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Evaluation of Fungicides and Bio-agent against Neck Blast Disease of Rice

Ghimire P[1]*, Gopal KC[2], Shrestha SM[2] and Parajuli G[3]

[1]Department of Plant Protection, Himalayan College of Agricultural Sciences and Technology (HICAST), Kathmandu, Nepal
[2]Department of Plant Pathology, Institute of Agriculture and Animal Science (IAAS), Kathmandu, Nepal
[3]Division of Plant Pathology, Nepal Agricultural Research Council (NARC), Lalitpur, Nepal

Abstract

Blast disease caused by *Pyricularia grisea*, is one of the most devastating diseases of rice in most rice producing areas of the world. In Nepal, the disease causes 10%-20% yield reduction in susceptible varieties, but in severe case, it goes up to 80%. Chemicals are commonly applied for controlling rice blast disease, but when chemicals are used indiscriminately, they also pose a serious threat to the environment. An experiment was conducted to check the efficacy against neck blast disease of rice variety "DY-69" (a Chinese variety) with Hexaconazole 5 SC, Tricyclozole 76 WP and Kasugamycin 3% SL as chemical fungicides while with *Trichoderma viridae* as biological agent during June to November 2014 in experimental plot with four replications at Plant Pathology Division of Nepal Agricultural Research Council, Lalitpur. The treatments were applied two times in the field i.e. at tillering stage, i.e. 35 days after transplanting (DAT), and at booting stage, i.e. 65 DAT. Disease incidence, disease index, test weight and total yield were calculated and mean computed. Disease scoring of neck blast was done following the standard scoring system developed by SES (2002). Tricyclazole appeared better to control the neck blast disease followed by Hexaconazole determined in terms of disease incidence, disease index, test weight and total yield. However, *T. viridae* appeared quite comparable to tricyclazole. So, use of *T. viridae* as an option of bio-agent to control a disease will be ecofriendly measure and more study in its dose and application should be tested in field to verify the results and to control the blast of rice. Thus, using appropriate fungicide or bio-agents (alternative to fungicide) help in reducing health hazard by minimizing adverse impact on environment.

Keywords: Blast disease; Rice; Fungal disease; Fungicides; *Pyricularia grisea*

Introduction

Blast disease is one of the most devastating diseases of both the seasons that occurs in all rice growing areas. The disease, caused by *Magnaporthe oryzae* (Hebert) Barr., anamorph *Pyricularia oryzae* [1-3], is an important fungal disease of rice known to occur in most rice producing areas of the world [1]. Rice blast is the most common and destructive disease in irrigated rice of both temperate and subtropical areas of East Asia [4].

In Nepal, the disease causes 10%-20% yield reduction in susceptible varieties, but in severe case, it goes up to 80% [2]. Panicle infection causes complete yield loss [1]. Yield reduction by neck blast infection is twice as severe as the leaf blast [5]. Blast can be successfully controlled through the fungicidal spray and seed treatment with systemic fungicide [6]. Chemicals are commonly applied for controlling rice blast disease [7]. Biological control may be an approach of blast control which is also an eco-friendly and cost- effective measure.

Objective: To evaluate efficacy of fungicides and bio-agents against neck blast disease of rice.

Methodology

An experiment was conducted to evaluate efficacy of fungicides and bio-control agent in management of neck blast by determining different parameters like disease incidence, disease index, Test weight and total grain yield, June to November 2014 in farm of plant pathology division, NARC, Khumaltar, Lalitpur. Disease scoring of neck blast was done after second application of the treatments, i.e. 75 days after transplanting selecting 10 hills of each plot following the standard scoring system developed by SES (2002). Diseases index (intensity) of neck blast was calculated by using the following formula from the data scored on a 0-9 scale above.

$$Disease\ index\ (\%) = \frac{\text{Sum of all numerical ratings}}{\text{Total no. plants observed} \times \text{Maximum rating}(9)} \times 100$$

Similarly, disease incidence and total grain yield were computed using the formula as below:

$$\text{Incidence of neck blast}(\%) = \frac{\text{Total number of infected panicles}}{\text{Total number of panicles}} \times 100$$

$$Grain\ (t/ha) = \frac{(100 - \text{MC}) \times \text{plot yield}(\text{kg}) \times 10000\ \text{m}^2}{(100 - 12) \times \text{plot area} \times 1000}$$

Where, MC: Original moisture content of grains in percentage after harvesting.

Thousand grain weight (test weight) was also taken/plot and mean values/treatment were calculated.

Results and Discussion

The treatments significantly (P=0.05) reduced neck blast disease as compared to control (Table 1). Minimum disease severity (16.50%) was recorded with Tricyclozole, followed by Hexaconazole (26.5%), which were not significantly different to each other. while disease incidence was minimum with Hexaconzole (29.29%) and then in Tricyclazole (34.26%), which were also not considerably different to each other. *T. viridae* was least effective (50%) to reduce the disease.

Tricyclazole and Hexaconazole were found significantly different

***Corresponding author:** Ghimire P, Assistant Professor, Department of Plant Protection, Himalayan College of Agricultural Sciences and Technology (HICAST), Kathmandu, Nepal, Tel: 977-9841169935; E-mail: prasri.me99@gmail.com

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Treatments	Disease incidence (%)	Disease index (%)
Tricyclozole	34.26^{c}	16.50^{d}
Hexaconazole	29.89^{c}	26.50^{cd}
Kasugamycin	49.09^{b}	36.50^{c}
Trichoderma viridae	49.56^{b}	50.00^{b}
Control	60.20^{a}	65.00^{a}
Mean	44.6	38.9
Coefficient of variation (%)	10.95	18.3
LSD value at a 0.05	7.25	10.99
SEM value ±	23.9	3.57
Probability	*	*

Figures followed by the same letter in a column are not significantly different by DMRT at 5% level. LSD: Least Significant Difference; SEM: Standard Error of Mean Difference; *: Significant at 5% Level.

Table 1: Effect of treatments on neck blast severity of rice in field at NARC, Khumaltar.

Treatments	Test weight (gm)	Total grain yield (t ha^{-1})
Tricyclozole	29.03^{a}	3.473^{a}
Hexaconazole	24.08^{b}	3.079^{b}
Kasugamycin	22.35^{bc}	2.631^{c}
Trichoderma viridae	22.23^{bc}	2.411^{d}
Control	20.20^{c}	1.878^{e}
Mean	23.58	2.694
Coefficient of variation (%)	6.7	4.2
LSD value at a 0.05	2.417	0.1752
SEM value ±	0.784	0.0569
Probability	*	*

Figures followed by the same letter in a column are not significantly different by DMRT at 5% level; LSD: Least Significant Difference; SEM: Standard Error of Mean Difference; *: Significant at 5% Level.

Table 2: Effect of treatments on test weight and grain yield of rice in field at NARC, Khumaltar.

with other treatments in reducing disease incidence, while in case of disease index Tricyclazole was significantly different with Kasugamycin, *T. viridae* and control, but Hexaconazole was significantly different with only *T. viridae* and control.

Test weight of rice genotypes differed significantly among the treatments. Tricyclazole had significantly highest test weight (29.03 g) than all the other treatments (Table 2). Hexaconazole had second highest (24.08 g) value.

Total grain yield was statistically significant (P=0.05) among the treatments. It was highest in Tricyclazole (3.473 t ha^{-1}), followed by Hexaconazole (3.079 t ha^{-1}) and Kasu-B (2.631 tha^{-1}) (Tables 1 and 2). Minimum yield (2.411 t ha-^{1}) was obtained from *T. viridae* except control (1.878 t ha^{-1}).

Conclusion

Tricyclazole appeared better to control neck blast disease of rice than all other treatments. Though, *T. viridae,* bio-agent, appeared less effective to the Neck blast disease, it is quite comparable to other treatments. So, tricyclazole should be preferred as chemical fungicide and bio-agent can also be used as alternative to chemical fungicides to control the blast of rice in field. Thus, using minimum dose of appropriate fungicide or bio-agents, alternative to fungicide help in reducing health hazard by minimizing adverse impact on environment.

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Author Contributions

During the course of experimental period, all the authors involved contributed their precious time and effort. Professor, Dr. Gopal K.C. was involved during experiment, initial from planning of experiment to till preparing manuscript. As well, Professor, Dr. Sundarman Shrestha had also involved and provided clear guidelines in conducting research in laboratory. Senior scientist, Mr. Gopal Parajuli had involved in creating a research environment and supervised in all step conducted in research process. Finally, Assistance. Professor, Mr. Prakash Ghimire had involved in all activities from planning for experiment, performing laboratory works, analyzing data and preparing manuscript.

References

1. Ou SH (1985) Rice disease. (2nd edn), Commonwealth Agricultural Bureau International Mycological Institute, Farham House, UK, p. 380.
2. Manandhar HK, Shrestha K, Amatya P (1992) Seed-borne diseases. In: Mathur SB, Amatya P, Shrestha K, and Manandhar HK (eds). Plant diseases, seed production, and seed health testing in Nepal. Danish Government, Institute of Seed Pathology for Developing Countries, Copenhagen, Denmark. pp. 59-74.
3. Rossman AY, Howard RJ, Valent B (1990) *Pyricularia grisea*, the correct name for the rice blast disease fungus. Mycologia 82: 509- 512.
4. Bonman JM, Estrada BA, Kim CK, Ra DS, Lee EJ (1991) Assessment of blast disease and yield loss in susceptible and partially resistant rice cultivars in two irrigated low land environments. Plant Dis 75: 462-466.
5. Hwang BK, Koh YJ, Chung HS (1987) Effects of adult-plant resistance on blast severity and yield of rice. Plant Dis 71: 1035-1038.
6. Prabhu AS, Filippi MC (1993) Seed treatment with pyroqilon for the control of leaf blast in Brazilian upland rice. Int J Pest Manage 39: 347-353.
7. Anwar A, Bhat GN, Singhara GN (2002) Management of sheath blight and blast in rice through seed treatment. Ann Plant Prot Sci 10: 285-287.