



## IMPACT OF FUNGICIDE ON RICE YIELD AND INCOME OF THE FARMERS IN MANDYA DISTRICT OF KARNATAKA

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**Abstract:** *The crop yield is determined by many factors such as seed variety, climate, soil, pest incidence etc. The pest incidence and its damage to the agricultural crops has been significant, where in the damage was to the extent of cent per cent in severe cases and the farmers had lost whole crop!. One such disease in case of rice was blast disease (*Magnaporthe grisea*) in southern dry Zone of Karnataka causing heavy crop damage. To manage this disease the scientists of UAS Bengaluru (UASB), through its Zonal Agricultural Research Station, VC Farm Mandya had released and recommended the Tricyclazole (Bbeem) fungicide during 2010 to the farmers to adopt and to manage it as to reduce the crop damage. Since then, many Rice growers had adopted to manage the disease. After lapse of 6 years of its release, the UASB was interested in to find out the performance of the technology on the farmers' field and their opinion in gaining economic returns when compared to other fungicides available in the market. From this backdrop the study was conducted during 2016 in Mandya district, Karnataka where there is large area under the rice crop. The district has 7 taluks, from each taluk 2 rice growing villages were selected. From 14 villages, 210 respondents who have adopted both Tricyclazole and Carbendazim (Before) were selected randomly and interviewed and information was sought. 'Before and After' research design was adopted to compare the results. The study found that, the Tricyclazole had effectively controlled the blast disease both at rice nursery and in main field when compared to Carbendazim. In case of obtaining additional grain yield obtained the Carbendazim yielded more but with respect to earning income it was relatively less when compared to Carbendazim as the farmer cost was more. There was no significant difference between Tricyclazole and Carbendazim in obtaining rice grain, straw yield and income as perceived by the respondents.*

### Introduction

The University of Agricultural Sciences, Bengaluru (UASB), Karnataka is one of the premiere University in India, engaged in evolving location specific, farmer need based technologies through its Zonal Agricultural Research Stations (ZARS) spread over in Southern Karnataka ( Southern dry zone -6) One such ZARS is located in VC Farm, Mandya district. The station was started way back during 1930s during erstwhile King, Vodeyar dynasty of Mysore, right before independence with an objective to conduct sugarcane research. Since then the station has initiated many research programs on Zonal major crops viz., (Rice, Finger millet, Maize, Sugarcane, Fodder and other major crops) and has come out with many novel technologies, among them the

application of Tricyclazole fungicide to control the rice yellow stem borer and leaf folder was one, released during 2011, for the benefit of the farming community.

The study aims to assess the impact of Tricyclazole fungicide in obtaining better yield and income. The UASB has funded this project to find out the impact of this released and recommended technologies from ZARS, in obtaining yields and income of the farmers and to find out extent of area covered under the technology in Mandya dist., Karnataka. From this back drop, the study was conducted in the year 2016-2017 with the following objectives.

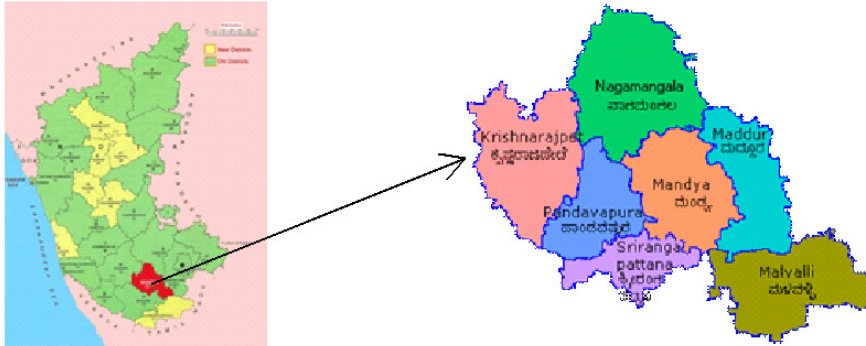
**2. Objectives**

- i. To find out the number of rice growers using the fungicides at different stages of rice cultivation.
- ii. To find out the impact of fungicides in controlling the rice blast disease at nursery and extent of seedlings available for transplanting in the mainland
- iii. To ascertain the extent of control of blast disease by applying fungicides
- iv. To find out extent of yield and income obtained y applying fungicides.

**Location of the study**

The study was conducted in Mandya district. It has 7 taluks, from each of the taluk, 2 villages were selected, Where the large area of rice was affected by blast disease recurrently.

**Study area:**



**Sample size:** The farmers who adopted the selected technologies were identified. A list such adopters was obtained from ZARS, KVK and KSDA Mandya.

Through cluster sampling method 210 respondents were selected randomly.

**Selection of villages: sample size**

Sl. no.	Taluk	Villages	Respondents
1	Mandya	Holalu	15
		Modachakanahalli	15
2	Maddur	Doddarasinakere	15
		Kesthur	15
3	Srirangapatna	Arakere	15
		Kodiyala	15
4	Pandavapura	Kythanahalli	15
		Dodda byadarahalli	15
5	K.R.pet	Bandihole	15
		Beriya	15
6	Nagamangala	Devalapura	15
		Bindenahalli	15
7	Malavalli	Kirgavalu	15
		Hittanahalli koppalu	15
<b>Total</b>			<b>210</b>

**Hypothesis:** There is significant difference between Tricyclazole and Carbendazim in obtaining yield and income.

**2.3 Research design:** Before and After type, Evaluation study

**2.4 Instruments of data collection:**

- i. Interview schedule

ii. PRA tools

iii. Focus group discussion

The data were collected during November 2016 to February 2017. by seeking the information and opinion of respondents based on their memory collection.

**Measurement of Variables**

**Impact of Tricyclazole fungicides on yield and income of the Rice respondents**

The impact of fungicides **Tricyclazole** was compared with **Carbendazim** fungicides by the respondents before. The impact of the fungicides has been analysed from the point of method of its application, by adopting to what extent these fungicides controlled the disease incidence in the nursery, if it controlled, to what extent the disease free rice seedlings were made available for transplanting in the main field ?. To what extent these fungicides controlled the blast disease in the main field?, when the blast disease incidence was noticed by the respondents etc.

- a) Method of application of fungicides to control the rice blast disease. It was measured by categorising with tree types. 1. Seed treatment 2. Spay at nursery stage. And spray at transplanted main field. The quantification as been done based on frequency and per cent of respondents.
- b) Extend of availability of rice seedling from nursery for transplanting in the main field. It was measured by categorizing in to tree ways “Sufficient” and “Insufficient” seed available. The opinion of the respondents was sought and quantified in terms of frequency and per cent.
- c) Extent of effectiveness in controlling rice blast disease : it was measured by categorising in to four point continuum “ Least effective” “less effective” “ Effective” and “ More Effective” by assigning nominal relative score 1,2,3 and 4 respectively and Summing of the score in the following formula was used find out the effectiveness quotient.

$$\text{Effectiveness quotient} = \frac{\text{Total score obtained}}{\text{Maximum Score}}$$

(The maximum Score possible was 840).

The additional yield and income means the yield obtain by the respondents above the normal yield when the rice crop affected the blast diseases. Such yield was recorded in term of quintal per acre

and income Rupees Per quintal of grain and straw yield biomass in terms of transfer acre.

**Data analysis:** Simple statistical tools such as frequency and per cent, were used to analyse the data and to draw the inferences. Paired ‘t’ test was applied to find out the differences of two variables.

**Findings of the Study**

**Method of application of fungicides Tricyclazole and Carbendazim to control the Rice blast:** The results from the (table-1 & graph-1) indicates that majority (85%) of the respondents had used the fungicides only when they noticed the incidence of blast in the transplanted main field. Further, it implies that almost none of respondents (1.44%) had practiced seed treatment with both of these fungicides as a measure of precaution to preventing the blast disease.

**Extent of availability rice seedlings for transplanting after using Tricyclazole and Carbendazim fungicides in the nursery stage:** The respondents had sprayed the fungicides after noticing the blast incidence in the nursery. The respondents were asked to give the information after the spray, whether they obtained sufficient seedlings for main field transplanting. The result (table-2 & graph-2) implies that majority of the respondents (94.28%) obtained sufficient blast disease free seedlings for transplanting in the main field after the spray of Tricyclazole. In case of Carbendazim also 3/4<sup>th</sup> of them (77.15%) obtained sufficient blast free seedlings for transplanting in the main field.

**Extent of control of blast disease by using Tricyclazole and Carbendazim fungicides in the transplanted main field:** The data (table 3& graph-3) reveals that, majority of the respondents (85%) opined that **Tricyclazole** fungicide had controlled the rice blast disease more effectively. In case of **Carbendazim** also many of them (45%) opined that it had controlled the blast disease ‘more effectively’ and also many of them (33%) opined that it had controlled ‘effectively’ in the main field. To draw an inference that Tricyclazole fungicide was more effective than that of Carbendazim in controlling the blast disease of rice in Mandya district than that of

Carbendazim as perceived by the respondents. None of the respondents opined that both fungicides were effective in controlling the blast disease in rice (graph-3). The table 3, also indicates the degree of effectiveness of fungicides with respect to control of blast disease in rice both in nursery as well as in mainland. The fungicide Tricyclazole has recommended the effectiveness index value of compared to 0.93 compared to Carbendazim 0.80 by Carbendazim.

**Additional rice grain yield obtained by using Tricyclazole and Carbendazim fungicides (Transplanted main field):** The respondents had used both fungicides Tricyclazole and Carbendazim (Before) to control the blast disease in main field. The average additional grain yield of rice they obtained by using Tricyclazole was 1.216 q/ac in case of Carbendazim it was 1.265 q/ac (Table-4 & graph-4). The Tricyclazole effect was less in obtaining additional grain yield compared to that of Carbendazim before. However, the difference was

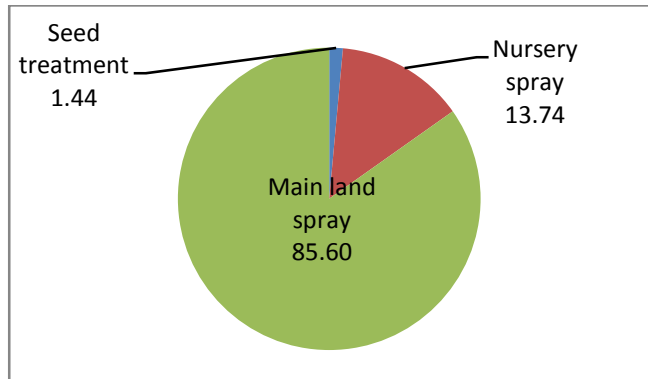
meagre and marginal (0.049q/ac). The ‘t’ test indicated no significant difference (0.04).

**Additional rice straw yield obtained by using Tricyclazole and Carbendazim fungicides (Transplanted main field):** The average additional straw yield of rice they obtained by using Tricyclazole was 0.27t /ac., in case of Carbendazim it was 0.13 t/ac (before). The Tricyclazole effect was slightly more (0.02t/ac.) compared to that of Carbendazim (Table-5 & graph-5).

**Additional income obtained by using Tricyclazole fungicide in Rice:** The respondents had obtained an additional net income of Rs.2935 /ac by using Tricyclazole, where as in case of Carbendazim it was Rs. 2214 /ac (Table-6 & graph-6). There was a marginal increase in net income of Rs. 721/ac. from Tricyclazole. The respondents had obtained additional income of Rs..721 compared to that of carbendazim fungicide. The ‘t’ test indicated no significant difference (0.08).

**Table 1: Method of application of fungicides Tricyclazole and Carbendazim to control the Rice blast N=210**

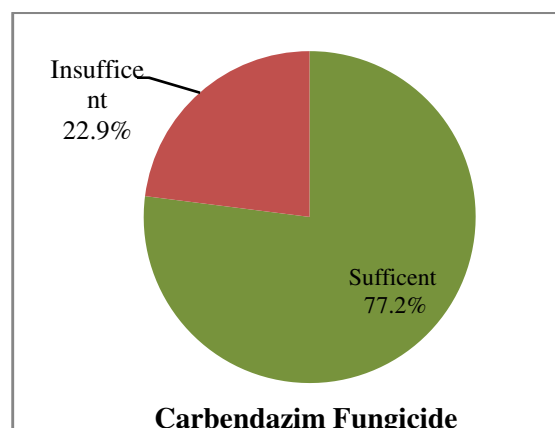
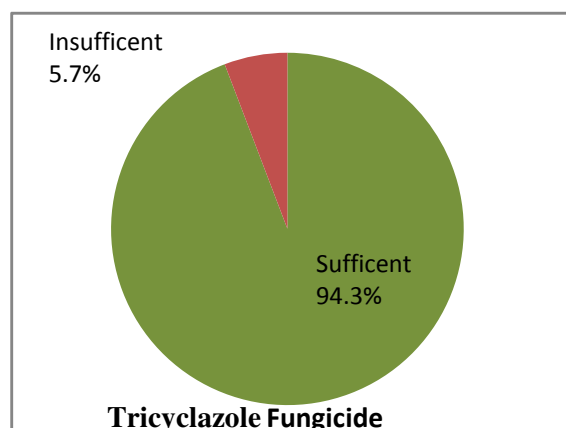
Sl. no	Method of application	Pandavapura	Maddur	Mandya	S.R.patna	K.R.Pet	Naga mangala	Malavalli	Total	%
1	Seed treatment	01	0	01	0	01	0	0	03	1.44
2	Spray at nursery	05	4	6	5	4	2	3	29	13.80
3	Spray at main filed	24	26	23	25	25	28	27	178	85.60
<b>Total</b>		30	30	30	30	30	30	30	210	100.0



**Graph 1: Method of application of fungicides Tricyclazole and Carbendazim to control the Rice blast**

Table 2: Extent availability rice seedlings for transplanting after using Tricyclazole and Carbendazim fungicides; (At nursery stage) N=210

Sl. No	Taluk	Tricyclazole				Total	Carbendazim				Total
		Sufficient		Insufficient			Sufficient		Insufficient		
		No	%	No	%		No	%	No	%	
1	Pandavapura	29	13.80	1	0.476	30	23	10.95	7	3.333	30
2	Maddur	28	13.33	2	0.952	30	25	11.90	5	2.380	30
3	Mandya	27	12.85	3	1.428	30	21	10.00	9	4.285	30
4	S.R.Patna	28	13.33	2	0.952	30	24	11.42	6	2.857	30
5	K.R.Pet	27	12.85	3	1.428	30	23	10.95	7	3.333	30
6	Nagamangala	30	14.28	0	0	30	24	11.42	6	2.857	30
7	Malavalli	29	13.80	1	0.476	30	22	10.47	8	3.809	30
<b>Total</b>		<b>198</b>	<b>94.28</b>	<b>12</b>	<b>5.714</b>	<b>210</b>	<b>162</b>	<b>77.14</b>	<b>48</b>	<b>22.85</b>	<b>210</b>
<b>%</b>			<b>94.28</b>		<b>5.72</b>	<b>100.0</b>		<b>77.15</b>		<b>22.85</b>	<b>100.0</b>

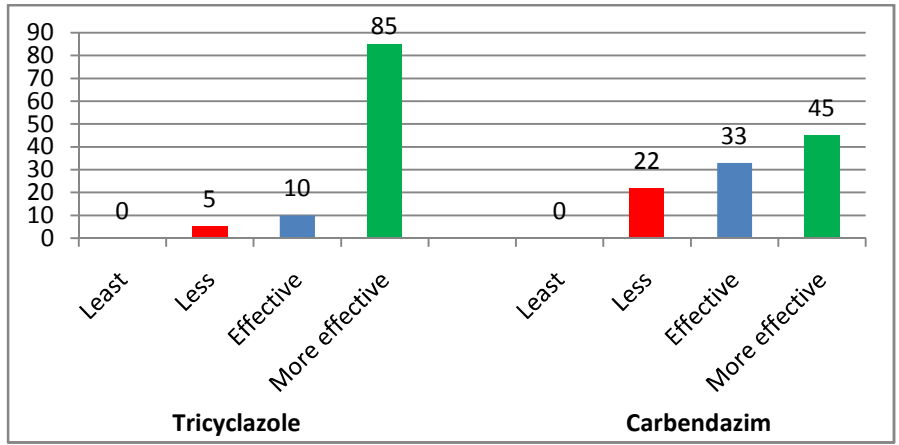


Graph 2: Extent availability rice seedlings for transplanting after using Tricyclazole and Carbendazim fungicides; (At nursery stage)

Table 3: Extent control of Leaf blast by using fungicides Tricyclazole and Carbendazim both in nursery & main field transplanted

Sl. No	Taluk	Extent control(%) by Tricyclazole				Extent control(%) by Carbendazim				Total
		Least effective (<24)	Less effective (25 to 50)	Effective (51 to 75)	More effective (>76)	Least effective (<24)	Less effective (25 to 50)	Effective (51 to 75)	More effective (>76)	
1	Pandavapura	0	1	2	27	0	7	9	14	30
2	Maddur	0	2	1	27	0	5	13	12	30
3	Mandya	0	3	4	23	0	9	10	11	30
4	S.R.Patna	0	2	3	25	0	6	8	16	30
5	K.R.Pet	0	3	2	25	0	7	9	14	30
6	Nagamangala	0	0	3	27	0	6	10	14	30
7	Malavalli	0	1	3	26	0	8	10	12	30
<b>Total</b>		<b>0</b>	<b>12</b>	<b>18</b>	<b>180</b>	<b>0</b>	<b>48</b>	<b>69</b>	<b>93</b>	<b>210</b>
<b>%</b>		<b>0</b>	<b>5.0</b>	<b>10.0</b>	<b>85.0</b>	<b>0</b>	<b>22.0</b>	<b>33.0</b>	<b>45.0</b>	<b>100.0</b>
<b>Score obtained</b>		<b>0</b>	<b>24</b>	<b>54</b>	<b>720</b>	<b>0</b>	<b>96</b>	<b>207</b>	<b>372</b>	
<b>Total score obtained</b>		<b>798</b>				<b>675</b>				
<b>Effectiveness Index</b>		<b>0.93</b>				<b>0.80</b>				

(score 4,3,2,&1 was given for response more effectiveness, effectiveness, less effectiveness and least effectiveness respectively. Maximum score Possible-840)



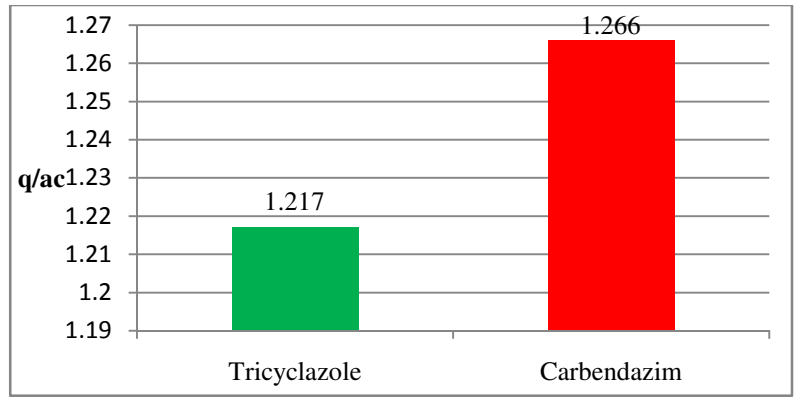
Graph 3: Extent of control of rice blast by using fungicides Tricyclazole and Carbendazim both in nursery & main field transplanted.

Table 4: Additional Rice grain yield obtained by using Tricyclazole and Carbendazim fungicides (Transplanted main field) N=210

Sl. No.	Taluk	After (Tricyclazole)	Before (Carbendazim)	Difference (q/ac)	Paired 't' test value
		yield (q/ac)	yield (q/ac)		
1	Pandavapura	1.19	1.12	0.07	0.04NS
2	Maddur	1.20	1.50	-0.30	
3	Mandya	1.45	1.32	0.13	
4	S.R.patna	1.65	1.25	0.40	
5	K.R.Pete	1.23	1.43	-0.20	
6	Nagamangala	0.92	1.14	-0.22	
7	Malavalli	0.88	1.10	-0.22	
<b>Average</b>		<b>1.217</b>	<b>1.266</b>	<b>-0.049</b>	

NS: Non-significant

(Popular var : Jaya,BR-2655,MTU-1001,IR-64)



Graph 4: Additional Rice grain yield obtained by using Tricyclazole and Carbendazim fungicides (Transplanted main field).

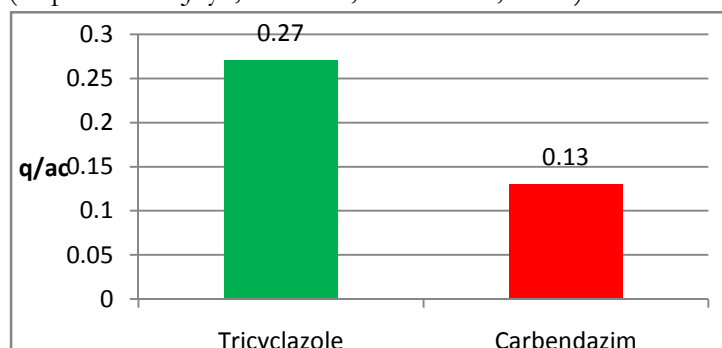
Table 5: Additional Rice straw yield obtained by using Tricyclazole and Carbendazim fungicides N=210

Sl. No	Taluk	After (Tricyclazole)	Before (Carbendazim)	Difference (t/ac)	Paired 't' test value
		yield (t/ac)	yield (t/ac)		
1	Pandavapura	0.11	0.14	-0.03	0.08 NS
2	Maddur	0.17	0.12	0.05	
3	Mandya	0.13	0.15	-0.02	
4	S.R.patna	0.15	0.14	0.01	



5	K.R.Pete	0.14	0.13	0.01
6	Nagamangala	0.10	0.12	-0.02
7	Malavalli	1.11	0.12	-0.01
	<b>Average</b>	<b>0.27</b>	<b>0.13</b>	<b>0.02</b>

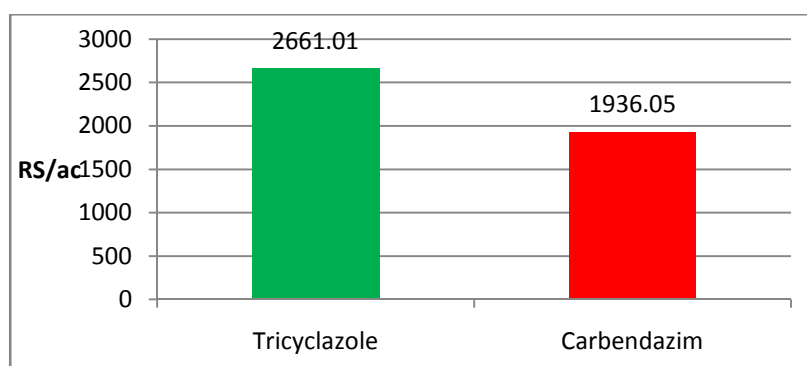
NS: Non-significant (Popular var : Jaya,BR-2655,MTU-1001,IR-64)



Graph 5: Additional Rice straw yield obtained by using Tricyclazole and Carbendazim fungicides

Table 6: Additional income obtained by using Tricyclazole and Carbendazim fungicides N=210

Sl. No.	Taluk	Tricyclazole Net income (Rs)	Carbendazim Net income (Rs)	Difference(Rs)
1	Pandavapura	2403.03	1716.72	686.31
2	Maddur	2972.66	2233.87	738.79
3	Mandya	3402.13	2615.15	786.98
4	S.R.patna	3049.04	1656.52	1392.52
5	K.R.Pete	2907.71	2229.63	678.08
6	Nagamangala	1827.79	1571.24	256.55
7	Malavalli	2065.18	1529.20	535.98
	<b>Average</b>	<b>2661.077</b>	<b>1936.047</b>	<b>103.5757</b>



Graph 6: Additional income obtained by using Tricyclazole and Carbendazim fungicides

### Conclusion

**Method of application of Tricyclazole and Carbendazim fungicides to control the Rice blast:** Respondents had used the fungicides only when they noticed the incidence of blast in the transplanted main field of Rice. Almost none of the respondents treated the rice seeds with recommended fungicides as a measure of precaution to avoid the blast both in nursery and main land of transplanted rice.

**Extent of Rice seedlings available for transplanting using Tricyclazole and Carbendazim fungicides in the nursery:** Respondents obtained sufficient blast disease free seedling for transplanting in the main field after the spray of Tricyclazole. In case of Carbendazim also majority of them obtained sufficient blast free seedlings for transplanting in the main field implying both fungicide are more effective.

**The extent of control by using Tricyclazole and Carbendazim fungicides in the transplants main field.** Respondents opined that **Tricyclazole** fungicide had controlled the rice blast more effectively, than that of **Carbendazim**. The effectiveness quotient value of Tricyclazole was 0.93 and in case of Carbendazim it was 0.80. This implies that Tricyclazole was relatively more effective compared to Carbendazim.

**Additional Rice grain yield obtained by using Tricyclazole and Carbendazim fungicides**

**(Transplanted main field):** The average additional grain yield of rice they obtained was 1.216 q/ac, Where as in case of **Carbendazim** it was 1.265 q/ac. The Tricyclazole effect was less in obtaining additional grain yield compared to that of **Carbendazim** before, However, the difference was minimum and marginal (0.049q/ac). However, there was no significant difference in obtaining grain yield.

**Additional Rice straw yield obtained by using Tricyclazole and Carbendazim fungicides**

**(Transplanted main field):** The average additional straw yield of rice they obtained by using

Tricyclazole was 0.27 t /ac. However, in case of **Carbendazim** it was 0.13 t/ac m (before). The Tricyclazole effect was slightly more (0.02t/ac.) compared to that of Carbendazim. However, there was no significant difference in obtaining straw yield.

**Additional income obtained by using Tricyclazole fungicide in Rice:** The respondents had obtained an additional net income Rs.2935 /ac by using **Tricyclazole**. In case of Carbendazim it was Rs. 2214/ac. There was marginal increase of net income of Rs. 64/ac. from Tricyclazole. However, there was no significant difference in obtaining additional net income.

**Implications and Researchable issue:**

Seed treatment is a low cost temporary need to the popularised by evolving an appropriate extension strategy to prevent the blast in nursery and reduce at the damage at main field.

The Tricyclazole fungicide is effective fungicide to manage the rice blast this can be made available at subsidised price for the farmers to apply and make timely available through Govt. and Private agencies.

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