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SCREENING OF LENTIL (*LENS CULINARIS* L.) GENOTYPES AND THEIR RESPONSE TO SULPHUR APPLICATION IN RELATION TO YIELD, GRAIN QUALITY AND SULPHUR UPTAKE

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Abstract

A field experiment was conducted during *rabi*, 2006-07 at C.S. Azad university of Agric. & Tech., Kanpur (U.P.), India; on loam soil having 7.8 pH. The 25 genotypes of mustard were tested at 3 levels of 0, 25 and 50 kg sulphur/ha through elemental sulphur. The results revealed that the new genotype FLIP 93-47 produced significantly highest grain yield (13.07 q/ha) closely followed by standard check DPL 44 (12.66 q/ha), which also yielded significantly higher grain than all other genotypes. Protein content in grain was estimated significantly highest (23.81%) in genotype DPL 44, though FLIP 93-47 (23.13%) was placed in second significant group of genotypes. These two genotypes also recorded higher S-uptake (6.41 and 6.39 kg/ha) by significant margin than all other tested genotypes. Sulphur application increased grain and straw yield, protein content in grain and S-uptake significantly with upto 50 kg S/ha with the values 11.37 q/ha, 10.44 q/ha, 23.31% and 5.99 kg/ha S, respectively. The effect of GxS interaction was not found significant on any crop character. These new genotype FLIP 93-47 proved highest grain yielder with similar quality grain of standard check DPL-44. application of 50 kg S/ha was found superior in all respects.

Key words : Lentil, genotypes, sulphur, yield, quality.

Introduction

Lentil is one of the important pulse crops grown in India. It is very nutritious and the grains contain good amount of protein, vitamins and minerals. In modern agriculture, the increasing use of high analysis NPK fertilizers resulted in the deficiency of certain secondary and micro-nutrients. Sulphur is such a secondary element the deficiency of which in soils is well marked. It is row recognized as the fourth major plant nutrient after NPK. The crops of pulses and oilseeds in general required more of sulphur which is to be mot by proper fertilization otherwise crop yield suffer. However, dose of sulphur varied under different crop conditions and which the crop is grown. Keeping this view in mind an experiment was conducted to study the response of lentil genotypes to increasing rates of sulphur application in central Uttar Pradesh condition.

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Materials and methods

A field experiment was conducted during *rabi* 2006-07 at Oilseed Research Farm Kalyanpur of C.S. Azad University of Agriculture and Technology, Kanpur (U.P.), India. The soil of experimental field was loam in texture and slightly alkaline in nature having 7.8 pH. It contained 4.03% organic carbon, 175.0 kg/ha available nitrogen, 8.9 kg/ha available P_2O_5, 165 kg/ha available K_2O and 8.5 kg/ha available sulphur. The treatments comprised 75 combination of 25 newly evolved lentil genotypes including standard checks DPL 44. DPL 62 and Barimasoor, and 3 levels of sulphur (0, 25 and 50 kg S/ha) applied through elemental sulphur. The design used was factorial randomized block design with 3 replication. A basal dose of 20 kg n + 50 kg P_2O_5 + 35 kg KO/ha was applied at sowing uniformly in all treatment plots, while sulphur was also applied before one week of sowing as per treatment N, P and K were applied through urea,

Table 1 : Effect of lentil genotypes and sulphur levels on yield and yield attributes, grain protein, S-content and uptake.

S. no.	Treatments/ Genotypes	100-seed wt. (g)	Yield q/ha		Grain protein (%)	S-content (%)		S-uptake (kg/ha)		
			Grain	Yield		Grain (%)	Straw (%)	Grain	Straw	Total
1.	FLIP 86-50	4.61	11.96	11.56	23.03	0.23	0.20	2.88	2.47	5.35
2.	FLIP 92-41	4.30	12.11	11.67	23.16	0.25	0.20	3.17	2.51	5.68
3.	FLIP 93-47	4.31	13.07	12.59	23.10	0.26	0.21	3.55	2.84	6.39
4.	FLIP 95-5	4.25	8.43	8.14	21.70	0.21	0.15	1.85	1.34	3.19
5.	FLIP 81-17	4.77	8.66	8.33	22.85	0.22	0.18	1.92	1.60	3.52
6.	FLIP 89503	4.25	9.85	9.54	22.49	0.20	0.17	1.99	1.72	3.71
7.	FLIP 96-58	4.68	7.68	7.44	21.72	0.16	0.10	1.30	0.78	2.08
8.	FLIP97-29	3.65	8.76	8.42	22.16	0.17	0.12	1.55	1.05	2.60
9.	FLIP97-31	2.67	11.14	10.63	22.64	0.22	0.20	2.48	2.33	4.81
10.	FLIP97-32	2.12	8.53	8.23	22.89	0.23	0.18	2.03	1.60	3.63
11.	FLIP93-33	2.65	11.14	10.76	22.33	0.24	0.19	2.69	2.17	4.86
12.	Barimasoor	2.64	9.15	8.83	21.95	.21	0.19	2.05	1.81	3.86
13.	DPL 44	3.24	12.66	12.35	23.83	0.27	0.22	3.57	2.84	6.41
14.	DPL 9156	2.67	11.56	11.13	22.95	0.24	0.21	2.89	2.49	5.38
15.	DPL 88527	2.44	9.82	9.46	22.70	0.20	0.19	2.04	1.94	3.98
16.	FLIP 99-27	2.13	11.08	10.68	22.00	0.24	0.16	2.76	1.88	4.64
17.	FLIP 99-18	2.11	9.81	9.45	22.56	0.24	0.15	2.37	1.54	3.91
18.	FLIP 99-19	3.74	12.01	11.82	22.66	0.23	0.21	2.89	2.59	5.48
19.	FLIP 99-20	3.16	9.22	8.87	22.14	0.25	0.12	2.33	1.15	3.48
20.	FLIP 99-21	3.20	11.64	11.12	22.76	0.24	0.18	2.83	2.21	5.04
21.	FLIP 99-22	3.15	9.79	9.41	22.33	0.19	0.13	1.93	1.34	3.27
22.	FLIP 99-23	3.14	8.09	7.78	22.20	0.20	0.14	1.65	1.19	2.84
23.	FLIP 99-24	2.54	6.89	6.62	22.37	0.19	0.16	1.36	1.10	2.46
24.	FLIP 99-25	2.73	6.65	6.39	21.97	0.20	0.15	1.38	0.99	2.37
25.	DPL 62	3.63	11.47	11.06	23.24	0.22	0.19	2.65	2.29	4.94
	S.Ed. ±	0.06	0.20	0.24	0.21	0.004	0.003	0.11	0.04	-
	C.D. (P = 0.05)	0.12	0.39	0.47	0.40	0.008	0.005	0.22	0.08	-
	S-levels									
1.	Control	3.14	8.63	8.74	21.86	0.15	0.11	1.30	0.95	2.25
2.	25 kg/ha	3.33	10.14	9.90	22.48	0.23	0.18	2.34	1.87	4.21
3.	50 kg/ha	3.54	11.37	10.44	23.31	0.29	0.23	3.32	2.67	5.99
	S.Ed. ±	0.05	0.24	0.26	0.44	0.03	0.02	0.46	0.36	-
	C.D. (P = 0.05)	0.11	0.47	0.50	0.58	0.05	0.04	0.90	0.72	-

DAP and MOP fertilizers, respectively. All genotypes were sown @ 50 kg seed/ha. Sowing of seed was done behind country plough in 30 cm apart furrows by kera method on 28th Oct., 2006. Except treatments the crop was raised with recommended package of practices under rainfed condition. The observations were taken on yield attributes and yield. The protein content in grain was estimated by determining N-content in seed samples using micro-Kjeldahl method (AOAC, 1965) and protein content was calculated by multiplying the n values with the common factor 6.25. Sulphur content in seed and stover samples was determined turbidimetrically as per method given by Chasmin and Yian (1951). Sulphur uptake was calculated by multiplying S-content values with grain or straw yields obtained from respective treatment plots.

Results and Discussion

Genotypes

Lentil genotypes differed significantly n all characters studied. FLIP 81-17 being at par with FLIP 96-58, recorded significantly higher 100-grain weight than remaining all genotypes. These were followed by FLIP 86-50, FLIP 93-47, FLIP 92-41, FLIP 95-5 and FLIP 89503 genotypes. The genotype FLIP 93-47 produced significantly highest grain yield of 13.07 q/ha followed by DPL 44 (12.66 q/ha), FLI 92-41 (12.11 q/ha), FLIP 99-19 (12.01 q/ha) and FLIP 86-50 (11.96 q/ha). Later three genotypes recorded grain yield at par with each other. Thus highest yielder FLIP 93-47 produced 41, 96, 106 and 111 kg/ha or 3.24, 7.93, 8.83 and 9.28% higher grain yield than DPL 44, FLIP 92-41, FLIP 99-19 and FLIP 86-50 genotypes, respectively. It is interesting to note here that genotypes FLIP 81-17 and FLIP 96-58, who remained at top in 100-grain weight, produced much lower grain yield of 8.66 and 7.68 q/ha and these were found 33.7 and 41.2% lesser than the highest yielder genotype FLIP 93-47, respectively. Straw yield followed the same pattern of grain yield in different genotypes, though significance varied. As regards grain quality, protein content in grain was estimated significantly highest in DPL 44 (23.83%) followed by DPL 62 (23.24%), FLIP 92-41 (23.16%), FLIP 93-47 (23.10%) and FLIP 86-50 (23.03%). Later all four genotypes remained in the same group of significance. These results show that genotype only FLIP 93-47 could complete with standard check DPL 44 in grain yield while no new genotype could complete with DPL 44 in case of grain protein content.

Sulphur content in grain and straw was estimated maximum (0.27 and 0.22%) in DPL 44 followed by FLIP 93-47 (0.26 and 0.21%), FLIP 92-41 (0.25 and 0.20%), DPL 91-56 (0.24 and 0.21%) and FLIP 93-33 (0.24 and 0.19%). In case of S-uptake in grain or straw and total S-uptake, genotypes DPL 44 and FLIP 93-47 being at par were found significantly superior to all other genotypes. These DPL 44 and FLIP 93-47 genotypes registered 6.41 and 6.39 kg/ha total S-uptake, respectively. The following genotypes were FLIP 92-41 (5.68 kg S/ha), FLIP 99-19 (5.48 kg S/ha), DPL 9156 (5.38 kg S/ha) and FLIP 86-50 (5.35 kg S/ha). Higher S-uptake values might be attributed to S-content in grain and straw and their yields. The varieties between genotype in yield and other crop characters might be attributed to their genetic make up of inherital characters. These results may be supported by the findings of Choudhary *et al.* (1998) and Wang and Daun (2006).

Sulphur levels

Each increase in sulphur levels increased al lentil characters under study significantly with upto 50 kg S/ha the application of 50 kg S/ha increased 100 grain weight over zero and 25 kg S/ha by the margin of 12.7 and 6.3%, respectively. It increased the grain and straw yield over zero and 25 kg S/ha by the margin of 274 and 123 kg/ha or 31.7 and 12.1% and 170 and 54 kg/ha or 19.5 and 5.5%, respectively. It showed that grain yield of lentil was more influenced by increasing sulphur levels than straw yield. The grain yield response at 25 and 50 kg/ha doses was computed 6.04 kg grain and 5.48 kg grain per kg of applied sulphur, respectively. Grain protein content was recorded significantly highest at 50 kg S/ha (23.31%) and significantly lowest (21.86%) without S application. Sulphur content and uptake in grain or straw showed grater increase with each higher application of sulphur. S-content in grain and straw increased with 50 kg S/ha over zero and 25 kg S/ha by the margins of 0.14 and 0.06% and 0.12 and 0.05% unit or 93.3 and 26.1%; and 109.1 and 27.8%, respectively. Such higher increases in S-content might be attributed to lower S status of experimental soil and higher uptake of S in plant which accumulated in grain and other plant parts. Almost similar increase in S-uptake due to increasing S levels was recorded in grain and straw. The total uptake of S in crop with 50 kg S/ha was increased by 3.74 and 1.78 kg/ha or 166.2 and 42.3% over zero and 25 kg S/ha respectively. It might be the cumulative effect of S content and yield of grain and straw which also showed greater increase with increasing levels of S application. These results corroborate to the findings of Khurana *et al.* (2003), Sharma *et al.* (2004) and Wang and Daun *et al.* (2006). In no case, the interaction between genotypes and sulphur levels was found significant.

References

AOAC (1965). *Association of Official Agriculture Chemists*. 9th Edition, Washington, U.S.A.

Chesnin, L. and C. H. Yian (1951). Turbidimatric determination of available sulphate. *Soil Science American Proceedings*, **15** : 149-151.

Chowdhary, A. K., M. A. Newaj, S. C. Samanta, S. Huda and M. Ali (1998). Response of lentil genotypes to cultural environments on nodulation, growth and yield. *Bangladesh Journal of Scientific and Industrial Research*, **33** : 258-262.

Khurana, M. P. S., R. L. Bansal and V. K. Nayyar (2003). Effect of sulphur fertilization on yield and uptake of sulphur and micronutrient cation by lentil in an alluminium soil. *Annals of Agricultural Research*, **23(2)** : 244-247.

Sharma, A. K., R. P. Singh, M. D. Vyas and S. K. Paliwal (2004). Effect of source and levels of sulphur on productivity of lentil in Vindhyan Plateau zone of Madhya Pradesh. *Indian Journal of Pulses Research*, **16(1)** : 69-70.

Wang, N. and J. K. Daun (2006). Effect of variety and crude protein content on nutrients and anti-nutrients in lentil (*Lens culinaris* L.). *Food Chemistry*, **95(3)** : 493-502.