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Research Article

Effect of Fertility Levels and Varieties on Growth and Yield of Wheat (*Triticum aestivum* L.)

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ABSTRACT

The present study was planned to ascertain the effect of different fertility levels and varieties on growth, yield and quality of wheat at the students instructional farm, department of Agronomy, Faculty of Agriculture, AKS University, Sherganj, Satna (M.P.) during rabi. season of 2020-21. In this experiment, 12 treatment combinations including four fertility levels and three varieties were involved and combination were F_0- NPK @ 00: 00: 00 kg/ha, F_1- NPK @ 100: 40: 20 kg/ha, F_2- NPK @ 120: 60: 40 kg/ha and F_3- NPK @ 140: 80: 60 kg/ha, while three wheat varieties were tested are V_1- GW 322, V_2- GW 366 and V_3- MP 1132. Higher plant height and number of tillers per meter row length at harvesting stage (88.15 cm and 77.33, respectively) was recorded in plots treated with NPK @ 140: 80: 60 kg/ha with wheat variety GW- 322. beside maximum number length of spike (9.59 cm), number of grains/spike (38.73), test weight (41.42 g), grain and Stover yield (50.03 and 69.26 q/ha, respectively) were recorded under same treatment combination of NPK @ 140: 80: 60 kg/ha with wheat variety GW- 322. Further this combination of treatment was proved to be effective and hence this was concluded for production of wheat crop.

Keywords: *Wheat, Variety, Spike, Test weight, Stover yield.*

INTRODUCTION

Wheat (*Triticum aestivum* L.) is the most important among all cereals used as a food grain in the world. It ranks first in the world cereal production and is a staple food of about one third of the world's population. It is one of the major sources of energy, protein and fiber in human diet (Arya et al., 2012). Wheat is the second most important cereal crop in the world after rice and globally cultivated on an area of 224.72 million ha with production and productivity of 734.62 million tones and 3.27 tones/ha, respectively (Anonymous, 2016).

The average yield per unit area of wheat observed in Madhya Pradesh is also below the potential yields due to a variety and nutritional factors.

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The low productivity of wheat in Madhya Pradesh is mainly owing to factors like low fertility levels of soil, moisture stress due to low water holding capacity of soil, lack of required soil depth, imbalanced use of fertilizers, non-availability of quality seed of locally recommended varieties etc. The high productivity of wheat can also be achieved by the adoption of suitable variety and improved agronomic practices with balanced and judicious use of fertilizers in an integrated way.

Fertilizer is the single most important input in modern agriculture to raise the crop productivity. The combined use of NPK fertilizers plays an important role in wheat production. Application of NPK in balanced share at proper time has great impact on wheat yield. Plant species, even varieties within species vary in their behaviors to obtain and utilize NPK for grain production. Nutrients play an important role in boosting the crop production. Crop species of wheat requires higher amount of nitrogen, phosphorus and potassium fertilizers. For maximizing production per unit area, growing of high yielding varieties with higher doses of fertility level is necessary. The chemical fertilizers are under wide recommendation to fulfill the nutrient need of this crop (Kumari et al., 2013).

Variety selection may be one major source of productivity gains. Many high yielding varieties have been evolved and recommended for general cultivation. These varieties are losing their yield potential due to change of various edaphic and environmental conditions. Therefore, continuous selection of high yielding varieties with mid-range of adaptability to edaphic and environmental conditions is very essential to increase yield per hectare. The present study was planned to estimate the exact application nutrients and its impact on growth and yield of different wheat cultivars.

MATERIALS AND METHODS

The experiment was carried out at student instructional farm, Faculty of Agriculture, AKS University, Satna (M.P.) during *rabi* season 2020- 21. The experiment was conducted in randomize complete block design having Factorial concept with three replications. Different rates of fertilizers and varieties will be allocated to the plots as per treatments. Seed rate used as 100 kg/ha on flat beds with 22.5 cm row to row distance. The treatments were four fertility levels and treatments were F_0- NPK @ 00: 00: 00 kg/ha, F_1- NPK @ 100: 40: 20 kg/ha, F_2- NPK @ 120: 60: 40 kg/ha and F_3- NPK @ 140: 80: 60 kg/ha, while three wheat varieties were tested are V_1- GW 322, V_2- GW 366 and V_3- MP 1132. 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 was uniformly applied to each plot (except control plots) 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 i.e., at tillering and late jointing stage. Fertilizers were applied by placement i.e., 5 cm away from seed row and of 5 cm below the seed zone. All the other agronomic practices were applied uniformly to all the treatments.

RESULTS AND DISCUSSION

The result shows that plant height, number of tillers at harvest stage, spike length, number of grains/spike, test weight, grain and stover yield was influenced significantly due to different concentrations of nitrogen and varieties.

Data regarding plant height and number of tillers per meter row length are reported in Table 1. Statistical analysis of the data revealed that maximum plant height and number of tillers per meter row length (84.35 cm and 60.93, respectively) were recorded in plots treated with the application of NPK @ 140: 80: 60 kg/ha while, lowest values were observed in plot that received no fertilizers. However, variety GW- 322 gave maximum plant height and number of tillers value of 83.02 cm and 59.13, respectively. The significantly higher plant height and number of tillers of wheat was recorded under the treatment combination consisting that the

application of NPK @ 140: 80: 60 kg/ha with wheat variety GW- 322 with the respective value of 88.15 cm and 77.33, respectively.

This increase in plant growth of wheat might be due better availability of nutrient throughout the crop growth stages, where the chemical fertilizer supplied the NPK at initial growth stages of the crop and later stages of nutrients. The plant growth of wheat at all observation stages of the crop, increased with treatments where higher amount of NPK were given through inorganic fertilizer. These findings are in confirmation with Singh and Sharma (2016), who reported that increase in plant height of wheat with application of higher doses of nitrogen through inorganic fertilizer over organic manure, is due to higher availability of nutrient in adequate proportion and its timely supply at active growth stages of wheat crop.

Among all the treatments, higher dose of NPK, produced the significantly maximum height and tillers. These results corroborate the findings of Kumar et al. (2012), who reported that application of recommended dose of nitrogen through chemical fertilizer (150% kg N /ha) in wheat produced statistically at par LAI with application of nitrogen at 225 kg /ha through organic sources. The improvement in growth parameters with fertility levels are in close conformity with Chopra et al. (2016), Singh and Sharma (2016) and Prajapati et al. (2018).

Between the varieties, GW- 322 resulted into the significant higher values of all these characters. The differences in growth characters due to varieties may be attributed to their inherent characteristics and adaptability to soil and climatic conditions. So much variations in growth parameters in different varieties was owing to variations in their genetic inheritance in these characters.

Statistical analysis of the data revealed that highest spike length, number of grains per spike, test weight, grain and stover yield (7.77 cm, 37.20, 38.76 g, 46.77 q/ha and 64.12 q/ha, respectively) were recorded in plots treated with the application of NPK @ 140: 80: 60 kg/ha while, lowest values were observed in plot that received no fertilizers. However, variety GW- 322 gave highest spike length, number of grains per spike, test weight, grain and stover yield value of 7.04 cm, 36.47, 37.76 g, 44.31 q/ha and 57.81 q/ha, respectively.

Similarly, in interaction the highest spike length, number of grains per spike, test weight, grain and stover yield value was recorded from plot receiving NPK @ 140: 80: 60 kg/ha with wheat variety GW- 322 value of 9.59 cm, 38.73, 41.42 g, 50.03 q/ha and 69.26 q/ha, respectively while minimum was recorded from plot receiving no fertilizers with wheat variety of MP- 1132.

Among treatments, higher dose of NPK produced significantly higher yield attributes. These results are in accordance with findings of Singh et al. (2017). They stated that sufficient supplied the nutrient in earlier stages of wheat; thus, better availability of nutrient in adequate proportion at all growth stages of wheat crop resulted to higher number of effective tillers in wheat. It is further mentioned that the improvement in yield components might have resulted from favourable influence of fertilizers on the growth attributes and efficient and greater partitioning of metabolites and adequate translocation of photosynthesis and nutrients to developing reproductive structures. These results confirm 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 increases in seed and straw yields obtained due to these treatments was exactly in accordance with the similar increases in the yield-attributing characters. This might be due to that maximum grain and straw yield of wheat, which these nutrients available continuously to the wheat crop for longer crop duration throughout crop growth period and resulted higher grain and straw yield. Similar results were also reported by Kumar et al. (2017), Singh et al. (2017) and Yadav et al. (2018).

Superior yield in GW- 322 were mainly contributed by higher biomass per plant due to higher plant height, number of

effective tillers, number of spikes and seed and straw yield per plant. The seed yield is the resultant of coordinated interplay of growth and development characters. Thus, the productivity parameters are based on the cumulative effect of the genetic ability and production efficiency of the varieties. The results are in close conformity with the finding of Yadav et al. (2020) and Adhikari et al. (2021).

Table 1: Responce 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=0.05)	2.63	6.83	0.99	2.12	1.95	2.29	2.80
	Interaction effect between fertility levels and varieties						
F_0V_1	75.45	35.93	3.26	33.07	33.29	33.86	38.43
F_0V_2	82.49	53.33	6.71	36.20	37.17	44.86	56.31
F_0V_3	85.99	69.93	8.59	37.87	39.17	48.50	67.25
F_1V_1	88.15	77.33	9.59	38.73	41.42	50.03	69.26
F_1V_2	74.13	33.20	2.81	32.27	32.85	32.11	38.29
F_1V_3	81.40	48.07	6.31	36.07	36.37	44.61	56.16
F_2V_1	83.17	55.67	6.89	37.07	38.06	45.53	66.58
F_2V_2	84.46	60.20	7.78	37.53	38.81	47.00	67.06
F_2V_3	70.49	27.67	2.45	19.80	31.78	19.89	33.03
F_3V_1	76.79	38.40	4.19	33.60	34.15	34.50	39.11
F_3V_2	79.42	42.00	5.25	34.07	35.48	41.56	55.85
F_3V_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=0.05)	0.93	2.42	0.35	0.75	0.69	0.81	0.99

CONCLUSION

It was concluded from the results that application of NPK @ 140: 80: 60 kg/ha with wheat GW- 322 improve the yield and yield components of wheat. It is recommended that NPK @ 140: 80: 60 kg/ha with wheat GW-322 should be used to improve the yield and yield components of wheat.

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Conflict of Interest

The author(s) declares no conflict of interest.

Author Contribution

All authors contributed equally to establishing the topic of the research and design experiment.

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