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Effect of certain traditional cultural practices for the management of blast disease of rice in Manipur agro-climatic conditions

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***Abstract**: Field experiments were conducted during kharif 2010 and 2011 seasons to ascertain the effect of various traditional cultural practices for the management of blast disease of rice (variety RCM10). Cultural practices viz. sowing method, sowing dates and weeding frequencies were considered. Among the treatments, timely transplanting reduces the disease parameters such as disease incidence, disease severity, AUDPC and rate of infection as compared to broadcasting method. However, no significant effect of seed sowing method was observed. Clean cultivation with three or more weeding showed relatively less disease parameters.*
***Index Terms:** Blast, rice, broadcasting, transplantation, sowing date, weeding, traditional.*

I. Introduction

Rice is the most important staple food of Manipur. In north-east India, cultivated mostly under rain fed conditions during kharif season as both dry land and wetland crop. Blast disease of rice caused by *Pyricularia grisea* (Cook) Sacc. is one of the most widely distributed foliar disease of rice cultivated under upland and wetland systems as in other parts of the globe where rice is grown (Singh, 2005) [5]. It occurs every year under the agro-climatic conditions (temperature, relative humidity, rainfall) of Manipur in mild or severe form. As the use of costly chemical fungicides for the control of blast disease has many harmful effects to the environment. Cultural practices practiced by the traditional rice farmers provide a scope for the economically and eco-friendly management of the disease without affecting the environment. As such these practices reduce the use of synthetic chemicals for the control of the disease to some extent although it is a labour intensive. Therefore an attempt has been made to ascertain the effect of the cultural practices for the management of blast disease of rice under the prevailing climatic conditions of Manipur with an objective of encouraging traditional rice farmers for improvement of eco-friendly practices and refraining them from the use of chemicals. The objective of the present study is to enhance knowledge to the poor and marginal farmers in understanding various eco-friendly management practices which are simple and affordable.

II. Materials And Methods

Field trials were carried out during kharif seasons (2010 and 2011) in a sick farmer's field which shows the occurrence of blast disease of rice during the last three years of cropping seasons. The experiment was laid out in a randomized block design in 3 × 3 m^2 plots with three replications for each treatment. A higher dose of nitrogenous fertilizer @ 100kg/ha as against the recommended dose (60 kg/ha) was applied to make the crop more prone to disease. Traditional cultural practices such as sowing method (broadcasting and transplanting), sowing dates (15th June, 30th June and 15th July) and weeding (one time weeding, two times weeding and three times weeding) were considered to see their effects on the epidemiology of blast disease of rice. Seed broadcasting and nursery planting (25 days old seedlings were transplanted in the field @ 2-3 plants per hill at a spacing of 20 cm row to row and 15 cm plant to plant) for transplanting treatment were done on the same day. For sowing dates, the seed nurseries were raised keeping 15 days of interval and transplanted to the field keeping the same interval. Hand weeding was done after 20 days of transplantation and subsequent weeding was done at 15 days interval. The disease parameters like percent disease incidence (D.I. %) and percent disease severity (D.S. %) were observed at fortnightly intervals starting from the occurrence of the disease till the flowering stage of the plant. Data on D.I.(%), D.S.(%), the area under disease progress curve (AUDPC) and apparent rate of disease infection (r) were using simple random sampling and calculated as follows.

i) $$\text{D.I.}(\%) = \frac{\text{Total no. plants infected by blast disease}}{\text{Total no. of rice plants assessed}} \times 100 \qquad (1)$$

ii) $$D.S.(\%) = \frac{\text{Sum of all numerical ratings}}{\text{No. of leaves obseved} \times \text{Maximum rating scale}} \times 100 \quad (2)$$

iii) $$AUDPC = \sum_{i=1}^{n} [(Y_{i+1} + Y_i)/2][X_{i+1} - X_i] \quad (3)$$

(Shaner and Finney, 1997) [4]

where,

Y_i and Y_{i+1} are the severity in the i^{th} and $(i+1)^{th}$ observations.

X_i and X_{i+1} are the time (in week) in the i^{th} and $(i+1)^{th}$ observations.

and, n is the total no. of observations.

iv) $$r = \frac{2.3}{t_2 - t_1}\left(\log\frac{x_2}{1-x_2} - \log\frac{x_1}{1-x_1}\right) \quad (4)$$

(Van der plank, 1963) [7]

where,

$t_2 - t_1$ is the time interval of consecutive observations.

X_1 and X_2 are the disease severity in time t_1 and t_2 respectively.

The data so obtained were statistically analyzed using ANOVA and t-test to ascertain the effectiveness of the treatments.

III. Results And Discussion

Data in (Table 1) showed that transplanting reduces the disease incidence and disease severity of blast in both the years (2010 and 2011) of investigation over broadcasting but not significant statistically. However, the AUDPC and rate of infection (r) were found to be comparatively low in transplanting method. Thingujam and Chhetry [6] reported maximum disease incidence and disease severity in broadcasting method of cultivation as compared to dibbling and spade tillage mode of cultivation practices under upland rice system. The disease incidence, disease severity, AUDPC and rate of infection of blast disease were reduced to some extent in seed sown on earlier dates as compared to later dates sown rice (Table 2) indicating that sowing dates significantly influence the epidemiology of blast disease of rice which might be due to the weather factors like low temperature and higher relatively humidity that favour the disease development. Dubey [1] reported that leaf, node and neck blast infection were minimum in early June sown rice and their infection increase gradually in crops sown at later dates. Rice under three times hand weeding showed less disease incidence and disease severity (Table 3). The AUDPC and 'r' were also recorded less in crops having weeded three times over hand weeding once and twice indicating role of certain weeds which serves as the alternate host for the blast pathogens. This finding corroborated with the findings of Thingujam and Chhetry [6]. Katans [2] also reported the potential significance of cultural practices in the reduction of soil and air borne diseases of numerous crops.

IV. Tables

Table 1. Effect of sowing methods on blast disease of rice (variety RCM10)

Treatments	Disease Incidence (%)			Disease Severity (%)			AUDPC			Apparent rate of infection 'r'		
	2010	2011	Mean	2010	2011	Mean	2010	2011	Mean	2010	2011	Mean
Broadcasting	32.27	34.40	33.34	19.97	21.54	20.76	1195.50	754.40	974.95	0.36	0.37	0.37
Transplanting	29.33	27.73	28.53	17.28	19.29	18.29	601.90	672.61	637.26	0.36	0.36	0.36
t-value	NS			NS			NS			NS		

Table 2. Effect of sowing dates on blast disease of rice (variety RCM10)

Treatments	Disease Incidence (%)			Disease Severity (%)			AUDPC			Apparent rate of infection 'r'		
	2010	2011	Mean	2010	2011	Mean	2010	2011	Mean	2010	2011	Mean
15^{th} June	23.73	25.07	24.40	11.82	12.98	12.40	393.72	454.22	423.97	0.33	0.33	0.33
30^{th} June	24.80	27.33	26.07	13.01	14.49	13.75	309.80	434.86	372.33	0.35	0.34	0.35
15^{th} July	27.47	30.13	28.80	16.59	15.94	16.27	452.92	484.30	468.61	0.35	0.35	0.35
CD (P=0.05)	1.24			1.15								

Table 3. Effect of weeding on blast disease of rice (variety RCM10)

Treatments	Disease Incidence (%)			Disease Severity (%)			AUDPC			Apparent rate of infection 'r'		
	2010	2011	Mean	2010	2011	Mean	2010	2011	Mean	2010	2011	Mean
One time hand weeding	29.60	31.74	30.67	17.42	20.09	18.76	645.76	595.37	620.57	0.36	0.37	0.37
Two times hand weeding	28.26	30.40	29.33	15.64	17.13	16.39	559.59	569.74	564.67	0.36	0.37	0.37
Three times hand weeding	25.33	28.27	26.80	12.53	14.31	13.42	461.16	500.59	480.88	0.33	0.34	0.34
CD (P=0.05)	1.80			1.47								

* Data of each year for all treatments are means of 3 replications, AUDPC – Area Under Disease Progress Curve

r – Apparent rate of disease infection.

V. Conclusion

Based on two years of investigation on traditional cultural practices, it could be concluded that cultural practices has positive effect on reducing the blast disease of rice. The calculation of disease occurrence and timing of cultivation are synchronized. In such a situation, traditional cultural practices may provide a useful means to the poor and marginal farmers who cannot afford costly chemicals for the control of disease. Hence, further research work need to be worked out in detail for a sustainable eco-friendly and cultural practices.

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