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EFFECT OF DIFFERENT APPLICATION METHODS AND NITROGEN LEVELS ON YIELD AND YIELD COMPONENTS OF FINE RICE (BASMATI-385)

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The study conducted during two consecutive seasons in 1996 and 1997 showed that fertilizer application by point placement method resulted in higher grain yield of Basmati-385 than with broadcast method. Nitrogen used @ 80 kg ha^{-1} appeared to be optimum to get higher grain yield followed by nitrogen level of 120 and 40 kg ha^{-1} in a descending order. Correlation between grain yield and yield components was significant and positive.

Key words: fine rice, yield and yield components

INTRODUCTION

Rice *(Oryza sativa* L.) is the principal food crop of more than half of the world population and is the major source of livelihood of the rural population living in tropical and subtropical areas of Asia, Africa and Latin America. In these areas, population increases are high and rice will continue to be the primary source of food. Nitrogen is expected to play a continued key role in sustaining high yield of fine rice. Numerous research trials on nitrogen-use efficiency have indicated that only 30-40% of applied N is utilized by rice plant and in many cases it is even less (Ali, 1989).

The low recovery of applied nitrogen by rice plant is considered to be due to the losses of nitrogen from the soil-plant system. The potential loss mechanisms are ammonia volatilization, denitrification, run off and leaching (Crasswell and Vlek, 1982). It has been documented that with proper application method and optimum N level, efficiency of N utilization in rice can be increased. The present study was conducted to determine the nitrogen-use efficiency under different methods of application to rice under the agro-climatic conditions obtaining at Faisalabad.

MATERIALS AND METHODS

The study was conducted at the Agronomic Research Area, University of Agriculture, Faisalabad during 1996 and 1997. The soil of experimental field was sandy-clay loam in texture with pH of 7.9, organic matter 0.75%, total nitrogen 0.049%, available P_2O_5 6.55 ppm and available K_2O 167.50 ppm. The experiment was laid out in a split plot design with 4 replications. The net plot size measured 2x3 m. Treatments comprised two application methods, M1 (broadcast) and M2 (point placement) and four nitrogen levels N0, N1, N2 and N3 representing 0, 40, 80 and 120 kg N ha^{-1}. Nitrogen application methods were placed in main plots while nitrogen levels in subplots. All phosphorus and potassium, each @ 60 kg ha^{-1} were given as a basal treatment while nitrogen was applied in three equal splits.

Point placement method involved nitrogen application by placing urea (wrapped in tissue paper) manually in the center of four hills in alternate rows. The placement depth was kept at 10 cm below ground level by a simple device made with an iron rod. Fisher's analysis of variance technique and LSD test at 5% level of probability were the main statistical measures used in this study (Steel and Torrie, 1984).

RESULTS AND DISCUSSION

The results have been summarized in Table 1. Both the nitrogen application methods and nitrogen levels, significantly influenced the yield and yield attributes. Point placement method produced higher grain yield (3.74 t ha^{-1}) than broadcast (3.55 t ha^{-1}), In 1996, 80 kg ha^{-1} resulted in higher grain yield (4.65 t ha^{-1}) than rest of the treatments. The yields with other treatments were N3(4.33 t), N1 (3.80 t) and N0 (3.20 t) showing significant differences among them. The trend showed that grain yield increased linearly from control to N2 whereas at a higher level of nitrogen (N3) it decreased. The same trend was observed in 1997. However, N1 and N3 although gave higher grain yield than control and lower than N2, but did not differ significantly from one another.

Higher grain yield in N application method M2 may be due to higher number of tillers hill-i, panicle bearing tillers, number of spikelets panicle! and higher 1000-grain weight recorded in this treatment. Higher grain yield recorded with nitrogen level N2 might as well be due to higher number of spikelets and higher 1000-grain weight observed in this treatment. These results are supported by those of Kandaswamy and Palaniappan (1990), Gill *et al.* (1991) and Nair and Gautam (1992) who noted a linear increase in rice grain yield with graded levels of nitrogen.

Simple linear correlation coefficients (r) were calculated to determine the degree and nature of relationship between dependent and independent variables. There was a non-significant positive correlation between grain yield and panicle bearing tillers hill! (r = 0.881). There was a positive and significant correlation between grain yield and spikelets panicle! (r = 0.990) and grain yield and 1000-grain weight (r= 0.970) in the year 1997.

Table 1. Effect of application methods and nitrogen levels on yield and yield components of fine rice (Basmati-385)

Treatments	[illegible]		Panicle bearing tillers hill^{-1}		Number of spikelets panicle^{-1}		1000-grain weight (g)		Grain yield (t ha^{-1})	
	1996	**1997**	**1996**	**1997**	**1996**	**1997**	**1996**	**1997**	**1996**	**1997**
A. Application methods										
M1= Broadcast	10.36*b	9.56b	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.98	3.55b
M2= Point placement	11.11a	10.31a	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.02	3.74a
LSD (5%)	0.34	0.47	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	NS	0.13
B. Nitrogen levels (kg N ha^{-1})										
N0= 0	8.44d	7.78d	8.00d	7.65d	95.23C	91.050d	19.10c	18.20d	3.20d	2.85c
N1=40	10.26c	1.00c	10.08c	9.82c	111.98 b	108.06b	21.20b	20.15b	3.80c	3.79b
N2=80	11.51b	10.52b	11.28b	10.35b	113.39a	112.94a	22.05a	21.03a	4.65a	4.10a
N3=120	12.70a	11.61a	12.55a	11.44a	111.10b	106.32c	20.88b	19.85c	4.33b	3.86b
LSD (5%)	0.71	0.50	0.77	0.51	1.29	1.76	0.40	0.22	0.12	0.10

NS= Non-significant; *means followed by different letters in a column are significantly different at 0.05 P.

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