



RESEARCH ARTICLE

STUDIES ON THE EFFICACY OF SOME NEWLY EVOLVED FUNGICIDES AGAINST GRAIN DISCOLOURATION DISEASE OF RICE (*ORYZA SATIVA L.*) IN WEST BENGAL

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ABSTRACT

Grain discoloration disease is presently becoming a serious threat in rice growing areas of India including West Bengal. The disease is causing both qualitative and quantitative losses of grain yield as well as reducing germination and increasing seedling mortality. Except other factors several micro organisms specially fungi play major role in development of this disease. On the background of these facts, the present investigation was carried out with some newly evolved and commercially available seven old and new generation fungicides. The experiment was conducted at farmer's field in village Falta under South 24 Parganas District during Boro Season 2013-14 and 2014-15. Among seven fungicides tested, five fungicides were found effective in reducing disease incidence. Among five fungicides, Trifloxystrobin25% +Tebuconazole 50% WG was found to be best performing fungicide with minimum level of PDI and percentage of severely disease infected seed was also very less. The other four fungicides namely Carbendazim25%+Mancozeb 50%WS, Tricyclazole 18%+Mancozeb 62% WP, Tricyclazole75 % WP, Propiconazole13.9%+ Difeconazole13.9% EC had significant role in reducing PDI and percentage of disease infected seeds.

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INTRODUCTION

Rice (*Oryza sativa L.*) is an important staple food and provides more than one fifth of the calories in the world for human consumption (Crawford and Lee, 2003). It is consumed as main food by more than 60% population in India. India is the second most populous nation, stands first in areas, second in production followed and preceded by China (Subudhi et al., 2012). In India, rice occupies 44.6 mha. In India, West Bengal is one the major rice growing states and rice is grown in all three season namely Aus, Aman and Boro. Presently, rice is cultivated in an area of 5.6 mha and average yield is almost 4100 kg/ha. In West Bengal the crop Suffers with a number of constrains which causes in reduction of grain yield. Disease is

one of the major constrains. Rice crop is subjected to attack by fifty (50) diseases which include six (6) bacterial, twenty one (21) fungal, four (4) nematodes, twelve (12) viral and seven (7) miscellaneous diseases and disorders (Hollier et al., 1993, Jabeen et al., 2012). Some major diseases are rice blast, brown spot, bacterial leaf blight (BLB), bacterial leaf streak (BLS), sheath blight, sheath rot etc. (Sharma and Bambawale, 2008). Besides the major diseases, grain discoloration is one of the important emerging rice diseases and it is reported in almost all parts of West Bengal. Grain discoloration of rice is a complex disease occurred, due to infection by certain micro organisms on glumes, Kernels or both. Two groups of fungi are associated in grain discoloration of rice (Ou, 1985). One group, is field fungi, more or less parasitic and infects grain before harvest like *Drechslera oryzae*, *Pyricularia oryzae*, *Alternaria padwiki*, *Fusarium moniliforme*, *Curvularia* sp., *Sarocladium* sp. etc. Other groups are storage moulds, saprophytes develop after harvest. They are mainly species of *Aspergillus* sp., *Penicillium* sp., *Mucor* sp., *Rhizopus* sp. etc.

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Grain discoloration of rice is gaining importance in almost all rice growing areas of the world in recent years (Biswas, 2003). It results in seedling mortality, reduction in germination and seedling vigour (Das and Narain, 1988; Zulkifi *et al.*, 1991). It also causes both quantitative and qualitative losses in rice (Vidhyasekaran and Ramadoss, 1973; Vidyasekaran *et al.* 1984) and also decreases grain yield and size (Sugha and Singh, 1989). Management of grain discoloration by application of different chemicals at different stages of flowering had been reported by different researchers (Arunyanant *et al.*, 1981). Keeping these views at the back drop a field experiment was conducted to investigate the efficacy of seven fungicides against grain discoloration disease of rice.

## MATERIALS AND METHODS

The field experiment was conducted at farmers field in village Falta (Latitude & Longitude) under South 24 Parganas District, West Bengal, India during Boro Season 2014 and 2015. Lalat, a high yielding variety and susceptible to grain discoloration disease in South Bengal condition was selected for the experiment. The experiment was conducted following completely Randomized Block Design (CRBD) with three replications adopting the plot size 5m x 3m by and a spacing of 20cm x 15cm. Standard agronomic practices were followed during raising of crop. Seven fungicides viz Trifloxystrobin 25%+Tebuconazole 50%WG, Pencycuron 22.9%SC, Thiafluzamide 24% SC, Carbendazim25%+Mancozeb 50%WS, Tricyclazole18%+Mancozeb 62% WP, Tricyclazole75 % WP and Propiconazole13.9%+, Difeconazole13.9% EC were used in this experiment (Table 2) and sprayed twice as per recommend dose of Deptt. of Agriculture, Government of West Bengal. We have selected the fungicides used in the experiment on the basis of their availability in the market in commercial form.

First spray was done at booting stage and second at 10 days after 1<sup>st</sup> spray. The list of fungicides alongwith trade name, nature and sources are given in Table 1.

At maturity stage panicles were harvested from five (5) locations of each plot (centre and four corner of plot leaving 25 cm from side) with 100 panicle per location. Total 500 no. of panicles were harvested from each plot. Then panicles were dried thoroughly on the floor for 2 -3 days in sunshine and seeds were separated out and bagged in clean cloth bags with proper levelling. Thousand (1000) number of seeds were randomly selected from each replication and seeds were separated as per scale formulated by IRRI according to the affected surface area of glume (0 : No incidence, 1 : less than 1%, 3 : 1-5%, 5: 6-25%, 7: 26-50% and 9: 51-100%). Then Percent Disease Index (PDI) was worked by using the formula given by Wheeler (1969).

$$PDI = \frac{\text{Sum of individual disease grain rating} \times 100}{\text{No. of grain assessed} \times \text{Maximum disease index}}$$

The severity of grain discoloration was estimated by counting grain with more than 25% of glume surface affected as formulated by IRRI.

Percentage of severely disease infected seeds were worked out following calculation as per scale developed by IRRI.

$$\text{Percentage of severely disease infected seed} = \frac{\text{Sum of diseased grains of scale 7 and 9} \times 100}{\text{No. of grain assessed}}$$

The PDI and Percentage of severely disease infected seed with no. of grain at different level of scale were shown in Table 2.

**Table 1. The list of fungicides with nature, trade name and sources**

S.No.	Active Ingredients	Nature	Trade Name	Source
1.	Tubeconazol 50 % Triflioxystrobin 25% WG	Systemic	Nativo	Bayer crop science Ltd., Cambridge
2.	Pencycuron 22.9 % SC	Contact	Monceren	Bayer crop science Ltd., Cambridge
3.	Thiafluzamide 24 % SC	Systemic	Pulsor	Insecticide India
4.	Carbendazim 25 % Mancozeb 50 % WS	Contact & Systemic	Sprint	Indofil chemicals Ltd.,Mumbai
5.	Tricyclazole 18 % Mancozeb 62 % wp	Contact & Systemic	Merger	Indofil chemicals Ltd.,Mumbai
6.	Tricyclazole 75% WP	Systemic	Baan	Indofil chemicals Ltd.,Mumbai
7.	Propiconazole 13.9 % Difeconazole 13.9 % EC	Systemic	Taspa	Syngenta

**Table 2. Effect of newly evolved fungicides on Percent Disease Index and Percentage of severely disease infected seed due to Grain Discolouration Disease of Rice**

Treatment	Total grain studied	No. of discoloured seed with different level of incidence						Percent Disease Index	Percentage of severely disease infected seed
		Scale-0	Scale-1	Scale-3	Scale-5	Scale-7	Scale-9		
Trifloxystrobin 25%+ Tebuconazole50%WG	1000	859	38	40	35	7	21	6.31	2.8
Pencycuron 22.9%SC	1000	660	93	91	80	46	30	15.08	7.6
Thiafluzamide 24% SC	1000	663	77	97	106	25	32	15.12	5.7
Carbendazim25% + Mancozeb 50%WS	1000	802	74	56	30	15	23	7.8	3.83
Tricyclazole18%+Mancozeb 62% WP	1000	811	64	62	42	10	20	7.91	3.03
Tricyclazole75 % WP	1000	795	83	51	36	15	19	7.74	3.43
Propiconazole13.9%+ Difeconazole13.9% EC	1000	802	71	57	38	13	20	7.52	3.28
Control	1000	665	80	95	76	49	40	16.13	8.93
CD ( 0.05)	-	-	-	-	-	-	-	3.045	1.883

## RESULTS AND DISCUSSION

By interpreting the data shown in table- 1 it was revealed that some fungicides had significant effect in controlling PDI and percentage of severely disease infected seed. The Trifloxystrobin 25%+Tebuconazole50%WG showed minimum PDI i.e 6.31 followed by Tricyclazole 75% (7.74), Carbendazim 25%+Mancozeb 50%WS (7.8) and Tricyclazole 18%+Mancozeb 62% WP (7.91) where as Pencycuron 22.9% SC and Thiafluzamide 24% SC had shown PDI i.e 15.08 and 15.12 which were not significant compared to control. The effect of Propiconazole13.9%+ Difeconazole 13.9% EC, Tricyclazole75 % WP, Carbendazim 25% + Mancozeb 50%WS and Tricyclazole 18% + Mancozeb 62% WP in reducing the disease was significantly better than control (Table 2). Whereas during interpreting data of severely disease infected seed, it was seen that the calculated value was minimum (2.8) for Trifloxystrobin 25%+ Tebuconazole 50% WG followed by Tricyclazole18%+ Mancozeb 62% WP (3.03), Propiconazole13.9%+, Difeconazole13.9% EC (3.28), Tricyclazole 75 % (3.43), Carbendazim25% + Mancozeb 50% WS (3.83). The effect of , Tricyclazole18%+ Mancozeb 62% WP, Propiconazole13.9%+ Difeconazole13.9% EC, Tricyclazole75 % WP & Carbendazim25% + Mancozeb 50% WS are at par in controlling disease where as Pencycuron 22.9% SC (6.56), Thiafluzamide 24% SC (5.7) Tricyclazole75 % WP had shown high level of percentage of severely disease infected seed like control plot (8.93) (Table 2). The effect of Tebuconazole 250 EC. & Carbenoazim 12% + Mancozeb 63% 75WP also worked out with other 6 agrochemicals by Bag *et al.*, 2010 and showed significant effect in controlling disease incidence which supports the present study. In the year 2008, under AICRIP, the effect of Carbendazim 12% + Mancozeb 63% 75WP were also evaluated at different locations in India and found as best performing fungicide in some locations (Bag *et al.*, 2010). So in the present study, it was revealed that Trifloxystrobin 25% + Tebuconazole 50% WG was the best performing fungicide. Propiconazole 13.9% + Difeconazole 13.9% EC, Carbendazim 25% + Mancozeb 50% WS, Tricyclazole 75 % WP, Tricyclazole 18%+ Mancozeb 62% WP were also good performing fungicides and had significant role in controlling disease incidence.

## REFERENCES

Arunyanant, P., Surin, A. and Disthaporn, S. 1981. Seed discoloration disease and its chemical control. *IRRN*, 6(3),14-15.

- Bag, M.K., B. Adhikari and M.K. Bhowmik, 2010. Evaluation of fungitoxic effect of some commercially available agrochemicals against discoloration (Gd) disease of rice in West Bengal. *The Journal of Plant Protection Science*, 2(1),103-104.
- Biswas, A., 2003. Grain discoloration disease of rice : A review. *J. Mycol. Res.*, 41,7-13.
- Crawford, G. W. and Lee, G. A. 2003. Agricultural Origins in the Korean Peninsula. *Antiquity*, 77(295), 87-95.
- Das, A. N. and Narain, A. 1988. Detection of grain discolorating fungal organisms of rice and production of disease free seeds. *Journal of Mycology and Plant Pathology*, 18, 24-30.
- Hoiller, C.A., Groth, D.E., Rush, M.C. and Webster, R. K. 1993. *Common Names of Plant Diseases. The American Phytopathological Society*, St. Paul. MN.
- Jabeen, R., Iftikhar, T., and Batool, H. 2012. Isolation characterization, preservation and pathogenicity test of *Xanthomonas oryzae* PV *oryzae* causing BL. B disease in rice 44(1), 261-265.
- Ou, S. H. 1985. Rice Diseases. CAB international Mycological Institute, Kew, Surrey, U.K.
- Sharma, O. P. and Bambawale, O. M. 2008. Integrated management of key diseases of cotton and rice *integrated Management of Plant Pest and Disease*, 4, 271-302.
- Subudhi, H.N., Swain, D., Das, Sanjukta, Sharma, S.G. and Singh, O.N. 2012. Studies on Grain Yield, Physico-Chemical and Cooking Characters of Elite Rice Varieties (*Oryza sativa* L.) in Eastern India, *Journal of Agricultural Science*, 4 (12).
- Sugha, S.K. and Singh, B.M. 1989. Effect of slume blight of rice on grain yield and quality *Indian Phytopath*, 42, 163-164.
- Vidhyasekaran, P. and Ramadoss, N. 1973. Quantitative and qualitative losses in paddy due to helminthosporiose epidemic. *Indian Phytopath*, 2, 479-484.
- Vidhyasekaran, P., Ranganathan, K. and Rajamanickam, B. 1984. Quality of rice grains from sheath rot affected plant. *News letter*. IRRI, Los Banos, Philippines.
- Wheeler, B.E.J. 1969. An Introduction to Plant Diseases, John Wiley and sons Ltd., New York.
- Zulkifi, E.L. and Castano, J. 1991. Effect of grain discoloration in upland rice on some yield components. *IRRN* 16, 20.

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