

Influence of Potash and Phosphorus on Dry Matter Yield and Uptake of Nutrients by Lucerne

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The dry matter yield of Sirsa 9 lucerne was increased by P application. It also increased significantly the uptake of N, P, K and Ca while K application had no effect or some times had significant depressing effect. The ratio of N : P : K uptake was not affected by treatments and the ratio was found to be around 30 : 1 : 7. A significant positive correlation was observed between N and P, and K and P and K uptake values.

Lucerne (*Medicago sativa* L.) is a very valuable leguminous fodder used for feeding cattle and poultry. Varying results of response of lucerne to P and K application had been reported by several workers. Jackobs *et al.* (1970) found that P application had consistent positive yield responses. Similar results were also obtained by Galgoci (1972) and Mamarova (1972). P application had also increased its content in lucerne but did not affect the crude protein content according to Hoff and Dotzenko (1968).

Naguyen *et al.* (1972) reported that K required for the incorporation of amino acids into protein, and K interaction with phosphorus should be taken into consideration to obtain maximum incorporation and yield. Gerwig and Ahlgren (1958) reported that potash was the most important factor in maintaining high yields in alfalfa. Hileman *et al.* (1966) observed that K gave increased yield on soils receiving P but K alone frequently depressed yields in lucerne. So to get

the information on the response of lucerne to P and K application and to find out the ratio of uptake of N, P and K in each cutting, this study was undertaken.

MATERIALS AND METHODS

A field trial was laid out in rabi season 1972-73 in a red loamy soil which had tested medium, low and high in available N, P and K. The variety used was lucerne Sirsa-9. Three levels of potash (viz. 0, 40 and 80 kg K₂O/ha) in combination with six levels of phosphate (viz. 0, 40, 80, 120, 160 and 200 kg/ha) were tried. The experiment was carried out in a split plot design with phosphate levels in the main plot and potash in sub-plots.

The treatments were replicated five times. A uniform basal dressing of 20 kg N/ha was applied along with P and K at sowing. The spacing adopted was 30 cm between rows with a net plot size of 3 x 2 m. The experiment was conducted under irrigated condi-

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TABLE. Dry matter yield and uptake of N, P, K and Ca by Lucerne. (Mean values in kg/ha)

Treatment	127 days after sowing						157 days after sowing						187 days after sowing								
	Dry matter	N	P	K	Ca	Dry matter	N	P	K	Ca	Dry matter	N	P	K	Ca	Dry matter	N	P	K	Ca	
Phosphorus 0	1155	47.86	1.62	9.47	30.73	1092	46.55	1.19	9.61	50.04	1173	45.74	1.34	12.69	48.48						
(P ₂ O ₅) 40	1331	58.20	2.04	11.76	32.37	1503	58.94	2.07	12.98	63.06	1602	62.36	2.06	17.08	55.85						
(kg/ha) 80	1421	62.06	1.80	13.01	34.20	1674	78.46	2.24	17.71	61.92	1866	75.40	2.58	19.76	70.10						
120	1198	52.48	1.70	11.86	33.71	1543	74.09	2.31	17.75	71.98	1692	68.59	1.97	17.73	64.12						
160	1616	64.72	2.89	17.19	51.90	1855	81.04	3.23	22.09	72.60	1269	81.47	2.63	20.45	69.35						
200	1398	64.69	2.01	13.93	40.03	1729	67.59	2.92	19.99	64.83	1887	76.89	2.50	20.28	76.43						
C.D. (P=0.05)	211	9.70	0.60	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Potash 0	1405	59.98	2.14	12.98	39.00	1623	74.28	2.24	16.67	68.23	1729	70.16	2.24	18.12	62.89						
(K ₂ O) 40	1305	55.42	1.98	12.20	36.69	1523	62.23	2.22	16.64	61.79	1681	67.35	2.14	17.69	62.44						
(kg/ha) 80	1349	58.61	1.91	13.43	35.79	1546	71.83	2.52	16.74	62.17	1685	67.71	2.15	17.68	66.77						
C.D. (P=0.05)	55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mean	1353	58.34	2.11	12.87	37.16	1566	69.45	2.33	16.69	64.07	1698	68.41	2.18	17.83	64.04						
C.D. (P=0.05)	173	7.90	—	2.4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

tions. The seeds were inoculated with rhizobial bacterial culture before sowing. The samples for analysis were collected at 127, 157 and 187 days after sowing. They were cut and dried in a forced air draught oven at 55°C and the moisture loss was also determined. The dried samples were powdered in the Wiley mill and used for chemical analysis. Nitrogen, P and K were analysed by microkjeldhal (Humphries, 1956), colorimetric and flame photometric methods respectively.

RESULTS AND DISCUSSION

The mean values of dry matter yield and uptake of N, P, K and Ca are presented in Table. The dry matter yield was significantly higher in the cut taken at 187 days which was on a par with 157 days cut. Phosphorus application gradually increased the dry matter yield with significantly higher value in 160 kg P_2O_5 /ha with the least value in control. Application of potash had a significant depressing effect on dry matter yield. This observation is in agreement with that of Hileman *et al.* (1966). The control treatment registered higher yield than 40 and 80 kg K_2O /ha which were on a par. The interaction effect of P and K was also significant indicating a judicious combination of P and K might result in maximum yield.

The uptake of N between different periods of cutting showed significant variation. The cuttings taken at 187 and 157 days after sowing had removed significantly higher N from the soil

than that at 127 days. Phosphorus application had significantly increased the N uptake in all the cuttings studied. However, potash application had depressed the N uptake. This is in conformity with the result obtained by Macleod (1965) who reported that N content decreased with K fertilization.

The phosphorus uptake was increased by P fertilization. The highest P uptake was obtained in 160 kg/ha treatment and the lowest in the control. Potassium seemed to have no effect on P uptake. Potassium uptake was significantly higher at 157 and 187 days than at 127 days. Phosphorus application increased K uptake, 160 kg/ha had caused removal of more of K from the soil than the control. Calcium uptake had also followed similar pattern of K uptake, the highest uptake being at 160 kg P_2O_5 /ha

The ratio in the uptake of N, P and K was also worked out for each cutting date. The N : P : K ratio observed was 28 : 1 : 6 (at 127 days), 30 : 1 : 7 (at 157 days) and 31 : 1 : 8 (at 187 days). From these ratios, it could be observed that the lucerne crop absorbed about four times more of N than K. Correlation coefficient was also worked out to find out the interrelationship between the uptake of these nutrients. It was observed that significant positive relationship existed between the uptake of N and P ($r=0.66^{**}$), N and K ($r=0.79^{**}$) and P and K ($r=0.75^{**}$). The significant correlations related that the N : P : K ratio tend to be a constant value irrespective of the treatment.

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