



IN VITRO EVALUATION OF SELECTED PLANT EXTRACTS ON THE MYCELIAL GROWTH OF *SCLEROTIUM ORYZAE* CATT.,

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ABSTRACT

Stem rot is important disease of paddy (*Oryza sativa*) causing significant reduction in yield. In this present study the pathogenic fungi was isolated from infected plant parts and *in vitro* efficacy of different plant extracts viz., *Nyctanthes arbor-tristis*, *Strychnos nux-vomica*, *Wrightia tinctoria*, *Syzygium cumini*, *Ocimum tenuiflorum* were tested to control stem rot pathogen. Different concentrations of plant extracts were used in the study. All the plant extracts showed significant reduction in the growth of pathogen. Among the different extracts 2% of *Nyctanthes arbor-tristis* was found effective followed by *Strychnos nux-vomica*, *Wrightia tinctoria*, *Ocimum tenuiflorum* and *Syzygium cumini*. Application of plant extracts which are easily available for controlling plant diseases are cost effective and eco-friendly. Further investigations are in progress to test the efficacy of these extracts in field applications.

KEY WORDS: Plant extract, pathogenic fungi, *Oryza sativa*, stem rot.



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INTRODUCTION

Rice is an important cereal crop affected by various fungal, bacterial and viral diseases. Stem rot has been documented to be the most important devastating rice disease. The fungal pathogen *Sclerotium oryzae* catt., perfect state *Magnaporthe salvinii* catt., is a destructive disease under favourable weather conditions in rice growing areas of the world which eventually causes substantial spectrum of diseases. The disease causes yield loss through reduced tillering unfilled panicles, chalky grain decreased milling yields and increased lodging. Yield loss of up to 75% has previously been reported^[8,9]. Many methods of plant disease control are used to control stem rot in rice, such as physical, chemical, cultural methods etc. Chemicals can effectively control several plant diseases, However there is an increasing awareness about the risks involved in chemical pesticides, and therefore much attention is being focused on alternative methods of plant pathogen bio control. Despite the fact that the world market continues to be extremely competitive and growers compete to supply high quality organic products and pesticides of plant origin. Inorganic farming for several higher plants and their constituents have been used successfully in plant disease control and proven to be harmless and non phyto-toxic, unlike chemical fungicides^[14]. Plethora of reports have from earlier works have significantly evidenced that several plant species possess antifungal and anti-bacterial properties^[2]. The use of plant extracts in soil treatment produced good quality results against various soil borne fungi like *Sclerotium ralfsii*, *Colletotrichum atramentarium*^[15] and *Fusarium oxysporium*^[5]. In the present study the effect of different plant leaf extracts on the growth of *Sclerotium oryzae* catt., was investigated.

MATERIALS AND METHODS

Plant extract preparation

Five angiosperm plant leaves were collected from the Taxonomical depository of Sri

Venkateswara University, and thoroughly washed. The leaves were shade dried at room temperature and grounded using a mechanical grinder. The leaf powder was extracted in distilled water, 10grams of leaf powder was soaked in 100ml of distilled water in a conical flask and loaded on to an orbital shaker at a speed of 120 rpm for 24 hours. The mixture was filtered using whatmann No-1 filter paper and filtrate was concentrated using rotary evaporator and dried using a lyophilizer. The dried extract was collected in an air tight container and stored at 4°C. These extract was used for inhibitory studies on *Sclerotium oryzae*.

Pathogen isolation

Stem rot disease infected plant parts were collected in the rice fields of Nellore district. plant sections of 3-5 mm² were cut from the margin of the infected lesions and sterilized for one minute in 1.0% sodium hypochlorite solution and rinsed three times in sterilized distilled water. The sterile pieces were blot dried and placed on potato dextrose agar plates. The plates were incubated at ambient conditions of light and temperature at 25±2°C and observed every day until five days, which were subsequently sub cultured to obtain axenic cultures.

Anti-fungal activity screening test

In vitro evaluation of plant leaf extracts was assessed using a standard poisoned food technique.^[3] The antifungal activity was screened using concentrations of 0.5%, 1.0%, and 2.0% against the mycelial growth in the above specified leaf extract amended and non-amended onto potato dextrose agar medium. The mature fungal spores were inoculated in the centre of the plate and radial growth of the pathogen was recorded for further interpretation. Effects of plant extract was tested and expressed as percentage of inhibition/stimulation of growth of the test pathogen. This was calculated by using the following formula:

$$\% \text{ of inhibition} = \frac{\text{Diameter of colony of control} - \text{Diameter of colony in treatment}}{\text{Diameter of colony of control}} \times 100$$

RESULTS AND DISCUSSION

The effect of different plant leaf extracts on mycelial growth of *Sclerotium oryzae* was significant. When compared with control, concentrations of 2% extract from all species were significantly effective in reducing the mycelia growth of *Sclerotium oryzae* under *in vitro* condition. In the anti-fungal activity test, all the leaf extract were shown to be effective as compared to control in the reduction of the mycelial growth of *Sclerotium oryzae*. The results are calculated in table 1 Maximum inhibition was recorded by *Nyctanthes arbor-tristis*, followed by *Strychnos nux-vomica*, *Wrightia tinctoria*, *Ocimum tenuifloru* and *Syzygium cumini*. This significant decrease in mycelia growth of the fungus treated with various plant leaf extract was probably due to presence of anti-fungal compounds or ingredients in plant leaf extracts. It is also possible that the extract inhibited the mode of action of their biological molecules. These results were in agreement with many earlier workers^[4] who studied antifungal characteristics of *Ocimum sanctum* L. and found that its leaf extract completely inhibited the growth of *Sclerotium rolfsii* and other related fungi. Use of bark and corks of commonly grown trees and shrubs is also an economical artifact and a feasible way of controlling major plant diseases. Leaf decoction of *Acacia nilotica*, *Colotropis procera*, *Datura stramonium*, *Dodonia viscosa* and *Rhazya stricta* were found to be effective in processing urediospore germination on detached leaves of wheat^[10]. The volatile fraction of two medicinal plants; *Azadirachta indica* and *Eucalyptus globules* were more effective in suppressing the sclerotial

germination of *Macrophomina phaseolina* non-volatile fractions^[11]. Interestingly the leaf extract of *Datura stramonium* reduced the development of rust pustules on the leaves of wheat^[17]. Herbaceous plants have been widely used in various ways against the fungal diseases. However few researchers have reported the aqueous leaf extract of *Allium sativum*, *Datura alba* and *Withania somnifera* inhibited the growth of *Alternaria alternata*, *A. brassicola* and *Myrothecium roridum*^[7, 11]. *Paecilomyces lilacinnus* (fungal parasite) was also effective in inhibiting the growth of Sclerotial fungi^[12]. The ethanol leaf extract of *Azadirachta indica*, *Datura stramonium*, *Ocimum* and *Polyalthiya longifolia* were shown toxic against *Alternaria brassicola*, *C. capsici*, *Fusarium oxysporum*, *R. solani* and *Sclerotinia sclerotiorum in vitro*. The biowash of the foliage *Jatropha*, *Annona* and *Parthenium* were shown to possess high levels of inhibition against *S. rolfsii* and *M. phaseolina*, the causal organisms of collar rot of chickpea, Fusarium wilt of chickpea and charcoal rot of sorghum, respectively^[16]. The phytochemical screening and antibacterial activity of *Syzygium cumini* leaves extracts evidenced from a report that they could be an effective anti-microbial agents against soil born fungi, food spoilage fungi and foliar pathogens^[13]. The results from the present study can be exploited for formulating integrated disease management of stem rot of rice. However more investigation is warranted to isolate and characterize some more effective antifungal moieties useful in felid applications.

Figure 1
Antifungal activity of plant leaf extracts

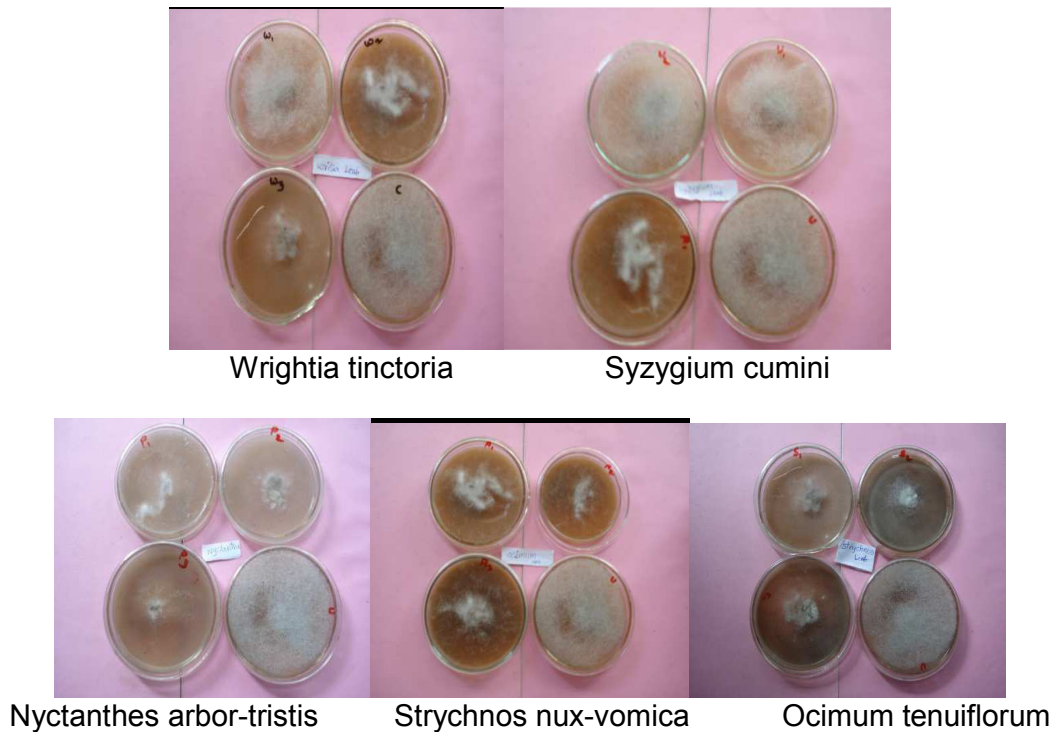


Table- 1
Concentrations of plant leaf extracts

S. No	Plant name	Extract concentration			control	Mein	% of inhibition
		0.5	1.0	2.0			
1	<i>Strychnosnux-vomica</i>	5.0	4.0	3.1	9.0	4.0	55.6
2	<i>Nyctanthes arbor-tristis</i>	6.0	3.0	2.5	9.0	3.3	63.3
3	<i>Syzygium cumini</i>	8.8	8.0	6.0	9.0	7.1	21.1
4	<i>Ocimum tenuiflirum</i>	6.0	5.5	4.9	9.0	5.7	36.6
5	Wrightiatinctoria	8.0	5.0	3.0	9.0	5.3	41.1

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