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EFFECT OF POTASH ALONGWITH NITROGEN AND PHOSPHORUS ON THE YIELD OF BERSEFM

Muhammad Aslam,* and Hayat Muhammad Bhatti**

In order to assess and evalute the effect of potash applied at two levels viz., 112 and 224 kg K_2O ha^{-1} on the yield of berseem fodder and seed, a field experiment comprising eight treatments was conducted on a loamy soil. Data revealed that application of potash alongwith phosphorus resulted in non-significant increase in yield of berseem fodder, while nitrogen phosphorus combinatiou gave the highest yield. Whereas phosphorus was found to be of real necessity for the crop. Similar to the green fodder yield, application of potash alongwith nitrogen and phosphosus resulted in non-significant increase of berseem seed also. Further, it was observed that the addition of only nitrogen to berseem was not economical.

INTRODUCTION

Berseem (*Trifolium alexandrium*-L) due to its many merits as a fodder crop and its soil improvement properties holds an important position among various fodders in Pakistan (Wahhab, 1960). Though average yields of this fodder are fairly good in former's fields, yet there is a very large scope of improvement provided balanced fertilization is practiced. MacGregor *et al.* (1961) reported that phosphate and phosphate potash fertilization to alfalfa increased the per acre production through increased hay yield. Keefer (1973) and Korter (1974) conducted field experiments under a vide variety of environmental conditions and found that lucerne yields were increased by the application of higher rates of phosphorus and potash. Zhunusov and Dantkulov (1974) conducted a pot experiment for three years with KCl, K_2SO_4 and potash labelled with K^{42} on lucerne. They found that K application increased hay yield by an average of 35-40% on pale and dark Chestnut Serozem soils to which only nitrogen and phosporus had been applied for a long time. Baier and Baierova

*Assistant Professor, Depott. of Soil Science, University of Agri. Faisalabad.
**Agricultural Chemist (Soils), Ayub Agricultural Research Inst. Faisalabad.

(1975) from a three years study on red clover, concluded that weather conditions markedly influenced nutrient uptake and yield of first cutting. In some cases crop even failed to produce any fodder. There was positive correlation between potash uptake and dry matter yield. Potash was considered to be a limiting factor in red clover yield. Martonffy and Sulyok (1977) carried out field trials at 13 sites and reported that highest rate of nitrogen, phosphorus and potash applied to lucerne gave the highest yield. Application of phosphorus was found to be more important than that of potash while nitrogen was the least effective. Andreen *et al.* (1978) conducted trials from 1973 to 1975 on lucerne and lucerne-grass mixture and concluded that the quality and productivity of lucerne and lucerne-grass mixture were mostly increased by the application of nitrogen and phosphorus. Chaudhry and Akhtar (1982) reported that with 2 berseem varieties "4/11" and "Lyp late" the application of 125 kg phosphorus ha^{-1} proved to be the most suitable and economical dose for getting higher green fodder yield of berseem.

Considerting the role potash plays in the production of crop plants in general and legumes in particular, the trail was under-taken to evaluate the needs, if any, of potash alongwith nitrogen and phosphorus in our soils to improve the yield of berseem, both of fodder and seed.

MATERIALS AND METHODS

The experiment was conducted in a loamy soil for three years, 1977-80. The soil samples up to 30 cm were taken each time before sowing of the crop. The analysis of the soil (USDA, Hand book 60) is given in Table 1. Potash @ 112 and 224 kg ha^{-1} was applied alongwith 56 kg ha^{-1} of nitrogen and 168 kg ha^{-1} of P_2O_5. There were 8 treatments in all including control.

The nitrogen, phosphorus and potash fertilizers were applied as urea, single super phosphate (SSP) and sulphate of potash (SOP) respectively and all the materials were added at the time of sowing and mixed well in the soil. The experiment was laid out in randomised complete block design with four replications. During the three years of the study berseem crop was sown in the period between the end of September to the first week of October.

Every year, five cuttings of green fodder were taken and fodder yields recorded. These cuttings were completed by the first week of April. Then the

crop was left for seed and seed yield was recorded for one year i.e. 1977-78 only; unfortunately the seed yield for the other two years could not be recorded due to bad weather conditions. The data of both fodder and seed yields were analysed statistically and LSD test was applied to determine the statistical significance of treatments.

Table 1. *Analysis of the soil samples collected from the experimental field before the soming of crop.*

Determinations	0–15 cm			15–30 cm		
	1977-78	1978-79	1979-80	1977-78	1978-79	1979-80
T.S.S.%	0.18	0.18	0.17	0.16	0.13	0.15
$\overline{=}$ CO_3, me/l	Nil	Nil	Nil	Nil	Nil	Nil
$\overline{-}$ HCO_3, me/l	1.27	1.28	1.4	1.12	1.04	1.32
$\overline{-}$ Cl, me/l	0.45	0.4	0.2	0.37	0.3	0.2
$\overline{=}$ SO_4 me/l	0.26	0.32	0.3	0.29	0.06	0.1
$Ca^{++} + Mg^{++}$, me/l	1.0	1.2	1.2	0.8	0.8	1.2
pH	8.0	7.5	7.8	7.9	7.6	7.7
Av.* (Phosphorus (ppm)	5.0	6.75	6.25	3.75	2.75	4.5
Av.* Potash (ppm)	230	220	200	200	200	190
Organic matter(%)	0.77	0.85	0.79	0.49	0.52	0.51
Textural class	Loam	Loam	Loam	Loam	Loam	Loam

* Available.

RESULTS AND DISCUSSION

Fodder yield.

The date of green fodder yields are presented in Table - 2. The resusıt indicate that the application of potash alongwith phosphorus caused a small increase in yield. This increase was statistically significant during 1977-78. However, when used alongwith nitrogen and phosphorus, potash did not result in any improvement in yield. The combinations of NPK and NP as well as phosphorus alone produced statistically similar yields which were significantly greater than the yields obtained through the use of nitrogen alone and control treatments. Application of NP, NPK and P resulted in 44.4%, 44.30% and

Table 2. *Yield of berseem green fodder as affected by K applied alongwith N and P.*

Treatment			Yield of berseem green fodder (tons ha^{-1} Av. of 5 cuttings			Mean	% increase over control	Seed yield kg ha^{-1}
N	P_2O_5 kg ha^{-1}	K_2O	1977-78	1978-79	1979-80			
0	0	0 (control)	55.69 c	73.71 c	79.95 b	69.78 b	—	278.93 c
0	168	0	88.38 b	100.83 b	102.32 a	97.18 a	39.27	379.17 b
0	168	112	97.21 a	101.81 b	96.44 a	98.49 a	41.13	399.97 b
0	168	224	95.29 ab	102.60 ab	98.54 a	98.81 a	41.60	494.64 a
56	0	0	58.35 c	76.83 c	76.75 b	70.64 b	1.23	261.26 c
56	168	0	90.21 ab	112.48 a	99.49 a	100.73 a	44.35	501.73 a
56	168	112	93.82 ab	109.36 ab	97.07 a	100.09 a	43.44	507.61 a
56	168	224	90.29 ab	109.88 ab	101.56 a	100.69 a	44.30	504.15 a

Average values followed by the same letters are statistically alike at 5% probability level.

39.3% increase in yield over the control treatment. These findings are in agreement with those of MacGregor *et al.* (1961), Keefer (1973) and Korter (1974) also reported that the application of potash had no significant influence on the yield of alfalfa. Nitrogen alone (56–0–0) produced 70.64 tons ha^{-1} of fodder while control treatment produced 69.78 tons ha^{-1} of fodder indicating very little effect of the use of nitrogen for berseem. Martonffy and Sulyok (1977) also observed that application of phosphorus was more important than that of potash, while nitrogen was the least important for lucerne.

From the results presented it can be concluded that no definite benefit of the application of potash was observed and phosphorus is the basic need to obtain better produce of berseem fodder.

Seed Yield.

In the presence of phosphorus the higher rate of potassium significantly enhanced seed yield (Table-2). However, in the presence of nitrogen and phosphorus, potassium application did not affect the seed production of berseem. Phosphorus application alone had a positive effect while combined application of nitrogen and phosphorus was much more effective in this respect. The results indicate that under the conditions of experiment, potassium was not required for seed production while application of phosphorus alongwith starter nitrogen was necessary for obtaining higher yield of berseem seed. These findings are in line with Keefer (1973) and Korter (1974).

Table 3. *Economics of fertilizer application*

Treatments N-P_2O_5-K_2O —kg ha^{-1}	Yield of berseem fodder (tons ha^{-1})	Price of berseem fodder Rs. 170/-ton^{-1}	Price fertilizer	Gross income	Net profit over control	Cdst benefit ratio
		Rs.	Rs.	Rs.	Rs.	
1. 0-0-0	69.78	11862.60	—	—	—	—
2. 0-168-0	97.18	16520.60	465.35	16055.24	4192.64	9.0
3. 0-168-112	98.49	16744.30	608.72	16135.58	4272.98	7.0
4. 0-168-224	98.91	16814.70	752.08	16062.62	4200.02	5.6
5. 56-0-0	70.64	12008.80	224.00	11784.00	– 77.60	—0.35
6. 56-168-0	100.73	17124.10	689.35	16434.74	4472.14	6.5
7. 56-168-112	100.09	17015.30	832.72	16182.58	4319.98	5.2
8. 56-168-224	100.69	17117.30	976.08	16141.22	4278.62	4.4

Economics of Fertilizer Application.

When the economics of fertilizer application to berseem (average of 3 years) on the green fodder yield basis (seed yield was not included as the results were only for one year) was considered, the highest net profit over oontrol was obtained with the treatment 56-168-0 (Rs. 4472.14) followed by treatment 56–168–112 (Rs. 4319.98) respectively. There was no net profit gain from the application of potash. So, it is not economical to apply potash fertilizer in our soils for maximizing tho production of bersoem. Addition of nitrogen alone did not even pay back its cost and a loss of Rs. 77.60 was recorded with its application in these trials. The application of phosphorus alone which gave a cost benefit ratio of 1:9 was the most economical treatment under the condition of this experiment.

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