

Varietal resistance to Bacterial Leaf Blight disease of rice in upland conditions of West Bengal, India

S. SAHA*

Rice Research Station, Bankura 722 101, West Bengal*

In the Kharif (wet) seasons of 2000, 2001 and 2002, 10 rice varieties with differential genetic background were evaluated for their response to bacterial leaf blight under artificial inoculated conditions at Bankura. Eight varieties recorded susceptibility in all the three seasons, while Ajaya and IR-20 exhibited resistant reaction.

Key words : Bacterial Leaf Blight, resistance; rice varieties

INTRODUCTION

Bacterial leaf blight (BLB) of rice caused by *Xanthomonas oryzae* pv. *oryzae* Dowson was first reported from Japan in 1994. Srinivasan *et al.* reported it for the first time from India in 1959 and subsequently it was reported to cause severe damage in different parts of the country (Singh *et al.*, 1977; Pavgi *et al.*, 1994). Hybrid rice also incurred a heavy loss due to this disease (Singha *et al.* 2000). This flare up of the disease was mainly due to the introduction of certain high yielding and late maturing varieties. The high tillering capacity of these varieties along with indiscriminate use of nitrogenous fertilizers provide a microclimate which predisposes the plants to the disease.

In 2000, 2001 and 2002 kharif seasons, under the All India Co-ordinated Rice Improvement Programme, 10 popular rice varieties with differential genetic background were evaluated for their response to bacterial leaf blight pathogen under artificial inoculated conditions at RRS, Bankura (representing red and lateritic zone). This was done so as to assess the infection pattern of the disease and the role played by the gene organization of these varieties in the paradigm of resistance or susceptibility.

MATERIALS AND METHODS

Ten (10) cultivars, namely, TN1, IET 8320, DV-85, IR-64, IR-20, BJ-1, Java-14, IR BB-21, Ajaya and IR-8 were screened against *Xanthomonas oryzae* pv. *oryzae* in the field during 2000, 2001 and 2002. Seed of all the cultivars were obtained from Directorate of Rice Research (ICAR), Hyderabad, India.

Each variety was planted in two 2 m rows spaced in 20 cm × 15 cm. The plot was fertilized with 120 kg N, 50 kg P and 30 kg K/Ha. Recommended agronomic practices were followed. During active tillering stage, randomly selected ten hills (except the border ones) were inoculated by using a 'clipping' technique (Kaufman *et al.*, 1973). The inoculum was prepared from leaf samples of local susceptible variety.

Disease reaction was recorded 15 days after inoculation. The disease scoring was done, according to the Standard Evaluation System (SES) for rice (0-9 scale) of IRRI (Anon, 1996).

RESULTS AND DISCUSSION

The differentials IR-20 and Ajaya were resistant (R)

* Present Address : State Agricultural Research Institute, 230A N. S. C. Bose Road, Kolkata - 700 040, W. Bengal, India.

to the pathogen in all the three years having scores of 3, 2.5, 3 and 2, 1.5, 2.5 respectively (Table 1). IET 8320 had a gradual breakdown in the resistance, exhibiting scores of 4, 5.5 and 6 in the consecutive years, but it could be considered as moderately resistant (MR) against the pathogen. TN-1, IR-8, DV-85 and IRBB-21 were susceptible (S) in all the seasons, although the former was MR in 2001. It may be due to the fact that the disease pressure was slightly lower in 2001 than the other

pathotype I, it can be assured that pathotype Ia is prevalent as IR-20 is resistant in all the three seasons. It is to be noted that IR-20 is susceptible to pathotype Ib (Reddy and Reddy, 1992).

However, for denoting exact pathotypes of *Xanthomonas oryzae* pv. *oryzae* and study their effect on different cultivars molecular approaches including DNA profiling, plasmid biology etc. needs to be orchestrated.

Table 1 : Reaction of different varieties to bacterial leaf blight disease under artificial inoculated condition during Kharif season 2000 to 2002.

Name of variety	Reaction to Leaf Blight (Score 0-9 scale)								
	2000			2001			2002		
	R1	R2	Mean	R1	R2	Mean	R1	R2	Mean
TN1	9	9	9	7	5	6	7	7	7
IET 8320	5	3	4	5	6	5.5	5	7	6
DV-85	7	7	7	7	7	7	7	6	6.5
IR-64	5	7	6	9	5	7	9	9	9
IR-20	3	3	3	2	3	2.5	3	3	3
BJ-1	5	7	6	7	7	7	7	7	7
Java-14	5	5	5	5	7	6	7	7	7
IRBB 21	7	6	6.5	9	7	8	7	9	8
Ajaya	2	2	2	2	1	1.5	3	2	2.5
IR-8	7	7	7	9	5	7	7	9	8

N.B. : R = 0-3; MR = 4-6; S = 7-9

two years. Both IR-64 and BJ-1 were MR in 2000, but in subsequent years they were susceptible to *Xanthomonas oryzae* pv. *oryzae*. Breakdown of resistance of IR-64 clearly indicated that gene pyramiding perhaps is not an unequivocal solution of managing the disease. This is because three specific resistant genes namely xa5, xa13 and xa21 are pyramided in different combinations in IR-64 and yet it was susceptible to the bacteria. This signifies that within a span of time the virulent genes could nullify the effect of resistant genes (Keen *et al.*, 1993). Java-14, on the other hand manifested MR reactions in the first two years, but in 2002, it also had shown a breakdown in resistance with a gradual tilt towards the susceptible end.

Susceptibility trend of different cultivars hinted the predominance of different pathotypes in this region. As DV-85 was susceptible in all the three seasons, it is evident that pathotype II was present throughout the period of the trial. Emergence of pathotype I was confirmed in 2002, when Java-14 became susceptible after exhibiting MR reactions in the first two years. Regarding the sub-groups of

REFERENCES

- Anonymous 1996. Standard Evaluation System (SES) for Rice, IRRI (Pub.), 20.
- Kaufman, H. E., Reddy, A. P. K., Hsieh, S. P. Y. and Merca, S. D. 1973. An improved technique for evaluating resistance of rice varieties to *Xanthomonas oryzae*, *Pl. Dis. Reprtr.* **57**(6) : 537-541.
- Keen, N. T., Bent, A and Staskawicz, B. 1993. Plant Disease Resistance Genes : Interactions with pathogens and their improved utilization to control plant diseases IN : *Biotechnology in Plant Disease Control* (Eds: Ilan Chet; Pub. by John Wiley and Sons, Inc. Publications, (USA) pp. 372.
- Pavgi, M. S., Singh, R. A. and Ram Dular 1964. Bacterial leaf blight of rice in North India. *Sci. and Cult.*, **30** : 405.
- Reddy, M. T. S. and Reddy, A. P. K. 1992. Occurrence of pathotypes of *Xanthomonas campestris* pv. *oryzae* in India. *Ind. J. of Mycol. Pl. Pathol.* **22** : 205-206.
- Singha, K. D.; Borkakoti, R. P., and Pathak, A. K. 2000. Evaluation of hybrid rice for disease resistance against bacterial blight, sheath blight and grain discolouration. *Ann. Biol.* **16**(2) : 163-166.
- Singh, G. P., Srivastava M. K., Singh, R. Y. and Singh, R. M. 1997. Variation in quantitative and qualitative losses caused by bacterial blight in different rice varieties. *Ind. Phytopath.* **30** : 180-185.
- Srinivasan, M. C., Thriumalachar, M. J. and Patel, M. K. 1959. Bacterial blight disease of rice. *Curr. Sci.* **28** : 469.

(Accepted for publication May 23 2006)