Effects of Different Sowing Dates on Yield Attributes of Different Lentil Varieties

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Abstract

The experiment was conducted at agricultural farm of Palli Siksha Bhavana, Visva-Bharati at Sriniketan of Birbhum district,West Bengal during *rabi* season of 2014-15 in red and lateritic soil to study the effects of different sowing dates on growth of different lentil varieties. The soil at experimental site was analysed sandy loam in texture with low in available n, medium in available p_2o_5 and k_2o and slightly acidic (p^H: 5.79) in nature. The experiment consisted of three levels of sowing dates (i.e. 31st October, 15th November and 30th November) and four levels of lentil varieties (i.e. L 4710, RKL 607-1, PL 406 and KLS 218) thus making twelve treatment combinations which were replicated thrice and was laid out in factorial randomized block design. Growth attributes like the number of days to 50% germination, 50% flowering, pod ignition, plant height, plant dry matter accumulation were recorded. Among the extra early varieties, the optimum date for RKL-607-1 was 31st October whereas l 4710 may be sown any time of the given dates 31st October, 15th November and 30th November. The traditional variety PL 406performed best, however it was statistically at par with KLS -218.

Keywords: extra early lentil variety, sowing dates, growth attributes

1. Introduction

Lentil (*Lens culinaris* Medik.) is one of the man's oldest food crops. It is an old world grain legume food crop that was domesticated in the near East arc along with other pulses such as pea, chickpea, and fababean in early Neolithic times (Ladizinsky, 1979). Lentil seed is a rich source of protein, minerals (K, P, Fe, Zn) and vitamins for human nutrition (Bhatty, 1988). Seeds can be fried and seasoned for consumption; flour is used to make soups and mixed with cereals to make bread and cakes (Williams and Singh, 1988). Furthermore, because of its high lysine and tryptophane content, its consumption with wheat or rice provides a balance in essential amino acids for human nutrition. Lentil straw is also a valued animal feed (Erskine et al., 1990). Planting date is the most important factor affecting the yield due to change in environment and by thermo-and photosensitive effects on growth and development of lentil. Under late planting conditions, growing season especially from flowering to maturity shortened due to forced maturity of crop, consequently, lentil yield was reduced in late planted crop as compared to normal planted crop has been described by Saxena and Singh (1976). Varietal responses to planting dates will be of great importance as varieties differ in their growth and development behaviour under different agro-ecological situation. Most of the lentil sowings in India get deferred because of the delayed harvest of the preceding crop, which quite often happens to be paddy. So, growing of this crop after preceeding rice in *kharif* season, farmer may not be able to sow summer crop in due time. Also, the crop suffers around the seed-filling stage due to the rising high temperatures in most of its cultivated areas. Since the growing time, thus, gets squeezed, it is imperative that early maturing varieties will be more suitable in India. Extra early varieties of lentil thus may pave the way of growing another crop in subsequent season and its potential yield is concerned.

2. Materials and Methods

2.1. Description of Study Area

The experiment was conducted at agricultural farm of Palli Siksha Bhavana, Visva-Bharati at Sriniketan of Birbhumdistrict,West Bengal during *rabi* season of 2014-15 in red and lateritic soil on a sandy loam soil. The farm was situated at 23°39' N latitude and 87°42' E longitude with an average altitude of 58.90 m above mean sea level. The soils of the experimental field had 215.74 kg ha-1 alkaline permanganate oxidizable nitrogen (N) (Subbiah and Asija, 1956), 29.48 kg ha^{-1} available phosphorus (P) (Bray and Kurtz, 1945), 146.54 kg ha^{-1} 1 N ammonium acetate exchangeable potassium (K) (Hanway and Heidel, 1952) and 0.42% organic carbon (OC) (Walkley and Black, 1934). The pH of soil was 5.79 (1: 2.5 soil and water ratio) recommended by soil reaction

committee (1930) and Jacson (1973) .

2.2. Experimental treatments and design

The experiment consisted of three levels of sowing dates (i.e. 31st October, 15th November and 30th November) and four levels of lentil varieties (i.e. L 4710, RKL 607-1, PL 406 and KLS 218) thus making twelve treatment combinations which were replicated thrice and was laid out in Factorial randomized block design.

2.3. Field preparation, fertilization, sowing and intercultural operation

At optimum moisture condition the land was ploughed twice by tractor drawn harrow thoroughly for obtaining good tilth. A general recommended dose of N:P_2O_5:K_2O for rainfed lentil was applied uniformly to each plot at the rate of 20:40:40 kg ha^{-1}. Boron @ 0.2% was sprayed once in the form of borax. Properly graded seeds of varieties L 4710, RKL 607-1, PL 406 and KLS 218 were sown @40 kg ha^{-1}. The lentil varieties were sown in row spaced at 25 cm apart on 31st October, 15th November and 30th November, 2014 respectively. Thinning operation was done at 20 days after sowing to maintain the optimum plant population for the different dates of sowing. First hand 1st weeding operation was done at 25 DAS and 2nd hand weeding was done at 45 DAS to control the weeds for the different dates of sowing.

Table 4.1.1: Effect of sowing dates and lentil varieties on number of days to 50% germination (DAS), 50% flowering (DAS), pod initiation (DAS) of different lentil varieties

Treatment / Variety	Days to 50 % germination (DAS)	Days to 50 % flowering (DAS)	Days to 50 % pod initiation (DAS)
L 4710	4.11	46.33	54.22
RKL 607-1	4.44	47.44	55.56
PL 406	5.11	67.89	76.78
KLS 218	5.78	67.56	75.89
SEm±	0.17	0.22	0.22
CD (*p*=0.05)	0.49	0.65	0.66
CV%	10.38	1.15	1.02
Sowing date			
31st October, 2014	5.00	57.50	66.08
15th November, 2014	4.17	56.42	65.00
30th November, 2014	5.42	58.00	65.75
SEm±	0.15	0.19	0.19
CD (*p*=0.05)	0.43	0.56	0.57
CV%	10.38	1.15	1.02

2.4. Studies on growth attributes of lentil

The following observations were taken to study the effect of varietal performance of lentil on different growth attributes of lentil legumes. Days to 50% germination, days to 50% flowering and days to pod initiation were counted in each plot in plants from three places in 1 m length and then the average of these was recorded. The plant height and plant dry matter accumulation was observed at 30, 45, 60, 75 and 90 DAS during.

2.5. Statistical analysis

The analysis of variance method (Cochran and Cox, 1977; Panse and Sukhatme, 1978) was followed to statistically analyse the various data. The significance of different source of variations was tested by "Error Mean Square Method" of Fisher Snedecor's 'F' test at probability level of 0.05. In the tables of result and discussion chapter, the standard error of Mean (SEm±) and the value of critical difference (CD) to compare the differences between means have been provided.

3. Results and Discussion

Among the varieties, KLS 218 variety took significantly maximum days to 50% germination than PL 406, RKL 607-1 and L 4710, respectively. Sowing on 30th November recorded significantly higher days to 50% germination. The data indicated that the lentil variety PL 406 took significantly maximum days to 50% flowering than RKL 607-1 and L

Table 4.1.2a: Effect of sowing dates and lentil varieties on plant height (cm) of different lentil varieties at different growth stages

Treatment	Plant height (cm)				
Variety	30 DAS	45 DAS	60 DAS	75 DAS	90 DAS
L 4710	13.33	19.81	23.04	25.44	27.32
RKL 607-1	11.68	16.62	22.05	25.14	27.22
PL 406	7.03	10.75	15.61	21.66	27.71
KLS 218	8.99	12.27	17.04	22.90	27.34
SEm±	0.29	0.38	0.38	0.78	0.67
CD (*p*=0.05)	0.85	1.10	1.10	2.28	NS
CV%	8.47	7.59	5.81	9.79	7.37
Sowing date					
31st October, 2014	10.74	15.05	19.13	22.27	27.65
15th November, 2014	11.36	16.39	21.02	26.08	29.70
30th November, 2014	8.67	13.14	18.16	23.01	24.85
SEm±	0.25	0.33	0.33	0.67	0.58
CD (*p*=0.05)	0.74	0.96	0.96	1.97	1.71
CV%	8.47	7.59	5.81	9.79	7.37

4710, respectively. The maximum days to 50% flowering was recorded on lentil sown on 30th November which was significantly higher than sowing on 15th November. Among the varieties, PL 406 took significantly maximum days to pod initiation over RKL 607-1 and L 4710, respectively. Sowing on 31st October recorded significantly higher days to pod initiation than 15th November.

At 30 DAS it was found that tallest (13.33 cm) plant was recorded with L 4710 variety which was significantly higher than RKL 607-1, KLS 218 and PL 406, respectively. Sowing on 15th November and 31st October recorded significantly higher plant height over 30th November. At 45 DAS the tallest (19.81 cm) plant was recorded with L 4710 variety whereas the shortest (10.75 cm) was recorded with the variety PL 406. Next to L 4710, RKL 607-1 resulted. Sowing on 15th November and 31st October recorded significantly higher plant height than 30th November. At 60 DAS it is also clear that L 4710 produced significantly higher plant height than KLS 218 and PL 406, respectively, however at par with RKL 607-1. Sowing on 15th November recorded significantly higher plant height. At 75DAS it is clearly defining that L 4710 and RKL 607-1 produced significantly higher plant height than KLS 218 and PL 406, respectively. Sowing on 15th November recorded significantly higher plant height. At 90 DAS it is clear that influence of varieties on plant height was non-significant.

Table 4.1.2b: Interaction between sowing dates and lentil varieties on plant height (cm) at 30 DAS

Variety	Sowing date		
	31st October, 2014	15th November, 2014	30th November, 2014
L 4710	14.90	14.62	10.47
RKL 607-1	11.88	13.90	9.27
PL 406	7.03	7.25	6.81
KLS 218	9.16	9.67	8.13
SEm±		0.5	
CD (p=0.05)		1.47	

At 30 DAS, it is clear that highest (52.6 g m^2) dry matter accumulation was recorded with RKL 607-1 variety which was significantly higher than KLS 218, PL 406 and L 4710, respectively. Plants accumulated highest dry matter when sown on 15th November. Sowing on 15th November recorded significantly 9.3% and 16.6% higher dry matter accumulation than 31st October and 30th November, respectively. At 60 DAS from Table 4.1.3, it is observed that KLS 218 variety remained statistically at par with RKL 607-1 and PL 406, respectively in respect to dry matter accumulation. Sowing on 15th November recorded significantly higher dry matter accumulation than 30th November but found non-significant with 31st October. At 75 DAS it is revealed that PL 406 accumulated significantly

Table 4.1.3: Effect of sowing dates and lentil varieties on plant dry matter accumulation at different growth stages

Treatment	Plant dry matter accumulation (g^{-2})				
Variety	30 DAS	45 DAS	60 DAS	75 DAS	90 DAS
L 4710	42.06	75.71	102.67	127.00	177.20
RKL 607-1	52.65	94.76	121.63	138.72	193.38
PL 406	42.77	76.98	117.70	160.82	212.91
KLS 218	47.04	84.67	121.96	153.89	198.85
SEm±	1.33	2.39	2.61	3.34	4.58
CD (*p*=0.05)	3.90	7.01	7.66	9.80	13.44
CV%	8.63	8.63	6.75	6.9	7.02
Sowing date					
31st October, 2014	45.65	82.17	115.97	157.01	209.66
15th November, 2014	49.92	89.86	122.53	144.30	194.55
30th November, 2014	42.81	77.06	109.47	134.01	182.54
SEm±	1.15	2.07	2.26	2.89	3.97
CD (*p*=0.05)	3.37	6.07	6.64	8.48	11.64
CV%	8.63	8.63	6.75	6.9	7.02

15.9% and 26.6% higher dry matter over RKL 607-1 and L 4710, respectively, Sowing on 31st October recorded significantly higher plant dry matter accumulation than 15th November and 30th November. At 90 DAS It can be inferred that PL 406 showed significantly 7.03%, 10.08% and 20.1% higher dry matter accumulation than KLS 218, RKL 607-1 and L 4710, respectively. Sowing on 31st October recorded significantly 14.9% and 6.6% higher dry matter accumulation than 15th November and 30th November, respectively.

Sowing on 30th November recorded significantly higher days to 50% germination than 15th November but it was at par with 31st October. Sharma and Dubey (2013) reported that early sowing is very good strategy for proper germination of *rabi* crops like mustard, lentil and barley. The extra early variety L 4710 showed faster (46.3 DAS) 50% flowering followed by RKL 607-1, KLS 218 and PL 406, respectively. Chandra and Asthana (1992) and Ezzat et al. (2005) also reported on flowering behavior of different lentil varieties.

The difference between the effects of sowing on 31st October and 30th November was found non-significant. Siddique et al. (1998) reported that early sowing of lentil varieties began early flowering. Highest plant height of PL 406 was observed when it was sown on 15th November that was statistically at par when sown on 31st October and 30th November, respectively. Almost similar trend was recorded with KLS 218. This variety sown on 15th November produced tallest (9.67 cm) plant which was statistically non-significant when compared with sowing dates

on 31st October and 30th November, respectively. it is clear that influence of varieties on plant height was non-significant. Studies on plant height of different lentil varieties were also reported by El-Far (2000), Jan et al. (2004), Ezzat et al. (2005), Kundu et al. (2014) and Singh et al. (2014). 31st October sown varieties were also significantly taller than 30th November. Kazemekas (2001), Allam (2002) reported that early sowing gave optimum plant height. Gray and Delgado (1986), Aziz (1992) reported that delay in sowing reduced plant height.

Gill (2012) found that sowing on 30th October increased growth parameters as dry matter production, plant height. Between the extra early varieties, RKL 607-1 also recorded higher dry matter accumulation that was statistically significant over L 4710. Kundu et al. (2014) reported that dry matter accumulation increased with the advancement of growth stages.

Sowing on 31st October recorded significantly 14.9% and 6.6% higher dry matter accumulation than 15th November and 30th November, respectively. Again, sowing on 15th November also recorded 6.6% higher dry matter accumulation which was statistically significant over 30th November. Gill (2012) conducted an experiment where lentil seeds were sown on four sowing dates i.e. 15th October, 30th October, 14th November and 30th November. He found that sowing on 30th October produced higher dry matter. Silim et al. (1991) reported that high dry matter accumulation always related to a high final economic biomass.

4. Conclusion

From the investigation, it can be concluded that among the extra early varieties, the optimum date for RKL-607-1 was 31st October whereas L 4710 may be sown any time of the given dates 31st October, 15th November and 30th November and the traditional variety PL 406performed best, however it was statistically at par with KLS 218 proved best in influencing growth attributes

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