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# Effect of different levels of Nitrogen and seed rates on growth and yield of nontraditional crop wheat (*Triticum aestivum*) in Telangana

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**Abstract**
An experiment on effect of different N levels and seed rate on wheat crop was conducted during rabi seasons of 2010-11 and 2011-12 at Agricultural Research Institute, Rajendranagar, Hyderabad Telangana. The experiment was laid out in Randomized Block Design with factorial concept (FRBD) at three different seeding rates of 100, 125 and 150 kg ha$^{-1}$ and three nitrogen levels of 120,180 and 240 kg N ha$^{-1}$. Two years pooled data indicated that significantly more number of tillers and panicles recorded in 125 kg seed rate ha$^{-1}$ than 100 kg ha$^{-1}$ and on par with 150 kg ha$^{-1}$. Accordingly, 125 kg seed rate ha$^{-1}$ recorded significantly higher grain yield (3084 kg ha$^{-1}$) than 100 kg ha$^{-1}$(2688 kg ha$^{-1}$) and statistically similar with 150 kg ha$^{-1}$ (3054 kg ha$^{-1}$). Grain yield and yield attributing characters did not differ significantly among different N levels. Interaction effect showed that wheat at 125 kg ha$^{-1}$ in combination with 240 kg N ha$^{-1}$ obtained higher grain yield (3823 kg ha$^{-1}$) which was on par with most of the treatments combinations.

**Keywords:** wheat, seed rate, N levels, nontraditional crop and grain yield

## Introduction
Wheat an energy rich winter cereal contributes 35% to food grain basket of the country from about 30.2 M ha with a production of 92.3 Mt. In order to meet the projected wheat demand of 109 Mt for the growing population of about 1.3 billion by 2020 it is essential to sustain the productivity at much higher level (Nagarajan 1998). In Telangana, wheat is grown in rabi as nontraditional crop with limited irrigations.

Rice-Rice cropping system resulted in over exploitation of natural resources particularly ground water, degradation of environment, sub soil compaction, development of pest and disease epidemics causing low yields with high production costs. Parts of southern Telangana zone experiences cool temperatures (<15°C), breezeless winds for > 2 months in rabi season (October-December). Wheat being a nontraditional crop may be a remunerative choice to farmer in this zone as it demands low inputs, labour and electricity under bore well irrigated system. Well-developed crop mechanization and MSP supported market price attracting farmer for wheat cultivation.

Optimum plant population, balanced fertilization and appropriate seed rates are primitive factors for achieving higher yield. If more seed rate is used, plant population will be more and there will be competition among plants for water, nutrients and sunlight resulting in low quality and low yield. If less seed rate is used yield will be less due to lesser number of plants unit area$^{-1}$. Optimum seeding rate is considered an important management factor for improving yield of wheat. It is of particular importance in wheat production because it is under the farmer's control in most cropping systems (Slafer and Satorre, 1999) [12]. Optimum plant densities vary greatly between areas, climatic conditions, soil, sowing time, and varieties (Darwinkel *et al.* 1977) [5]. If optimal seeding rates exceed, yield reductions often occur (Beuerlein and Lafever, 1989; Harrison and Beuerlein, 1989) [2, 6]. Previous research as shows that seeding rates significantly affected biological yield (Ayaz *et al.* 1997) [1], achieved stands (Stoppler *et al.* 1990), spike number and weight (Ozturk *et al.*2006). Higher seeding rates compensate for reduced tiller development and promote more main stem spikes which can be favorable, especially for cultivars that tend to produce fewer tillers (Coventry *et al.* 1993; Staggenborg *et al.*2003) [4, 13]. A close relationship exists between wheat stands and yield components (Zhen–Wen *et al.* 1988) [16].

Similarly nitrogen is very important for plant. It plays an important role in crop life. It is necessary for protein synthesis. In case of nitrogen deficiency, drying and firing of leaves occur, poor growth is achieved, grain poorly filled and yield is severely affected. Excess nitrogen, in particular, is also not good for wheat crop; it causes an early exhaustion of soil moisture, induces lodging, reduces resistance to leaf diseases, and delay maturity.

Although sufficient information is available on the N doses and seed rates on wheat yield at different agro climatic conditions of northern India, it has to be studied under Deccan plateau soils and agro climatic situations of Telangana state.

## Materials and Methods

A study to examine the effect of different seed rates and different levels of nitrogen was conducted at Agricultural Research Institute, Rajendranagar, Hyderabad, and Telangana, India during Rabi 2010-11 and 2011-12. Test variety GW-411 was sown at seeding rates of 100, 125 and 150 kg $ha^{-1}$ with three nitrogen levels of 120,180 and 240 kg N $ha^{-1}$. The experiment was laid out in Randomized Block Design with factorial concept (FRBD). The gross and net plot size were 6 m x 3.5 m and 5.5 m x 3 m. The initial physical and chemical properties of soils indicated that soils are sandy loam in texture and neutral reaction with pH of 7.2 and low salinity (EC- 0.23 $dSm^{-1}$) in nature. Fertility status indicated that the soils were low in organic carbon (0.2%), low in available N (185 kg $ha^{-1}$), and medium in available P (15 kg $ha^{-1}$) and high in available K (310 kg $ha^{-1}$).

The land was prepared by ploughing the field for 2-3 times with cultivator followed by leveling with blade. Wheat seed was dibbled by maintaining row to row distance of 25 cm. The nitrogen fertilizer in the form of urea was applied as per treatments in three equal splits at sowing, tillering and panicle initiation stages. SSP and MOP were used as source for P and K. entire $P_2O_5$ was applied as basal and $K_2O$ was applied in 2 equal splits as basal and at panicle initiation. All plots received uniform cultural practices other than treatments. Weed, pest and disease management was done as per recommendations. Total six number of irrigations were given. The data on grain and straw yields were recorded at harvest. The data was analyzed statistically by the standard procedure outlined by Gomez and Gomez (1984).

## Results and Discussion

During first year, N levels did not show any significant Influence on all growth and yield attributing parameters except panicle number where 240 kg N $ha^{-1}$ recorded significantly higher panicle number than 0, 120 kg N $ha^{-1}$ and on par with 180 kg N $ha^{-1}$ (Table 1). Grain yield was significantly higher at 240 kg N $ha^{-1}$(3000 kg $ha^{-1}$) than 180 (2705 kg $ha^{-1}$) and 120 kg N $ha^{-1}$ (2538 kg $ha^{-1}$).

Tiller number and panicle number were significantly higher at 150 kg seed $ha^{-1}$ than 100 kg $ha^{-1}$ and on par with 125 kg $ha^{-1}$. Other yield attributing characters did not differ among seed rates. However, 150 kg $ha^{-1}$ recorded significantly higher grain yield (3147 kg $ha^{-1}$) than 125 (2787 kg $ha^{-1}$) and 100 kg seed $ha^{-1}$ (2311 kg $ha^{-1}$).

During second year, N levels did not any significant influence on yield and yield attributing characters (Table 1). Significantly more number of tillers, panicle and filled grains were observed at 125 kg seed $ha^{-1}$ than 100 kg $ha^{-1}$. Grain yield did not differ among seed rates. Interaction effect showed that wheat at 125 kg $ha^{-1}$ in combination with 240 kg N $ha^{-1}$ obtained higher grain yield (3823 kg $ha^{-1}$) which was on par with most of the treatments combinations.

Two years pooled data indicated that grain yield and yield attributing characters did not differ significantly among different N levels (Table 1). Significantly more Number of tillers and number of panicles recorded in 125 kg $ha^{-1}$ than 100 kg $ha^{-1}$and on par with 150 kg $ha^{-1}$. Different seed rates did not show any significant effect on other yield attributing characters like filled grains $panicle^{-1}$ and 1000 grain weight. Among seed rates used, 125 kg seed rate $ha^{-1}$ recorded significantly higher grain yield (3084 kg $ha^{-1}$) than 100 kg $ha^{-1}$ (2688 kg $ha^{-1}$) and statistically similar with 150 kg $ha^{-1}$ (3054 kg $ha^{-1}$). Higher grain yield in 125 kg $ha^{-1}$ is due to vigorous crop growth due to optimum plant population maintained in 125 kg $ha^{-1}$ than 100 and 150 kg $ha^{-1}$ and it is evident from highest number of tillers and panicles were observed in 125 kg seed $ha^{-1}$ than other seed rates.

These results are in agreement with findings of Chatta *et al*., (1986), Ibrar (1999) [9], Hameed *et al*., (2003) [7] and Ijaz *et al*., (2003) [8], who reported that grain yield increased as seed rate increased and the highest grain yield was noted in plots seeded at the rate of 120 kg $ha^{-1}$.Wajid Ali Shah *et al.,* (2011) [15] reported that 120 kg $ha^{-1}$ seed rate fertilized with 120 kg N $ha^{-1}$ resulted in higher yield and economics. Mazurek *et al*. (1984) reported that 125 kg $ha^{-1}$ had better yield than 150 and above seed rates.

**Table 1:** Influence of Nitrogen levels and seed rate on growth, yield attributes and grain yield of wheat

| | Plant height (cm) | | | No of tillers $m^{-2}$ | | | No of panicles $m^{-2}$ | | | Filled grains $panicle^{-1}$ | | | 1000 grain weight (g) | | | Grain yield (kg $ha^{-1}$) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Treatment** | **I** | **II** | **pooled** | **I** | **II** | **pooled** | **I** | **II** | **pooled** | **I** | **II** | **pooled** | **I** | **II** | **pooled** | **I** | **II** | **pooled** |
| N Levels | | | | | | | | | | | | | | | | | | |
| 120 kg $ha^{-1}$ | 83.7 | 81.3 | 82.5 | 202 | 284 | 243 | 168 | 262 | 215 | 36 | 38 | 37 | 3.8 | 5.6 | 4.7 | 2538 | 3098 | 2818 |
| 180 kg $ha^{-1}$ | 84.6 | 82.3 | 83.5 | 218 | 264 | 241 | 190 | 244 | 217 | 35 | 38 | 37 | 3.8 | 5.5 | 4.7 | 2705 | 2963 | 2834 |
| 240 kg $ha^{-1}$ | 83.7 | 81.2 | 82.5 | 217 | 290 | 254 | 198 | 268 | 233 | 39 | 38 | 39 | 4.1 | 5.5 | 4.8 | 3000 | 3344 | 3172 |
| SEm± | 1.8 | 1.5 | 1.8 | 5.8 | 14.1 | 10.0 | 3 | 14 | 9 | 1.0 | 0.3 | 0.7 | 0.1 | 0.1 | 0.1 | 95 | 157 | 126 |
| CD (P=0.05) | NS | NS | NS | NS | NS | NS | 9 | NS | NS | NS | NS | NS | NS | NS | NS | 287 | NS | NS |
| Seed rates | | | | | | | | | | | | | | | | | | |
| 100 kg $ha^{-1}$ | 80.6 | 80.9 | 80.8 | 189 | 251 | 220 | 178 | 229 | 204 | 38 | 37 | 38 | 3.8 | 5.5 | 4.7 | 2311 | 3064 | 2688 |
| 125 kg $ha^{-1}$ | 85.6 | 81.4 | 83.5 | 214 | 300 | 257 | 191 | 280 | 236 | 36 | 39 | 38 | 3.8 | 5.6 | 4.7 | 2787 | 3381 | 3084 |
| 150 kg $ha^{-1}$ | 85.8 | 82.6 | 84.2 | 235 | 286 | 261 | 187 | 265 | 226 | 36 | 38 | 37 | 4.1 | 5.4 | 4.8 | 3147 | 2960 | 3054 |
| SEm± | 1.8 | 1.5 | 1.7 | 5.8 | 14.1 | 10 | 3 | 14 | 8.5 | 1 | 0.3 | 0.7 | 0.1 | 0.1 | 0.1 | 95 | 157 | 126 |
| CD (p=0.05) | NS | NS | NS | 17.4 | 42.2 | 30 | 9 | 43 | 26 | NS | 1.0 | NS | NS | NS | NS | 287 | NS | 379 |
| Interaction | | | | | | | | | | | | | | | | | | |
| SEm± | 3.2 | 2.6 | 2.9 | 10.1 | 24 | 17.1 | 5 | 25 | 15 | 2 | 0.6 | 1.3 | 0.2 | 0.2 | 0.2 | 166 | 272 | 222 |
| CD (P=0.05) | NS | 7.8 | NS | NS | 73 | NS | NS | 75 | NS | NS | 2 | NS | NS | NS | NS | 496 | 817 | NS |

**Conclusion**

Application of 120 kg N $ha^{-1}$ to wheat sown with 125 kg seed $ha^{-1}$ is recommended to achieve higher grain yield (3 t $ha^{-1}$) under irrigated semi-arid agro climatic condition of Southern Telangana Zone.

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