Website : www.ssdatmeerut.in
Progressive Research : An International Journal
Vol 16 (1) : 27-29 (January-2021), Print ISSN : 0973-6417, Online ISSN : 2454-6003
Society for Scientific Development in Agriculture and Technology, Meerut (U.P.) India

Comparison of Nitrogen Application with Leaf Color Chart and Conventional Method Inbasmati Rice (*Oryza sativa* L.)

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ABSTRACT

The field experiment was conducted during *kharif* season of 2019 to study the comparison of nitrogen application with leaf color chart and conventional method in basmati rice (*Oryza sativa*) with nine treatments in three replications. The experiment consisted eight levels of nitrogen, *viz.* 50, 75, 100 and 125% of recommended doses of nitrogen (RDN) applied in two and three splits and one nitrogen application through leaf color chart (LCC). Significant difference was observed with the application of different nitrogen levels in growth parameters and yield attributes of Basmati rice. The plant population of basmati rice was not significantly influenced with the nitrogen application through leaf colour chart. The highest level of nitrogen i.e., 125% of RDN recorded significantly higher plant height applied either in 2 or 3 splits as compared to rest of the treatments. LCC recorded 101.5 cm was at par with 75% of RDN (100.3). Different nitrogen levels also significantly affected the yield and yield attributes of aromatic varieties. Nitrogen levels also influenced tillers/hill significantly. The highest tillers/hill were found in the 125% of RDN put in three splits (13.0) which was at par with 100% ofRDN applied in three splits (12.0), but was significantly higher over rest of the treatments. The 50% ofRDN put in two splits recorded lowest tillers/hill (7.16). Leaf colour chart (LCC) recorded 10.5 tillers which were at par with 75% of RDN applied in 3 splits (10.1).The 50% days to flowering was delayed in 125% of RDN applied in three splits while 50% ofRDN put in two splits crop reached at 50% flowering much earlier. Nitrogen application through leaf colour chart also recorded delay in 50% flowering compared to the rest of the treatments. Yield attributes such as panicles/hill, grains/panicle and 1000 grains weight (g) were influenced significantly with nitrogen levels. The highest panicles/hill, grains/panicle and 1000 grain weight were recorded in 125% ofRDN applied in 3 splits (12.7, 99.1 and 29.4). Leaf color chart observed (10.9, 96.9 and 27.5). Application of 125% ofRDN put in three splits gave significantly higher grain yield (37.7 q/ha). The leaf colour chart recorded 33.3 q/ha, grain yield of which significantly less than 125% ofRDN applied in both the splits over the rest of the treatments. The straw yield and harvest index were also recorded highest in 125% of RDN (59.0 q/ha and 38.9%, respectively), as compared to 36.7q/ha and 36.7% through leaf colour chart.

Key words : *Basmati rice, nitrogen levels and leaf color chart.*

Introduction

Basmati rice (*Oryza sativa* L.) is a long-grain Indian rice with a delicate fragrance. Basmati varieties (Punjab basmati 4, Punjab basmati 5, CSR 30 and Punjab basmati 2) with superior cooking and eating characteristics can be produced if the crop matures in relatively cooler temperature (1). The cultivation of basmati rice is highly remunerative as it fetches two to three times higher price than that of non basmatirice (2). It has demand in international market and commands a premium price in the world market. During 2019-2020, the production in India estimated was 117.94 m t with yield of 2.6 thousand kg ha^{-1}, Punjab recorded 13 mt of basmati rice with yield of 4366 kg ha^{-1} (1). Rice is the largest single use of land for producing food, covering 9% of the earth arable land. Rice crops require hot and humid climate. The average temperature required for basmati rice ranges from 21 to 37^{0}C with well distributed rainfall of about 650 cm (3). Nitrogen is one of the most essential and most limiting nutrients for rice production. The N nutrients present in almost all soil are insufficient for crop needs, therefore, additional N must be given to maintain or increase yields. Of all the nutrients supplied to the soil, so far N fertilization has the most influence in increasing crop production (4). N deficiency is characterized by low growth rates and stunted plants (5). Leaf color chart is asuitable tool to optimize the use of N, with various sources of N fertilizer; organic-fertilizer, bio-fertilizer or chemical fertilizer. A leaf color chart is used to measure green color intensity of riceleaves, serves as a cheaper tool to assess the nitrogen requirements by non destructive method (6).

Materials and Methods

The present field investigation was carried out during summer season of 2019 at Agriculture Farm of School of Agricultural Sciences and Technology, RIMT University, Mandi Gobindgarh (Punjab). Geographically, it is located at 30.6642^{o}N latitude and 76.2914^o E longitude at an altitude of 268 meters above mean sea level. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. The experimental site was medium in organic carbon (0.48%) and available nitrogen 40% ofrecommended dose of nitrogen/ha.The

Received : December-2020 Revised : January-2020 Accepted : January-2021

Table-1 : Effect of nitrogen levels applied through leaf color chart in comparison to conventional method on the yield of basmati rice.

Treatments	Plant population/m^{-2}	Plant height (cm)	Tillers /hill	Days to 50% flower-ing	Panicl es/hill	Grains/ panicle	1000-grain weight (g)	Grain yield (q/ha)	Straw yield (q/ha)	Har-vest index (%)
50% of RDN/ha in 2 splits (3 and 6 WAT)	24.2	93.1	7.16	49.0	6.03	92.6	23.0	25.7	55.0	31.8
75% of RDN/ha in 2 splits (3 and 6 WAT)	26.0	97.6	9.10	50.3	7.26	96.5	24.2	28.8	56.3	33.7
100% of RDN/ha in 2 splits (3 and 6 WAT)	27.9	102.3	10.2	52.0	8.43	97.4	25.3	30.2	56.7	34.7
125% of RDN/ha in 2 splits (3 and 6 WAT)	25.3	104.3	11.0	52.6	10.6	97.7	27.0	33.3	57.2	36.7
50% of RDN/ha in 3 splits (2,4 and 6 WAT)	25.8	95.8	8.63	50.6	7.13	94.8	23.7	27.3	54.0	33.7
75% of RDN/ha in 3 splits (2,4 and 6 WAT)	28.1	100.3	10.1	51.6	9.46	97.7	25.3	31.1	57.0	35.3
100% of RDN/ha in 3 splits (2,4 and 6 WAT)	25.4	103.7	12.0	54.3	10.8	98.5	26.6	35.5	58.0	37.9
125% of RDN/ha in 3 splits (2,4 and 6 WAT)	27.1	106.4	13.0	54.6	12.7	99.1	29.4	37.7	59.0	38.9
Nitrogen application through leaf color chart (25.5 kg N/ac)	29.2	101.5	10.5	55.0	10.9	96.9	27.5	33.3	57.3	35.6
C.D. (5%)	NS	0.92	0.60	1.83	0.67	0.71	1.50	2.22	1.46	1.21
SE (m)	1.05	0.41	0.27	0.81	0.29	0.31	0.66	0.88	0.66	0.56

experiment consisted of eight levels of nitrogen, *viz.* 50, 75, 100 and 125% of recommended dose of nitrogen applied in two and three splits and one nitrogen application through leaf color chart (LCC).The gross plot size was 3.5× 4.5 m and net plot size was 3×4 m. The crop was sown by broadcast on June 12, 2019 and transplanted on 14 July 2019 at a spacing of 20×15 cm. The all other cultural practices were uniformly followed in all the treatments.

Results and Discussion

Growth Parameters : The plant population of basmati rice was not significantly influenced with the nitrogen levels and nitrogen application through leaf colour chart (Table-1). The highest level of nitrogen i.e. 125% ofrecommended dose of nitrogen recorded significantly higher plant height applied either in 2 or 3 splits as compared to rest of the treatments. (7) also reported maximum plant height with the application 150% ofrecommended dose of nitrogen in rice.

Nitrogen levels also influenced tillers/hill significantly. The highest tillers/hill were found in the 125% ofrecommended dose of nitrogen applied in three splits (13.0) which was at par with 100% ofrecommended dose of nitrogen applied in three splits (12.0), but was significantly higher over rest of the treatments. The 50% of recommended dose of nitrogen applied in two splits recorded lowest tillers/hill (7.16). Leaf colour chart (LCC) recorded 10.5 tillers which were at par with 75% of recommended dose of nitrogen applied in 3 splits (10.1). (8) also obtained thesignificantly higher number of tillers was at 125% of RDN than 75% of RDN.

The 50% days to flowering was delayed in 125% ofrecommended dose of nitrogen applied in three splits while 50% ofrecommended dose of nitrogen applied in two splits crop reached at 50% flowering much earlier. Nitrogen application through leaf colour chart also recorded delay in 50% flowering compared to the rest of the treatments (9) observed high level of N fertilizer delay in flowering with the 60% of RDN in rice.

Yield Attributes : Yield attributes such as panicle per hill, grains per panicle and 1000 grains weight (g) were influenced significantly with nitrogen levels. Application of 125% ofrecommended dose of nitrogen applied in three splits and nitrogen application through leaf colour chart produced more number of panicles per hill (12.7 and 10.9, respectively) as compared to rest of the treatments. (10) recorded maximum number of panicles per hill with application of 220% ofrecommended dose of nitrogen. The highest grains per panicle were recorded in 125% of recommended dose of nitrogen applied in 3 splits (99.1) and 100% ofrecommended dose of nitrogen applied in 3 splits (98.5). Nitrogen application through leaf color chart (96.9) was at par with 75% ofrecommended dose of nitrogen applied in 2 splits (96.5). (7) observed highest grains per panicle with application 150% ofrecommended dose of nitrogen.

The 1000 grain weight of basmati rice was highest in the 125% ofrecommended dose of nitrogen applied in three splits (29.4 g), whereas, nitrogen application through leaf colour chart (27.5) was found to be at par with 125% ofrecommended dose of nitrogen applied in two splits (27.0). (11) observed higher test weight with application 100% of recommend dose of nitrogen/ha in aromatic rice.

Yield : Application of 125% ofrecommended dose of nitrogen applied in three splits gave significantly higher grain yield (37.7 q/ha). The leaf colour chart recorded 33.3 q/ha grain yield of which significantly less than 125% ofrecommended dose of nitrogen applied in both the splits over the rest of the treatments. (12) recorded highest grain yield with application 120% of recommended dose of nitrogen over N control in rice during 2006, 2007 and 2008, respectively. The straw yield and harvest index were also recorded highest in 125% ofrecommended dose of nitrogen put in 3 splits (59.0 q/ha and 38.9%, respectively), as compared to 36.7q/ha and 36.7% through leaf colour char. (7) also recorded higher straw yield with application 125% recommended dose of nitrogen (108.48) as compared to rest of the treatments.

Conclusion

It may be concluded that nitrogen maximize the growth and yield of basmati rice. The higher seed yield was obtained with the application 125% ofrecommended dose of nitrogen applied in two or three splits. The leaf color chart also increased grain yield equal to 75% RDN.

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