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Effect of sowing time and row spacing on growth, yield and quality of Chandrasur (*Lepidium sativum* L.)

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Abstract

The present study was undertaken to investigate “Effect of sowing time and row spacing on growth, yield and quality of Chandrasur (*Lepidium sativum* L.)” was carried out at the “Horticulture Research Farm” College of Horticulture Mandsaur, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (M.P.) from October 2017 to March 2018. Among the different 3 dates of sowing (15th October, 30th October and 15th November) and different 3 row spacing (20 cm, 30 cm and 40 cm) with 3 replication, the was analyzed by Factorial RBD. The plant height (119.60 cm), number of branch per plant (22.30) chlorophyll content (1.95 SPAD), days to 50% emergence (3.67), days to maturity (107.33), number of racemes per plant (130.13), weight of 1000 seed (1.88 g), seed yield per plant (21.15 g) and oil content in seed (23.83%) recorded maximum values with respectively in D₂S₂ (30th October and 30 cm).

Keywords: Sowing time, row spacing, Factorial RBD, growth, yield and Chandrasur

Introduction

Chandrasur (*Lepidium sativum* L.) it is also known as asalio and garden cress the plant belongs to family Brassicaceae. There are diploid (2n=16) and tetraploid (2n=32) (Wadhwa *et al.*, 2012) [13] forms of asalio. The species is a native of Ethiopia and, is said to have been introduced to Europe and Asia. Plants are of about 45-60 cm tall. Leaves are entire or variously lobbed or pinnatisect. Flowers are small and white, arranged in racemes. It has been cultivated for food before the ancient Egyptians and is still widely used. It is most commonly eaten in the seedling form, where it is the cress of mustard. It is a fast growing crop that can be ready to eat within 7 days of sowing the seed. The plant has traditional medicinal uses also and is the source of edible oil that can be used for lighting. It is grown in Ethiopia for the edible oil obtained from its seed. In India, it is cultivated as winter crop in selected parts of Rajasthan, Gujarat and Madhya Pradesh for seeds. The seeds are galactagogue, laxative and diuretic. Seeds contain phytochemicals that resemble estrogen action. Hence it is used in treating amenorrhoea and irregular menstrual cycles. It is fed to lactating mothers for improving breast milk production. Seed paste is used as poultice to relieve pain, worm infestation in wounds and useful in skin disorders associated with itching. The mucilage obtained from the seeds is used against intestinal irritations. The leaves are used as diuretic and to treat liver diseases. It is also used as salad for treating anaemia. Seeds are used for propagation.

Material and Methods

The experiments were carried out during 2017 to 2018, at the Research Farm, College of Horticulture, Mandsaur, RVSKVV, Gwalior (M.P.). Geographically Mandsaur is situated in Western part of Madhya Pradesh between latitude of 23 °45' to 24 °13' N and longitude of 74 °44' to 75 °18' E at an altitude of 435.2 Meter above MSL. The annual rainfall is 544.05 mm most of which is from 20th June to end of September. Dry spell is a common feature due to uneven distribution of rainfall. The soil of experimental field was medium black clay in texture with uniform topography. The treatments consisted of the three sowing time (15th October, 30th October and 15th November) and three plant geometry (20x10 cm, 30x10 cm and 40x10 cm) These treatments were sown in Factorial Randomized Block Design with three replications. Observations were recorded under investigation *i.e.* plant height, number of branch per plant, chlorophyll content (SPAD), days to 50% emergence, days to maturity, number of racemes per plant, weight of 1000 seed, seed yield per plant and oil content in seed.

Results and Discussion

Effect of sowing time

All the phenological parameters were significantly influenced with different dates of sowing and shown early pheno-phases under late sown conditions. However, days to 50% emergence (4.00) and days to maturity (107.67) were took recorded due to sowing on 15th November (D₃) as compared to other dates of sowing.

Among the growth attributes, sowing time significantly influenced all the growth parameters at different growth stages. Moreover, maximum plant height (11.82, 76.96, 115.84 and 117.852 cm), number of branches per plant (17.82, 21.24 and 21.57), and chlorophyll content (29.65, 40.85, 68.12 and 1.81 SPAD) were observed at 30, 60, 90 DAS and at harvest respectively due to sowing of seeds on 30th October (D₂) as compared to 15th October (D₁) and 15th November (D₃).

Date of sowing significantly influenced all the yield and yield attributing traits except weight of 1000 seed (g) and harvest index under investigation. Maximum number of racemes per plant (127.14), racemes length (29.12 cm), weight of 1000 seed (1.84 g), yield per plant (18.75 g) and yield (22.44 q/ha) were recorded due in chandrasur on 30th October (D₂) as compared other two dates of sowing.

Quality parameters were also influenced with different sowing time. However, the maximum seed germination (89.22%), oil content in seed (22.53%) and dry matter content in seed (93.92%) were recorded due to seeds on 30th October (D₂) as compared other two dates of sowing.

Effect of plant geometry

All the phenological parameters were non-significantly influenced with different plant geometry and shown early pheno-phases under S₂ (30 cm) spacing. However, the minimum days to 50% emergence (5.44), days to 50% flowering (63.89) and days to maturity (119.78) with S₂ (30 cm) as compare to S₁ (20 cm) and S₃ (40 cm).

Among the various plant geometry, spacing S₂ (30 cm) was exhibited significant maximum value for plant height (10.53, 72.91, 109.78 and 111.26 cm), and chlorophyll content (29.82, 38.70, 53.85 and 1.78 SPAD) as compared to S₁ (20 cm) and S₃ (40 cm) at all the growth stages respectively. However, number of branches (14.63, 16.07 and 16.74) was recorded highest values with the same spacing but non-

significantly at all the growth stages respectively as compare to other spacing.

Plant geometry was significantly influence all the yield and yield attributing traits except racemes weight, weight of 1000 seed and harvest index. The maximum number of racemes per plant (115.08), racemes length (26.06 cm), weight of 1000 seed (1.80 g), seed yield per plant (17.91 g) and seed yield (18.94 q/ha) were observed in S₂ (30 cm) as compare to S₁ (20 cm) and S₃ (40 cm).

Quality parameters influenced with different plant geometry. However, the maximum seed germination (89.33%), oil content in seed (22.15%) and dry matter content in seed (93.75%) were recorded with S₂ (30 cm) as compare to S₁ (20 cm) and S₃ (40 cm).

Interaction Effect of sowing time and plant geometry

In the present study the combined effect of sowing time and plant geometry showed non-significantly variations in pheno-phases. However, days to 50% emergence (3.67), days to 50% flowering (61.67) and days to maturity (107.33) were took lowest days with D₃S₂ (15th November and 30 cm) among the interactions.

Under the interaction of sowing time and plant geometry, all the growth attributes were significantly influence under the whole lifespan development except initial stage of growth. However, the highest plant height (12.63, 78.47, 119.47 and 119.60 cm), number of branch per plant (18.13, 22.07 and 22.30) and chlorophyll content (34.74, 40.94, 71.13 and 1.95 SPAD) were recorded at 30, 60, 90 DAS and at harvest respectively in D₂S₂ (30th October and 30 cm) as compare to other combinations.

Sowing time and plant geometry was significantly influence all the yield and yield attributing traits except racemes weight, weight of 1000 seed. The maximum number of racemes per plant (130.13), racemes length (31.25 cm), weight of 1000 seed (1.88 g), seed yield per plant (21.15 g) and seed yield (23.97 q/ha) were observed with D₂S₂ (October 30th and 30 cm) as compare to other combinations.

Quality parameters influenced with the interaction of sowing time and plant geometry under investigation. However, the maximum seed germination (90.33%), oil content in seed (23.83%) and dry matter content in seed (95.07%) were recorded with D₂S₂ (30th October and 30 cm) compare to other combinations.

Table 1: Effect of different sowing time, plant geometry and their interaction on days to 50% emergence days to 50% flowering and days to maturity of chandrasur.

Treatment	Phenological attributes		
	Days to 50% emergence	Days to 50% flowering	Days to maturity
Sowing dates (D)			
D ₁ - 15 Oct.	7.67	67.56	130.89
D ₂ - 30 Oct.	5.33	62.44	121.44
D ₃ - 15 Nov	4.00	62.22	107.67
S.Em ±	0.23	0.43	0.63
CD at 5%	0.68	1.29	1.90
Plant geometry (S)			
S ₁ - 20x10 cm	6.00	64.33	120.33
S ₂ - 30x10 cm	5.44	63.89	119.78
S ₃ - 40x10 cm	5.56	64.00	119.89
S.Em ±	0.23	0.43	0.63
CD at 5%	NS	NS	NS
Interaction (DxS)			
D ₁ S ₁	8.00	68.00	131.67
D ₁ S ₂	7.67	67.33	130.33
D ₁ S ₃	7.33	67.33	130.67
D ₂ S ₁	5.67	62.00	121.33

D ₂ S ₂	5.33	62.00	122.00
D ₂ S ₃	5.00	63.00	121.00
D ₃ S ₁	4.33	62.33	107.67
D ₃ S ₂	3.67	61.67	107.33
D ₃ S ₃	4.00	63.00	108.00
S.Em ±	0.39	0.74	1.10
CD at 5%	NS	NS	NS

Table 2: Effect of different sowing time, plant geometry and their interaction on plant height and number of branches per plant.

Treatment	Plant height (cm)				Number of branches		
	30 DAS	60 DAS	90 DAS	AT HARVEST	60 DAS	90 DAS	AT HARVEST
Sowing dates (D)							
D ₁ - 15 Oct.	7.00	68.22	101.07	101.75	11.56	12.29	12.91
D ₂ - 30 Oct.	11.82	76.96	115.84	117.82	17.82	21.24	21.57
D ₃ - 15 Nov	11.26	68.53	105.51	109.05	13.76	14.51	14.89
S.Em ±	0.57	0.86	0.44	0.47	0.08	0.60	0.31
CD at 5%	1.70	2.57	1.31	1.40	0.25	1.79	0.91
Plant geometry (S)							
S ₁ - 20x10 cm	10.36	71.98	108.53	110.58	13.96	15.96	16.20
S ₂ - 30x10 cm	10.53	72.91	109.78	111.26	14.63	16.07	16.74
S ₃ - 40x10 cm	9.18	68.82	104.11	106.79	14.54	16.02	16.42
S.Em ±	0.57	0.86	0.44	0.47	0.08	0.60	0.31
CD at 5%	NS	2.57	1.31	1.40	0.25	NS	NS
Interaction (DxS)							
D ₁ S ₁	8.43	69.20	103.67	104.80	11.50	12.93	13.07
D ₁ S ₂	7.30	67.00	102.13	102.77	11.27	11.80	12.37
D ₁ S ₃	5.27	62.20	97.40	97.68	11.90	12.13	13.30
D ₂ S ₁	12.00	77.40	114.47	117.53	17.53	20.47	20.80
D ₂ S ₂	12.63	78.47	119.47	119.60	18.13	22.07	22.30
D ₂ S ₃	10.66	75.00	113.60	116.33	17.80	21.20	21.60
D ₃ S ₁	10.49	71.73	107.47	110.60	13.07	14.47	14.73
D ₃ S ₂	11.67	73.27	107.73	111.40	14.00	14.33	14.60
D ₃ S ₃	11.80	66.87	101.33	105.15	14.20	14.73	15.33
S.Em ±	0.98	1.48	0.76	0.81	0.15	1.03	0.53
CD at 5%	NS	4.44	2.27	2.42	0.44	NS	NS

Table 2: Effect of different sowing time, plant geometry and their interaction on fresh & dry weight of plant.

Treatment	Fresh weight of plant (g)				dry weight of plant (g)			
	30 DAS	60 DAS	90 DAS	AT HARVEST	30 DAS	60 DAS	90 DAS	AT HARVEST
Sowing dates (D)								
D ₁ - 15 Oct.	1.28	62.09	72.56	63.22	0.39	7.42	14.84	28.96
D ₂ - 30 Oct.	1.36	72.18	82.51	72.81	0.45	14.35	28.69	38.55
D ₃ - 15 Nov	1.03	48.49	56.47	47.18	0.14	5.57	11.14	12.92
S.Em ±	0.08	0.34	0.32	0.31	0.05	0.30	0.60	0.31
CD at 5%	0.24	1.01	0.97	0.93	0.15	0.89	1.79	0.93
Plant geometry (S)								
S ₁ - 20x10 cm	1.11	59.59	68.65	59.77	0.23	8.33	16.67	25.51
S ₂ - 30x10 cm	1.30	62.98	72.00	62.40	0.40	9.72	19.44	28.14
S ₃ - 40x10 cm	1.25	60.19	70.89	61.05	0.36	9.28	18.56	26.79
S.Em ±	0.08	0.34	0.32	0.31	0.05	0.30	0.60	0.31
CD at 5%	NS	1.01	0.97	0.93	NS	0.89	1.79	0.93
Interaction (DxS)								
D ₁ S ₁	1.01	42.90	54.80	45.49	0.13	4.97	9.93	11.23
D ₁ S ₂	1.07	48.21	55.49	46.53	0.16	5.47	10.93	12.27
D ₁ S ₃	1.02	54.37	59.12	49.53	0.14	6.27	12.54	15.27
D ₂ S ₁	1.08	70.70	80.26	71.00	0.17	12.53	25.07	36.74
D ₂ S ₂	1.42	74.80	84.40	74.25	0.55	16.93	33.87	39.99
D ₂ S ₃	1.41	71.03	82.87	73.18	0.45	13.57	27.15	38.92
D ₃ S ₁	1.26	59.87	70.20	61.77	0.39	7.00	14.00	27.51
D ₃ S ₂	1.33	62.87	73.47	63.41	0.50	7.27	14.53	29.15
D ₃ S ₃	1.40	63.53	74.00	64.48	0.48	8.00	16.00	30.22
S.Em ±	0.14	0.59	0.56	0.54	0.09	0.52	1.03	0.54
CD at 5%	NS	1.76	1.68	1.62	NS	1.55	3.10	1.62

Table 3: Effect of different sowing time, plant geometry and their interaction on Yield attributes of chandrasur.

Treatment	Yield attributes				
	Number of racemes per plant	Number of racemes per branch	Racemes length (cm)	Racemes weight (g)	Weight of 1000 seed (g)
Sowing dates (D)					
D ₁ - 15 Oct.	93.42	8.40	21.89	0.69	1.73
D ₂ - 30 Oct.	127.14	12.95	29.12	0.83	1.84
D ₃ - 15 Nov	115.31	9.31	24.37	0.72	1.76
S.Em ±	0.45	0.24	0.39	0.02	0.03
CD at 5%	1.36	0.73	1.18	0.07	NS
Plant geometry (S)					
S ₁ - 20x10 cm	109.47	9.25	24.63	0.73	1.74
S ₂ - 30x10 cm	115.08	11.06	26.06	0.77	1.80
S ₃ - 40x10 cm	111.32	10.35	24.69	0.75	1.77
S.Em ±	0.45	0.24	0.39	0.02	0.03
CD at 5%	1.36	0.73	1.18	NS	NS
Interaction (DxS)					
D ₁ S ₁	90.87	7.40	20.65	0.67	1.71
D ₁ S ₂	97.42	9.27	25.65	0.69	1.75
D ₁ S ₃	91.97	8.52	24.55	0.70	1.72
D ₂ S ₁	127.91	12.93	28.68	0.82	1.84
D ₂ S ₂	130.13	13.12	31.25	0.87	1.88
D ₂ S ₃	123.37	12.80	27.43	0.81	1.80
D ₃ S ₁	125.35	7.41	23.73	0.71	1.72
D ₃ S ₂	100.85	10.79	21.29	0.73	1.79
D ₃ S ₃	119.73	9.73	22.91	0.74	1.76
S.Em ±	0.79	0.42	0.68	0.04	0.06
CD at 5%	2.36	1.26	2.04	NS	NS

Table 4: Effect of different sowing time, plant geometry and their interaction on Yield attributes of chandrasur.

Treatment	Yield attributes				
	Seed yield per plant (g)	Seed yield (q/ha)	Biological yield (q/ha)	Harvest index (%)	Oil content in seed %
Sowing dates (D)					
D ₁ - 15 Oct.	14.98	16.75	67.39	24.86	20.21
D ₂ - 30 Oct.	18.75	22.44	87.30	25.70	22.53
D ₃ - 15 Nov	17.78	16.84	69.98	24.06	21.35
S.Em ±	0.47	0.25	0.36	2.09	0.38
CD at 5%	1.42	0.75	1.06	NS	1.13
Plant geometry (S)					
S ₁ - 20x10 cm	16.04	18.38	74.02	24.83	20.70
S ₂ - 30x10 cm	17.91	18.94	75.53	25.08	22.15
S ₃ - 40x10 cm	17.56	18.70	75.12	24.89	21.24
S.Em ±	0.47	0.25	0.36	2.09	0.38
CD at 5%	1.42	0.75	1.06	NS	1.13
Interaction (DxS)					
D ₁ S ₁	13.61	15.68	64.92	24.15	18.42
D ₁ S ₂	14.60	16.45	67.94	24.21	20.42
D ₁ S ₃	16.71	15.82	69.29	22.83	21.80
D ₂ S ₁	19.22	21.85	87.79	24.89	23.73
D ₂ S ₂	21.15	23.97	89.14	26.89	23.83
D ₂ S ₃	15.90	21.50	84.98	25.30	22.30
D ₃ S ₁	18.60	17.96	68.29	26.30	21.45
D ₃ S ₂	17.99	18.43	73.65	25.02	21.47
D ₃ S ₃	16.76	16.41	67.92	24.16	18.84
S.Em ±	0.82	0.43	0.62	3.62	0.65
CD at 5%	2.47	1.30	1.84	NS	1.95

Conclusion

On the basis of one year research It could be concluded that the D₂S₂ (October 30th and 30 cm) sowing time and plant geometry combination on plant growth, yield and quality of chandrasur under Malwa condition of Madhya Pradesh.

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