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Research on how cutting and intra-row spacing affect fenugreek (*Trigonella foenum-graecum* L.) leaf and seed production

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Abstract

Fenugreek is an annual herb with light green leaves that grows to a height of 30 to 60 cm. It produces slender, beaked pods that are 10 to 15 cm long and contain 10 to 20 small, hard, yellowish brown seeds that are smooth, oblong, and about 3 mm long. Each pod has a groove across one corner that gives the seeds a hooked appearance. Two factors—three cutting levels (C) (C0: No cutting, C1: One cutting, and C2: Two cuts) and four intra-row spacing levels (S) (S1: 30 x 5.0 cm, S2: 30 x 7.5 cm, and S3: 30 x 12.5 cm)—were used in a field experiment. The results showed that two cuttings (60 & 90 DAS) and tighter spacing (30 x 5.0 cm) were preferable for leaf harvest. In terms of seed production, 30 x 7.5 cm spacing is preferable, followed by 30 x 10 cm at one or no cutting condition. From an economic perspective, in Uttar Pradesh conditions, single cutting at 60 days after planting and spacing at 30 x 7.5 cm is preferable.

Key Words: Leaf cut, yield, interrow spacing, fenugreek, and *Trigonella foenum-graecum* L.

Introduction

Trigonella foenum-graecum L., or fenugreek, is a member of the Fabaceae family (2n=16). Egypt is where it first appeared. Growing in northwest India is its wild form. The top producers of fenugreek are Argentina, Egypt, Southern France, Morocco, Spain, Turkey, China, Pakistan, and Lebanon. Since the beginning of recorded history, India has been referred to as the "land of spices." However, Rajasthan, which produces the majority of fenugreek in India—roughly 80% of the nation's total—claims the production monopoly. The seeds are fried and seasoned with a modest amount of oil to enhance the taste and nutritional content of meals. Many ayurvedic medications are made from seeds because of their mucilaginous, demulcent, diuretic, carminative, astringent, emollient, and aphrodisiac qualities. In addition, young, fragile plants and their leaves are used as nutrient-dense vegetables. The genuine spice, fenugreek, is a high source of proteins, vitamins A, C, and B2 (Kor & Zadeh 2013). Diosgenin, which is found in seeds, is utilised to make contraceptive tablets (Anitha et al. 2016). The sowing season in North India runs from the last week of October through the first week of November. In South India, it is

cultivated throughout both the Rabi and Kharif cropping seasons: the first two weeks of October during Rabi and the second two weeks of June and July during Kharif. Typically, 25 kg of seeds per hectare are used for planting in both seasons. During the Rabi season, the yield is higher. The typical yield is about 10–11 q/ha, but with better cultivars and management techniques, it may reach 15–20 q/ha. Crop farming in Uttar Pradesh is limited to large-scale production. It is grown on marginal ground with inadequate spacing, low fertility, and a long harvest season. As a result, although while the crop has a high nutritional, medicinal, and commercial value and is less susceptible to pests and diseases, the yield of green leaf, seed/spice, and its quality components has declined. In order to get a high output for both vegetables and seed/spice purposes with superior quality qualities, they need standardising the number of cuttings and intra-row spacing. This experiment was carried out in light of the aforementioned.

Materials and Methods

The current experiment, "Studies on effect of cutting and intra row spacing on leaf and seed yield of fenugreek (*Trigonella foenum-graecum* L.)," was conducted in cv. IC-74 at the Vegetable Research Farm of the Department of Horticulture, Kulbhashkar Ashram P.G. College Prayagraj, in Rabi 2019–2020. The experiment was set up in a Randomised Complete Block Design (Factorial) with three replications of each treatment combination (Cutting x intra row spacing). The farm's climate is often described as sub-humid, sub-temperate, with chilly winters. In general, December and January are the coldest months, while May and June are the warmest. April was the warmest month, while January was the coldest. The experimental farm's soil structure ranges from gravelly loam to clay loam, with pH, EC, and OC values of 6.85–7.09, 0.60–0.80 ds, and 0.80–0.92 percent, respectively. During the growth season, the maximum mean temperature ranged from 17.6 to 26.3 degrees Celsius, while the minimum was 47.0 percent. The majority of the 466.9 mm of rainfall that fell during the growing season—383.5 mm—came from January to March. The treatments included four intra-row spacings (S) (S1:30 x 5.0 cm, S2:30 x 7.5 cm, and S3:30 x 12.5 cm) and three cuts (C0: No cutting, C1: One cutting, and C2: Two cuttings). The yield (leaf & seed) per hectare (kg) and per plot (g) were noted. Green leaf yield data were collected per plot (g) and translated to per hectare (kg) for the initial cuttings (C1) at 60 days after sowing (DAS) and the second cuttings (C2) at 60 and 90 DAS. Following the threshing and cleaning of the whole biomass, the seed yield per plot was measured, weighed (g), and converted to hectares (kg). Panse & Shuklatme (1985) recommended a statistical analysis of this data.

Result and Discussion Effect of cutting and intra row spacing on leaf yield:

The combination C2 x S1 (two cuttings & 30 × 5.0 cm) produced the largest leaf yield per plot (2334.33g), whereas C1 x S4 (one cutting & 30 x 12.5 cm) produced the lowest (641.66g). Meanwhile, the combination C1 x S4 (one cutting & 30 × 12.5 cm) produced the lowest leaf yield per hectare (1899.33 kg), while C2 x S1 (two cuts & 30 x 5.0 cm) produced the most (6909.62 kg). More leaves were produced per hectare and per plot (1695 g and 5018.42 kg, respectively) with two cuts (C2). The crop's improved vegetative development after the first cutting (C1) is the clear explanation for the higher leaf yield at two cuts. One cutting (C1) had a lower leaf yield per plot and per hectare (816.66 g and 2417.33 kg, respectively). According to Rafat et al. (2017) and Guha et al. (2013), the yield of green leaf cuttings was roughly proportionate to the level of cutting and was nearly three times higher in the case of three cuttings than single cutting treatment. The results had a significant impact on leaf yield, with two cuttings

producing significantly higher leaf yield than one cutting. Dahiya et al. (2019) reported a similar outcome. The highest leaf yield per plot and per hectare (1725.50g and 5107.47 kg, respectively) was obtained with the tightest intra-row spacing S1 (30 x 5.0 cm). Intrarow spacing and leaf yield per unit area were negatively correlated, meaning that the closest intrarow spacing resulted in the highest leaf yield per unit area. The greater plant population per unit area in narrower intra-row spacing was the primary cause of the increased leaf production (Moosavi et al. 2012; Zandi et al. 2011). In contrast to the combination C1 x S4 (one cutting & 30 x 12.5 cm), the interaction C2 x S1 (two cuts & 30 x 5.0 cm) produced the maximum leaf yield per plot and per hectare (2334.33 g and 6909.62 kg, respectively). produced the least amount of leaves per hectare and per plot (641.66 g and 1899.33 kg, respectively). According to Radhawa et al. (1997), 20x 10.0 cm spacing and two cuttings had a better leaf yield than 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:

The interaction C1 x S2 (one cutting & 30 x 7.5 cm) produced the largest seed output per plot (246.20 g), whereas C2 x S4 (two cuts & 30 x 12.5 cm) produced the lowest (57.32 g). Meanwhile, C2 x S4 (two cuttings & 30 x 12.5 cm) produced the lowest seed output per hectare (169.66 kg), whereas C1 x S2 (one cutting & 30 x 7.5 cm) produced the most (728.75 kg). Without cutting, the highest seed yield per plot and per hectare (213.42 g and 631.63 kg, respectively) was achieved (C0). The findings were consistent

with those of Radhawa (1997), who found that no leaf cutting treatment increased the yield of both processed and uncooked seeds. Reduced growth time for food collection and delivery to emerging sinks, as well as loss of photosynthesis from leaf cutting, decreased seed output. Dahiya et al. (2009), Muhammad (2017), Kumar et al. (2018), and Tiwari et al. (2016) all found similar findings. Two cuttings (C2) produced the lowest seed yield per plot and per hectare (77.84 g and 230.42 kg, respectively), which is consistent with the findings of Kauser et al. (2018), Korla & Saini (2003), 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 drastically reduced seed yield in the case of one or two cuttings. Among the various intrarow spacing, S2 (30 x 7.5 cm) produced the highest seed yield per plot and per hectare (196.89 g and 582.79 kg, respectively). Singh et al. (2019) found that closer row spacing produced higher seed yield than wider spacing, and Sharma (2000) found that 30 x 7.5 cm plant spacing produced the highest seed yield per plot. Spacing S4 (30x12.5 cm) had the lowest seed yield per plot and per hectare (115.93 g and 343.15 kg, respectively). Wider intra-row spacing resulted in a decreased plant population per unit area. Wider row spacing significantly affected seed output, according to Sharma's (2000) findings. But according to Kumar et al. (2018), there were no appreciable variations in seed output between the in-row spacing treatments.

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 C₁x S₂ (one

cutting & 30 x 7.5 cm) gave the highest seed yield per plot and per hectare (246.20 and 728.75 kg, respectively)

. According to Radhawa et al. (2017), row spacing at 20 or 30 cm without leaf cutting may be cost-effective for seed purposes. They also reported that the treatment with spacing 40 x 5.0 cm without cutting produced the significantly highest seed yield compared to spacing 20 x 10.0 cm without cutting. Therefore, in order to maximise financial benefits when green leaf yield is the primary goal, the crop should be sown at a closer spacing of 30 x 5.0 cm and left for seed production after one cutting (60 DAS). In contrast, if seed yield is the primary goal, sowing at a spacing of 30 x 7.5 cm and taking seed crop one cutting (60 DAS) is advantageous under Uttar Pradesh's midplane conditions.

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