Indian J. Pl. Genet. Resources 10(1): 7-10, 1997

RESISTANCE OF SOME INDIAN TRADITIONAL RICE VARIETIES TO THE PHILIPPINES ISOLATE OF RICE TUNGRO DISEASE AND ITS VECTOR, THE GREEN LEAF HOPPER

S.S. Malik[1], R.C. Aquino, E.L. Coloquio, L.M. Sunio and S.R. Venkitesh

International Rice Research Institute, P.O. Box 933, Manila, Philippines

Abstract : The Indian traditional rice varieties Jonwphool, Malsundri and Tulsidas showed resistance and Basmata, Bedubhajana, Mundadhan and Sonakathi showed moderately resistance reaction in India as well as in Philippines. Resistance/moderately resistance reaction of Jonwphool and Bedubhajana is indicative of the resistance of these varieties to green leaf hopper.

INTRODUCTION

Rice Tungro Disease (RTD) which is the most important disease for south and south east Asia, transmitted through green leaf hopper (*Nephotettix virescens*), was first observed in the Philippines at IRRI farm in 1963 (Rivera and Ou, 1965). This disease caused by a complex of two viruses, rice tungro spherical virus (RTSV) and rice tungro bacilliform virus (RTBV) shows stunting and yellowing of the leaves and plant. The RTSV transmitted by rice green leaf hopper (GLH) induces a few symptoms but RTBV is not transmitted by leaf hopper and causes severe symptoms of the disease on its own (Cabauatan and Hibino, 1985).

Most of the resistance to RTD is short lived. Resistance to leaf hopper vector generally breaks down after adaptation of vector to new cultivars (Dahal et al. 1990). It is believed that Indian isolate of RTD is different from that of Philippines as they showed differential reaction to different varieties. The present study was conducted to found the resistance sources for both the isolates of RTD, Indian as well as Philippines.

MATERIALS AND METHODS

Thirty Indian traditional rice varieties, resistant or moderately resistant, to RTD under field conditions (Malik et al. 1993) at the National Bureau of

1. *Present address*: National Center for DNA Fingerprinting, NBPGR, New Delhi

Plant Genetic Resources, Cuttack (India), were evaluated at IRRI using mass screening test (MST) and field screening test to determine their resistance to the Philippines isolate of RTD. The varieties which showed severity score of 7 or less in the MST at IRRI (Table 1) were further tested for resistance to RTBV and RTSV using forced inoculation test (FIT) with TN1 as control (Table 2). Virus free adults GLH were given 4 days of access to rice cultivar TN1 infected with RTBV. Seven days old seedlings growing in a test tube were infected with three viruliferous GLH for 24 h in two replications and 20 seedlings/replications. Inoculated seedlings were later transplanted in pots, sprayed with insecticide inside a green house. Youngest leaf samples from the test plants were collected 30 days after inoculation and tested for the presence of RTBV and RTSV by ELISA method.

Table 1. Screening of Indian rice germplasm lines against RTD at CRRI, Cuttack and IRRI, Philippines

Collector No.	Variety	IRRI Insect resistance	CRRI MST Score	IRRI MST Rating	IRRI MST Score	IRRI FIT Score	IRRI FS Score	MST/FIT/FS Score
D12	Kakirinou	7	5	MR	9	9	9	S/S/S
D115	Paddy	7	3	R	9	8	9	S/S/S
D154	Ratnachudi	7	4	MR	9	8	9	S/S/S
D155	Ratnapakhia	7	2	R	NT	NT	9	NT/NT/S
D176	Baniamalta	7	3	R	9	7	9	S/S/S
D219	Kanthakamala	7	3	R	8	6	9	S/MR/S
D281	Dhabkuji	7	3	R	9	NT	9	S/NT/S
D699A*	Jonwphool	3	3	R	5	3	3	MR/R/R
D725	Bhutia	7	3	R	9	8	9	S/S/S
D747	Kanali	7	5	MR	7	5	9	S/MR/S
D786	Lohana	7	5	MR	9	9	9	S/S/S
D814	Basmata	9	3	R	9	9	6	S/S/MR
D829	Dhusuri	7	5	MR	9	9	9	S/S/S
D914	Kanyasar	7	5	MR	8	5	9	S/MR/S
D956	Jagar	NT	5	MR	8	7	NT	S/S/NT
D1253	Basmati	5	5	MR	8	8	8	S/S/S
D1422	Jaldubi	7	5	MR	7	NT	9	S/NT/S
D1549	Bedubhajana	3	5	MR	9	9	6	S/S/MR

D1556	Dhusuri	NT	5	MR	9	7	NT	S/S/NT
M256	Chiptidhan	9	5	MR	7	7	9	S/S/S
M265*	Mundadhan	7	5	MR	5	2	4	MR/R/MR
M266*	Sonakathi	7	5	MR	4	2	4	MR/R/MR
M269*	Malsundri	7	5	MR	5	3	3	MR/R/R
M302	Kendulkathi	7	5	MR	8	6	9	S/MR/S
M303	Molidhan	7	5	MR	6	8	9	MR/S/S
M305	Kharandi	7	5	MR	4	4	9	MR/MR/S
M392	Ushagondhi	NT	5	MR	8	NT	NT	S/NT/NT
M394	Umusi	5	5	MR	8	7	7	S/S/S
M430*	Tulsidash	9	5	MR	6	3	3	MR/R/R
JBT2/225	Jhilli		5	MR	9	NT	NT	S/NT/NT
TN1			9	S	9	9	9	S/S/S

*0-9 score of damage in both RTD and GLH based on Standard Evaluation System of rice, IRRI, 1990.

Table 2. Presence of RTBV and RTSV in R/MR rice varieties tested by ELISA

Collector No.	Variety	Seedlings tested (no.)	RTBV ELISA (%) infection	RTSV ELISA (%) infection	RTBV ELISA Av reading	RTSV ELISA Av reading
D219	Kanthakamala	32	87	43	0.67	0.42
D699A	Jonwphool	27	70	0	0.69	0
D747	Kanali	33	90	40	0.66	0.38
D914	Kanyasar	29	88	55	0.63	0.35
M265*	Mundadhan	31	90	0	0.71	0
M266*	Sonakathi	31	100	0	0.73	0
M269*	Malsundri	32	90	0	0.73	0
M302	Kendulkathi	28	86	37	0.71	0.46
M305	Kharandi	31	100	12	0.71	0.44
M430	Tulsidash	29	100	88	0.72	0.49
	TN1	28	100	50	0.91	0.52

Each variety was grown in the field at IRRI surrounded by susceptible check TN1 for field screening during 1995 wet season. Sufficient population of viruliferous GLH was introduced to the field during the early vegetative stage of the plant to enhance the RTD infection. Disease score was taken 30 and 45 days after transplanting (Table 1).

RESULTS AND DISCUSSION

Results revealed that Jonwphool, Mundadhan, Sonakanthi and Malsundri were not infected with RTSV but have high titer of RTBV. Kanthakamala, Kanali, Kanyasar, Kendulkathi, Kharandi and Tulsidas had both RTBV and RTSV. The low severity score of these varieties in FIT may be due to the tolerance of these varieties to RTD infection.

Varieties Jonwphool, Malsundri and Tulsidas showed resistance and Basmata, Bedubhajana, Mundadhan and Sonakathi showed moderate resistance to RTD in the field test at IRRI. The resistance of these varieties to the Philippines GLH vector population was also evaluated. Many of these varieties are susceptible to the GLH at IRRI (Table 1). Resistance/ moderate resistance of Jonwphool and Bedubhajana towards RTD may be due to the resistance of these varieties to GLH. Previous studies have suggested that there is marked variation among the Indian and Philippines isolates of RTD. The present results confirmed these views. We found that some resistant varieties from India also serve as a source of resistance to the Philippines isolate of RTSV.

REFERENCES

Cabauatan, P.U., R.C. Cabunagan and H. Konga Nezawa. 1994. Comparative transmission of two strains of rice tungro spherical virus in the Philippines. IRRN **19**(2): 10-11.

Rivera, C.T. and S.H. Ou. 1965 Leaf hopper transmission of "tungro" disease of rice. *Plant Disease Reporter* **51**: 877-881.

Cabauatan, P.Q. and H. Hibino. 1985 Transmission of rice tungro bacilliform and spherical virus by *Nephotettix virescens*. Disant. *Philippines Phytopathol.* **21**: 103-109

Malik, S.S., N. Dikshit, S.K. Singh, U.D. Singh and B. Padhi. 1993. Rice germplasm screening for important diseases. Paper presented in the Indian Soc. of PGR, Dialogue at New Delhi, 1-2 Dec. 1993.: 52.