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Studies on effect of cutting and intra row spacing on leaf and seed yield of fenugreek (*Trigonella foenum-graecum* L.)

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Abstract

Fenugreek is an annual herb having light green leaves, 30-60cm tall and produces slender, beaked pods, 10-15 cm long and each pod contains 10-15 cm long and each pod contain 10-20 small hard yellowish brown seeds, which are smooth and oblong, about 3mm long, each grooved across one corner, giving them a hooked appearance. A field experiment was conducted and treatments imposed with two factors i.e., three cuttings level (C) (C₀: No cutting, C₁: One cutting and C₂: Two cuttings) and four intra row spacing level (S) (S₁:30 x 5.0cm, S₂: 30 x7.5cm, S₃:30 x 12.5 cm). Result revealed that closer spacing (30 x 5.0 cm) and two cuttings (60 & 90 DAS) better for leaf harvest. As far as seed production better at 30x 7.5 cm spacing followed by 30 x 10cm at one or no cutting condition. Economic point of view single cutting at 60 days after sowing and spacing at 30 x7.5 cm better in Uttar Pradesh condition.

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Introduction

The fenugreek (*Trigonella foenum-graecum* L.) belongs to family Fabaceae, 2n=16. It has been originated in Egypt. Its wild form for are found growing in north western India. Argentina, Egypt, Southern France, Morocco, Spain, Turkey, China, Pakistan and Lebanon are the leading counties for fenugreek production. India has been known as land of spices since very early period of recorded history. However in India it is mainly grown in Rajasthan claims the monopoly in production accounting for about

80% of fenugreek produce in country. The seeds are used as spices and condiment to improve the flavor and nutritive value of food, fried and seed with a small quantity of oil is used for seasoning vegetables. Being due to its mucilaginous, demulcent diuretic, carminative, astringent, emollient and aphrodisiac properties of seed are also used in preparation of several ayurvedic medicines. Besides young green tender plant and leaves are also used as nutritionally rich the vegetable. Fenugreek which forms the actual spices is rich sours of vitamins A, C, B2 and

proteins (Kor & Zadeh 2013). Seed contains diosgenin which is used in the preparation of contraceptive pills (Anitha et al. 2016). In North India, the sowing season is from the last week of October to the first week of November. It is grown in both the cropping seasons of Rabi and Kharif in South India – first fortnight of October during Rabi and second fortnight of June–July during Kharif. The amount of seeds used for sowing during both seasons is generally 25 kg/ha. The yield is more during Rabi season. The average yield is about 10–11 q/ha with 15–20 q/ha achievable with improved varieties and optimal management methods. In Uttar Pradesh, cultivation of crop is restricted to large scale production. It is cultivated on the marginal land with poor fertility, improper spacing and harvest duration. Therefore, the productivity of green leaf, seed/spice and its quality components have been deteriorated, although the crop is less sensitive to pests and diseases, as well as having high nutritional, medicinal and market value. These necessitate the standardization of number of cuttings and intra row spacing for obtaining high yield both for vegetables as well as seed/ spice purpose with better quality attributes. In view of the above this experiment was conducted.

Materials and Methods

The present experimental site GPS coordinates of 25° 28' 22.9224" N and 81° 52' 42.0852" E entitled "Studies on effect of cutting and intra row spacing on leaf and seed yield of fenugreek (*Trigonella foenum-graecum* L.)" was carried out in cv. IC-74 and the experiment was laid out in a Randomized Complete Block Design (Factorial) with three replication of each treatment combination

(Cutting x Intra row spacing) at Vegetable Research Farm of the Department of Horticulture, Kulbhashkar Ashram P.G. College Prayagraj, during Rabi 2019-2020. The climate of the farm is generally characterized as sub-humid, sub-temperate with cool winters. Generally, May and June are the hottest months and December and January are the coldest ones. January was the coldest, while April was the hottest. The soil structure of the experimental farm is gravelly loam to clay loam with pH, EC and OC values ranging from 6.85-7.09, 0.60-0.80 ds and 0.80-0.92 per cent, respectively. Maximum mean temperature, varied from 17.6 C to 26.3 C and minimum was 47.0 per cent during the growing season. The total rainfall during growing season was 466.9 mm, most of which was received from January to March viz. 383.5mm. The treatments comprised of three cutting viz. C₀: No cutting, C₁: One cutting and C₂: Two cuttings and four intra row spacing (S) viz. S₁:30 x 5.0cm, S₂: 30 x 7.5cm, S₃:30 x 12.5 cm. The observations were recorded on yield (leaf & seed) per plot (g) and per hectare (kg). Data recorded on green leaf yield cut successively first (C₁) at 60 days after sowing (DAS) and two cuttings (C₂) at 60 and 90 DAS were recorded per plot (g) and converted this in to per hectare (kg). Similarly, seed yield per plot was recorded after threshing and cleaning of total biomass and weighed (g) and converted in hectare (kg). These data were analyzed statistically suggested by Panse & Shuklatme (1985).

Result and Discussion

Effect of cutting and intra row spacing on leaf yield: Regarding leaf yield per plot, the highest (2334.33g) was obtained with the

combination $C_2 \times S_1$ (two cuttings & 30 x 5.0cm), while, $C_1 \times S_4$ (one cutting & 30 x 12.5 cm) gave the lowest (641.66g). In the meanwhile, interaction between $C_2 \times S_1$ (two cuttings & 30 x 5.0cm) gave the highest leaf yield per hectare (6909.62kg) and the combination $C_1 \times S_4$ (one cutting & 30 x 12.5cm) gave the lowest (1899.33 kg). Two cuttings (C_2) resulted in more leaf yield per plot and per hectare (1695 g and 5018.42 kg, respectively). The obvious reason for more leaf yield at two cuttings may be attributed to better vegetative growth of the crop after first cutting (C_1). Lesser leaf yield per plot and per hectare (816.66 g and 2417.33 kg, respectively) were obtained by one cutting (C_1). The results had a significant effect on leaf yield and two cuttings produced significantly higher leaf yield than one cutting and Rafat et al. (2017) who reported that the green yield was the maximum under the highest cutting frequency as well as Guha et al. (2013) who reported that the yield of green leaf cuttings was approximately proportionate to the level of cutting and was almost three

times higher in the case of three cuttings than single cutting treatment. Similar result was reported by Dahiya et al. (2019). The closest intra row spacing S_1 (30 x 5.0cm) gave the maximum leaf yield per plot and per hectare (1725.50g and 5107.47 kg, respectively). Yield of leaves per unit area was inversely related to intra row spacing i.e. the closest intra row spacing produced the maximum yield of leaves per unit area. The higher yield of leaves was mainly contributed by the higher plant population per unit area in closer intra row spacing (Moosavi et al. 2012; Zandi et al. 2011). The interaction $C_2 \times S_1$ (two cuttings & 30 x 5.0 cm) gave significantly highest leaf yield per plot and per hectare (2334.33 g and 6909.62 kg, respectively), whereas, the combination $C_1 \times S_4$ (one cutting & 30 x 12.5 cm). Gave the lowest leaf yield per plot and per hectare (641.66 g and 1899.33 kg, respectively). Radhawa et al. (1997) reported that the higher leaf yield was obtained with 20x 10.0 cm spacing and two cuttings as compared to 40x 50 cm spacing and two cuttings.

Table 1. Effect of cutting and intra row spacing on leaf yield of fenugreek

S. No.	Treatment combination	Details *	Leaf yield	
			Plot ⁻¹ (g)	Ha ⁻¹ (kg)
1	C0S1	No cutting & 30x5.0cm	0	0
2	C0S2	No cutting & 30x7.5cm	0	0
3	C0S3	No cutting & 30x10.0cm	0	0
4	C0S4	No cutting & 30x12.5cm	0	0
5	C1S1	One cutting & 30x5.0cm	1116.7	3308.3
6	C1S2	One cutting & 30x7.5cm	816.6	2417
7	C1S3	One cutting & 30x10.0cm	691.5	2049.1
8	C1S4	One cutting & 30x12.5cm	641.6	1901
9	C2S1	Two cutting & 30x5.0cm	2334.3	6909.6
10	C2S2	Two cutting & 30x7.5cm	1972.0	5843.1
11	C2S3	Two cutting & 30x10.0cm	1447.0	4271.3
12	C2S4	Two cutting & 30x12.5cm	1933.3	3061.7
	Range		641.6-2334.3	1901-6909.6

CD	Cuttings (C)	171.81	508.56
at	Spacing (S)	242.98	719.2
5%	CxS	343.62	1017.1

* One cutting (60) and two cuttings (60 & 90) days after sowing

Table 2. Effect of cutting and intra row spacing on seed yield of fenugreek

S. No.	Treatment combination	Seed yield		Per cent yield over C0S1
		Plot ⁻¹ (g)	Ha ⁻¹ (kg)	
1	C0S1	224.11	663.36	-
2	C0S2	243.61	721.08	108.70
3	C0S3	205.95	609.61	84.54
4	C0S4	180.03	532.88	87.41
5	C1S1	204.50	605.35	113.60
6	C1S2	246.20	728.75	120.38
7	C1S3	134.76	398.88	54.73
8	C1S4	110.43	362.87	90.97
9	C2S1	69.96	206.78	56.98
10	C2S2	100.43	298.54	144.38
11	C2S3	83.33	246.65	82.62
12	C2S4	57.32	169.66	68.79
	Range	57.32-246.2	169.66-728.75	68.79-120.38
CD	Cuttings (C)	1.26	3.75	-
at	Spacing (S)	1.46	4.33	-
5%	CxS	2.05	7.51	-

Effect of cutting and intra row spacing on seed yield:

Regarding seed yield per plot, the highest (246.20g) was obtained with the interaction C₁ x S₂ (one cutting & 30 x 7.5 cm), while C₂ x S₄ (two cuttings & 30 x 12.5cm) gave the lowest (57.32 g). In the meanwhile, the interaction between C₁ x S₂ (one cutting & 30 x 7.5 cm) gave the highest seed yield per hectare (728.75 kg), while, C₂ x S₄ (two cuttings & 30 x 12.5 cm) gave the lowest (169.66kg). The maximum seed yield per plot and per hectare (213.42 g and 631.63 kg, respectively) was obtained with no cutting (C₀). The results were in line with findings of Radhawa (1997) who reported that higher unprocessed and processed seed yield was obtained with no leaf cutting treatment. Loss of photosynthesis due to leaf cutting and reduction in growing period for food

accumulation and its distribution to developing sinks reduced seed yield. Similar results were reported by Dahiya et al. (2009); Muhammad (2017); Kumar et al. (2018) and Tiwari et al. (2016). Two cuttings (C₂) resulted in minimum seed yield per plot and per hectare (77.84 g and 230.42 kg , respectively) which are in conformity with the findings of Kauser et al. (2018) who stated that increasing number of leaf cuttings drastically reduced seed yield; Korla & Saini (2003) who stated that cutting of leaves should not be made in the fenugreek crop grown for seed purpose and Kauser et al. (2018) who reported that poor seed yield obtained under two cuttings might be due to delayed flowering and seed setting as well as Singh et al. (2019) who reported that drastic reduction in seed yield was observed in case of one and

two cuttings , which may be due to the loss of photosynthetic energy by way of leaf cutting, which otherwise could have been used by the plants for enhancing the plant vigour and ultimately the seed yield as well as Similar results were reported by Yadav et al. (2000). Among the different intra row spacing S_2 (30 x 7.5 cm) gave the maximum seed yield per plot and per hectare (196.89 g and 582.79 kg, respectively), Similar results were observed by Singh et al. (2019) who reported that the closer row spacing gave higher seed yield than wider spacing as well as Sharma (2000) who

stated that seed yield per plot was the highest with 30x7.5 cm plant spacing. The minimum seed yield per plot and per hectare (115.93 g and 343.15 kg, respectively) was obtained with spacing S_4 (30x12.5 cm). This was due to lower plant population per unit area in wider intra row spacing. Similar result were observed by Sharma (2000) stated that wider row spacing had a significant impact on seed yield. However, Kumar et al. (2018) stated that the in-row spacing treatments had no significant differences on seed yield.

Table 3. Effect of cutting and intra row spacing on seed yield of fenugreek

S. No.	Treatment	Cost of cultivation (Rs.)	Income from leaf yield(Rs.)*	Income from seed yield ha-1 (Rs.)*	Gross income (Rs.)
1	C0S1	47,223.0	0	53068.8	53068.8
2	C0S2	47,223.0	0	57686.4	57686.4
3	C0S3	47,223.0	0	48768.8	48768.8
4	C0S4	47,223.0	0	42630.4	42630.4
5	C1S1	49,223.5	16541.5	48428.0	64969.5
6	C1S2	49,223.5	12085	58300.0	70385.0
7	C1S3	49,223.5	10245.5	31910.4	42155.9
8	C1S4	49,223.5	9505	29029.6	38534.6
9	C2S1	51,223.5	34548	16542.4	51090.4
10	C2S2	51,223.5	29215.5	23883.2	53098.7
11	C2S3	51,223.5	21356.5	19732.0	41088.5
12	C2S4	51,223.5	15308.5	13572.8	28881.3

*Sale unit fresh leaf Rs.5/kg and seed Rs. 80/kg

The interaction between $C_1 \times S_2$ (one cutting & 30 x 7.5 cm) gave the highest seed yield per plot and per hectare (246.20 and 728.75 kg, respectively). Radhawa et al. (2017) stated that for seed purpose, row spacing at 20 or 30 cm with no leaf cutting may be economical and further they reported that the treatment with spacing 40 x 5.0 cm without cutting produced the significantly highest seed yield as compared to spacing 20 x 10.0 cm and no cutting. Therefore, when

green leaf yield is the primary objective, the crop should be sown at closer spacing of 30 x 5.0 cm and left for seed production after one cuttings (60 DAS) for getting maximum financial benefits, whereas in case of seed yield being the primary objective, sowing at spacing 30 x 7.5 cm and taking seed crop one cutting (60 DAS) is beneficial under mid plane conditions of Uttar Pradesh.

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