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Dinkar Sawarn
M.Sc. Scholar, School of
Agriculture, Dev Bhoomi
Uttarakhand University,
Dehradun, Uttarakhand, India

Manisha Phaugat
Professor and Dean, School of
Agriculture, Dev Bhoomi
Uttarakhand University,
Dehradun, Uttarakhand, India

Ankit
Assistant Professor, School of
Agriculture, Dev Bhoomi
Uttarakhand University,
Dehradun, Uttarakhand, India

Corresponding Author:
Dinkar Sawarn
M.Sc. Scholar, School of
Agriculture, Dev Bhoomi
Uttarakhand University,
Dehradun, Uttarakhand, India

Evaluation of growth and yield performance of different wheat (*Triticum aestivum* L.) varieties under irrigated conditions

Dinkar Sawarn, Manisha Phaugat and Ankit

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Abstract

The present investigation entitled “Evaluation of growth and yield performance of different wheat (*Triticum aestivum* L.) varieties under irrigated conditions” was planned and carried out during Rabi season of 2025-26 at the Crop Research Farm, School of Agriculture, Dev Bhoomi Uttarakhand University, Dehradun, Uttarakhand, India. The soil of Experimental site was very sandy loam in texture with optimum PH (7.5). It was moderate in fertility status with low in organic carbon, available Nitrogen, available Phosphorus and available potassium. The experiment was laid out in Randomized Block Design with ten Varieties. The wheat varieties was sown using the seed rate of 100 kg ha⁻¹ in well prepared soil maintaining a row spacing of 20 cm and sown at depth of 3-4cm. Mean data showed significant maximum plant height, plant dry weight, number of tillers, leaf area index, crop growth rate and relative growth rate were recorded in T₉ (Veer 1212) followed by T₈ (Easle 1204) during the year of experiment. T₂ (Mahashaktishali 303) recorded 3rd place in all the growth attributes. Maximum yield and yields attributes viz. number of spike/plant, number of grains/ spike, test weight, grain yield and stover yield were also recorded T₉ (Veer 1212) followed by T₈ (Easle 1204) during the year of experiment. Harvest index also found maximum T₂ (Mahashaktishali 303) followed by T₈ (Easle 1204) during the year of experiment.

Keywords: Wheat, *Triticum aestivum*, varieties, growth, yield

Introduction

India is currently fighting with food crisis due the erosion of its bio-diversity and focus on mono cropping in agriculture. Besides, the climate change and the consequences of the overuse of chemicals and fertilizers, have adversely affected the productivity of the crops. According to Richharia and Govindasamy (1990) India is endowed with wheat germplasm collections of wheat consisting nearly two lakh varieties. 4 But, consequent to the green revolution and the resultant invasion of improved high yielding varieties (HYVs) the area under indigenous wheat in India have been declined gradually.

Among the cereals, wheat (*Triticum aestivum* L.) rank first in terms of nutritional value and it is considered as the most important field crop in the world covering 220.10 m ha and with a production of 763.26 m t (USDA, 2019). It is used as staple food by more than one third of the world's population. As one of the commonest cereal crops, it plays an important role in daily energy intake and in many developing nations, provides over 50% of the daily caloric intake (Cakmak, 2008) [13]. In India, wheat is the 2nd most important food crop next to rice with a production of 99.87 m t in 29.65 m ha in the year 2018-19. The share of wheat to total food grain production in India is around 35% and it occupies about 23.3% of the total area under food grains. Keeping in view of the growing population demand, wheat production needs to achieve a targeted demand of 140 million tonnes by 2050 (ICAR-IIWBR, 2015). It is quite clear that sustaining wheat productivity is essential to both food as well as nutritional security in India. In the recent past, yield plateauing has been noticed in most wheat ecologies and even it has started declining in most productive zone of North India. The major traditional wheat-growing states like Punjab, Haryana and Uttar Pradesh, witnessed a negative change in production of wheat. Inappropriate nutrient management is one of the major causes for such yield gap.

Variety plays an important role in producing high yield of a crop. Because of genetic variation, different cultivars of crop differ in their growth and developmental behaviour as well as response differently to varied input, prevailing environment and management practices (Ram *et al.*, 2018). So, apart from nutrient management high yielding varieties also play an important role in enhancing the production. Number of tillers, number of spikelets, panicle length, grain size, grain yield and other yield contributing characters differ from one variety to another. So, selection of suitable varieties is also of prime importance. Generally, modern wheat varieties consume nutrient in high quantity. Therefore, consumption of NPK fertilizers also differs from one variety to another. As PBW 373 is a common variety grown for more than 20-25 years in Dehraduni, expanding research on other new cultivars also need to be test for their potential under Dehradun conditions.

Indigenous wheat varieties cultivated and maintained by peasants are the sources of germplasm for developing new wheat varieties. They have traits potentially compliant to a wide range of biotic and abiotic stresses. Collection, characterisation, evaluation and maintenance of the germplasm are essential in wheat breeding and development of new cultivars. Germplasm comprises the total gene pool of a species and forms the raw material for any crop improvement programme (Brown, 1989). Germplasm collection furnishes the richest source and information on variability. Furthermore these collections preserve the genetic diversity of a cultivated species and serve as gene reservoir from which precious genes can be extracted for crop improvement programmes (Dilday *et al.*, 1999). Plant breeding being a continuous process these diverse genetic resources remains a significant input and valuable asset.

Materials and Procedures

The present investigation entitled “Evaluation of growth and yield performance of different wheat (*Triticum aestivum* L.) varieties under irrigated conditions” was planned and carried out during Rabi season of 2025-26 at the Crop Research Farm, School of Agriculture, Dev Bhoomi Uttarakhand University, Dehradun, Uttarakhand, India. The soil of Experimental site was very sandy loam in texture with optimum PH (7.5). It was moderate in fertility status with low in organic carbon, available Nitrogen, available Phosphorus and available potassium.

The experiment was laid out in Randomized Block design with ten varieties viz. T₁ PAN 5050, T₂ Mahashaktishali 303, T₃ Kranti 303, T₄ Sri Ram Super 303, T₅ PBW 343, T₆ SR 05, T₇ PBW 550, T₈ Easle 1204, T₉ Veer 1212 and T₁₀ HD 2567 in three replications. Irrigation was applied depending upon requirements and other crop management practices were followed as per the recommendation of the area. Standard method were employed for observation and analysis of soil and plant materials. During the course investigation, periodical observations on growth characters i.e., plant height (cm), No. of tillers (m²), dry matter production (g/plant) were recorded at different stage i.e., 30, 60, 90 days after sowing and at harvest. However yield attributes viz; No. of tillers, ear length (cm), Number of grain ear hear⁻¹, 1000 grain weight (gm), grain; straw yield (q ha⁻¹) and harvest index were recorded at harvest. Analysis of soil and plant samples and appropriate statistical method for the analysis of data were used.

Results and Discussion

Plant growth parameters

The data presented in table 1 and 2 Indicated that various

growth characters of wheat plants i.e., plant height, dry matter accumulation and number of tillers per plant were significantly influenced different varieties on plant growth.

Among the various growth parameters mean data showed significant maximum plant height, plant dry weight, number of tillers, in T₉ (Veer 1212) followed by T₈ (Easle 1204) during the year of experiment. Similarly, growth analytic parameters viz. leaf area index, crop growth rate and relative growth rate were recorded maximum in T₉ (Veer 1212) followed by T₈ (Easle 1204). Pradhan *et al.* and Kumar *et al.* reports similar results. Ghasal *et al.* (2017) ^[23] carried out their field trials over the years 2013–14 and 2014–15. In comparison to the other six wheat types, the results showed that HD 2967 had the longest and heaviest spike, which was very similar to HD 2687. Additionally, HD 2967 had the largest grain yield, which was much higher than PBW 343. According to the findings of a pot research that was conducted in Pantnagar by Rawat *et al.* (2017), the plant with the highest grain production and the highest average dry matter yield per plant at harvest was UP 2628, whereas the plant with the lowest value was UP 262. The higher dry weight of wheat could have been achieved through production of more number of tillers owing to the availability of all the nutrients. Which helped the plant roots to exploits greater volume of soil there by improving the nutrients uptake by the plants.

Yield attributes

Yield attributes, which determine yield, is the resultant of the vegetative development of the plant. All the attributes of yield viz. Ear length, number of grains ear⁻¹, test weight, grain yield per plant, straw yield per plot, biological yield were significantly influenced by different varieties. Maximum yield and yields attributes viz. number of spike/plant, number of grains/ spike, test weight, grain yield and stover yield were also recorded T₉ (Veer 1212) followed by T₈ (Easle 1204) during the year of experiment. The all growth attributes help in plant photosynthesis, which ultimately help in yield attributes. The combined application of fertilizers also increased weight. However, in case of test weight, the treatment difference lacked significance including control. Stimulated vegetative growth of wheat on account of adequate and prolonged supply of essential nutrients in treatments receiving fertilizer main fested itself in increased no. of effective tillers m², no. of grains per ear, grain weight per plant and test weight.

Yield characters

The cumulative effect of improved growth, increased dry matter accumulation and yield contributing characters significantly increased the grain yield of wheat. Grain (q/ha) and straw (q/ha) were significantly influences by varieties Maximum yield viz. test weight, grain yield and stover yield were also recorded T₉ (Veer 1212) followed by T₈ (Easle 1204) during the year of experiment.

It was significantly superior over all the treatments. However, the lowest grain yield was recorded with T₁. The possible reasons are, higher growth attributes contributes higher yield attributes. The high yield this is due to the availability of more nutrients. The increase in grain and straw yield of wheat might be due to the increase availability of essential nutrients to the crop. The harvest index of wheat also recorded a trend similar to grain short of significance.

Table 1: Influence of various treatments of phosphorus and zinc on growth attributes at of wheat

Treatments	Symbol	Growth attributes		
		Plant height (cm)	Dry matter accumulation (g)	No. of tillers
PAN 5050	T ₁	81.89	62.30	4.70
Mahashaktishali 303	T ₂	89.38	68.00	5.22
Kranti 303	T ₃	85.19	64.81	4.97
Sri Ram Super 303	T ₄	87.02	66.20	5.08
PBW 343	T ₅	87.99	66.94	5.13
SR 05	T ₆	88.87	67.61	5.19
PBW 550	T ₇	88.76	67.53	5.18
Easle 1204	T ₈	89.75	68.28	5.24
Veer 1212	T ₉	90.64	68.96	5.29
HD 2567	T ₁₀	89.01	67.71	5.19
SEM ±		2.14	1.63	0.13
CD(P = 2.25%)		4.50	3.43	0.29

Table 2: Influence of various treatment on length of ear (cm), ear grain weight (gm), No. of spikelet, No. of grain per ear (gm) test weight (gm) in wheat

Treatments	Symbol	Influence of various treatment on yield attributes of wheat			
		Effective tillers /m ²	No. of spike / plant	No. of grains/ spike	Test weight (g)
P ₀ Zn ₂	T ₁	136.94	5.18	19.45	33.38
P ₁ Zn ₁	T ₂	152.03	5.66	21.60	35.92
P ₃ Zn ₀	T ₃	144.91	5.39	20.59	34.24
P ₂ Zn ₁	T ₄	148.02	5.51	21.03	34.98
P ₀ Zn ₀	T ₅	149.67	5.57	21.26	35.36
P ₃ Zn ₂	T ₆	151.16	5.62	21.47	35.72
P ₁ Zn ₀	T ₇	150.98	5.62	21.45	35.67
P ₂ Zn ₂	T ₈	152.66	5.68	21.69	36.07
P ₀ Zn ₁	T ₉	154.18	5.74	21.90	36.43
P ₁ Zn ₂	T ₁₀	151.40	5.63	21.51	35.77
P ₃ Zn ₁	T ₁₁	136.94	5.18	19.45	33.38
P ₂ Zn ₀	T ₁₂	152.03	5.66	21.60	35.92
SEM ±		3.80	0.14	0.54	0.87
D (P=0.05%)		7.98	0.29	1.13	1.43

Table 3: Influence of various treatments on grain yield (gm/ha⁻²), straw yield (q/ha⁻¹). Biological yield (q/ha⁻¹) and harvest index%

Treatments	Symbol	Influence of various treatments on grain yield (gm/ha ⁻²), straw yield (q/ha ⁻¹). Biological yield (q/ha ⁻¹) and harvest index%		
		Grain yield (q/ha ⁻¹)	Straw yield (q/ha ⁻¹)	Harvest index
P ₀ Zn ₂	T ₁	35.36	52.65	39.69
P ₁ Zn ₁	T ₂	38.06	56.67	40.28
P ₃ Zn ₀	T ₃	36.28	54.01	39.78
P ₂ Zn ₁	T ₄	37.06	55.17	39.48
P ₀ Zn ₀	T ₅	37.47	55.78	39.47
P ₃ Zn ₂	T ₆	37.84	56.34	39.72
P ₁ Zn ₀	T ₇	37.80	56.27	39.26
P ₂ Zn ₂	T ₈	38.22	56.90	39.93
P ₀ Zn ₁	T ₉	38.60	57.47	39.36
P ₁ Zn ₂	T ₁₀	37.90	56.43	39.17
P ₃ Zn ₁	T ₁₁	35.36	52.65	39.69
P ₂ Zn ₀	T ₁₂	38.06	56.67	40.28
SEM ±		0.93	1.38	0.89
CD = (P=0.05%)		1.94	2.89	NS

Conclusion

From the outcomes of the current experiment, it is possible to draw the conclusion that T₉ (Veer 1212) is the most suitable variety for the cultivation of wheat crops. Plant growth and yields were also found maximum with the variety of Veer 1212 during the year of experiment.

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