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COMPARATIVE BIOLOGY OF RICE GREEN LEAFHOPPER ON RESISTANT AND SUSCEPTIBLE HOSTS

S. VENNILA [1] and P. C. SUNDARA BABU [2]

The biology of *Nephotettix virescens* (Distant) was studied on 4 rice (*Oryza sativa* L.) varieties *viz.* TKM 9, IR 8, IR 50 and PY 3 having differential reaction to green leafhopper (GLH) and rice tungro virus (RTV) and on an alternate weed host *Cyperus rotundus L.* Among the rice varieties, TKM 9, the variety susceptible to GLH and RTV was more suitable for the development of *N. virescens* favouring higher fecundity, lesser pre-oviposition and incubation period, lower mortality and nymphal duration, prolonged adult longevity and higher sex ratio than IR 8, IR 50 and PY 3. Differential influence was exhibited by IR 8 (resistant to GLH but susceptible to RTV), IR 50 (moderately resistant to GLH but resistant to RTV) and PY 3 (resistant to both GLH and RTV) on various aspects of life history of *N. virescens*. Weed host *C. rotundus* offered more resistance than rice varieties and had not favoured the population build up, though it aided in sustaining GLH.

Biology of the green leafhopper (GLH) *Nephotettix virescens* (Distant), was studied on four rice varieties with differential reaction to GLH and RTV and on a weed host, *Cyprus rotundus L.* to know the effect of these hosts on the life stages of GLH.

MATERIALS AND METHODS

Biology of *N. virescens* was studied on TKM 9 (susceptible to both GLH and RTV), IR 8 (resistant to GLH but susceptible to RTV), IR 50 (moderately resistant to GLH but resistant to RTV) and PY 3 (resistant to both GLH and RTV) and on *C. rotundus* L. at Agricultural College and Research Institute, Coimbatore during 1986. Plants of the 4 rice varieties and weed host were grown individually in 10 cm clay pots. Plants of 25 days old, in clay pots were placed in separate microplots, pots were buried in the soil and four replications were maintained.

One pair of freshly emerged male and female adults from the stock culture was caged on each plant and covered with a cylindrical mylar cage. Observations were made daily, in the early morning hours for the emergence of nymphs.

The period of pre-oviposition and incubation was recorded together. The nymphs that emerged on a particular day were transferred to other plants of the same variety/weed for each of the replications and covered with mylar cages and further

[1] Clare Hall, Herschel Road, Cambridge CBE 9 AL, United Kingdom.
[2] Professor and Head, Department of Agrl. Entomology, Agricultural College and Research Institute Tamil Nadu Agricultural University, Madurai 625 104

observations were made on moulting, nymphal mortality during each instar and nymphal duration. For fixing adult longevity, adults that emerged on a particular day in each of the replications were caged to fresh plants of the same veriety/weed and observed for their mortality daily in the early morning hours. During the transfer to fresh plants, sex of adults was determined and recorded.

RESULTS AND DISCUSSION

The pre-oviposition and incubation period of GLH on TKM 9 averaged 13 days and the period observed was more or less same as reported by Cheng and Pathak (1971) on Taichung Native 1 (TN 1), a GLH and RTV susceptible variety. IR 8 and PY 3 recorded prolonged pre-oviposition and incubation periods equally indicating that varieties with resistance to GLH behaved similarly.

There were no differences in number of nymphs emerged with regard to resistant and moderately resistant entries. But TKM 9, recorded the maximum nymphal emergence (146.0) which is in agreement with the findings of Karim (1978). Nymphal duration for each of the five instars as well as the total duration was the lowest on TKM 9 (17 days) followed by IR 50(21days). Developmental duration was prolonged for the first and second instars on PY 3 than on IR 8 and *vice versa* with regard to third and fourth instars, while it was equal for the last instar, though both the varieties were resistant to GLH. This suggested the differential influence of GLH-resistant varieties on different instars. Total nymphal period indicated that the effect of GLH-resistant varieties was on a par irrespective of the varietal reaction to RTV. Nymphal mortality on TKM 9 and IR 50 had not differed significantly, but was higher on the GLH-resistant variety IR 8. High mortality of GLH on IR 8 was reported to be either due to the possession of toxic materials or lack of nutrients vital for the insect survival (Cheng and Pathak, 1972). Nymphal mortality on PY 3 was significantly higher than even IR 8.

nfluence of varieties on adult longevity was similar regardless of the reaction of varieties to GLH,either moderately resistant or resistant, but the susceptible TKM 9 recorded longer longevity of adults irrespective of sex. Considering the sex, females lived longer than males on TKM 9 and IR 8, the susceptible varieties to RTV. as reported by Anil Kumar, (1983) because females of *N. virescens* were reported to be more efficient than males in the transmission of tungro besides being more aggressive in migration (Shukla and Anjaneyulu 1982). Males had a higher longevity on RTV resistant varieties *viz.*, IR 50 and PY 3. Significantly more males were produced on PY 3, a GLH and RTV-resistant variety and it was reverse on TKM 9, the GLH and RTV - susceptible variety. Almost

equal sex ratios were recorded with regard to IR 8 and IR 50-resistant and moderately resistant, respectively which differed from that of susceptible and resiatant varieties of GLH, indicating the resistance in the veriety as an influencial factor on the sex ratio of the progeny.

Total developmental period of GLH on susceptible and moderately resistant varieties was quicker in TKM 9 (37.8) days followed by IR 50 (43.0) days. On the GLH-resistant varieties the developmental period was markedly delayed. Equal total developmental period observed on IR 8 and PY 3 was quite predictable from the pre-oviposition incubation period and nymphal duration observed for both the varieties.

Various aspects of life history observed on the weed host *C. rotundus* differed significantly from rice varietes by recording longer pre-oviposition and incubation period, lower nymphal emergence, higher nymphal period, lowest longevity of adults, highest total developmental period and lowest sex ratio (Table 1). These factors made the weed unfavourable to GLH. The nymphal mortality on the weed which was lower than on IR 8 and PY 3 alone was the favouring factor. The number of nymphs emerged was also much less from the weed plant. This suggested that *C. rotundus* was more favourable than even the resistant rice varieties. However, the weed plant could act as a host in the absence of rice crop that would aid in sustaining the population though not favouring a high population build up. Also, it might serve as a link host between two crops of the rice in places where a single crop is grown per year. Thus there was a distinct difference in the preference by *N virescens* for the main host than for weed as reported by Anjaneyulu *et al.* (1981)

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REFERENCES

ANIL KUMAR, C. 1983. Resistance in rice to the green leafhopper, *Nephotettix virescens* (Distant), and tungro virus. M. Sc. (Ag.) Thesis, Tamil Nadu Agric. University, Coimbatore. 68 p.

ANJANEYULU, A., V. D. SHUKLA, G. M. RAO and S. K. SINGH. 1981. Perpetuation of rice tungro virus and its vectors. *Intr. Rice Res. Newsl.* 6 (1) : 12–13.

Table 1. Biology of *N. virescens* on different rice varieties and an alternate host plant (Mean of four replications)

Variety / host plant	Preoviposition + incubation period (days)	Nymphs emerged (No. ***)	Nymphal mortality (%) ****	Nymphal duration (days)	Longevity of adults days			Sex ratio male : female	Total developmental period (days)
					Male	Female	Irrespective of sex		
TKM 9	13.0 a	2.16 a (146)	13.86 a (5.76)	17	20.6	23.6	22.1 a	1 : 1.969	37.8 a
IR 8	16.0 bc	1.66 b (46)	32.15 b (28.36)	25	8.9	13.3	11.2 b	1 : 1.238	48.3 b
IR 50	15.5 b	1.80 ab (64)	15.28 a (7.20)	21	13.3	9.0	11.1 b	1 : 1.392	43.0 c
PY 3	16.3 c	1.71 ab (52)	43.08 c (46.64)	25	13.5	10.3	11.9 b	1 : 0.910	47.3 b
Cyperus rotundus L.	20.8 d	1.04 d (11)	20.95 d (13.59)	33	5.1	4.1	4.6 d	1 : 0.527	58.0 d
CD (P=0.05)	2.314**	0.470**	5.530*				1.194**		1.568**

*** Analysis based on logarithmic transformation

**** Analysis based on arc sine $\sqrt{\text{percentage}}$ transformation

Figures in parentheses are actual values.

In a column, means followed by a common letter are not significantly different as per least significant difference test.

CHENG, C. H. and M. D. PATHAK. 1971. Binomics of the rice green leafhopper, *Nephotettix impicticeps*, Ishihara. *Phil. ppines Entomol.*, 2 : 67–74.

CHENG, C.H. and M. D. PATHAK. 1972. Resistance to *Nephotettix virescens* in rice varieties. *J. Econ. Entomol.*, 65 : 1148–53.

KARIM, A.N.M.R. 1978. Varietal resistance to the green leafhopper, *Nephotettic virescens* (Distant). Sources, mechanisms and genetics of resistance. Ph. D. Thesis, University of Philippines, Los Banos, 169 p.

SHUKLA, V. D. and A. ANJANEYULU. 1982. Population and sex ratios of rice green leafhoppers in the rice field. *Sci. & Cult.*, 48 65–66.