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# MANAGEMENT OF BROWN SPOT DISEASE OF RICE BY SAFER FUNGICIDES AND SOME BIOAGENTS

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## Abtract

The effects of bio-agents and chemicals namely *Trichoderma harzianum, Trichoderma viride,* and Carboxin, Propiconazole. was compared against economically important Brown spot disease of rice (*Helminthosporium oryzae*) under field conditions by seed and spray treatment during kharif season (2012). *T.viride* + Propiconazole(ST+SP) was found to be the most effective aginst Brown spot disease. with the lowest mean disease intensity of (5 and 13%) as compared to (20 and 32%) in untreated check at 60 and 90 days after transplanting. Second best treatment appeared to be Carboxin + *Trichoderma viride* (ST+SP) that was also quite effective in reducing the disease intensity to (8 and 19%) followed by *Trichoderma viride* (ST) (10 and 21%), *Trichoderma viride* + *Trichoderma harzianum*(ST+SP) (11 and 24 %), *Trichoderma harzianum* (SP) (14 and 25 %) , Carboxin + Propiconazole(ST+SP) (15 and 26%), Propiconazole(SP) (17 and 29%) and *Trichoderma viride* (ST) (10 and 21%)as compared to control. *T.viride* + Propiconazole(ST+SP) was also significantly superior for plant no. of tillers, shoot length, root length, and yield in comparision to control.

***Key words :*** Rice, Brown Spot, bio-agents, chemicals.

ST= Seed treatment, SP= Spray treatment.

## Introduction

Rice (*Oryza sativa.* L) is one of the most important crops in the world and a staple food for more than half of the world's people. World's annual rice production during economic year 2014 was 741.3 million tonnes (FAO STAT, 2014). Around 90% of total rice is produced by Asia continent alone (Hafiz *et al.,* 2013). Major rice producer countries are China, India, Indonesia, Bangladesh, Philippines and Pakistan. As a cash crop, it contributes 4.49% to the foreign exchange earnings and accounts for 1.3% GDP (Anonymous, 2014). Rice crop is attacked by 50 diseases, *i.e.*, fungal, bacterial, parasitic (nematodes) and viral diseases (Mew and Gonzales, 2002). The three most important pathogens of rice are *Helminthosporium oryzae, Pyricularia oryzae* and *Xanthomonas oryzae,* which causes brown spot ,blast and bacterial blight correspondingly (Singh *et al.,* 2013)**.** Among them, *H. oryze* caused by brown spot of rice is the most devastating disease in the world. The first documented case of *H. oryzae* was reported in Bengal, India. In 1942-43 where 50-90% of the rice crops were destroyed that causes a major famine in which two million people died of starvation (Padmanabhan, 1973). Hau (1980**)** reported that *H. oryzae* causes both quantity and quality loses in the crop that may range 7- 45% yield loss.(Jatoi *et al.,* 2016) Now a-days integrated disease management is fast picking up and biocontrol agent are being used as an alternate to chemicals (Biswas *et al*., 2008). Management of *Helminthosporium oryzae* by chemical can be spectacular but this is relatively short term measure and more over the accumulation of harmful chemical residues some time cause ecological problems. An attempt was therefore made to test relative efficacy of different fungitoxicants against the Brown leaf spot in under field conditions.

## Materials and Methods

The experiments were conducted in a randomized block design (RBD) with three replications and plot size of $4m^2$ (spacing 15cm × 30cm) on rice variety Pusa

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Basmati-1 (Singh *et al*., 2009) at Central Research farm of Sam Higginbottom Institute of Agriculture, Technology and Sciences Allahabad U.P., during Kharif season of 2015. The trials were conducted separately for each disease. The dose of NPK fertilizer were applied and other cultural operations done as recommend for rice .Test plots were bounded all around to prevent the movement of water from one plot to another.

**Assessment of Dease Prevalaence**

Disease severity (percent infection) was recorded on the basis of 0 to 9 scale (Aluko, 1970). The percent disease intensity (PDI) was computed using the following formula:

Sum of all numerical ratings PDI = × 100 Total number of observations x Maximum rating.The area under brown spot progress curve (AUBSPC) value was calculated as given by (Pandey *et al.,* 1989):

**Isolation and Multiplication of the Pathogen**

Diseased leaves were collected and associated pathogen was isolated by standard tissue culture technique (Rangaswami and Bagyaraj, 1998). The culture of the pathogen was purified using single spore technique. Identification of the pathogen was carried out according to the cultural, morphological and microscopic characteristics described by (Mew and Gonzals 2002). The isolated pathogen was multiplied on potato dextrose medium (PDA) and incubated in B.O.D. incubator at 26±1$^0$C for 15 days. The mycelial mats harvested from 15-day old cultures grown in Petri-plates, were suspended in sterilized distilled water, homogenized and strained through double layered muslin cloth to get a clump-free uniform suspension of mycelial bits/fungal spores.

**Pathogenicity Test**

Pathogenicity test was carried out in plastic cups. In each of these two cups (Treatment and control) 5 seeds of susceptible variety (Basmati-370) were placed containing sterilized soil. The spore suspension of the *Helminthosporium oryzae* ($1\times10^5$ spores/ml) was sprayed on the seedlings at two leaves stage and evaluation for the symptoms so developed was carried out after 7 days of inoculation.

Efficacy of the chemicals and bio-agents namely Carboxin @ 0.2 g/kg, Propiconazole@500ml/ha and *Trichoderma viride* @ 6 g/kg, *Trichoderm harzianum* @ 10 g/l, was compared against brown spot disease of rice under natural field conditions. For calculating the disease intensity, shoot length, root length, No. of tillers and yield was recorded at different intervals (30, 60 and 90, DAT). Data was recorded for from five plants randomly selected each replication. The disease intensity score was recorded by 0-9 scale mentioned in standard evaluation system for rice (Anon, 1996).

## Results

The data (table-1) indicated that all the treatments were significantly effective in reducing the disease intensity when compared to untreated check.

**Table 1:** Management of Brown spot disease with some chemicals and bio-agents No. of tillers, Shoot length, Root length, Disease intensity and Yield of rice.

| Treatments | No. of Tillers | | | Shoot length (cm) | | | Root length (cm) | Disease intensity (%) | | Yield (g/ plot) |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30 DAT | 60 DAT | 90 DAT | 30 DAT | 60 DAT | 90 DAT | 90 DAT | 60 DAT | 90 DAT | 90 DAT |
| Control | 8 | 12 | 15 | 15 | 32 | 40 | 10 | 20 | 32 | 348 |
| Carboxin (ST) | 10 | 15 | 23 | 21 | 45 | 58 | 16 | 16 | 27 | 510 |
| Propiconazole (SP) | 10 | 15 | 22 | 20 | 44 | 56 | 15 | 17 | 29 | 480 |
| *Trichoderma viride* (ST) | 13 | 19 | 28 | 25 | 52 | 60 | 18 | 10 | 21 | 768 |
| *Trichoderma harzianum* (SP) | 12 | 18 | 24 | 23 | 46 | 63 | 17 | 14 | 25 | 674 |
| Carboxin+Propiconazole(ST+SP) | 10 | 16 | 24 | 22 | 46 | 61 | 16 | 15 | 26 | 586 |
| Carboxin+*Trichoderma harzianum* (ST+SP) | 15 | 22 | 30 | 24 | 52 | 62 | 20 | 8 | 19 | 850 |
| *Trichoderma viride* + Propiconazole (ST+SP) | 16 | 23 | 35 | 28 | 60 | 72 | 24 | 5 | 13 | 994 |
| *Trichodermaviride*+ *Trichoderma harzianum* (ST+SP) | 13 | 18 | 26 | 24 | 51 | 58 | 17 | 11 | 24 | 712 |
| S.Ed. (±) | 2.24 | 1.81 | 1.85 | 1.35 | 1.74 | 2.02 | 1.25 | 1.33 | 1.31 | 72.87 |
| C.D. (5%) | 4.87 | 3.94 | 4.03 | 2.94 | 3.78 | 4.39 | 2.72 | 2.89 | 2.86 | 158.79 |

DAT = Date after transplanting, ST= Seed treatment, SP= Spray treatment

*Trichoderma viride* + Propiconazole (ST+SP) was found to be most effective treatment in reducing the disease intensity (5 and 13 %) at 60 & 90 days after transplanting, shoot length (28, 60 and 72 cm) at 30, 60 and 90 DAT, root length (24 cm) at 90 DAT, no. of tillers (16, 23 and 35) at 30, 60 & 90 DAT and grain yield (994 g/plot) followed by Carboxin+*Trichoderma harzianum* (ST+SP) which was the next best treatment in order of superiority in controlling disease intensity (8 and 19%), shoot length (24, 52 and 62 cm), root length (20 cm), no. of tillers (15, 22 and 30) and grain yield (850 g/plot) in comparision to control where disease intensity (20 and 32%), shoot length (15, 32 and 40 cm), root length (10 cm), no. of tillers (8,12 and 15) and grain yield (348 g/ plot). reported that seed+ spray treatment with *Trichoderma viride* +Propiconazole was highly effective against brown leaf spot of rice. Caused *Helminthosporium oryzae* similar results were also reported by Devi and Paul (2008),

## Conclusions

From the findings of the investigation, Present study can serve as a handy recommendation for the farmers, who can use *Trichoderma viride* @ 6 g/kg seed treatment + Propiconazole@500ml/ha for spray treatment against brown spot of rice. This recommendation can also be incorporated as an essential component in integrated disease management of Brown spot of rice along with other ecofrendly The maximum incidence and severity of the diseases was found in untreated control, with minimum number of effective panicles/hill, *Trichoderma viride* @ 6 g/kg seed treatment + Propiconazole@500ml/ha for spray treatment number of filled grains/panicle, number of rachis/panicle and therefore, with minimum weight of grains/panicle (gm), weight of grains/hill (gm), 1000 seed weight (gm) and grain yield/plot (kg). The minimum incidence and severity of the diseases was found *Trichoderma viride* @ 6 g/kg seed treatment + Propiconazole@500ml/ha for spray treatment with maximum number of effective panicles/ hill, number of filled grains/panicle, number of rachis/ panicle and therefore, with maximum weight of grains/ panicle (gm), weight of grains/hill (gm), 1000 seed weight (gm) and grain yield/plot (kg).

From the results, it was also observed that minimum incidence and severity results maximum yield. It was also observed that disease incidence and severity was gradually increased from flowering stage to milking stage to maturity stage. l seed treatments were highly effective against the seed borne diseases.

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