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Effect of varieties and nitrogen levels on growth and productivity of late sown wheat (*Triticum aestivum* L.)

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Abstract

A field experiment was conducted during rabi season of 2022-2023 at the instructional farm, AKS, University, Sherganj, Satna (M.P.) site is situated at the latitude of 23° 58' N and longitude of 80° 0' 81", East in kymore plateau of M.P. The experiment consisted of 12 treatments in randomized block design with 3 replications viz; T₁ V1N1 JW-3336 + 80 kg/ha, T₂ V1N2 JW-3336 + 100 kg/ha, T₃ V1N3 JW-3336 + 120 kg/ha, T₄ V2N1 Pusa Tejas + 80 kg/ha, T₅ V2N2 Pusa Tejas + 100 kg/ha, T₆ V2N3 Pusa Tejas + 120 kg/ha, T₇ V3N1 GW-17 + 80 kg/ha, T₈ V3N2 GW-17 + 100 kg/ha, T₉ V3N3 GW-17 + 120 kg/ha, T₁₀ V4N1 JW-3288 + 80 kg/ha, T₁₁ V4N2 JW-3288 + 100 kg/ha, T₁₂ V4N3 JW-3288 + 120 kg/ha. In general, enhanced at the faster rate between 30 days up to 60 days stage of plant growth and reached maximum up to 90 days stage. At 90 days stage, the plant height ranged from 66.30 cm in N80 to 61.04/plant in N120 treatment. The tillers were ranged from 115.37 to 127.09/m² at 60 DAS and from 125.05 to 136.71/m² at 90 DAS stage of plant growth. varieties, Pusa Tejas resulted in significantly higher length of spike (10.70 cm), number of healthy seeds (31.0/spike), test weight (39.75 g) and seed yield (19.79/plant). The second and third best varieties were JW-3288 and JW-3336. Pusa Tejas gave the maximum net income up to Rs. 67361/ha with 3.01 B:C ratio. The variety JW-3288 stood the second best (Rs. 62800/ha with 2.87 B:C ratio). The variety JW-3336 was the third best (Rs. 59408/ha with 2.77 B:C ratio). The lowest net income (Rs. 58635/ha with 2.75 B:C ratio) was secured from GW-17 variety of wheat.

Keywords: Varieties, nitrogen levels and productivity of wheat

Introduction

Wheat (*Triticum aestivum* L.) is the second most important cereal crop in India. It is the most important crop among all cereals used as a food grain. Wheat is a good supplement for nutritional requirement of human body as it contains 8.0-15.0% protein, 60-68% starch (carbohydrates), 1.5-2.0% fat, 2.0-2.5% cellulose and 1.5-2.5% minerals. Wheat plays an important role in food and nutritional security as it is an excellent health building staple food; consumed by nearly 65 percent of the population in the various forms. In India, the wheat production is about 998.70 lakh tonnes from an area of around 29.65 lakh hectares and productivity of 3368 kg ha⁻¹. Madhya Pradesh is one of the important wheats growing state of India, which accounts over 53.16 lakh hectares area with production of 159.10 lakh tonnes and productivity of 2993 kg ha⁻¹ (Anonymous, 2017-18) ^[1].

Nitrogen (N) is a key element for plant nutrition. Applying N and phosphorus (P) fertilizers and other management practices increased the yield of wheat but in some cases these show adverse effects due to severely limiting irrigation. Nitrogen use efficiency can be increased by combining fertilizer, soil, water, and management. Two main approaches can be undertaken: increasing the use of N during crop growing season and decreasing the losses of N by applying optimum doses. Proper growth and development of wheat needs favorable soil moisture in the root zone.

Materials and Methods

Field studies were conducted during rabi season of 2022-2023 at the instructional farm, AKS, University, Sherganj, Satna (M.P.) site is situated at the latitude of 23° 58' N and longitude of 80° 0' 81" East in kymore plateau of M.P. state of India The soil of the experimental unit was sandy loam in texture, neutral in reaction (7.4) having medium in organic carbon (0.43) and available N (176.60 kg/ha) and medium in phosphorus (12.50 Kg/ha) whereas it was high in available k (200 Kg/ha). The experimental farm lies in humid subtropical zone with an average rainfall from 1077 mm.

The mean temperature ranges from 21 °C to 31 °C during summer and rarely goes below 5 °C in winter due to high atmospheric humidity. The experiment consisted of 12 treatments in randomized block design with 3 replications. Wheat was sown in row 22.5 cm apart, using 100 kg/ha seeds.

Result and Discussion

Growth characters

Among these vegetative growth parameters, plant height and leaves formation, in general, enhanced at the faster rate between 30 days upto 60 days stage of plant growth and reached maximum up to 90 days stage. At 90 days stage, the plant height ranged from 66.30 cm in N₈₀ to 61.04/plant in N₁₂₀ treatment. The tillers were ranged from 115.37 to 127.09/m² at 60 DAS and from 125.05 to 136.71/m² at 90 DAS stage of plant growth. The present results corroborate with those of several researchers (Negi *et al.*, 2013; Jat and Singh, 2014 and Pandey *et al.*, 2008) [3,4,5].

Yield-attributing

The perusal of data in Summary Table reveal that amongst the wheat varieties, Pusa Tejas resulted in significantly higher length of spike (10.70 cm), number of healthy seeds

(31.0/spike), test weight (39.75 g) and seed yield (19.79/plant). The second and third best varieties were JW-3288 and JW-3336, respectively. The results are in accordance with those of Negi *et al.* (2013) [3]; Jat and Singh (2014) [4] and Pandey *et al.* (2008) [5].

Out of the applied nitrogen levels, the maximum 120 kg N/ha brought about significantly higher length of spike (10.82 cm), healthy seeds (30.99/spike), test weight (39.57 g) and seed yield (21.52 g/plant). This was followed by 100 kg N/ha. The lowest yield attributes were recorded in case of 80 kg N/ha.

Economical

The economical aspect of crop production is the major consideration for the farmers while making a decision for adoption of new technology. Amongst the varieties, Pusa Tejas gave the maximum net income up to Rs. 67361/ha with 3.01 B:C ratio. The variety JW-3288 stood the second best (Rs. 62800/ ha with 2.87 B:C ratio). The variety JW-3336 was the third best (Rs. 59408 /ha with 2.77 B:C ratio). The lowest net income (Rs. 58635/ha with 2.75 B:C ratio) was secured from GW-17 variety of wheat.

Table 1: Growth, yield, quality and economics of wheat under different treatments

Treatments	Plant height (cm) (90 DAS)	Leaves per plant (90 DAS)	Tillers/ m ² (90 DAS)	Length of spike (cm)	Healthy grains per spike	Test weight (g)	Grain yield/plant (g)	Seed yield (q/ha)	Straw yield (q/ha)	Harvest index (%)	Protein content (%)	Net income (Rs./ha)	B:C ratio
Varieties													
JW-3336	70.60	53.37	129.62	9.78	29.09	37.41	17.54	35.50	55.56	38.70	12.37	59408	2.77
Pusa Tejas	74.48	57.63	136.12	10.70	31.00	39.75	19.79	38.23	58.98	39.29	12.68	67361	3.01
JW-17	68.89	51.28	126.02	9.66	28.95	37.35	17.18	34.72	55.34	38.55	12.28	58635	2.75
JW-3288	72.46	54.15	132.50	10.34	30.13	38.50	18.44	36.28	57.96	38.48	12.55	62800	2.87
S.Em _±	0.28	0.29	0.46	0.09	0.37	0.12	0.10	0.46	0.44	0.08	0.11	--	--
C.D. (P=0.05)	0.79	0.82	1.30	0.26	1.05	0.35	0.29	1.30	1.25	0.22	0.30	--	--
N-levels (kg/ha)													
80	66.30	47.35	125.05	9.61	28.56	37.16	15.17	32.98	52.80	38.46	11.88	54326	2.64
100	71.87	53.94	131.44	9.94	29.83	38.03	18.03	36.36	57.15	38.88	12.57	62727	2.87
120	76.65	61.04	136.71	10.82	30.99	39.57	21.52	38.88	60.92	38.94	12.96	69100	3.05
S.Em _±	0.32	0.34	0.53	0.11	0.43	0.14	0.12	0.53	0.51	0.09	0.12	--	--
C.D. (P=0.05)	0.92	0.95	1.50	0.30	1.21	0.40	0.34	1.50	1.44	0.26	0.34	--	--
Interaction	Sig.	Sig.	NS	Sig.	NS	Sig.	Sig.	Sig.	Sig.	Sig.	NS	--	--

Conclusion

Based on one year experiment on wheat, it is concluded that amongst the varieties, Pusa Tejas performance the best with respect to growth parameters, yield-attributes, seed yield, seed protein and economical gain/ha. The seed and straw yield was 38.23 and 58.98 q/ha, respectively. Seed protein was 12.68% and net income Rs. 67361/ha with 3.01 B:C ratio.

In case of nitrogen levels, 120 kg N/ha registered maximum growth and yield-attributing parameters, yield, seed protein and economical gain. The seed and straw yield was 38.88 and 60.92 q/ha, respectively. Seed protein was 12.96% and net income Rs. 69100/ha with 3.05 B:C ratio.

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