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Response of Wheat (*T. aestivum L.*) Varieties to different levels of Nitrogen

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ABSTRACT

Wheat (Triticum aestivum L.) dominates the agronomic crops in terms of production and acreage and occupies an important position in agriculture policies and farming (Shehzad et al., 2012a; Shehzad et al., 2012b). The world's major dietary sources are cereals because, in most countries, they constitute the main protein and energy supply (Bos et al., 2005). Wheat is a staple food for approximately 1/3rd of the population of the world (Hussain and Shah, 2002). It was cultivated on an area of 8.66 million hectares with an average yield of 2714 kg/ha (MINFAL, 2011). Nitrogen occupies a prominent position in plant metabolic processes. Nitrogen is an essential constituent of protein which is associated with all the vital processes in plants. Therefore, addition of nitrogen in the form of chemical fertilisers is important in order to get maximum crop production. Balanced use of nitrogen is a key point for higher land profitability and healthy environment. Nitrogen is one of the major essential nutrients applied to the crop for higher vegetative growth, productivity and quality (Gwal et al., 1999; Ali et al., 2000; Iqbal et al., 2012). A high yielding variety for one locality may face problems in another agro climatic region. Yield production varies for different varieties, like, Pak81, Khyber-70 and WL-71 (Khan et al., 1990). Keeping in view the significant role of nitrogen in crop production systems, the present research project was designed to study the effect of different levels of nitrogen on wheat varieties yield and related traits under the agro climatic conditions of India.

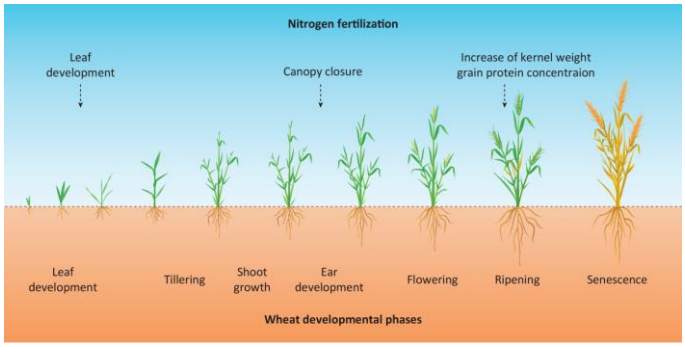
I. Introduction

A field experiment entitled "Response of wheat varieties to different nitrogen levels under agro-climatic conditions" was conducted at Agricultural Research Institute, Lucknow, Uttar Pradesh, during winter season 2011. The experiment was laid out in randomised complete block design with three replications in split plot arrangement.

Wheat basically *Triticum aestivum* L. , i.e., Pir Sabak04 (P.S), P.S-05, P.S-08, Atta Habib and Siran, were assigned to main plots while three nitrogen (N) levels of 0, 60, 120 and 180kg/ha were assigned to sub plots. The size of sub plot was 5 x 3m 2 having six rows per plot with a row to row distance of 30cm. A seed rate of 120 kg/ha was used. Various doses of N-fertilizer (60, 120 and 180kg/ha) were also applied in split doses, i.e., one at the time of sowing and second after germination. The sources were urea fertiliser. All the recommended agronomic practices, including, irrigation, weeding and hoeing, were carried out uniformly for all the treatments. The data obtained was subjected to the analysis of variance, using MSTATC (Bricker, 1991) and for means separation, LSD test was used.

II. Observations

Tillers per m² of wheat were statistically found significant for both plant and nitrogen levels . Analysis of the data revealed that higher tillers per m² (404, 401 and 395) were produced in varieties P.S-2008, P.S2004 and P.S-2005, respectively, while comparatively lower tillers per m² were recorded for the variety Siran and Atta Habib.



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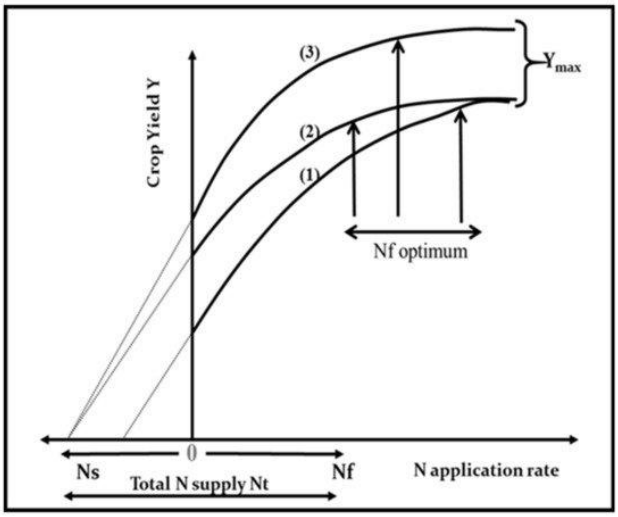
The difference in tillers per m² might be due to different genetical make-up of the varieties. Among nitrogen levels, maximum tillers per m² (404, 395 and 389) were recorded when nitrogen was applied at the rate of 120, 180 and 60 kg/ha, respectively. Nitrogen is a primary nutrient required by plants in large quantity for their vegetative growth. The difference in tillers per m² of wheat, due to application of nitrogen, might be due to the ability of nitrogen to enhance vegetative growth. Similar results were reported by Burnett et al. (2003), who concluded that application of nitrogen increase tillers per m ²

III. Discussion

Number of grains per spike was significantly affected by varieties, nitrogen levels and their interaction . Analysis of the data showed that maximum number of grains per spike (81) was produced in the variety P.S-2008 while lower number of grains per spike (73) was recorded in P.S-2005. The probable reason for this is that different varieties have different genetic make-up. Among nitrogen levels, maximum number of grains per spike (80) was produced when nitrogen was applied at the rate of 120 kg/ha while lower number of grains per spike were observed in the rest of the levels. The increase in number of grains per spike might be due to high availability of nitrogen and the crop's efficient use of nitrogen.



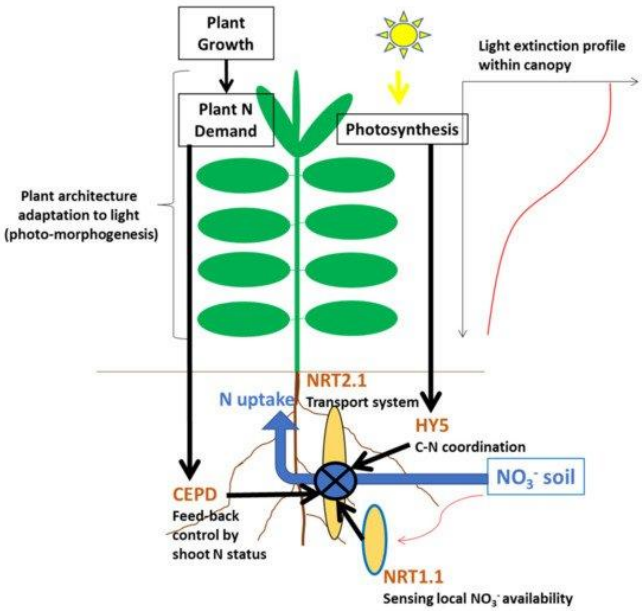
These results are in line with those of Bakht et al. (2010), who reported that addition of different levels of nitrogen to different varieties enhances the number of grains per spike. The interactive effect of varieties and nitrogen levels indicated that grains per spike increased in Siran, P.S-2004 and P.S-2008 with increase in nitrogen up to 120 kg/ha while further increase in nitrogen decreased the grains per spike. Similarly, for the varieties Atta Habib and P.S-2005, grains per spike increased up to 120kg of N per hectare. Further increase in nitrogen had no effect on grains per spike. Probable reason for this is that different varieties have different genetical potential to use nitrogen efficiently.

Grain yield of wheat was significantly affected by different wheat varieties, nitrogen levels and their interaction . Grain yield was higher (3681 and 3638 kg/ha) in varieties Atta Habib and P.S-2008, while lower grain yield (3204kg/ha) was produced by Siran. Among nitrogen levels, nitrogen applied at the rate of 120kg/ha produced maximum grain yield (3624kg/ha) while lower grain yield (3378 and 3407kg/ha) was recorded in the plots treated with 0 and 60kg of N per hectare. This may be due to the optimum requirements of wheat crop in the present study. Similar results were previously reported by Ram et al. (2002), who suggested that nitrogen enhanced the grain yield of wheat. The interactive response of varieties and nitrogen indicated that increasing nitrogen level increased grain yield in Atta Habib, in case of P.S-2004, P.S-2005 and P.S-2008 grain yield increased with the increase in nitrogen application up to 120kg/ha while further increase in nitrogen decreased the grain yield in these varieties. In variety Siran, grain yield increased with increase in nitrogen level up to 120kg/ha while further increase in nitrogen level did not increase or decrease grain yield. This might be due to the fact that different varieties have

different genetic make-up and hence respond differently to nitrogen.

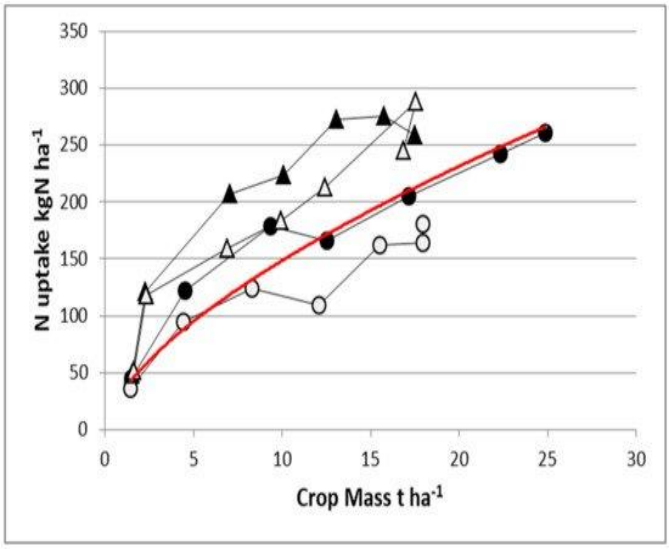
IV. Results

Thousand grains weight of wheat was significantly affected by different wheat varieties and nitrogen levels while their interactive response was not significant .



Meditation of the data showed that higher thousand grains weight (51.3 and 49.7g) was observed in P.S-2008 and Atta Habib, respectively, while lower thousand grains weight was recorded in the rest of the varieties. The increase in thousand grains weight due to the varieties might be due to their genetical make-up. Of nitrogen levels, plots treated with 120kg of N per hectare had maximum thousand grains weight (50.9g) while lower thousand grains weight was recorded in the rest of the treatments. This increase might be due to more dry matter accumulation in seed because of nitrogen. Similar results are reported by Ling and Silberbush (2002), who reported that application of nitrogen produced heavier grains.

Biological yield of wheat was significantly affected by varieties, nitrogen levels and their interaction . Higher biological yield (13738kg/ha) was obtained from wheat variety Atta Habib while lower biological yield (11108kg/ha) was produced by the variety P.S-2004.



This variation may be due to different genetic make-up of the testing genotypes. Similarly, nitrogen applied at the rate of 120kg/ha produced maximum biological yield (12546kg/ha) while lower biological yield was recorded in the rest plots. The probable reason for this increase in biological yield might be that nitrogen enhanced the vegetative growth which results in greater biomass. These results are in line with those of (Noy-Meir and Briske, 2002), who suggested that N limitation may contribute to growth suppression and reduction in biomass production. The interaction V x N showed that increasing nitrogen level up to 120 kg/ha increased the biological yield in P.S-2005, P.S-2008 and Atta Habib and further increase in nitrogen level decreased the biological yield. In wheat variety P.S-2004, biological yield increased with increase in nitrogen levels. Wheat variety Siran's biological yield decreased with increasing nitrogen levels. The probable reason for the interactive response is that different varieties respond differently to nitrogen.

V. Conclusion

Harvest index of wheat was significantly affected by different wheat varieties and the interactive response of varieties and nitrogen while not significantly affected by nitrogen levels . Higher harvest index (31 and 30%) was calculated for P.S-2004 and P.S-2005 while lower harvest index (26%) was calculated for Siran. This might be due to difference in the genetic make-up of varieties. The interactions of wheat varieties and nitrogen showed that harvest index increased in Siran and Atta Habib with increase in nitrogen application while in varieties P.S-2004, P.S-2005 and P.S2008 harvest index increased with the increase in nitrogen up to 120kg/ha while further increase in nitrogen decreased the harvest index of wheat. This

might be probably due to difference of varieties response to nitrogen.

It is concluded from this research study that the varieties Pirsabak-2008 and Atta Habib produced maximum seed yield. Similarly, nitrogen applied at the rate of 120kg/ha performed better and enhanced the wheat productivity as compared to other treatments.

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