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Stomatal Index and Size of Stomatal Opening of Rice Cultivars Varying in Reaction to Bacterial Leaf Blight

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Stomatal index and length of stomatal opening of twelve rice varieties having different disease reaction to bacterial leaf blight have been studied. Stomatal index was significantly less in resistance and moderately resistant varieties as compared to susceptible ones. There was no correlation between the length of stomatal opening and disease reaction.

Key Words: Stomatal index, Rice, Bacterial leaf blight

Introduction

Bacterial leaf blight (BLB) of rice which is caused by *Xanthomonas compestris* pv *oryzae* (Ishiyama) Dye is one of the most severe diseases of rice in Asia (Ou 1972, Srivastava 1972). Identification of the morphological or the anatomical characters of the host are associated with resistance or susceptibility will facilitate in understanding the disease in order to evolve suitable control measures. Some of the anatomical characters of the rice plant such as hydothodes have been studied and found to be generally more in BLB resistant varieties than in susceptible ones (Mizukami 1961). Since the stomata have been found to be the channels of entry of the bacterial leaf blight pathogen (Tabai 1967), an attempt has therefore been made to find out whether there is any correlation between the number of stomata distributed on leaf of rice cultivars and their reaction to bacterial leaf blight. In the present investigation, stomatal index and length of stomatal opening of twelve varieties have been studied.

Materials and Methods

Twelve varieties having different disease reaction (table 1) were sown separately in earthen pots. When the seedlings became 45 days old, the third leaf from the base of each variety was cut and kept immediately in distilled water. Leaf of each variety was cut one inch below into 5–6 pieces from the tip. For obtaining the epidermal peels the method developed by Mohan Ram and Nayyar (1974) was followed. Having separated the epidermal layers, the entire contents were poured into a Petri dish. The fluid was

decanted and the peels were washed 4 or 5 times with water to remove the debris and the last traces of the reagents. The isolated epidermis of each variety was mounted in glycerine. The number of stomata as well as the total number of cells in one microscopic field was observed. The length of stomatal opening was also measured. Three observations in different microscopic fields were made for each variety. The stomatal index was calculated by the following formula:

$$\text{Stomatal index} = \frac{\text{Total No. of stomata}}{\text{Total No. of epidermal cells in the corresponding microscopic field}} \times 100$$

The data were statistically analysed. The angular values and C.D. for the stomatal index as well as the length of stomatal opening are given in table 1.

Results and Discussion

The stomatal index was significantly low in resistant and moderately resistant varieties as compared to the susceptible varieties (table 1). The stomatal index was lowest in (Lacrose × Zenith)—Nira (resistant) and highest in Benibhog (susceptible). There was no correlation between the length of the stomatal opening and disease reaction (table 1). However, the length of the stomatal opening was significantly more in Benibhog, T(N)1 and IR–20 than in other varieties.

Tabai (1967) confirmed that the coleoptile and foliage leaf sheath of rice seedlings collected in farmers' fields carried *Xanthomonas*

Table 1 *Stomatal index and length of stomatal opening of some rice cultivars*

Name of variety	Disease reaction	Stomatal index (Angular value)	Length of stomatal opening in μ (Angular value)
BJ 1	R	18.38	20.83
CB II	R	21.69	20.83
TKM 6	R	19.34	17.83
(L×Z)–N	R	18.10	25.00
IR–20	MR	20.81	30.42
Ratna	MR	21.37	24.17
Jaya	S	24.04	23.33
IR–8	S	26.03	17.50
Bala	S	27.87	20.00
Karuna	S	24.34	20.00
Benibhog	S	28.65	36.67
T (N) 1	S	26.06	30.00
		CD 5% — 3.19 CD 1% — 4.33	CD 5% — 3.38 CD 1% — 4.57

R = Resistant
MR = Moderately resistant
S = Susceptible

compestris pv *oryzae* through stomata which were the primary source of inoculum. The bacterium may be released from stomata and they may be a source of secondary infection and may enter through hydothodes, injured roots and wounds on other parts of the plant to the vascular system causing the usual symptoms. In the present study, it was observed that the stomata were more frequent in susceptible varieties than in the resistant and moderately resistant varieties when the seedlings were 45 days old. The susceptible varieties may carry more amount of primary inoculum which results in the rapid spread of the disease. The role of stomata in carrying the primary inoculum at nursery and later stages of the growth of the plant needs further investigation.

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References

Mizukami T 1961 Studies on ecological properties of *Xanthomonas oryzae* (Uyeda et Ishiyama) Dowson, the causal organism of bacterial leaf blight of rice plant (In Japanese with English summary); *Agri. Bull. Saga Univ.* **13** 1–85

Mohan Ram H Y and Nayyar V L 1974 A rapid Method of obtaining epidermal peels in plants by treatments with cupric sulphate and Hydrochloric acid; *Stain Technology* **49** 114–116

Ou S H 1972 *Rice diseases.* Commonwealth Mycol. Institute, Kew, Surrey, England pp 368

Srivastava D N 1972 Bacterial Blight. *Indian Phytopathology* **25** 1–16

Tabai H 1967 Anatomical studies of rice plants affected with bacterial leaf blight with special reference to stomatal infection at the Coleoptile and the foliage leaf sheath of rice seedlings (In Japanese with English summary); *Ann. Phytopath. Soc. Japan* **33** 12–16