Study of bio efficacy and phytotoxicity of Azoxystrobin 120 + Tebuconazole 240 SC against Blast (*Pyriculariaoryzae*) diseases in Rice

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Abstract

Rice blast caused by (*Pyriculariaoryzae)* is the major disease affecting the rice production. In the present investigation study of bioefficacy and phytotoxicity of Azoxystrobin 120 + Tebuconazole 240 SC against Blast (*P. oryzae*) diseases in Rice. The field experiment was conducted at Killimangalam village, Cuddalore dt., Tamilnadu. The treatments, Azoxystrobin 120 + Tebuconazole 240 SC @ 830ml/ha reduced the blast incidence to the minimum with a PDI of 04.11, 04.09 and 04.16 per cent after first, second and third spray respectively. This was followed by Azoxystrobin 120 + Tebuconazole 240 SC @ 676 ml/ha which recorded 04.71, 04.69 and 04.76 per cent blast incidence after first, second and third spray respectively. Azoxystrobin120 + Tebuconazole 240 SC @ 520 ml/ha and the market standards Tebuconazole 25.9 % EC @ 750 ml/ha,Hexaconazole 5% EC @ 1000 ml, Kitazin 48% EC @ 0.20% and Kresoxim-methyl 44.3% SC @ 500 ml were on par with each other in reducing blast disease incidence. While the untreated control recorded the maximum PDI (16.21, 27.12 and 35.24 per cent after first, second and third spray observations respectively**).**Similarly the treatment with Azoxystrobin 120 + Tebuconazole 240 SC @ 830ml/ha recorded the maximum grain yield with 48.42 q/ha and maximum straw yield with 40.21q/ha which was at par with Azoxystrobin 120 + Tebuconazole 240 SC @ 676 ml/ha & 520 ml/ha. The untreated control recorded the lowest yield with 30.11q/ha of grain yield and 27.63 q/ha of straw yield. The occurrence of natural enemies population were not affected in the plots treated with Azoxystrobin 120 + Tebuconazole 240 SC @ 830ml/ha Phytotoxicity .The use of Azoxystrobin 120 + Tebuconazole 240 SC fungicide is found to be safe to chilli crop and none of the symptoms like chlorosis, necrosis, scorching, epinasty and hyponasty symptoms were recorded even at the highest dosage of treatment viz., 3320 ml/ha and up to 10 days of after I,II and III spraying

Keywords: Azoxystrobin+Tebuconazole,paddyBlast(*Pyriculariaoryzae,)*bioefficacy, andPhytotoxicity

Introduction

Rice (*Oryzasativa* L.) isone of the most important cereals of the world and is consumed by50%oftheworldpopulationLuo*et al*,(1998). In India, it is cultivated on an area of 53.2 million hectares with a total production of 99.8 million tons. The Natural esources Institute (NRI) London gave first rank to rice blast disease in itsstudyofpre-harvestpestsanddiseasesaffectinginsouthAsiaGurindere.*etal*.(2006).).Riceaffectedbyvariousdiseasesamongthem blast is the most frequent and ferocious disease in irrigated rice of both temperate and

subtropical areas of East Asia Bonman et al.(1991)and it appeared at all stages of vegetative growth. Blast disease caused by *Pyricularia oryzea* is an infectious disease which significantly reduces quality and seed production of rice Pasha et al.(2013). Pathogens attacks on stem nodes, leaves and all portions of the panicle and grains Chin.(1974). Blast epidemic causes the completed efeat of seedling Chaudhary. (1999) at the nursery and in field condition (Teng*etal*.1991) and accomplish up to 80% of total yield fatalities Koutroub as et al.(2009). Rice blast caused by *Pyricularia oryzae* is one of the most destructive and wide spread disease of rice Padmanabhan, (1965)]. This disease has caused significant yield losses in many rice growing countries viz, 75 % loss of grains in India Awodera and Esuruoso, (1975)50 % loss in Philippines Mina *et a*l. (2013)and 40 % loss in Gade, (2013) Under field condition, fungicide based managementis mostsuccessfulinmajorityofthe cases. Bhuvaneswari and Raju. (2012) and Kumar et al.(2013).Thus, present study was undertaken to determine the field efficacy of a new combination fungicide Azoxystrobin 120 + Tebuconazole 240 SC against Blast (*Pyricularia oryzae*) diseases in Rice under field conditions.

Materials and methods

Fieldstudies

A field experiment was conducted at Killimangalam village, Cuddalore dt., Tamil nadu during 2016-2017.The plott size is 40m ^{2}per treatment with spacing of 25x25cm ,and the soil type is clay loamy soil.The experiment was laid out in Randomized Block Design (RBD),with three replications. The test fungicide,Azoxystrobin120+Tebuconazole240,was evaluated at three doses 830, 676,and 520ml, along with standards and untreated check against target diseases. The crop was raised as per the recommended package of practices, except plant protection measures. The first treatment spray was done soon after the on set of the disease and subsequent three sprays were taken up, at an interval of 15days.500 liter spray volume was used per hectare the crop was maintained with judicial irrigation and fertilizer schedule were followed as per standard procedures.

Treatment details : Eight treatments

Treatments	Product name	Dosage per ha	
		A.I. (gm)	**Formulation (ml)**
T_1	Azoxystrobin 120 + Tebuconazole 240 SC	156	520
T_2	Azoxystrobin 120 + Tebuconazole 240 SC	203	676
T_3	Azoxystrobin 120 + Tebuconazole 240 SC	249	830
T_4	Hexaconazole 5% EC	50	500
T_5	Tebuconazole 25.9 % EC	187.5	750
T_6	Kresoxim-methyl 44.3% SC	250	0.04%
T_7	Kitazin 48% EC	0.10% or 100gm / 100 litr of water	0.20% or 200 ml/ 100 litr of water
T_8	Control	-	-

Observations recorded:

Bio-efficacy (PDI) for each diseases

a. Phytotoxicity viz., Leaf injury on tips/surface, Wilting, Vein clearing, Necrosis, Epinasty, Hyponasty etc. (If any) evaluation at 3, 7 & 15 days after spray using 0 -10 rating scale
b. Yield data at the time of harvest (q/ha)
   Effect on Natural Enemies

Assessment of Blast disease incidence:

The data pertaining to the incidence of blast disease was collected one week after the last application of fungicides by using the disease rating scale of 0-9 developed by International Rice Research Institute (IRRI. 1996) and then converting into Per cent Disease Index by using the formula.

$$\text{Percent Disease Index} = \frac{\text{Sum of the ratings}}{\text{Number of observations}} \times \frac{100}{\text{Highest rating in scale}}$$

Disease rating scale:

Score	Description
0	No lesions
1	Small brown specks of pinhead size without sporulatingcentre
2	Small roundish to slightly elongated, necrotic grey spots , about 1-2 mm in diameter with a distinct brown margin , lesions are mostly found on the lower leaves
3	Lesions type is the same as in scale 2, but significant number lesions are on the upper surface
4	Typical sporulating blast lesions, 3mm or longer, infecting less than 2% of the leaf area
5	Typical blast lesions infecting 2-10 % of the leaf area
6	Blast lesions infecting 11-25 % leaf area
7	Blast lesions infecting 26-50 % leaf area
8	Blast lesions infecting 51-75% leaf area
9	More than 75 % leaf area affected

Phytotoxicity and residues

Phytotoxicity effects (If any) at 'X', '2X' and '4X'was recorded at 1, 3, 5, 7 and 10 days after application.

Product Name	Dosage	
	a.i. g/ha	Formulation ml/ha
Azoxystrobin 120 + Tebuconazole 240 SC	249	830
Azoxystrobin 120 + Tebuconazole 240 SC	498	1660
Azoxystrobin 120 + Tebuconazole 240 SC	996	3320

Phytotoxicity scale

Crop response/ Crop injury	Rating
0-00	0
1-10%	1
11-20%	2
21-30%	3
31-40%	4
41-50%	5
51-60%	6
61-70%	7
71-80%	8
81-90%	9
91-100%	10

Effect on Natural Enemies

The population of the natural enemies viz., Spiders, Dragon fly, Wasp and damsel fly was also assessed following standard procedures in the fungicide treated and untreated plots and recorded.

Grain yield and straw yield:

The crop was harvested at maturity and sun dried. The harvested plants were thrashed, grains separated and cleaned by winnowing. The grains and straw were weighed separately. The yield per hectare was calculated and recorded.

Results and discussion

Blast

In general, all the treatments with chemical fungicides significantly reduced the incidence of leaf blast disease when compared to control. However, among the treatments, Azoxystrobin 120 + Tebuconazole 240 SC @ 830ml/hareduced the blast incidence to the minimum with a PDI of04.11, 04.09and 04.16 per cent after first, second and third spray respectively. This was followed by Azoxystrobin 120 + Tebuconazole 240 SC @ 676 ml/ha which recorded 04.71, 04.69and 04.76per cent blast incidence after first, second and third spray respectively. Azoxystrobin120 + Tebuconazole 240 SC @ 520 ml/ha and the market standards Tebuconazole 25.9 % EC @ 750 ml/ha, Hexaconazole 5% EC @ 1000 ml, Kitazin 48% EC @ 0.20% and Kresoxim-methyl 44.3% SC @ 500 ml were on par with each other in reducing blast disease incidence. While the untreated control recorded the maximum PDI (16.21, 27.12 and35.24per cent after first, second and third spray observations respectively**)** (Table 1).Similar result was recorded by Magar *et al*.(2015),Kishan La *et al*.(2017)

Yield (Grain and Straw)

The results showed that all the treatments with chemical fungicides recorded higher grain and straw yields when compared to control. However, among the treatments the treatment with Azoxystrobin

120 + Tebuconazole 240 SC @ 830ml/harecorded the maximum grain yield with 48.42q/ha and maximum straw yield with 40.21q/ha which was at par with Azoxystrobin 120 + Tebuconazole 240 SC @ 676 ml/ha& 520 ml/ha. These were followed by the treatments withTebuconazole 25.9 % EC @ 750 ml/ha. Hexaconazole 5 % EC, Kresoxim methyl 44.3 % SC and Kitazin 48 % EC.The untreated control recorded the lowest yield with 30.11q/ha of grain yield and 27.63q/ha of straw yield (Table 1).similar to the results obtained by Prabhu ,*et al*.(2002),Kishan La *et al*.(2017)

3.4 Effect on the population of natural enemies:

The population of natural enemy's viz., spiders, Dragon fly, Damsel flies and wasps were not affected in the plots treated with Azoxystrobin 120 + Tebuconazole 240 SC(Table 4).

Phytotoxicity

The use of Azoxystrobin 120 + Tebuconazole 240 SC fungicide is found to be safe to rice crop and none of the symptoms like chlorosis, necrosis, scorching, epinasty and hyponasty symptoms were recorded even at the highest dosage viz., 3320 ml/ha and up to 10 days of after first, second and third sprayings (Table 4a, 4b & 4c).This was in accordance with the results of Nithyameenakshi *et al*. (2006), the fungicides azoxystrobin and difenoconazole were generally non phytotoxicat or below the re commended dose for field application(2.2µga.iml^{-1}).But at higher concentration, both the fungicides exhibited concentration dependant phytotoxicity in *Vigna catjung* Walp. SendhilVel *et al*. (2004) and Sundaravadana (2005) reported that there were no phototoxic symptoms throughout the cropping season of grape vine and mango due to azoxystrobin application .Ahiladevi and prakasam (2013) state that there were no phototoxic symptoms were recorded after spraying on the plant seven at highest dose. The azoxystrobin 25 SC on chilli anthracnose disease will increase the choice of fungicides.

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Table 1. Efficacy of Azoxystrobin 120 + Tebuconazole 240 SC on the management of blastdisease incidence and yield of rice (ADT,43)

Tr. No.	Treatments	Dose ml or gm/ha (formulation)	Blast disease PDI % after first spray		Blast disease PDI % after Second spray		Blast disease PDI % after Third spray		Yield q/ha	
			PDI %	% red over control	PDI %	% red over control	PDI %	% red over control	Grain	Straw
T_1	Azoxystrobin 120 + Tebuconazole 240 SC	520	5.91 (14.06)	63.54	05.80 (13.93)	78.61	05.83 (13.97)	83.45	46.78	36.14
T_2	Azoxystrobin 120 + Tebuconazole 240 SC	676	04.71 (12.53)	70.94	04.69 (12.50)	82.70	04.76 (12.60)	86.49	47.02	38.17
T_3	Azoxystrobin 120 + Tebuconazole 240 SC	830	04.11 (11.69)	74.64	04.09 (11.66)	84.91	04.16 (11.76)	88.19	48.42	40.21
T_4	Hexaconazole 5% EC	1000	09.93 (18.36)	38.74	9.82 (18.26)	63.79	09.84 (18.28)	72.07	43.91	34.11
T_5	Tebuconazole 25.9 % EC	750	07.08 (15.43)	56.32	07.00 (15.34)	74.18	07.09 (15.44)	79.88	43.27	36.76
T_6	Kresoxim-methyl 44.3% SC	500	11.91 (20.18)	26.52	11.81 (20.09)	56.45	11.82 (20.10)	66.45	40.13	33.13
T_7	Kitazin 48% EC	0.20% or 200 ml /200litres of water	10.12 (18.54)	37.56	9.97 (18.40)	63.23	10.00 (18.43)	71.62	41.31	33.72
T_8	Control		16.21 (23.74)	------	27.12 (31.38)	----	35.24 (36.41)	--	30.11	27.63
	SEd CD (p=0.05)		0.51 1.32		0.74 1.87		0.23 0.98		0.65 1.42	0.35 0.98

Table 3.Effect of Azoxystrobin 120 + Tebuconazole 240 SCon the population of natural enemies

Tr.No	Treatments	Dose ml or gm/ha	'Spiders (Nos.)			'Dragon fly (Nos.)			'Damsel fly (Nos.)			'Wasp (Nos.)		
			First spray	Second spray	Third spray	First spray	Second spray	Third spray	First spray	Second spray	Third spray	First spray	Second spray	Third spray
T1.	Azoxystrobin 120 + Tebuconazole 240 SC	520	11.00	11.12	11.21	1.83	1.78	1.85	4.80	5.70	5.63	3.71	3.35	3.86
T2.	Azoxystrobin 120 + Tebuconazole 240 SC	676	11.50	252	11.66	1.84	1.79	1.85	4.81	5.69	5.64	3.74	3.37	3.96
T3.	Azoxystrobin 120 + Tebuconazole 240 SC	830	11.75	11.95	12.10	1.87	1.84	1.86	4.84	5.79	5.70	3.78	3.70	4.12
T4.	Hexaconazole 5% EC	1000	10.23	10.46	10.52	1.80	1.78	1.80	4.79	5.40	5.63	3.70	3.61	3.82
T5.	Tebuconazole 25.9 % EC	750	11.41	11.46	11.52	1.84	1.82	1.92	4.81	5.57	5.61	3.57	3.40	3.62
T6.	Kresoxim-methyl 44.3% SC	500	9.27	9.50	9.51	1.62	1.45	1.63	4.80	5.44	5.63	3.12	3.30	3.15
T7	Kitazin 48% EC	0.20% or 200 ml / 200 lit of water	11.43	11.50	11.72	1.77	1.78	1.83	4.81	5.60	5.60	3.76	3.50	3.80
T8	Control		11.30	11.91	12.94	1.83	1.79	1.84	4.80	5.70	5.64	3.75	3.35	3.82
	SEd CD (p=0.05)		0.02 0.06	0.01 0.03	0.03 0.07	0.01 0.02	0.31 0.63	0.01 0.04	0.03 0.08	0.01 0.02	0.02 0.05	0.01 0.02	0.04 0.09	0.03 0.07

Table 4a. Evaluation of Phytotoxic effect of Azoxystrobin 120 + Tebuconazole 240 SCrice (ADT,43)

Treatments	Phytotoxicity Symptoms- Days after application of test chemical (DAA)																																			
	Leaf Injury						Wilting						Vein Clearing						Necrosis						Epinasty						Hyponasty						Stunting					
	0	1	3	5	7	10	0	1	3	5	7	10	0	1	3	5	7	10	0	1	3	5	7	10	0	1	3	5	7	10	0	1	3	5	7	10	0	1	3	5	7	10
Azoxystrobin 120 + Tebuconazole 240 SC 830 ml/ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Azoxystrobin 120 + Tebuconazole 240 SC1660ml/ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Azoxystrobin 120 + Tebuconazole 240 SC **3320 ml/ha**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Untreated Control	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4b. Evaluation of Phytotoxic effect of Azoxystrobin 120 + Tebuconazole 240 SC rice (ADT,43)

Treatments	Phytotoxicity Symptoms- Days after application of test chemical (DAA)																																			
	Leaf Injury						Wilting						Vein Clearing						Necrosis						Epinasty						Hyponasty						Stunting					
	0	1	3	5	7	10	0	1	3	5	7	10	0	1	3	5	7	10	0	1	3	5	7	10	0	1	3	5	7	10	0	1	3	5	7	10	0	1	3	5	7	10
Azoxystrobin 120 + Tebuconazole 240 SC 830 ml/ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Azoxystrobin 120 + Tebuconazole 240 SC1660ml/ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Azoxystrobin 120 + Tebuconazole 240 SC **3320 ml/ha**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Untreated Control	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4c. Evaluation of Phytotoxic effect of Azoxystrobin 120 + Tebuconazole 240 SC rice (ADT,43)

Treatments	Phytotoxicity Symptoms- Days after application of test chemical (DAA)																																							
	Leaf Injury						Wilting						Vein Clearing						Necrosis						Epinasty						Hyponasty						Stunting					
	0	1	3	5	7	10	0	1	3	5	7	10	0	1	3	5	7	10	0	1	3	5	7	10	0	1	3	5	7	10	0	1	3	5	7	10	0	1	3	5	7	10
Azoxystrobin 120 + Tebuconazole 240 SC 830 ml/ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Azoxystrobin 120 + Tebuconazole 240 SC1660ml/ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Azoxystrobin 120 + Tebuconazole 240 SC **3320 ml/ha**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Untreated Control	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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