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Study on Growth and Yield Parameters in Fenugreek

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ABSTRACT

A field experiment 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, Growth parameters, Yields parameters.*

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 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. It is a short duration crop fitting well in several cropping systems.

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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 with respect to growth and yield parameters 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 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).

3. 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.*[5] and Singh *et al.* [5] in fenugreek; Aggarwal *et al.*[12], Halesh *et al*. [7], Gowda *et al.*[6] in fenugreek; Chaudhari *et al.*[4] in coriander; Susil and Rajkumar[12] in Ajowan. Baswana *et al.*[1], Bhati[2], Pan *et al.*[8], Bhadkariya *et al.*[3], Sharangi, *et al.* [8] in coriander; Saddam *et al.* [9] in fennel and Ali *et al.* [9] in cumin.

FLOWERING AND FRUITING PARAMETERS

1. 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).

2. Days taken to first pod formation

Highest number of days taken to pod formation (47.66) was recorded by the plants sown on 15th October followed by 1st November sown plants (45.26). Minimum number of days taken to first pod formation (41.60) which was on par with 1st December sown plants(42.60). Among the varieties, highest number of days taken to first pod formation (45.80) was observed in Co-1which was on par with the Co-2 (44.93) and the lowest number of days taken to first pod formation was observed by the variety Rmt – 1 (42.53) which was on par with the variety Rajendra kanthi (43.26).

3. 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).

Sowing on different sowing dates resulted in different times for flowering and fruiting. The possible reason for recording minimum number of days for flowering to pod maturity in delayed sowing might be insufficient time for vegetative growth as the plant entered in the reproductive phase at a faster rate. The similar effect would have carried to the further stages like pod formation and pod maturity. Co-1 variety sown on 15th October exhibited superior values in respect of most of the parameters among the interactions. The variety Co-2 was found to be at par with Co-1 in case of few flowering parameters. These results are found to be in consonance with the findings of Halesh *et al.* [7], Gowda *et al.* [6] and Sharangi, *et al.*[8].

YIELD AND QUALITY PARAMETERS

1. Number of pods per plant

The highest number of pods per plant (70.20) was recorded by the plants sown on 15th October followed by 1st November sown plants (64.40). The minimum number of pods per plant (42.40) was recorded by the 15th December sown plots. Among the varieties, maximum number of pods per plant (61.80) was noticed by Co-1 on par with Co-2 (58.40) and Hissar sonali (55.00) and the minimum number of pods per plant was recorded by the Rmt – 1 (47.80).

2. Weight of pod (g)

Highest value with respect to weight of the pod (0.3146 g) was noticed by the plants sown on 15th October which is on par with the 1st

November sown plants (0.3074 g). Minimum weight of the pod (0.3005 g) was recorded by the 15th December sown plots. Among the varieties, maximum pod weight (0.315 g) was observed in Co-1on par with Co-2 (0.3113 g) and minimum pod weight was recorded by the Rmt – 1 (0.2955 g).

3. Length of pod (cm)

Maximum value with respect to length of the pod (12.00 cm) was recorded by the plants sown on 15th October followed by the 1st November sown plants (11.50 cm). The lowest pod length (9.48 cm) was observed in the 15th December sown plots. Among the varieties, highest length of the pod (11.50 cm) was recorded by Co-1 which is on par with Co-2 (11.18 cm) and lowest value with respect to length of pod was found in the Rmt – 1 (10.00 cm).

4. Number of seeds per pod

The Maximum number of seeds per pod (14.00) was found in the plants sown on 15th October which is on par with the 1st November sown plants (13.60).The minimum number of seeds per pod (11.20) was recorded by the 15th December sown plots. Among the varieties, the highest value with respect to number of seeds per pod (15.00) was recorded by Co-1followed by Co-2 (13.80) and the lowest number of seeds per pod was recorded by the Rmt – 1 (10.80).

5. Seed yield per plant(g)

The data presented in the below revealed significant differences among the dates of sowing, varieties and their interaction with respect to seed yield per plant. 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).

6. 1000- seed weight (g)

Maximum weight of 1000 seed (15.60 g) was recorded by the plants sown on 15th October which was on par with the 1st November sown plants (14.86 g). The lowest weight 1000 seed (13.43 g) was observed in the 15th December sown plots. Among the varieties, highest weight of 1000 seeds (15.54 g) was recorded by Co-1 which is on par with Co-2 (14.97 g) and lowest value with respect to weight of 1000 seed was observed in the Rmt – 1 (13.31 g).

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[7], Sheoran *et al.*[11] and Gowda *et al.*[6] in fenugreek; Batra *et al.* [2], Saddam *et al.* [9] in fennel, Chaudhari *et al.*[4] in amaranthus, Seyyed *et al.* [10], Bhadkariya *et al.*[3] and Baswana *et al.* [1] in coriander. Korla and Amit[4] in fenugreek; Seyyed *et al.*[10] in coriander; Saddam *et al.*[9] in fennel and Ahmad *et al.*[9] in cumin.

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

Date of sowing/ Variety	Plant height at maturity						Number of branches 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	56.00	52.70	52.00	49.33	44.00	**50.81**	6.66	6.33	6.00	6.00	5.33	**6.06**	22.00	19.00	17.00	15.00	14.00	**17.40**
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**	20.00	17.00	16.00	14.33	14.00	**16.27**
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**	23.00	19.00	18.00	16.00	17.00	**18.60**
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**	21.00	18.00	16.00	15.00	14.00	**16.80**
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**	22.00	20.00	18.00	17.00	13.66	**18.13**
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**	**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		0.97		2.76			Sowingdate		0.12		0.35		Sowing date		0.32		0.90	
Variety		1.00		2.84			Variety		0.14		0.39		Variety		0.41		1.18	
Interaction		1.63		4.66			Interaction		0.23		0.64		Interaction		0.92		2.62	

Table 2: Days taken to 50 % flowering and Days taken to 50% pod formation as influenced by date of sowing and variety in fenugreek

	Days taken to 50% flowering						Days taken to 50% pod formation					
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	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**
Rajendrakanti	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 3 : Weight of the pod, Length of the pod and No. of seeds/pod as influenced by date of sowing and variety in fenugreek

Date of sowing/ Variety	Weight of the pod(g)						Length of the pod(cm)						No. of seeds/pod					
	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	0.3181	0.3066	0.3065	0.3099	0.3006	**0.3084**	12.00	11.50	11.30	9.70	9.50	**10.80**	14.00	14.00	13.00	12.00	11.00	**12.80**
Rmt-1	0.3079	0.2976	0.2928	0.2939	0.2855	**0.2955**	11.00	10.50	10.30	9.20	9.00	**10.00**	12.00	11.00	11.00	10.00	10.00	**10.80**
Co-1	0.3216	0.3145	0.3119	0.3148	0.3126	**0.3151**	13.00	12.50	12.00	10.10	9.90	**11.50**	16.00	16.00	16.00	14.00	13.00	**15.00**
Rajendrakanthi	0.3107	0.3065	0.3041	0.3015	0.2937	**0.3033**	11.50	11.00	10.80	9.50	9.30	**10.42**	13.00	12.00	12.00	11.00	10.00	**11.60**
Co-2	0.3144	0.3116	0.3093	0.3111	0.3099	**0.3113**	12.50	12.00	11.80	9.90	9.70	**11.18**	15.00	15.00	14.00	13.00	12.00	**13.80**
Mean	**0.3146**	**0.3074**	**0.3049**	**0.3062**	**0.3005**	**0.3067**	**12.00**	**11.50**	**11.24**	**9.68**	**9.48**	**10.78**	**14.00**	**13.60**	**13.20**	**12.00**	**11.20**	**12.80**
Factor		S.Em ±		CD at 5% LOS			Factor		S.Em ±		CD at 5% LOS		Facyor		S.Em ±		CD at 5% LOS	
Sowing date		0.0038		0.0108			Sowing date		0.2381		0.6794		Sowing date		0.2799		0.7988	
Variety		0.0051		0.0146			Variety		0.2514		0.7174		Variety		0.3332		0.9509	
Interaction		0.0087		0.0248			Interaction		0.5911		1.6869		Interaction		0.6310		1.8008	

Table 4: No.of pods/plant, Seed yield/plant and 1000 seed weight as influenced by date of sowing and variety in fenugreek

Date of sowing/ Variety	No. of pods per plant						Seed yield /plant						1000 seed weight					
	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	72.00	64.00	51.00	46.00	42.00	**55.00**	10.30	8.65	6.63	5.86	5.13	**7.31**	15.71	14.86	14.29	14.00	13.43	**14.46**
Rmt-1	64.00	58.00	43.00	38.00	36.00	**47.80**	8.49	7.24	5.14	4.45	4.02	**5.87**	14.57	13.71	13.14	12.86	12.29	**13.31**
Co-1	74.00	72.00	59.00	54.00	50.00	**61.80**	11.16	10.48	8.28	7.44	6.63	**8.80**	16.57	16.00	15.43	15.14	14.57	**15.54**
Rajendrakanthi	68.00	60.00	47.00	42.00	38.00	**51.00**	9.37	7.80	5.87	5.13	4.45	**6.52**	15.14	14.29	13.71	13.43	12.86	**13.89**
Co-2	73.00	68.00	55.00	50.00	46.00	**58.40**	10.63	9.55	7.44	6.63	5.86	**8.02**	16.00	15.43	14.86	14.57	14.00	**14.97**
Mean	**70.20**	**64.40**	**51.00**	**46.00**	**42.40**	**54.80**	**9.99**	**8.74**	**6.67**	**5.90**	**5.22**	**7.30**	**15.60**	**14.86**	**14.29**	**14.00**	**13.43**	**14.43**
Factor		S.Em ±		CD at 5% LOS			Factor		S.Em ±		CD at 5% LOS		Factor		S.Em ±		CD at 5% LOS	
Sowing date		1.87		5.33			Sowing date		0.26		0.74		Sowing date		0.29		0.83	
Variety		2.66		7.60			Variety		0.29		0.82		Variety		0.33		0.95	
Interaction		4.04		11.53			Interaction		0.56		1.61		Interaction		0.74		2.10	

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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