Environment and Ecology 41 (1C) : 569—575, January–March 2023
ISSN 0970-0420

Impact of Sowing Date and Crop Geometry on Growth and Seed Yield of Fenugreek cv Kasuri (*Trigonella corniculata*)

Deepanshi Deora, K. C. Meena, Shubham Yadav, Sanjay Yadav, Akansha Deora

Received 3 November 2022, Accepted 27 January 2023, Published on 16 March 2023

ABSTRACT

The present field experiment was conducted at Research Farm, College of Horticulture Mandsaur, RVSKVV, Gwalior (MP) during the year 2021-2022 with three dates of sowing viz., D_1 - 15th October, D_2 - 30th October and D_3 - 15th November and four different plant spacings S_1 (15 × 10 cm), S_2 (20 × 10 cm), S_3 (25 × 10 cm) and S_4 (30 × 10 cm). The result obtained during present investigation to measure the morphology, seed yield and yield attributing parameters were studied. The plant height, number of branches, number of leaves, fresh weight of plant, dry weight of plant, seed yield and yield attributing parameters were found maximum when crop sown on 30th October. The plant height decreased gradually while other mentioned parameters except seed yield ha^{-1}, biological yield and harvest index increased with wider spacing from 15 cm to 30 cm.

Interaction effect of date of sowing and spacing showed that kasuri methi sown on 30th October with 15 × 10 cm spacing recorded maximum height while 30th October with 30 × 10 cm spacing recorded maximum branches, leaves, weight of plant and yield attributing parameters while 30th October with spacing 25 × 10 cm produced maximum seed yield (6.67 q ha^{-1}).

Keywords Kasuri methi, Date of sowing, Spacing, *Trigonella corniculata.*

INTRODUCTION

Trigonella corniculata L., or kasuri methi belongs to family Leguminaceae and used for its greens and seeds as a condiment, is one of the significant winter season legume crops and one of the primary seed spices farmed in India. It is indigenous to South-Eastern Europe and Western Asia. In general, seed production is taken after 3-4 cuttings, but seed yield obtained without cuttings is superior to seed yield obtained after 2-3 cuttings (Nandre *et al.* 2011). The seeds and tender pods of kasuri methi are used as a spice in pickle making. These are also used in traditional medicine as diuretics, tonics, carminatives, astringents and aphrodisinics (Sharma 2006). Regular consumption of kasuri methi seeds is thought to lower blood glucose levels, total cholesterol and helps in stimulating the secretion of insulin (Babale-

Deepanshi Deora*[1], K.C. Meena[2], Shubham Yadav[3], Sanjay Yadav[4], [1,3,4]Research Scholar, [2]Assistant Professor,
Department of Plantation, Spices, Medicinal and Aromatic Crops, College of Horticulture (Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior), Mandsaur 458001, Madhya Pradesh, India

Akansha Deora[5]
[5]Research Scholar,
Division of Plant Pathology, Rajasthan Agricultural Research Institute (Sri Karan Narendra Agriculture University, Jobner) Durgapura 302018, Jaipur, Rajasthan, India

Email: deepanshideora29@gmail.com
*Corresponding author

shawar *et al.* 2020). Kasuri methi is often grown in the winter. Initially, dry, cold temperatures promote vegetative development, while dry, somewhat heated conditions promote seed formation (Al-Dalain *et al.* 2012). Seeding time is critical for vegetative growth and eventual yield manifestation (Aggarwal *et al.* 2013). When growing vegetatively, the crop loves a cool climate, and when mature, it prefers a warm, dry climate (Halesh *et al.* 2000). Crop development, production, and quality may be hampered by early or late sowing. When kasuri methi is planted early, it blooms earlier. Late sowing, on the other hand, had a negative impact on quality, yield and growth (Singh *et al*. 2005). Maximum yield and efficient land use are produced by optimal plant spacing, which ensures optimal plant growth and development. Plant spacing has a significant impact on seed production of kasuri methi.

MATERIALS AND METHODS

During the *rabi* season of 2021-2022, the field experiment was conducted at the "Horticulture Research Farm," College of Horticulture, Mandsaur, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (MP) in the Factorial Randomized Block Design with three dates of sowing viz., D_1 - 15th October, D_2 - 30th October and D_3 - 15th November and four different plant spacings S_1 (15 × 10 cm), S_2 (20 × 10 cm), S_3 (25 × 10 cm) and S_4 (30 × 10 cm) in three replications. The Akfg-1 variety used in this experiment was obtained from NRCSS, Tabiji Farm, Ajmer (Rajasthan). This variety was developed from a local collection. It is suitable for irrigated cultivation in semi-arid regions. This variety matures in 130 to 150 days and is frost resistant. The seeds were sown to a depth of 2 cm. Furrows were properly covered with a thin layer of soil, and plots were lightly irrigated immediately after sowing. The morphological parameters such as plant height, number of primary branches, number of leaves, fresh weight and dry weight of plant at 30, 60, 90 DAS and at harvest were taken. At 75 and 90 DAS, leaves were cut for herbage yield and the sum of both yields was recorded as the fresh yield of fresh kasuri methi leaves. After both cuttings, the plant was grown solely for seed production and due to both the cuttings, the production of seed was comparatively low.

RESULTS AND DISCUSSION

Effect of date of sowing

All the morphological parameters showed significant variation to different dates of sowing at 30, 60, 90 DAS and at harvest. The maximum plant height (5.07, 18.88, 37.68 and 39.39 cm), number of primary branches (3.51, 10.95, 16.15 and 17.05), number of leaves (10.17,102.95, 186.80 and 189.70), fresh weight (3.69, 16.54, 39.84 and 55.24 g) and dry weight (0.51, 2.32, 5.40 and 8.58 g) of plant were recorded in main treatment, D_2-30th October while the minimum was recorded in main treatment D_3-15th November as shown in Tables 1-2. This could be because the kasuri methi crop was exposed to conductive environmental conditions throughout its growth after being planted at the appropriate time. Improvements in overall growth, i.e., plant height, number of primary branches per plant, and number of leaves per plant, as a result of optimal sowing date, could have greatly increased plant fresh and dry weight, whereas delayed sowing did not allow enough time for vegetative growth, resulting in a weak plant canopy and a decrease in fresh weight.

The seed yield and yield attributing parameters were significantly influenced by dates of sowing except harvest index by seed and the maximum number of pods plant^{-1} (364.11), number of seeds pod^{-1} (5.04), pod length (2.34 cm), seed yield (2.31 g plant^{-1} and 6.06 q ha^{-1}), test weight of seed plot^{-1} (1.52 g), biological yield (29.67 q ha^{-1}) and harvest index by seed (20.44%) were found in main treatment D_2-30th October while the minimum were recorded in main treatment, D_3-15th November as shown in Table 3. This may be due to the fact that planting at the proper time can prolong the growth phase, improve reproductive growth and seed filling, and enable the plant to accumulate more heat units by utilizing soil nutrients and moisture, which is reflected in total plant biomass and economic yield. Similar to this, Bhavar *et al.* (2019) demonstrated that choosing the right sowing time increased yield attributes like the number of florets per plant, the number of pods per floret, and the number of seeds per pod, leading to a higher seed yield per plant. Earlier researchers, such as Yousaf *et al.* (2002), Ayub *et al.* (2008) in fennel,

Table 1. Plant height (cm), number of primary branches, number of leaves per plant at different treatments and their interactions.

	Plant height (cm)				Number of primary branches				Number of leaves			
	30 DAS	60 DAS	90 DAS	At harvest	30 DAS	60 DAS	90 DAS	At harvest	30 DAS	60 DAS	90 DAS	At harvest
	Main plot - Date of sowing (D)				Main plot - Date of sowing (D)				Main plot - Date of sowing (D)			
D_1 (15th Oct)	4.52	17.07	35.10	36.60	3.07	9.82	15.02	15.92	8.75	78.65	162.05	164.95
D_2 (30th Oct)	5.07	18.88	37.68	39.39	3.51	10.95	16.15	17.05	10.17	102.95	186.80	189.70
D_3 (15th Nov)	3.95	15.13	32.79	33.89	2.70	8.98	14.17	15.07	8.12	68.08	151.52	154.42
SEm ±	0.04	0.13	0.21	0.20	0.06	0.13	0.14	0.13	0.11	1.54	1.71	1.65
CD at 5%	0.13	0.38	0.62	0.58	0.18	0.38	0.40	0.39	0.32	4.51	5.01	4.84
	Sub plot - Spacing (S)				Sub plot - Spacing (S)				Sub plot - Spacing (S)			
S_1 (15×10 cm)	5.18	19.17	37.85	39.67	2.63	8.95	14.12	15.04	8.17	68.78	152.18	155.08
S_2 (20×10 cm)	4.77	17.97	36.34	37.63	2.92	9.54	14.74	15.64	8.62	75.18	159.08	161.98
S_3 (25×10 cm)	4.23	16.19	34.20	35.57	3.23	10.32	15.52	16.42	9.28	90.33	173.73	176.63
S_4 (30×10 cm)	3.87	14.78	32.37	33.62	3.60	10.86	16.06	16.95	9.99	98.60	182.16	185.06
SEm ±	0.05	0.15	0.25	0.23	0.07	0.15	0.16	0.15	0.13	1.77	1.97	1.91
CD at 5%	0.15	0.44	0.72	0.67	0.21	0.44	0.46	0.45	0.38	5.20	5.78	5.59
	Interactions (D × S)				Interactions (D × S)				Interactions (D × S)			
D_1S_1	5.21	19.43	37.78	39.87	2.52	9.01	14.21	15.11	7.76	57.77	141.17	144.07
D_1S_2	4.93	18.15	36.87	37.84	2.68	9.41	14.61	15.51	8.13	68.15	151.55	154.45
D_1S_3	4.12	16.54	34.09	35.43	3.44	9.93	15.13	16.03	8.87	86.54	169.94	172.84
D_1S_4	3.84	14.15	31.68	33.27	3.65	10.95	16.15	17.05	10.25	102.12	185.52	188.42
D_2S_1	5.58	20.88	39.57	41.58	2.93	9.48	14.62	15.58	9.21	94.01	177.41	180.31
D_2S_2	5.32	19.57	39.13	40.82	3.61	10.41	15.61	16.51	9.76	94.18	179.41	182.31
D_2S_3	4.95	18.17	37.01	38.91	3.71	11.93	17.14	18.03	10.64	109.37	192.77	195.67
D_2S_4	4.43	16.92	35.01	36.23	3.80	11.99	17.21	18.08	11.07	114.22	197.62	200.52
D_3S_1	4.77	17.21	36.22	37.57	2.43	8.37	13.53	14.43	7.53	54.56	137.96	140.86
D_3S_2	4.08	16.20	33.03	34.25	2.47	8.81	14.01	14.91	7.97	63.22	146.28	149.18
D_3S_3	3.62	13.87	31.51	32.38	2.54	9.09	14.29	15.20	8.33	75.09	158.49	161.39
D_3S_4	3.33	13.25	30.41	31.35	3.34	9.63	14.83	15.73	8.64	79.47	163.32	166.22
SEm ±	0.09	0.26	0.43	0.40	0.12	0.26	0.27	0.26	0.22	3.07	3.42	3.30
CD at 5%	0.25	0.77	1.25	1.16	0.36	0.77	0.80	0.77	0.65	9.01	10.02	9.69

Nandre *et al.* (2011) and Sharangi and Roychowdhury (2014) in coriander found similar results in fenugreek.

Effect of spacing

Significant effect was shown by all the morphological parameters to different spacing at 30, 60, 90 DAS and at harvest. Among spacings, S_1-15 × 10 cm spacing had obtained maximum (5.18, 19.17, 37.85 and 39.67 cm) and S_4-30×10 cm spacing had minimum plant height while maximum number of primary branches (3.60, 10.86, 16.06 and 16.95), number of leaves (9.99, 98.60, 182.16 and 185.06), fresh weight (3.61,16.40, 39.80 and 54.88 g) and dry weight (0.51, 2.29, 5.40 and 8.55 g) of plant were recorded in sub treatment S_4-30×10 cm spacing while the minimum were recorded in sub treatment S_1-15 × 10 cm spacing as shown in Tables 1-2. Due to increased plant exploitation for space, sunlight, nutrients, water, and other factors that led to vertical growth of plants rather than horizontal growth, plant height reduction with an increase in row spacing is possible (Ganvit *et al.* 2019). More space between plants allows them to spread, which increases the number of branches, leaves, fresh weight, and dry weight of the plant. These findings support those of Bhadkariya *et al.* (2007), Bagari *et al.* (2010) and Bairagi (2014) in relation to coriander, fennel and fenugreek.

The seed yield and yield attributing parameters were significantly influenced by spacing except harvest index by seed. The maximum number of pods

Table 2. Fresh weight (g plant^{-1}) and dry weight (g plant^{-1}) at different treatments and their interactions.

Treatments	Fresh weight (g plant^{-1})				Fresh weight (g plant^{-1})			
	30 DAS	60 DAS	90 DAS	At harvest	30 DAS	60 DAS	90 DAS	At harvest
	Main plot - Date of sowing (D)				Main plot - Date of sowing (D)			
D_1 (15th Oct)	3.19	14.72	37.10	51.71	0.45	2.06	5.02	8.23
D_2 (30th Oct)	3.69	16.54	39.84	55.24	0.51	2.32	5.40	8.58
D_3 (15th Nov)	2.99	13.78	35.62	49.97	0.42	1.92	4.82	8.00
SEm ±	0.05	0.11	0.51	0.31	0.01	0.02	0.03	0.04
CD at 5%	0.15	0.33	1.49	0.90	0.02	0.06	0.10	0.11
	Sub plot - Spacing (S)				Sub plot - Spacing (S)			
S_1 (15×10 cm)	2.97	13.54	34.90	49.24	0.41	1.90	4.71	7.91
S_2 (20×10 cm)	3.14	14.47	36.80	51.49	0.44	2.03	4.98	8.19
S_3 (25×10 cm)	3.44	15.65	38.58	53.63	0.48	2.19	5.23	8.43
S_4 (30×10 cm)	3.61	16.40	39.80	54.88	0.51	2.29	5.40	8.55
SEm ±	0.06	0.13	0.59	0.35	0.01	0.02	0.04	0.04
CD at 5%	0.17	0.38	1.72	1.04	0.02	0.07	0.12	0.12
	Interactions (D × S)				Interactions (D × S)			
D_1S_1	2.77	12.73	34.06	47.67	0.39	1.78	4.59	7.79
D_1S_2	3.00	13.91	36.18	50.27	0.42	1.95	4.89	8.19
D_1S_3	3.34	15.50	38.22	53.56	0.47	2.17	5.17	8.37
D_1S_4	3.67	16.76	39.96	55.36	0.51	2.35	5.42	8.58
D_2S_1	3.49	15.51	38.38	53.78	0.49	2.17	5.20	8.41
D_2S_2	3.55	16.26	39.34	54.74	0.50	2.28	5.33	8.50
D_2S_3	3.84	16.98	40.35	55.75	0.53	2.38	5.47	8.65
D_2S_4	3.89	17.42	41.29	56.69	0.54	2.44	5.61	8.78
D_3S_1	2.67	12.37	32.27	46.27	0.36	1.73	4.35	7.54
D_3S_2	2.87	13.24	34.87	49.46	0.40	1.85	4.71	7.88
D_3S_3	3.15	14.48	37.18	51.58	0.44	2.03	5.04	8.26
D_3S_4	3.26	15.04	38.16	52.58	0.46	2.08	5.17	8.30
SEm ±	0.10	0.22	1.02	0.61	0.01	0.04	0.07	0.07
CD at 5%	NS	0.66	NS	1.80	0.03	0.12	0.20	0.21

plant^{-1} (383.75), number of seeds pod^{-1} (5.27), pod length (2.29 cm), seed yield plant^{-1} (2.53 g plant^{-1}), test weight of seed plot^{-1} (1.57 g) were found in sub treatment S_4-30×10 cm spacing and the minimum were recorded in sub treatment S_1-15 × 10 cm spacing while the maximum seed yield (5.85 q ha^{-1}), biological yield (29.04 q ha^{-1}) and harvest index by seed (20.15%) were found in sub treatment S_3-25 × 10 cm spacing whereas the minimum were recorded in sub treatment S_1-15 × 10 cm spacing as shown in Table 3. This may be because there was less competition for growth factors at high plant spacing than at low plant spacing, which led to an increase in the number of pods, seed yield per pod, pod length, seed yield per plant and test weight. However, the maximum seed yield per hectare, biological yield and harvest index by seed was found at spacing of 25 × 10 cm spacing, which may be related to the decrease in the number of plants per unit area at widest spacing combined with low plant-to-plant competition. These findings concur with those of Meena *et al.* (2003) and Nandal *et al.* (2007) in the study of fenugreek and Al-dalain *et al.* (2012) in the study of kasuri methi.

Interaction effect of date of sowing and spacing

With the exception of fresh weight during interaction at 30 and 90 days after sowing, all morphological parameters were significantly influenced by the interaction of different sowing dates and spacing during advancement of crop growth stage as shown in Tables 1- 2. The interaction D_2S_1-30th October with

Table 3. Seed yield and yield attributing parameters at different treatments and their interactions.

Treatments	No. of pods (plant^{-1})	No. of seeds (pod^{-1})	Pod length (cm)	Seed yield (g plant^{-1})	Seed yield (q ha^{-1})	Test weight (g)	Biological Yield (q ha^{-1})	Harvest index (%) by seed
Main plot - Date of Sowing (D)								
D_1 (15th Oct)	322.09	4.82	1.98	1.96	4.97	1.42	24.71	20.12
D_2 (30th Oct)	364.11	5.04	2.34	2.31	6.06	1.52	29.67	20.44
D_3 (15th Nov)	286.65	4.16	1.81	1.51	4.01	1.31	21.27	18.88
SEm. ±	3.16	0.05	0.03	0.03	0.13	0.02	0.30	0.62
CD at 5%	9.26	0.16	0.08	0.09	0.38	0.07	0.87	NS
Sub plot - Spacing (S)								
S_1 (15×10 cm)	260.51	3.78	1.80	1.23	4.13	1.24	21.11	19.47
S_2 (20×10 cm)	306.62	4.48	1.96	1.72	5.27	1.37	26.06	20.13
S_3 (25×10 cm)	346.25	5.16	2.12	2.23	5.85	1.48	29.04	20.15
S_4 (30×10 cm)	383.75	5.27	2.29	2.53	4.83	1.57	24.65	19.50
SEm ±	3.64	0.06	0.03	0.04	0.15	0.03	0.34	0.72
CD at 5%	10.69	0.18	0.09	0.10	0.44	0.08	1.00	NS
Interactions (D × S)								
D_1S_1	255.40	3.82	1.67	1.21	3.61	1.24	18.97	19.09
D_1S_2	296.72	4.75	1.85	1.75	5.70	1.39	25.48	20.54
D_1S_3	349.89	5.29	2.05	2.30	6.03	1.49	30.85	19.58
D_1S_4	386.33	5.43	2.37	2.60	4.56	1.55	23.56	19.40
D_2S_1	302.25	4.00	2.17	1.50	5.23	1.26	25.44	20.55
D_2S_2	337.83	4.95	2.27	2.07	6.37	1.46	31.64	20.16
D_2S_3	387.09	5.56	2.40	2.67	6.67	1.57	32.45	22.41
D_2S_4	429.24	5.65	2.50	3.01	5.99	1.77	29.15	20.52
D_3S_1	223.86	3.53	1.55	0.98	3.54	1.21	18.94	18.86
D_3S_2	285.30	3.74	1.76	1.35	3.73	1.26	21.06	17.83
D_3S_3	301.76	4.64	1.92	1.73	4.84	1.37	23.81	20.34
D_3S_4	335.66	4.75	2.01	1.98	3.93	1.39	21.26	18.49
SEm ±	6.31	0.11	0.05	0.06	0.26	0.04	0.59	1.25
CD at 5%	18.51	0.32	0.15	0.18	0.77	NS	1.74	NS

15 × 10 cm spacing was recorded maximum plant height (5.58, 20.88, 39.57 and 41.58 cm) whereas maximum number of branches (3.80, 11.99, 17.21 and 18.08), number of leaves (11.07, 114.22, 197.62 and 200.52), fresh weight (3.89,17.42, 41.29 and 56.69 g) and dry weight (0.54, 2.44, 5.61 and 8.78 g) per plant showed in D_2S_4-30th October with 30 × 10 cm spacing at 30, 60, 90 DAS and at harvest. The minimum plant height was recorded in treatment D_3S_4-15th November with 30 × 10 cm spacing while number of branches, number of leaves, fresh weight and dry weight per plant was showed in treatment D_3S_1-15th November with 15 × 10 cm spacing. This may be a result of the favorable weather experienced throughout the crop period as well as timely nutrient absorption from wider spacing which reduces competition and provide sufficient sunlight availability which led to an increase in the number of branches, leaves and weight of plant while closer spacing promotes vertical growth. Similar results in fenugreek and kasuri methi were reported by Nandre *et al*. (2011), Habib *et al.* (2019) and Anupama (2012).

The interaction of the dates of sowing and spacing had a significant impact on yield and yield-attributing parameters such as number of pods plant^{-1}, number of seeds pod^{-1}, pod length, seed yield plant^{-1} and ha^{-1} and biological yield, whereas test weight and harvest index by seed showed non-significant variations as shown in Table 3. The maximum number of pods plant^{-1} (429.24), number of seeds pod^{-1} (5.65), pod length (2.50 cm), seed yield plant^{-1} (3.01

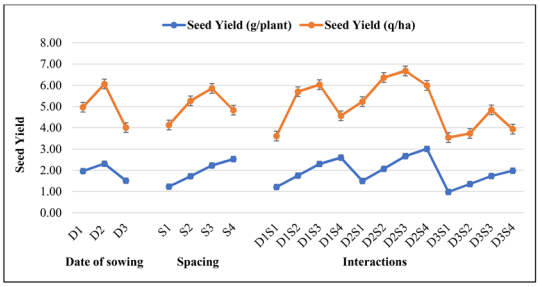

Fig. 1. Seed yield (g plant^{-1} and q ha^{-1}) at different treatments and their interaction.

g) and test weight (1.77 g) were accumulated by the treatment combination D_2S_4-30th October with 30 × 10 cm spacing. However, D_2S_3-30th October with 25 × 10 cm spacing saw the greatest seed yield ha^{-1} (6.67 q), biological yield (32.45 q ha^{-1}), and harvest index by seed (22.41%). This may be related to improved photosynthetic efficiency and photosynthate transfer from source to sink when crop is sown at the appropriate time which will result in more primary branches per plant, pods per plant, and seeds per pod (Sowmya *et al*. 2017). In contrast to closer spacing, wide spacing produces the more pod plant^{-1} and seed plant^{-1}, but it also results in lower seed yield ha^{-1} as shown in Fig.1 and biological yield due to lower plant-to-plant competition and fewer plants per unit area (Al-dalain *et al.* 2012) also reported by Meena *et al.* (2003) in fenugreek and Nandal *et al.* (2007).

ACKNOWLEDGMENT

College of Horticulture (RVSKVV, Gwalior), Mandsaur, India is acknowledged for providing help during this study.

REFERENCES

Al-Dalain SA, Abdel-Ghani AH, Al-Dalaeen JA, Thalaen HA (2012) Effect of planting date and spacing on growth and yield of fennel (*Foeniculum vulgare* Mill.) under irrigated conditions. *Pak J Biol Sci* 15(23): 1126-1132.

Aggarwal KB, Ranjan JK, Rathore SS, Saxena SN, Mishra BK (2013) Changes in physical and biochemical properties of fenugreek (*Trigonella* sp. L.) leaf during different growth stages. *Int J Seed Spices* 3(1): 31-35.

Anupama G (2012) Effect of nitrogen and spacing levels on growth and yield of kasuri methi (*Trigonella corniculata* L.) var. Pusa kasuri. MSc thesis. (Unpub.) University of Horticultural Sciences, Bagalkot.

Ayub M, Nadeem MA, Tanveer A, Tahir M, Saqib MT, Nawaz R (2008) Effect of different sowing methods and times on the growth and yield of fennel (*Foeniculum vulgare* Mill). *Pak J Bot* 40(1): 259- 264.

Babaleshawar S, Shetty GR, Pooja DA, Bhat R (2020) Performance of kasuri methi (*Trigonella corniculata* L.) under Hill Zone of Karnataka. *Int J Curr Microbiol Appl Sci* 9(06): 1758-1762.

Bagari S, Singh PP, Naruka IS, Rathore SS, Shaktawat RPS (2010) Effect of date of sowing and nitrogen levels on growth, yield and quality of fennel. *Ind J Hortic* 67(4): 518-524

Bairagi SK (2014) Effect of different doses of phosphorus and row spacing on the yield and quality of fenugreek seed (*Trigonella foenum-graecum* L.). *The Asian J Hortic* 9 (2): 338-341.

Bhadkariya S, Gupta A, Bobade A, Singh KB, Singh TL (2007) Effect of different times of sowing on growth, yield and seed quality of coriander (*Corriandrum sativum* L.) cv CIMPO S-33 Institute of Agriculture Science, Bundelkhand University, Jhansi, (UP). *Bhartiya Krishi Anusandhan Patrika* 22(3): 229-232.

Bhavar SV, Ghawade SM, Lajurkar VG, Gore RP (2019) Influence of sowing times and fertilizer levels on vegetative growth in kasuri methi (*Trigonella corniculata* L.), under Akola (MS.) conditions. *Int J Chem Studies* 7(3): 3427-3429.

Ganvit JB, Sharma S, Surve VH, Ganvit VC (2019) Effect of sowing dates and crop spacing on growth, yield and quality of linseed under south Gujarat condition. *J Pharmacog Phyto chem* 8(1): 388-39

Habib MA, Chowdhury MSN, Sultana T, Saha TR (2019) Yield and yield attributes of fenugreek (*Trigonella foenum- graecum)* influenced by nitrogen and spacing levels. *Int J Biosci* 14(4): 214-224.

Halesh DP, Gowda MC, Farooqi AA, Vasundhara M, Srinivasappa KN (2000) Effects of dates of sowing and spacing on Growth and yield in Fenugreek (*Trigonella foenum-graecum* L.). Spices and aromatic plants: Challenges and oppor tunities in the New Century. Contributory Papers. *Centennial Conference Spices Aromatic Pl Calicut, Kerala, India* 20(3): 129-132.

Meena BR, Jat NL, Meena RP (2003) Varietal response of fenugreek (*Trigonella foenum-graecum* L.) to row spacing and phosphorus nutrition in relation to growth attributes and yield. *Annals Agri-Bio Res* 8(2): 201-204.

Nandal JK, Dahiya MS, Gupta V, Singh D (2007) Response of sowing time, spacing and cutting of leaves on growth and seed yield of fenugreek. *Haryana J Horticult Sci* 36(3/4): 374-376.

Nandre DR, Ghadge RG, Rajput BS (2011) Effect of sowing dates and nutrient management on growth and seed yield fenugreek. *Adv Res J Crop Improvement* 2(2): 215-220.

Sharangi AB, Roychowdhury A (2014) Phenology and yield of coriander as influenced by sowing dates and irrigation. *Bioscan.* 9(4): 1513–1520.

Sharma SK (2006) Effect of different fertility levels on yield and nutrient uptake by kasuri methi (*Trigonella corniculata* L.). MSc thesis (Unpub). Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur.

Singh S, Buttar GS, Singh SP, Brar DS (2005) Effects of date of sowing and row spacing on yield of fenugreek (*Trigonella*

foenum-graecum). *J Med Aromatic Pl Sci* 27(4): 629-630 .5).
Sowmya PT, Naruka IS, Shaktawat RPS, Kushwah SS (2017) Effect of sowing dates and stage of pinching on growth, yield and quality of fenugreek (*Trigonella foenum-graecum* L.). *Int J Bio-Resour Stress Manage* 8(1): 091-095.
Yousaf M, Ahmad A, Jahangir M, Naseeb T (2002) Effect of different sowing dates on the growth and yield of canola (Sarson) varieties. *Asian J Pl Sci* 1: 634-635.