

To Study the Performance of Wheat (*Triticum Aestivum* L.) Varieties with Different Levels of Nitrogen in Eastern UP

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ABSTRACT: To evaluate the effect of different levels of nitrogen on growth and yield of wheat a field experiment was conducted at research area of cereals and pulses section of a field in Eastern part of Uttar Pradesh. Eight levels of nitrogen i.e. 0, 29, 58, 87, 116, 145, 174, 203 kg ha⁻¹ were evaluated. Experiment was laid out under randomized complete block design (RCBD) with three replications with a net plot size of 10×5m. Data were recorded for growth and yield parameters like number of tillers, plant height, spiklets per spike, seeds per spike, biological yield, 1000 grain weight, grain yield and harvest index. Different levels of nitrogen significantly increased all the growth and yield parameters. Maximum number of tillers, highest plant height and biological yield was recorded from the treatment where nitrogen was applied @ 203 Kg ha⁻¹ while 1000 grain yield, seeds per spike and grain yield was achieved highest from where nitrogen applied @ 145 Kg ha⁻¹.

Nitrogen is one of the most important nutrients limiting yield of bread wheat. Application of a large amount of N fertilizer has been a method of increasing yield in the study area which is costly and can cause environmental pollution. Therefore, a field experiment was conducted for two consecutive years to evaluate the effect of N application rates on grain yield, nitrogen uptake and N use efficiency of bread wheat varieties. The treatments consisted of a factorial combination of four rates of nitrogen (0, 120, 240 and 360 kg ha⁻¹) and wheat *Triticum aestivum* L in a randomized complete block design with four replications.

KEYWORDS: wheat, eastern UP, nitrogen, performance, study, fertilizer, effect

I. INTRODUCTION

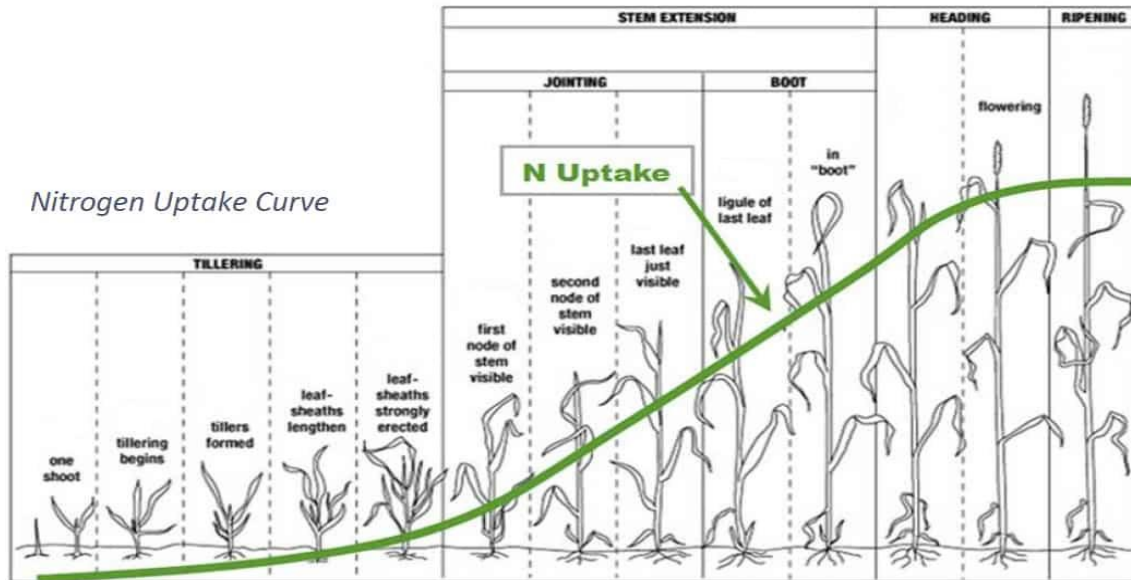
Bread wheat (*Triticum aestivum* L.) is one of the most important cereal crops of the world and is a staple food for about one third of the world's population [1]. It is one of the major cereal crops grown in the eastern parts of Uttar Pradesh, India. Despite the long history of wheat cultivation and its importance to the agriculture, its average yield is still very low, not exceeding 2.4 t ha⁻¹ [2] which is below the average of 3.4 t ha⁻¹ [5]. The low yield of wheat in India may be due to the use of low-yielding varieties, inadequate and erratic rainfall, diseases, low soil fertility and waterlogging [3].

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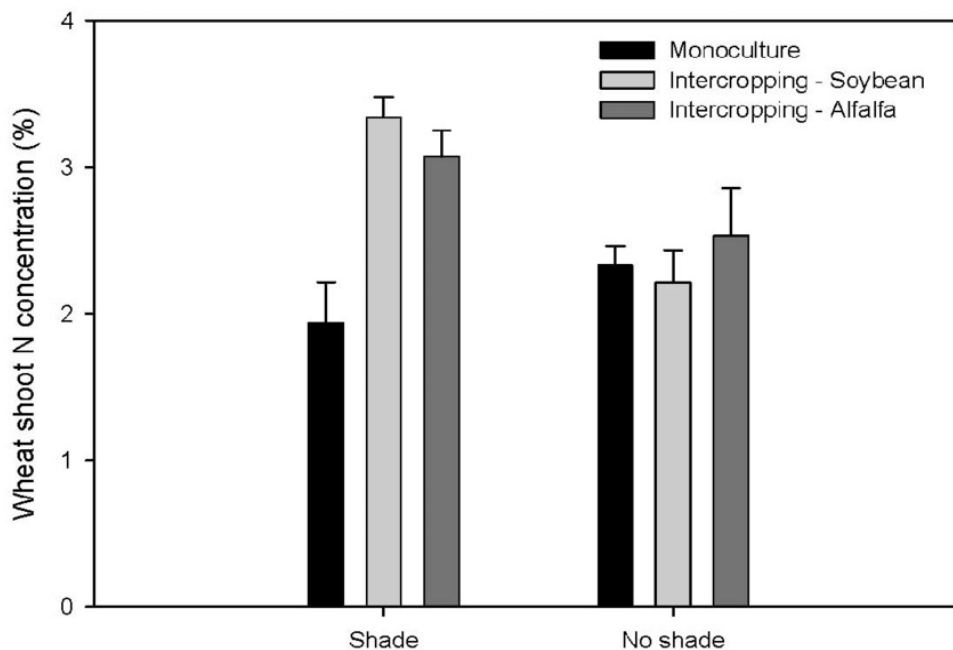
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Source: S.A. Ebelhar, University of Illinois.

The application of N is one of the major inputs used by farmers to achieve desired crop yields on these soils [4]. However, nitrogen use efficiency (NUE) in cereals is generally poor, where it is estimated that only 30–40% of the total of N-fertilizers applied are actually harvested in the grain. The remainder of the applied N is lost to the soil through leaching and runoff, where the often excessive application can affect natural ecosystems through N pollution. Loss of N also contributes to significant direct economic losses to the grower particularly when N fertilizer costs are high [5].



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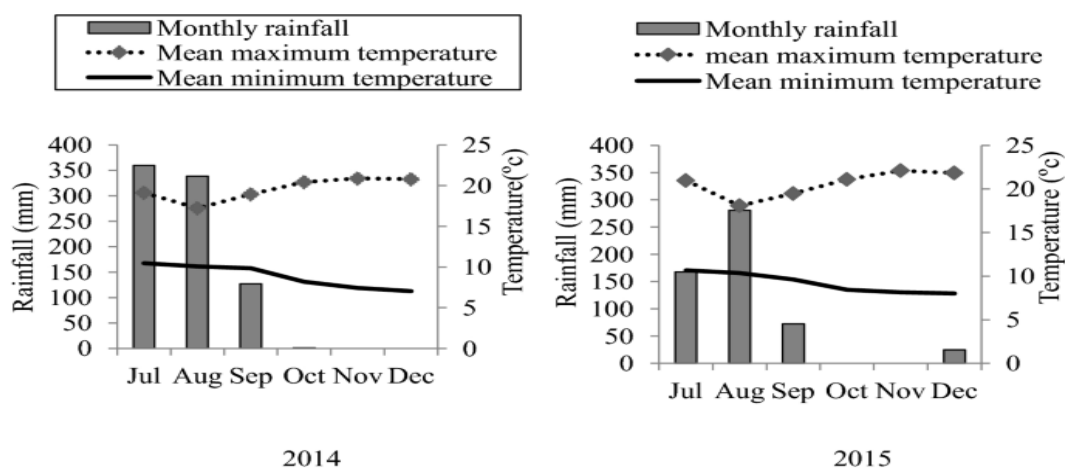
Thus, the application of the appropriate rate of N fertilizer is considered to be a primary means of increasing wheat grain yield, in improving N uptake and use efficiency and consequently nitrogen harvest index [6]. Many studies have shown genetic variation of wheat in nitrogen utilization efficiency (NUE) and nitrogen uptake efficiency (NUpE) and nitrogen recovery efficiency (NRE) [7] and that the use of the best-adapted genotype can contribute to improved efficiency in how cereal crops acquire and use soil N or fertilizer N. The studies showed that interactions of genotype and nitrogen supply affect NUE. However, improved varieties are often developed without considering their ability to grow and yield under low soil nutrient status and have been selected for high yield under high nutrient input conditions [8]. In contrast, the use of modern wheat cultivars can contribute to improve nitrogen use efficiency [13].

II. DISCUSSION

Rainfall in the study area varied considerably between the two growing years. The total rainfall during the cropping season was 826.8 mm and 545.6 mm, respectively. Differences in temperatures between the two growing seasons were relatively modest. Prior to planting, surface (0–20 cm) soil samples, from ten spots across the experimental field, were collected, composited and analyzed for soil physicochemical properties. [9]

The experimental plots were prepared by tractor plowing and harrowing. In accordance with the specifications of the design, a field layout was prepared and each treatment was assigned randomly to experimental plots within each block independently. Wheat seed was sown by drilling in rows at the recommended rate of 150 kg ha⁻¹ on July 24th in both years.[10,11]

Each year, all the wheat plots were supplied with triple superphosphate (TSP) at a recommended rate of 138 kg P₂O₅ ha⁻¹ once at sowing whereas nitrogen was applied in the form of urea in split, i.e., half at sowing and the remaining half at tillering. Plots were kept free of weeds by hand weeding. No insecticide or fungicide was applied since there was no outbreak of insects or diseases. Harvesting was done manually using hand sickle.[14]



III. RESULTS

The increase in yield of the varieties with increasing N rates up to adequate level might be due to the role of N in increasing the leaf area and promote photosynthesis efficiency which promote dry matter production and increase yield. In line with this, improvements in wheat yield and its components under the acceptable increasing N rates. The lower

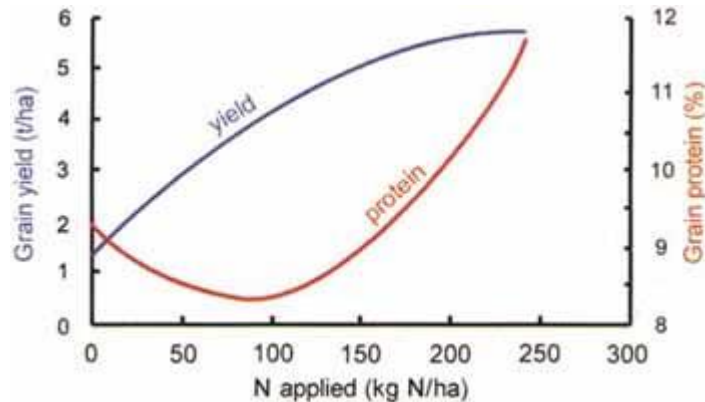
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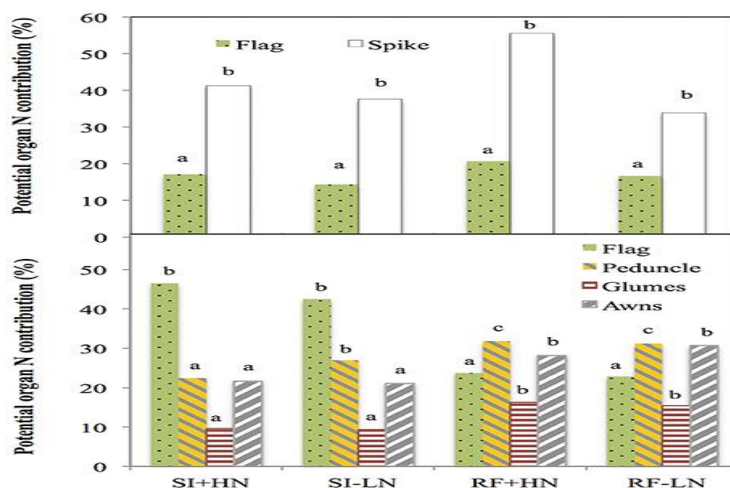
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rainfall condition in 2015 reduced the problem of waterlogging and increased the availability of N which increased the aboveground biomass production under the lower N rates and reduced the amount of nitrogen translocated to the grain (dilution effect), [12] whereas increasing the level of nitrogen beyond 240 kg ha⁻¹ did not significantly affect grain nitrogen concentration between the two growing seasons. This indicate that the application of N above 240 kg ha⁻¹ in both growing years had an effect on accumulation of nitrogen on the grain, resulted in both the increment of aboveground biomass and nitrogen accumulation in the grain.[13]



The total N uptake also reflected the biomass yield response of varieties to the applied N fertilizer rates. Total uptake of nitrogen differed significantly between years, N fertilizer rate and variety. Likewise, the interaction of year × N rate, year × variety and year × N rate × variety revealed a significant effect on total nitrogen uptake.[11]



IV. CONCLUSION

From the study, it can be concluded that grain yields of wheat were maximized with N application rates of 240 kg ha⁻¹ which were statistically at par, whereas the application of 360 kg N ha⁻¹ resulted in a decline in yield . The highest grain and straw nitrogen concentration in the wetter and in the drier years. Nitrogen fertilizer application led to a general decrease in nitrogen use efficiency traits in both growing seasons; these values were higher for the varieties

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tested in the second growing season. Also, breeding objectives should not only focus on the improvement of grain yield but also on varieties which are efficient in utilization of the applied nitrogen.[14,15]

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