EFFECT OF DIFFERENT NITROGEN LEVELS ON YIELD AND YIELD COMPONENTS OF FINE GRAIN ADVANCE RICE LINE PK 8677-18-7-1-14.

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ABSTRACT: An experiment was conducted during the kharif seasons (from May to November) for two successive years i.e. 2010 and 2011 in research block of Rice Research Institute, Kala Shah Kaku to assess appropriate nitrogen fertilizer dose for maximum paddy yield production of a new advanced fine grain rice line PK 8677-18-7-1-14. Six nitrogen levels i.e. 0, 110, 133, 156, 179, and 202 kg ha^{-1} were applied. Agronomic parameters like Plant height, tillers count per plant, panicle length, grains per panicle, 1000 grain weight and yield increased with application of nitrogen from 0 to 133 N kg ha^{-1}. Above this level, paddy yield and all the yield components remained at par with each other, showing that the dose of 133 nitrogen kg ha^{-1} was optimum for obtaining maximum yield of this rice line.

Key words: Rice line PK 8677-18-7-1-14; nitrogen levels; yield components; paddy yield.

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INTRODUCTION

Rice is very important food and cash crop of our country which holds about 11% of total cultivated cropped area. Rice is planted on 2.79 million hectares and produced 6.798 million metric tons of milled rice (Anonymous I. 2013-14). In the world, Pakistan is among the major rice exporting country after Thailand, Vietnam and United States earns 1.667 billion US$ foreign exchange from its export during 2013-14 (Anonymous I. 2013-14).

The province of Punjab is the chief rice producer in Pakistan and it contributes 63% to the national rice production. During 2013-14, it covered 1.78 million hectares area under rice crop having production of 3.42 million tons (Anonymous II. 2013-14). Rice yield of different varieties is much lower than their actual potential. Many reasons are responsible for creating difference between existing and potential yields one of them is poor nutrient status of our soils. For higher production the use of plant nutrients especially nitrogen is very important (Ahmad, 1992).

Now a day's world is encountering the shortage of major fertilizer nutrients especially nitrogen. Pakistan is facing severe shortage of nitrogenous fertilizers however the significance of increasing nitrogenous fertilizers use and its effectiveness cannot be ignored even when its supply is adequate. Yield and quality of rice was remarkably affected by the application of nitrogen either in large quantity or less than best feasible rate. Therefore utilization of crop nutrition at optimum rates is very important (Manzoor *et al.*, 2006).

Rice yield increased considerably between ranges of 90-250 Kg ha^{-1} nitrogen application (Meena *et al.*, 2003; Mirnia *et al*., 2005; Manzoor *et al.*, 2006; Quanbao *et al*,. 2007; Hirzel *et al*., 2011; Li *et al.*, 2011; Roshan *et al.*, 2011; Salem *et al.*, 2011; Youseftabar *et al.*, 2012; Pramanik *et al*., 2013; Tayefe *et al*,.2014 and Tari and Amiri., 2015). The plant height was increase with nitrogen supply up to 175 kg ha^{-1} (Singh and Sharma., 1987; Manzoor *et al.*, 2006; Pramanik *et al*,. 2013 and Tayefe *et al.*, 2014). Increase in nitrogen fertilizer supply boosted the tillers count per plant was observed by Awan *et al*., 2011; Salem *et al.*, 2011; Pramanik *et al*., 2013 and Tayefe *et* al., 2014. By increasing rate of nitrogen application up to 150 kg ha^{-1} increase in spike length was studied by Rafey *et al.*, 1989; and Pramanik *et al*,.2013. Youseftabar *et al.*, 2012 and Pramanik *et al*,.2013 found a significant increase in number of grains per panicle and 1000-grain weight by enhancing nitrogen dose. This study was planned to determine the best possible dose of nitrogen to exploit the maximum potential of a new advanced fine grain rice line PK 8677-18-7-1-14.

MATERIALS AND METHODS

Field trial was planned in the kharif seasons for two successive years i.e. 2010 and 2011 in Rice Research Institute, Kala Shah Kaku, Sheikhupura, The purpose of the experiment was to find out the appropriate dose of nitrogen for a new advanced fine grain rice line PK 8677-18-7-1-14. The experimental vicinity was analyzed for physio- chemical properties (Table 1). Nitrogen, phosphorous and potassium were obtained from Urea, DAP and SOP respectively. Nitrogen was used @ 0, 110, 133, 156, 179 and 202 kg ha^{-1} keeping phosphorus and potash constant @ 85 and 62 kg ha^{-1} except in control

treatment. This experiment was planed out by using Randomized Complete Block Design (RCBD) having three replications with plot size of 4m x 9m (36 m^2). DAP was applied at the time of transplanting whereas Urea and SOP were used in three splits viz. 1st at transplanting time, 2nd at 50 % tillering stage (8-12 tillers / plant) and 3rd at the stage of panicle formation.

Table. 1. Physio- chemical properties of experimental site.

Parameter	0-6 Inch Depth	6-12 Inch Depth
E.C. (mS\Cm)	1.0	0.8
Soil pH	7.8	8.0
Organic Matter (% age)	1.1	0.83
Nitrogen % (ppm)	0.055	0.042
Available Phosphorous (ppm)	9.3	8.3
Available Potash (ppm)	100	80
Saturation (% age)	40	38
Texture	Clay Loam	Clay Loam

The nursery of new advanced fine grain rice line PK 8677-18-7-1-14 was sown in 2nd week of June and thirty days nursery was transplanted. After 12 days $ZnSO_4$ @ 12.5 kg ha^{-1} was applied. All agronomic practices were kept optimum and plant protection measures were also adopted. Each year, the harvesting was done at maturity. Agronomic characters like Plant height, tillers count per plant and length of panicle was recorded at maturity time while paddy yield and other yield contributing characters were recorded at harvesting time. The data recorded during two consecutive years were pooled and Fisher's analysis of variance technique was used for its analysis. Comparison of treatment means were checked by least significant difference (LSD) test (Steel and Torrie, 1997).

RESULTS AND DISCUSSION

Two year's mean data revealed that plant height, tillers count per plant, length of panicle, grains per panicle, weight of 1000 grains and paddy yield significantly differ while applying different nitrogen levels (Table 2). At nitrogen rates from 133 to 202 kg ha^{-1}, yield and yield components were at par but significantly higher than control and 110 kg ha^{-1}nitrogen level. Highest plant of 151.17 cm was obtained from 202 kg ha^{-1} nitrogen level which was statistically similar with treatments receiving 179, 156 and 133 kg N ha^{-1}. The least plant height (131.09 cm) was obtained from control having no fertilizer. Awan *et al*., (2011), Pramanik *et al.,* (2013) and Tayefe *et al.,* (2014) observed that application up to 180 N kg ha^{-1} resulted in considerable increase in rice plant height. Better nitrogen rates resulted in higher plant height was a product of improved vegetative growth with more nitrogen supply to plants (Manzoor *et al.*, 2006).

Nitrogen level 202 kg ha^{-1} acquired highest number of productive tillers per plant (15.19) which were statistically similar with 133 to 202 kg nitrogen ha^{-1} applied levels. The lowest numbers of productive tillers per plant (10.82) were obtained where no fertilizer was applied (control). Munda, (1989), Wei *et al*.,(2003), Manzoor *et al.,* (2006), Awan *et al*., (2011), Salem *et al.*, (2011), Pramanik *et al*,.(2013) and Tayefe *et al*,.(2014) observed similar findings in their studies. Increase in tillers count per plant was due to excessive nitrogen application at tiller formation stage (Manzoor *et al.*, 2006).

Likewise the longest panicles (34.22 cm) were created by rice plants getting 202 kg ha^{-1} nitrogen which remained at par between 156 to 202 kg ha^{-1} nitrogen application levels. Shortest panicles of 30.10 cm were produced in control receiving no fertilizer. This result was in agreement with the conclusion of Manzoor *et al.*, (2006), Awan *et al*., (2011), Salem *et al.*, (2011), Pramanik *et al*,.(2013) and Tayefe *et al*,.(2014). Treatments receiving better nitrogen status produced longer panicles were because of enhanced nitrogen position during panicle formation stage (Manzoor *et al.*, 2006).

179 kg ha^{-1} nitrogen dose produced maximum grains (111.77) per panicle which remained statistically similar with 133 to 202 kg ha^{-1} nitrogen levels. The least value (105.33) was recorded in control. Manzoor *et al.*, (2006), Awan *et al*., (2011), Youseftabar *et al.,* (2012), Pramanik *et al.,* (2013) and Tayefe *et al.,* (2014) observed similar results in their studies. The higher number of grains per panicle during panicle formation period may be due to better nitrogen status at that stage.

Highest 1000 grain weight (25.85 gm) was obtained when nitrogen was applied @ 179 kg ha^{-1} which was statistically at par with 133, 156 and 202 kg ha^{-1} nitrogen application levels. Zero kg ha^{-1} nitrogen (control) produced lowest grain weight (22.33 gm). Same findings were also illustrated by Rafey *et al.,* (1989), Manzoor *et al.,* (2006), Awan *et al*., (2011), Salem *et al.*, (2011), Youseftabar *et al.,* (2012) and Pramanik *et al*,.(2013). At higher nitrogen rates increase in grain weight was due to higher chlorophyll contents of leaves leading to enhanced photosynthesis process during grain development period (Manzoor *et al.*, 2006).

Application of 179 kg nitrogen ha^{-1} resulted in maximum paddy yield of 3.59 t ha^{-1} which was similar with 133, 156, and 202 kg ha^{-1} nitrogen rates. The lowest yield (1.85 t ha^{-1}) was received from control. In a study Kanade and Kalra (1986) and Spanu and Pruneddu (1997) also reported highest paddy yields while applying nitrogen @ 150 kg ha^{-1} and 250 kg ha^{-1} respectively.

These results were also supported by Bali *et al.*, (1995), Meena *et al.*, (2003), Wei *et al*,.(2003), Mirnia *et al*., (2005), Manzoor *et al.*, (2006), Quanbao *et al*,.(2007), Awan *et al*., (2011), Hirzel *et al*., (2011), Li *et al.*, (2011), Salem *et al.*, (2011), Roshan *et al.*, (2011), Youseftabar *et al.*, (2012) Tayefe *et al*., (2014) and Tari and Amiri, (2015). At nitrogen level of 179 kg ha^{-1} highest paddy yield was a result of maximum grains per panicle having higher 1000 grain weight at that level. A turn down in paddy yield at 202 kg ha^{-1} nitrogen might be the reason of less number of grains per panicle with less 1000 grain weight at that nitrogen rate. The results of study showed that up to 133 kg ha^{-1} nitrogen level all yield related traits and paddy yield increased significantly where as above this level the application of nitrogen proved to be uneconomical.

Table 2. Yield and yield components of new advanced fine grain rice line PK 8677-18-7-1-14 as affected by different nitrogen levels. (Pooled data of 2 years)

Tr. No.	Fertilizer rates $N\text{-}P_2O_5\text{-}K_2O$ (kg ha^{-1})	Plant height (cm)	No of tillers/plant	Panicle length (cm)	No. of grains/ panicle	1000 grain weight (g)	Paddy yield (t ha^{-1})
T1	0 – 0 - 0	131.09 C	10.82 C	30.10 D	105.33 C	22.33 C	1.85 C
T2	110-85-62	144.38 B	12.85 B	32.27 C	109.59 B	23.94 B	2.71 B
T3	133-85-62	148.85 A	14.58 A	32.98 BC	111.14 AB	25.50 A	3.39 A
T4	156-85-62	149.94 A	14.87 A	33.81 AB	111.50 A	25.70 A	3.48 A
T5	179-85-62	150.81 A	15.11 A	34.11 A	111.77 A	25.85 A	3..59 A
T6	202-85-62	151.17 A	15.19 A	34.22 A	111.53 A	25.68 A	3.51 A
	LSD	**2.364**	**0.7116**	**0.9276**	**1.663**	**0.7972**	**0.4813**

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