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Comparative performance of phosphatic fertilizers and time of nitrogen application on wheat (*Triticum aestivum* L.) Variety PBW-343

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ABSTRACT

A field experiment on wheat PBW-343 was conducted during *rabi* 2005-06 and 2006-07 at Students' Instructional Farm of C.S.Azad University of Agriculture and Technology, Kanpur. Three sources of P *viz*, DAP, SSP and NPK mixture (12:32:16) and four times of N application *viz*., zero, 25, 33.3 and 50% as basal + rest N in two equal splits at C.R.I. and heading stages were tried in Randomised block design. The treatment of DAP @125 kg./ha having at par with SSP @60kg P_2O_5/ha + 25 or 33.3 % N as basal + rest N in two equal splits at C.R.I. and heading stages produced higher grain (46.68 q/ha) and straw yield (51.78 q/ha) and net profit (Rs. 31771/ha) than other treatments. The treatment of SSP + 50% N as basal + rest N in two equal splits at C.R.I. and heading stages produced significantly minimum seed (35.78 q/ha) and straw yield (40.70 q/ha), and net profit (Rs. 19779/ka). Nitrogen was applied @ 150 kg N/ha in all treatments.

Key words : Wheat, DAP, Single super phosphate, Yield, Net profit

INTRODUCTION

Wheat is the staple food crop of our country. It responds well to fertilizer nutrients particularly the major plant nutrients N, P and K. It is the use of fertilizer which made a breakthrough in wheat production through high yielding dwarf wheat varieties. The fertilizer, Di-ammonium phosphate gained much popularity among wheat farmers, thus majority of farmers are using it in wheat crop. Now-a-days, there is acute shortage of this fertilizer, thus alternatives are needed. Nitrogen is quickly mobilized under field conditions results in poor efficiency particularly in light textured soils. It needs the application of N in splits. Therefore, an experiment was carried out to compare the effectiveness of different phosphatic fertilizers and times of nitrogen application on wheat under sandy loam soil conditions.

MATERIALS AND METHODS

A field experiment was conducted during 2005-06 and 2006-07 at Students' Instructional Farm of C.S. Azad University of Agriculture and Technology, Kanpur. The soil of experimental field was sandy loam in texture having 7.6 pH, 0.40 % O.C., 17.0 kg/ha available P_2O_5 and 225 kg/ha available K_2O. The treatments tried were as -T_1 Recommended P and K as basal + 50% N at CRI and 50% N at heading stage, T_2 Recommended P and K as basal + 25% N as basal + 37.5% N at C.R.I. and 37.5% N at heading stage, T_3 Recommended P and K as basal + 33.3% N basal +33.3% N at C.R.I. + 33.3% N at heading stage. T_4 Recommended P and K as basal +50% N basal +25% N at C.R.I. +25% N at heading stage, T_5 N:P:K mixture (12:32:16) @ 125 kg/ha basal +67.5 kg N/ha each at C.R.I. and heading stages, T_6 DAP (18:46) @ 125 kg/ha basal + 63.75 kg N/ha each at C.R.I. and heading stages. The design used was randomized block design with four replications. Recommended P and K were considered as 60 kg P_2O_5 and 40 kg K_2O /ha supplied through single super phosphate and muriate of potash, respectively. In all treatments, nitrogen was applied @ 150 kg N/ha. Except treatments, source of nitrogen was urea fertilizer.

The sowing of wheat variety PBW-343 was done in furrows 20 cm apart behind country plough on 27th November, 2005 and 4th December, 2006. Seed rate was used @ 100 kg/ha uniform in all treatment plots. Crop was irrigated 4 times in each year as per requirement. The observations were recorded as growth characters, yield attributes, yields and economics of wheat under different treatments.

RESULTS AND DISCUSSION

Effect on growth characters

Dry weight /plant and total number of tillers/plant were recorded significantly maximum of 4.98 g and 330.88/m^2, respectively in treatment T_6 of DAP application followed by treatment T_2, which registered significantly higher growth values over treatment T_4. Other treatments remained at par with each other in both dry matter and number of tillers/m^2 (Table 1). Plant height was not influenced significantly by treatment effects. The best performance of treatment T_6 might be due to sufficient starter dose of N through DAP and more availability of P to growing plants in early stage of growth. Dravid (1989) reported that P utilization was 11.8% from

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Table 1: Effect of fertilizers treatments on growth and yield attributes of wheat (Mean of 2 years pooled data)

Treatments	Plant height (cm)	Dry weight per plant (g)	Total tillers/m^2	No. of productive tillers /m^2	Spike length (cm)	Spike weight (g)	No. of grains/ spike	Grain wt./spite (g)
T_1	81.74	3.22	314.89	178.20	10.68	2.44	38.87	1.985
T_2	82.23	3.57	315.65	189.48	10.77	2.57	41.62	1.995
T_3	82.20	3.46	303.62	184.20	10.73	2.48	38.47	1.980
T_4	81.39	3.12	302.06	170.74	10.58	2.41	38.20	1.920
T_5	81.66	3.53	313.28	177.20	10.63	2.43	39.85	1.960
T_6	82.45	4.98	330.88	223.71	11.12	2.71	43.62	2.135
C.D. (P=0.05)	N.S.	0.35	13.37	5.42	0.52	0.28	1.07	0.087

DAP against 10.4% from SSP in cereals. Among N splits treatments, T_2 performed better because of regular supply of N particularly at peak requirement of crop. It confirms the results reported by Sharma and Kumar (1972).

Effect on yield attributes

Number of productive tillers/m^2, number of grains/ spike and grain weight/spike were recorded significantly maximum in treatment T_6 of DAP application (Table 1). It might he due to better tillering and early initiation of flower primordial in tillers because of increased phosphorus availability in earlier stage of crop growth which increased the yield attributes. Keshwa and Singh (1988) also observed superiority of DAP over SSP in yield attributes of wheat. Spike length and spike weight were also recorded highest in treatment T_6 but these were significantly higher only over T_4 treatment. The minimum values of yield attributes in T_4 treatment might be due to the reason that 50% N was applied as basal which could not be fully utilized by growing plants and N loss occurred because of course soil texture. Singh and Singh (1991) also reported that N application in 3 equal splits improved yield attributes of wheat compared to application of major parts of N as basal.

Effect on yield and net profit:

Highest grain and straw yields were produced in treatment T_6 which were at par with treatments T_2 and T_3 but significantly higher than others pooled results (Table 2). On pooled basis over years, treatment T_6 of DAP produced highest of 46.68 q/ha grain yield which was 0.78, 2.50, 7.48, 7.58 and 30.46 higher than the grain yield under T_2, T_3, T_5, T_1 and T_4 treatments, respectively. Straw yield in treatment T_6 was numerically highest (51.78 q/ ha) but it was found significantly higher only over straw yield in treatment T_4 (40.70 q/ha). Grain yield under different treatments was attributed to yield attributes, while straw yield was attributed mainly to number of total tillers and dry weight/plant. Keshwa and Singh (1988) and Chakravarty and Gogoi (1991) also obtained higher grain and straw yield of wheat with DAP application than SSP. Higher yields in treatments T_2 and T_3 might be associated with regular availability of N as in these treatments. N was applied in three splits almost in equal quantities. Thus, in reproductive phase, crop utilized required N from soil which assimilated in crop yields. These results are in accordance to those of Abdin *et al.* (1996) and Rahman *et al.* (1997).

Numerically net profit was estimated maximum from treatment T_6 during both years, but treatments T_2 and T_3 were found at par with T_6 in this respect. In pooled results, T_6 earned maximum of Rs. 31771/ha net profit, which was at par with T_2 (Rs. 31111/ha) and T_3 (Rs. 30279/ha) treatments but was found significantly higher than

Table 2: Effect of fertilizers treatments on yield and economics of wheat (Mean of 2 years pooled data)

Treatments	Grain Yield (q/ha)			Straw yield (q/ha)			Net profit (Rs./ha)		
	2005-06	2006-07	Pooled	2005-06	2006-07	Pooled	2005-06	2006-07	Pooled
T_1	44.28	42.49	43.39	49.07	47.71	48.39	28597	27307	27952
T_2	46.85	45.78	46.32	51.48	49.86	50.67	31295	30926	31111
T_3	45.79	45.28	45.54	50.53	48.71	49.62	30182	30376	30279
T_4	36.57	34.99	35.78	41.32	40.07	40.70	20501	19057	19779
T_5	44.21	42.64	43.43	49.05	47.86	48.46	28925	27881	28403
T_6	47.29	46.07	46.68	52.35	51.21	51.78	32047	31494	31771
C.D. (P=0.05)	4.41	3.21	2.88	5.65	3.95	3.68	2783	2397	2173

remaining treatments (Table 2). These net profit values are attributed to grain and straw yields which also behaved in a similar manner.

The overall results of the present study showed that DAP and SSP proved equally effective but were better source of P than NPK fertilizer mixture for wheat. Split application of nitrogen 25 or 33.3% as basal and rest in two equal splits each at crown root initiation and heading stages were found suitable time of N application for higher production and profit from wheat grown on sandy loam soil.

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