INCIDENCE OF INSECT PESTS ON RICE CROP UNDER VARIOUS NITROGEN DOSES

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ABSTRACT

To investigate the effect of different doses of Nitrogen fertilizer on the incidence of rice insect pests, the experiments were conducted at six locations. The lowest percent infestation of stem borers was recorded in the treatment where nitrogen was not applied at all but the yield was also adversely affected. The pest incidence in LCC based N application treatment was at par with the treatments without Nitrogen with highest yield. The crop with 120 Kg/ha nitrogen application showed highest susceptibility to insect pests with the highest pest incidence. There was significant yield improvement in LCC based nitrogen application (92 Kg N/ha). With further increase in N (100Kg/ha) the yield became stagnant and at 120 Kg N/ha, it start declining but remained at par with LCC based N application. The results further reveal that excessive use of N fertilizers to the crop is the wastage of resources that pose serious effects on crop health in the form of pest incidence. Optimizing the dose of nitrogen in relation with other macronutrients and its split applications are extremely essential because high nitrogen makes tissue vulnerable to pest attack.

Key words: Pests, Rice, Nitrogen fertilizer, stem borer, basmati

INTRODUCTION

Rice crop is attacked by 70 species of insect pests in Pakistan (Hashmi, 1994). Of these, Stem borers, white backed planthopper, leaffolder and grasshoppers are the pests of economic importance (Saleem, 2002). It has been estimated that these pests cause 25-30% losses to the crop annually (Ahmad, 1987; Inayatullah *et al*., 1989 and Salim *et al*, 2001). Only the stem borer species viz; *Scirpophaga innotata* (Wlk), *Scirpophaga incertulas* (Wlk) and *Sesamia inferens* may cause 4-5% losses to paddy crop every year (Ramzan *et al*, 1988). These losses may go upto 70 to 90% during the years of severe devastations. Out of the species listed above, the first two have been reported to be the most destructive in the rice growing areas of the Punjab and cause serious losses to this lucrative crop (Salim *et al*, 2004).

Leaffolder, *Cnaphalocrosis medinalis* Gn has inflicted severe losses on paddy crop since its epidemic outbreak in 1989 (Rehman *et al*, 2003). Ramzan *et al* (1992) ranked it as one of the major rice pests. In normal years, the pest causes 15-25% yield losses in basmati rice in Pakistan.

White backed plant hopper, *Sogatella furcifera* is also one of the major pests of rice in Pakistan (Ashfaq *et al*, 2005). It cause 7-10% paddy yield losses every year but in the years of severe devastations, the pest may destroy the crop completely by causing hopper burns. The pest inflicts more damage on coarse rice varieties than on basmati rice. However, in the favourable environmental conditions, it causes hopper burn even in basmati fields. In the past various insecticidal trials have been conducted for the control of these insect pests. These pesticides have posed hazardous effects on human being and animals. These also cause environmental pollution problems. There was a dire need to explore other means of pest management and fertilizer management was seemed the basic and unexplored point in this regard.

MATERIALS AND METHODS

In order to explore the effect of various N fertilizer doses on the incidence of rice insect pests the experiments were conducted in randomized complete block design in three replications with a plot size of 5m x 10m at six different locations viz; Kala Shah Kaku, Shahbaz Farm, Nangal Kus Wala (Distt. Sheikhupura) and Sahhoke & Adaptive Research Farm (Distt. Gujranwala). Rice variety Super

Table-1: Fertilizer treatments, method and time of application

Treatments (NPK Kg/ha)	Method and time of N Fertilizer application
0-60-60	No N fertilizer application
80-60-60	N fertilizer in two splits i.e.(1)23Kg N/ha at transplanting (2) 57 Kg N/ha at mid tillering (35DAT)
100-60-60	N fertilizer in three splits i.e. (1) 30Kg N/ha at 15DAT (2) 35Kg N/ha at 35 DAT (3) 35Kg N/ha at 50DAT
120-60-60	N fertilizer in three splits i.e. (1) 40Kg N/ha at transplanting (2) 40Kg N/ha at 35 DAT (3) 40Kg N/ha at 50DAT
LCC-60-60	23 Kg N/ha at transplanting. Nitrogen application through leaf colour chart till flowering each split of 23 Kg N/ha

Observations on insect pest incidence were recorded at fortnight intervals.

Basmati was transplanted at 20x20 cm spacing. Fertilizer treatments, method and time of application are given in Table-1. Source of fertilizer was urea, triple super phosphate and murate of potash.

Incidence of stem borers and leaffolder were recorded with the help of quadrat ($1m^2$) randomly at three different sampling sites in each treatment. Population of white backed plant hopper was recorded with the help of hand net, 10 sweeps from three different sampling sites in a treatment were taken. Data were analyzed statistically using Fishers analysis of variance technique (Steel *et al*., 1997).

RESULTS AND DISCUSSION

Stem borers, Leaffolders and white backed planthopper were observed major pests damaging the crop. Detail of their incidence on crop is given in Table-2.

Stem borers: The results indicate that the lowest percent incidence of stem borers was in the treatment where nitrogen was not applied at all that was at par with leaf colour chart (92 Kg / ha in three splits). The results further show that the pest incidence increases with the dose increase of nitrogen fertilizer application. The highest incidence (1.8%) of stem borers was recorded in 120 Kg/ha nitrogen application treatments. These findings are in accordance with Singh *et al* (1990) who reported that NPK ratio of 120-60-60 Kg/ha increased the susceptibility of rice crop to rice stem borers. Saha and Saharia (1970) reported the incidence of stem borers from 8.36% in plots without nitrogen fertilizer to 20.12% in those treated with 100 Kg/ha.

Table-2: Effect of different doses of nitrogen fertilizer on the incidence of rice insect pests

Treatments (NPK Kg/ha)	Stem Borers (%)	Leaffolder (%)	WBPH/ 10 sweeps
0-60-60	0.3 d	0.77 e	30.16 d
80-60-60	0.67c	2.88 c	45.00 c
100-60-60	0.9 b	4.38 b	105.00 b
120-60-60	1.8 a	5.21 a	122.16 a
92-60-60 (LCC)	0.27 d	1.36 d	34.00 cd
LSD	0.1786	0.4125	13.02

Leaffolder: The lowest percent incidence (0.77%) of leaffolder was recorded in the plots without nitrogen that tends to increase with the increase of nitrogen application. The highest pest incidence (5.21%) was noted in the plots with 120Kg N/ha. The lowest incidence (1.36%) of leaffolder was observed in the plots where nitrogen was applied on leaf colour chart basis (92 Kg N/ha in three splits). The findings are in agreement with Ramzan *et al*. (1992) who stated that high infestation of pest is correlated with the high use of nitrogenous fertilizers. They further advocated that split applications of nitrogen should be applied only when it is absolutely required and suggested it as the most appropriate and successful strategy of pest management.

White backed planthopper: The incidence of white backed plant hopper in the plots without nitrogen application was the lowest followed by the plots treated with nitrogen on the basis of leaf colour chart. The pest incidence increased with the increase of nitrogen application. The highest population (122.16) per 10 sweeps was noted in the plots with NPK 120-60-60 Kg/ha. Pest population in 100 Kg N/ha plots was also high and was at the level to cause economic losses to the crop. The pest incidence in plots with 80 Kg N/ha was below the economic threshold level and followed by LCC based nitrogen application plots. The results indicate that optimizing the dose of nitrogen in relation with other macronutrients and its split applications are extremely essential as high nitrogen makes tissues vulnerable to pest attack.

Paddy yield (t/ha): The results reveal that the plots without nitrogen application produced the lowest yield (3.54t/ha). There was significant increase in yield with the increase of nitrogen application upto 100 Kg/ha but beyond that there was no significant increase in yield was observed (Table 3). These results are in accordance with Srivastava (1992) and Litsinger (1994) who reported that optimum dose of nitrogen with proper splitting into basal and top dressing yield increase with concomitant reduction in quantity of nitrogen was obtained on farmers fields.

Table-3: Effect of different doses of nitrogen fertilizer on Cost Benefit Ratio

Treatments	Yield (t/ha)	Cost/ha (Rs)	Income (Rs)	Benefit (Rs)	C.B.R
00-60-60	3.54 c	36715	52380	15665	1: 1.43
80-60-60	3.95 b	39328	58018	18690	1: 1.48
100-60-60	4.42 a	40636	64480	23844	1: 1.59
120-60-60	4.33 a	40949	63243	22294	1: 1.54
92-60-60 (LCC)	4.43 a	40490	64618	24128	1: 1.60

Means sharing a letter in common do not differ statistically (p=0.05)

Cost benefit ratio: The highest cost benefit ratio was observed in LCC based nitrogen application treatment (1: 1.60) that was almost at par with 100 Kg N /ha. The lowest ratio was recorded in 0 N followed by 80 Kg N /ha. The cost benefit ratio in 120 Kg N /ha was

comparatively lower than LCC treatment. The results further reveal that excessive use of nitrogen has no positive effects on yield but also wastage of resources (Table3).

REFERENCES

Ahmad, M. (1987). Serious attack of stem borers of rice crop at Gujjo (Sind, Pakistan). Pakistan J. Agri. Rws. 8: 355.

Ashfaq, M., Mansoor-ul-Hassan and M. Sagheer. (2005). Integrated pest management of rice insect pests with special reference to biological control. Proc. Int. Seminar on rice crop. Oct.2-3, 2005. pp: 239-249.

Hashmi, A. A. (1994). Insect pest of paddy rice. In Insect pest management of cereal and cash crops. Pakistan Agricultural Research Council, Islamabad. pp: 1-59.

Inayatullah, C., Ehsan-ul-Haq, Ata-ul-Mohsin, A. Rehman and P. R. Hobbs. (1989). Management of stem borers and the feasibility of adopting zero tillage in wheat. Pakistan Agri. Res. Council, Islamabad, Pakistan.

Listinger, J. A. (1994). Chemical, Mechanical and physical control of rice pest. In Biology and Management of Rice Insects. (ed. Heinrichs, E. A.). IRRI. Wiley Eastern Ltd., pp.549-584.

Ramzan, M., Mann, R. A. and Chatha, M. R. (1992). Leaffolder: The most deleterious pest of rice. Pakistan and Gulf Economist: 15-21.

Ramzan, M., M. C. Shaukat, M. Ismail and A. Majid. 1988. Influence of different rice based cropping patterns on the survival of stem borers. Pakistan Entomol. 10(1-2): 83-85.

Rehman, A., M. Salim and M. Ramzan. (2003). Integrated management strategies for leaffolder: A major pest of rice in Pakistan. Booklet. Pub. Rice Programme, NARC-PARC, Islamabad, 2003. pp. 8.

Saha, N. N. and D. Saharia, (1970). Effects pf dates of transplanting and levels of nitrogen on the incidence of stem borer, Tryporyza incertulas (Wlk) in paddy in Assam. Indian J. Entomology. 32(3): 225-229.

Saleem, M., M. Ramzan, Z. Manzoor and I. Ali. (2004). Effect of various tillage practices on the population of hibernated stem borer larvae in rice-wheat cropping systems. J. Anim.Pl. Sci.14(1-2):14-15

Salim, M. (2002). Final Technical DFID Project Report. Tillage by nutrient interaction in rice-wheat system, NARC, Islamabad. pp.13-25.

Salim, M., S. A. Masud, and M. Ramzan. (2001). Integrated insect pest management of Basmati rice in Pakistan. In Speciality rices of the world breeding, production and processing. FAO Rome, Italy

Singh, Y. P., B. Baba, and N. D. Pandey, (1990). Chemical control of Sesmia inferens Wlk. In wheat crop. Indian J. Entomology. 52 (3): 431-434.

Srivastava, S. K. (1992). Farmers' perception on constraints in rice wheat system. In Rice-Wheat cropping system (eds. Pandey, R. K., Dwivedi, B. S. and Sharma, A. K.). Proceeding of the Rice- Wheat workshop held on 15-16 October, 1990 at Modipurum, Project Directorate for cropping System Research. Modipurum, Meerut, India, pp. 109-202.

Steel, R. G. D., J. H. Torrie and D.A. Dickey (1997). Principles and Procedures of statistics. (3rd Edition) Mc Graw Hill Book Co. Inc. Singapore. pp: 172-177.