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Identification of Physiologic Race(s) of *Magnaporthe grisea* (Herbert) Barr Causing Blast Disease of Rice Prevailing in Different Agro-Climatic Zones of Assam, India

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A B S T R A C T

Blast is one of the most destructive and wide spread disease of rice. It is caused by *Magnaporthe grisea* (Herbert) Barr in different stages of its growth period. Of the 16 number of isolates collected from different locations of Assam, 6 physiologic races *viz.*, IB8, IB33, IC17, ID1, ID10 and IF1 are found prevailing in this region. The isolate belongs to international race groups IB has not been detected so far in India. Under the race group IB, two new races were identified IB8 and IB33. Besides, in international race group ID and IF new race ID 10 and IF 1 respectively were also identified.

Introduction

Rice is the main staple food in India. It is cultivated throughout India and more particularly in Assam. But most of time its production become limited due to attack by many diseases. One of the most destructive and wide spread fungal diseases of rice (*Oryza sativa* L.) is blast caused by *Magnaporthe grisea* (Herbert) Barr (anamorph *Pyricularia grisea* Cav.) also affect other host grasses. However, reports on the specific range of blast fungus hosts are contradictory. This discrepancy could be attributed to the variation of genetic back-ground of the fungus. The variation of genetic back ground leads to variation in pathogenicity, increase difficulties in developing resistant varieties suitable for different agro climatic conditions. Padmanabhan *et al.*, (1970) also reported existence of great variability of pathogenicity among the *Pyricularia oryzae* isolates further similar result was also reported by Ou (1985). Padmanabhan *et al.*, 1970, Veeraraghavan and Premalatha Dath 1975, 1976 and 1977 were reported existence of different physiologic races of *Magnaporthe grisea* time to time. The prevalence of physiologic race of *P. oryzae* 'IE 3' in Assam was reported by Roy (1987). Considering the long gap of work in this aspect particularly, to determine the number and distribution of physiologic races of

Magnaporthe grisea prevalent in different agro-climatic zones of the state, a study was conducted at Regional Agricultural Research Station, Shillongani, Nagaon during 2014 & 2015 for identification of physiologic race of *Magnaporthe grisea* and its prevalence in Assam.

Materials and Methods

All total 16 isolates have been collected from 5 (five) agro-climatic zones of Assam *viz.*, Upper Brahmaputra Valley Zone (UBVZ), Central Brahmaputra Valley Zone (CBVZ), Lower Brahmaputra Valley Zone (LBVZ), Barak Valley Zone (BVZ) and Hills zone. Of the 16 isolates, 2 isolates from Jorhat district of UBVZ, 2 isolates from Nagaon district of CBVZ, 2 and 1 numbers of isolates from Borpeta and Dhubri districts respectively of LBVZ, 2 isolates from each district namely, Cachar and Karimganj of BVZ and 5 isolates from Karbi Anglong district of Hills Zone of Assam.

Isolation was done from leaves and necks of infected portion of plants collected from different rice growing areas of Assam on oat meal agar (OMA) with trace biotin and thiamine (B & T). Purification of cultures had been done by serial dilution technique and hypha from single-spore colony transferred to corn-meal-rice-straw agar medium and incubated at 28+ 2 ^{0}C for 12-15 days for sporulation (Sun *et al.,* 1989). Spore suspensions of inoculums were prepared from 12-15 days old culture with 1-2 x 10^{5} conidia/ml. In case of weakly sporulating isolates, the entire thallus was removed from corn-meal-rice-straw agar medium and homogenized with water in a Waring Blendor for inoculation.

Eight international rice differential cultivars *viz*., Raminad Str. 3, Zenith, NP-125, Usen, Dular, Kanto-51, Sha-tiao-tsao (S) and Caloro proposed by the United State –Japan Co-operative Blast project, have been used in identification of physiologic race of *Pyricularia grisea* along with IR 50 as susceptible check. For this purpose, the differential cultivars were grown in earthen pot (12 cm in diameter) under isolated and controlled condition.

The earthen pots were filled with soil mixed with urea and SSP left overnight before sowing of seeds. The seedlings were again refertilized at 15 days with 2% urea by foliar spraying.

The seedlings (21 days old) were inoculated with spore suspension of *M. grisea* at a conc. of 1-2 x 10^{5} conidia per ml along with 1% carboxy methyl cellulose (CMC) as sticker during the evening hours (Sun *et al.,* 1989).

Inoculation with spore suspension of *M. grisea* was carried out in late evening (15.00 hrs) in two sets one in the month ‘Sept-Oct’ and another ‘March-April’ for easy handling of large number of isolates.

Disease scoring was done a week after inoculation (Ahn *et al.,* 1988) and differential cultivars were refertilized by spraying 2% urea and final record of disease was done when the susceptible check showing high susceptible reactions and then physiologic race classification was followed as per standard method (Ling and Ou, 1969).

Results and Discussion

On the basis of disease reactions on eight international differentials, 6 physiologic races of *M. grisea viz.,* IB8, IB33, IC17, ID1, ID10 and IF1 were identified (Table 1). These physiologic races were belongs to the international race groups IB, IC, ID and IF. The international race group IB has not been reported so far in India.

Table.1 Reactions of rice differential cultivars to isolates of *Magnaporthe grisea* and race identification

Name of districts	Reactions on international rice differential cultivars								International race group	International race designation
	Reminad Str.3	Zenith	NP-125	Usen	Dular	Kanto-51	Sha-tiao-tsao(S)	Caloro		
Jorhat	R*	S+	R	S	S	S	S	S	IB	**33**
Nagaon	R	R	R	S	S	S	S	S	ID	**1**
Borpeta	R	R	R	S	R	S	S	S	ID	**10**
Dhubri	R	R	R	R	R	S	S	S	IF	**1**
Cachar	R	R	S	R	S	S	S	S	IC	**17**
Karimganj	R	R	S	R	S	S	S	S	IC	**17**
Karbi Anglong	**R**	**S**	**S**	**S**	**R**	**R**	**R**	**R**	**IB**	**8**

*R= Resistant; +S= Susceptible

Table.2 Geographical distribution of race *Magnaporthe grisea* in Assam

Agro-climatic zones of Assam	International race group and races			
	IB	IC	ID	IF
Upper Brahmaputra Valley	33	-	-	-
Central Brahmaputra Valley	-	-	1	-
Lower Brahmaputra Valley	-	-	10	**1**
Barak Valley	-	17	-	-
Hill zone	**8**	-	-	-

In the present investigation, out of 6 physiologic races; 2 have already been reported from Assam *i.e.,* IC 17 and ID 1 by different workers time to time (Padmanabhan *et al.,* 1970, Veeraraghavan and Premalatha Dath 1975, 1976 and 1977) and 4 physiologic races namely, IB 8, IB 33, ID 10 and IF 1 were detected for first time in Assam. The number of isolates falling in race group IB, IC, ID and IF were 7, 4, 4 and 1 respectively.

The geographical distributions of identified races are recorded IB 33 in UBVZ, ID1 in CBVZ, ID10 and IF1in LBVZ, IC 17 in BVZ, and IB 8 in Hills Zone. The race group IB was detected in Hills zone as well as in UBVZ, race group ID is recorded in two zones namely, CBVZ and LBVZ, race group IF is found in LBVZ and race group IC was encountered from BVZ (Table 2).

Padmanabhan *et al.,* (1970) reported four physiologic races *viz.*, IA6, ID1, IF3 and IJ1 from Assam. Thereafter, Veeraraghavan and Premalatha Dath (1975, 1976 and 1977) stated that the physiologic race IC 17 was also prevalent in Assam during 1972 to 1975. Roy (1987) reported prevalence of physiologic race IE3 from Assam. Race groups *viz*., IA, IC, ID, IE, IF and IJ had been reported time to time by different workers. However, the race groups *viz*., IA, IE and IJ were not encountered in this study though reported by different workers. Therefore, detection of the race groups namely, IC, ID and IF simply indicates their prevalence of the region for long time. Detection of physiologic races namely, IC17 and ID1 in this study, indicates its wide distribution and stability in Assam. The race group IF detected in this study has already been reported by Padmanabhan *et al.,* (1970) with race IF3. However, under the race group 'IF' one new physiologic race *i.e.*, IF1 has been identified. The race group IC, ID and IF detection indicates the stable race group of Assam. Besides, a new race group IB has also been detected for the first time from India with two new physiologic races IB8 and IB33.

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