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Management of leaf scald disease of rice caused by *Microdochium oryzae* with selective Botanicals, Bio-agents and Fungicides

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Abstract

In the present field experiment, two botanicals (Neem leaf extract @ 10% and Soap nut extract @ 10%), two bio-agents (*Pseudomonas fluorescens* @ 5 g/lit and *Trichoderma viride* @ 5 g/lit) and three fungicides (Copper oxychloride 50% WP @ 0.25%, Carbendazim 12% + Mancozeb 63% WP @ 0.1% and Propiconazole 25% EC @ 0.1%) which were emerged as the most effective among the evaluated under *in vitro* study which were further tested for their efficacy under natural epiphytotic condition in the field. The results of field trail revealed that, maximum reduction of 86.03% in leaf scald of rice over control was recorded with two sprays of copper oxychloride 50% WP (0.25%). Carbendazim 12% + mancozeb 63% WP (0.1%) gave 79.63% reduction in disease. These were followed by *Pseudomonas fluorescens* (5 g/lit), propiconazole 25% EC (0.1%), neem extract (10%) and *Trichoderma viride* (5 g/lit), with 78.57%, 62.48%, 52.86% and 47.09% reduction over control, respectively. Soapnut extract was least effective against leaf scald of rice with 45.07 per cent reduction over control, respectively.

Keywords: Management, scald disease, *Microdochium oryzae*, Botanicals, Fungicides

Introduction

Rice is the important cereal crop grown on large scale in India. Rice crop is suffering from various diseases caused by diverse type of pathogens. Diseases of rice estimated to cause annual loss about 15.6 per cent (Mondal *et al.* 2017) [4]. Among the various diseases of rice, leaf scald caused by *Microdochium oryzae* is one of the most damaging diseases responsible for considerable yield losses upto 23.4% (Srinivasan, 1981) [9]. The disease was first described by Hashioka and Ikegami in 1955 although it occurred much earlier in Japan. In Bangladesh, the disease the disease has been found to cause 30 per cent yield losses (Bark and Miah, 1975). In India, leaf scald of rice was first reported from Kerala (Shanmughom *et al.* 1973) [7] and now it is gradually a widespread in different parts of country. The fungus overwinters in the form of dormant mycelium in crop debris however the main source of inoculum is seed. Fungus spreads through winds and splashing water.

The plant diseases need to be controlled to maintain both the quantitative and qualitative yield levels, thus prompting to search strategies for control the disease by using phytoextracts, bio-agents and fungicides solely to increase the yield by reducing disease intensity and production cost. Different plant extracts and bio-agents has been reported the antifungal properties against different pathogens of plants. Integrated approach of disease management does not mean to eliminate the use of fungicides, but aims to utilize the least disruptive options and to reduce the use of fungicides for disease control to the lowest possible level. It will help farmers to promote the sustainable logical and eco-friendly disease management alternatives and helps in selection of effective and novel control measures for disease control.

Materials and Methods

A Field experiment was conducted on Rice cultivar (Ratnagiri 1) during *Kharif*, 2020 at the rice field of Department of Agronomy, College of Agriculture, Dapoli, Dist. Ratnagiri. The experiment was laid in Randomized Block Design (RBD) with three replications and eight treatments. Two botanicals (Neem leaf extract @ 10% and Soap nut extract @ 10%), two bio-agents (*Pseudomonas fluorescens* @ 5g / lit and *Trichoderma viride* @ 5g / lit) and three fungicides (Copper oxychloride 50%WP @ 0.25%, Carbendazim 12% + Mancozeb 63% WP @ 0.1% and Propiconazole 25% EC @ 0.1%) which were found effective in *in vitro* studies against test pathogen *M. Oryzae* were evaluated for their efficacy to control disease under natural epiphytotic conditions.

Two sprays of each treatment were taken with first at initiation of disease and second spray at 15 days after first spray. The efficacy of these botanicals, bio-agents and fungicides were compared with the control plot which was sprayed with sterile water. Data were recorded visually by observing the symptoms critically. Five plants per treatment per replication were randomly selected for recording disease incidence of leaf scald of rice. First observations were recorded a day before first spray, second observation, day before second spray and final observations were recorded 15 days after second spray. The observations were recorded by following standard methodology. The disease intensity was recorded in 0-9 scale as described below.

Table 1: Standard Evaluation System (SES) scale for leaf scald disease of rice

| Scale | Affected leaf area |
|-------|--|
| 0 | No incidence |
| 1 | Less than 1% (apical lesions) |
| 3 | 1-5% (apical lesions) |
| 5 | 6-25% (apical and some marginal lesions) |
| 7 | 26-50% (apical marginal lesions) |
| 9 | 51-100% (apical and marginal lesions) |

(Standard Evaluation System for Rice)

Per cent disease intensity (PDI)

Per cent disease intensity was calculated by following formula given by Wheeler, 1969^[10].

Sum of all disease ratings

$$\text{PDI (\%)} = \frac{\text{Sum of all disease ratings}}{\text{Total no. of ratings} \times \text{Maximum disease grade}} \times 100$$

Per cent disease control (PDC)

$$\text{PDC (\%)} = \frac{\text{PDI in control} - \text{PDI in treatment}}{\text{PDI in control}} \times 100$$

Results and Discussion

Results (Table 2) of present research revealed that all the treatments evaluated were found significantly effective in field management of leaf scald of rice incited by *Microdochium oryzae*. Minimum incidence of leaf scald infection (3.73%) was recorded when the crop was sprayed twice with copper oxychloride 50 WP @ 0.25% (T₅) which showed 86.03 percent disease control. Treatment T₆ (two sprays of carbendazim 12% + mancozeb 63% WP @ 0.1%) with 5.44% disease incidence and 79.63% disease reduction over control was statistically at par with treatment T₁ (two sprays of *Pseudomonas fluorescens* @ 5g/lit) with 5.82% disease incidence with considerable disease reduction of about 78.57% over control. Next effective treatment in order of merit was treatment T₇ (two sprays of propiconazole 25% EC @ 0.1%) with 10.02% disease incidence and 62.48% disease reduction over control followed by with two treatments namely, treatment T₂ (two sprays of *Trichoderma viride* @ 5g/lit) with 12.59% disease incidence and 52.86% disease reduction over control and treatment T₃ (two sprays of neem extract @ 10%) with 14.13% disease incidence and 47.09% disease reduction over control. Treatment T₄ (two sprays of soapnut extract @ 10%) was least effective against leaf scald of rice with 14.67% disease incidence and 45.07% disease reduction over control.

Table 2: Field evaluation of botanicals, bio-agents and fungicides

| Tr. No | Treatment details | Per cent Disease Incidence | | | | PDC |
|----------------|--|----------------------------|-------|-------|-------|-------|
| | | RI | RII | RIII | Mean | |
| T ₁ | Two sprays of <i>Pseudomonas fluorescens</i> @ 5g/lit | 6.59 | 5.74 | 5.12 | 5.82 | 78.57 |
| T ₂ | Two sprays of <i>Trichoderma viride</i> @ 5g/lit | 12.78 | 12.70 | 12.30 | 12.59 | 52.86 |
| T ₃ | Two sprays of Neem leaf extract @ 10% | 14.50 | 14.10 | 13.80 | 14.13 | 47.09 |
| T ₄ | Two sprays of Soapnut extract @ 10% | 14.90 | 15.02 | 14.10 | 14.67 | 45.07 |
| T ₅ | Two sprays of Copper oxychloride 50% WP @ 0.25% | 3.44 | 4.38 | 3.36 | 3.73 | 86.03 |
| T ₆ | Two sprays of Carbendazim 12% + Mancozeb 63% WP @ 0.1% | 5.16 | 5.55 | 5.6 | 5.44 | 79.63 |
| T ₇ | Two sprays of Propiconazole 25% EC @ 0.1% | 10.02 | 9.82 | 10.21 | 10.02 | 62.48 |
| T ₈ | Control | 26.04 | 26.90 | 27.18 | 26.71 | - |
| | S.Em± | | | | 0.27 | |
| | CD at 5% | | | | 0.82 | |
| | C.V.% | | | | 4.43 | |

*PDC: Per cent disease control

The results of present investigation are in close conformity with the results obtained by Singh and Gupta (1982)^[8] and Hunter *et al.* (1986)^[2] who reported that copper oxychloride and propiconazole were the most effective fungicides against scald of rice and barley. The results are also in accordance with Pocięcha and Dziurka (2015)^[6], Mc Lean and Hollaway (2017)^[3] and Moura *et al.* (2014)^[5] who reported that *Trichoderma* and *Pseudomonas fluorescens* were effective against *Microdochium*.

Conclusion

From the results of present field trial it is concluded that leaf scald disease of rice incited by *Microdochium oryzae* can be effectively controlled by two sprays (first at initiation of disease and second 15 days after first spray) of copper oxychloride 50% WP (0.25%) or Carbendazim 12% + mancozeb 63% WP (0.1%) or *Pseudomonas fluorescens* @ 5g/lit. As non-chemical measure, bio-agents namely *Pseudomonas fluorescens* and *Trichoderma viride* each @ 5g/lit and botanicals namely neemleaf and soapnut rind extracts were also able to reduce the disease by upto 50%.

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