromaticum* L. Merr. & Perry.) against pea (*Pisum sativum* L.) root-rot fungus *Rhizoctonia solani*.

Khair and Nadia (2011) studied the effect of aqueous extracts of Chilli, *Lantana*, Lemon grass and Onion seeds which highly reduced the mycelial growth of *F. solani* and of *R. solani* in *Phaseolus vulgaris* plants.

Mangang and Chhetry (2012) reported antifungal properties of some plant extracts including *Lantana camara* against *R. solani* causing root rot of French bean in organic soil of Manipur.

Gurjar *et al.* (2012) explained the role of important plant botanicals including Neem (*Azadirachta indica*, A. Juss), Garlic (*Allium sativum*, Linn.), Eucalyptus (*Eucalyptus globulus*, Labill.), Turmeric (*Curcuma longa*, Linn.), Tobacco (*Nicotiana tabacum*, Linn.), Ginger (*Zingiber officinale*, Rosc.) in plant disease management.

CONCLUSIONS

Extracts of *Allium sativum* followed by *Ricinus communis* and *Nerium indicum* gave best results in control of *Rhizoctonia solani* in smooth gourd. Thus it can be recommended that the use of plant extracts of *Allium sativum*, *Ricinus communis* and *Nerium indicum* for the management of root rot of sponge gourd caused by *R. solani* gave better results as they are biologically based and environmentally safe alternatives. The botanicals are non pollutive, cost effective, non hazardous easily available and do not disturb the ecological balance.

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