



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(10): 1451-1453
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www.thepharmajournal.com
Received: 10-08-2023
Accepted: 18-09-2023

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Performance of different varieties of wheat (*Triticum aestivum* L.) under various organic sources of nutrients in late sown conditions

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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° 81' East in kymore plateau of M.P. The experiment consisted of 12 treatments in randomized block design with 3 replications, the wheat varieties, Pusa Tejas resulted in significantly higher length of spike (10.41 cm), number of seeds (37.44/spike), test weight (39.0 g) and seed yield (16.93/plant). The second and third best varieties were JW-3288 and JW-3336, respectively. The GW-3336 variety recorded lowest spike length (9.36 cm), seeds (34.03/spike), test weight (36.70 g) and seed yield (14.58 g/plant). The varietal differences in yield-attributes may be due to similar variations in the growth parameters, responsible for increased photosynthates, DM production and their translocation. The wheat varieties, Pusa Tejas resulted in significantly higher length of spike (10.41 cm), number of seeds (37.44/spike), test weight (39.0 g) and seed yield (16.93/plant). The second and third best varieties were JW-3288 and JW-3336, respectively. The maximum net realization of Rs.61209/ha with 2.59 B: C ratio was noted under Pusa Tejas variety of wheat. This was followed by JW-3288 and then JW-3336 (Rs.57175 and Rs.53224/ha, respectively). This was in accordance with the productivity of varieties and their market sale values. In case of applied organics, vermicompost (5 t/ha) recorded maximum net income Rs.60391/ha with 2.33 B: C ratio.

Keywords: Varieties, organic sources of nutrients 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° 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.

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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.

Results and Discussion

Growth characters

Amongst the applied organic sources of nutrients, vermicompost (5 t/ha) brought about maximum plant height, leaves formation per plant and effective tillers/m row length at every stage of observations. At the maximum growth formation 90 days stage, the maximum plant height was 6.73 cm, leaves 59.92/plant and effective tillers 109.8/m row length with the application of vermicompost. The second best organic treatment was FYM (10 t/ha) and the third position was attained by the application of Beejamrit five times (Negi *et al.*, 2013; Jat and Singh, 2014 and Pandey *et al.*, 2008) [3, 4, 5].

Yield-attributing

The wheat varieties, Pusa Tejas resulted in significantly higher length of spike (10.41 cm), number of seeds (37.44/spike), test weight (39.0 g) and seed yield (16.93/plant). The second and third best varieties were JW-3288 and JW-3336, respectively. The GW-3336 variety

recorded lowest spike length (9.36 cm), seeds (34.03/spike), test weight (36.70 g) and seed yield (14.58 g/plant). The varietal differences in yield-attributes may be due to similar variations in the growth parameters, responsible for increased photosynthates, DM production and their translocation. The results are in accordance with those of Negi *et al.* (2003) [3], Jat and Singh (2004) [4] and Pandey *et al.* (2008) [5].

Out of the organic sources of nutrients, vermicompost (5 t/ha) brought about significantly higher length of spike (11.14 cm), seeds (39.05/spike), test weight (39.82 g) and seed yield (17.47 g/plant).

Economical

The economical aspect of crop production is the major consideration for the farmers while making a decision for adoption of new technology. The maximum net realization of Rs. 61209/ha with 2.59 B: C ratio was noted under Pusa Tejas variety of wheat. This was followed by JW-3288 and then JW-3336 (Rs.57175 and Rs.53224/ha, respectively). This was in accordance with the productivity of varieties and their market sale values. In case of applied organics, vermicompost (5 t/ha) recorded maximum net income Rs. 60391/ha with 2.33 B: C ratio. Application of FYM (10 t/ha) or Beejamrit (500 lit./ha five times) gave almost equal net income (Rs. 56431 and Rs.56137/ha with 2.25 and 2.40 B: C ratio, respectively).

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

Treatments	Plant height (cm) (90 DAS)	Leaves per plant (90 DAS)	Effective tillers/m row (90 DAS)	Length of spike (cm)	Seeds per spike	Test weight (g)	Seed yield/plant (g)	Seed yield (q/ha)	Straw yield (q/ha)	Harvest index (%)	Carbohydrate content (%)	Net income (Rs./ha)	B: C ratio
Varieties													
Pusa Tejas	72.10	54.16	103.7	10.41	37.44	39.00	16.93	38.92	58.91	40.46	70.95	61209	2.51
JW-3288	69.77	51.28	99.5	10.10	35.76	37.88	15.77	37.23	57.66	39.33	70.48	57175	2.41
JW-3336	67.40	47.97	94.7	9.36	34.03	36.70	14.58	35.72	55.46	38.34	69.65	53224	2.31
S.Em±	0.17	0.21	0.57	0.06	0.22	0.16	0.12	0.23	0.20	0.09	0.19	--	--
C.D. (P=0.05)	0.48	0.60	1.62	0.16	0.63	0.44	0.33	0.64	0.55	0.26	0.54	--	--
Organic sources of nutrients													
Control	62.32	42.41	86.9	9.00	30.68	36.16	13.81	33.98	52.23	39.49	67.32	55845	2.66
Vermicompost (5 t/ha)	76.73	59.92	109.8	11.14	39.05	39.82	17.47	40.11	61.25	39.17	72.44	60391	2.33
FYM (10 t/ha)	73.39	54.54	102.7	10.02	37.42	38.03	16.38	38.53	59.57	39.37	71.89	56436	2.25
Beejamrit (500 lit/ha) (five times)	67.00	47.67	97.6	9.65	35.81	37.42	15.37	36.54	56.33	39.47	69.78	56137	2.40
S.Em±	0.19	0.25	0.66	0.07	0.26	0.18	0.14	0.26	0.23	0.11	0.22	--	--
C.D. (P=0.05)	0.55	0.70	1.87	0.19	0.73	0.51	0.38	0.74	0.64	NS	0.63	--	--
Interaction	Sig.	Sig.	Sig.	Sig.	Sig.	NS	NS	Sig.	Sig.	Sig.	Sig.	--	--

Conclusion

Based on one year experiment on wheat, it is concluded that amongst the varieties, Pusa Tejas came out the best variety which recorded maximum growth parameters, yield-attributing characters, productivity, seed protein and monetary gain per hectare. The seed and straw yield was 38.92 and 58.91 q/ha, respectively. Carbohydrate content was 70.95% and net income Rs. 61209/ha with 2.51 B: C ratio.

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