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# Growth and yield response of wheat (Triticum aestivum L.) under different fertility levels and varieties

Dr.T Singh , Dr. V.D.Dwivedi, Prachi singh, Balram patidar

Department of agronomy a.k.s University

Sherganj, Satna 485001,M.P.

## Abstract

In order to investigat in the possibility of improving growth as will as yield of wheat due to use of different fertility levels and varieties therefore, a field experiment was planned and executed at the research farm, Aks University, sherganj , Satna (M.P.)during Rabi season,2021 There were twelve treatment combination including four fertility levels ie (00:00:,00kgNPK/ha,100:40:20kgNPK/ha,120:60:40kgNPK/ha and140:80:60kg NPK/ha) and three cultivars ie(GW322,GW366and M. P.1132)were evaluated in randomized block design with factorial concept in three replications. Higher plant heights and number of tillers per meter row length at harvest step(88.15cm and 77.33cm respectively)were obtained under the treatment where 140:80:60 kg NPK/ha along with GW 322 was used. Besides, maximum length of a spike(9.59cm),number of grains per spike (38.73) test weight(41.42g) grain and straw yield(50.03 and 69.26 q/ha )respectively were recorded under same treatment combinations of NPK @ 140:80:60 kg NPK/ha with Wheat variety GW 322.

**Key words:** variety, spike, test weight.

## Introduction

Wheat ( triticum aestivum L. ) is the most important crop among the cereals and used as food grains in the world. It means first in the cereals production and is staple food of about one third of the word population. It is one of the major source of energy, protein and fibre in human diet (Arya et al 2012) wheat is the second most important cereal crop in the world after rice and globally cultivated in an area of 224.72 million ha with production and productivity of 734.62 million tonnes and 3.27 10 ton/ ha respectively (anonymom 2016).However, the average yield per unit area of wheat recorded in M.P is also below. The potential yield due to not cultivating high yielding varieties of wheat and nutritional factor as well. The low productivity of wheat in M.P may be due to poor fertility status of soil, moisture stress due to low water holding capacity of the soil, imbalance use of fertilizers, non availability of quality seed, use of local varieties etc. However, high productivity of wheat can also be achieved by adopting high yielding varieties of wheat along with use of improved agronomic practices.

Fertilizer is the single most important input of modern agriculture to raise the productivity of Crop. Joint application of all the three major nutrients important plays role in wheat production

 

incorporation of NPK in balanced share at proper time has great impact on wheat yield. plant species even varieties with in species vary in their behavior to obtain and utilize NPK for grain production. Requirement of NPK of wheat cultivars differ varieties to variety. Therefore for maximizing production per unit area growing of high yielding varieties with higher dosage of fertility labels is necessary. The chemical fertilizer are underwide recommendation to fulfill the nutrient need of the crop (Kumari et al 2013).

Selection of varieties may be one major source of productivity of grain. Many high yielding varieties have been evolved and recommended for general cultivation. These varieties are loosing their yielding potential due to change of a adaphic and environmental condition. Therefor continuous selection of high yielding varieties with mid range of adaptability to adaphic and environmental condition is very essential to increase yield per hectare. The present investigation have been planned to estimate the exact application of nutrients and its impact on growth and yield of different wheat cultivars.

**Material and methods**

The present experiment was conducted at the research farm, AKS University, sherganj, satna M.P during rabi season of 2021.The experiment was executed in randomized block design having factorial concept with three replications. Different fertility levels and varieties were allocated to the plot as per treatment combination. Seed was used @ 100 kg /ha on flat bed with 22.5 cm row to row distance. The treatment involved were four fertility levels ie (@:00:00:00kg NPK/ha, 100:40:20Kg NPK/ha, 120:60:40 kg NPK/ha and 140:80:60NPK/ha where as three wheat varieties ie GW- 322 ,GW 366 and MP 1132 thus making twelve treatment combination were evaluated in an appropriable design of experiment. The gross and net plot size was 5.0 m x 3.5 m and 4.0 m x 3.0 m respectively. Full recommended dose of phosphorus and potassium as per treatment were uniformly applied to each plot except control with half dose of Nitrogen as basal dose before sowing. Remaining half dose of Nitrogen was applied in two equal splits at 30 and 60 DAS ie at tillering and late jointing stage. All the fertilizer were applied by placement ie 5 cm away from seed row and 5 cm below the seed zone. All the agronomical were practiced as and when required for better stand of the crop.

**Result and discussion**

Analysed data displayed in table-1obiviously indicated that height of the plant, number of tillers at harvest, length of a spike, number of grain per spike, test weight, grain and straw yield were influenced Paramountly due to use of different fertility levels as well as varieties. Height of plant, number of tillers per meter row length 84.35 cm and 60.93 respectively were recorded when NPK@ 140:80:60 kg /ha was applied. However, variety GW- 322 gave maximum plant height( 80.02 cm) and numbers of tillers per meter row length (59.13) which were significantly superior over rest of the varieties.

 

The significantly heigher plant height and number of tillers was recorded under the use of treatment combination of 140,80 and 60 kg NPK/ha + GW 322 with the respective value of 88.15 cm and 77.33 respectively. The increase in height of the plant might be due to better availability of nutrient through out the crop growth period. The growth of plant of wheat was increased linearly as different levels of NPK was increased. These findings and report are enclosed conformity with the finding of Singh and Sharma (2016). They have also reported that increase in plant height of wheat with application of higher doses of Nitrogen through inorganic fertilizer over organic one is due to higher availability of nutrient in adequant proportion and its timely supply at active growth stage of wheat crop. Among the treatment higher dose of NPK produced significantly maximum height and tillers. These findings completely corroborate the finding of Kumar et al (2012). Who had reported that application of Nitrogen @ 150 kg /ha caused better response in connection with growth parameters. The improvement in growth parameters with fertility levels are in close conformity with Chopra et al (2016 ),Singh and Sharma (2016) and Prajapati (2018) GW 322 resulted significantly higher values of growth characters. The difference in growth characters due to varities may be attributed to their inherent characteristics and adaptability to soil and climate condition. So much variation in growth parameters in different varieties were owing to variation in their genetic inheritance with respect to these characters.

Data portrayed in table 1 on yield and yield attributes evident that highest spike length, number of grain per spike, test weight, grain and straw yield (7.77 cm,37.20, 38.76 g 46.77q/ ha and 64.12 q/ha respectively were obtained when plots were treated with 140 :80:60 kg NPK/ha. However, variety GW- 322 produced highest spike length, number of grains/spike, test weight(g) grain and straw yield value of 7.04cm, 36.47 ,37.76 g 44.31 q/ha and 57.81 q/ha respectively which were significantly superior Over rest of the varieties. Similarly, in an interaction the highest spike length, number of grains per spike, test weight(g) grain and straw yield were recorded highest when interactive use of 140: 80:60 kg and NPK /ha with wheat variety GW 322 was made (table- 1).Among treatments higher dose of NPK produced significantly higher yield and yield attributes. These findings are in accordance with findings of Singh et al (2017). They stated that appropriate large amount of nutrients supplied in early stage of growth, the higher number of effective tillers in wheat were noted and they affected all the yield as will as yield attributes. It is further maintained that enhancement in yield and yield components might be due to favourable impact of fertilizer on grown attributes and efficient and greater partitioning metabolites and adequats translocation of photosynthates and nutrients to develop reproductive structure of plants. These statements confer the findings of Patel et al (2018 )the grain and straw yield of wheat significantly increased with application of higher rate of NPK. The trend of increase in grain and straw yield which was obtained might be due to these treatments which was exactly in accordance with the similar increase in the yield attributes characters. Similar report were also made by Kumar et al (2017), singh et al (2017) and Yadav et al(2018).Superior yield in GW- 322 was also mainly contributed by higher biomass per plant and it was due to

 

longer plant height, number of effective tillers, length of spike and number of grains per spike and straw yield. There findings are in close conformily with the findings of Yadava et al (2020) and Adhikari et al (2021).

**TABLE- 1: Response of fertility levels and varieties on Growth and yield of wheat**

| Treatment | Plant height (cm) | Number of tillers/m row length | Spike length(cm) | Number of grains per spike | Test weight(g) | Grain yield (q/ha) | Stover yield (q/ha) |
|---|---|---|---|---|---|---|---|
| Effect of fertility levels | | | | | | | |
| $F_0$ | 73.36 | 32.27 | 2.84 | 28.38 | 32.64 | 28.62 | 36.58 |
| $F_1$ | 80.23 | 46.60 | 5.74 | 35.29 | 35.90 | 41.33 | 50.53 |
| $F_2$ | 82.86 | 55.87 | 6.91 | 36.33 | 37.57 | 45.19 | 63.23 |
| $F_3$ | 84.35 | 60.93 | 7.77 | 37.20 | 38.76 | 46.77 | 64.12 |
| S.Em± | 0.78 | 2.02 | 0.29 | 0.63 | 0.58 | 0.68 | 0.83 |
| C.D.(P=0.05) | 2.28 | 5.92 | 0.86 | 1.84 | 1.69 | 1.99 | 2.43 |
| | Effect of varieties | | | | | | |
| $V_1$ | 83.02 | 59.13 | 7.04 | 36.47 | 37.76 | 44.31 | 57.81 |
| $V_2$ | 80.79 | 49.28 | 5.95 | 35.73 | 36.52 | 42.31 | 57.02 |
| $V_3$ | 76.78 | 38.33 | 4.46 | 30.70 | 34.37 | 34.81 | 46.01 |
| S.Em± | 0.90 | 2.33 | 0.34 | 0.72 | 0.67 | 0.78 | 0.96 |
| C.D. P=(O.05) | 2.63 | 6.83 | 0.99 | 2.12 | 1.95 | 2.29 | 2.80 |
| | Interaction effect between fertility levels and varieties | | | | | | |
| $F_0$ $V_1$ | 75.45 | 35.93 | 3.26 | 33.07 | 33.29 | 33.86 | 38.43 |
| $F_0$ $V_2$ | 82.49 | 53.33 | 6.71 | 36.20 | 37.17 | 44.86 | 56.31 |
| $F_0$ $V_3$ | 85.99 | 69.93 | 8.59 | 37.87 | 39.17 | 48.50 | 67.25 |
| $F_1$ $V_1$ | 88.15 | 77.33 | 9.59 | 38.73 | 41.42 | 50.03 | 69.26 |
| $F_1$ $V_2$ | 74.13 | 33.20 | 2.81 | 32.27 | 32.85 | 32.11 | 38.29 |
| $F_1$ $V_3$ | 81.40 | 48.07 | 6.31 | 36.07 | 36.37 | 44.61 | 56.16 |
| $F_2$ $V_1$ | 83.17 | 55.67 | 6.89 | 37.07 | 38.06 | 45.53 | 66.58 |
| $F_2$ $V_2$ | 84.46 | 60.20 | 7.78 | 37.53 | 38.81 | 47.00 | 67.06 |
| $F_2$ $V_3$ | 70.49 | 27.67 | 2.45 | 19.80 | 31.78 | 19.89 | 33.03 |

 

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $F_3$ $V_1$ | 76.79 | 38.40 | 4.19 | 33.60 | 34.15 | 34.50 | 39.11 |
| $F_3$ $V_2$ | 79.42 | 42.00 | 5.25 | 34.07 | 35.48 | 41.56 | 55.85 |
| $F_3$ $V_3$ | 80.43 | 45.27 | 5.95 | 35.33 | 36.06 | 43.28 | 56.05 |
| S.Em± | 0.45 | 1.16 | 0.17 | 0.36 | 0.33 | 0.39 | 0.48 |
| C.D. P=(O.05) | 0.93 | 2.42 | 0.35 | 0.75 | 0.69 | 0.81 | 0.99 |

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