

## Effect of Variety and Planting Time on the Productivity of Fenugreek in Coastal Area

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**Abstract:** A field experiment was conducted at West KillarChar, Companigonj, Noakhali under On-Farm Research Division, Bangladesh Agricultural Research Institute (BARI) during *Rabi* season of 2011-13 to study the effect of variety and planting time on productivity of Fenugreek in coastal area. The experimental treatments include (i) 3 varieties viz.,  $V_1$  = BARI Methi-1,  $V_2$  = BARI Methi-2,  $V_3$  = Local Methi (Fenugreek); (ii) 3 dates of sowing viz.,  $S_1$  = 12 December,  $S_2$  = 22 December,  $S_3$  = 1 January. Results revealed that variety and planting time had significant influences on various crop characters and seed yield. The variety BARI Methi-2 showed superiority in plant height, number of branches plant<sup>-1</sup>, number of pods plant<sup>-1</sup> and number of seeds pod<sup>-1</sup> over other two varieties resulting in highest seed yield of 1600 kg ha<sup>-1</sup>. Among the planting time treatments,  $S_1$  (Sowing on 12 December) was superior in relation to plant population m<sup>-2</sup>, plant height, number of branches plant<sup>-1</sup>, number of pods plant<sup>-1</sup>, number of seeds pod<sup>-1</sup>, Pod length and 1000-seed weight compared to  $S_2$  and  $S_3$  treatments which resulting the highest seed yield of 1696 kg ha<sup>-1</sup>. In case of interaction effect of variety and planting time,  $S_1V_2$  treatment combination showed superiority in crop characters, yield attributes and yield (1916 kg ha<sup>-1</sup>) of Fenugreek than any other treatment combinations. The highest gross return (Tk.114960 ha<sup>-1</sup>) and gross margin (Tk.79835 ha<sup>-1</sup>) was recorded from BARI Methi-2 sown on 12 December. During the period of experiment the salinity range was 1.10 to 7.5 dS m<sup>-1</sup>.

**Key words:** Fenugreek variety • Planting time • Coastal area

### INTRODUCTION

Fenugreek (*Trigonella foenum-graecum* L.) is a diploid, annual, self pollinating plant that is strongly scented [1]. Fenugreek locally known as "methi" belongs to the family- Leguminosae and sub family- Papilionaceae is widely used as a spice and condiment to add flavor in various foods [2]. Fenugreek is a diverse species. Authors have widely debated the probable ancestry of *Trigonella foenum-graecum* (L.), although the divergent schools of opinion identify three probable centers of origin for the plant i.e Mediterranean region, Asian/India and Turkey [3-7]. Fenugreek is now cultivated in all habitable continents of the world. Some of these continents have a long history of use, while other continents only started cultivating the crop during the past 2-3 decades [8] Asia is positioned in 1<sup>st</sup> place among continents in terms of fenugreek production and acreage with India leading in Fenugreek seed production, producing about 90 % of the

world Fenugreek grown [3]. Among other Asian countries; Iran, Israel, China and Pakistan also have high levels of production. A wide range of medicinal properties has been attributed to Fenugreek such as wound-healing, bust enhancement, enhanced lactation in weaning mothers, as an aphrodisiac, anti-diabetic, anti-hyperthyroidism, anticancer, gastro-protective, antioxidant, antipyretic, antimicrobial, anthelmintic, antisterility, antiallergy, antiinflammatory effects [3,9].

Fenugreek is a cash crop at KillarChar of Companigonj and BayarChar of Hatia. Farmer cultivates their local variety of low yield potentiality and do not know appropriate planting time. Planting time is one of the most important production factors that can be manipulated to counter the effects of the adverse environment. In most cases, crop productivity is the highest when it expose to the most favorable growth environment of the season. Crop planted before or after optimum date produces lower yield. Spice Division of

BARI has developed some potential high yielding varieties of Fenugreek [10]. Varietal performance of BARI released varieties need to be tested in the farmer's field. The present study was undertaken to evaluate the effect of variety and planting time on productivity of Fenugreek in coastal areas under farmer's field condition and popularize them among the farmers to promote their adoption in the areas.

## MATERIALS AND METHODS

The experiment was conducted in the farmer's field at West KillarChar, Companigonj, Noakhali during the *Rabi* season of 2011-13. The soil was silty clay loam belonging to Hatia series of Young Meghna Estuarine Flood plain of Bangladesh. The experiment was laid out in a factorial randomized complete block design (RCBD) with six dispersed replications. Two factors considered in this experiment were: A. Fenugreek variety ( $V_1$  = BARI Methi-1,  $V_2$  = BARI Methi-2,  $V_3$  = Local Methi) and B. Date of sowing ( $S_1$  = 12 December,  $S_2$  = 22 December,  $S_3$  = 1 January). The size of unit plot was 10 m x 8 m and unit plots were separated by 0.75m spacing. The land was opened with a power tiller and prepared by ploughing four times followed by laddering. The crop was fertilized with 81, 35, 68 and 20 kg ha<sup>-1</sup> of N, P, K and S, respectively. Half of urea and entire amount of other fertilizers were applied as basal during final land preparation and the remaining half of urea was top dressed after 22 days of germination. The quantity of seed required for each plot was weighed on the basis of recommended seed rate (12 kg ha<sup>-1</sup>) and were sown according to the treatments in 25 cm apart lines at a depth of about 3-4cm.

Weeding was done in 2 times. The experimental plots were frequently observed but there was no attack of pests and disease incidence on the crop. The three years (2011-2013) average maximum and minimum temperatures and rainfall in Noakhali are presented in Figure 1. During the growing season of fenugreek there was almost no rainfall except in February. Harvesting was done from last week of March to 1<sup>st</sup> week of April in each year. Data on the different crop parameters were collected from the 10 sample plants and then average was taken. The collected data were analyzed statistically using MSTATC programme and the treatment means were adjudged by Duncan's Multiple Range Test [11].

## RESULTS AND DISCUSSION

**Effect of Variety:** The effect of variety on crop characters and yield attributes was presented in Table 1. Results revealed that the variety BARI Methi-2 was superior in relation to plant height, number of branches plant<sup>-1</sup>, number of pods plant<sup>-1</sup> and number of seeds pod<sup>-1</sup> compared to other varieties which resulting the highest seed yield ha<sup>-1</sup>. The highest plant population m<sup>-2</sup> was recorded in BARI Methi-2 (47.0) that followed by BARI Methi-1 (44.0). In contrast, the lowest plant population was recorded in Local Fenugreek (43.5). The tallest plant was observed in BARI Methi-2 (46.7cm) followed by Local Fenugreek (46.1 cm) and the shortest plant was recorded in BARI Methi-1 (36.3 cm). The highest number of pods plant<sup>-1</sup> (32.3) was observed in BARI Methi-2 which was statistically similar that of BARI Methi-1 (28.9). On the other hand, the lowest number of pods plant<sup>-1</sup> was recorded in Local Fenugreek (25.0).

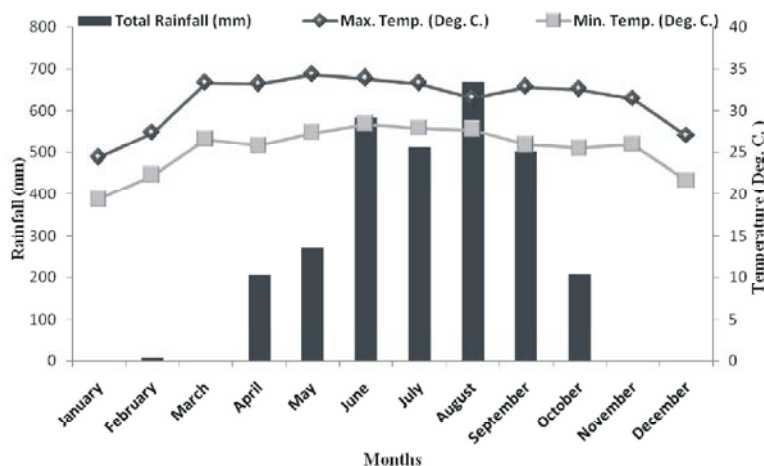


Fig. 1: Three years (2011-13) average maximum and minimum temperatures and total rainfall in the experimental site of Noakhali

Table 1: Effect of variety on the yield and yield contributing characters of Fenugreek at West KillarChar, Companigonj, Noakhali during the *Rabi* season of 2011-13

| Variety      | Plantm <sup>-2</sup> | Plant height (cm) | No. of branches plant <sup>-1</sup> | No. of pods plant <sup>-1</sup> | No. of Seeds pod <sup>-1</sup> | Pod length (cm) | 1000 seeds wt. (g) | Yield (kg ha <sup>-1</sup> ) |
|--------------|----------------------|-------------------|-------------------------------------|---------------------------------|--------------------------------|-----------------|--------------------|------------------------------|
| BARI Methi-1 | 44.0                 | 36.3              | 2.9                                 | 28.9                            | 10.2                           | 6.5             | 10.1               | 1347                         |
| BARI Methi-2 | 47.0                 | 46.7              | 3.3                                 | 32.3                            | 12.0                           | 8.1             | 11.6               | 1600                         |
| Local Methi  | 43.5                 | 46.1              | 2.2                                 | 25.0                            | 11.9                           | 7.8             | 7.5                | 1121                         |
| LSD (0.05)   | 2.28                 | 9.89              | NS                                  | 6.10                            | NS                             | NS              | 2.26               | 207.6                        |
| CV (%)       | 5.49                 | 7.38              | 12.96                               | 11.66                           | 6.21                           | 6.56            | 6.79               | 6.63                         |

Table 2: Effect of sowing time on the yield and yield contributing characters of Fenugreek at West Killar Char, Companigonj, Noakhali during the *Rabi* season of 2011-13

| Sowing date    | Plantm <sup>-2</sup> | Plant height (cm) | No. of branches plant <sup>-1</sup> | No. of pods plant <sup>-1</sup> | No. of Seeds pod <sup>-1</sup> | Pod length (cm) | 1000 seeds wt. (g) | Yield (kg ha <sup>-1</sup> ) |
|----------------|----------------------|-------------------|-------------------------------------|---------------------------------|--------------------------------|-----------------|--------------------|------------------------------|
| S <sub>1</sub> | 53.7                 | 53.5              | 3.6                                 | 33.9                            | 12.1                           | 7.9             | 11.6               | 1696                         |
| S <sub>2</sub> | 46.5                 | 42.9              | 3.2                                 | 26.9                            | 11.3                           | 7.5             | 10.2               | 1180                         |
| S <sub>3</sub> | 34.9                 | 30.0              | 2.8                                 | 22.5                            | 10.9                           | 6.9             | 8.4                | 894                          |
| LSD (0.05)     | 8.58                 | 10.96             | NS                                  | 3.17                            | NS                             | NS              | 1.47               | 209.6                        |
| CV (%)         | 5.49                 | 7.38              | 12.96                               | 3.34                            | 6.29                           | 6.94            | 6.79               | 7.63                         |

S<sub>1</sub> = 12 December, S<sub>2</sub> = 22 December, S<sub>3</sub> = 1 January

The highest pod length was observed in BARI Methi-2 (8.1 cm) followed by Local Fenugreek (7.8 cm). On the other hand, the lowest pod length was recorded in BARI Methi-1 (6.5 cm). The highest number of seeds pod<sup>-1</sup> was recorded in BARI Methi-2 (12.0) that followed by Local Fenugreek (11.9) whereas the lowest seeds pod<sup>-1</sup> was observed in BARI Methi-1 (10.2). The highest 1000-seed weight was recorded in BARI Methi-2 (11.6 g) that was similar with BARI Methi-1 (10.1 g). The highest seed yield was recorded in BARI Methi-2 (1600 kg ha<sup>-1</sup>) that was statistically significant with BARI Methi-1 (1347 kg ha<sup>-1</sup>) and local variety (1121 kg ha<sup>-1</sup>).

**Effect of Sowing Time:** Crop characters and yield attributes as influenced by sowing dates were presented in Table 2. Results revealed that the treatment S<sub>1</sub> (sown on 12 December) was superior in relation to plant population m<sup>-2</sup>, plant height, number of pods plant<sup>-1</sup>, number of seeds pod<sup>-1</sup>, Pod length and 1000-seed weight which resulting the highest seed yield ha<sup>-1</sup> compared to S<sub>2</sub> and S<sub>3</sub> treatments. In contrast, the lowest number of branches plant<sup>-1</sup>, number of pods plant<sup>-1</sup>, number of seeds pod<sup>-1</sup>, 1000 seed weight, plant population m<sup>-2</sup> and seed yield was recorded in S<sub>3</sub> treatment where seeds were sown on 1 January. The tallest plant was recorded in S<sub>1</sub> treatment (53.5 cm) i.e. the first date of sowing. In contrast, the shortest plant was recorded in S<sub>3</sub> treatment (30.0 cm) i.e. the third date of sowing. The highest number of branches

plant<sup>-1</sup> (3.6) was recorded in S<sub>1</sub> treatment and lowest number of branches plant<sup>-1</sup> (2.8) was in S<sub>3</sub> treatment. The highest number of pods plant<sup>-1</sup> was observed in S<sub>1</sub> treatment (33.9) and lowest number of pods plant<sup>-1</sup> was recorded in S<sub>3</sub> treatment (22.5). The highest pod length was observed in S<sub>1</sub> treatment (7.9 cm) that is followed by S<sub>2</sub> treatment and shorter pod was recorded in S<sub>3</sub> treatment (6.9 cm). The highest no. of seeds pod<sup>-1</sup> was recorded in S<sub>1</sub> treatment (12.1) and the lowest seeds pod<sup>-1</sup> was recorded in S<sub>3</sub> treatment (10.9). The highest 1000-seed weight was recorded in S<sub>1</sub> treatment (11.6g) which was statistically identical with S<sub>2</sub> treatment (10.2 g). In contrast, the lowest 1000-seed weight was recorded in S<sub>3</sub> treatment (8.4g). The highest plant population m<sup>-2</sup> was recorded in S<sub>1</sub> treatment (53.7) followed by S<sub>2</sub> treatment (46.5). In contrast, the lowest plant population m<sup>-2</sup> was recorded in S<sub>3</sub> treatment (34.9). The highest seed yield (1696 kg ha<sup>-1</sup>) was recorded in S<sub>1</sub> treatment. The lowest seed yield (894 kg ha<sup>-1</sup>) was recorded in S<sub>3</sub> treatment followed by S<sub>2</sub> treatment (1180 kg ha<sup>-1</sup>). The highest seed yield in S<sub>1</sub> might have resulted due to the cumulative favorable effects of the number of plant m<sup>-2</sup>, number of pods plant<sup>-1</sup>, number of seeds pod<sup>-1</sup> and 1000-seed weight.

**Interaction Effect of Variety and Planting Time:** Seed yield and other attributes were significantly influenced by the interaction of varieties and sowing dates (Table 3).

Table 3: Combined effect of variety and sowing time on the yield and yield contributing characters of Fenugreek at West KillarChar, Companigonj, Noakhali during the Rabi season of 2011-13

| Combined effect               | Plantm <sup>-2</sup> | Plant height (cm) | No. of branches plant <sup>-1</sup> | No. of pods plant <sup>-1</sup> | No. of Seeds pod <sup>-1</sup> | Pod length (cm) | 1000 seeds wt. (g) | Yield (kg ha <sup>-1</sup> ) |
|-------------------------------|----------------------|-------------------|-------------------------------------|---------------------------------|--------------------------------|-----------------|--------------------|------------------------------|
| S <sub>1</sub> V <sub>1</sub> | 52.1 ab              | 44.0 c            | 3.5 bc                              | 36.3 a                          | 9.9 c                          | 6.19cd          | 11.1ab             | 1753 b                       |
| S <sub>1</sub> V <sub>2</sub> | 53.7 a               | 60.4 a            | 4.4 a                               | 38.2 a                          | 12.1 abc                       | 8.59 a          | 12.0 a             | 1916 a                       |
| S <sub>1</sub> V <sub>3</sub> | 52.0 ab              | 55.9 b            | 3.21 c                              | 26.6 c                          | 11.9abc                        | 6.87d           | 7.53 de            | 1417 c                       |
| S <sub>2</sub> V <sub>1</sub> | 42.2 c               | 37.7 d            | 2.66 d                              | 28.1 bc                         | 10.6 bc                        | 6.99d           | 11.1 ab            | 1116 df                      |
| S <sub>2</sub> V <sub>2</sub> | 49.1 b               | 44.5 c            | 3.91 ab                             | 31.6 b                          | 11.1 abc                       | 7.74bc          | 11.1 ab            | 1422 c                       |
| S <sub>2</sub> V <sub>3</sub> | 45.3 c               | 46.7 c            | 2.4 de                              | 20.1 ef                         | 11.1 abc                       | 8.15b           | 8.03 cde           | 999 ef                       |
| S <sub>3</sub> V <sub>1</sub> | 35.4 de              | 25.4 f            | 1.8 f                               | 22.2 df                         | 10.5 bc                        | 6.11 e          | 9.02cd             | 874 f                        |
| S <sub>3</sub> V <sub>2</sub> | 37.2 d               | 30.5 e            | 1.93 ef                             | 26.2 cd                         | 13.4 a                         | 7.85c           | 10.02 bc           | 1162 d                       |
| S <sub>3</sub> V <sub>3</sub> | 32.0 e               | 33.2 e            | 1.62 f                              | 16.1 f                          | 13.1 ab                        | 8.57ab          | 7.09 e             | 647 g                        |
| LSD (0.05)                    | 3.87                 | 3.35              | 0.51                                | 4.13                            | 2.43                           | 0.63            | 1.70               | 125.6                        |
| CV (%)                        | 4.67                 | 4.27              | 9.80                                | 8.08                            | 11.29                          | 4.55            | 9.51               | 5.35                         |

V<sub>1</sub> = BARI Methi-1, V<sub>2</sub> = BARI Methi-2, V<sub>3</sub> = Local Fenugreek, S<sub>1</sub> = 12 December, S<sub>2</sub> = 22 December, S<sub>3</sub> = 1 January

Table 4: Cost and return analysis of Fenugreek varieties sown on different dates

| Combined effect               | Gross return (Tk. ha <sup>-1</sup> ) | Total Variable cost (Tk. ha <sup>-1</sup> ) | Gross Margin (Tk. ha <sup>-1</sup> ) |
|-------------------------------|--------------------------------------|---------------------------------------------|--------------------------------------|
| S <sub>1</sub> V <sub>1</sub> | 105180                               | 35125                                       | 70055                                |
| S <sub>1</sub> V <sub>2</sub> | 114960                               | 35125                                       | 79835                                |
| S <sub>1</sub> V <sub>3</sub> | 85020                                | 35125                                       | 49895                                |
| S <sub>2</sub> V <sub>1</sub> | 66960                                | 35125                                       | 31835                                |
| S <sub>2</sub> V <sub>2</sub> | 85320                                | 35125                                       | 50195                                |
| S <sub>2</sub> V <sub>3</sub> | 59940                                | 35125                                       | 24815                                |
| S <sub>3</sub> V <sub>1</sub> | 52440                                | 35125                                       | 17315                                |
| S <sub>3</sub> V <sub>2</sub> | 69720                                | 35125                                       | 34595                                |
| S <sub>3</sub> V <sub>3</sub> | 38820                                | 35125                                       | 3695                                 |

Selling Price: Fenugreek (BARI Methi-1, BARI Methi-2 and Local Fenugreek) @ 60.00 Tk. kg<sup>-1</sup>

Table 5: Salinity levels in the experimental plots at West KillarChar, Companigonj, Noakhali (Rabi 2011-2013)

| Growth Stages     | Salinity range (dS m <sup>-1</sup> ) |
|-------------------|--------------------------------------|
| Emergence stage   | 1.10-1.73                            |
| Vegetative stage  | 1.95-3.1                             |
| Pod bearing stage | 3.4-5.2                              |
| Maturity stage    | 5.4-7.5                              |

Result revealed that S<sub>1</sub> treatment showed superiority in crop characters and yield attributes of any Fenugreek variety whereas the lower was recorded in S<sub>3</sub> treatment with any variety. It was observed that plant height was taller (60.4 cm) in S<sub>1</sub> treatment in combination with V<sub>2</sub> (BARI Methi-2) than the other treatments under study (Table 3). The shortest plant was recorded in the treatment combination of S<sub>3</sub>V<sub>3</sub> (33.2) which was statistically identical with treatment combination of S<sub>3</sub>V<sub>2</sub>

(30.5). The highest number of branches plant<sup>-1</sup> was observed in the treatment combination of S<sub>1</sub>V<sub>2</sub> (4.4) followed by other treatment combinations. In contrast, the lowest number of branches plant<sup>-1</sup> was observed in the treatment combination of S<sub>3</sub>V<sub>3</sub> (1.6). The highest number of pods plant<sup>-1</sup> was observed in the treatment combination of S<sub>1</sub>V<sub>2</sub> (38.2) followed by other treatments. In contrast, the lowest number of pods plant<sup>-1</sup> was observed in the treatment combination of S<sub>3</sub>V<sub>3</sub> (16.1). The longest pod (8.59 cm) was recorded in V<sub>2</sub> with S<sub>1</sub> treatment and the shortest (6.11 cm) was recorded in S<sub>3</sub>V<sub>1</sub>. The highest 1000-seed weight was observed in the treatment combination of S<sub>1</sub>V<sub>2</sub> (12.0 g) followed by other treatment combinations. In contrast, the lowest 1000-seed weight was recorded in the treatment combination of S<sub>3</sub>V<sub>3</sub> (7.09 g). Result revealed that seed yield was higher in S<sub>1</sub> treatment with any variety. The highest seed yield was recorded in the treatment combination of S<sub>1</sub>V<sub>2</sub> (1916 kg ha<sup>-1</sup>) and lowest seed yield was observed in the treatment combination of S<sub>3</sub>V<sub>3</sub> (647 kg ha<sup>-1</sup>).

**Cost and Return:** Gross return, total variable cost and gross margin of different combination of sowing dates and varieties were calculated (Table 4). From the economic analysis it was revealed that BARI Methi-2 gave the highest gross return (Tk.114960 ha<sup>-1</sup>) and gross margin (Tk.79835 ha<sup>-1</sup>) sown on 12 December (S<sub>1</sub>) and local variety gave the lowest gross return (Tk.38820 ha<sup>-1</sup>) and gross margin (Tk.3695 ha<sup>-1</sup>) sown on 1 January (S<sub>3</sub>). Considering gross margin, it was found that BARI Methi-2 sown on 12 December was economically profitable and viable for the production of fenugreek in coastal area of Noakhali.

**Soil Salinity:** Soil salinity gradually increased up to maturity stage of the crop (Table 5). Salinity level at the emergence stage was varied from 1.10 to 1.73 dS m<sup>-1</sup>. At vegetative stage, salinity level was 1.95-3.1 dS m<sup>-1</sup> while it reached up to 7.5 dS m<sup>-1</sup> at maturity stage.

### CONCLUSION

Based on the experimental results, it may be concluded that variety and planting time had significant influences on various crop characters and seed yield. Among the treatment combinations BARI Methi-2 sown on 2<sup>nd</sup> week of December gave the highest yield and economic return in Coastal area of Noakhali.

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