

RICE CULTURES AND VARIETIES WITH RESISTANCE TO RICE TUNGRO VIRUS (RTV) DISEASE

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ABSTRACT

Investigations were carried out to identify rice cultures resistant to rice tungro virus (RTV) disease. Sixty two rice cultures/varieties were screened for resistance to RTV by exposing to one, two and five viruliferous vector insects [green leafhoppers (GLH), *Nephotettix virescens* (Distant)] per seedling. Seven cultures and one variety were identified as resistant, when exposed to one viruliferous GLH per seedling. Among these only four were found resistant when the inoculum pressure was increased as two viruliferous GLH per seedling and remaining cultures were moderately resistant. All the eight changed from resistant to moderately resistant, when exposed to five viruliferous GLH per seedling.

Tungro is the most important virus disease of rice (*Oryza sativa* L.) in south and south east Asia. It is a composite disease caused by rice tungro beciilliform virus (RTBV) and rice tungro spherical virus (RTSV). It occurs in epidemic form and spreads very quickly over a large area sometimes causing yield losses even up to 100 per cent. Control of the tungro disease through the application of insecticides to kill the vector is often not effective and is costly. Thus, major emphasis has been given to the identification and utilization of tungro-resistant varieties to control the disease.

MATERIALS AND METHODS

Newly emerged adult GLH were collected using an aspirator and released on the RTV infected T(N)1 plants and confined by using a mylar cage (30x60 cm) for acquiring the virus by the insects. After four days of acquisition access feeding, these viruliferous insects were ready for inoculation. Seedlings of 10 days age were taken, their roots washed free of soil and placed individually in glass tubes with little water. For each rice culture/variety 20 seedlings were taken and replicated thrice. Then into the each test tube (containing single seedling) single viruliferous GLH was released for inoculation access feeding. Immediately the mouth of the test tube was covered with muslin cloth and secured with rubber band. After 24h of inoculation access feeding, the insect was removed using an aspirator and the seedling was transplanted in mud pots. Observations on RTV infection on seedlings were made 21 days after transplanting. Rice seedlings unexposed to viruliferous GLH kept as check. Similar procedure was followed for screening the rice cultures/varieties with increased

level of RTV inoculum by using two and five viruliferous insects per seedling. Rice variety T(N)1 was kept as susceptible check.

Twenty one days after inoculation, the number of infected seedlings of each culture/variety was counted. Based on the percentage of infection, the reaction of each culture/variety was graded by using Standard Evaluation System for Rice (IRRI, 1988).

RESULTS AND DISCUSSION

The degree of resistance of 62 rice cultures/varieties of RTV on artificial inoculation under varying levels of inoculum pressure in glasshouse conditions, revealed the following results.

One viruliferous GLH per seedling

Among the 62 cultures/varieties tested, eight of them were resistant to RTV viz., IR 72, IR 33043-46-1-3, IR 50404-57-2-2-3, IR 52431-60-1-2-1m IR 34686-56-2-2-2, CRM 25, TNAU LFR 842718 and AS 33773 recording a grade value of 3: 18 were moderately resistant recording a grade value of 5: 24 were susceptible with a grade value of 7: and 12 were highly susceptible with a grade value of 9 (Table 1).

Two viruliferous GLH per seedling

When the inoculum pressure was increased to two viruliferous GLH per seedling, three cultures and one variety were resistant to RTV viz., IR 72, IR 33043-46-1-3, IR 50404-57-2-2-3 and IR 52431-60-1-2-1 recording a grade value of 3: 11

Table 1. Reaction of different cultures/variety of rice to RTV.

Culture/Variety	Percentage of RTV infection* IGLH	Scale ^a	Percentage of RTV infection* 2GLH	Scale ^a	Percentage of RTV infection* 5GLH	Scale ^a
IR 72	20.00 (26.57) a	3	25.00 (30.00) a	3	35.00 (36.27) a	5
IR 33043-46-1-3	21.67 (27.71) ab	3	28.33 (32.14) ab	3	40.00 (39.23) ab	5
IR 50404-57-2-2-3	25.00 (30.00) bc	3	30.00 (36.27) b	3	40.00 (39.23) ab	5
IR 52431-60-1-2-1	25.00 (30.00) bc	3	30.00 (36.27) b	3	41.67 (40.20) b	5
IR 34686-56-2-2-2	25.00 (30.00) bc	3	35.00 (36.27) c	5	45.00 (42.13) bc	5
CRM 25	26.67 (31.07) cd	3	35.00 (36.27) c	5	45.00 (42.13) bc	5
TNAU LFR 842718	26.67 (31.07) cd	3	35.00 (36.27) c	5	40.00 (39.23) ab	5
AS 33773	30.00 (33.21) cd	3	40.00 (39.23) d	5	50.00 (45.00) c	5
IR 47761-27-1-3-6	35.00 (36.27) e	5	45.00 (42.13) cf	5	58.33 (49.80) de	7
IR 45131-45-2-2-1-3	35.00 (36.27) e	5	41.67 (40.20) de	5	56.67 (48.84) d	7
IR 45912-9-1-2-2	38.33 (38.24) ef	5	45.00 (42.13) cf	5	63.33 (52.74) efg	7
IR 50363-8-1-1-3	40.00 (39.23) fg	5	43.33 (41.16) def	5	61.67 (51.76) def	7
IR 44538-131-3-1-3	40.00 (39.23) fg	5	45.00 (42.13) cf	5	68.33 (55.77) ghi	7
CR 404-14-1	40.00 (39.23) fg	5	56.67 (48.84) i	7	73.33 (58.93) ijkl	9
IR 50363-27-3-2-3	41.67 (40.20) fgh	5	46.67 (58.09) fg	5	65.00 (53.73) fgh	5
IR 39485-151-2-1-3	41.67 (40.20) fgh	5	50.00 (45.00) gh	5	65.00 (53.73) fgh	7
CR 491-1553	41.67 (40.20) fgh	5	55.00 (47.87) i	7	73.33 (58.93) ijkl	9
CR 30-26-1	43.33 (41.16) ghi	5	55.00 (47.87) i	7	75.00 (60.00) jklm	9
CR 544-1-7	43.33 (41.16) ghi	5	58.33 (49.80) ij	7	75.00 (60.00) jklm	9
TNAU 801793	43.33 (41.16) ghi	5	55.00 (47.87) i	7	68.33 (55.77) ghi	7
TNAU (AC) 88115	45.00 (42.13) hij	5	55.00 (47.87) i	7	70.00 (56.79) hij	7
AS 34011	46.67 (43.09) ijk	5	55.00 (47.87) i	7	71.67 (57.86) ijk	9
IR 44530-41-1-2-1	48.33 (44.04) jkl	5	53.33 (46.91) hi	7	75.00 (60.00) jklm	9
TNAU BPHR 831293	48.33 (44.04) jkl	5	58.33 (49.80) ij	7	70.00 (56.79) hij	7
IR 35346-28-3-3-1	50.00 (45.00) klm	5	61.67 (51.76) jk	7	76.67 (61.14) klmn	9
CR 544-1-6	50.00 (45.00) klm	5	68.33 (55.77) lm	7	81.67 (64.69) nop	9
IR 50363-61-1-2-2	51.67 (45.96) lm	7	63.33 (52.74) k	7	78.33 (62.29) lmno	9
IR 32809 314-2-3-1	51.67 (45.96) lm	7	61.67 (51.76) jk	7	75.00 (60.00) jklm	9
IR 32822-94-3-3-2-2	51.67 (45.96) lm	7	61.67 (51.76) jk	7	78.33 (62.29) lmno	9
IR 34686-179-1-2-1	51.67 (45.96) lm	7	63.33 (52.74) k	7	80.00 (63.43) mnop	9
AS 25370	51.67 (45.96) lm	7	63.33 (52.74) k	7	78.33 (62.29) lmno	9
IR 34583-22-1-2	53.33 (46.91) m	7	68.33 (55.77) lm	7	83.33 (65.95) opq	9
IR 47903-151-3-2-3-2	53.33 (46.91) m	7	65.00 (53.73) kl	7	78.33 (62.29) lmno	9
IR 44482-9-3-1-3	55.00 (47.87) mn	7	65.00 (53.73) kl	7	80.00 (63.43) mnop	9
IR 52287-153-1-1-2	55.00 (47.87) mn	7	65.00 (53.73) kl	7	80.00 (63.43) mnop	9
AS 24717	55.00 (47.87) mn	7	65.00 (53.73) kl	7	75.00 (60.00) jklm	9
TNAU BPMR 831305	55.00 (47.87) mn	7	65.00 (53.73) kl	7	78.33 (62.29) lmno	9
IR 42029-38-1-3-3-2	55.00 (47.87) mn	7	65.00 (53.73) kl	7	80.00 (63.43) mnop	9
IR 49517-23-2-2-3-3	58.33 (49.80) no	7	63.33 (52.74) k	7	83.33 (65.95) opq	9
IR 39323-182-2-3-3-2	58.33 (49.80) no	7	63.33 (52.74) k	7	80.00 (63.43) mnop	9
IET 9762	58.33 (49.80) no	7	65.00 (53.73) kl	7	80.00 (63.43) mnop	9
IR 37721-16-3-1-3-2	61.67 (51.76) op	7	68.33 (55.77) lm	7	83.33 (65.95) opq	9

Table 1. (Contd.).

Culture/Variety	Percentage of RTV infection* 1GLH	Scale ^a	Percentage of RTV infection* 2GLH	Scale ^a	Percentage of RTV infection* 5GLH	Scale ^a
IR 45131-59-2-3-2-3	63.33 (52.74) p	7	70.00 (56.84) mn	7	85.00 (67.40) pqr	9
CR 544-1-2	63.33 (52.74) p	7	75.00 (60.00) op	9	83.33 (65.95) opq	9
IET 9757	63.33 (52.74) p	7	73.33 (58.93) no	9	80.00 (63.55) mnop	9
CR 380-26-39	65.00 (53.73) pq	7	78.33 (62.29) pq	9	85.00 (67.21) pqr	9
IET 9819	65.00 (53.73) pq	7	70.00 (56.79) mn	7	86.67 (68.86) qrs	9
BR 153-2B-10-1-3	65.00 (53.76) pq	7	71.67 (57.86) mno	9	80.00 (63.55) mnop	9
AS 37800	68.33 (55.77) qr	7	80.00 (63.55) qr	9	88.33 (70.12) rst	9
TNAU 851979	70.00 (56.84) rs	7	83.33 (65.95) rs	9	90.00 (71.57) stu	9
IR 32809-26-3-3	71.67 (57.86) rst	9	85.00 (67.21) s	9	90.00 (71.57) stu	9
BG-360-2	71.67 (57.86) rst	9	83.33 (65.95) rs	9	90.00 (71.57) stu	9
AD 85358	73.33 (58.93) st	9	80.00 (63.43) qe	9	88.33 (70.12) rst	9
TM 4309	73.33 (58.93) st	9	83.33 (65.95) rs	9	90.00 (71.57) stu	9
AD 85361	75.00 (60.00) tu	9	81.67 (64.69) qrs	9	91.67 (73.79) tu	9
IR 44482-49-2-2	78.33 (62.29) uv	9	83.33 (65.95) rs	9	90.00 (71.57) stu	9
AD 85469	78.33 (62.29) uv	9	83.33 (65.95) rs	9	90.00 (71.57) stu	9
IET 8059	78.33 (62.29) uv	9	88.33 (70.12) t	9	93.33 (75.24) u	9
IET 9286 (TNAU BFHRE 71390)	78.33 (62.29) uv	9	83.33 (65.95) rs	9	90.00 (71.57) stu	9
AD 86465	80.00 (63.43) v	9	85.00 (67.21) s	9	93.33 (75.24) u	9
AD 86749	83.33 (65.95) w	9	90.00 (71.57) t	9	93.33 (75.24) u	9
T(N)I (Susceptible check)	90.00 (71.57) x	9	100.00 (83.58) u	9	100.00 (83.58) v	9

* Mean of three replications

^a Scale of 0-9 grade based on percentage of infected plants by the Standard Evaluation System for rice 1988.

In a column, means followed by same letter (s) are not significantly different ($P=0.05$) by DMRT.

were moderately resistant, 29 were susceptible and 18 were highly susceptible (Table 1).

Five viruliferous GLH per seedling

When the inoculum pressure was increased to five viruliferous GLH per seedling, eight, 10 and 44 rice cultures/varieties were found to be moderately resistant, susceptible and highly susceptible respectively. None of them were resistant to RTV, when exposed to five viruliferous GLH per seedling (Table 1). These observations suggest that the resistant varieties succumb to the increased inoculum pressure. This is in conformity with the observations made by Tiongco *et al.* (1983) that when the number of GLH was increased from one to five, the reaction of IR 36 and IR 42 was altered

from resistant to susceptible and IR 50 and IR 54 showed reduced level of resistance. Similar results were also obtained by several workers (IRRI, 1983; Sunio and Tryon (1987) reported that the culture IR 33043-46-1-3 was resistant to both RTV and GLH at IRRI.

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