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Evaluation of rice germplasm for identification of slow blasting genotypes

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Several instances of frequent breakdown of vertical resistance in different plant pathosystems due to appearance of matching vertical pathotypes has created interest among the plant pathologists and breeders in varieties possesing rate-reducing type of horizontal resistance, which is more stable and long lasting. Blast of rice caused by *Pyricularia grisea* Sac. is the most serious disease in upland as well as rainfed lowland condition. It is essential to identify such type of slow blasting resistant genotypes. The present investigation was aimed at screening of the rice germplasm for identification of slow blasting genotypes from the international list of donors for various biotic and abiotic stresses.

A total number of 83 rice genotypes with predetermined blast disease score of 1-4 in the SES scale (2) were selected from the international list of donors for various biotic and abiotic stresses, provided by the International Rice Research Institute, Manila, Philippines, through the National Bureau of Plant Genetic Resources, New Delhi, India. Seeds of these genotypes were sown in the uniform blast nurseries with two rows of susceptible flankings after three rows of each of the test entries. Two rows of the susceptible check Karuna were sown along both the longitudinal borders of each nursery. Fertiliser was applied at the rate of 100 kg N/ha in the form of ammonium sulphate in three split doses. High humidity was maintained by running the overhead sprinklers during hotter periods of the day (10.00 AM to 3.30 PM) with one hour intermittent stoppage after each hour of running. Observation on the foliar blast severity was recorded on the middle row of each plot at every alternate day, beginning from the initiation of the disease symptom till completion of the epidemic period, following the methods developed by Padmanabhan and Ganguly (4). Observation was recorded on the middle row of each plot at every alternate day, till the susceptible check Karuna reached more than 90% severity, following Padmanabhan and Ganguly (4). The area under disease progress curve (ADPC) was estimated following the method of Shaner and Finney (5). The estimates of ADPC were normalised (1) by dividing it with the number of days from the first appearance of the disease till end of the observation period in order to bring them into a comon time base to facilitate better comparison among the genotypes over the seasons. The normalised ADPC was referred to as the relative area under disease progress curve (RDPC). The preliminary screening was repeated twice, while the selected genotypes were tested for four seasons (i.e. wet seasons 1992 and 1993, and dry seasons of 1993 and 1994) for confirmation of their reactions.

The environmental conditions during all the four test seasons were highly favourable (i.e. the night temperature was 20 to 28°C and relative humidity was more than 90%) for disease development resulting in 100% disease pressure in the suceptible check Karuna. Of the 83 entries, 24 were highly susceptible (Table 1) exhibiting disease severity (DS) more than 50% and typical sigmoid curve of disease progress (Fig. 1) characterised by early disease initiation, rapid disease

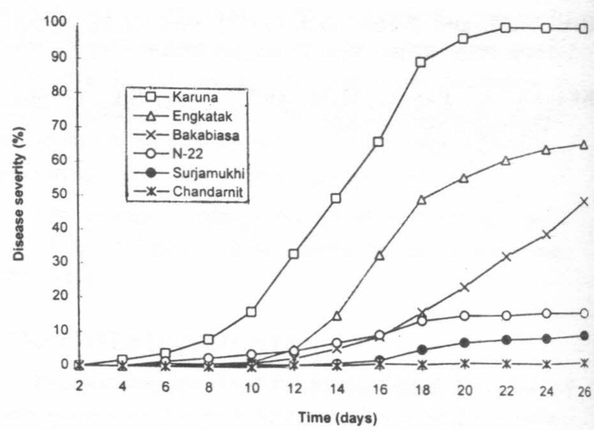

Fig. 1. Disease progress curves for representative genotypes from each group.

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Table 1. Reaction of 83 accessions to rice blast disease

Name of the entries	Disease reaction	Characteristics of each group
ARC-7046, Bakka Biasa, Bico Branco, CR 289-1045-16, CL-2011, Dima, D-Jaub, Engkatek, Gampai-30-12-15, Hang Sanaya, India Dular, IR 1561-4614, IR-50, IR 54, Jaya, Karuna, Kalubawee, Mlidai Karuppan, OS-4, Pusa 4-1-11, Ratna, Seritusmalam, Tiace, Warrangal-1253	HS	Highly susceptible, fast-blasting genotypes, characterised by early disease initiation, rapid disease development with lapse of time resulting in almost signmoid DPCs and high RDPC estimates
Baka Batjere, Bhoro Nepa, BJ-1, Blue Bonnett-50, Carreon, Cas 209, DNJ-146, H-5, Himalaya-2, IR-8, IR 31868-64-2-3-3, IR 4547-2-1-2, IR 5533-PP-854-1, Madhukar, Mailyang-51, Melot, Monulaya, Red Rice, Rok-2, Salumpikit, Tetep, Zenith	HR	Highly resistant genotypes, characterised by a few minute brown specks, estimation of ADPC and RDPC not possible
Bir-Co-Tsan, Chandarnit, Co-15, DJ-114, DJOWE-II, DV-110, Lal Aman, M-1-48, Mak Thua, Marunga, Matao Liso, Molla Diga, O-25-4, PTB-8, PTB-18, Peta, Prolific, Raj Bhawalta, Salak, Sam Houang, 20-A	SBR	Slow-blasting genotypes, characterised by delayed disease initiation, low disease severity, DPCs almost parallel to x-axis, reactions variable over seasons with no disease to very low severity resulting in zero to extremely low RDPC estimates
Chiang-Tsene-tao, CR-570, Dahanala-2014, DJ-88, DM-27, DNJ-155, DZ-192, E-425, Goda Heenathi, Jumi-1, Laurent-TC, Lien-Tsan-50, N-22, Sakai, Surjamukhi, UCP-188	SBR	Stable slow-blasting genotypes, characterised by delayed disease initiation, slow rate of diseae progress with lapse of time and low RDPC estimates

HS = Highly susceptible; HR = Highly resistant; SBR = Slow-blasting resistant; DPC = Disease progress curve; ADPC = Area under disease progress curve; RDPC = Relative area under disease progress curve.

development and high estimates of ADPC and RDPC values. Twenty two genotypes exhibited highly resistant reaction characterised by a few minute brown specks. A total number of 37 entries were identified as possessing slow blasting resistance (DS<20%), 21 of which exhibited late disease initiation, low disease severity, little or no advancement in the DPC with lapse of time and variable reaction over seasons, ranging from zero to extremely low estimates of ADPC as well as RDPC values (Fig. 1). Rest of the 16 genotypes consistently exhibited typical slow blasting resistance over a period of four seasons, which was characterised by longer incubation period and latent period, shorter infection period, lower infection efficiency, number of lesions, necrotic zone area, chlorotic zone area, mean lesion area, total affected tissues, and sporulation capacity in terms of spores per lesion, spores per lesion per day and spores per leaf per day (3). In view of the stable reaction obtained through repeated tests over seasons, these genotypes appeared to possess durable resistance.

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