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Assessment of IDM modules with some fungicides for rice blast in Chhattisgarh

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Abstract
Rice blast diseases caused by *Magnaporthe grisea* is an economically important disease in Chhattisgarh that attacks at all stage of crop growth like nursery, booting and flowering stage, causing different types of disease symptoms as leaf blight, node blast and neck blast. Among the attacking stages neck blast is very serious stage that's can affect 15-16% yield loss. Considering the importance of disease the experiment was carried out to assessment of IDM module with some systemic fungicides in rice through on field trials (OFT) against rice blast disease in Kabirdham district of Chhattisgarh during Kharif season 2014-15 and 2015-16 at different location of farmer's field by supervision of Indira Gandhi Krishi Vishwavidyalaya, Krishi Vigyan Kendra, Kabirdham (Chhattisgarh). The efficacy of two systemic fungicides *viz*. Tricychalazole and Carbendazim were tested by application of different method at all stages of plant growth at recommended dose. The observation was recorded at all stage of plant growth on various parameters *viz*. disease incidence (%), severity (%) and yield with cost benefit ratio in two consecutive years. The use of Tricychlazole 75 WP @ 0.075% at nursery stage found economically more effective for blast with low disease incidence, severity as well as cost: befit ratio compare to Carbendazim.

Keywords: IDM, rice, blast, fungicide, assessment, Chhattisgarh

Introduction
Rice is one most widely cultivated food crop in the world and it's most important chief and staple food grains for Indian people living in the rural and urban areas because it is one of the world's largest producer's countries, accounting for 20% of all world rice production. In which, Chhattisgarh is currently one of the main states for production and exporter of rice in India with occupies on average an area of 3.6 million hectare production approx. 77 lakh tonnes and productivity 1700kg/ha. Rice production in CG is gradually increasing due to availability of high yielding variety, fertile soil and favourable climate this helps CG become one of the main exporter of the rice in India. It is for these reasons that CG is called the "Rice Bowl" of Central India. The production can be improve by reducing losses inflicted on rice crop by number of fungal, bacterial, viral and nematode diseases. More than 70 diseases are caused by fungi, bacteria, viruses or nematodes on rice (Ahuja, and Kandhari, 2000) [1]. Among the fungal diseases blast caused by *Magnaporthe grisea* is one of devastative and destructive diseases of rice worldwide, causing yield losses to the extent of 70-80% in various rice ecosystems Srinivas Prasad *et al*., (2011) [13] and the losses may be reach up to 100 per cent that depends on cultivar susceptibility, environmental conditions and management system (Ou 1980) [8]. Rice blast is a seed and soil borne disease that can infects all parts of the shoot (Talbot 2003; Sesma and Osbum 2004) [14, 11] and caused three different symptomatology - neck, collar and leaf blast. Out of the three phases of symptoms of blast disease, neck blast is the most destructive phase throughout globe and is more detrimental to rice yield (Laha *et. al.* 2016). So great is the potential threat for crop failure from this disease that it has been ranked among the most important plant diseases of them all. Other grasses, including crabgrass, are infected with closely related fungi (*Magnaporthe grisea, Magnaporthe poae, Magnaporthe rhizophila* and *Magnaporthe salvinii*), which cause nearly identical symptoms on their respective hosts. Therefore, it is a serious constraint to production in most of the world's rice-growing regions (Bonman *et. al.*, 1989) [4]. It is also important disease in Chhattisgarh that can causes 15-16% yield loss depending upon the location, variety infected and severity of diseases. For reducing threats to environment for sustaining higher yields use sustainable agriculture that is depends on the use of chemical fungicides, pesticides, herbicides and fertilizers. Repeated use of these chemicals is causing severe concern from the health and environmental point of view.

In view of these, the development of IDM based control method of blast is now viewed not only as an eco-friendly but also sustainable agriculture. IDM is a disease control method, where judicious integration of chemical application with cultural practices, resistant cultivars and biological control methods that reduce the use of fungicides/insecticides whereby the level of disease is reduced as it avoids indiscriminate use of pesticides and increasing the grain and straw yields of paddy as well as monitory returns. Approach of Integrated Disease Management (lDM) appears to be most appealing and virtuous as it envisages. There is need to test and demonstrate IDM technique at farmers' field for their wide adaptability. Therefore, to achieve these targets fulfilled through On-farm trials and frontline demonstrations, that were conducted by Krishi Vigyan Kendra Kawardha District of Chhattisgarh to highlight IDM modules for rice disease management and to boost rice production in blast affected area with permissible cost: benefit. Yield improved to the tonne of 10 per cent by IDM module over farmers practice plots.

Materials and Methods

Assessment of IDM module with some systemic group of fungicides (Tricychalazole and Carbendazim) in rice crop for blast disease (*Magnaporthe grisea*) was conducted through on field trials (OFT) in different location of farmer field during 2015-16 and 2016-17 under supervision of Indira Gandhi Krishi Vishwavidyalaya, Krishi Vigyan Kendra Kabirdham District of Chhattisgarh. Most of the IDM approaches were applied including chemical application with some cultural methods like summer ploughing, removal of collateral/alternate host, field sanitation, selection of variety, time of sowing, plant spacing, use of organic manure, recommended dose of fertilizer application, grow certified seed and proper follow up of cultivated crop, to reduce the use of agriculture chemicals in rice crop. All the agronomic practices of rice crop were used as per recommendation for rice crop. Chemicals fungicides were used as per recommendation as protective and need base at heading/booting stage (50% Panicle emergence) for disease control. The observations on diseases were recorded by following 0 – 9 SES scale as per IRRI, Philippines (Anonymous, 2002) and then converting into per cent disease intensity by using the formula.

$$\text{Per cent disease intensity} = \frac{\text{Sum of the scores X 100}}{\text{Numbers of observations X highest rating i.e. 9}}$$

The data on the grain and straw yields were recorded in net plot as described by Seebold *et al*., 2004 [10] and tillers within the plot were cut and harvested in order to determine the yield.

Results & Discussions

Two systemic fungicides (Tricychalazole 75 WP @ 0.075% and Carbedazim 50 WP @ 0.1%) were assessed with IDM modules against blast disease (*Magnaporthe grisea*) at nursery stage in rice indicated as T_1 & T_2 Treatments (Table 1). The results indicate that T_2 is highly acceptable performance by increasing 9.97% yield, with reduced the disease incidence by 6.0% and disease intensity 7.31% respectively an average of both the year (i.e. 2015 & 2016) compare to farmer practices. The average net income and B: C Ratio increased with 2.385:1, due to increment of yield is 40968/- Rs/ha. (Table1) Graphical representation of results for T_1 and T_2 showed similar trends as per table data is given in Fig. 1 and Fig. 2 respectively. Further Lore *et al.* (2007) [7] also noticed same type of results with same group of fungicides and "Zole" group was the most effective against various rice diseases and it was followed by a widely used, systemic, broad-spectrum fungicide benzimidazole group - carbendazim @ 0.1%, which is in agreement with the present studies. Hossain and Kulkarni (2001) [5] also recorded with same as the best fungicide in managing the blast disease of paddy. However, it was concluded that the use of Tricychlazole 75 WP @ 0.075% at nursery stage found economically more effective for blast with low disease incidence, severity as well as cost: befit ratio compare to Carbendazim. Almost similar results against blast have also been reported earlier (Ram Singh *et. al.* 2004 and 2010; Srinivas Prasad *et. al*. 2011; Upmanyu and Rana 2012; Pattanayak, and Das 2020) [12, 13, 15, 9]. Use of tricyclazole, a melanin biosynthesis inhibitor has been advocated by Yamaguchi (2004) [16] as this is an environmentally safe fungicide and is less likely to lead to resistance development in the pathogen. It is therefore it may be recommended to farmer for use against blast disease for long term use in future.

Table 1: Assessment of IDM modules with some fungicides for rice blast disease during 2015-16

Observed Parameters	Treatments							
	T_1 – Carbendazim Spray @1gm/Lit. of water at Booting stage				T_2 - Tricychlazole Spray @0.075gm / Lit. of water at Booting stage			
Year & Average	2015	2016	Average	Decrease over control	2015	2016	Average	Decrease over control
Disease Incidence (%)	65.50	63.40	64.45	-	6.25	5.75	6.0	90.7
Disease Intensity (%)	48.32	58.23	53.27	-	4.52	10.11	7.31	86.64
Yield(q ha-1)	45.36	44.12	44.74	-	49.74	48.66	49.2	-
% change in Yield	-	-	-	-	9.65	10.29	9.97	-
Net Income (Rs/ha)	34534	35256	34895	-	40336	41600	40968	40968
B:C Ratio**	2.19:1	2.19:1	2.19:1		2.38:1	2.39:1	2.385:1	

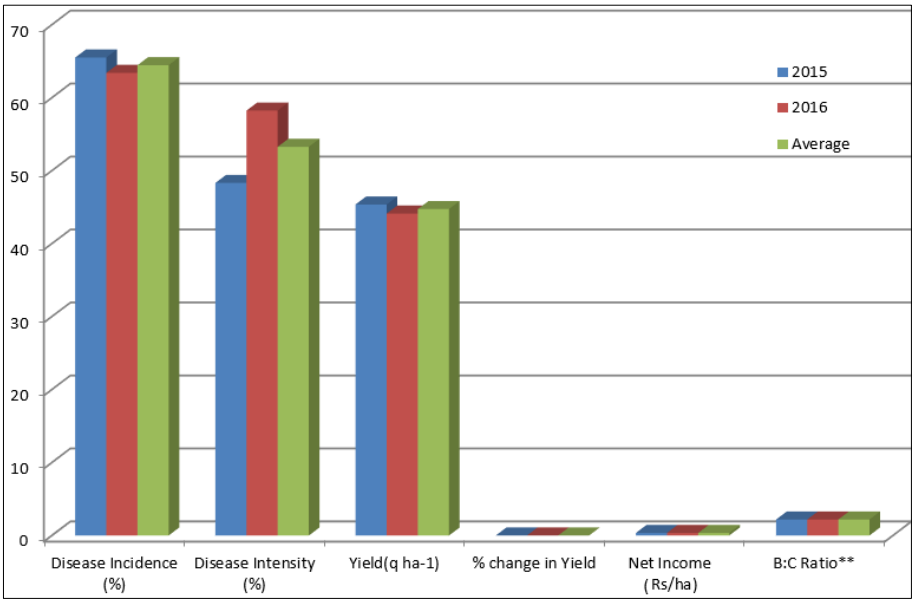

Fig 1: Assessment of IDM module with Carbendazim spray @ 1gm./lit. of water for rice blast at nursery stage (T1)

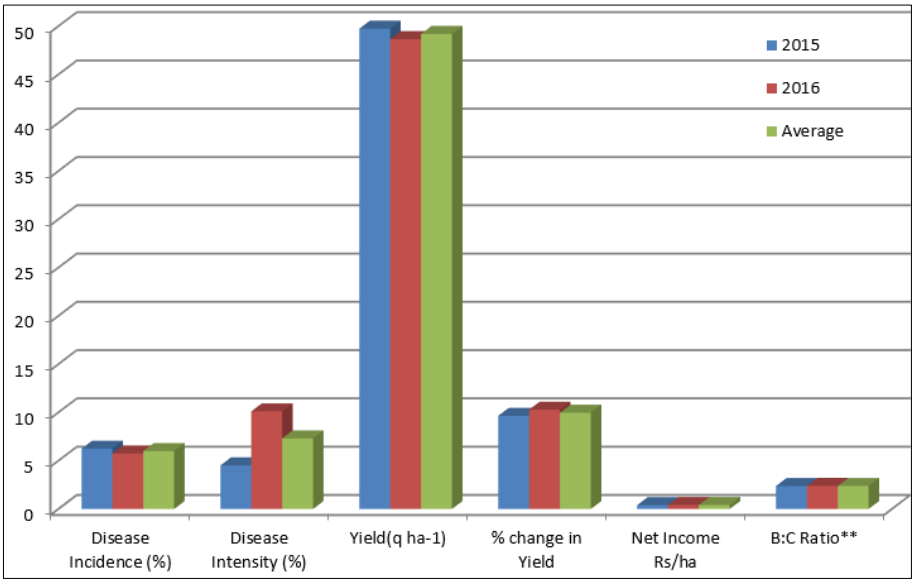

Fig 2: Assessment of IDM module with Tricychalazole spray @ 0.075gm./lit. of water for rice blast at nursery stage (T2)

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