Environment & Ecology 27 (4B) : 2088—2091, 2009
 ISSN 0970-0420

Nutrient Content and Uptake in Berseem as Influenced by Phosphorus and Farmyard Manure

G. S. TOMAR

Department of Agronomy, Indira Gandhi Krishi Vishwa Vidyalaya
Raipur 492006, Chhattisgargh, India
E-mail : gstomarigkv@yahoo.co.in

Abstract

An experiment was conducted during the winter seasons of 2001 and 2002 to assess the influence of phosphorus and farmyard manure on the nutrient content and uptake by berseem. Basal application of phosphorus at 80 P_2O_5/ha to (P_3) berseem increased the nitrogen and phosphorus content in green fodder during all the cuts, seed and straw yield during both the year. Incorporation of 10 t FYM (M_2) brought about a significant improvement in nitrogen and phosphorus contents in green fodder, seed and straw yields and their uptake through respective produce of berseem. Interaction effects of phosphorus × FYM on nutrient contents and uptake were not found to be significant in either of the year.

Key words : Berseem, Nutrient content and uptake, Phosphorus, Farmyard manure.

Forage crops being heavy producers of biomass remove large quantities of nutrients from soil. Berseem crop, however not exhaustive to nitrogen due to its N-fixing ability but puts high demand for phosphorus on soil for its proper growth and development. High cost of phosphatic fertilizers and short supply at peak cropping period necessitated the need of research on alternate and renewable source of nutrients. High yields of berseem can be obtained only by maintaining optimum levels of nutrients in the soil. Berseem being a leguminous crop with the unique built in mechanism for N fixation, it responds well to the application of P which is the most critical element limiting its growth, nodulation and production (1). Nitrogen and phosphorus contents and their uptake by berseem increased due to the application of farmyard manure (2) and phosphorus (3). However, meager information is available on the response of phosphorus in conjunction with farmyard manure and PSB culture on the nutrient contents and their uptake by berseem crop, hence an attempt was made to study on such aspects.

Methods

An experiment was conducted during *rabi* seasons of 2000-2001 and 2001-2002 at the Instructional Farm, Indira Gandhi Agricultural University, Raipur (CG). The soil of the experimental site was sandy loam in texture (Inceptisols), neutral in reaction, low in organic carbon and available N, medium in available P and high in available K status. The climate of the region is dry moist, sub-humid with an average annual rainfall of 1,326 mm. The berseem crop received 27.0 and 19.0 mm rainfall during first and second year, respectively. The treatments consisted of four phosphate levels viz., no phosphorus (P_0), 40 kg P_2O_5/ha as basal (P_1), 40 kg P_2O_5/ha as basal and 40 kg P_2O_5/ha as basal (P_3) keeping in main plot, and three organics viz. no FYM (M_0), FYM at 10 t/ha as basal (M_1) and FYM at 5 t/ha as basal and 5 t/ha after 1st cut (M_2)and seed treatment with PSB (M_3) keeping in sub-plot laid out in split plot design with three replications. Berseem var JB-2 was sown on 10 November each year using a seed rate of 30 kg/ha. Other crop management practices were followed based on recommendations. The first cut of berseem was taken at 55 days after sowing and subsequently at an interval of 25 to 30 days. Total of three cuts were taken then crop was left for seed setting.

Fresh weight of green forage from each plot was recorded immediately after each cut and the dry matter was worked out. The plant samples were first air-dried and then heated in an oven at 75 C to constant weight at atmospheric pressure. The loss of weight is considered as moisture and the residue as dry matter.

Table 1. Effect of phosphorus and FYM on N content (%) in fodder, seed and straw yields of berseem.

	Green fodder									
	1st cut		2nd cut		3dr cut		Straw		Seed	
	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002
Phosphorus levels										
P_0	1.89	1.94	2.06	1.93	1.90	1.87	0.51	0.52	3.51	3.45
P_1	2.15	1.99	2.29	2.08	1.98	2.01	0.59	0.59	3.67	3.35
P_2	2.22	1.98	2.40	2.19	2.13	2.16	0.55	0.65	3.61	3.63
P_3	2.35	1.99	2.62	2.49	2.24	2.24	0.63	0.68	3.59	3.68
CD 5%	0.08	0.03	0.08	0.08	0.08	0.20	0.03	0.04	0.11	NS
Levels of FYM										
M_0	2.04	1.97	2.23	2.03	1.97	1.97	0.52	0.55	3.55	3.44
M_1	2.23	2.11	2.34	2.23	2.07	2.10	0.58	0.62	3.60	3.55
M_2	2.19	2.08	2.49	2.30	2.14	2.18	0.62	0.68	3.67	3.65
M_3	2.16	2.03	2.31	2.14	2.05	2.02	0.56	3.59	3.56	3.46
CD 5%	0.03	0.03	0.03	0.05	0.03	0.05	0.02	0.03	0.03	NS

The dried samples were finelly powdered and digested for N and P estimation. Nitrogen and phosphorus uptakes were calculated by multiplying N and P contents with dry-matter yields in respective treatments.

Results and Discussion

Influence of Phosphorus

The nitrogen concentration in fodder increased up to second cuttings, thereafter it decreased steadily with the commencement of reproductive phase (Table 1). Due to high mobility of N it was translocated to the capsules and concentration in the seed increased. This shows that concentration of N is derived from foliage. Comparing the influence of phosphorus, it was noticed that there was marked improvement in the N content and its uptake as a result of raising the P levels (Tables 1 to 3). Phosphorus application increased the N content and uptake over control in different cuttings for fodder, seed and straw, maximum

Table 2. Effect of phosphorus and FYM on P content (%) in fodder, seed and straw yields of berseem.

	Green forage									
	1st cut		2nd cut		3rd cut		Straw		Seed	
	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002
Phosphorus levels										
P_0	0.31	0.33	0.33	0.41	0.29	0.30	0.09	0.11	0.27	0.3
P_1	0.35	0.37	0.35	0.42	0.33	0.34	0.12	0.14	0.30	0.34
P_2	0.36	0.37	0.35	0.45	0.32	0.36	0.14	0.15	0.31	0.34
P_3	0.40	0.46	0.38	0.47	0.40	0.39	0.17	0.18	0.35	0.40
CD 5%	0.03	0.07	0.02	NS	0.02	NS	0.03	0.02	0.02	0.07
Levels of FYM										
M_0	0.32	0.36	0.33	0.4	0.31	0.32	0.1	0.12	0.28	0.33
M_1	0.36	0.41	0.39	0.45	0.35	0.36	0.13	0.15	0.32	0.36
M_2	0.38	0.39	0.37	0.47	0.36	0.37	0.15	0.17	0.33	0.37
M_3	0.36	0.38	0.34	0.42	0.33	0.34	0.12	0.14	0.30	0.34
CD 5%	0.01	0.03	0.01	0.02	0.01	0.03	0.01	0.01	0.008	0.008

Table 3. Effect of phosphorus and farm yard manure on N uptake (kg/ha) by fodder, seed and straw of berseem.

	Green forage									
	1st cut		2nd cut		3rd cut		Straw		Seed	
	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002
Phosphorus Levels										
P_0	30.57	32.32	45.55	39.72	26.05	26.14	9.72	9.25	3.88	3.65
P_1	39.46	37.06	52.42	46.31	32.98	34.13	11.8	11.55	6.20	5.59
P_2	42.95	39.32	52.36	49.36	36.29	37.32	12.26	13.47	7.2	7.13
P_3	46.59	45.39	60.5	58.93	41.82	42.49	12.89	13.22	7.09	7.48
CD 5%	1.76	2.97	3.46	4.15	3.76	4.94	0.64	0.78	0.80	1.15
Levels of FYM										
M_0	36.96	36.24	50.00	44.09	32.36	32.98	9.93	10.17	5.15	5.23
M_1	42.75	41.39	53.11	49.88	34.69	35.9	12.08	12.16	6.04	5.85
M_2	40.68	38.9	55.68	52.79	36.57	37.6	13.39	13.87	7.15	7.00
M_3	39.18	37.56	51.05	47.55	33.51	33.6	11.27	11.27	6.03	5.78
CD 5%	1.24	0.77	1.62	1.7	1.27	1.32	0.49	0.63	0.50	0.68

being noted under the highest dose of 80 kg P_2O_5/ha (P_3). Mean maximum nitrogen contents of 2.3, 2.5, 2.2, 0.66 and 3.6% were recorded in green forage at 1st, 2nd 3rd cut, straw and seeds of berseem respectively under the application of 80 kg P_2O_5/ha. Similar observations were also recorded with respect to phosphorus contents. This may be because P application resulted in the development of more efficient root system, improved root nodulation and biologically fixed nitrogen, thereby increasing N content in fodder and its greater uptake. Increase in nitrogen content might be due to more synthesis of protein and phosphoprotein compounds in the presence of phosphorus (3).

Phosphorus in foliage increased up to second cuttings and thereafter decreased due to partitioning to reproductive parts as well as increased in dry matter production. Application of phosphorus increased the P content and its uptake (Tables 2 and 4) in ber-

Table 4. Effect of phosphorus, farm yard manure and PSB on the phosphorus uptake (kg/ha) by fodder, seed and straw yields of berseem.

	Green forage									
	1st cut		2nd cut		3rd cut		Straw		Seed	
	2001	2002	2001	2002	2001	2002	2001	2002	2001	2000
Phosphorus Levels										
P_0	5.02	5.56	6.35	8.34	3.99	4.90	1.77	1.99	0.30	0.31
P_1	6.19	6.99	7.76	9.43	5.49	6.56	2.34	2.67	0.51	0.59
P_2	6.62	7.27	7.86	10.04	5.52	6.96	3.02	3.18	0.62	0.78
P_3	7.9	9.25	8.93	11.16	7.46	7.41	3.10	3.46	0.68	0.84
CD 5%	1.21	1.28	1.28	1.10	1.55	0.83	1.76	0.72	0.35	0.2
Levels FYM										
M_0	5.69	6.58	6.92	8.74	5.12	5.99	1.98	2.29	0.41	0.52
M_1	6.73	8.11	8.37	10.04	5.85	6.73	2.74	2.94	0.54	0.63
M_2	6.89	7.31	8.08	10.85	6.13	7.11	3.19	3.46	0.66	0.76
M_3	6.41	7.07	7.23	9.31	5.37	6.00	2.32	2.61	0.5	0.61
CD 5%	0.48	0.72	0.4	0.66	0.31	0.65	0.19	0.27	0.05	0.07

seem fodder, seed and straw up to 80 kg P_2O_5/ha. Mean maximum nitrogen uptake of 45.9, 59.7, 42.1, 13.0 and 7.2 straw up to 80 kg P_2O_5/ha. Mean maximum nitrogen uptake of 45.9, 59.7, 42.1, 13.0 and 7.2 kg/ha through green forage at 1st, 2nd, 3rd cut, straw and seed yields of berseem were drawn with the basal application of phosphorus at 80 kg P_2O_5/ha. Phosphorus uptake also followed the same trend. Phosphorus fertilization significantly increased both fodder and seed yields which ultimately increased removal of plant nutrients. Moreover, P application increases its availability and absorption by the plants indicated that its application has decisive effect on P content of berseem forage. Several workers also reported that P application increased the P content and P uptake (4).

Influence of Farmyard Manure

Application of farm yard manure to berseem crop at 10 t/ha also proved beneficial in enhancing the N and P content and their uptake in different cuttings of fodder, seed and straw over control (Tables 1–4) due to greater availability of nutrients to plants in the presence of organic manures and also due to its solubilizing effects on fixed forms of nutrients in soil (5). Mean maximum nitrogen contents of 2.4, 2.1, 0.65 and 3.6% were recovered from green forage at 2nd cut, 3rd cut, straw ad seeds of berseem respectively with the split application of farmyard manure (M_2). Similar trends were follows with respect to phosphorus contents. Mean maximum amount of 54.2, 37.0, 13.63 and 7.07 kg/ha was drawn by green forage at 2nd cut, 3rd cut, straw and seed yields of berseem respectively under split application of farmyard manure (M_2). Similar results were found with respect to phosphorus uptake. The increase in total N and P uptake can be ameliorated in dry matter, seed and straw yields and higher N and P contents with the application of farmyard manure. Improvement in uptake of nitrogen and phosphorus in berseem due to application of FYM was probably due to improvement in soil conditions, which encouraged the proliferation of roots and improved synchrony between supply and plant demand, which in turn drew more nutrients from larger area and greater depth as reported by Minhas and Sood (6). Organic manuring significantly increased the fodder and seed yields, which ultimately increased the removal of plant nutrients from the soil. These results are in agreement with those of El-Latif et al.(2). Seed inoculation of berseem with PSB culture also step-up the N and P contents in fodder and seeds and their uptake over the treatment, which did not receive PSB treatment during both the years.

Interaction of Phosphorus and Farmyard Manure

The combined effect of phosphorus and organic manuring had no significant effect on nutrient concentration and their uptake by the crop in either of the years. However, maximum content of N and P was estimated under P_3M_2 treatment combination, which resulted considerable quantity of nitrogen and phosphorus uptake through fodder and seeds of berseem during both the years.

References

1. Mani S. K. and M. M. Singh. 1979. Effect of phosphorus level and cutting interval on forage yield and quality of berseem *(Trifolium alexandrinum). Indian J. Agric. Sci.* 67 : 604—605.
2. Ei-Latif L. I. A., N. M. Ei-sarangawy and M. A. Morsy. 1982. *Effect of different levels of P_2O_5 with or without FYM on the green fodder, dry matter yield. N and P_2O_5 content and their uptake by berseem under sandy soil conditions.* Res. Bull. Fac. Agric. Ains Shams Univ. No. 2073 19 pp.
3. Rafey A., M. N. Shahani and A. R. Khan. 1978. Effect of different levels of phosphatic and potassic fertilizers on the quality of berseem forage. *Ferti. Techno.* 15 : 73—77.
4. Bajpai P. D. and B. R. Gupta. 1979. Effect of salinization, phosphorus fertilization and their interaction on the symbiosis between Rhizobium trifolii and berseem (*T. alexandrinum* L.) *J. India Soc. Soil Sci.* 27 : 462—469.
5. Yoshida S. 1979. Effect of farm yard manure on the nitrogen nutrition of soybean. *Japanese J. Crop Sci.* 48 : 17—24.
6. Minhas R. S. and A. Sood. 1996. Effect of inorganic and organic fertilizers on the yield and nutrient uptake by three crops in rotation on acid alfisol. *J. Indian Soc. Soil Sci.* 37 : 257—260.