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IMPACT OF NITROGEN LEVELS AND ITS APPLICATION METHODS ON YIELD AND KERNEL QUALITY OF FINE RICE

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The impact of nitrogen levels and its application methods on yield and kernel quality of fine rice was assessed. The results indicated that point placement method of nitrogen application led to higher grain yield of fine rice than with broadcast method. Nitrogen level N2 i.e. 80 kg ha-! appeared to be optimum to get higher grain yield. Application methods in general, had non-significant influence on quality characteristics studied, while nitrogen used @ 80 kg ha-! gave higher percentage of seed protein and amylose. Alkali spreading value was non-significantly affected both by application methods and nitrogen levels.

Key words: fine rice, yield and kernel quality

INTRODUCTION

The increasing importance of quality is apparent from recent shifts in research emphasis. Of course, the importance of quality varies across countries. It is less important as breeding and management objective where rice self-sufficiency is the permanent goal but it is more important where market competition is vital.. In Pakistan, Basmati rice is a major source of foreign exchange earnings. At present, Pakistan is earning nearly 264 million USD annually from rice export (Anonymous, 1996-97).

Among various quality parameters, nutritional value and milling deserve more attention since these determine the market acceptability. Rice is one of the most important of all the cultivated plants with respect to consumption by humans. Rice grain contains 73.4-80.8% carbohydrates (mainly starch) and 5.5-9.3% protein (Deshaprabhu, 1966), which under normal conditions are genetically controlled but appropriate cultural and management practices do contribute to improved kernel quality. The present study was carried out to ascertain the response of yield and kernel quality to different nitrogen levels and its application methods.

MATERIALS AND METHODS

Some of the details pertaining to this section have been given in Khalid *et al.* (1999). Twenty-five days old seedlings of rice variety Basmati-385 were transplanted in 1st week of July in both the years at a spacing of 20x20 cm in a net plot size 2x3 m with one seedling hilP. Seed protein content was determined by measuring Kjeldhal nitrogen and multiplying it by the factor 6.25 (Jacobs, 1956). Amylose content was estimated according to Juliano (1971). Alkali spreading value was determined according to the method of Jones (1938). Statistical techniques employed in this study comprised Fisher's analysis of variance and LSD test at 5% level of probability (Steel and Torrie, 1984).

RESULTS AND DISCUSSION

Grain Yield: Data given in Table 1 showed that in 1996 the effect of application methods on grain yield was non-significant. In 1997, application method M2 produced higher grain yield (3.74 t ha-') than Ml (3.55 t ha-'). Nitrogen level N2 resulted in higher yield 'Compared with rest of the treatments in both the years. Higher grain yield obtained with M2 may be attributed to minimum N losses due to its prolonged availability. These results agree with those of Gill *et al. (1991).*

Protein Content: Protein is one of the most important determinants of grain quality in rice. Protein content was significantly influenced by nitrogen levels in both the years of study. In 1996, seed protein content was higher (8.81%) with nitrogen treatment N2 than with rest of the nitrogen treatments. Seed protein content behaved similarly in 1997 too.

Amylose Content: Amylose content is important because it has a marked effect on the cooking and palatability characteristics. Table 1 showed that in 1997, application method M2 produced higher value of amylose content (21.72%)

Table 1.. Impact of nitrogen application methods and nitrogen levels on yield and kernel quality of fine rice

Treatments	Grain yield (t ha-')		Protein content (%)		Amylose content (%)		Alkali spreading value (%)	
	1996	1997	1996	1997	1996	1997	1996	1997
A. Application methods								
M1= Broadcast	3.98*	3.55b	7.87	8.02	22.08	21,64b	4.246	4.267
M2= Point placement	4.02	3.74a	8.06	8.08	22.16	21,72a	4.342	4.371
LSD	NS	0.13	NS	NS	NS	0.04	N&	NS
B. Nitrogen levels (kg ha·ˡ)								
NO=0	3.20d	2.85c	7.06d	7.17d	20,46c	20.13c	4.238	4.300
N1=40	3.80c	3.79b	7.74c	7.83c	22.22b	21,77b	4.313	4.300
N2=80	4.65a	4.10a	8.81a	8.89a	23.52a	23.03a	4.325	4.346
N3=120	4.33b	3.86b	8.25b	8.32b	22.27b	21,80b	4.300	4.329
LSD	0.12	0.10	0.23	0.13	0.16	0.18	NS	NS

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

than M1 (21,64%). In 1996, nitrogen level N2 produced higher amylose content (23.52%) compared to rest of the nitrogen treatments. Nitrogen levels NI and N3 resulted in 22.22 and 22.27% amlylose, being non-significantly different from each other. In 1997 too, higher amylose content was noted with N2 (23.03%) followed by those of NI (21,77%) and N3 (21.80%), both being statistically equal. Amylose content was the lowest (20.13%) with NO.

Alkali Spreading Value: Alkali spreading value is determined by alkali degradation test which is applied to parboiled rice (Arai *et al.,* 1975). The grains are treated for the test with a very dilute alkali. The degradation is then observed the next day. Raw rice grains remain unaffected while samples of parboiled rice are degraded. The extent of degradation being proportional to severity of parboiling. Table 1 showed that the alkali spreading value was not significantly affected either by nitrogen application methods or by nitrogen levels.

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