

Effect of Different Levels of Nitrogen and Granular Insecticides in the Control of the Rice Leaf Roller, *Cnaphalocrocis medinalis* (Guenee)

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The rice leaf roller damage was found to increase with increasing levels of nitrogen. Among the two granular insecticides tested viz. carbofuran 3 G and phorate 10 G for its control, carbofuran controlled the pest effectively. Increase in the levels of nitrogen necessitated corresponding increase in the dose of carbofuran. Different concentrations of phorate had no influence in controlling the pest.

The introduction and extension of area under high yielding varieties and intensive cultural practices like increased use of fertilizers have significantly altered the insect fauna of rice crop in India. Hence, the use of fertilizers and plant protection chemicals in a scientific way becomes vital in the modern strategy of increasing crop yields. In the present study an attempt was made to study the effect of different levels of nitrogen and insecticides on the incidence and control of the rice leaf roller, *Cnaphalocrocis medinalis* Guenee.

MATERIALS AND METHODS

Two field trials were conducted with the rice variety IR 8 during 1972-74 under randomised block design with three replications. Four levels of nitrogen, viz. 0, 60, 120 and 180 kg, and 0, 60, 180 and 240 kg/ha were included in the first and second year experiments respectively. Nitrogen was

applied in the form of urea in two equal splits, one at the time of planting and the other a month after planting.

Two systemic granular insecticides, viz. carbofuran 3% (Furadan) and phorate 10% (Thimet) were tested under 0.5, 1.5 and 2.5 kg a.i./ha doses in both the trials. The granules were applied on 20th and 50th day after transplanting. The plot sizes were 4 x 2.5 m and 4 x 3.5 m in the first and second year experiment respectively. For assessing the leaf roller damage, total number of affected and healthy leaves were counted in fifty randomly selected plants.

RESULTS AND DISCUSSION

Levels of nitrogen: The incidence of leaf roller on plants receiving different levels of nitrogen is given in the Table I and II. It was found that the damage level increased with increase in the levels of nitrogen in both the experi-

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ments. N_0 level significantly recorded the minimum damage of 12.1 and 15.5 per cent on leaf basis in the two controls in the first year experiment. The maximum injury of over 42.4 per cent was observed under the highest level of 180 kg/ha nitrogen. When the mean incidence, irrespective of the applica-

tion of granular insecticides, was compared, N_0 recorded 11.5 per cent incidence as against 36.7 per cent in N at 180 kg/ha (Table I). In the second year trial, there was no check plot without the insecticide application. Nevertheless, N_0 had the least leaf roller damage of 4.7 per cent in con-

TABLE I. Effect of different levels of nitrogen and insecticides on the incidence of rice leaf roller in the first experiment (1972-73)
(Mean of 15 values)

(Figures in parentheses are transformed values)

% of leaves affected

Levels of nitr in kg/ha	Concentration in kg a. i./ha								Mean for the chemical		
	0.0		0.5		1.5		2.5		Carbofuran	Phorate	Mean
	Carbofuran	Phorate	Carbofuran	Phorate	Carbofuran	Phorate	Carbofuran	Phorate			
N_0 (0)	12.12 (18.68)	15.54 (20.40)	6.42 (18.44)	18.41 (23.94)	1.62 (5.80)	16.96 (21.65)	1.42 (5.06)	19.41 (21.58)	5.40 (10.49)	17.59 (21.89)	11.49 (16.19)
N_1 (60)	18.44 (22.43)	27.57 (28.25)	25.74 (25.45)	47.27 (43.03)	6.05 (13.18)	29.17 (30.78)	4.96 (10.67)	29.89 (30.47)	13.79 (17.93)	33.47 (33.35)	23.63 (25.64)
N_2 (120)	44.63 (42.44)	36.90 (36.01)	22.91 (25.94)	30.72 (30.97)	18.12 (21.15)	43.16 (39.80)	10.82 (15.97)	43.72 (41.19)	24.12 (26.39)	38.12 (36.99)	31.37 (31.69)
N_3 (180)	42.37 (41.37)	42.41 (40.87)	39.60 (38.65)	45.40 (42.65)	18.08 (22.68)	39.02 (46.65)	9.02 (14.78)	47.90 (45.98)	27.27 (29.37)	46.18 (44.04)	36.72 (36.70)
Mean	29.39 (31.23)	30.61 (31.45)	23.66 (25.62)	35.46 (35.80)	10.97 (15.70)	34.58 (34.72)	6.56 (11.62)	35.23 (34.81)	17.64 (21.04)	33.97 (34.07)	25.81 (27.55)

Comparison of significant effects	Level of significance	C. D. (P=0.05)
Between insecticides	0.01	6.94
Between nitrogen levels	0.01	5.00
Between insecticides and concentrations	0.01	1.99
Between nitrogen levels and insecticides	N. S.	—

trast to 12.7 per cent in N at 240 kg/ha (Table II). Similar results of increased incidence of the leaf roller with increasing levels of nitrogen has been reported by Michaelraj and Morachan (1973), Chandragiri *et al.* (1974) and Subbiah and Morachan (1974). The insect might prefer plants receiving more N for better development and

reproduction resulting in greater levels of damage. Increased level of damage might also be due to succulent growth of plants, and favourable micro-climate for the insect due to luxuriant crop growth.

Levels of Insecticides: Among the two granules tested, carbofuran

TABLE II. Effect of different levels of nitrogen and insecticides on the incidence of leaf roller in the second experiment (1973-74)
(Mean of 12 values)

(Figures in parentheses are transformed values)
% of leaves affected

Nitrogen level in kg/ha	Concentration in kg a. i./ha						Mean		
	0.5		1.5		2.5		Carbofuran	Phorate	Mean
	Carbofuran	Phorate	Carbofuran	Phorate	Carbofuran	Phorate			
N ₀ (0)	1.82 (5.38)	7.86 (12.89)	0.86 (3.47)	5.17 (9.70)	0.22 (1.31)	12.46 (16.42)	0.96 (3.38)	8.49 (13.00)	4.72 (8.19)
N ₁ (120)	2.65 (7.84)	14.01 (17.91)	1.06 (4.25)	22.85 (22.75)	0.86 (3.90)	10.15 (15.35)	1.52 (5.33)	15.67 (18.67)	8.59 (12.00)
N ₂ (180)	3.91 (9.01)	28.53 (28.03)	1.26 (4.54)	17.46 (20.51)	0.92 (2.04)	17.32 (19.53)	2.03 (5.19)	21.10 (22.69)	11.56 (13.94)
N ₃ (240)	10.01 (13.96)	26.34 (30.73)	1.17 (4.74)	21.94 (23.76)	2.32 (6.87)	14.69 (19.05)	4.50 (8.52)	20.99 (24.51)	12.74 (16.51)
Mean	4.59 (9.04)	19.18 (22.39)	1.08 (4.25)	16.86 (19.18)	1.08 (3.53)	13.65 (17.58)	2.25 (5.60)	16.56 (19.71)	9.40 (12.66)

Comparison of significant effects	Level of significance	C. D. (P=0.05)
Between insecticides	0.01	11.61
Between nitrogen levels	0.01	3.95
Between insecticides and concentrations	N. S.	—
Between nitrogen levels and insecticides	0.01	3.76

significantly and consistently recorded lesser leaf roller damage in both the experiments. Carbofuran treated plots recorded a mean damage of 17.6 and 2.3 per cent as against the 34.0 and 16.6 in phorate treated plots in the I and II experiments respectively. Among the two various concentrations tested in both the granules, carbofuran at 2.5 kg a.i./ha recorded the minimum injury of 1.4 and 0.2 per cent. The damage level was found to decrease from 39.6 to 9.0 per cent and 10.0 to 2.3 per cent with increasing concentration of carbofuran in the first and second year experiments. On the contrary, the different concentrations of phorate had no influence in controlling the pest, and all of them were statistically on par with each other (Table I). Similar results of decreased leaf roller damage with increasing concentration of carbofuran and higher incidence of the leaf roller in phorate treated plot have been reported by Jayaraj *et al.* (1976) and Lakshmanan and Jayaraj (1976). Further, Ashworth *et al.* (1970) reported the translocation of C^{14} labelled carbofuran in tobacco to leaves without accumulating in the roots. This might be attributed for the lesser infestation of the leaf roller in carbofuran treated plots, as the leaf roller damage mostly occurs in the terminal leaves.

Nitrogen levels and insecticides: The interaction between different nitrogen levels and insecticides was statistically significant in the second year experiment only. Under all levels of nitrogen, carbofuran recorded lesser damage than phorate.

Both the chemicals exhibited increasing damage with increasing nitrogen level (Table II). In carbofuran treated plot the damage was found to vary slightly from 1.0 to 4.5 per cent with increasing levels of nitrogen. In spite of the steep increase in the levels of nitrogen, the corresponding leaf roller damage was not so high in carbofuran treated plot, indicating the effectiveness of the chemical at all levels of nitrogen. Because of this fact N_0 , N_1 and N_2 nitrogen levels and again N_1 , N_2 and N_3 were statistically on par with each other (Table II). But in phorate treated plot percentage of infestation was in proportion to the corresponding increase in the levels of nitrogen. Hence, under phorate treated plots, the lower levels of nitrogen were on par with each other and were statistically independent from the higher doses. The higher levels of nitrogen were again on par with each other indicating that the leaf roller was found to increase with increasing levels of nitrogen under phorate treatment.

It is, therefore, obvious that for the control of leaf roller, adoption of lesser level of nitrogen will have least infestation. If the nitrogen level is increased, a corresponding increase in the dose of carbofuran is also necessary. The chemical phorate under varying concentrations has no effect in controlling the pest.

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REFERENCES

- ASHWORTH, T., RONALD, and J. S. THOMAS, 1970. Uptake and translocation of carburefuran in tobacco plants. *J. econ. Ent.* 63 : 30-64.
- CHANDRAGIRI, K.K., R.VELUSAMY, I.P. JANAKI and M. S. RAMAKRISHNAN, 1974. Effect of different levels of nitrogen on rice leaf roller *Cnaphalocrocis medinalis* incidence. *Madras agric. J.* 61 : 717.
- JAYARAJ, S., N. CHANDRAMOHAN and R. SANKARANARAYANAN, 1976. Control of rice stem borer, leaf roller and gall midge through water surface application of granular insecticides. *Madras agric. J.* 63 : 308-11.
- LAKSHMANAN, P. L. and S. JAYARAJ, 1976. Control of rice gallfly by water surface application of granular insecticides with special reference to timing of application. *Madras agric. J.* 63 : 299-303.
- MICHAELRAJ, S. and Y. B. MORACHAN, 1973. Effect of fertilisation and Diazinon application on the incidence of stem borer and leaf roller on rice. *Madras agric. J.* 60 : 431-35.
- SUBBIAH, K. K. and Y. B. MORACHAN, 1974. Effect of nitrogen nutrition and rice varieties on the incidence of rice leaf roller (*Cnaphalocrocis medinalis* Guen.). *Madras agric. J.* 61 : 716.