

# EFFECT OF BIO-CONTROL AGENTS, PLANT EXTRACTS AND CHEMICALS ON DISEASE INCIDENCE OF RICE

M.A.U. Razu and I Hossain

Department of Plant Pathology, Bangladesh Agricultural University, Mymensingh  
Corresponding author email: razu2125@gmail.com

---

## ABSTRACT

M.A.U. Razu and I. Hossain. Effect of bio-control agents, plant extracts and chemicals on disease incidence of rice. Bangladesh J. Plant Pathol. 32 (1&2): 33-36

The field experiment was carried out from July, 2013 to March, 2014 to evaluate the comparative efficacy of BAU-Biofungicide (2%), a product of *Trichoderma harzianum*; Garlic (*Allium sativum*) clove extract (5%), Allamanda (*Allamanda cathartica*) leaf extract (5%), Bion (25ppm), Amistar (0.1%) and Tilt 250EC (0.1%) for eco-friendly management of diseases of rice as well as for successful crop production. Data on Brown spot, Narrow brown leaf spot, Bacterial leaf blight and Sheath blight were recorded in the field.

**Key-words:** BAU-Biofungicide, Allamanda, Garlic, Bion, Amistar, Tilt 250EC, Rice.

The lowest incidence of brown spot and narrow brown leaf spot was observed in plots treated with BAU-Biofungicide and that of bacterial leaf blight was observed in plots sprayed with Allamanda leaf extract. In case of sheath blight, the lowest incidence was observed in BAU-Biofungicide sprayed plots. The highest grain yield (3.68 t/ha) was recorded in plots sprayed with BAU-Biofungicide which is 40.56% higher over control.

---

## INTRODUCTION

Rice (*Oryza sativa* L.) ranked first position by production during the year 2015-2016 among all the cereals in Bangladesh (BBS 2016). Rice is the most important food for over two billion people in Asia and for hundreds of million in Africa and Latin America. To feed the ever increasing population of these regions the world's annual rice production must be increased from the present 560 to 750 million tones by 2020 (Saranraj *et al.* 2013). At present the total area and production of rice in Bangladesh is about 11.38 million hectares and 34.71 million metric tons, respectively (BBS 2016). Among reasons of low yield of rice, diseases pose a major threat to its production (Ou 1985). Rice is suffering from brown spot to a great extent. Bacterial leaf blight is a destructive systemic disease and may cause an average 20-30% yield loss (Ou, 1985). Sheath blight has been also documented to be one of the major and destructive diseases of rice occurring in Bangladesh (Miah *et al.* 1985, Shahjahan *et al.* 1987). The common diseases of rice are being controlled specially by sowing of seed treated with fungicides and foliar application in the field that break down the natural ecological balance. The use of eco-friendly management practices may help in avoiding environmental pollution as well as increase the production of rice. Considering the above facts the present study was undertaken to find out the efficacy of BAU-biofungicide, Garlic clove extract, Allamanda leaf extract, Bion, Amistar and Tilt 250EC on yield of rice.

---

## MATERIALS AND METHODS

The experiment was carried out in the field laboratory of the Department of Plant Pathology, Bangladesh Agricultural University (BAU), Mymensingh during the period from July, 2013 to March, 2014. BRRI dhan 49, a high yielding rice variety was used as test crop. The field experiment was carried out in Randomized Complete Block Design with 3 replications. The unit plot size was 10 m<sup>2</sup> (5m×2m). Normal agronomic practices and fertilization were used for the study as per recommended dose of Fertilizer Recommendation Guide (BARC 2012). BAU-Biofungicide (2%), Garlic clove extract (5%), Allamanda leaf extract (5%), Bion (25ppm), Amistar (0.1%) and Tilt 250EC (0.1%) were applied as foliar spray for 3 times with 10 days interval at 65, 75 and 85 Days After Transplanting (DAT), respectively. Water was sprayed in case of control plots. Data were recorded on Brown spot, Narrow brown leaf spot, Bacterial leaf blight (BLB) and Sheath blight at 70, 80 and 90 DAT, respectively. The disease incidence was calculated following (Ansari 1995). The severity of the diseases was recorded following Standard Evaluation System for Rice (IRRI 2002). Data were analyzed for evaluating test of significance. After harvesting the field plots, the rice seeds of individual plots were stored separately in small-sized white colored cotton bags at room temperature.

## RESULTS AND DISCUSSION

The lowest brown spot incidence was observed in plots sprayed with BAU-Biofungicide (9.59%,) which was the highest reduction of disease incidence (28.75%) over control (Table 1). This finding is

similar to the observation of (Joshi *et al.* 2007) who evaluated the efficacy of *Trichoderma harzianum* and *Pseudomonas fluorescens* in talc- and oil-based formulations against brown spot of rice cultivars PR 116 and Basmati rice 386 under field conditions in India during 2005. The lowest incidence of narrow brown leaf spot was observed in plots treated with BAU-Biofungicide (6.90%) which is 42.64% lower over control. This finding is supported by (Reyes *et al.* 2007) who reported that *Trichoderma harzianum* has good potentialities for the control of narrow brown leaf spot of rice. The lowest incidence of bacterial leaf blight was observed in plots sprayed with Allamanda leaf extract (2.67%) which is 44.83% lower over control. This finding is in accordance with the

findings of (Mostafa 2004). He reported that, leaf extract of Allamanda was best in reducing the incidence of bacterial and viral diseases of rice. In case of sheath blight, the lowest incidence was observed in BAU-Biofungicide sprayed plots (13.35%) which is 43.91% lower over control. This finding can be correlated with the work of (Rahman 2007) who carried out an experiment to find out the effectiveness of *Trichoderma* spp. for controlling sheath blight of rice. *Trichoderma harzianum* significantly reduced the pathogen of sheath blight of rice. This is similar to the findings of (Reyes *et al.* 2007, Khan and Sinha 2005).

**Table 1. Efficacy of plant extracts, bio-control means and chemicals on incidence of different diseases of rice cv. BRRI dhan 49**

Treatments	Mean Disease Incidence (%)			
	Brown spot	Narrow brown leaf spot	Bacterial leaf blight	Sheath blight
BAU-Biofungicide	9.59 f (28.75)	6.90 d (42.64)	3.17 d (34.50)	13.35 e (43.91)
Garlic (clove extract)	9.99 ef (25.78)	8.44 c (29.84)	3.62 c (25.21)	15.77 d (33.74)
Allamanda (leaf extract)	10.25 e (23.85)	9.96 b (17.21)	2.67 e (44.83)	19.26 c (19.08)
Bion	11.21 c (16.72)	8.69 c (27.76)	3.43 c (29.13)	19.57 c (17.77)
Amistar	12.58 b (6.54)	10.24 b (14.88)	4.20 b (13.22)	21.97 b (7.69)
Tilt 250EC	10.75 d (20.13)	8.48 c (29.51)	4.72 a (2.48)	19.88 c (16.47)
Control	13.46 a	12.03 a	4.84 a	23.80 a
Level of significance	**	**	**	**

Figures in a column with same letter(s) do not differ significantly.

\*\* Significant at 1% level of significance.

Data in parentheses indicate % reduction over control.

The lowest brown spot severity was found in plots sprayed with Garlic clove extract (13.72%) (Table 2). This finding is in agreement with that of (Ahmed 2002) who reported that Neem and Garlic extracts were effective against *Bipolaris oryzae* at 1:1 dilution. The lowest severity of narrow brown leaf spot was found in BAU-Biofungicide sprayed plots (9.89%). This finding is similar to the observation of (Khan and Sinha 2007) who found that *Trichoderma harzianum* was found best in managing narrow brown leaf spot, compared to other commercial formulations of bioagents, giving 48.1% reduction in disease severity.

The lowest bacterial leaf blight severity (%) was also found in plots sprayed with BAU-Biofungicide (16.10%). This finding supports the work of (Tang *et al.* 2001). They evaluated the biological control efficiency of *Trichoderma* spp. against the bacterial leaf blight pathogen, *Xanthomonas oryzae*. The lowest severity of sheath blight was found in BAU-Biofungicide (7.27%). This finding is in accordance with the findings of (Tewari and Rajbir 2005). They observed that, foliar spray of *Trichoderma harzianum* was superior showing significantly reduced sheath blight severity (40.82%) compared to other treatments.

**Table 2. Efficacy of plant extracts, bio-control means and chemicals on severity of different diseases of rice cv. BRRI dhan 49**

Treatments	Mean Disease Severity (%)			
	Brown spot	Narrow brown leaf spot	Bacterial leaf blight	Sheath blight
BAU-Biofungicide	14.44 f (39.43)	9.89 f (50.92)	16.10 g (57.55)	7.27 d (35.83)
Garlic (clove extract)	13.72 g (42.45)	11.79 e (41.49)	24.02 d (36.67)	9.21 c (18.71)
Allamanda (leaf extract)	16.93 d (28.98)	16.96 b (15.83)	18.78 f (50.49)	9.05 c (20.12)
Bion	22.01 b (7.68)	13.73 d (31.86)	27.59 c (27.26)	10.28 b (9.27)
Amistar	20.11 c (15.64)	14.96 c (25.76)	30.60 b (19.33)	10.77 ab (4.94)
Tilt 250EC	15.84 e (33.56)	10.00 f (50.37)	20.06 e (47.11)	8.91 c (21.36)
Control	23.84 a	20.15 a	37.93 a	11.33 a
Level of significance	**	**	**	**

Figures in a column with same letter(s) do not differ significantly.

\*\* Significant at 1% level of significance.

Data in parentheses indicate % reduction over control.

BAU-Biofungicide showed best performance in case of maximum panicle length (21.76 cm), highest number of grains/panicle (114.12) and highest weight of grains/panicle (Table 3). The highest weight of 100 grains (2.37g) was observed in Tilt 250EC sprayed plots. The highest grain yield was observed in case of

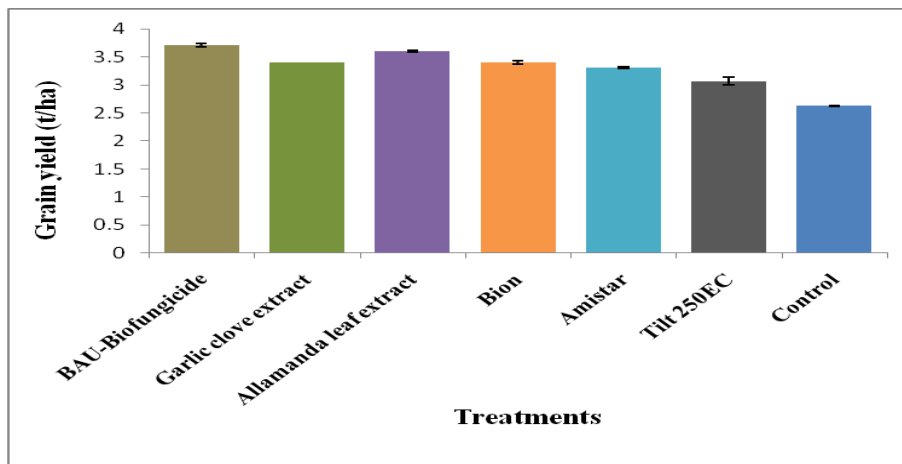
BAU-Biofungicide (3.68 t/ha) which is 40.56% higher over control (Figure 1 and Figure 2). These findings are in accordance with the findings of Khan and Sinha (2005). They reported that foliar spray of *Trichoderma harzianum* was most effective in increasing grain yield of rice (20.25-23.13%).

**Table 3. Efficacy of plant extracts, bio-control means and chemicals on yield components of rice cv. BRRI dhan 49**

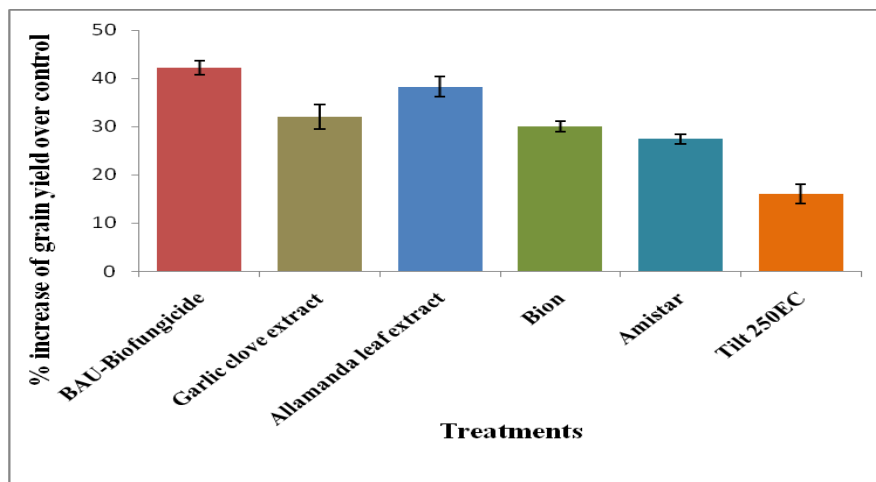
Treatments	Mean Panicle length (cm)	Mean Number of grains/panicle	Mean Weight of grains/Panicle (g)	Mean Weight of 100 grains (g)
BAU-Biofungicide	21.76	114.12 a	2.73 a	2.29 ab
Garlic (clove extract)	19.83	108.75 b	2.45 b	2.28 ab
Allamanda (leaf extract)	19.83	103.90 c	2.32 c	2.00 cd
Bion	19.63	100.02 d	2.17 d	2.14 bc
Amistar	19.93	99.82 d	1.99 e	1.97 cd
Tilt 250EC	20.16	113.70 a	2.13 d	2.37 a
Control	18.87	97.87 e	1.99 e	1.93 d
Level of significance	NS	**	**	**

Figures in a column with same letter(s) do not differ significantly.

\*\* Significant at 1% level of significance, NS=Not significant



**Fig. 1. Efficacy of plant extracts, bio-control means and chemicals on grain yield**



**Fig. 2. Efficacy of plant extracts, bio-control means and chemicals on % increase of grain yield over control**

## LITERATURE CITED

- Ahmed, M.F. 2002. Efficacy of some fungicides and plant extracts against *Biploris oryzae*. MS thesis, Department of Plant Pathology, Bangladesh Agricultural University, Mymensingh, Bangladesh, pp.1-82.
- Ansari, M.M. 1995. Control of sheath blight of rice by plant extracts. *Indian Phytopathol.* 3:268-270.
- BARC, 2012. Fertilizer Recommendation Guide. Bangladesh Agricultural Research Council, 84 p.
- BBS, 2016. Statistical pocket book Bangladesh. Bangladesh Bureau of Statistics, Statistics Division, Ministry of Planning Government, People's Republic of Bangladesh, 207 p.
- IRRI, 2002. Standard Evaluation System for Rice (SES) 6, 12.
- ISTA, 1996. International Rules of Seed Testing Association. In. Proc. Int. Seed Testing Association, pp. 19-41.
- Joshi, N., Brar, K.S., Pannu, P.P. and Singh, P. 2007. Field efficacy of fungal and bacterial antagonists against brown spot of rice. *Biological Control* 21: 159-162.
- Khan, A.A. and Sinha, A.P. 2007. Biocontrol potential of *Trichoderma* species against sheath blight of rice. *Indian Phytopathol.* 60: 208-213.
- Miah, S.A., Shahjahan, A.K.M., Hossain, M.A. and Sharma, N.R. 1985. Survey of rice diseases in Bangladesh. *Tropical Pest Management* 31: 208-213.
- Mostafa, M. 2004. Effect of some plant extracts on viral disease of tomato. MS thesis, Department of Plant Pathology, Bangladesh Agricultural University, Mymensingh, Bangladesh, pp.1-56.
- Ou, S.H. 1985. Rice diseases, 2nd edition. Commonwealth Mycological Institute, Kew, Surrey, England, 198 p.
- Rahman, Z. 2007. Biological control of sheath blight of rice using antagonists *Trichoderma*. MS thesis, Department of Plant Pathology, Bangladesh Agricultural University, Mymensingh, Bangladesh, pp. 1-58.
- Reyes, R., Rodriguez, T.G., Pupo, A.D., Alarcon, L. and Limonta, Y. 2007. *In vitro* efficacy of *Trichoderma harzianum* for biocontrol of *Rhizoctonia solani* and *Pyricularia grisea* isolated from rice crop (*Oryza sativa* L.). *Fitosanidad* 11: 29-33.
- Saranraj, P., Sivasakthivelan, P. and Sivasakthi, S. 2013. Prevalence and production of plant growth promoting substance by *Pseudomonas fluorescens* isolated from paddy rhizosphere soil of Cuddalore district, Tamil Nadu, India. *African Basic and Applied Sci.* 5: 95-101.
- Shahjahan, A.K.M., Duve, T. and Bonman, J.M. 1987. Climate and rice disease in weather and rice. IRRI, Los Banos, Leguna, Philippines, pp. 125-128.
- Tang, J., Tian, B., LingXia, M., Ping, W. and Hong, C. 2001. Biocontrol of *Rhizoctonia solani* with *Trichoderma* spp. CRRN. *Chinese Rice Res. Newsl.* 9, 8 p.
- Tewari, L. and Rajbir, S. 2005. Biological control of sheath blight of rice by *Trichoderma harzianum* using different delivery systems. *Indian Phytopathol.* 58: 35-40.

