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Efficacy of certain botanicals in the management of blast of paddy (*Oryza sativa* L.) caused by *Pyricularia oryzae*

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Abstract
Paddy blast disease caused by *Pyricularia oryzae* (*Magnaporthe grisea*) causes significant yield loss in India. This study was conducted to isolate, identify and characterize the pathogen (using morphological, physiological and biochemical methods). The blast appears every year in varying intensity and cause heavy losses in yield. Studies were conducted on the isolation, pathogenicity of *Pyricularia oryzae* on paddy, botanicals against *Pyricularia oryzae* causes blast of paddy. Two botanical viz. neem, tulsi, and carbendazim, used in present studies were evaluated under *in vitro* against *Pyricularia oryzae* by poisoned food technique at 10.00 per cent concentration of incubation. The maximum per cent inhibition of mycelial growth was recorded T3-Carbendazim (89.67%), T1-Neem *(Azadirachta indica)* (57.48%), T2-Tulsi (leaf) (45.00%), as compared to control (00.00%), in botanical whereas the *Pyricularia oryzae* maximum disease intensity (%) was recorded in T_1Neem Leaf Extract @ 10% FS (*Azadirachta indica)* (24.57) as compared to treated (13.12) T_0 untreated check (30.31).

Keywords: botanicals, tulsi, neem and paddy

Introduction
Rice belongs to the family Poaceae (Gramineae) and tribe Oryzeae. This tribe has 11 genera of which *Oryza* is the only one with cultivated species. *Oryza* has two cultivated and 22 wild species. of the two cultivated species, *O. sativa* (2n = 24, AA) the Asian rice is grown worldwide *O. glaberrima*. Rice is the most important crop of India with world ranking one in area (43m. ha. 2010) and second to China in production (89.5 M ton,). During the last five decades the rice production trend has kept in pace with population growth trend. Rice exports from India have steadily grown from 1.8 million tons during 2001 to 7.5 million tons during 2009. India now occupies second position in rice export, next only to Thailand, among the rice trading countries of the world. However, the surplus production scenario has no room for complacency. Keeping in view, the average annual population growth rate of 1.5% and per capita consumption estimate of about 400 g of rice per day, demand for rice is expected to be 100 M tons during 2010 and 140 M tons by 2025. This demand can only be met by maintaining the increase in production trend steady.

Rice (*Oryza sativa* L.) is the world's most important crop and a primary source of food for more than half of the world's population. More than 90 percent of the world's rice is grown and consumed in Asia where 60 percent of the earth's people live**.** Globally rice occupies an area of 163 m ha with a production of 719 m t of paddy (FAO, 2012) [8]. Rice is known to be attacked by many pests and diseases which cause huge losses annually worldwide. Among fungal diseases of rice, rice blast caused by *Magnaporthe oryzae* is of significant economic importance.

Outbreaks of rice blast are a serious and recurrent problem in all rice growing regions of the world. It is estimated that each year enough of rice is destroyed by rice blast alone to feed 60 million people (Zeigler *et al.* 1994) [17]. Rice blast probably the disease known as rice fever disease in China was reported as early as 1637 and then reported in Japan in 1704, Italy 1828, USA 1876 and in India in 1913. It is a disease of immense importance in temperate, tropical, subtropical Asia, Latin America and Africa and found in approximately 85 countries throughout the world.

Rice (*Oryza sativa* L.) is an important agricultural commodity that supplies approximately 23 per cent of the per capita energy for six billion people worldwide. There are many serious plant diseases of rice, including the ascomycete fungus *Pyricularia grisea* (Telemorph: *Magnaporthe grisea*) which causes the disease known as rice blast (Correll *et al.* 2000) [7].

Pyricularia grisea can infect most sections of the plant, but infections of the node or the panicle are the most damaging phases of the disease (Ou 1985) [13]. When *P. grisea* infects rice and produces neck rot or panicle blast, it will either kill the host plant or prevent seed development, respectively. *P. grisea* also causes disease in other graminacious species besides rice (Malcaand Owen 1957, Bain *et al.* 1972, Ou 1985, Sundaram *et al.*, 1972) [13, 5, 14] and there are reports of this pathogen in more than 85 countries (Agarwal *et al.*, 1989) [1].

Materials and Methods

Field experiments were conducted at the field Department of Plant Pathology, Sam Higginbottom Institutes of Agriculture, Technology and Sciences, Allahabad (Deemed-To-Be-University) *Kharif* season during 2015-2016. The site selected was uniform, cultivable with typical sandy loam soil having good drainage.

Glassware cleaning

For all laboratory experiments, Borosil and Corning glassware were used. The glassware's were kept for 24 hours in the cleaning solution containing 60.0 g of potassium dichromate, 60.0 ml of concentrated sulphuric acid in 1000 ml of water. They were washed with detergent solution followed by rinsing with tap water and finally with distilled water.

Sterilization

The Petri plates and pipettes were wrapped in clean paper and sterilized in hot air oven at a temperature of 160 ^{0}C for two hours**.** Sterilization of both solid and liquid media was achieved by autoclaving at 1.1 kg/cm^2 (121.6 ^{0}C) pressure for 20 minutes for all the laboratory studies. All cultural studies were conducted in aseptic condition under laminar air flow. The tips of inoculation needle, forceps and cork borers were sterilized under flame.

3.2.3 Potato Dextrose Agar (PDA) media

Potato Dextrose Agar medium was used to isolate and maintain the culture of the pathogen *Pyricularia oryzae* from the diseased plant parts. The composition of PDA used is given below.

Peeled Potato	:	200 g
Dextrose	:	20 g
Agar-Agar	:	20 g
Distilled water	:	1000 ml

Two hundred grams of peeled potatoes were cut into pieces. These pieces were boiled in water and the extract was collected by filtering through muslin cloth. Twenty gram each of dextrose and agar-agar was dissolved in potato extracts and the final volume was made up to 1000 ml by adding distilled water. The flask containing dispensed medium was sterilized at 1.1 kg/cm^2 pressure for 20 minutes.

Isolation of pathogen

Infected plant material-Infected part was collected from infested Rice plant showing characteristic symptoms of blast of rice, these symptoms after preparing slide was examined under microscope to confirm the presence of *Pyricularia oryzae.*

Isolation-the infected parts was cut to piece (2-3mm), surface sterilization was done with 0.1% mercuric chloride solution for 30 seconds washed 3 times in sterilized distilled water and then transferred aseptically on PDA medium contained in petri dishes, after few days (3-4) the fungus grow in petri dishes, then slide were prepare and identify by referring to suitable literature and monographs.

Maintenance of the culture

The fungus was sub cultured on PDA slants and allowed to grow at 27 ± 1 ^{0}C for 15 days. Such slants were preserved in refrigerator at 5 ^{0}C and sub cultured once in two months.

The efficacy of botanicals against *Pyricularia oryzae* was assessed by inhibition of radial growth of mycelia by poison food technique respectively.

Poisoned food technique

Five millimeter diameter disc of *Pyricularia oryzae* was kept at the centre of each Petri plate containing the fungicides of required concentration dissolved in PDA. Three replications were maintained. The plates were incubated at 27±1 ^{0}C for ten days and colony diameter was recorded per cent inhibition of mycelial growth was calculated by using the formula given by Atia and Esh (2005) [3].

$$\text{Disease intensity (\%)} = \frac{\text{Sum of all disease rating}}{\text{Total no.leaf x Max.disease grade}} \text{ x } 100$$

Results and Discussion

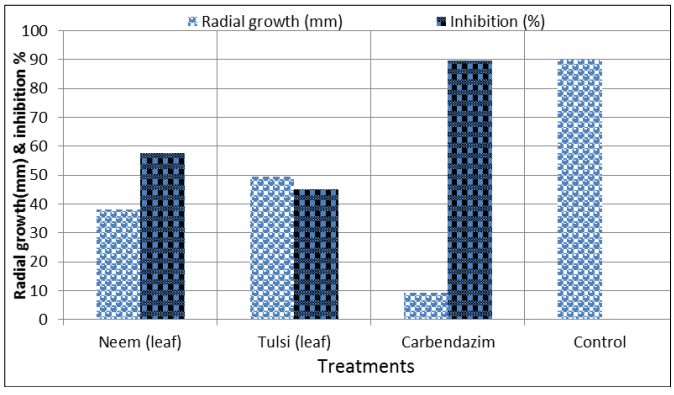
Evaluation of plant extracts against *Pyricularia oryzae* by food poison technique.

As natural products isolated from plant appears to be one of the best alternatives in plant disease management as they are known to have minimal environmental impact and danger to consumers in contrast to synthetic pesticides.

The plant extracts like Neem (5%), Tulsi (5%), and carbendazim were tested against *Pyricularia oryzae.* All the botanicals tested were significantly effective in inhibiting the growth of pathogen over control and degree of inhibition varied from 45.00% to 89.67% at 5% concentration.

Among different plant extracts tested treated control at 5 per cent showed maximum inhibition of (89.67%) per cent, followed by Neem leaves (57.48%), and least effectiveness was found in Tulsi leaves (45.00%).

Treatment	Radial growth (mm)	Inhibition (%)
Neem (leaf)	38.00	57.48
Tulsi (leaf)	49.50	45.00
Carbendazim	9.30	89.67
Control	90.00	0.00
F- test	S	S
S. Ed. (±)	0.890	1.055
C. D. (P = 0.05)	1.886	2.238



Conclusion

Thus it can be concluded that plant extracts were found effective in reducing mycelial growth of blast fungus and

therefore used for the management of the diseases in rice. Moreover, they are nature friendly, reduces chemical hazards and are economical and feasible thus easily accessible to the growers.

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