AU Res. J. 1990. 15 (2) : 6-11

Effect of Seed Rate and Phosphorus Levels on the Seed Production of Lucerne Var. A-2 Under Different Dates of Sowing

J. R. Patel, A. T. Patel, P. C. Patel and B. B. Patel

A. I. C. R. P. on Forage Crops, GAU, Anand Campus, Anand

ABSTRACT

An experiment was conducted on lucerne for three years at Sardar Krushinagar to study the effect of seed rates and phosphorus levels on the seed production of lucerne var. A-2 under different dates of sowing. The results revealed that in lucerne early sowing date (last week of October) obtained higher seed yield than other delayed sowing dates. Similar was the case for green forage and dry matter yields. Last week of October indicated the highest total returns and Net Incremental Cost Benefit Ratio (NICBR). Seed rate of 5 kg seed/ha gave higher seed yield of lucerne seed but for forage production, a seed rate of 10 kg/ha was found significantly superior than that of lower seed rate of 5.0 and 7.5 kg/ha. Relative profitability of different seed rates of lucerne showed that higher total returns were obtained when the seed rate of lucerne was used at the rate of 10 kg seed/ha. Application of phosphorus to lucerne crop failed to increase significant seed yield of lucerne. Application of 80 kg P_2O_5/ha produced significantly higher green forage and dry matter yields and this level showed higher total returns and NICBR. The interaction of sowing of lucerne on last week of October x application of 80 kg P_2O_5/ha produced significantly higher seed yield and forage yields of lucerne as well as highest net returns and NICBR.

(Received on 18th March, 1988)

INTRODUCTION

Lucerne crop is more popular among farmers in Gujarat during winter season. It is also a important forage crop in milkshed area where the livestock production is involved. In any seed production programme, seeds and fertilizers are the major costly inputs, so their proper utilization is a must. Sowing date is non-monetory input, however, appropriate time of sowing significantly increases the forage yield. In absence of preliminary information regarding the seed rate requirement, sowing date and phosphorus requirement for the production of lucerne seeds in the North Gujarat condition, this investigation was carried out at Sardar Krushinagar to study the effect of seed rates and phosphorus levels on the seed production of lucerne (Anand-2) sown on different dates.

MATERIALS AND METHODS

A field experiment was conducted at Forage Research Project Farm, Gujarat Agricultural University, Sardar Krushinagar during three consecutive *Rabi* season of 1984-85, 1985-86 and 1986-87. The experiment was laid out in split plot design with three replications. The treatment comprised of four sowing dates (October, 26; November, 10; November, 25 and December, 10, - D_1, D_2, D_3, and D_4, respectively) as main plot, three seed rates (5.0 , 7.5 and 10.0 kg seed/ha - R_1, R_2, and R_3, respectively) as sub-plot treatments and three phosphorus levels (0, 40 and 80 kg P_2O_5/ha - P_0, P_1 and P_2 respectively) as sub-sub plot treatments.

A basal dose of 25 kg N/ha in the form of urea and phosphorus as per treatment in the form of

single super phosphate was given before sowing. The crop was sown at 25 cm apart in rows as per the treatments of sowing dates and seed rates. First cut of green forage was harvested after 55 days of sowing and subsequent cuts were taken up after 25-30 days interval. After taking the last cut of green forage during 3rd March to 11th March, the crop was left for seed production. The seed crop was harvested between 15th to 23rd May during all the three years. One foliar spray of Dithane M-45 was given as a preventive measure for downy mildew disease. BHC 10% dust at the rate of 40 kg/ha alongwith basal fertilizers was given for the control of termites. One spray of Rogar was also given to control aphids-jassids. Other cultivation practices were followed as per recommendations.

The soil was loamy sand, low in organic matter, medium in available phosphorus (26.0 to 27.0 kg P_2O_5/ha) and potassium (285 to 289 kg K_2O/ha) having pH value of 7.4 to 7.7.

RESULTS AND DISCUSSION

Effect of sowing date

The effect of sowing dates on seed, green forage and dry matter yields are reported in Table 1. The data showed that early sowing of lucerne i.e. last week of October (D_1) gave significantly higher seed yield than other sowing dates on pooled basis. Similar type of trend was also observed during the years 1985 and 1986. Early sowing of lucerne during last week of October was significantly superior for green forage and dry matter yields over other dates of sowing on pooled basis and also on the results of individual years. Patel *et al.* (1987) reported that last week of October sowing produced significantly higher green forage yield of lucerne than delay sowing of lucerne i.e. last week of November and second week of December. The dry matter yield was also significantly higher in last week of October sowing than sowing of lucerne on second week of December. The experiment was conducted at Anand during 1982-83, 1983-84 and 1984-85. The climatic parameters of Anand and Sardar Krushinagar centres are shown in Fig.1.

Relative profitability of different sowing dates indicated that higher total returns and Net Incremental Cost Benefit Ratio obtained from last week of October sowing (Table 2).

Effect of seed rates

Lucerne seed rate of 5 kg seed/ha gave significantly higher seed yield of lucerne over 7.5 and 10.0 kg seed/ha during the year 1984-85. The seed yield of lucerne did not differ significantly due to 5 kg and 7.5 kg seed rate/ha but lucerne crop sown with 10 kg seed rate/ha was found significantly superior for green forage and dry matter yields than other seed rates on pooled basis. So in lucerne crop, forage yield is also an important factor which reflects the economic of the crop Maslinkov *et al.* (1980) did not notice any significant increase in seed yield with increase in seed rate. Lucerne crop sown with 10 kg seed rate/ha was found significantly superior for green forage and dry matter yield than other seed rates on pooled basis. This is in line for individual year also. Belzile (1984) reported that lucerne seed rate of 13.4 kg seed/ha yielded more than that of 6.7 kg seed/ha at the first cut and total forage yields of all the cuts. The soil of Sardar Krushinagar is sandy i.e. lighter type of soils and it has great-problem of termites, so plant mortality is higher and hence higher seed rate of lucerne i.e. 10 kg/ha gave significantly higher green forage and dry matter yields than that of lower seeds of 5.0 and 7.5 kg/ha.

Relative profitability of different seed rates of lucerne indicated that higher total returns were obtained when the seed rate of lucerne was used at the rate of 10 kg seed/ha (Table 2).

Effect of phosphorus levels

The data indicated that application of 80 kg P_2O_5/ha gave significantly higher yield than no application of phosphorus during the year 1984-85 and 1986-87, application of 80 kg P_2O_5/ha had also produced significantly higher yield over 40 kg P_2O_5/ha. Similar type of trend was observed when data were pooled but the yield differences did not reach to the level of significance. It was observed that there was no significant response of seed yield of lucerne even under medium soil available phosphorus.

Experimental results of three years at Anand revealed that foliar application of phosphorus at the rate of 2% or 4% as well as soil application (40 to 120 kg P_2O_5/ha) did not show any significant effect on seed yield of lucerne (Anon., 1977-78; 1978-79

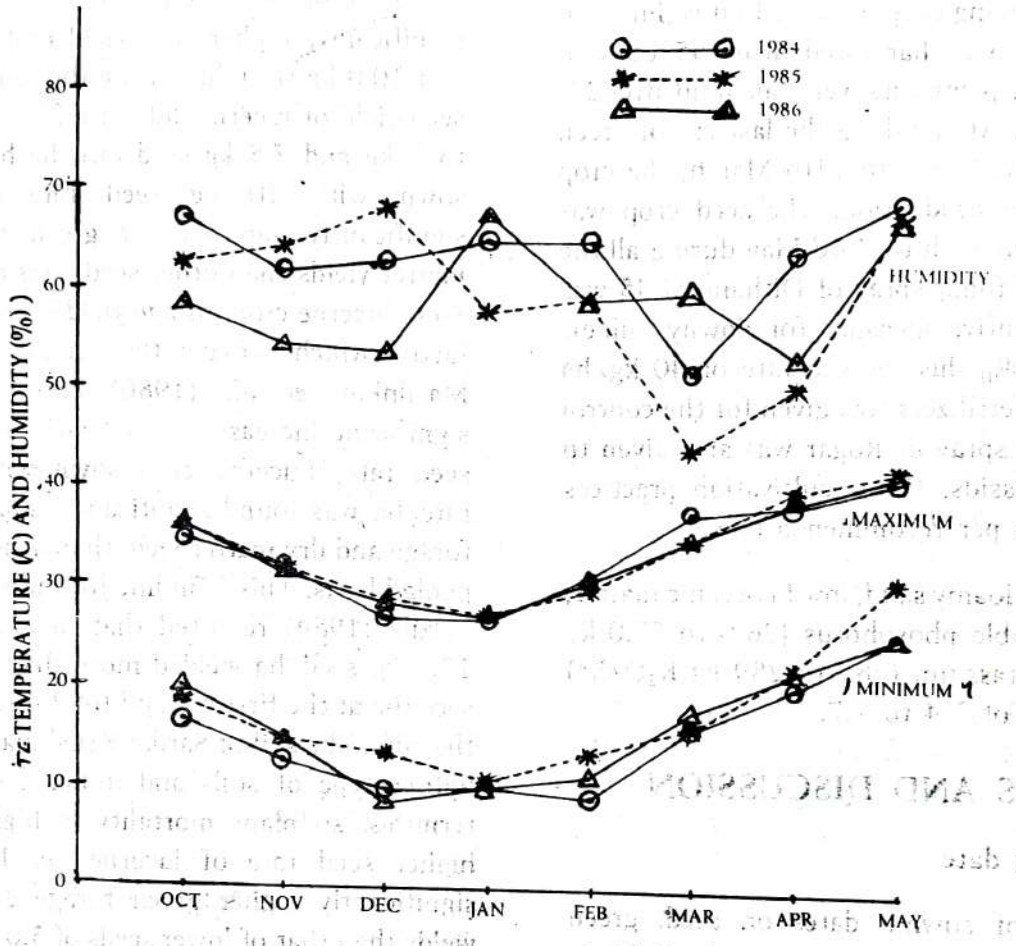

Fig. 1. Showing weather data during growth period of lucerne

nd 1979-80). Similar type of results were also btained at Uralikanchan and Jhansi (Anon., 1983-4) Mc Caslin and Gledhill (1980) also did not bserve any effect of phosphorus on seed yield of ucerne.

Considering forage yield of lucerne, it was bserved that application of 80 kg P_2O_5/ha to ucerne crop gave significantly higher green forage nd dry matter yields than other phosphorus levels, showed that there was response on forage roduction of lucerne even under medium soil ailable phosphorus.

Relative profitability of different levels of osphorus indicated that application of 80 kg O_5/ha recorded higher total returns and net remental cost benefit ratio (Table 2).

The interaction effect was significant for ing dates (D) × phosphorus levels (P) for seed yield of lucerne on pooled basis (Table 3). The interaction of early sowing of lucerne on last week of October (D_1) × application of 80 kg P_2O_5/ha produced significantly higher seed yield of lucerne than other treatment combinations. The said interaction gave significantly higher green forage and dry matter yields than other treatment combinations (Table 4). Hence, this treatment showed the highest total returns and Net Incremental Cost Benefit Ratio (Table 2).

So present study showed that for obtaining higher net realization and seed yield as well as green and dry forage yields of lucerne variety Anand-2 should be sown in line 25 cm apart during last week of October by keeping seed rate of 10 kg/ha and apply 80 kg P_2O_5/ha under Sardar Krushinagar soil condition where available phosphorus is medium (22 to 56 kg P_2O_5/ha).

TABLE 1

Effect of seed rates and phosphorus levels on the seed production as well as green forage and dry matter yields of lucerne under different sowing dates.

Treatment	Seed yield (kg/ha)				Green forage yield (q/ha)				Dry matter yield (q/ha)				Average plant stand tiller/ m. row
	1984	1985	1986	Pooled	1984	1985	1986	Pooled	1984	1985	1986	Pooled	
Sowing Date (D)													
26th October D_1	141	331	227	233	282	316	311	303	54.0	53.7	50.0	53.9	46.4
10th November D_2	96	287	205	196	257	266	220	248	48.3	47.4	40.8	48.0	40.3
25th November D_3	98	261	202	187	197	211	196	201	37.4	34.8	34.3	36.6	35.0
10th December D_4	87	249	181	172	133	156	127	139	25.3	27.1	24.7	25.9	36.8
S.Em. ±	3.3	13.5	3.1	4.7	14	5	7	6	2.4	0.9	1.2	0.9	—
C. D. (5%)	11.3	46.5	10.7	14.0	48	18	25	16	8.3	3.2	4.1	2.8	—
Seed rate (kg/ha)													
5.0 R_1	121	287	204	204	199	218	197	205	38.0	37.8	34.9	37.9	37.2
7.5 R_2	100	272	209	193	219	237	218	224	41.4	40.8	37.9	41.2	40.8
10.0 R_3	97	286	198	194	234	257	226	239	44.4	43.5	39.5	44.1	43.0
S.Em. ±	2.1	11.5	2.7	4.0	3	3	2	2	0.6	0.5	0.5	0.3	—
C. D. (5%)	6.2	NS	8.0	NS	10	9	6	5	1.8	1.6	1.4	0.9	—
Phosphorus levels (P) (P_2O_5 kg/ha)													
0 P_0	100	293	152	181	201	211	192	201	38.0	37.1	34.8	37.7	39.6
40 P_1	106	277	200	194	221	237	215	225	42.0	40.4	36.7	41.5	40.8
80 P_2	111	276	259	215	229	263	234	242	43.7	44.7	40.8	44.0	40.9
S.Em. ±	2.1	6.7	3.8	14.7	4	2	2	0.5	0.7	0.4	0.3	0.3	—
C. D. (5 %)	5.9	NS	10.8	NS	10	5	5	1.2	1.9	1.1	1.0	0.8	—

Pooled seed yield (kg/ha), green forage (q/ha), total return additional return over control, additional cost (Rs/ha) as well as gross ICBR and net ICBR of lucerne as effected by sowing dates, phosphorus levels and seed rates.

Treatment	*Pooled seed yield (kg/ha)*	*Pooled green forage yield (q/ha)*	*Total return Rs/ha*	*Additional return over control (Rs/ha)*	*Additional cost (Rs/ha)*	*Gross ICBR*	*Net ICBR*
1	2	3	4	5	6	7	8
Sowing Dates (D)							
D_4	172	127	8,216	—	—	—	—
D_3	187	196	10,091	1,875	654	1:2.87	1:1.87
D_2	196	220	10,868	2,652	1,082	1:2.45	1:1.45
D_1	233	311	13,909	5,693	1,736	1:3.28	1:2.28
Phosphorus (P)							
0 kg/ha (P_0)	181	201	9,975	—	—	—	—
40 kg/ha (P_1)	194	225	10,902	927	260	1:3.57	1:2.57
80 kg/ha (P_2)	215	242	11,935	1,960	520	1:3.77	1:2.77
Seed rate (R)							
5.0 kg/ha (R_1)	204	205	10,832	—	—	—	—
7.5 kg/ha (R_2)	193	224	10,849	17	247.5	1:0.07	—1:0.93
10.0 kg/ha (R_3)	194	239	11,182	310	330.0	1:0.94	—1:0.06
Interaction (D×P)							
D_4P_0	157	122	7,621	—	—	—	-
D_3P_0	169	188	9,337	1,716	654	1:2.52	1:1.62
D_3P_1	179	201	9,927	2,306	914	1:2.52	1:1.52
D_3P_2	212	216	11,316	3,695	1,174	1:3.15	1:2.15
D_2P_0	190	224	10,750	3,129	1,082	1:2.89	1:1.89
D_2P_1	198	253	11,594	3,973	1,342	1:2.96	1:1.96
D_2P_2	200	266	11,920	4,299	1,602	1:2.68	1:1.68
D_1P_0	210	272	12,370	4,749	1,736	1:2.74	1:1.74
D_1P_1	221	306	13,413	5,792	1,996	1:2.90	1:1.90
D_1P_2	268	331	15,464	7,843	2,256	1:3.48	1:2.48

Selling price of lucerne seed = Rs.33/kg
Selling price of green gorage yield = Rs.20/q.
Cost of Phosphorus = Rs. 6.5/kg
Harvesting Cost = Rs.440/cut/ha
Irrigation Cost = Rs.214/Irrigation/ha.

TABLE 3
Interaction table of sowing dates (D) × phosphorus levels (P) for seed yield of lucerne (kg/ha) on pooled basis.

D/P	D_1	D_2	D_3	D_4	Me
P_0	210	190	169	157	1
P_1	221	198	179	179	1
P_2	268	200	212	181	2
Mean	233	196	187	172	
S.Em. ±	5.3				
C.D. at 5%	14.7				

TABLE 4
Interaction table of sowing dates (D) × phosphorus levels (P) for green forage and dry matter yield (q/ha) of lucerne on pooled basis.

D/P	D_1	D_2	D_3	D_4	Mean
P_0	274 (48.4)	224 (44.6)	188 (34.5)	122 (23.4)	201 (37.7)
P_1	306 (54.5)	253 (49.5)	201 (36.6)	139 (25.4)	225 (41.5)
P_2	331 (58.8)	266 (50.0)	216 (37.6)	155 (28.8)	242 (44.0)
Mean	303 (53.9)	248 (48.0)	201 (36.6)	139 (25.9)	
S. Em. ±	3 (53.9)				
C.D. at 5%	8 (1.6)				

Figures in parentheses indicates dry matter yield.

REFERENCES

Anonymous, 1978. Annual Report of Forage Crops Research G.A.U., Anand, pp. 54.

Anonymous, 1979. Annual Report of Forage Crops Research G.A.U., Anand. pp. 70.

Anonymous, 1980. Annual Report of Forage Crops Research G.A.U., Anand, pp. 81.

Anonymous, 1984. Annual progress report of All India Co-ordinated Project for Research on Forage Crops. Indian Grassland and Fodder Research Institute, Jhansi, India. pp. 14.

Belzile, L. 1984. Influence of cultivars, date and rate of sowing on yield and quality of lucerne sown in late summer. *Can. J. Pl. Sci.* 64 :

Maslinkov, M. Mirtscher M. and Antonowa, N. 1980. Studies on the optimal sowing rate for lucerne for seed production. Martin-Luther Universitat Hasle Wiltenberg, 20 (5) pp. 324-335. *Herb. Abst.* 1982, 52 (12) : 544.

McCaslin, B. D. and Gledhill, R. J. 1980. Alfalfa fertilization in New Mexico. New Mexico Agric. Expt. Stn., Bull., 675 : 36. *Herb Abstr.* 1982, 52 (8) : 353.

Patel, J. R., Patel, P. C., Raj, M. F. and Saiyad, M. R. 1987. Effect of sowing date and seed rate on forage yield and quality of different genotypes of lucerne. *Forage Res.*, 13 : 25-32.