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EFFECT OF NITROGEN LEVELS ON YIELD AND ECONOMICS OF BASMATI RICE VARIETIES

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Abstract – A field experiment was conducted during kharif season (2020) at Crop Research Farm, Department of Agronomy, SHUATS, Allahabad (U.P.). The soil of experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.1), low in organic carbon (0.28 %), available N (225 kg/ha), available P (19.50 kg/ha) and available K (213.7 kg/ha). The Treatments consisted of 3 levels of Nitrogen N_1 (90 kg/ha), N_2 (100 kg/ha), N_3 (110 kg/ha) and 3 different varieties (Basmati 1121), (Basmati 1718) and (Pusa basmati -1). The experiment was laid out in Randomized Block Design with 9 treatments and replicated thrice. The results revealed that the application of Nitrogen 110 kg/ha + basmati 1121 recorded maximum plant height (73.00 cm), Number of tillers/hill (15.20), plant dry weight (22.14 g/hill), panicle length (31.93 cm), number of panicle per meter (565.90), number of panicle per hill (9.80), number of filled grains per panicle (141.90), number of grains per panicle (197.20), test weight (29.30), grain yield (2.56 t/ha), straw yield (4.78 t/ha) and harvest index was found to be non-significant. Maximum Gross retunes (125722 INR/ha), Net retunes (59522.10 INR/ha) and B:C ratio (1.76) were also recorded with the treatment with the application of Nitrogen 110 kg/ha + basmati 1121.

INTRODUCTION

Rice (*Oryza sativa* L.) is principal food crop of South India and South Eastern countries and supports nearly one half of the world population. It, being the staple food for more than two third of the Indian population, holds the key for food security and plays a pivotal role in national economy. Basmati occupies a prime position in Indian culture, not only for its superior organoleptic qualities, but also as an auspicious food. India had an immense wealth of aromatic rice, much of which has been lost during the last three decades in the aftermath of the Green Revolution, where emphasis was on yield rather than on quality. Basmati (bas means aroma, Mati means queen) is popular not only throughout Asia but also in Europe and the United States. Basmati rice is traditionally associated with Himalayan foothills with India and Pakistan producing 70 and 30 per cent respectively, of the total Basmati rice of the world (Bligh, 2000). Upon cooking/ cooked Basmati rice is characterized by extra-long, super-fine, slender grains with chalky endosperm and a shape comparable with a Turkish dagger; pleasant and exquisite aroma, sweet taste, dry and soft texture, delicate curvature; medium to low gelatinization temperature and one and a half to two-fold length-wise elongation, with least breadth-wise expansion and tenderness (Siddiq *et al.,* 1997). Basmati rice responds differently to N application as compared to non-basmati rice. Most of the basmati rice cultivars are susceptible to disease and insect-pest attack, and more prone to lodging. Therefore, nitrogen requirement of basmati rice is quite low and excessive use of N adversely affects the crop yield. To achieve high yield and to improve quality, N is a major factor considered in all types of environment. Low N may not lead to realization of maximum yield potential and high N may lead to lodging, increased incidence of insect pest attack and lower quality. One major consequence of inadequate N is reduced leaf area, thereby, limiting

light interception, photosynthesis and finally biomass growth, grain yield and water productivity (Sinclair 1990). In the last one decade, IARI New Delhi has developed and released basmati type varieties such as Pusa Basmati 1121. These varieties have also been released and recommended by PAU Ludhiana for Punjab state as Pusa Basmati 1121. These varieties have quite high yield as compared to tadeonal basmati varieties. It is quite obvious to achieve full yield potential of these varieties, nitrogen requirement may be greater than traditional basmati varieties. Therefore, it is necessary to know the optimum rate of N application, as well as its influence on components of yield and growth parameters of high yielding basmati varieties. Keeping these facts/observations in view, present experiment entitled Influence of nitrogen application on the yield and yield parameters of different cultivars of basmati rice was conducted.

MATERIALS AND METHODS

The experiment was conducted during *Rabi* season of 2020-2021. The experiment was conducted in Randomized Block Design consisting of nine treatment combinations with three replications and was laid out with the different treatments allocated randomly in each replication. The soil of the experimental field was sandy loam in texture, slightly alkaline reaction (pH 7.1) with low level of organic carbon (0.28%), available N (225 Kg/ha), P (19.50 kg/ha) and higher level of K (92.00 kg/ha). The treatment combinations are T_1- Nitrogen 90 kg/ha + basmati 1121, T_2- Nitrogen 90 kg/ha + basmati 1718, T_3- Nitrogen 90 kg/ha + pusa basmati-1, T_4- Nitrogen 100 kg/ha + basmati 1121, T_5- Nitrogen 100 kg/ha + basmati 1718, T_6- Nitrogen 100 kg/ha + pusa basmati -1, T_7- Nitrogen 100 kg/ha + basmati 1121, T_8- Nitrogen 110 kg/ha + basmati 1718, T_9- Nitrogen 110 kg/ha + pusa basmati-1. The observations were recorded on different growth parameters at harvest. The experimental data analysed statistically by applying the technique of analysis of variance (ANOVA) prescribed for the design to test the significance of overall difference among treatments by the F test and conclusion were drawn at 5% probability level. Economics of treatments was also worked out.

RESULTS AND DISCUSSION

Yield

The grain yield of basmati rice was significantly influenced by rate of N application and varieties (Table 2). The treatments with the application of Nitrogen 110 kg/ha + basmati 1121, grain yield of rice is (2.56 t/ha) which was significantly superior all over treatments except with the treatment of application of Nitrogen 100 kg/ha + basmati 1121 (2.47 t/ha) and Nitrogen 90 kg/ha + basmati 1718 which was statistically at par with the treatment of application of Nitrogen 110 kg/ha + basmati 1121 variety.Treatment with application of Nitrogen 110 kg/ha + basmati 1121 was recorded maximum stover yield (4.78 t/ha) which was significantly superior over all other treatments and treatment with application of Nitrogen 100 kg/ha + basmati 1121 (4.55 t/ha) is statistically at par with the treatment withapplication of Nitrogen 110 kg/ha + basmati 1121.The highest harvest index was observed with application of Nitrogen 110 kg/ha + basmati 1121(35.3) and minimum in treatment with application of nitrogen 90 kg/ha + pusa basmati-1. Similar results were observed by Gunri *et al.* (2004).

Table 1. Yield of Basmati rice varieties influenced by different nitrogen levels.

Treatments	Grain yield (t/ha)	Straw yield(t/ha)	Harvest index (%)
Nitrogen 90 kg/ha + Basmati 1121	2.28	4.25	34.3
Nitrogen 90 kg/ha + Basmati 1718	2.45	4.19	34.8
Nitrogen 90 kg/ha + Pusa Basmati-1	2.15	4.12	33.7
Nitrogen 100 kg/ha + Basmati 1121	2.47	4.55	34.6
Nitrogen 100 kg/ha + Basmati 1718	2.33	4.42	35.2
Nitrogen 90 kg/ha + Pusa Basmati-1	2.32	4.26	35.1
Nitrogen 110 kg/ha + Basmati 1121	2.56	4.78	35.3
Nitrogen 110 kg/ha + Basmati 1718	2.27	4.60	34.8
Nitrogen 110 kg/ha + PusaBasmati-1	2.17	4.35	34.9
SEm (±)	0.04	0.09	0.49
CD (P=0.05)	0.12	0.28	— —

Table 2. Yield of Basmati rice varieties influenced by different nitrogen levels.

Treatment	Cost of cultivation	Gross return	Net return	B:C Ratio
Nitrogen 90 kg/ha + basmati 1121	33745	112729	46529.20	1.37
Nitrogen 90 kg/ha + basmati 1718	34055	120170	53600.00	1.57
Nitrogen 90 kg/ha + Pusa Basmati – 1	33465	106602	40682.10	1.21
Nitrogen 100 kg/ha + basmati 1121	33745	121950	55756.00	1.65
Nitrogen 100 kg/ha + basmati 1718	34045	115619	49109.20	1.44
Nitrogen 100 kg/ha + Pusa Basmati – 1	33465	114157	48236.70	1.44
Nitrogen 110 kg/ha + basmati 1121	33745	125722	59522.10	1.76
Nitrogen 110 kg/ha + basmati 1718	34055	114743	48233.10	1.41
Nitrogen 110 kg/ha + Pusa Basmati – 1	33469	108565	42644.60	1.27

Economics

Economic return of basmati rice varieties t was evaluated after harvesting of crop was based on market price showed increasing trend as par the increasing the yield trend according treatment. The maximum Gross returns (INR 125722 /ha), Net returns (INR 59522.10/ha) and Benefit cost ratio (1.76) was evaluated under treatment with application of Nitrogen 110 kg/ha + Basmati 1121 variety.

CONCLUSION

On the basis of one season experimentation application Nitrogen 110 kg/ha + basmati 1121 was found more productive (2.56t/ha) as well as economic (59522.10 INR/ha).

The conclusions drawn are based on one season data only which requires further confirmation for recommendation.

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