



# EVALUATION OF NEW GENERATION FUNGICIDES AGAINST PADDY SHEATH BLIGHT UNDER *IN VIVO* CONDITIONS

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## Abstract

The study was conducted to know the field efficacy of different fungicides against sheath blight of rice under irrigated eco-system. Among the different treatments in the field trails the fungicide hexaconazole5SC treatment recorded the least PDI (33%) and with maximum yield (2485Kg/ha) followed by azoxystrobin (35.5%), difenconazole (34.2%) and its combination azoxystrobin+difenconazole (36.6%), which were statistically on par with hexaconazole in both yield and PDI. Azoxystrobin alone and its combinations were found equally effective with hexaconazole under field conditions. Maximum PDI (57.7%) was recorded in pyroclostrobulin 20% WG when compared to control (76.0%).

**Key words :** Sheath blight, hexaconazole, azoxystrobin, yield, PDI.

## Introduction

Rice production and productivity is affected by number of biotic and abiotic factors, which causes yield losses upto 20-30%. Among all the biotic constraints, fungal diseases are most predominant across the world where ever rice is grown. Sheath blight caused by *Rhizoctonia solani* Kuhn [Teleomorph : *Thanetophorus cucumeris* (Frank) Donk] is potentially devastating fungal disease in all temperate and tropical rice production regions especially in irrigated eco-system (Dath, 1990). It has become more prevalent on most of the improved varieties currently grown in India. To date, only partial resistance to rice sheath blight has been identified, as evidenced by a survey of 6000 rice cultivars from 40 countries, from which no cultivar exhibiting a major gene for rice sheath blight resistance was identified (Hashiba, 1974). This is due to absence of suitable donors and information on inheritance of resistance. Fungicide application is the most common approach among the farmers for the management of sheath blight throughout the world due to resistant or tolerant sources to sheath blight are not available and biological controlis still not successful at field level. Although, most of fungicides

are effective against sheath blight disease, it has been advised to rotate the fungicides to overcome the development of fungicide resistance in targeted fungal population. Due to continuous development of fungicide tolerance in fungal population, it is inevitable to search for a new group of fungicide with different mode of action so that new information on diverse fungicides with different modes of action can be offered to farmers. In this regard, we have tested nine fungicides with different modes of action under field conditions to know their effectiveness.

## Materials and Methods

The efficacy of nine fungicides with four concentrations (500ppm, 1000ppm, 1500ppm, 2000ppm) against sheath blight disease was tested in field conditions. The experiment was conducted at ICAR-Indian Institute of Rice Research farms in *kharif*-2016. The seedlings of susceptible variety TN-1 were transplanted in the field manually. In this trial, three randomized replicates per treatment were used with a minimum plot size of 1m<sup>2</sup>. The cultivation of the crop was according to normal practical standards. Totally 15 plants of 45 days old were selected per plot and inoculated with 4-5 typha stem bits. The fungicides were sprayed three days after inoculation

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when plant starts to show initial symptoms. The plant height, lesion height, number of tillers, affected tillers and disease score was recorded at 10 days after spraying. Grain yield was recorded at the time of harvest.

### Observations

$$\text{Percent Disease Index (PDI)} = \frac{\text{Sum of all individual disease ratings}}{\text{Total no. of plants assessed} \times \text{maximum rating}} \times 100$$

## Results and Discussion

### Effect of fungicides on per cent Disease Index (PDI %)

Nine fungicides were tested for their efficacy against sheath blight disease under field conditions (*in vivo*) during *Kharif*-2016. Data on PDI was recorded and presented in table. All treatments were found significantly effective in managing the disease compared to control. PDI was recorded low at 2000ppm by hexaconazole 5%SC (33.3%) followed by difenconazole 25%EC (34.2%), azoxystrobin 23%SC (35.5%), azoxystrobin + difenconazole 325SC (36.6%), tebuconazole 25.9%EC (36.6), azoxystrobin11% + tebuconazole 18.30%w/w SC (38.0%), which were on par with each other. Maximum PDI (57.7%) was recorded in pyroclostrobulin 20%WG

when compared to control (76.0) followed by metiram 70% WG (52.2) and metiram 55% + pyroclostrobulin 5% WG (49.5%).

### Effect of fungicides on yield (kg/ha<sup>-1</sup>)

The effect of fungicides on yield was also recorded and data presented in Table 1. The data revealed that all the treatments significantly increased the yield when compared to control. However at 2000ppm hexaconazole 5% SC recorded the highest yield (2485kg ha<sup>-1</sup>) followed by difenconazole 25% EC (2450 kg ha<sup>-1</sup>), azoxystrobin + difenconazole 325SC (2440kg/ha<sup>-1</sup>), azoxystrobin 11% + tebuconazole 18.30% SC (2420 kgha<sup>-1</sup>), tebuconazole 25.9% EC (2405kg ha<sup>-1</sup>), azoxystrobin 23% SC (2400kg ha<sup>-1</sup>), metiram70% WG (2300kgha<sup>-1</sup>), which are on par with each other, while lowest yield (2050kgha<sup>-1</sup>) was recorded in pyroclostrobulin 20% WG sprayed plot followed by metiram 55% + pyroclostrobulin 5% WG (2210kgha<sup>-1</sup>).

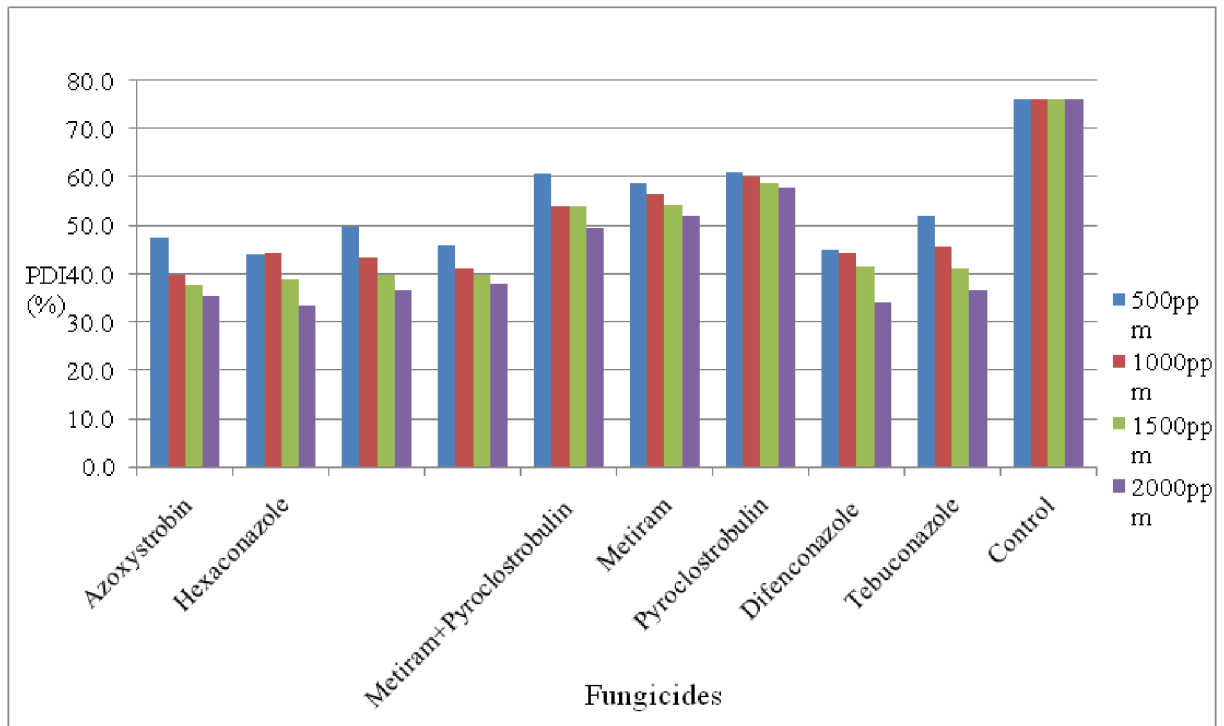
Among all the fungicides hexaconazole 5%SC scored the least PDI 33.3 and produced high yield 2485 Kgha<sup>-1</sup>. When compared to the control it increased the yield upto 785 kgha<sup>-1</sup>.

The present results are in accordance with findings of Johnson *et al.* (2013) he reported that the fungicide

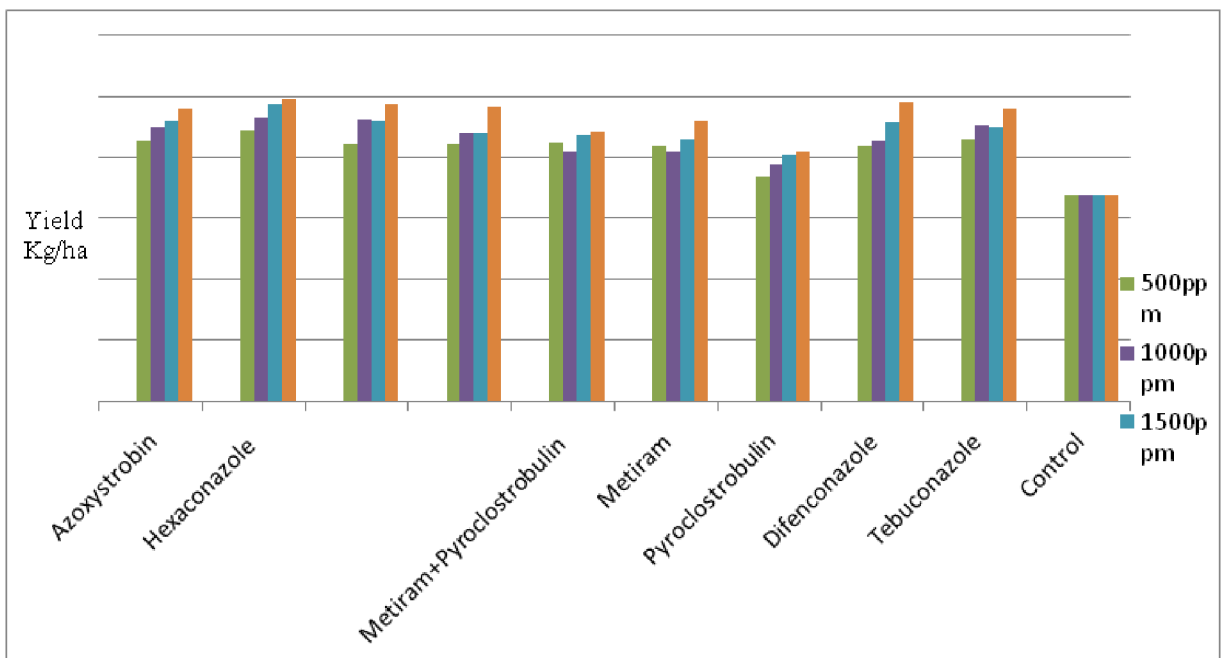
**Table 1 :** Efficacy of fungicides against sheath blight of rice under *in vivo* conditions during *Kharif*-2016.

S.no.	Treatments/Fungicides	Dosage (PDI)				Yield (kg/ha)			
		500 ppm	1000ppm	1500ppm	2000ppm	500 ppm	1000ppm	1500ppm	2000ppm
1	Azoxystrobin 23% SC	47.4	40.0	37.7	35.5	2145	2250	2300	2400
2	Hexaconazole 5% SC	44.1	44.4	38.9	33.3	2225	2335	2445	2485
3	Azoxystrobin 18.2% + Difenconazole 11.4 SC	49.7	43.3	39.7	36.6	2120	2320	2300	2440
4	Azoxystrobin 11% + Tebuconazole 18.30% w/w SC	46.0	41.0	40.0	38.0	2120	2200	2200	2420
5	Metiram 55% + Pyroclostrobulin 5% WG	60.9	54.0	54.0	49.5	2125	2050	2185	2210
6	Metiram 70% W	58.7	56.6	54.3	52.2	2100	2050	2150	2300
7	Pyroclostrobulin 20% WG	61.1	60.0	58.9	57.7	1850	1950	2025	2050
8	Difenconazole 25% EC	45.0	44.3	41.4	34.2	2100	2145	2285	2450
9	Tebuconazole 25.9% EC	52.2	45.5	41.1	36.6	2150	2265	2250	2405
10	Control	76.0	76.0	76.0	76.0	1700	1700	1700	1700
	C.V	4.9	2.8	4.3	4.715	155.97	258.7	315.4	260.6
	C.D	6.1	3.3	4.8	4.86	7.55	12.17	6.29	5.07

Highly Significant at (P<0.001), Highly Significant at (P<0.001)



**Fig. 1 :** Effect of fungicides against sheath blight of rice under *in vivo* condition during *Kharif*- 2016.



**Fig. 2 :** Effect of fungicides on paddy yield under *in vivo* conditions during *kharif*- 2016.

hexaconazole was effective at all the concentrations (500, 1000, 1500 and 2000 ppm). However the maximum reduction of disease was recorded at 2000ppm. Similarly, Dubey and Toppo (1997) and Chia Tiohuat (1997) also reported the effectiveness of hexaconazole in managing sheath blight disease of rice.

In the present study, azoxystrobin (35.5%) and difenconazole 25% EC (34.2%) also found effective in

decreasing the disease incidence. Bhuvanewari and Raju (2012) reported that combination of fungicides having azoxystrobin 18.2% and difenoconazole 11.4% SC was effective against rice sheath blight disease under field conditions. Ali and Archers (2003) reported that azoxystrobin was effective against sheath blight disease caused under field conditions. Similarly, Agarwal and Sunder (2012) also reported that strobilin compounds

were more effective against sheath blight disease under field conditions. Azoxystrobin belongs to group strobilurins fungicides, which have a common mode of action to interfere with respiration and energy production in the fungal cell by blocking electron transfer at the site of quinol oxidation (the Qo site) in the cytochrome bc1 complex, thereby preventing ATP formation. Azoxystrobins move trans-laminarly and systemically through the vascular system of the plant. The present results indicated that azoxystrobin alone and its combinations were found equally effective with hexaconazole (Sterol bio synthesis inhibitors). Hence, these chemicals may be utilized in the disease management.

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