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Response of berseem (*Trifolium alexandrinum*) to nitrogen and phosphorus fertilizer

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ABSTRACT

An experiment was conducted at Veterinary College, Anjora (Durg), Chhattisgarh, to study the effect of nitrogen and phosphorus fertilizer on berseem during the winters of 1996–97 and 1997–98. An application of nitrogen enhanced the yield attributes, green as well as dry forage and seed yields of berseem (*Trifolium alexandrinum* L.) but the significant effect was noticed up to 30 kg N/ha. Similarly, these parameters were increased significanlty with each increment dose of P up to 90 kg P_2O_5/ha.

Key words : Berseem, Nitrogen, Phosphorus, Yield

Berseem is a nutritious, succulent and palatable winter forage crop. This fodder is available for fairly long period during winter, spring and early summer for livestock (Barik and Tiwari, 1998). Crop readily responds to all the 3 major plant nutrients, i.e. NPK (Latif and Sinha, 1983; Sinha and Rai, 1995). Further, berseem being a legume crop, requires more phosphorus for proper root development and efficient utilization of added as well as atmospheric N by rhizobium in nodules. An adequate supply of P increases the activity of soil bacteria in fixing atmospheric N which ultimately increases the yield of legume crop (Tiwana *et al.*, 1998). Very scanty information is available on fertilizer management of berseem in agroclimatic condition of Chhattisgarh. Therefore, the present study was undertaken to find out the optimum dose of nitrogen and phosphorus for berseem crop.

MATERIALS AND METHODS

A field experiment was conducted at the College of Veterinary Sciences and Animal Husbandry, Anjora (Durg), Chhattisgarh, during the winter season 1996–97 and 1997–98. The soil was clay loam with normal pH, having 210.2, 8.3 and 350.7 kg/ha available nitrogen, phosphorus and potassium respectively. The experiment was laid out in split-plot design with 3 replications. The treatments comprising 4 levels of N (0, 15, 30 and 45 kg N/ha) in main plot and 4 of P (0, 30, 60 and 90 kg P_2O_5/ha) in subplot. The entire quantity of nitrogen and phosphorus (as per treatments) and a common dose of 25 kg K_2O/ha were applied basally. Berseem ('Pusa Giant') was sown in lines at 30-cm-row distance by using 25 kg seeds/ha on 20 and 25 November during 1996 and 1997 respectively. The crop was left for seed production after the third cut of forage in each treatment and finally berseem was harvested for seed during the first week of May in both the years.

RESULTS AND DISCUSSION

Green and dry fodder yield

Application of N influenced the green-fodder yield of berseem at different cuttings (Table 2). With the increase in the level of N, the forage yield of crop increased in both the years, but the significant effect was noticed up to 30 kg N/ha. However, 15 and 30 kg N/ha recorded statistically at par green fodder in the first cut of forage during 1996–97 crop season. On total green fodder basis, 30 kg N/ha resulted higher forage yield over 15 and 0 kg N/ha by 8.18 and 64.94% in the first year and 12.30 and 38.55% in the second year respectively. Dry forage yield also showed the similar trend. Taneja *et al.* (1990) and Barik and Tiwari (1998) also reported similar results. The higher green- and dry-fodder yields were attributed to the better yield-contributing characters, i.e., plant height and shoots/m row length (Table 1).

The green forage yield in all cuttings and dry forage yield of berseem were affected by P fertilization (Table 2). Both green and dry fodders increased significantly with the increase in P level (0 to 90 kg P_2O_5/ha). The dose 30, 60 and 90 kg P_2O_5/ha registered 33.41, 60.58 and 84.75 q/ha more total green fodder yield over the control, respectively, in 1996–97. The respective increase in 1997–98 was 50.97, 83.52 and 115.04 q/ha. The higher green and dry fodder yields with a increase in applied phosphorus

Table 1. Yield attributes and seed yield of berseem as affected by nitrogen and phosphorus fertilizers

Treatment	Plant height (cm)		Shoots/m row length		Grains/ head		Grain weight/100 heads (g)		Seed yield (q/ha)	
	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2
Nitrogen (kg/ha)										
0	52.7	57.2	360.1	369.5	52.7	53.4	9.8	9.8	2.94	3.24
15	68.9	73.3	388.7	397.2	60.2	61.0	10.7	10.8	3.09	3.57
30	80.3	84.4	419.3	427.4	65.3	65.9	11.1	11.3	3.29	3.89
45	85.1	88.5	424.7	430.6	70.1	70.6	11.4	11.5	3.52	3.95
CD (P=0.05)	6.2	6.4	17.8	18.2	8.1	6.4	0.5	0.5	0.31	0.21
Phosphorus (P_2O_5 kg/ha)										
0	50.2	52.4	350.4	356.2	50.1	50.3	9.3	9.4	1.83	2.25
30	67.8	70.5	380.7	385.9	59.2	59.6	10.2	10.5	2.76	2.88
60	76.4	80.3	393.5	398.4	63.5	63.9	10.8	10.9	3.66	3.74
90	80.2	84.7	406.2	410.9	69.2	69.5	11.2	11.4	4.59	4.63
CD (P=0.05)	3.1	3.3	12.0	12.4	4.2	4.3	0.3	0.3	0.18	0.34

Y_1 1996–97; Y_2, 1997–98

Table 2. Berseem fodder yield as influenced by nitrogen and phosphorus fertilizers

Treatment	Green fodder yield in different cuts (q/ha)								Total dry fodder yield (q/ha)	
	First		Second		Third		Total			
	A	B	A	B	A	B	A	B	A	B
Nitrogen (N kg/ha)										
0	41.63	60.17	72.08	105.55	142.08	185.66	256.00	351.38	48.62	66.68
15	78.33	83.55	118.50	146.30	193.50	203.64	390.33	433.49	74.81	82.70
30	82.08	108.21	129.58	158.11	210.58	220.51	422.25	486.83	81.44	92.84
45	84.66	115.74	132.25	167.90	214.25	230.17	431.16	513.81	83.15	95.95
CD (P=0.05)	3.82	8.13	4.06	9.10	4.05	11.71	10.04	27.77	2.90	3.14
Phosphorus (P_2O_5 kg/ha)										
0	59.41	70.10	96.91	110.74	179.91	191.55	330.25	372.39	59.40	67.59
30	68.00	88.44	109.33	122.21	186.32	212.71	363.66	423.36	68.91	80.15
60	74.66	98.55	119.58	135.53	196.58	221.83	390.83	455.91	74.30	85.33
90	84.83	107.33	126.58	149.35	203.58	230.75	415.00	487.43	81.52	91.78
CD (P=0.05)	4.34	7.22	4.23	8.62	4.25	8.50	8.97	21.60	3.50	3.57

A, 1996–97; B, 1997–98

was probably owing to the better performance of yield-attributing characters (Table 1). Sood *et al.* (1994) and Kumar and Yadav (1999) also observed beneficial effect of P fertilization on forage yield of berseem.

Seed yield

Berseem gave significantly higher seed yield with nitrogen application (Table 1) compared with the control. The highest seed yield was obtained with 45 kg N/ha, but was on a par with 30 kg N/ha. Similarly, 30 and 15 kg and 15 and 0 kg N/ha were also similar during the first year. These results corroborate the findings of Sinha and Rai (1995).

Seed yield obtained after the third cut was also influenced by P fertilization (Table 1). The highest seed yield was recorded at 90 kg P_2O_5/ha, which was significantly higher than all other treatments. Similarly, 60 and 30 kg P_2O_5 were also significantly better than their lower levels. More grains/head and higher grain weight/100 heads (Table 1) were the main reasons for higher seed production with phosphorus application to berseem crop. The results are in accordance with those of Pandey *et al.* (1997).

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