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# Efficacy of Certain Botanical Extracts in the Management of Brown Leaf Spot of Rice Cause by *Helminthosporium oryzae*

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**Rice is suffering from several fungal diseases among them brown spot caused by *Helminthosporium oryzae* is important. In the present investigation, Results showed that the treatment *Azadirachta indica*@10% FS was found most effective treatment against brown leaf spot of rice. Minimum disease intensity was recorded significantly at 30, 45, 60, 75 days in treatment carbendazim (2.73, 6.21, 11.10, 21.09 %), as compared to the untreated control, Maximum Plant height was recorded at 30, 60, 90 and number of tillers at 60 days after transplanting in treatment *Azadirachta indica* (19.43, 40.13, 58.73) and (23.6)as compared to control, on the other hand maximum fresh shoot weight and dry shoot weight was recorded at 110 and 120 days after transplanting in treatment *Azadirachta indica* (187.46), (26.04) compared to control, maximum fresh root weight and dry root weights was recorded at 110 and 120 days after transplanting in *Azadirachta indica* (37.46), (25.42) compared to controls. Maximum yield and cost benefited ratio was recorded in carbendazim (43.01 q/ha), (2.16) as compared to controls respectively, So it may be concluded that botanical extracts can be use for the effective management of brown leaf spot of rice.**

**Key words:** *Azadirachta indica,* botanicals, brown leaf spot disease, chemical, rice.

Rice (*Oryza sativa* L.) is the most cultivated cereal crop worldwide and it has been estimated that half the world's population subsists wholly or partially on this crop[1]. Rice cultivation takes place in all states of India, but West Bengal, Uttar Pradesh, Madhya Pradesh, Punjab, Orissa and Bihar are the major rice producing states. Worldwide, rice is grown on 161 million hectares, with an annual production of about 678.7 million tons of paddy. About 90% of the world's rice is grown and produced (143 million ha of area with a production of 612 million tons of paddy) in Asia[2].

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Rice provides 30–75% of the total calories to more than 3 billion Asians[3]. Rice is the one of major cereal crops in India. The crop is suffering from number of fungal, bacterial, viral and mycoplasmal diseases. Among them the fungal diseases like blast (*Pyricularia oryzae*), brown spot (*Bipolaris oryzae*), stem rot (*Sclerotium oryzae*), sheath blight (*Rhizoctonia solani*), sheath rot (*Sarocladium oryzae*), bacterial diseases such as bacterial blight (*Xanthomonas oryzae* pv. *oryzae*) and viral diseases such as tungro (rice tungro virus) are most important. Losses due to rice diseases have been estimated to be 10- 15% in general[4]. However, major diseases are brown spot, rice blast, bacterial leaf blight and leaf streak, sheath blight, sheath rot, *Fusarium* wilt or Bakanae, stem rot, Tungro virus, false smut and post-harvest diseases[5].

However, the frequent use of fungicides on crops may cause hazards to human beings, plant health, beneficial micro-organisms, and develop fungicide resistance into the pathogens and residual toxicity in plant parts. On the other hand, some botanical pesticides and bio-control agents have proved to be most secure and have no adverse impact on environment[6].

## MATERIALS AND METHODS

The present investigation was conducted on "Efficacy of certain botanical extracts in the management of brown leaf spot of rice cause by *Helminthosporium oryzae*" during 2014-15 in the Research field of SHIATS-DU, Allahabad.

**The nursery**

Seeds of rice cultivar Pusa basmati-1121 at the rate of 60 kg fed-1 were soaked in water for 24 hours and incubated for 48 hours to hasten early germination. Pre-germinated seeds were uniformly broadcast in the nursery on 15th may in 2014 seasons.

**Preparation of the experimental field**

The selected field area was well prepared and plot marked as per the lay out plan of the experiment. The selected field was dug up, cleaned and the soil was pulverized after which the total area was divided in to sub-plots.

**Use of Neem Botanical**

**Preparation of neem leaf extracts**

The collected plant leaves were chopped after cleaning in running tap water three times to remove soil materials. The dried leaves of each plant species were made into powder separately using a sterilized mortar and pestle and then sieved with one millimeter sieve. The extracts were filtered through cheese cloth. The powder of neem leaf extracts was packed in water proof plastic bags and labeled appropriately as described by Akinbode and Ikotun and stored at 4°C until used. Crude plant extracts were obtained by infusing 50 g of plant material in 100 ml SDW to give 50% w/v in a 500 ml conical flask and the mixture was incubated at 25°C - 28°C for 20 hours. The infusion was filtered separately through sterile double-layered cheese cloth into a sterile 400 ml beaker and the resulting stock solution was collected and stored at 25°C - 28°C until used.

**Application of spray solution**

Plant extracts and chemicals were sprayed as solution into the experimental plots as per treatments. Spraying was done for 3 times with 10 days interval at 65, 75 and 85 DAT respectively. Adequate precautions were taken to avoid drifting of spray materials from one plot to the neighboring ones**.**

**Multiplication of the Pathogen**

Pathogen was mass multiplied on sorghum grains. Grain of sorghum was soaked in the boiling water for 30 minutes and then autoclaved at 15 ibs/inch$^2$ pressure for two consecutive days. On cooling of medium each flask was inoculated with mycelial bit (3 mm in diameter) of *Helminthosporium oryzae* under aseptic conditions and culture was incubated at $25 \pm 2^oC$ until the whole medium is covered with mycelium. Inoculums prepared by mass culturing was incorporat**5**ed in the soil @ 25g/plot and mixed well, before 10 days of transplanting[7].

**Assessment of the disease severity in the field**

Each plot was visited for recording the severity. The disease incidence was recorded in the three growth stage of the plant namely flowering stage, milking stage and maturity stage. Assessment of the disease severity in the field five plants from each unit plot were randomly selected and tagged for grading the severity of diseases. Disease severity of leaf blast (*Pyricularia oryzae*) of rice was recorded by **[8]**. used a 0-9 scale as follow: 0 = no lesion observed; 1 = 1% leaf area covered; 3 = 10% leaf area covered; 5 = 25% leaf area covered; 7 = 50% leaf area covered and 9 = more than 50% leaf area covered. Disease severity of leaf blast (*Pyricularia oryzae*) of rice was recorded by Singh (2012) used a 0-9 scale as follow: 0 = no lesion observed; 1 = 1% leaf area covered; 3 = 10% leaf area covered; 5 = 25% leaf area covered; 7 = 50% leaf area covered and 9 = more than 50% leaf area covered by using the disease rating scale of 0-9 developed by International Rice Research Institute **(IRRI. 1996)** and then converting into percent disease by using the formulas.

Disease severity % =

Sum of disease grades X No. of infected tillers/ hill X 100
No. of Tillers X Maximum disease grade X No. of tillers asses

**Measurement of Shoot and Root weight**

After the assessment of disease when the rice plants were 60 days after transplanting. The plants were uprooted carefully from the field. The root region was cut separated from the plants and washed thoroughly to remove adhered soil particles with much care and the fresh shoot weight, dry shoot weight, fresh root weight and dry root weight of the plants of each treatment were measured in gram.

**Experimental design and statistical analysis**

The experiment was done following Randomized Complete Block Design (RCBD) with three replications. The experimental field was primarily divided into 7 blocks. Each block was further divided into 3 plots. Total number of plots was 21.

## RESULT AND DISCUSSION

**Effects of biotic and botanicals inducers on rice crop**

The statistical analysis of data at 30, 60 and 90 DAT. showed presented in (Table1). Among the botanicals used the maximum plant height (cm) was recorded in treatment $T_2$-*Azadirachta indica* @ 10% (19.43, 40.13, 58.73cm) as compared to the controls (13.8, 22.66, 37.33 cm) respectively **[9].** reported that there was significant increase in the plant height and leaf number at all growth stages from 7-49 days in neem extract treatments in comparison to controls, Neem based formulations in all the treatments were found to be superior over control on shoot height, number of leaves, number of buds, number of flowers and number of fruits in respect of control. Maximum number of tiller was recorded 60 DAT in treatment $T_2$-*Azadirachta indica* (23.6, cm) as compared to the controls respectively. Minimum percent disease intensity was recorded at (30, 45, 60 and 75 DAT) in treatment $T_1$-Carbendazim 50 WP 0.1% FS (2.73, 6.21, 11.10, 21.09 %) as compared to the controls (4.81, 10.01, 14.51, 28.76 %) respectively[10] study All the fungicides tested were found effective and significantly reduced the disease intensity over unsprayed control. Among the fungicides, Carbendazim (@ 0.1%) recorded least mean disease intensity (19.55%). It also recorded highest reductions in the disease intensity (40.73%), over unsprayed control. Maximum Fresh shoot and root

**Table 1.** Efficacy of certain botanical extracts in the management of brown leaf spot of rice caused by *Helminthosporium oryzae*

| Treatment | Plant height (cm) | | | Diseases intensity % | | | | Number of tiller 60 DAT | Fresh Shoot weight (gm) | Dry root weight (gm) | Dry shoot weight (gm) | Fresh root weight (gm) | Yield q/ha |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30DAT | 60 DAT | 90 DAT | 30 DAT | 45 DAT | 60DAT | 75DAT | | | | | | |
| Control | 13.8$^{d}$ | 22.66$^{b}$ | 37.33$^{b}$ | 4.81$^{a}$ | 10.01$^{a}$ | 14.51$^{a}$ | 28.76$^{a}$ | 11$^{b}$ | 169$^{b}$ | 20$^{b}$ | 20.47$^{b}$ | 30.50$^{b}$ | 27.17$^{d}$ |
| Carbendazim | 18.5$^{ab}$ | 39.4$^{a}$ | 56.73$^{a}$ | 2.73$^{d}$ | 6.21$^{f}$ | 11.10$^{f}$ | 21.09$^{f}$ | 23.46$^{a}$ | 186.96$^{a}$ | 25.04$^{a}$ | 25.52$^{a}$ | 36.4$^{a}$ | 43.01$^{a}$ |
| *Azadirachta indica* | 19.43$^{a}$ | 40.13$^{a}$ | 58.73$^{a}$ | 3.32$^{c}$ | 6.88$^{e}$ | 11.25$^{ef}$ | 22.07$^{ef}$ | 23.6$^{a}$ | 187.46$^{a}$ | 25.42$^{a}$ | 26.04$^{a}$ | 37.46$^{a}$ | 37.23$^{b}$ |
| *Cinnamonum tamala* | 17.36$^{bc}$ | 37.46$^{a}$ | 54$^{a}$ | 3.77$^{bc}$ | 7.92$^{cd}$ | 12.44$^{cd}$ | 24.19$^{d}$ | 22.66$^{a}$ | 185.93$^{a}$ | 24.62$^{a}$ | 24.71$^{a}$ | 36.33$^{a}$ | 35.35$^{bc}$ |
| *Trachyspermum ammi* | 17.15$^{bc}$ | 37.26$^{a}$ | 53$^{a}$ | 3.99$^{b}$ | 8.21$^{c}$ | 13.25$^{bc}$ | 25.69$^{c}$ | 22.13$^{a}$ | 185.7$^{a}$ | 23.86$^{a}$ | 24.45$^{a}$ | 35.73$^{a}$ | 33.09$^{bc}$ |
| *Nigella sativa* | 16.2$^{c}$ | 36.06$^{a}$ | 52.33$^{a}$ | 4.14$^{b}$ | 8.95$^{b}$ | 13.55$^{b}$ | 27.40$^{b}$ | 18.93$^{a}$ | 185.66$^{a}$ | 23.34$^{a}$ | 24.18$^{a}$ | 35.6$^{a}$ | 32.01$^{c}$ |
| *Allium sativum* | 17.5$^{bc}$ | 38.2$^{a}$ | 55.06$^{a}$ | 3.47$^{c}$ | 7.55$^{d}$ | 12.14$^{dc}$ | 23.32$^{de}$ | 22.93$^{a}$ | 186.86$^{a}$ | 24$^{a}$ | 24.91$^{a}$ | 36$^{a}$ | 36.19$^{bc}$ |
| S. Ed. | 0.807 | 2.087 | 3.450 | 0.214 | 0.296 | 0.438 | 0.604 | 2.566 | 3.310 | 0.999 | 0.915 | 1.016 | 2.085 |
| CD. (0.05) | 1.755 | 4.54 | 7.511 | 0.474 | 0.657 | 0.958 | 1.311 | 5.593 | 7.218 | 2.175 | 1.993 | 2.218 | 4.548 |

weight 110 DAT recorded in treatment $T_2$-*Azadirachta indica* @ 10% (187.46 and 37.46 gm). Maximum dry shoot and root weight 120 DAT, (26.04 and 25.42 gm)[11] reported that organically with foliar application of leaf extract of neem (*Azadiractaindica*) which increased biological yield and yield attributes, dry matter of plant, number of pods per plant, pod weight, seed weight and 100 seed weight.

Besides seed germination, shoot, root, seedling lengths, seedling dry weight and vigour indices increased considerably. Maximum yield (q/ha) was recorded in treatment $T_1$-Carbendazim 50 WP 0.1% FS (43.01 q/ha) as compared to the controls (27.17 q/ha) respectively. Maximum cost benefited ratio was obtain in treatment $T_1$-Carbendazim 50 WP 0.1% FS (2.16) as compared to the controls (1.02) respective[12] efficacy of fungicides, bioagents and botanicals in the management of anthracnose / pod blight of soybean. Resultsindicated that all five fungicides, two botanicals the disease intensity and thereby enhanced the seed yield over unsprayed control. However, fungicide Carbendazim (@ 0.1%) was found most effective and economical in controlling the disease, which recorded least mean foliage anthracnose (19.43%), mean defoliation (11.85%),mean pod blight (9.64%) with highest seed yield (2605 kg/ha) and most economical C:B ratio (1:13.55). This was followed by the fungicides Hexaconazole and Propiconazole. Mehandi leaf extract @ 10%, NSKE @ 5% and bioagents tested were also found effective against the disease.

## CONCLUSIONS

The present study conducted Efficacy of Botanical extracts against *Helminthosporium oryzae* causative agent of Brown leaf spot of rice. From the critical analysis of the present finding it was concluded that among all the treatment, botanical extracts was most effective in all plant observation except disease intensity and yield. In chemical Carbendazim significantly reduced disease intensity. However, the present study was limited to one season only, therefore to substantiate the present findings more trials over a period of seasons is needed to come out with sound recommendations.

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