Studies on Varietal Reaction of Tuberose against Stem Rot Diseases Caused by *Sclerotium rolfsii*

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A B S T R A C T

Tuberose (*Polianthus tuberosa Linn.*) is a commercially important bulbous ornamental perennial plant cultivated in the world as well in India for cut and loose flower trade. Tuberose gets infected by many fungal, bacterial and viral diseases. The most devastating disease is basal stem rot caused by the fungus *Sclerotium rolfsii*. According to the present studies, using varietal screening method against the *Sclerotium rolfsii* is considered as an ecological and durable method for controlling this disease. Therefore, three different varieties and three local cultivars were evaluated by pot culture under controlled condition. Study of varietal resistance revealed that all the six cultivars tested under controlled glass house condition were found highly susceptible (HS) to stem rot or basal stem rot diseases. But some other cultivars are found low level of per cent disease incidence.

Introduction

Tuberose (*Polianthus tuberosa Linn.*) is a monocot, perennial, bulbous ornamental plant belonging to family Amaryllidaceae (Rose 1903-05, Baily 1939). Hutchinson (1944, 1959, 1960) placed it under the family of Agavaceae. Tuberose is a multipurpose flower which is used for floral ornaments, artistic garlands, bouquets and buttonholes or crown frequently used during marriages and religious ceremonies (Randhawa and Mukhopdhyay, 1986). The flower is also used for the extraction of its highly valued natural flower oil which is one of the most expensive raw material of high-grade perfumes, cosmetic products (Mallavarapu, 1995).

It also contains anti-inflammatory and antispasmodic properties (Maliga, 2003).Tuberose floral essential oil are fetching higher price than the other floral essential oil. The fungal disease stem rot (*Sclerotium rolfsii*) is one of the most serious

problem in tuberose cultivated areas. It causes high loss in tuberose production. The pathogen is soil borne. It causes sucker rot, stem rot, basal stem rot, rhizome rot, and as well as premature death of affected plants. Under severe condition, the losses due to stem rot disease may go up to 50-60 per cent (Kakade, 2007). In case of more severe condition, affected plant does not produce flowering shoots (Das, 1961).

In Tamil Nadu, losses estimated range from 20-40% per cent (Theradimani *et al*., 2018). The pathogen produces dormant resting body (sclerotia). These resting bodies survive in soil for many years which germinate under favourable condition and infect the plants.

The objective of the present study to use immune or resistant cultivars is a long term solution to manage this disease. Therefore, the study was initiated to screen tuberose cultivars against stem rot or basal stem rot diseases.

Materials and Methods

Four different tuberose cultivars were collected from Floriculture Research station, Thovalai, Tamil Nadu and another two local cultivars were collected from farmer's field. Totally six different cultivars were used for this study. Inoculum of *Sclerotium rolfsii* isolated from infected plant was multiplied in sand maize medium for soil infestation. Experiment was conducted in pots at Department of Plant Pathology, AC & RI, Killikulam. Soil was twice sterilized in autoclave at 121°C for 15 lps.

Then sterilized soil was filled in pots. Potted soil was inoculated with test fungi *Sclerotium rolfsii* multiplied in sand maize medium. Three sucker of each variety in each pot was sown after seven days incubation of soil. Before sowing tuberose suckers were surface sterilized with 1% sodium hypochlorite solution and three times washed with sterilized distilled water. Finally observation of stem rot mortality were recorded at 35-40 days after sowing and analysed statistically.

Statistical analysis

The experimental results were recorded and analysed by using WASP (Web Agri Stat Package). The data with percentage values were transformed into arc sine at critical difference at 5% significant levels.

Classification of disease reaction

The observations on disease intensity were recorded by using 0-7 grade score card as per Handle (2001) and Gaikwad (2002). Infectious lesions are produced by the pathogen under the stem, bulb and leaves. According to the disease intensity the ranking from immune to highly susceptible was done for every tuberose variety.

Results and Discussion

To ascertain the resistance / tolerance in tuberose cultivars against stem rot or basal stem rot, the experiment was conducted in pot culture under glass house condition.

The experimental result of six different cultivars of tuberose were studied for varietal screening against *Sclerotium rolfsii*, the single Mexican variety are found lower per cent disease incidence (55.55) followed by hybrid Prajwal found (66.66) when compared with other cultivars namely Suvasini (77.77), Thovalai local (88.88), Salem local (88.88), Dharmapuri local (88.88). all the cultivars were found susceptible (S) to stem rot or basal stem rot diseases but some cultivars (single Mexican and hybrid Prajwal) are found low level of infection or per cent disease incidence.

The study suggests that all the six different cultivars of tuberose studied for varietal screening against Sclerotium *rolfsii* were found highly susceptible (HS) to basal stem rot disease.but some other cultivars are found low level of infection or per cent disease incidence compared with other cultivars namely the single Mexican variety (55.55) followed by hybrid Prajwal found (66.66) when compared with other cultivars. Similar research on various plants screened against some of the plant pathogens have been reported by various researchers. Swapnil Konde *et al*., (2017) studied varietal resistance of 16 soybean varieties against root rot and collar rot disease. Six varieties were moderately susceptible and ten were found highly susceptible to collar rot diseases. Pancheshwar *et al.,* (2016) reported the screening of 77 soybean cultivars against collar rot disease and Sugha *et al.,* (1991) evaluated 210 chickpea cultivars and observed that none of the varieties were found moderately resistant or resistant. Palaiah *et al.,* (2019) evaluated 64 different germplasm and 33 ground nut varieties against the stem rot disease. Out of 64 germplasm, six germplasm showed moderate resistance and out of 33 groundnut varieties, 20 varieties showed moderate resistance.

Table.A Disease Reaction

Disease index	Stem/leaf base area infection (PDI)	Symptoms	Infection reaction
0	-	Nil	Immune (I)
1	<1	About 5% area of the stem/bulb showing brown discolouration	Highly Resistant (HR)
2	1.01-10.0	About 15% area of the stem/bulb showing brown discolouration	Resistant (R)
3	10.01-20.0	About 35% area of the stem/bulb showing brown discolouration, with mycelial mat intermingled with few sclerotia.	Moderately Resistant (MR)
4	20.01-30.01	About 50% area of the stem/bulb showing brown discolouration, with mycelial mat intermingled with moderate sclerotia.	Moderately Susceptible (MS)
5	30.01-40.01	About 75% area of the stem/bulb showing brown discolouration, with mycelial mat intermingled with profuse sclerotia.	Susceptible (S)
6	40.01-50.01	About 90% area of the stem/bulb showing brown discolouration, with mycelial mat intermingled with profuse sclerotia.	Highly Susceptible (HS)
7	>50.01	About 100% area of the stem/bulb showing brown discolouration, with mycelial mat intermingled with profuse sclerotia.	Highly Susceptible (HS)

Table.1 Reaction of tuberose cultivars to *Sclerotium rolfsii* infection in pot culture experiment

SI.no.	Cultivars	Per cent mortality	Disease reaction
1	Salem Local	88.88 (78.05)a	Highly susceptible (HS)
2	Single Mexican	55.55 (48.24)a	Highly susceptible(HS)
3	Dharmapuri local	88.88 (78.05)a	Highly susceptible(HS)
4	Suvasini	77.77 (71.56)a	Highly susceptible(HS)
5	Prajwal	66.66 (59.90)a	Highly susceptible(HS)
6	Thovalai Local	88.88 (78.05)a	Highly susceptible(HS)
7	control	00.00 (0.28)b	Control plants
	CD (0.05)	36.85	

*Mean of three observations; The treatment means are compared using Duncan multiple range test (DMRT)
values in parentheses are arcsine transformed
In a column, mean followed by a common letter (S) are not significantly different (p=0.05)
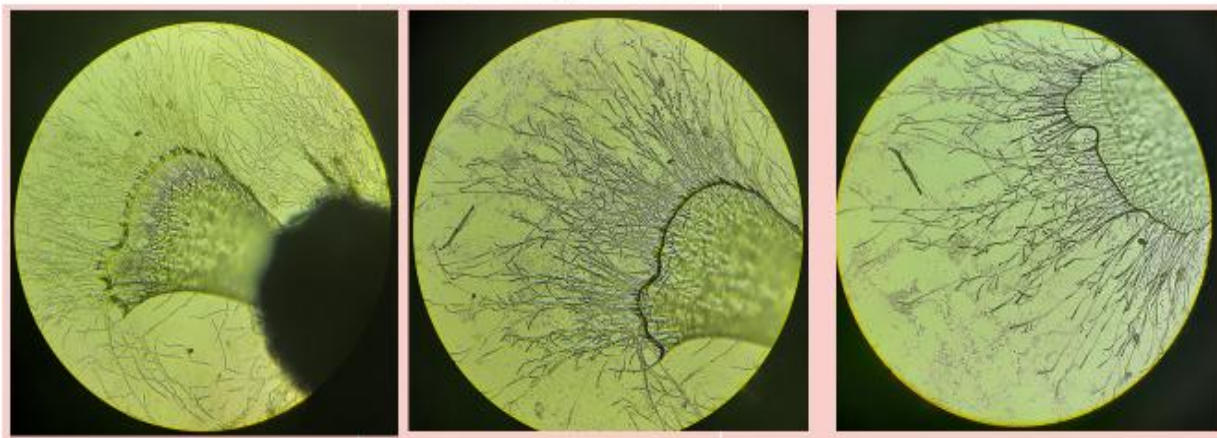
Sclerotial germination

Fig.1 Microscope view of Sclerotium germination

Fig.2 Tuberose bulb rot symptoms and pure culture of *Sclerotium rolfsii*

Pure culture   Pure culture + sclerotial bodies

Fig.3 Mass Multiplication of *Sclerotium rolfsii*

Fig.4 Sand Maize Medium

Fig.5 Reaction of tuberose cultivars to *Sclerotium rolfsii* infection in pot culture experiment

These findings suggest that all the cultivars are highly susceptible to the stem rot pathogen, But some other cultivars are found low level of infection or per cent disease incidence compared with other cultivars namely the single Mexican variety followed by hybrid Prajwal. So management of this disease should be done using this two different varieties followed by adapting various chemical or biological method to reduce the pathogen infection and increase the production and productivity of tuberose.

Acknowledgements

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How to cite this article: