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Effect of different nitrogen levels on growth and yield of wheat (*Triticum aestivum* L.)

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Abstract
The present investigation entitled "Effects of Different Nitrogen Levels on Growth and Yield of Wheat (*Triticum aestivum* L.)" was conducted during the year 2022-2023 at the CRC in ITM University Gwalior (M.P). The experiment consisted of ten treatments T_1: Nitrogen @ 0 kg ha^{-1}, T_2: Nitrogen @ 20 kg ha^{-1}, T_3: Nitrogen @ 40 kg ha^{-1}, T_4: Nitrogen @ 60 kg ha^{-1}, T_5: Nitrogen @ 80 kg ha^{-1}, T_6: Nitrogen @ 100 kg ha^{-1}, T_7: Nitrogen @ 120 kg ha^{-1}, T_8: Nitrogen @ 140 kg ha^{-1}, T_9 : Nitrogen @ 160 kg ha^{-1} , T_{10}: Nitrogen @ 180 kg ha^{-1} The study revealed that, among the treatments,T_9 (Nitrogen @ 160 kg ha^{-1}) recorded highest plant height at 30, 60, 90 and harvest (22.57 cm, 56.34 cm, 94.14 cm, 97.48 cm), total dry matter/ m^2 at 30, 60, 90 and harvest (55.06 g, 446.77 g, 1062.23 g, 1117.23 g), Leaf are index at 30, 60 and 90 (0.826, 3.04 and 4.14), No. of spikelets/ spike (20.89), No. of grains/ spike (31.08) and test weight (44.03 g) compared to control. In the present study, it can be concluded that the T_9 is the best treatment for wheat variety on basis of Growth and yield.

Keywords: Nitrogen, growth, yield, wheat

Introduction

Wheat (*Triticum aestivum* L.) is a staple food of the world and belongs to family Poaceae (Gramineae). It is a C3 plant primarily grown in temperate regions and also at higher altitude under tropical climatic areas in winter season. Wheat is the single most important cereal crop that has been considered as integral component of the food security system of the several nations. It has been described as the 'King of cereals' because of the acreage and high productivity which also occupies a prominent position in the international food grain trade. Wheat provides nearly 55% of the carbohydrate and 20% of food calories which is consumed by two billion people (36% of the world population) as staple food. It is said that as a food, wheat is more nutritive as compared to the other cereals. It has good nutrition profile with 12.1 per cent protein, 1.8 per cent lipids, 1.8 per cent ash, 2.0 per cent reducing sugars, 6.7 per cent pentose's, and provides 314 Kcal/100g of food. Wheat is also a good source of minerals and vitamins *viz*., calcium (37 mg/100g), iron (4.1 mg/100g), thiamine (0.45mg/100g), riboflavin (0.13mg/100g) and nicotinic acid (5.4mg/100mg). Unlike other cereals, wheat contains a high amount of gluten, the protein that provides the elasticity necessary for excellent bread making. Hard wheat is high in protein (10-17%) and yields a flour rich in gluten, making it particularly suitable for yeast breads. Wheat ranks first in the world among the cereals both in respect of area (221.68 million hectare) and production (757.92 million metric tonnes) with productivity of wheat 3.29 tonnes per hectare (FAS/USDA 2021-22). In India, total production of wheat crop was 86.53 metric tonnes from an covered area of 30.23 million hectare during the past 2022-2023 *Rabi* season and account for 38% 4th Advance estimate.

Materials and Methods

Experimental site and situation

The experimental site was geographically located at an elevation of 206 meters above mean sea level (AMSL), which has a value of 260 14° N latitude and 780 14° E longitude. It falls in the sub-tropical areas on the outskirts of Gwalior, Madhya Pradesh.

Topography and climatic condition
The experimental site falls under sub-tropical zone in gwalior region. The region received an average rainfall of about 800 mm out of which about 80% is concentrated from mid-June to end of September. The winter months are very cold whereas summer months are hot and dry. Westerly hot winds are started from the April and remain continue till onset of monsoon.

Soil characteristics of the experimental field
In order to determine the fertility status and soil class. Soil samples were taken randomly from different places of the experimental field with the help of soil auger to a depth of 0-15 cm. The collected soil samples were mixed together to make composite sample representing the fertility of the whole field. These samples were air dried and grind with the help of pestle mortar and packed in polythene bag and analysed for different soil parameters.

Design and layout
The experiment was laid out in randomized block design with variety (PANT-505) and treatments of different nitrogen doses with three replications. The experimental field was divided into 24 plots. Each gross plot size was 3m x 3.0 m and net plot size was 2m x 2m and row to row distance was maintained 20 cm.

Treatment details
The treatments and their symbols used in the experiment were given as under:

S. No.	Treatment	Symbol
1	Nitrogen @ 0 kg ha^{-1}	T_1
2	Nitrogen @ 20 kg ha^{-1}	T_2
3	Nitrogen @ 40 kg ha^{-1}	T_3
4	Nitrogen @ 60 kg ha^{-1}	T_4
5	Nitrogen @ 80 kg ha^{-1}	T_5
6	Nitrogen @ 100 kg ha^{-1}	T_6
7	Nitrogen @ 120 kg ha^{-1}	T_7
8	Nitrogen @ 140 kg ha^{-1}	T_8
9	Nitrogen @ 160 kg ha^{-1}	T_9
10	Nitrogen @ 180 kg ha^{-1}	T_{10}

Result and Discussion
Plant Height
Different levels of nitrogen affected the plant height significantly. Maximum plant height (97.48 cm) was recorded from treatment T_9 at harvest stage where nitrogen was applied @ 160 Kg N which was statically at par with T_{10} (98.94 cm) and T_8 (95.63 cm) minimum plant height was recorded form T_1 (41.10 cm) where nitrogen was not applied. As the level of nitrogen increased plant also gradually increased. Cells protein content increase as the application of nitrogen increase and size of plant cell increases, as a result of that leaf area and photosynthesis rate rises which ultimately make the plant taller.

Leaf area index
The data as presented in (Table. 1) related to the leaf area index of wheat at harvest stage revealed that among the varying levels of nitrogen, at 90 DAS, application of T_9 (160 kg N/ha) recorded the significantly higher leaf area index (4.142), which was statistically at par with application of T_8 (120 kg N/ha) and T_8 (180 kg N/ha). This may be due to the fact that the higher application of nitrogen increase the nitrogen content which helps to increase the vegetative parts. Findings are of similar trend as reported by Kumar *et al*. (2015) [20]. These findings are in agreement with those of Patel (2019) and Parmar and Sindhu (2013).

Dry matter accumulation of plant
The data pertaining to the dry weight of the wheat plant recorded at harvest as shown in (Table 1) when the field was fertilized with varying levels of nitrogen. Among the varying levels of nitrogen, application of 160 kg N ha^{-1} recorded the higher dry weight of the plant (1117.23), which was statistically at par with application of 140 kg N ha^{-1} (1088.13) and 180 kg N ha^{-1} (1102.61). The improved plant height, number of primary branches and secondary branches might be the reasons of increasing SDMA with increase in levels of nitrogen. These results are further supported by the findings of other researchers (Ali *et al.*, 2011) [3] reported the increase in shoot dry matter with nitrogen application as compared to unfertilized control.

Table 1: Effect of different levels of nitrogen on growth of wheat

S. No	Treatments	Growth Parameters		
		Plant height	Leaf area index	Dry matter accumulation
1	Nitrogen @ 0 kg ha^{-1}	41.10	1.747	351.67
2	Nitrogen @ 20 kg ha^{-1}	48.98	2.079	471.51
3	Nitrogen @ 40 kg ha^{-1}	56.70	2.410	606.42
4	Nitrogen @ 60 kg ha^{-1}	64.45	2.738	730.90
5	Nitrogen @ 80 kg ha^{-1}	72.26	3.067	852.69
6	Nitrogen @ 100 kg ha^{-1}	79.98	3.398	951.54
7	Nitrogen @ 120 kg ha^{-1}	87.83	3.727	1025.56
8	Nitrogen @ 140 kg ha^{-1}	95.63	4.060	1088.13
9	Nitrogen @ 160 kg ha^{-1}	97.48	4.142	1117.23
10	Nitrogen @ 180 kg ha^{-1}	98.94	3.989	1102.61
Sem±		2.17	0.110	22.82
C.D. (P=0.05)		6.43	0.327	67.81

Number of Spiklet's spike^{-1}
Number of spiklets/spike were significantly different in treatments where no application of nitrogen (T_1) was done and in T_{10} (160 kg N/ ha). Maximum number of spiklets/spike (21.02) were recorded in T_{10} (160 kg N/ ha) that were also statistically at par to T_9 (20.89) and T8 (20.43) while minimum number of spiklets/spike (6.36) were found in T_1 where no nitrogen was applied. Nitrogen has mainly effected on the vegetative growth of plant while at reproductive stage its role is less considerable that's why different levels of nitrogen did not effected the number of spiklets/spike significantly. These results are in contradiction. Many researchers concluded form their studies that if there is more absorption of nitrogen by the plants produce a greater number of spikes per unit are, enhanced vegetative growth and more number of tillers per unit area.

Number of grains/ spike
Number of seeds per spike was also significantly increased by the high levels of nitrogen application. Maximum number of seeds/ spike (31.94) were recorded from T_{10} (160 Kg N ha $^{-1}$) that were also statistically at par to T_9 (31.08) and T8 (30.51) while minimum were observed in T_1 (12.87) where no nitrogen was applied. Nitrogen promotes the initiation of spiklets that resulted in more number seeds/spike but more nitrogen from 180 Kg N ha-1 level decreased the number of seeds due to increased vegetative growth as was observed in case of plant height. These results are quite in line with. Nitrogen fertilizer applied in optimum dose decrease the chance of seeds to deteriorate in the spikes otherwise in case of seed deterioration grain yield reduced.

100-grain weight (Test weight)
The highest 100-grain weight was observed with 160 kg N ha^{-1} which was significantly higher than 0 kg N ha^{-1} but statistically at par with 140 kg N ha^{-1} and 180 kg N ha^{-1}. This might be due to improved mobility of the nitro - synthates inside the plant system by the application of nitrogen which might have made the grains plump and bold in comparison to no application of nitrogen. These results are further supported by the findings of Pandey *et al.* (2001) [18] in chickpea.

Table 2: Effect of different levels of nitrogen on yield attributes of wheat

S. No.	Treatments	Yield attributes		
		Number of Spikelet's $spike^{-1}$	Number of grains/spike	Test weight
1	Nitrogen @ 0 kg ha^{-1}	6.36	12.87	40.47
2	Nitrogen @ 20 kg ha^{-1}	8.35	15.34	40.67
3	Nitrogen @ 40 kg ha^{-1}	10.34	17.90	41.37
4	Nitrogen @ 60 kg ha^{-1}	12.36	20.45	41.88
5	Nitrogen @ 80 kg ha^{-1}	14.38	22.94	42.45
6	Nitrogen @ 100 kg ha^{-1}	16.41	25.43	42.92
7	Nitrogen @ 120 kg ha^{-1}	18.41	27.95	43.50
8	Nitrogen @ 140 kg ha^{-1}	20.43	30.51	43.74
9	Nitrogen @ 160 kg ha^{-1}	20.89	31.08	44.03
10	Nitrogen @ 180 kg ha^{-1}	21.02	31.94	43.87
Sem±		0.67	0.83	2.15
C.D. (P=0.05)		1.98	2.46	6.39

Summary and Conclusion
The protection measures as per recommendation. The salient features and conclusions drawn are summarized here under. The growth characters of wheat *viz.*, plant height, leaf area index and dry matter accumulation increased significantly with increasing level of nitrogen. Nitrogen level *viz.*, 160 Kg N/ha produced significantly the highest values of all growth attributes at all the stages. The yield attributes of wheat *viz.*, number of spikes m^{-2}, number of grains $spike^{-1}$ and 100-grain weight increased significantly with increasing level of N.

References

1. Agricultural Statistics at a Glance. Ministry of Agriculture & Farmers Welfare, Department of Agriculture, Cooperation & Farmers Welfare, Directorate of Economics & Statistics, Government of India, New Delhi. Agronomy. 2018;38(2):204-209.
2. Alam MZ, Rahman MS, Haque ME, Hossain MS, Azad MAK, Khan MRH. Response of irrigation frequencies and different doses of N fertilization on the growth and yield of wheat. Pak J Biol Sci. 2003;6(8):732-734.
3. Ali A, Ahmad A, Syed WH, Khaliq T, Asif M, Aziz M, *et al*. Effects of nitrogen on growth and yield components of wheat. Sci. Int. 2011;23(4):331-332.
4. Ali L, Mohy-ud-din Q, Ali M. Effect of different doses of nitrogen fertilizer on the yield of wheat. Int. J Agric Biol. 2003;4:438-439.
5. Anonymous. Foreign Agricultural Service, United State Department of Agriculture. Wheat outlook; c2016 December, 1-21.
6. Bandyopadhyay KK, Misra AK, Ghosh PK, Hati KM, Mandal KG, Moahnty M. Effect of irrigation and nitrogen application methods on input use efficiency of wheat under limited water supply in a Vertisol of Central India. Irri Sci. 2010;28:285-299.
7. Bhardwaj V, Yadav V, Chauhan BS. Effect of nitrogen application timings and varieties on growth and yield of wheat grown on raised beds. Archives of Agronomy and Soil Science. 2010;56(2):211-222.
8. Bhat MA, Mahal SS, Hussain A, Mushki GM. Effect of nitrogen levels, irrigation regimes and weed management in durum wheat (*Triticum durum* Desf.). Indian J Crop Sci. 2006;1:184-188.
9. DAC. Department of Agriculture and Cooperation, GOI. Agricultural DEFRA, 2005. India-UK collaboration on impacts of climate change in India; c2011. http://www.defra.gov.uk/environment/climatechange/internat/devcouy/india2.htm (accessed 18 April 2006).
10. Directorate of economics and statistics. Ministry of agriculture and farmers welfare, India; c2016.
11. FAO. Food and Agriculture Organization, Regional Office for Asia and the Pacific, Bangkok, 2011. Available at: http://eands.dacnet.nic.in/At_A_Glance 7.1.xls
12. Iqbal J, Hayat K, Hussain S, Ali A, Bakhsh MAAHA. Effect of seeding rates and nitrogen levels on yield and yield components of wheat (*Triticum aestivum* L.). Pak J Nutr. 2012;11(7):531-536.
13. Jakhar P, Singh J, Nanwal RK. Effect of planting methods, biofertilizers and nitrogen levels on growth, yield and economics of wheat (*Triticum aestivum* L.). Ann Agric Res New Series. 2005;26:603-605.
14. Jermuss A, Vigovskis J. Nitrogen management effects on spring wheat yield and protein. Latvian J Agron. 2008;11:224-229.
15. Litke L, Gaile Z, Ruza A. Effect of nitrogen fertilization on winter wheat yield and yield quality. Agronomy Research. 2018;16(2):500-509.
16. Liu D, Shi Y. Effects of different nitrogen fertilizer on quality and yield in winter wheat. Adv J Food Sci Tech. 2013;5(5):646-649.
17. Maqsood M, Akbar M, Mahmood MT, Wajid A. Yield and quality response of wheat to different nitrogen doses in rice-wheat cropping system. Int. J Agric Bio. 2000;2:107-108.
18. Pandey RK, Maranville JW, Chetima MM. Tropical wheat response to irrigation and nitrogen in a Sahelian environment. II Biomass accumulation, nitrogen uptake and water extraction. Euro J Agron. 2001;15:107-118.
19. Patra Bishnupriya, Ray PK. Response of Wheat to Various Nitrogen Levels under Late Sown Condition. Journal of Experimental Agriculture International. 2018;21(1):1-5.
20. Kumar S, Ahlawat W, Kumar R, Dilbaghi N. Graphene, carbon nanotubes, zinc oxide and gold as elite nanomaterials for fabrication of biosensors for healthcare. Biosensors and Bioelectronics. 2015 Aug 15;70:498-503.