Biological Forum – An International Journal **15(5): 339-342(2023)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Performance of Different Lentil varieties under varying Sowing Time in Eastern Semi-arid Sub Zone of Haryana

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(Received: 02 March 2023; Revised: 15 April 2023; Accepted: 19 April 2023; Published: 20 May 2023)
(Published by Research Trend)

ABSTRACT: Determination of optimum sowing time of Lentil varieties is important as declining temperatures may affect the final yield. There is limited information available on the optimum sowing date for lentil in waterlogged saline soil of Rohtak. So, field study were conducted during *rabi* season of 2020-21 and 2021-2022 at Research farm of CCSHAU Regional Research Station, Rohtak to study the effects of date of sowing and varieties on phenology and agronomical traits of lentil. The experiment was laid out in a split plot design with five dates of sowing viz., 30th October, 10th November, 20th November, 30th November, and 10th December in main plots and three lentil varieties *viz*., Sapna, HM 1 and Garima in sub plots replicated thrice. Overall results depicted that significantly more number of days was taken to attain 50% flowering, 50 % podding and maturity in 30th October sown crop than other sowing dates. Delayed sowing of lentil upto 10th December resulted in 15.43%, 14.80% and 14.63 % lower seed yield than 30th October, 10th November, and 20th November sown lentil respectively. Lentil variety Sapna is being at par with HM1 recorded significantly higher seed yield than Garima at all the dates of sowing, except in case of 30th November sown lentil where seed yield recorded in variety HM 1 was significantly higher than Sapna and Garima varieties. The crop sown on 30th October is at par with 10th and 20th November sown crop produced significantly higher seed yield over 30th November and 10th December sown crop. Among different lentil varieties Sapna being at par with HM 1 produced significantly higher seed yield and better yield attributes (100 seed weight, Number of pods/plant and No. of grains/pod) than Garima (1291 kg/ha). Both Sapna and HM1 varieties performed better than Garima variety at all the dates of sowing. In 30th November sown lentil, seed yield recorded in variety HM 1 was significantly higher than Sapna while Sapna outperforms rest two varieties (HM1 and Garima) at all the dates of sowing.

Keywords: Lentil, sowing date, variety, seed yield, Garima, Sapna and HM 1.

INTRODUCTION

Lentil is an important food legume crop grown during *rabi* season throughout Indian continent under varied agro-ecological conditions, soil types and cropping system, in areas where winters are extremely cold. It is preferred over chickpea and pea due to its tolerance to frost. Due to lack of desired plant population, its average yield in the country is quite low as compared to its yield potential (18.20 q/ha). It is an annual food legume highly valued in the food and nutritional security of millions of people for its grain. It contains relatively higher amount of protein, carbohydrate and calories compared to other legumes and it is the most desired pulse because of its high average protein content and rich in Fe, Zn, Ca, fibers, protein, lysine and micronutrients. Swargiary *et al.* (2021) reported that Lentil is typically rich in micronutrients and has the potential to provide adequate dietary amounts, especially for Iron (Fe), Zinc (Zn), and Selenium (Se). Singh (2001) reported that lentil contains about 11% water, 25% protein and 60% carbohydrates. This crop is adapted to low rainfall and is predominantly grown in the winter in regions where the annual average rainfall is 300 to 400 mm (Sarker *et al.*, 2003) Yield of any legume can be increased by biofertilizer inoculation, sowing at optimum time with best genotype, at proper row spacing and by manipulating the seed rate particularly for its delayed sowing (Rani *et al.*, 2016). Among cultivation practices, sowing time is an important parameter which affects the growth, development, and yield of lentil to great extent (Sen, 2016). Since information on these aspects in eastern semi-arid sub zone of Haryana was limited, therefore the present investigation was carried out to find out the optimum varieties and date of sowing of lentil. There is limited information published on the optimum sowing date for lentil varieties under Rohtak condition where water table is high. So, the objectives of this study were to determine the optimal sowing date and to select the best lentil varieties for the zone.

MATERIALS AND METHODS

A field experiment was conducted at Samargopalpur research farm of CCSHAU Regional Research Station, Rohtak. The aim of this experiment was to find lentil variety and its optimum time of sowing to get potential

yield. The soil of the experimental field was sandy loam in texture, neutral in reaction, low in organic carbon and available nitrogen, medium in available phosphorus and high in available potassium. The experiment was laid out in a split plot design with five dates of sowing *viz*., 30th October, 10th November, 20th November, 30th November, and 10th December in main plots and three lentil varieties *viz.*, Sapna, HM 1 and Garimain sub plots replicated thrice. The climate of Rohtak (28°40' N latitude and 76° 13' E longitude) is classified as subtropical monsoon, mild and dry winter, hot summer and sub-humid which is mainly dry with very hot summer and cold winter except during monsoon season when moist air of oceanic origin penetrates the district. The hot weather season starts from mid-March to last week of the June followed by the South West monsoon which lasts up to September. The transition period from September to November forms the post monsoon season. The normal annual rainfall in Rohtak district is about 592 mm spread over 23 days. The South West monsoon sets in the last week of June and withdraws towards the end of September and contributes about 84% of the annual rainfall. July and August are the wettest months. About 16% of the annual rainfall occurs during the non-monsoon months in the wake of thunder storms and western disturbances. The experimental field was prepared by two ploughings and one planking, followed by pre-sowing irrigation. Three lentil varieties (Sapna, Garima and HM 1) were sown as per the treatment at four different dates of sowing. Lentil was sown with row-to-row spacing of 22.5 cm. Harvesting and threshing of lentil was done manually to minimize yield losses. As per the treatment full dose of phosphorus and nitrogen were applied as basal dose at the time of sowing as per package of practice. Two irrigations were given first at 45 days after sowing and second at pod filling stage. The other agronomic practices from sowing to harvesting like fertilizer application, insect-pests control and weed control measures were done as per recommended package of practices of Chaudhary Charan Singh Haryana Agricultural University, Hisar. The phenophases (*viz*., 50 % flowering, podding and maturity) of all the three lentil varieties sown at different dates were noted by regular field inspection method. Data on five randomly selected tagged plants from each plot in each replication were recorded on different quantitative characters *viz*., plant height (cm), number of pods/plant and number of seeds/pod. For recording test weight of lentil, grain samples were taken from the produce of each treatment and 100 grains were counted and were dried in oven at 60°C for 48 hours. After drying, they were weighed and mean weight of 100 grains was noted as test weight.

RESULT AND DISCUSSION

Performance of variety. The pooled data pertaining to days taken to 50 % flowering, podding and maturity under different treatments is presented in Table 1. Perusal of data reveals that lentil variety HM1 took significantly lower number of days to reach 50 % flowering, podding and maturity stage as compared to Sapna and Garima. Variety Garima took significantly higher days to attain all the three phenological stages. The variations in the time taken to reach these stages by various lentil varieties might be attributed to the differences in their genetic makeup. Among different varieties of lentil, Sapna recorded the tallest plant with higher number of branches/plant. Lentil variety Sapna (1634 kg/ha) also produced the highest seed yield with better yield attributing characters like number of pods/plant, test weight and number of grains/pod followed by HM 1 (1561 kg/ha) and Garima (1386 kg/ha) (Table 2). Dixit *et al.* (2011); Reja *et al.* (2017) also characterized lentil genotypes and noted significant difference in growth and yield attributes.

Among different lentil varieties Sapna and HM1 recorded 14.99 and 13.12 % higher seed yield, respectively, than Garima. Lentil genotypes with a short duration can produce higher seed yield if they efficiently partition the photosynthetic assimilates into economic profit (Kumar and Srivastava 2015; Mukherjee *et al.,* 2020). This might be the reason for the higher yield in Sapna and HMI over Garima. Variation in yield among three lentil varieties might be due to their respective nature of branching and podding characteristics. Highest B:C was recorded in variety Sapna (2.30) while lowest in Garima (2.00). This might be due to higher yield associated with the respective varieties during the experimentation.

Effect of date of sowing. The critical analysis of pooled data in Table 1 reveals that significant effect of date of sowing was observed on occurrence of various phenophases, growth parameters, yield attribute and yield of lentil. Significantly more number of days was taken to attain 50% flowering, 50 % podding and maturity in 30th October sown crop than other sowing dates. Singh *et al.* (2005) reported similar reduction in time to 50% flowering and maturity for delay in sowing of lentil (cv. LG 308) from10th November to 10thDecember at Gurdaspur, Punjab. Corroborative findings have also been reported by Sen *et al.* (2016). Significantly taller plants and higher no. of branches /plant was recorded in timely sown lentil (30th October to 30th November) as compared to late sown (10th December 2020). The reason for increased *plant height* in early *sowing* may be the enhanced vegetative development of crops due to favorable weather conditions. With the delay in sowing, significant reduction in plant height was observed which might be due to delayed germination and early maturity of the crop. Delayed emergence with the delay in sowing was due to the decrease in minimum temperature at the time of sowing and early maturity might be due to the abrupt rise in temperature during the reproductive phase, which ultimately resulted in early maturity of the lentil varieties. Sethi *et al.* (2016) also reported the reduction in plant height with the delay in sowing time of chickpea. Corroborative findings have also been reported by Venugopalan *et al.* (2022) where he reported taller plants in early sown lentil. This might be due to its congenial weather condition during the first sowing date of the lentil crops which provide a favorable environment for the growth and development of the crop.

October 30th sown crop being at par with 10th, 20th and 30th November sown crop produced significantly higher 100 seed weight, no. of pods/plant, number of grains per pod and seed yield over 10th December sown crop. It may be concluded that the sowing of lentil could be done from 30th October to 20th November as late sowing upto 10th December resulted in lower seed yield than 30th October, 10th November, and 20th November sown lentil, respectively which was in conformity with the findings of Gill (2012). Sen *et al.* (2016) also reported that lentil sown on 15th November produced the highest seed yield, which was about 3 and 16% higher over the earlier (1st November) and later (30th November) sown conditions, respectively. Highest B:C was recorded in October 30th sown lentil while lowest in 10th December sown lentil (1.94).

Interaction effect. A close look of the pooled data in Table 3 reveals that Lentil variety Sapna and Garima sown from 30th October to 20th November registered higher seed yield. Delayed sowing to 30th November and 10th December caused significant reduction in seed yield of both Sapna and Garima varieties. Significantly higher seed yield of Garima variety was recorded in case of 30th October sowing (1440 kg/ha). The lentil variety Garima sown on 10th, 20th and 30th November were at par in seed yield, however, significantly lower seed yield was recorded in Varity Garima sown on 10th December as compared to the earlier sowings. Lentil variety Sapna out performs rest two varieties (HM1 and Garima) at all the dates of sowing, except in case of 30th November sown lentil where seed yield recorded in variety HM 1 was significantly higher than Sapna and Garima varieties. In case of 10th December sown crop seed yield of Lentil variety Sapna and HM 1 were at par with each other but significantly better than variety Garima. However, in case of delayed sowing up to 10th December lentil varieties Sapna and HM 1 should be preferred followed by variety Garima. Among all the lentil varieties, the optimum date of sowing for Sapna was 10th November whereas variety HM 1 may be sown any time from 30th October to 20th November and the variety Garima performed best when sown on 30th October. It may be concluded that the sowing of lentil could be done from 30th October to 20th November. The crop sown during this period produced better growth, yield attributes and higher seed yield. Sowing of all lentil varieties beyond 20th November was not advisable as it resulted in shorter reproductive phase and leads to forced maturity owing to higher day and night temperatures during the late reproductive and crop maturity phase.

Table 1: Phenology and growth of lentil varieties as influenced by different date of sowing.

Treatments	Days to 50% flowering (DAS)	Days to 50% podding (DAS)	Days to maturity (DAS)	Plant height (cm)	No. of branches/ plant
Date of sowing					
30th October	87	104	134	45	7.69
10th November	82	97	130	43	6.33
20th November	82	94	125	41	5.27
30th November	79	91	119	40	4.12
10th December	75	86	114	36	3.29
CD at 5 %	3.4	4.3	7.7	1.5	0.88
Varieties					
Sapna	82	95	123	43	6.28
HM 1	76	91	119	41	5.13
Garima	85	98	132	39	4.61
C.D. at 5 %	**5.2**	**3.9**	**6.2**	**1.8**	**0.96**

Table 2: Yield attributes and yields of lentil varieties as influenced by different date of sowing.

Treatments	100 seed weight (g)	No. of pods/plant	No. of grains per pod	Seed yield (kg/ha)	B:C
Date of sowing					
30th October	2.83	125	1.97	1,582	2.30
10th November	2.76	121	1.92	1,571	2.29
20th November	2.68	115	1.86	1,568	2.28
30th November	2.09	103	1.81	1,472	2.14
10th December	1.94	96	1.79	1,339	1.94
CD at 5 %	0.12	4.8	0.01	20.78	-
Varieties					
Sapna	2.61	128	1.97	1,584	2.30
HM 1	1.85	107	1.86	1,558	2.26
Garima	2.92	101	1.78	1,377	2.00
C.D. at 5 %	0.43	5.2	0.03	10.73	-

Table 3: Interaction effect of date of sowing and varieties on seed yield (kg/ha) of lentil.

Treatments	Varieties			Mean
Date of sowing	Sapna	HM 1	Garima	
30th October	1,684	1,623	1,440	1,582
10th November	1,701	1,609	1,402	1,571
20th November	1,679	1,617	1,408	1,568
30th November	1,453	1,543	1,419	1,472
10th December	1,403	1,398	1,216	1,339
Mean	1,584	1,558	1,377	
CD (p =0.05) Variety at same level of date of sowing				25.31
CD (p =0.05) Date of sowing at same level of variety				28.52

CONCLUSION AND FUTURE SCOPE

It may be concluded that October 30th sown lentil crop being at par with 10th, 20th and 30th November sown crop produced 18.14 % higher seed yield than 10th December sown crop. Lentil variety Sapna outperforms rest two varieties (HM 1 and Garima) at all the dates of sowing, except in case of 30th November sown lentil where seed yield recorded in variety HM 1 was significantly higher than Sapna and Garima varieties.

Acknowledgement. The authors wish to express their appreciation to Regional Director, faculty, and staff of CCSHAU, Regional Research Station, Rohtak, for providing experimental material and the help and support during the experimentation. Due acknowledgement is also given to HOD, Agronomy and HOS Pulses section, CCS HAU Hisar for providing help in designing of the experiment.
Conflict of Interest. None.

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How to cite this article: Meena Sewhag, D.S. Ahlawat, Neeraj Pawar, Ajay Singh and Gurdeep Singh Malhi (2023). Performance of Different Lentil varieties under varying Sowing Time in Eastern Semi-arid Sub Zone of Haryana. *Biological Forum – An International Journal*, *15*(5): 339-342.