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SUSCEPTIBILITY OF DIFFERENT RICE VARIETIES TO RICE TUNGRO VIRUS (RTV) INFECTION AND ITS RECOVERY BY *NEPHOTETTIX VIRESCENS* DISTANT FROM THE MOST SUSCEPTIBLE HOST

BY

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Among the nine varieties Taichung Native 1 [T(N)1] was found to be most susceptible to Rice tungro virus (RTV) with 80 percent infection and 43.66 percent stunting while IET-2222 was resistant with only 6.66 and 12.03 percent infection and stunting respectively. The other varieties like Jaya, IR-22, Latisail, Ratna, IR-28, Vijoya, IR-20 differed in respect to infection and stunting. The virus required minimum 4 days incubation period in its susceptible host like T (N) 1 for its recovery by the vector *Nephotettix virescens* and rate of recovery increased with the increase of incubation period.

INTRODUCTION

Rice tungro virus (RTV) is becoming a very important disease in all the rice growing states of India and could infect large number of high yielding and tall indica varieties. Tungro infected plants are primarily recognised by its prominent yellow to yellow orange colour with different gradation of stunting depending upon age of the plant at the time of infection, strain of the virus and susceptibility of the host (Rao and Anjaneyulu, 1979 ; Ling and Palomar, 1966 ; Naryanasamy 1972, 1973). The establishment of virus in its host also depends upon genetic character of the variety (Shastry *et al*, 1972).

Tungro epidemic primarily depends upon the susceptibility of the host and transmission efficiency of its vector *(Nephotettix virescens* and *Nephotettix nigropictus)*. Similarly the variation in acquisition and transmission of RTV by its vector may also be influenced by virus concentration, its distribution and age of the plants. Considering the economic importance of the disease present studies were undertaken so as to find out a suitable variety for RTV endemic area. Studies have also been made on recovery of RTV by *N. virescens* from its susceptible host during different periods after inoculation. This information will also help in selecting suitable insecticides for adopting control measures at right time.

MATERIAL AND METHODS

Nine commonly grown rice cultivars *viz.* Taichung (Native) 1, Ratna, IR-28, IR-22, IR-20, Vijoya, Jaya, Latisail and IET-2222 selected for the purpose were seperately raised under insect proof conditions in earthen flat pots of 9" diameter. Seedlings at 20 days old were seperately transplanted and thirty plants of each variety were inoculated by releasing two RTV viruliferous leafhoppers *(N. virescens)* for twenty four hours for inoculation feeding in butyrate cages following the procedure described elsewhere by Mukhopadhyay and Chowdhury (1970). Leafhoppers used for inoculation were made viruliferous by confinding them on RTV infected source plants of Jaya variety for 24 hours. All the nine varieties were inoculated in same way and after inoculation feeding, insects were withdrawn from the test seedling by an aspirator. Inoculated plants were transplanted variety wise in the earthen pots and kept in glasshouse under insect proof conditions for the development of RTV symptoms. Five non-inoculated healthy plants of each variety were also placed with inoculated ones as control. Final observations were recorded 30 days after inoculations and varieties were graded as susceptible, intermediate and resistant following international scale of standard evaluation system for resistance of rice cultivars for tungro disease, developed by International Rice Research Institute (IRRI, 1979). Accordingly, varieties showing 10 percent or less infection were graded as resistant, 11-40 percent as intermediate and 41-100 percent infection as susceptible. To find out significant difference in susceptibility among the varieties, percent infection and percent stunting over control were taken into consideration and data thus obtained was statistically analysed.

To study the recovery of virus from the infected plants T(N)1 variety was selected considering the high susceptibility of this variety to RTV. Seedlings of T(N)1 variety were raised in earthen flat pots under insect proof conditions. At two leaf stage twenty healthy seedlings were inoculated individually by releasing four viruliferous insects per plant for 24 hours in butyrate cages. Considering 24 hours of inoculation feeding time as sufficient period for transmission of RTV, viruliferous insects were withdrawn and at the same time non-viruliferous insects were released as 1st day acquisition feeding. After expiry of 24 hours, insects were withdrawn and released in healthy T(N)1 test seedlings for assessing the virus. Mean while fresh batch of non-viruliferous insects were released on to originally inoculated plants for another 24 hours as 2nd day acquisition feeding and were withdrawn and tested for virus recovery. Similarly acquision and inoculation was carried out after every 24 hours and continued for ten days. All the inoculated test T(N)1 seedlings were raised under insect proof conditions and observation were made for symptom development.

RESULTS AND DISCUSSION

All the nine varieties tested have shown different grades of susceptibility to RTV infection. Percentage of infection and reduction in height due to RTV infection are presented in Table 1. It was observed that T(N)1 is the most susceptible variety to tungro virus infection exhibiting 80% infection with 43.66% stunting while IET-2222 was found to be resistant with minimum of 6.60% infection and 12.03% stunting. However no significant difference was found in percent infection among the varieties like IET-2222, IR-20 and Vijoya, while as T(N)1 was significantly susceptible from all other varieties.

TABLE 1. *Susceptibility of different rice varieties to tungro virus infection*

Variety	*Percentage of infection	*Percentage of stunting
Taichung (Native) 1	80.00 (63.93) a	43.66 (41.43) a
Jaya	53.33 (47.00) b	32.43 (34.70) ab
IR-22	46.66 (42.99) b	30.10 (33.13) ab
Latisail	30.33 (35.21) bc	30.26 (33.31) ab
Ratna	26.66 (30 29) c	42.23 (40.52) ab
IR-28	20.00 (26.07) c	36.70 (37.27) ab
Vijoya	16.66 (23.86) cd	33.36 (35.26) ab
IR-20	13.33 (21.14) cd	26.66 (31.08) b
IET-2222	6.66 (12.28) d	12.03 (16.75) c
C. D. at 5%	12.16	10.33

* Figures in parenthesis show the mean transformed angular values. Mean followed by a common letter are not significantly different at 5% level.

TABLE 2. *Recovery of tungro virus from its susceptible host T(N)1 after different periods of incubation*

Incubation period (in days)	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Percentage of infection*	Nil	Nil	Nil	Nil	20.00	33.30	45.25	60.00	64.62	72.35

* Average of 20 seperate inoculations.

Following the International Scale for tungro evalution system the tested cultivars were grouped as resistant, intermediate and susceptible depending upon their percentage of infection. Thus variety IET-2222 (6.66%) was grouped as resistant, while as IR-20 (13.33%), Vijoya (16.66%), IR-28 (20.00%), Ratna (26.66%), Latisail (33.33%) as intermediate and IR-22 (46.66%) Jaya (53.33%) and T(N)1 (80%) as susceptible.

When the stunting percentage due to RTV infection was considered it was observed that infection percentage and stunting percentage is not proportional except in T(N)1 and IET-2222. Highest percentage of stunting was observed in T(N)1 and it is followed by Ratna (42.23%), IR-28 (36.70%), Vijoya (33.36%), Jaya (32.43%), Latisail (30.26%), IR-22 (30.10%), IR-20 (26.66%) and IET-2222 (12.03%).

The recovery period of RTV in its susceptible host T(N)1 was judged in terms of time required for development of symptoms in test T(N)1 seedlings after regular transmission from source plant at an interval of 24 hours upto ten days through its vector *Nephotettix virescens*. Results presented in Table-2 indicate that RTV required at least 4 days in its susceptible host for initial recovery of virus by its vector. Percentage of recovery as indexed in T(N)1 test seedlings was also varied with the incubation period of the virus in the host. Percentage of infection thus obtained on 5, 6, 7, 8, 9 and 10 days and 10 days after incubation was 20.00, 33.30, 45.25, 60.42, 64.00 and 72.35 respectively. It is apparent that the different varieties of rice differed in their susceptibility to RTV and on the basis of their susceptibility they can be grouped as resistant, intermediates and susceptible. In the present investigation only one varieties namely IET-2222 was found to be resistant, IR-22, Jaya and T(N)1 as susceptible and the remaining were intermediate in regards to RTV infection. Infection percentage of different varieties were statistically analysed and it was found that many of them did not significantly differed with each other.

Further it was noted that there is no correlation between percent infection and percent stunting except in T(N)1 and IET-2222 which confirmed the findings of Rao and Anjaneyulu (1979). The variation in reaction to the infection of RTV exhibited by different varieties may be attributed to the intrinsic character of the varieties. Resistant reaction as observed in IET-2222 could be either due to failure of transmission by the vector or failure of establishment of virus due to genetic character of the variety (Shastry *et al*, 1972).

In regards to recovery of RTV by its vector, Rao and Anjaneyulu (1979) also observed 4 days as latent period of RTV in susceptible variety, while Narayansamy (1972) observed a latent period of 33 hours and 48 hours in ten days old seedlings. These difference in recovery period by different workers may be due to the difference in age of the seedlings, strain of the virus and environmental

conditition. Further more it was observed that the percentage of infection gradually increased as incubation period of virus in its host increased and was variable with large numbers of factors (Ling, 1975). In the present investigation few rice varieties have been screened for RTV and the varieties which showed minimum level of tungra infection should be incorporated in tungro endemic areas. Similarly it is also suggested that suitable insecticides also to be applied in right time considering the recovery period of the virus by its vector.

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