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Effect on Yield, Attribute Character and Economics of Various Treatment in Wheat (*Triticum aestivum* L.) Crop

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

A field experiment was conducted at Agronomy Research Farm of Narendra Deva University of Agriculture & Technology, Narendra Nagar (Kumarganj), Faizabad (U.P.) during *Rabi* season of 2014-15 to study the response of late sown wheat varieties to doses of nitrogen application. Eighteen treatment consisted of six doses of nitrogen (0, 40, 80, 120, 160 and 200 kg N ha^{-1}) and three varieties of wheat (PBW-373, HD-2327, and NW-1014). The experiment was carried out in

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Randomized Block Design R.B.D. (factorial) with three replications on silt loam having low organic carbon (0.37%), nitrogen (194.25 kg ha^{-1}), medium in phosphorus (15.25 kg ha^{-1}) and potassium (250.25 kg ha^{-1}). All the growth and yield parameters increased significantly with increasing nitrogen doses up to 200 kg ha^{-1}. The maximum net return (Rs. 40712ha^{-1}) was obtained at 160 kg N ha^{-1} with NW-1014 and B:C ratio 1.19 followed by same variety at 120 kg N ha^{-1}. Thus it may be concluded that application of 160 kg N ha^{-1} proved appropriate levels of nitrogen for exploration of the yield potential of the late sown wheat varieties. Among the varieties NW-1014 was found the most suitable for cultivation under late sown condition for Northern East Plain zone.

Keywords: B:C ratio; net return; PBW-373; NW-1014 and organic carbon.

1. INTRODUCTION

"Wheat (*Triticum aestivum* L.) belongs to family Poaceae, is a staple food of the world. India is one of the principle wheat producing and consuming country in the world. Its importance in Indian agriculture is second after rice. About 55% of the world population depends on wheat for intake of about 20% of food calories" [1]. Globally, according to Anonymous [2] reported that "wheat is grown in the world with an area of 220.88 million hectares, production of 725.47 million tonnes with a productivity of 3.28 tonnes per hectare. In India it is grown in an area of 30.47 million hectares, production of 95.85 million tonnes with a productivity of 3.15 tonnes per hectare".

From past few years, the area of late sown wheat has increased in U.P. due to many obvious reasons. In U.P., rice-wheat cropping system is widely practiced by the most of farmers. Late transplanting of rice due to delayed monsoon, use of long duration varieties and heavy rain during later phase of crop growth are the main reasons for delayed sowing of wheat. Besides the preceding crops like sugarcane, potato and toria also vacate the fields quite late.

2. MATERIALS AND METHODS

The field experiment was conducted at Agronomy Research Farm, Narendra Deva University of Agriculture and Technology, Narendra Nagar (Kumarganj) Faizabad (U.P.), during *Rabi* season of 2014-2015. 113.0 meter from mean sea level and is subjected to extremes of weather conditions. The experiment was laid out in randomized block design with four varieties (PBW-373, HD-2327 and NW-1014) and six nitrogen levels (0, 40, 80, 120, 160 and 200 kg N ha^{-1}) with three replications.

"Cost of cultivation for different treatments were worked out by considering all the expense incurred in the cultivation of experimental crop and added with variable cost due to treatments. Gross return was worked out by multiplying the grain and straw yield separately under various treatments to their existing market price. The money value of both grain and straw yield was added together in order to achieve gross return (Rs ha^{-1}). Net return was calculated by deducting the cost of cultivation from the gross return of the individual treatment" [3].

3. RESULTS AND DISCUSSION

Yield was the outcome of a coordinated interaction of yield characteristics. Plants that are vigorously growing can receive a greater amount of mineral nutrients through a well-developed root system. The highest grain and straw yield was credited to variety NW-1014 followed by variety HD-2327. Minimum grain and straw yield recorded with variety PBW-373 might be due to less number of spike bearing tillers, small shoots head and less number of grains $spike^{-1}$ and poor grain development. The grain yield significantly increased only up to 160 kg N ha^{-1}. This might be due to more spike length, number of grains $spike^{-1}$, grain weight $spike^{-1}$ and 1000 grain weight. Similar findings were reported by Nakhtore and Kewat [4] as well as Jain and Jain [5]. Straw yield influenced significantly only up to 160 kg N ha^{-1}. This may be probably due to higher shoots and increased rate of dry matter accumulation. Similar findings were reported by Roy et al. [6]. Wheat harvest index was not considerably changed by nitrogen management methods. Singh [7] obtained similar results. "The maximum cost of cultivation (Rs 34651 ha^{-1}) was recorded at 200 kg N ha^{-1} with all the varieties, due to additional cost of nitrogenous fertilizers and the same cost for each variety. The highest gross return (Rs. 74755 ha^{-1}) was recorded with 160 kg N ha^{-1} with the variety NW-1014 due to higher grain yield and straw yield. The

Table 1. Effect of different treatments on grain yield, straw yield and harvest index

Treatments	Grain yield (q ha^{-1})	Straw yield (q ha^{-1})	Harvest index (%)
(A) Varieties			
PBW-373	29.64	40.88	41.99
HD-2327	33.11	44.92	42.40
NW-1014	34.88	46.90	42.59
SEm±	0.46	0.60	0.49
CD (P=0.05)	1.32	1.74	1.43
(B) Nitrogen levels (kg ha^{-1})			
0	27.68	39.86	40.96
40	30.17	42.03	41.76
80	32.67	44.13	42.54
120	34.62	45.26	43.31
160	36.08	47.27	43.52
200	36.10	47.30	42.87
SEm±	0.65	0.85	-
CD (P=0.05)	1.87	2.46	-

Table 2. Economics of various treatment combinations

Treatment combinations	Cost of cultivation (Rs.ha^{-1})	Gross return (Rs.ha^{-1})	Net return (Rs.ha^{-1})	B:C (Ratio)
PBW-373, 0kg	31613	53944	22331	0.70
PBW-373, 40kg	32219	58404	26185	0.81
PBW-373, 80kg	32828	62848	30020	0.91
PBW-373, 120kg	33435	66261	32826	0.98
PBW-373, 160kg	34043	68929	34886	1.02
PBW-373,200kg	34651	65826	31175	0.89
HD-2327, 0kg	31613	55979	24366	0.77
HD-2327, 40kg	32219	60505	28286	0.87
HD-2327, 80kg	32828	65025	32197	0.98
HD-2327, 120kg	33435	68610	35174	1.05
HD-2327, 160kg	34043	71337	37294	1.09
HD-2327, 200kg	34651	67310	32659	0.94
NW-1014, 0kg	31613	58522	26909	0.85
NW-1014, 40kg	32219	63257	31038	0.96
NW-1014, 80kg	32828	68040	35212	1.07
NW-1014, 120kg	33435	71834	38399	1.14
NW-1014, 160kg	34044	74755	40712	1.19
NW-1014, 200kg	34651	72355	37704	1.08

lowest gross return (Rs 53944 ha^{-1}) was obtained with variety PBW-373 under 0 kg N ha^{-1}" [8-10].

Highest net return (Rs 40712 ha^{-1}) obtained under the treatment combination of 160 kg N ha^{-1} with the variety NW-1014 and lowest net return (Rs 22331 ha^{-1}) recorded with variety PBW-373 under 0 kg N ha^{-1} was due to lowest gross return in proportion to cost of cultivation under this combination. Maximum benefit cost ratio (1.19) obtained from treatment combination of 160 kg N ha^{-1} with the variety NW-1014. The minimum benefit cost ratio (0.70) obtained with variety PBW-373 under 0 kg N ha^{-1}. It was due to lowest net return under this treatment combination.

Maximum cost of cultivation (Rs 34651.1ha^{-1}) was recorded at 200 kg N ha^{-1} combined with all the varieties [11-13]. The maximum gross return (Rs 74755 ha^{-1}) was recorded with variety NW-1014 in combination of 160 kg N ha^{-1}. The maximum net return (Rs 40712 ha^{-1}) was obtained under treatment combination of variety NW-1014 with 160 kg N ha^{-1} and benefit cost ratio (1.19) was obtained under treatment combination of same variety NW-1014 with 160 kg N ha^{-1} [14,15].

4. CONCLUSION

On the basis of grain and straw yield q ha^{-1} were significantly affected by various nitrogen levels. Nitrogen at 160 kg N ha^{-1} being at par with 120 and 200 kg N ha^{-1} recorded significantly more grain and straw yield as compared to rest of the nitrogen levels. Harvest index was not influenced significantly with nitrogen levels. It should be economical, it may be concluded that a dose of

160 kg followed by 120 kg N ha^{-1} along with the variety NW-1014 was remunerative, which gave highest net return (Rs.40712 ha^{-1}) and benefit cast ratio (1.19).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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