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Performance of Fenugreek Cultivars for Growth and Seed Yield

B. Anitha*, M. Lakshmi Narayana Reddy, A.V.D. Dorajee Rao, T.S.K.K. Kiran patro and D. R. Salomi Suneetha

Horticultural College & Research Institute, Dr. Y.S.R. Horticultural University, Venkataramannagudem, West Godavari District-534101

*Corresponding Author E-mail: bandianitha786@gmail.com

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ABSTRACT

An investigation was conducted at Horticultural College and Research Institute, Venkataramannagudem, Dr. YSR Horticultural University with an objective of evaluating the effect of sowing date, variety and their interaction on growth, yield and quality of seed fenugreek in order to assess its fitment into sequence cropping under delayed sowing conditions. A total of five varieties viz., Hissar Sonali, Rmt-1, Co-1, Rajendrakranti and Co-2 were evaluated on five sowing dates at 15-day interval starting from 15th October to 15th December in split plot design with five main plots as sowing dates and five sub-plots as varieties. There were significant differences in the vegetative and yield parameters. The maximum values in respect of many of these parameters was recorded by Co-1 and Co-2 by sowing on 15th october it is also observed that Co-1 and Co-2 varieties were at par in some of these characters and on the other hand at lower level Rmt-1 and Rajendrakanthi were on par with one another. Regarding the sowing dates 15th October was found to be on par with 1st November and similarly 1st December and 15th December were also on par though recorded minimum values in respect of some of the characters including seed yield per plant and per plot.

Key words: *Fenugreek, Varietal evaluation, Growth characters, Seed yield.*

INTRODUCTION

Fenugreek (*Trigonella foenum- graecum* L.) is an important seed spice, originated from South-Eastern Europe and belongs to the family Leguminosae. Fenugreek seed is one of the principal odoriferous constituents of curry powder. The dried seeds, leaves and tender shoots are all consumed and are valued as food, flavouring agent and medicine. Aggarwal *et al.*[1] stated that its leaves are specially used for vegetable purpose. India is the largest producer of fenugreek, where it is the third largest spice after coriander and cumin. It is mainly cultivated in Rajasthan, Gujarat and Madhya Pradesh and to a limited extent in Andhra Pradesh, Tamil Nadu, Haryana, Maharashtra and Punjab. Rajasthan is considered as "fenugreek bowl" of the country. Fenugreek is mainly grown as leafy vegetable throughout India and there is ample scope for its cultivation as seed spice.

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It is a short duration crop fitting well in several cropping systems. Seed crop requires cool dry climate and takes about three months duration thus fitting well as a *rabi* crop after the harvest of *kharif* main crops like paddy, chillies, cotton and pigeon pea. It is well known that among yield influencing factors date of planting is said to be the major one having direct influence on growth, yield and quality of fenugreek.

In general, the crop requires cool climate during vegetative growth and warm dry climate during maturity. During *rabi* season sowing in the month of October is recommended both for seed and leaf crop under coastal A.P. conditions. However delay in sowing has become a common feature due to vagaries in monsoon and far approachability to canals in certain localities. Under these circumstances, seed fenugreek is one among such choices for *rabi* sequence crop. However, time of sowing varies according to the cultivar selected for cultivation and agro climatic conditions and also there are several modern cultivars developed by different research institutes. But their performance under different agro-climatic conditions was not uniform. The useful interactions between sowing time and cultivar offer us a scope to select the best sowing time for a particular seed fenugreek variety and *vice versa.*

MATERIAL AND METHODS

A field experiment was conducted on growth and yield parameters of fenugreek at Horticultural College and Research Institute, Venkataramannagudem, Dr.YSR Horticultural University during 2014-15. A total of five varieties *viz.,* Hissar Sonali, Rmt-1, Co-1, Rajendrakranti and Co-2 were evaluated on five sowing dates at 15-day interval starting from 15th October to 15th December in split plot design with five main plots as sowing dates and five sub-plots as varieties. Recommended practices were followed. All the observations on growth parameters were recorded at different growth stages of plant and observations on yield and yield components of fenugreek were recorded after harvesting of the crop.

RESULTS AND DISCUSSION

Growth parameters:

1 Plant height (cm)

The highest plant height at maturity (56.00 cm) was recorded by the plants sown on 15th October followed by 1st November sown plants (52.93 cm). The shortest plants at maturity (44.00 cm) were observed in the 15th December sown plots. Among the varieties, the highest plant height at maturity (54.57 cm) was observed in Co-1 on par with Co-2 (52.52 cm) and the lowest plant height was recorded by the variety Rmt – 1 (47.35 cm).

2. Number of leaves per plant

Maximum number of leaves per plant at maturity (94.66) was noticed by the plants sown on 15th October followed by 1st November sown plants (92.00). The minimum number of leaves per plant at maturity (85.20) was observed in the 15th December sown plots. Among the varieties, highest number of leaves at maturity (93.33) was found in Co-1 on par with Co-2 (91.33) and the lowest number of leaves were found in the variety Rmt – 1 (86.53).

3. Number of branches per plant

The highest number of branches per plant at maturity (6.60) was recorded by the plants sown on 15th October on par with 1st November sown plants (6.40). Minimum numbers of branches per plant at maturity (5.00) were observed in the 15th December sown plots. Among the varieties, maximum number of branches at maturity (6.46) were observed in Co-1 on par with Co-2 (6.13) and minimum number of branches per plant were observed in the variety Rmt – 1 (5.53).

4. Plant spread

Minimum value with respect to plant spread at maturity (34.50) was observed in the 15th December sown plots. Among the varieties, highest plant spread at maturity (44.70) was recorded by Co-1 on par with Co-2 (42.70) and lowest value with respect to plant spread was observed in the variety Rmt – 1 (36.70).

5. Fresh weight of the plant (g)

The Maximum fresh weight at maturity (21.07 g) was found in the plants sown on 15th October followed by 1st November sown plants (19.46 g).The minimum fresh weight at maturity (15.80 g) was observed in the 15th December sown plots. Among the varieties, the highest value with respect to fresh weight at maturity (19.93 g) was recorded by Co-1 which was on par with Co-2 (19.06 g) and the lowest value with respect to fresh weight was recorded by the variety Rmt – 1 (17.07 g).

6. Dry weight of the plant (g)

The Maximum dry weight at maturity (15.33 g) was recorded by the plants sown on 15th October followed by 1st November sown plants (13.79 g).The minimum dry weight at maturity (8.73 g) was found in the 15th December sown plots. Among the varieties, the highest value with respect to dry weight at maturity (13.66 g) was observed in Co-1 which was on par with Co-2 (12.80 g) and Hissar sonali (11.93 g) and the lowest value with respect to dry weight was recorded by the variety Rmt – 1 (10.06 g).

7. Leaf area (cm^2)

The highest leaf area at maturity (21.60 cm^2) was recorded by the plants sown on 15th October followed by 1st November sown plants (18.60 cm^2). The lowest value with respect to leaf area at maturity (14.53 cm^2) was observed in the 15th December sown plots. Among the varieties, the maximum leaf area at maturity (18.60 cm^2) was observed in Co-1 which was on par with Co-2 (18.13 cm^2) and the lowest value with respect to leaf area was recorded by the variety Rmt – 1 (16.27 cm^2).

Under local conditions of Venkataramannagudem, the fenugreek sown on 15th October was found to produce more plant height, number of leaves per plant, number of branches per plant, plant spread,leaf area and dry weight, as compared to other sowing dates This might be due to The plants sown on 15th October might had benefited by favourable conditions like temperature, and humidity and could achieve better germination, seedling vigour, maximum photosynthetic surface leads to accumulation of maximum fresh weight and dry weight and as compared to those sown on late rabi. Out of the five varieties studied in the present investigation, vegetative parameters were more in magnitude in case Co-1 which was at par with Co-2 in some of the parameters. The superior performance of Co-1 may be attributed to its genetic potential and suitability to local agro-climatic conditions. Similar results of significant differences in these characters due to date of sowing were also reported by Gill *et al.* [6] and Singh *et al.* [5] in fenugreek; Aggarwal *et al.* [1], Halesh *et al*. [8], Gowda *et al.*[7] in fenugreek; Chaudhari *et al.*[5] in coriander; Susil and Rajkumar[12] in Ajowan. Baswana *et al.*[2], Bhati [3], Pan *et al.*[11], Bhadkariya *et al.*[4], in coriander; Saddam *et al.* .[9] in fennel and Ali in cumin.

Yield parameters:

8. Days taken to 50% flowering

Maximum number of days taken to 50% flowering (42.66) was noticed by the plants sown on 15th October followed by 1st November sown plants (41.13). Minimum number of days taken to 50% flowering (38.20) followed by 1st December sown plants. Among the varieties, highest number of days taken to 50% flowering (41.93) was found in Co-1 and the lowest number of days taken to 50% flowering was found in the variety Rmt – 1 (38.93) which was on par with the variety Rajendra kanthi (39.60).

9. Days taken to 50% pod formation

Maximum number of days taken to 50% pod formation (50.93) was recorded by the plants sown on 15th October which was on par with the 1st November sown plants (50.00). Minimum number of days taken to 50% pod formation (47.60) which was on par with 1st December sown plants (48.20). Among the varieties, highest number of days taken to 50% pod formation (51.00) was observed in Co-1 followed by the Co-2 (49.93) and the lowest number of days taken to 50% pod formation was observed by the Rmt – 1(47.20) which was on par with the Rajendra kanthi (43.26).

10. Weight of pods per plant (g)

Maximum value with respect to weight of the pods per plant (14.36 g) was recorded by the

plants sown on 15th October which was on par with the 1st November sown plants (12.88 g). The lowest weight of the pods per plant (8.31g) was observed in the 15th December sown plots. Among the varieties, highest weight of the pod (12.67 g) was recorded by Co-1 which is on par with Co-2 (11.82 g) and lowest value with respect to weight of pods per plant was observed in the Rmt – 1 (9.23 g).

11. Weight of pods per plot (kg)

The Maximum weight of the pods per plot (0.66 kg) was found in the plants sown on 15th October followed by 1st November sown plants (0.59 kg).The minimum weight of the pods per plot (0.38 kg) was recorded by the 15th December sown plots. Among the varieties, the highest value with respect to weight of the pods per plot (0.58 kg) was recorded by Co-1 which was on par with Co-2 (0.54 kg),Hissar sonali (0.51kg) and Rajendra kanti (0.47 kg). The lowest weight of the pods per plot was recorded by the Rmt – 1 (0.43kg).

12. Seed yield per plant(g)

The highest seed yield per plant (9.99 g) was recorded by the plants sown on 15th October followed by 1st November sown plants (8.74 g). The lowest seed yield per plant (5.22 g) was noticed by the 15th December sown plots. Among the varieties, the maximum seed yield per plant (8.80 g) was observed in Co-1 which was on par with Co-2 (8.02 g) and the lowest seed yield per plant was recorded by the Rmt – 1 (5.87 g).

13. Seed yield per plot (g)

The maximum seed yield per plot (460.25 g) was recorded by the plants sown on 15th October followed by 1st November sown plants (312.84 g). The minimum seed yield per plot (240.48 g) was recorded by the 15th December sown plots. Among the varieties, Highest seed yield per plot (405.48 g) was recorded by Co-1 and the lowest seed yield was recorded by the Rmt – 1 (270.38 g).

14. Percentage of grain filling

The Maximum percentage of grain filling (82.15) was recorded by the plants sown on 15th October which is on par with the 1st November sown plants (79.90) and the 15th November sown plants. The minimum percentage of grain filling (65.80) was observed in the 15th December sown plots. Among the varieties, the highest percentage of grain filling (88.13) was observed in Co-1 which was on par with Co-2 (81.08) and Hissar sonali (75.20).The lowest value with respect to percentage of grain filling was recorded by the Rmt – 1 (63.45).

15. Shelling percentage

The highest shelling percentage (69.40) was recorded by the plants sown on 15th October which is on par with the 1st November sown plants (67.63). The lowest shelling percentage (62.51) was noticed by the 15th December sown plots. Among the varieties, the maximum percentage of shelling (69.05) was observed in Co-1 which was on par with Co-2 (67.33) and the lowest seed yield per plant was recorded by the Rmt – 1 (63.02).

The data obtained on yield parameters revealed the better performance of 15th October sown crop compared to late sown crop. Among the varieties Co-1 recorded higher values in respect of many of the yield attributing parameters. The combination of both of them showed the highest value among the interactions. The plants sown on 15th October and those belong to Co-1 variety were found to produce more number pods per plant, maximum weight of the pods per plant, seed per pod as well as test weight. And also increment in Biological yield is due to higher values for growth parameters *viz.* plant height, branches per plant and dry matter accumulation which improved the yield attributing characters and hence improvement in seed and straw yield. Thus the cumulative effect of the merit exhibited by these combinations could have ultimately led to increased seed yield per ha. This might be due to favourable environmental conditions available to the crop that was sown on 15th October as compared to late sown crops in case of both Co-1 and Co-2 varieties. These results are in conformity with the findings of Halesh [8], Sheoran *et al.*[11] and Gowda *et al.*[8] in fenugreek; Batra *et al.* [4], Saddam *et al.* .[9] in fennel, Chaudhari *et al.* [5] in amaranthus, Seyyed *et al.* [10], Bhadkariya *et al.* [4] and

Baswana *et al.*[2] in coriander. Korla and Amit [4] in fenugreek; Seyyed *et al.* [10] in coriander; Saddam *et al.*[9] in fennel and Ahmad *et al.* [12] in cumin.

Table 1: Plant height, Number of branches and Number of leaves as influenced by sowing date and variety in Fenugreek

Date of sowing/ Variety	Plant height at maturity						Number of branches at maturity						Number of leaves at maturity					
	15- Oct	1 –Nov	15- Nov	1 -Dec	15- Dec	**Mean**	15- Oct	1- Nov	15 Nov	1 Dec	15 Dec	**Mean**	15 Oct	1 Nov	15 Nov	1 Dec	15 Dec	**Mean**
Hissar sonali	56.00	52.70	52.00	49.33	44.00	**50.81**	6.66	6.33	6.00	6.00	5.33	**6.06**	94.66	92.00	89.33	86.66	85.33	**89.60**
Rmt-1	52.00	50.00	48.76	46.00	40.00	**47.35**	6.33	6.00	5.66	5.00	4.66	**5.53**	90.66	88.00	86.66	84.66	82.66	**86.53**
Co-1	60.00	56.76	54.33	53.76	48.00	**54.57**	7.00	6.66	6.66	6.66	5.33	**6.46**	98.66	96.00	93.33	90.66	88.00	**93.33**
Rajendrakanthi	54.00	50.60	48.76	48.00	42.00	**48.67**	6.33	6.33	5.66	5.66	4.66	**5.73**	92.66	90.00	87.33	86.00	84.00	**88.00**
Co-2	58.00	54.60	54.00	50.00	46.00	**52.52**	6.66	6.66	6.33	6.00	5.00	**6.13**	96.66	94.00	91.33	88.66	86.00	**91.33**
Mean	**56.00**	**52.93**	**51.57**	**49.42**	**44.00**	**50.78**	**6.60**	**6.40**	**6.06**	**5.86**	**5.00**	**5.98**	**94.66**	**92.00**	**89.60**	**87.33**	**85.20**	**89.76**
Factor		S Em ±		CD at 5% LOS			Factor		S Em±		CD at 5% LOS		Factor		S Em±		CD at 5% LOS	
Sowing date		0.97		2.76			Sowing date		0.12		0.35		Sowing date		0.77		2.19	
Variety		1.00		2.84			Variety		0.14		0.39		Variety		0.83		2.37	
Interaction		1.63		4.66			Interaction		0.23		0.64		Interaction		1. 41		4.02	

Table 2: Plant spread, Dry weight and leaf area of the plant (g) as influenced by sowing date and variety in Fenugreek

Date of sowing/ Variety	Plant spread(cm)						Dry weight at maturity						Leaf area at maturity					
	15- Oct	1 -Nov	15- Nov	1 –Dec	15- Dec	**Mean**	15- Oct	1 -Nov	15- Nov	1 -Dec	15- Dec	**Mean**	15- Oct	1 –Nov	15- Nov	1 -Dec	15- Dec	**Mean**
Hissar sonali	45.50	42.83	41.50	38.50	34.50	**40.57**	15.33	13.66	11.66	10.00	9.00	**11.93**	22.00	19.00	17.00	15.00	14.00	**17.40**
Rmt-1	41.50	39.50	37.50	34.50	30.50	**36.70**	13.33	12.33	9.66	8.00	7.00	**10.06**	20.00	17.00	16.00	14.33	14.00	**16.27**
Co-1	49.50	47.50	45.50	42.50	38.50	**44.70**	17.33	15.66	13.00	12.00	10.33	**13.66**	23.00	19.00	18.00	16.00	17.00	**18.60**
Rajendrakanthi	43.50	40.66	39.50	36.50	32.50	**38.53**	14.33	12.66	10.66	9.00	7.33	**10.80**	21.00	18.00	16.00	15.00	14.00	**16.80**
Co-2	47.50	45.50	43.50	40.50	36.50	**42.70**	16.33	14.66	12.00	11.00	10.00	**12.80**	22.00	20.00	18.00	17.00	13.66	**18.13**
Mean	**45.50**	**43.20**	**41.50**	**38.50**	**34.50**	**40.64**	**15.33**	**13.79**	**11.40**	**10.00**	**8.73**	**11.85**	**21.60**	**18.60**	**17.00**	**15.46**	**14.53**	**17.44**
Factor		S.Em ±		CD at 5% LOS			Factor		S.Em ±		CD at 5% LOS		Factor		S.Em ±		CD at 5% LOS	
Sowing date		0.91		2.60			Sowing date		0.32		0.92		Sowing date		0.32		0.90	
Variety		0.95		2.71			Variety		0.64		1.82		Variety		0.41		1.18	
Interaction		1.62		4.64			Interaction		0.94		2.67		Interaction		0.92		2.62	

Table 3: Days taken to 50 % flowering and Days taken to 50% pod formation as influenced by date of sowing and variety in fenugreek

Date of sowing/ Variety	Days taken to 50% flowering						Days taken to 50% pod formation					
	15- Oct	1 -Nov	15- Nov	1 -Dec	15- Dec	**Mean**	15- Oct	1 -Nov	15- Nov	1 -Dec	15- Dec	**Mean**
Hissar sonali	42.66	41.00	40.33	39.66	38.33	**40.40**	51.00	52.00	49.00	48.00	47.00	**49.40**
Rmt-1	40.66	39.66	39.00	38.00	37.33	**38.93**	49.00	46.00	47.00	47.00	47.00	**47.20**
Co-1	44.66	43.00	41.66	41.00	39.33	**41.93**	53.00	52.00	51.00	50.00	49.00	**51.00**
Rajendrakanthi	41.66	40.00	39.33	39.33	37.66	**39.60**	50.00	49.00	47.00	47.00	47.00	**48.00**
Co-2	43.66	42.00	41.33	40.00	38.33	**41.06**	51.66	51.00	50.00	49.00	48.00	**49.93**
Mean	**42.41**	**41.13**	**40.08**	**39.50**	**38.16**	**40.21**	**50.93**	**50.00**	**48.80**	**48.20**	**47.60**	**49.11**
Factor		S.Em ±		CD at 5% LOS			Factor		S.Em ±		CD at 5% LOS	
Sowing date		0.32		0.92			Sowing date		0.33		0.95	
Variety		0.34		0.97			Variety		0.34		0.96	
Interaction		0.67		1.91			Interaction		0.66		1.89	

Table 4: Pod yield/plant and Seed yield/plant as influenced by date of sowing and variety in fenugreek

	Pod yield per plant (g)						Seed yield per plant (g)					
Date of sowing/ Variety	15- Oct	1 -Nov	15- Nov	1 -Dec	15- Dec	**Mean**	15- Oct	1 -Nov	15- Nov	1 –Dec	15- Dec	**Mean**
Hissar sonali	14.89	12.75	10.16	9.27	8.21	**11.06**	10.30	8.65	6.63	5.86	5.13	**7.31**
Rmt-1	12.81	11.22	8.18	7.26	6.68	**9.23**	8.49	7.24	5.14	4.45	4.02	**5.87**
Co-1	15.47	14.72	11.96	11.05	10.16	**12.67**	11.16	10.48	8.28	7.44	6.63	**8.80**
Rajendrakanthi	13.73	11.95	9.29	8.23	7.26	**10.09**	9.37	7.80	5.87	5.13	4.45	**6.52**
Co-2	14.92	13.77	11.06	10.11	9.27	**11.82**	10.63	9.55	7.44	6.63	5.86	**8.02**
Mean	**14.36**	**12.88**	**10.13**	**9.18**	**8.31**	**10.97**	**9.99**	**8.74**	**6.67**	**5.90**	**5.22**	**7.30**

Factor	S.Em ±	CD at 5% LOS	Factor	S.Em ±	CD at 5% LOS
Sowing date	0.34	0.97	Sowing date	0.26	0.74
Variety	0.37	1.04	Variety	0.29	0.82
Interaction	0.71	2.02	Interaction	0.56	1.61

Table 5: Percentage of grain filling, Shelling percentage and 1000 seed weight(g) as influenced by sowing date and variety in Fenugreek

	Percentage of grain filling						Shelling percentage					
Date of sowing/ Variety	15- Oct	1 -Nov	15- Nov	1 –Dec	15- Dec	**Mean**	15- Oct	1 -Nov	15- Nov	1 -Dec	15- Dec	**Mean**
Hissar sonali	82.25	82.25	76.38	70.50	64.63	**75.20**	69.15	67.85	65.25	63.24	62.54	**65.61**
Rmt-1	70.50	64.63	64.63	58.75	58.75	**63.45**	66.25	64.51	62.85	61.25	60.25	**63.02**
Co-1	93.50	94.00	94.50	82.25	76.38	**88.13**	72.15	71.23	69.25	67.35	65.25	**69.05**
Rajendrakanthi	76.38	70.50	70.50	64.63	58.75	**68.15**	68.23	65.25	63.14	62.35	61.28	**64.05**
Co-2	88.13	88.13	82.25	76.38	70.50	**81.08**	71.24	69.32	67.25	65.58	63.25	**67.33**
Mean	**82.15**	**79.90**	**77.65**	**70.50**	**65.80**	**75.20**	**69.40**	**67.63**	**65.55**	**63.95**	**62.51**	**65.81**

Factor	S.Em ±	CD at 5% LOS	Factor	S.Em ±	CD at 5% LOS
Sowing date	3.95	11.26	Sowing date	0.88	2.53
Variety	4.56	13.00	Variety	0.92	2.63
Interaction	7.41	21.16	Interaction	1.88	5.37

CONCLUSION

Thus it can be conclusively stated that the date of sowing as 15th October was found to be on par with 1st November in respect of some of the characters including seed yield per plant and per plot. Under the local conditions of coastal Andhra Pradesh the fenugreek cultivars *viz.*, Co-1 and Co-2 are found to be better as compared to other varieties like Hissar Sonali, Rajendrakranthi and Rmt-1 in the order. Hence these varieties can be preferred to sow fenugreek as sequence crop in *rabi* season. In case the season is delayed the negative effect on yield has also been quantified in respect of different parameters.

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