

GENETIC DIVERSITY AGAINST SHEATH ROT DISEASE IN RICE (*ORYZA SATIVA* L.)

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Seventy six lines of diverse origin in rice were evaluated for sheath rot disease. Fifteen genotypes were found to be resistant having no disease incidence. These resistant lines were mostly late and all types in nature. However, one early maturing and dwarf genotype (Shakti 1) could be identified as a source of resistance to sheath rot. These genotypes can be exploited in rice breeding programme.

Key Words : *Acrocyldrium oryzae*, *Sarocladium oryzae*, rice, sheath rot, germplasm

The sheath rot disease of rice caused by *Sarocladium oryzae* (Swada) W. Gams and D. Hawksw (*Acrocyldrium oryzae*, Swada) has become a serious problem in rice production for Asian countries. In India, generally dwarf and semi dwarf rice varieties are severely affected during kharif season (Raina and Singh, 1981). With the increased area under cultivation of dwarf and semi-dwarf cultivars, the disease has assumed serious problem causing upto 57% loss (Mohan and Subramaniam, 1979).

None of the high yielding variety have been found to be resistant so far. The present investigation aims to know the reaction and nature of rice genotypes to sheath rot disease.

MATERIALS AND METHODS

Seventy six lines of diverse sources including improved cultivars of rice were grown in randomized block design with two replications at experimental farm of Central Rice Research Institute, Cuttack. Each entry was allotted in a single row plot of 3m length with spacing of 15 × 15cm between row to row and plant to plant, respectively. The artificial inoculation of the disease was done after 20 and 30 days of transplanting, respectively as per the method suggested by Estrada *et al.* (1978).

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For measuring the disease intensity, ten randomly sampled plants from each line were tagged. Observations were recorded on individual plant at booting stage. The present disease intensity was calculated using the following formula

$$\% \text{ Disease intensity} = \frac{\text{Number of affected tillers}}{\text{Total number of tillers}} \times 100$$

The rating of disease was done as per Standard Evaluation System (SES) for rice developed at IRRI (1980). The genotypes were classified in different reaction group as resistant (no incidence), moderately resistant (1% tillers are affected), tolerant (1 to 5 per cent tillers are affected), moderately susceptible (6 to 25 per cent tillers are affected), susceptible as (26-50 per cent tillers are affected) and highly susceptible (more than 50% tillers are affected).

RESULTS AND DISCUSSION

On the basis of disease reaction, all the seventy six genotypes were classified into various groups (Table 1). Fifteen genotypes were recorded to be resistant because they showed no incidence of disease at all. On the other hand, twelve genotypes exhibited upto five per cent affected tillers and considered as tolerant. A total number of 23 genotypes including improved cultivars have shown moderate susceptibility. Regarding susceptible genotypes 16 genotypes found to be susceptible to this disease because of higher incidence of disease i.e., upto 50%, while remaining ten genotypes, showed almost all the tillers affected and considered to be highly susceptible.

Table 1. Performance of seventy six lines against sheath rot disease in rice

| % of affected tillers | Disease Reaction | No. of genotypes |
|-----------------------|------------------------|------------------|
| No incidence | Resistant | 15 |
| Less than 1 | Moderately resistant | 0 |
| 1-5 | Tolerant | 12 |
| 6-25 | Moderately susceptible | 23 |
| 26-50 | Susceptible | 16 |
| 51 and above | Highly susceptible | 10 |

Dwarf plant types are considered to be most favourable genotypes for yield. In general, if we consider plant stature and duration simultaneously in relation to disease resistance; fifteen resistant lines can be further classified into several groups (Table 2). Among them, Shakti 1 was the only early maturing and dwarf statured genotype which showed resistant reaction. This genotype could be successfully exploited in breeding programmes.

A persual of data presented in Table 2 demonstrate that most of the resistant genotypes were tall and late maturing types. This suggested that plant stature is somehow related to disease reaction as also reported by Amin (1976) where it has been emphasized that resistance can be successfully

Table 2. Classification of sheath rot resistant genotypes based on plant height and maturity duration in rice.

| Criteria | Genotypes |
|-----------------------|---|
| Tall and early | T-141, BJ1 |
| Tall and medium | CR 1014 |
| Tall and late | ASD-2, Manoharsali, Tetep, PTB-18, Raminad Str-3, CO4, GEB 24, ADT-10 |
| Semi dwarf and early | CO22, Pankhani |
| Semi dwarf and medium | RP 2071-20-21. |
| Dwarf and early | Shakti 1 |

transferred to dwarf lines. However, present study demonstrated that even tall genotypes can be used in resistance breeding programme following appropriate mating designs. Two genotypes of tall and early (T141, BJ1) and a tall and medium maturity (CR1014) can be directly introduced for general cultivation or may be used in breeding programme. Earlier it had been assumed that none of the dwarf cultivar was resistant to this disease. After continuous evaluation over two years, the present study has identified one line of dwarf and early maturing type (Shakti 1) to be resistant. This line can directly be recommended for rice growers and/or it can be considered as dwarf source to this disease in varietal development programmes. Therefore, present study clearly demonstrates the availability of sources of resistance against sheath rot in tall as well as in dwarf genetic backgrounds in rice germplasm.

REFERENCES

- Amin K.S. 1976. Sources of resistance to *Acrocyldrium* sheath rot of rice. *Plant Disease Reporter*, 60(1): 2-72.
- Estrada B.A., L.M. Sanchez and P. Grill. 1979. Evaluation of screening methods for sheath rot resistance of rice. *Plant Disease Reporter*, 63 (11) : 908-911.
- IRRI-International Rice Research Institute (1980) Annual Report for 1979, P.O. Box 933, Manila, Philippines.
- Mohan R. and C.L. Subramaniam. 1979. Yield loss due to sheath rot disease of rice caused by *Acrocyldrium oryzae*, Swada. *Madras Agric. J.*, 66 (3): 195.
- Raina G.L. and G. Singh. 1981. Sheath rot outbreak in Punjab. *International Rice Research Newsletter*, 5 (1): 16.