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Effect of genotype, seeding method and diammonium phosphate on yield and protein and nutrient uptake by lentil (*Lens culinaris*)

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ABSTRACT

A field experiment was conducted during the winter season of 1994–95 and 1995–96 at Kumarganj, Faizabad, to study the effect of genotype, seeding method and diammonium phosphate (DAP) levels on yield, protein yield and nutrient uptake by lentil (*Lens culinaris* Medikus). The genotype 'Pant L 639' with seed rate of 60 kg/ha coupled with narrow row spacing (20 cm) recorded significantly higher yield, protein yield and nitrogen and phosphorus uptake. Application of DAP up to 100 kg/ha significantly increased the seed yield, protein yield and nutrient uptaken.

Key words : Lentil, Genotype, Seeding method, DAP, Yield, Protein

In Eastern Uttar Pradesh rice–wheat cropping system is very much popular, but traditional practice of this system reduces the productivity of system and deteriorates the soil fertility. Introduction of legume crop in rice–wheat sequence or replacement of wheat or rice by legume crop increases the yield of next cereal crop and improves the soil fertility (Singh *et al.*, 1996). Therefore rice–wheat sequence was changed into rice + lentil cropping sequence under limited moisture availability to improve the soil fertility and productivity. Improved agronomic practices play an important role in increasing yield of lentil. Fertilizer recommendations are normally made based on nutrient requirement of individual crops, ignoring the residual effect. Rao *et al.* (1991) observed the residual effect of phosphorus and its utilization in cereal–legume sequence. Keeping this in view, screening of some important lentil genotypes in relation to seeding method and fertility were done in above-mentioned conditions.

MATERIALS AND METHODS

The field experiment was conducted during the winter season of 1994–95 and

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1995–96 at Kumarganj, Faizabad, for selection of suitable genotypes, seeding method and optimum dose of DAP. The treatment consisted of 4 genotypes ('Pant L 209', 'Pant L 639', 'Pant L 406' and 'T 36'), 2 seeding methods (120-cm-row spacing with 60 kg seed rate and 30-cm-row spacing with 45 kg seed rate) and 4 levels of DAP (0, 50, 100 and 150 kg/ha). The soil was silty loam having 195 kg/ha available N, 18.3 kg/ha available P_2O_5 and 304 kg/ha available K_2O, with pH 8.2. The whole quantity of DAP fertilizer (as per treatment) was placed below the seed at the time of sowing. The sowing was done on 30 November and 3 December during 1994–95 and 1995–96 respectively after harvesting of rice crop. The treatments, genotypes, seeding methods and DAP were laid out in main plot, subplot and sub-sub plot in split-plot design with 3 replications respectively. One irrigation was given at the time of pre-flowering stage in both the years.

RESULTS AND DISCUSSION

Since the error variance for yield, yield attributes and nutrient uptake was homogenous during both the years, pooling

Table 1. Yield and yield attributes of lentil as influenced by genotype, seeding method and fertility levels

Treatment	Branches/ plant	Pods/ plant	Seeds/ pod	Test weight (g)	Seed yield (q/ha)		
					1994–95	1995–96	Pooled
Genotype							
'Pant L 209'	10.94	91.37	1.77	18.15	12.36	12.81	12.59
'Pant L 639'	12.90	97.81	1.93	18.73	13.81	14.20	14.01
'Pant L 406'	11.69	90.03	1.89	18.23	12.30	12.89	12.60
'T 36'	10.40	82.49	1.75	17.26	9.98	10.21	10.10
CD (P = 0.05)	1.12	4.28	0.07	0.15	0.86	0.92	0.63
Seeding method							
20 cm + 60 kg seed	10.87	79.94	1.81	17.99	12.80	13.61	13.21
30 cm + 45 kg seed	12.13	100.78	1.83	18.11	11.42	11.89	11.66
CD (P = 0.05)	0.21	1.90	NS	NS	0.75	0.78	0.54
DAP (kg/ha)							
0	9.09	76.79	1.75	17.72	9.27	10.12	9.70
50	11.68	88.72	1.84	18.09	11.87	12.13	12.00
100	12.49	96.55	1.87	18.23	13.50	13.89	13.70
150	12.66	99.07	1.88	18.33	13.79	14.21	14.00
CD (P = 0.05)	0.76	3.35	0.04	0.10	1.31	1.12	0.82

of the result was done.

Genotypes

'Pant L 639' was found superior to all the genotypes. Higher yield of 'Pant L 639' was owing to more branches/plant, seeds/pod, pods/plant and test weight, followed by rest of the genotypes. It was at par with 'Pant L 406' for pods/plant and test weight; 'Pant L 639' outyielded 'Pant L 209', 'Pant L 406' and 'T 36 with a margin of 11.28, 11.19 and 38.71 % respectively (Table 1). These results are in conformity with the findings of Singh and Verma (1996). 'Pant L 209' and 'Pant L 406' produced similar branches/plant, pods/plant and test weight, which were significantly higher than those of 'T 36'. 'Pant L 209' and 'Pant L 406' were at par for significantly higher seed yield than 'T 36'.

Dry-matter production and protein yield were also significantly higher in 'Pant L 639' than rest of the genotypes (Table 2). It might be due to higher N and P contents and seed yield. On the basis of nutrient uptake, 'Pant L 639' showed markedly higher N and P in seed and straw than the other genotypes. It was owing to higher dry-matter accumulation and N and P contents (seed and straw) in 'Pant L 639' genotype.

'Pant L 209' was significantly superior to 'T 36' where it was non-significant with 'Pant L' 406 for dry-matter accumulation, protein yield and N and P uptake.

Table 2. Dry-matter production, protein yield and N and P uptake in lentil as influenced by genotypes, seeding method and DAP (pooled mean)

Treatment	Dry matter (kg/ha)	Protein yield (kg/ha)	N uptake (kg/ha) in		P uptake (kg/ha) in	
			Seed	Straw	Seed	Straw
Genotype						
'Pant L 209'	3,979	405	39.11	39.90	4.14	4.25
'Pant L 639'	4,375	485	44.85	46.11	4.49	4.61
'Pant L 406'	3,878	424	38.41	39.61	4.20	4.32
'T 36'	3,265	340	32.43	33.57	3.37	3.47
CD (P=0.05)	139	29	1.11	1.42	0.15	0.17
Seeding method						
20 cm + 60 kg seed	4,179	431	40.09	42.22	4.27	4.41
30 cm + 45 kg seed	3,566	394	36.81	37.37	3.84	3.88
CD (P=0.05)	145	24	1.36	1.50	0.17	0.20
DAP (kg/ha)						
0	3,001	313	28.88	30.47	2.98	3.13
50	3,750	401	37.58	38.55	4.00	4.14
100	4,296	458	43.55	43.85	4.44	4.61
150	4,447	484	44.78	45.83	4.52	4.76
CD (P=0.05)	229	34	1.49	1.54	0.31	0.22

Seeding method

Narrow row spacing (20 cm) with increased seed rate up to 60 kg/ha gave significantly higher seed yield than wider row spacing (30 cm) with normal seed rate (45 kg/ha). However, more branches and pods/ plant were recorded in 30-cm-row spacing with 45 kg/ha seed rate (Table 1). The higher seed yield by 13.29% in narrow row spacing with higher seed rate over wider row spacing with lower seed rate was owing to more plant population irrespective of less branches and pods/plant. Similar findings were also reported by Ahlawat *et al.* (1982).

Narrow row spacing (20 cm) with higher seed rate (60 kg/ha) resulted in significantly higher dry-matter and protein yield than wider row spacing (30 cm) with optimum seed rate (45 kg/ha), owing to higher plant population and better seed yield (Table 2). Similarly, higher N and P uptake were also recorded in narrow row spacing (20 cm) with higher seed rate (60 kg/ha).

Diammonium phosphate

Significant effect of DAP application was observed on branches/plant, pods/ plant, seeds/pod and test weight up to 100 kg DAP/ha. This was attributed to super vegetativeness and increased biological yield at higher DAP but the transformation of this biological yield into seed Sink was proportionately less. The effect of DAP on seed production was significantly greater under 100 kg/ha compared with 50 kg/ha and the control. Similar beneficial effect of phosphatic fertilizer in lentil was also reported by Singh and Singh (1991).

Significant effects of DAP on dry-matter production, protein yield and nitrogen and phosphorus uptake were observed. Increase in level of DAP from 0 to 100 kg/ha resulted in significant increase in dry-matter production and protein yield. Application of 150, 100 and 50 kg DAP/ha resulted in significantly higher protein yield by 53.7, 44.3 and 28.2% over the control. The increase in DAP up to the 100 kg/ha increased N and P uptake due to supply of these nutrients. The nutrients increased their concentration in plant but also resulted in higher dry-matter accumulation and seed yield (Table 2).

The quadratic function for seed yield of lentil and DAP levels were found significant and following quadratic equations were fitted:

1994–95

$$Y = 9.252 + 0.065\ X - 0.000231\ X_2$$

1995–96

$$Y = 9.811 + 0.0684\ X - 0.000269\ X_2$$

The economic doses of DAP were 123.17 and 113.81 kg/ha, yielding 13.75 and 14.11 q/ha seed during 1994–95 and 1995–96 respectively.

It was concluded that higher seed yield of lentil could be achieved by sowing of variety 'Pant L 639' using 20-cm-row spacing with 60 kg seed/ha and 100 kg DAP/ha.

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