



## IN VITRO EVALUATION OF BOTANICALS AGAINST FOOT ROT (*SCLEROTIUM ROLFSII* SACC.) OF TOMATO

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### ABSTRACT

Foot rot of tomato caused by *Sclerotium rolfsii* is an important disease of tomato inflicting heavy loss. The present investigation was carried out to evaluate the efficacy of botanicals viz., neem leaf extract, eucalyptus leaf extract, jathropa leaf extract, tulsi leaf extract, garlic bulb extract, onion bulb and marigold leaf extract and these were screened at three different concentration (5, 10 and 15 %). Among the botanicals tested against *S. rolfsii* under *in vitro* conditions onion bulb extract showed 100% inhibition at all the three concentrations followed by garlic bulb extract (97.77 %, 98.88 % and 100% at 5, 10 and 15% concentration, respectively) while least inhibition of mycelium was observed (22.55, 24.44 and 44.07 % inhibition at 5, 10 and 15% concentration, respectively) in jathropa leaf extract.

**KEY WORDS:** *Sclerotium rolfsii*, *In vitro*, Botanicals, Concentration, Poison food technique.

### INTRODUCTION

Tomato (*Solanum lycopersicum* L.) is an important nutritive rich and warm season vegetable crop grown throughout the world. In the world, tomato is cultivated in an area of 4.8 million hectare with an annual production of 161.8 million tonnes (Anon, 2012). In India, it occupies an area of about 0.88 million hectares with the production of 18.22 million tonnes (Anon, 2013). In Karnataka it occupies an area of 0.05 million hectare with a production of 1.76 million tonnes (Anon, 2013). The production is concentrated in the belts of Belgaum, Dharwad, Kolar, Bangalore and Bellary. Though, the area under tomato cultivation was high, the productivity is 34.3 MT/ha and this attributed to the potential loss in yield due to a number of diseases. The annual loss of vegetable due to the pathogen is 10%, major loss is due to the fungal pathogen. Among the phyto pathogenic fungi, disease caused by *Sclerotium rolfsii*, a soil borne fungi which causes foot rot or collar rot of tomato is gaining a serious status. *S. rolfsii* has become a major limiting factor and the challenging to both farmers and scientists. Many approaches have been exploited for management of this disease. Management of foot rot has been accomplished primarily by the application of chemical fungicides not considered to be long-term solutions, due to concerns of expense, exposure risks, fungicide residues and other health and environmental hazards. In an attempt to modify this condition, some alternative methods of control have been adopted. Natural products isolated from plant appear to be minimal environmental impact and danger to consumers in contrast to synthetic pesticides (Varma and Dubey, 1999). The use of plant extracts has been shown to be eco-friendly and effective against many plant pathogens (Saadabi, 2006; Gachomo and Kotchoni, 2008; Thobhunluepop, 2009; Duru and Onyedineke, 2010), most of these substances were evaluated in order to find a safe alternative control methods to the human and the

environment. The present work was designed to investigate the antifungal activity of aqueous extracts of seven botanicals against *S. rolfsii* under *in vitro* conditions.

### MATERIALS & METHODS

The pathogenic isolate of *S. rolfsii* was isolated from tomato plants showing typical symptoms of foot rot by using potato dextrose agar (PDA) and pathogen were identified as *S. rolfsii* according to Sarma *et al.* (2002). Collection of botanicals/ plant materials: Fresh healthy leaves of seven disease free botanical plant viz., neem leaf extract, eucalyptus leaf extract, jathropa leaf extract, tulsi leaf extract, garlic bulb extract, onion bulb and marigold were collected from in and around VC Farm Mandya, UAS, GKVK, Bengaluru, Karnataka, India.

#### Preparation of cold aqueous extract

Fresh sample of each test plant were collected and washed first in tap water and then in distilled water. 100 g of fresh sample was crushed in a surface sterilized pestle and mortar by adding 100 ml sterile distilled water (1:1 w/v). The extract was used as stock solution for the study. To study the anti-fungal activity of plant extracts, the poison food technique was followed. To prepare 5, 10 and 15 % concentrations of plant extract, five, ten and fifteen ml of stock solution was mixed with 95, 90 and 85 ml of sterilized molten potato dextrose agar medium respectively. The medium was thoroughly shaken for uniform mixing of the extract and then the media were sterilized again. Twenty ml of sterilised and molten medium was poured into each of the 90 mm sterilized petriplates. Each plate was inoculated with 5 mm mycelial discs taken from the periphery of *S. rolfsii* culture and incubated at 27±1°C till the growth of colony touched the periphery in the control plate. The disc was placed upside down in the center of the petriplate, so that the mycelium was in direct contact with the medium poisoned with the

requisite plant extract at required concentration. Three replications were maintained in each treatment. Suitable control plates were maintained where in culture discs were inoculated into the centre of potato dextrose agar plates without plant extracts. Mean colony diameter in each case was recorded by taking the diameter of the colony in two directions. Radial growth of the fungus was measured and per cent inhibition of mycelial growth over control was calculated by using the formula given by Vincent (1947). Percent inhibition of mycelia will be calculated by using formula:

$$\text{Inhibition rate (\%)} = \frac{C - T}{C} \times 100$$

C = Radial growth of fungi in control condition

T = Radial growth of fungi in silicon treated condition

The data obtained from this study were subjected to statistical analysis as per the procedure given by Sundaraj *et al.* (1972). Factorial completely randomized design used for to study and compare the treatments effects.

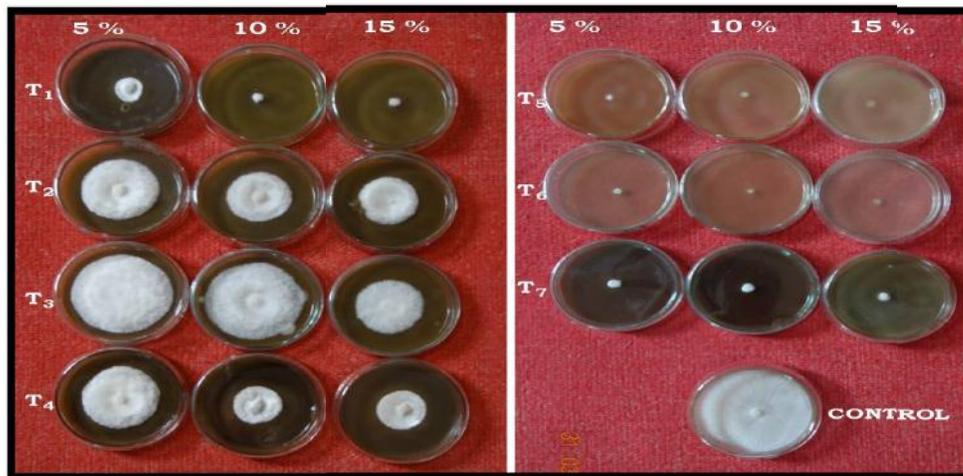
### RESULTS & DISCUSSION

Among the extracts of seven botanicals, complete inhibition of mycelia growth was recorded in onion bulb extract at all the concentration tested (5, 10 and 15%) followed by garlic bulb extract with the inhibition of 97.77, 98.88 and 100 per cent at 5, 10 and 15 per cent concentration respectively with mean of 98.88 per cent and data are presented in Table 1 and Plate 1.

**TABLE 1:** *In vitro* evaluation of botanicals against foot rot fungus *Sclerotium rolfsii*

Treatments	Extracts of Botanicals	Mean percent mycelial inhibition			
		Concentration of botanicals (%)			
		5	10	15	MEAN
T <sub>1</sub>	Neem leaf	75.55 (60.35)	91.11 (72.64)	93.33 (75.02)	86.66 (68.56)
T <sub>2</sub>	Eucalyptus leaf	38.88 (38.56)	50.00 (44.99)	53.00 (46.71)	47.29 (43.44)
T <sub>3</sub>	Jathropa leaf	22.55 (28.34)	24.44 (29.62)	44.07 (41.58)	30.35 (33.42)
T <sub>4</sub>	Tulsi leaf	38.88 (38.56)	59.67 (50.56)	61.67 (51.73)	53.40 (46.94)
T <sub>5</sub>	Garlic bulb	97.77 (81.40)	98.88 (83.91)	100 (89.98)	98.88 (83.91)
T <sub>6</sub>	Onion bulb	100 (89.98)	100 (89.98)	100 (89.98)	100 (89.98)
T <sub>7</sub>	Marigold leaf	86.33 (68.28)	89.67 (71.23)	90.78 (72.31)	88.92 (70.54)
	Botanicals	Concentrations	B X C		
	SEm±	0.150	0.139	0.367	
	C.D at 1%	0.569	0.527	1.393	

† Values in parenthesis are arcsine transformed values



**PLATE 1:** Effect of botanicals on the mycelia growth of *Sclerotium rolfsii* on tomato

#### Legend:

T<sub>1</sub>: Neem leaf extract, T<sub>2</sub>: Eucalyptus leaf extract, T<sub>3</sub>: Jathropa leaf extract, T<sub>4</sub>: Tulsi leaf extract, T<sub>5</sub>: Garlic bulb extract, T<sub>6</sub>: Onion bulb extract, T<sub>7</sub>: Marigold leaf extract

However, in marigold leaf extract 86.33, 89.67 and 90.78% inhibition at 5, 10 and 15% concentrations was recorded respectively. Neem leaf extract showed 75.55, 91.11 and 93.33 % inhibition at 5, 10 and 15 per cent concentrations respectively. In tulsi leaf extract 38.88, 59.67 and 61.67% inhibition was recorded at 5, 10 and 15% concentrations respectively; 38.88, 50 and 53% inhibition was observed in eucalyptus leaf extract at 5, 10 and 15% concentration respectively. Minimum inhibition was observed in jathropa leaf extract, with 22.55, 24.44

and 44.07% inhibition at 5, 10 and 15% concentration respectively with a mean of 30.35%. The present results are in line with the observation of Gaikwad and Kapgate (1990) who found that the *Alium sativum* L. at 0.1, 0.15 and 0.25% concentration was found toxic to *S. rolfsii*. Singh *et al.* (2007) observed that neem extract (*Azadirachta indica*) caused the maximum inhibition of mycelial growth and sclerotial production, its size and variability. However in the present study onion bulb extract showed maximum mycelial inhibition which is

attributed to presence of phytochemicals and alkaloids which have inhibitory effect on *Sclerotium rolfsii*. The present findings strongly suggest that the aqueous leaf extracts of botanicals have direct fungitoxic activity against the foot rot of tomato caused by *S. rolfsii*.

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