

Original Research Article

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Performance of Fenugreek (*Trigonella foenum-graecum* L.) Varieties for Table Purpose under *Kharif* Season

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ABSTRACT

An experiment was carried out at Department of Agricultural Meteorology Research Farm, College of Agriculture, and Pune during *kharif*, 2019. Field experiment was laid out in a split plot design with three replications. There were sixteen treatment combinations comprising of four varieties (Phule Kasturi, RMT-1, Methi Extra Bold and Local Variety) as main plot treatment and four sowing windows (26, 27, 28 and 29MW) as sub plot treatment. The gross and net plot sizes were 3.0m × 2.0m and 2.6m × 1.8m, respectively. The plant protection measures were given as per requirement. The periodical observations on growth and yield contributing characters were recorded to assess the treatment effects. Different varieties of fenugreek showed a significant influence on growth and yield parameters. Among the four cultivars of table purpose fenugreek, Phule Kasturi recorded significantly higher growth components like plant height, number of functional leaves plant⁻¹, leaf area plant⁻¹, dry matter accumulation plant⁻¹ and yield components resulted in increased fresh foliage yield as compared to RMT-1, Methi Extra Bold and Local Variety. From this investigation, it was concluded that table purpose fenugreek variety Phule Kasturi was found good and optimum time for sowing of table purpose fenugreek should be last week of June. A table purpose fenugreek variety Phule Kasturi when sown during 26 MW (25th June -1st July) favorably influenced growth and yield contributing characters resulted in better yields.

Keywords

Fenugreek, Variety,
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Introduction

Fenugreek (*Trigonella foenum-graecum* L.) belonging to the family *fabaceae*, is an important leafy vegetable as well as an important seed spice. Because of its various uses, fenugreek ranks as the third most important seed spice of India after coriander and cumin. Fenugreek is a multipurpose crop being used as a leafy vegetable, spice, fodder

and medicinal plant. The fresh tender leaves and shoots are much used as a vegetable for human consumption since ancient times and as forage for cattle and also in medicine (Govindaraj *et al.*, 2019). The name fenugreek came from the species name "*foenum-graecum*" means "Greek hay" (Flammang *et al.*, 2004). It is an annual herb having light green leaves, pinnately trifoliate, flowers papilionaceous, long, narrow, curved,

tapering with a slender point and containing small deeply furrowed seeds. There are two species of the genus *Trigonella*, which are of economic importance viz., *T. foenum graecum*, the common *methi* and *T. corniculata*, the *Kasuri methi*. These two differ in their growth habit and yield. The latter one is a slow growing type and remains in rosette condition during most of its vegetative growth period.

The leaves and fruits have a pleasant aromatic odour. Fresh fenugreek leaves as part of the fenugreek plant is used as an edible herb. Now a days, the consumption of leaves has considerably gained attention in stabilizing the insulin, blood sugar, haemoglobin levels and condition of diabetes (Mehta *et al.*, 2013). Fenugreek contains 23 to 26% protein, 6 to 7% fat and 58% carbohydrates of which about 25% is dietary fiber (US Department of Agriculture, 2012).

Performance of the fenugreek crop varies from variety to variety and season to season due to variation in agroecological conditions. With this consideration in view, the investigation was planned with the objective to find out suitable variety of fenugreek under *kharif* season.

Materials and Methods

A field experiment was conducted on growth and yield parameters of fenugreek at Department of Agricultural Meteorology Research Farm, College of Agriculture, Pune during *kharif*, 2019. A total of four varieties viz., Phule Kasturi, RMT-1, Methi Extra Bold and Local Variety were evaluated on four sowing dates at 7- days interval (26 MW, 27 MW, 28 MW and 29 MW) in split plot design with four main plots as varieties and four sub-plots as sowing dates. Recommended practices were followed. All the observations on growth parameters were recorded at the

different growth stages of plant and observations on yield of fenugreek were recorded after harvesting of the crop. Details of treatments along with their symbols are mentioned in Table 1.

Results and Discussion

The results obtained from different growth characters viz., plant count, plant height, number of functional leaves, dry matter accumulation plant^{-1} , leaf area plant^{-1} and yield character like fresh foliage yield plant^{-1} and ha^{-1} were studied. The experimental results are interpreted along with the corresponding tables and figures 1–10.

Plant count

Initial and final plant count

The initial plant count in fenugreek was recorded ten days after each sowing date, whereas, final plant count was recorded at harvest.

The mean initial plant count after ten days of sowing (ha^{-1}) and its percentage was found 33.26 lakh ha^{-1} and 96.90%, respectively, whereas, the final plant count at harvest (ha^{-1}) with its percentage were 33.18 lakh ha^{-1} and 96.61%, respectively (Table 2, Fig.1).

The mean initial and final plant counts (ha^{-1}) in fenugreek and their percentage were not significantly influenced by different varieties of fenugreek indicating that variation obtained in the investigation is the mere differences due to treatments tried.

Growth characters

Plant height

Data on mean plant height of fenugreek as influenced periodically are presented in Table

3 and graphically depicted in Fig.2. It showed that the mean plant height progressively increased up to 21 DAS and then its growth rate gradually slowed down and reached up to 18.78 cm at harvest. The mean plant height at 7, 14, 21, 28 DAS and at harvest was found to be 3.37 cm, 8.25 cm, 12.84 cm, 17.20 cm and 18.78 cm, respectively.

The plant height of fenugreek was significantly influenced by varieties at all the stages of crop growth. A variety Phule Kasturi was found significantly superior over other varieties in producing taller plants up to harvest. The mean plant height of Phule Kasturi was significantly superior at 7, 14, 21, 28 DAS and at harvest i.e. 4.04, 8.77, 13.61, 18.20 and 19.67 cm, respectively, over varieties RMT-1, Methi extra bold and Local variety during all the growth stages (Table 7). It might be due to its genetical character of variety Phule Kasturi. Revanappa *et al.*, (2012), Aggrwal *et al.*, (2013), Singh *et al.*, (2013), Sharma (2015), Girdhar *et al.*, (2016) and Latye *et al.*, (2016) reported similar findings.

Mean number of functional leaves plant⁻¹

The data recorded on mean number of functional leaves plant⁻¹ in fenugreek as affected periodically by different treatments are presented in Table 4 and graphically represented in Fig.3. Data revealed that the number of functional leaves increased from 2.10 at 7 days to 16.53 at harvest.

The difference between the mean number of functional leaves plant⁻¹ in different fenugreek varieties showed significant results at all the crop growth stages (Table 4). The highest number of functional leaves recorded (18.07) with variety Phule Kasturi at harvest. This might be due to genetical character of variety Phule Kasturi. Revanappa *et al.*, (2012), Aggrwal *et al.*, (2013), Singh *et al.*, (2013),

Sharma (2015), Girdhar *et al.*, (2016) and Latye *et al.*, (2016) reported similar findings.

Leaf area plant⁻¹ (cm²)

The data recorded on mean leaf area plant⁻¹ in fenugreek as affected by different treatments are presented in Table 5 and graphically depicted in Fig.4.

The mean leaf area plant⁻¹ was 1.59, 5.17, 13.69, 22.50 and 23.94 cm² recorded at 7, 14, 21, 28 days after sowing and at harvest, respectively. It was observed that the mean leaf area increased up to harvest.

The mean leaf area plant⁻¹ was significantly affected due to different fenugreek varieties at 7, 14, 21, 28 days after sowing and at harvest. A variety Phule Kasturi recorded higher leaf area (24.69 cm²) than rest of the varieties at harvest. This might be due to genetical characters of Phule Kasturi. Revanappa *et al.*, (2012), Aggrwal *et al.*, (2013), Singh *et al.*, (2013), Sharma (2015), Girdhar *et al.*, (2016) and Latye *et al.*, (2016) reported similar findings.

Dry matter plant⁻¹

Data in respect of periodical accumulation of mean total dry matter plant⁻¹ (mg) amongst the various plant parts of fenugreek as affected by various treatments are presented in Table 6 and graphically presented in Fig.5. Mean dry matter plant⁻¹ at 7, 14, 21, 28 DAS and at harvest was 74.00, 151.91, 312.41, 386.83 and 442.31 mg plant⁻¹, respectively. At initial stages, the rate of increase of dry matter was the highest between 7 to 21 DAS. Thereafter, the rate of increase of dry matter gradually slowed down.

Mean total dry matter accumulation plant⁻¹ was significantly influenced due to fenugreek varieties at all the stages of crop growth

(Table 6). A variety Phule Kasturi significantly produced maximum dry matter plant⁻¹ 87.75, 169.99, 338.93, 413.98 and 476.45 mg at 7, 14, 21, 28 and at harvest, respectively, over variety Methi Extra Bold, RMT-1 and Local variety. This might be due

to genetical characters of Phule Kasturi. Revanappa *et al.*, (2012), Aggrwal *et al.*, (2013), Singh *et al.*, (2013), Sharma (2015), Girdhar *et al.*, (2016) and Latye *et al.*, (2016) reported similar findings.

Table.1 Details of treatments along with their symbols

A) Main plot : Varieties (4)		B) Sub plot: Sowing Windows (4)	
V ₁	PhuleKasturi	S ₁	MW 26 (25 June-1 July)
V ₂	RMT-1	S ₂	MW 27 (2 July-8 July)
V ₃	Methi Extra Bold	S ₃	MW 28 (9 July-15 July)
V ₄	Local Variety	S ₄	MW 29 (16 July-22 July)

Fig.1 Mean initial and final plant count (ha⁻¹) as affected by different varieties in fenugreek

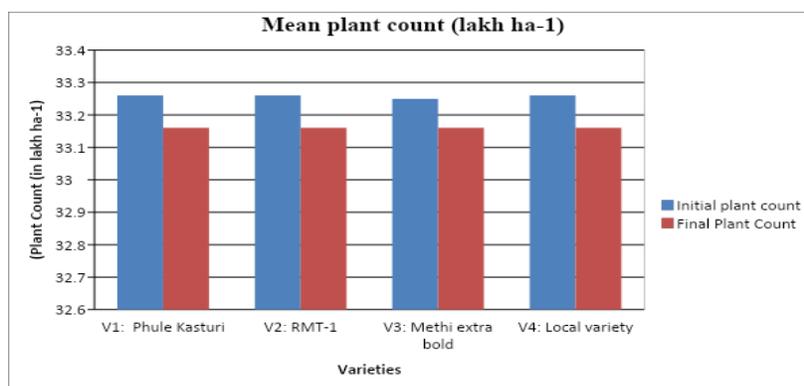


Table.2 Mean plant population as affected by different treatments in fenugreek

Treatment	Plant count			
	Initial		Final	
	(lakh ha ⁻¹)	(%) to total	(lakh ha ⁻¹)	(%) to total
Varieties (V)				
V₁: Phule Kasturi	33.26	96.91	33.16	96.61
V₂: RMT-1	33.26	96.90	33.16	96.61
V₃: Methi extra bold	33.25	96.89	33.16	96.61
V₄: Local variety	33.26	96.91	33.16	96.61
S.Em_±	0.01	0.02	0.01	0.02
C.D. at 5 %	NS	NS	NS	NS
General mean	33.26	96.90	33.18	96.61

Table.3 Mean plant height (cm) as affected periodically by different treatments in Fenugreek

	Days after sowing				
	7	14	21	28	At
Varieties (V)					
V₁: Phule Kasturi	4.04	8.77	13.61	18.20	19.67
V₂: RMT-1	3.74	8.64	13.46	17.62	19.45
V₃: Methi Extra Bold	3.18	8.09	12.90	17.27	18.77
V₄ : Local variety	2.52	7.49	11.39	15.73	17.23
S.Em_±	0.02	0.03	0.02	0.02	0.02
C.D. at 5 %	0.08	0.10	0.05	0.07	0.06
General mean	3.37	8.25	12.84	17.20	18.78

Table.4 Mean number of functional leaves plant⁻¹ as affected periodically by different treatments in fenugreek

Treatment	Days after sowing				
	7	14	21	28	At harvest
Varieties (V)					
V₁: Phule Kasturi	2.28	6.23	9.18	15.03	18.07
V₂: RMT-1	2.00	5.83	8.58	14.33	15.95
V₃: Methi Extra Bold	2.12	6.07	8.90	14.80	16.84
V₄ : Local variety	2.00	5.17	7.99	13.98	15.27
S.Em_±	0.02	0.05	0.04	0.05	0.06
C.D. at 5 %	0.07	0.18	0.12	0.19	0.20
General mean	2.10	6.83	8.66	14.54	16.53

Table.5 Mean leaf area plant⁻¹ (cm²) as affected periodically by different treatments in fenugreek

Treatment	Days after sowing				
	7	14	21	28	At
Varieties (V)					
V₁: Phule Kasturi	1.68	5.39	14.66	23.47	24.69
V₂: RMT-1	1.57	5.20	14.02	22.61	24.10
V₃: Methi Extra Bold	1.64	5.29	14.47	22.89	24.40
V₄ : Local variety	1.48	4.79	11.61	21.04	22.57
S.Em+	0.03	0.01	0.03	0.07	0.02
C.D. at 5 %	0.11	0.05	0.09	0.24	0.07
General mean	1.59	5.17	13.69	22.50	23.94

Table.6 Mean dry matter plant⁻¹ (mg) as affected periodically by different treatments in Fenugreek

Treatment	Days after sowing				
	7	14	21	28	At
Varieties (V)					
V₁: Phule Kasturi	87.75	169.99	338.93	413.98	477.02
V₂: RMT-1	69.12	150.48	323.11	391.20	453.19
V₃: Methi Extra Bold	77.72	155.95	335.74	404.08	470.73
V₄ : Local variety	61.38	131.22	251.87	338.07	368.31
S.Em±	0.57	1.04	0.68	0.95	1.23
C.D. at 5 %	1.98	3.60	2.36	3.29	4.25
General mean	74.00	151.91	312.41	386.83	442.31

Table.7 Mean number of days to harvest as influenced by different treatments in fenugreek

Treatment	Days to harvest
Varieties (V)	
V₁: Phule Kasturi	37.00
V₂: RMT-1	32.92
V₃: Methi Extra Bold	34.67
V₄ : Local variety	35.17
S.Em±	0.25
C.D. at 5 %	0.88
General mean	34.94

Table.8 Mean weight of fresh foliage plant⁻¹ (mg) as affected by different treatments at harvest in fenugreek

Treatment	Weight of fresh foliage plant ⁻¹ (mg)
Varieties (V)	
V ₁ : Phule Kasturi	1136.21
V ₂ : RMT-1	958.68
V ₃ : Methi Extra Bold	1017.74
V ₄ : Local variety	849.47
S.Em±	1.94
C.D. at 5 %	6.73
General mean	990.52

Table.9 Yield contributing character and yield as influenced by different treatments fenugreek

Treatment	Fresh foliage yield of fenugreek (q ha ⁻¹)
Varieties (V)	
V ₁ : Phule Kasturi	37.67
V ₂ : RMT-1	31.78
V ₃ : Methi Extra Bold	33.74
V ₄ : Local variety	28.17
S.Em±	0.06
C.D. at 5 %	0.22
General mean	32.84

Fig.2 Mean plant height (cm) as affected periodically by different varieties in fenugreek

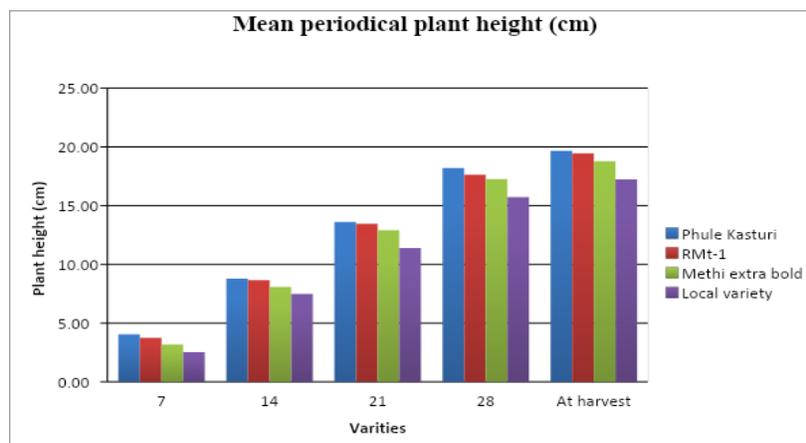


Table.10 Cumulative growing degree days (GDD) as influenced periodically by different varieties and sowing windows in fenugreek

Treatment		Cumulative growing degree days (⁰ Days)				
		Phenological Stage				
		Germination	2 nodes	4 nodes	6 nodes	At harvest
V₁: Phule Kasturi	S ₁ : 26MW (25 th June – 1 st July)	69.50	217.80	330.10	435.35	557.00
	S ₂ : 27MW (2 nd July – 8 th July)	57.65	196.85	315.70	422.45	544.65
	S ₃ : 28MW (9 th July – 15 th July)	56.45	201.20	323.30	428.10	549.80
	S ₄ : 29MW (16 th July – 22 nd July)	62.10	224.40	352.40	466.40	589.75
V₂: RMT-1	S ₁ : 26MW (25 th June – 1 st July)	51.60	190.20	315.65	404.90	496.00
	S ₂ : 27MW (2 nd July – 8 th July)	44.75	168.70	300.35	391.45	483.15
	S ₃ : 28MW (9 th July – 15 th July)	42.20	170.45	308.10	398.20	490.45
	S ₄ : 29MW (16 th July – 22 nd July)	46.30	190.25	335.80	435.15	528.50
V₃: Methi extra bold	S ₁ : 26MW (25 th June – 1 st July)	51.60	203.70	330.10	420.25	511.80
	S ₂ : 27MW (2 nd July – 8 th July)	44.75	182.60	315.70	407.25	497.35
	S ₃ : 28MW (9 th July – 15 th July)	42.20	185.50	323.30	412.50	520.90
	S ₄ : 29MW (16 th July – 22 nd July)	43.30	194.60	330.40	423.20	523.50
V₄: Local variety	S ₁ : 26MW (25 th June – 1 st July)	69.50	217.80	315.65	420.25	527.00
	S ₂ : 27MW (2 nd July – 8 th July)	57.65	196.85	300.35	407.25	546.65
	S ₃ : 28MW (9 th July – 15 th July)	56.45	201.20	308.10	412.50	520.90
	S ₄ : 29MW (16 July – 22 July)	62.10	224.40	335.80	423.20	535.10
General mean		53.63	197.91	321.30	419.28	526.41

Table.11 Light use efficiency (LUE) ($\text{g}/\mu\text{mole m}^{-2}\text{s}^{-1}$) as affected by different treatments in fenugreek

Sr. No.	Treatment	Cumulative Absorbed PAR ($\mu\text{mole m}^{-2}\text{s}^{-1}$)	Dry Matter (g/m^2)	LUE ($\text{g}/\mu\text{mole m}^{-2}\text{s}^{-1}$)
1	V ₁ S ₁	212.80	158.96	0.75
2	V ₁ S ₂	218.33	158.06	0.72
3	V ₁ S ₃	216.65	158.50	0.73
4	V ₁ S ₄	218.89	157.04	0.72
5	V ₂ S ₁	226.50	154.79	0.68
6	V ₂ S ₂	228.60	149.32	0.65
7	V ₂ S ₃	227.33	149.52	0.66
8	V ₂ S ₄	233.88	147.38	0.63
9	V ₃ S ₁	221.20	156.98	0.71
10	V ₃ S ₂	224.50	156.14	0.70
11	V ₃ S ₃	222.89	156.30	0.70
12	V ₃ S ₄	225.94	154.86	0.69
13	V ₄ S ₁	233.94	123.92	0.53
14	V ₄ S ₂	242.92	122.88	0.51
15	V ₄ S ₃	235.44	123.86	0.53
16	V ₄ S ₄	245.20	117.83	0.48

Fig.3 Mean number of functional leaves plant^{-1} as influenced periodically by different varieties in fenugreek

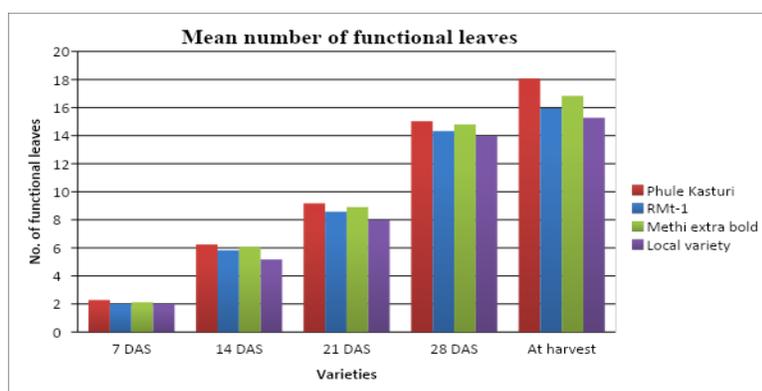


Fig.4 Mean leaf area plant⁻¹ (cm²) as affected periodically by different varieties in fenugreek

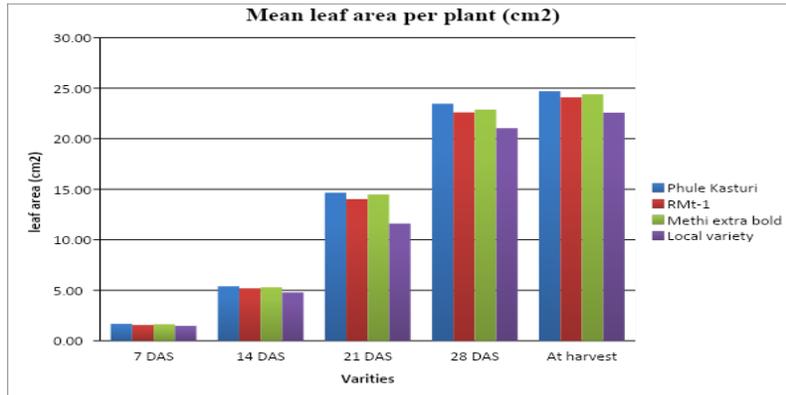


Fig.5 Mean dry matter plant⁻¹ (mg) as affected periodically by different varieties in fenugreek

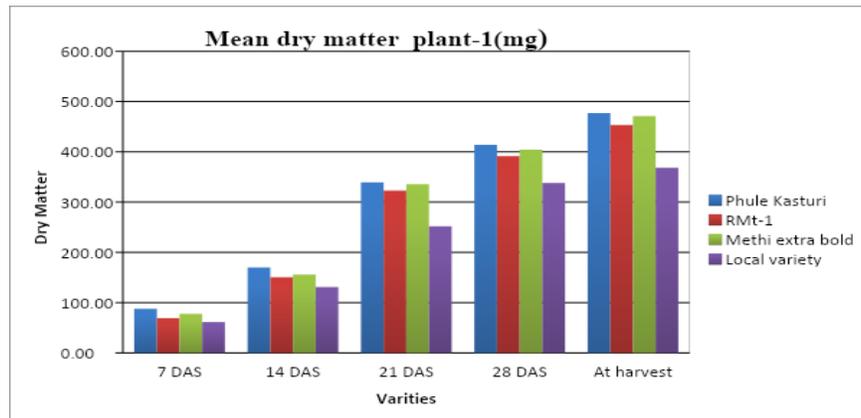


Fig.6 Mean number of days to harvest as affected by different varieties in fenugreek

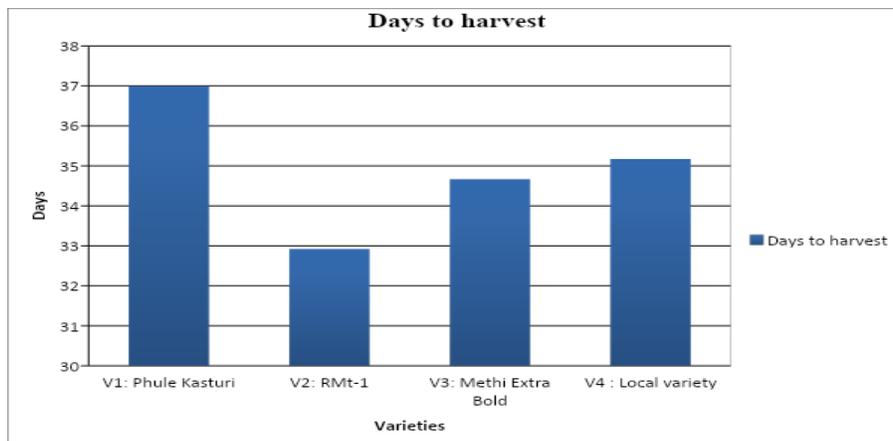


Fig.7 Mean weight of fresh foliage plant⁻¹ (mg) as affected by different varieties in Fenugreek

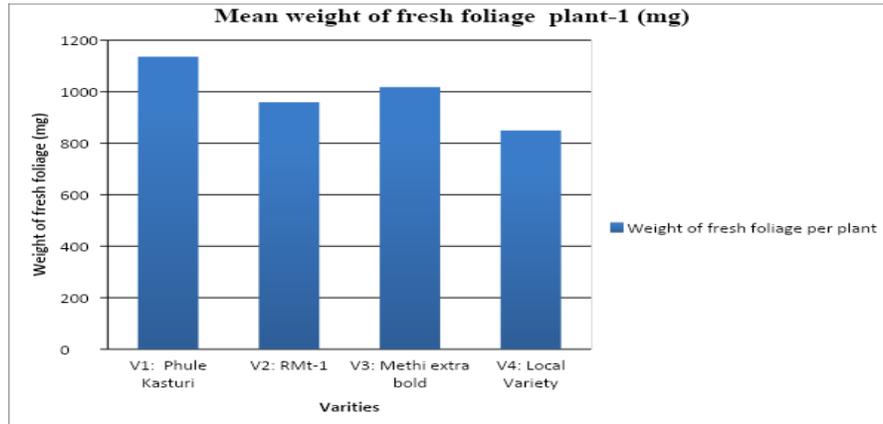


Fig.8 Fresh foliage yield (q ha⁻¹) as affected by different varieties in fenugreek

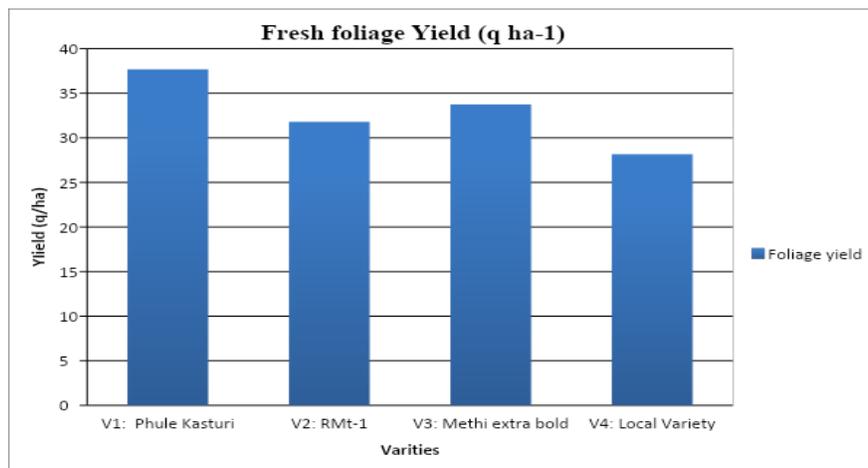


Fig.9 Cumulative growing degree days (GDD) as affected periodically by different varieties in fenugreek

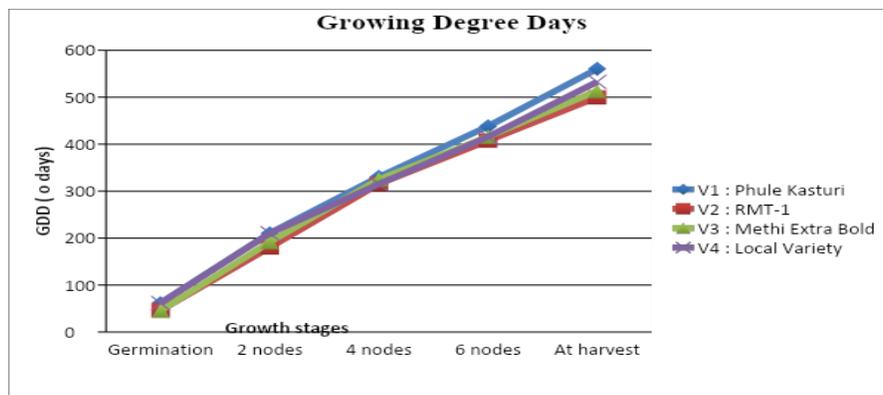
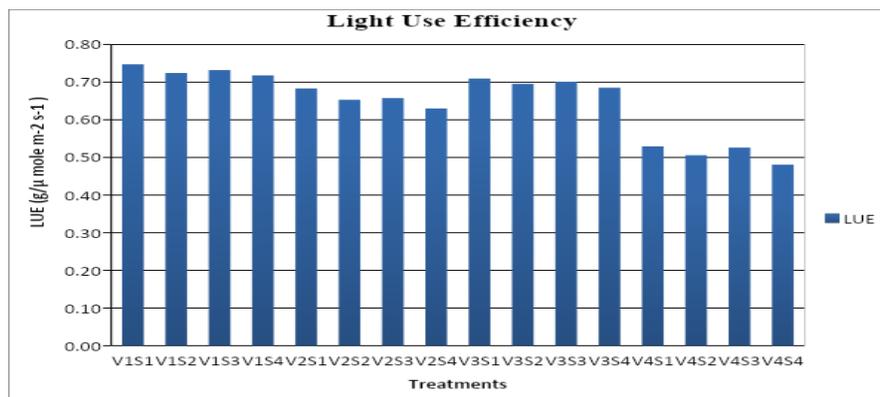


Fig.10 Light Use Efficiency (LUE) ($\text{g} / \mu \text{mole m}^{-2} \text{s}^{-1}$) as affected by different treatments in fenugreek



Days to harvest

The data regarding mean days to harvest influenced by different fenugreek varieties and sowing windows are presented in Table 7 and graphically depicted in Fig 6. The days to harvest were significantly influenced due to varieties and sowing windows. The mean days to harvest was 34.94.

The data regarding mean days to harvest as influenced by different fenugreek varieties are presented in Table 7. It was significantly influenced due to varieties.

A variety RMT-1 recorded minimum days to harvest (32.92) and maximum for variety Phule Kasturi (37.00). This was due to the climatic conditions at that windows and genetic factors of those varieties. Revanappa *et al.*, (2012), Aggrwal *et al.*, (2013), Singh *et al.*, (2013), Sharma (2015), Girdhar *et al.*, (2016) and Latye *et al.*, (2016) reported similar findings.

Post harvest observations

Weight of fresh foliage plant⁻¹ at harvest

The data recorded on weight of fresh foliage plant⁻¹ (mg) in fenugreek as affected by different treatments are presented in Table 8

and graphically represented in Fig.7.

The weight of fresh foliage plant⁻¹ with respect to different fenugreek varieties showed significant results (Table 8). The highest weight of fresh foliage plant⁻¹ (1136.21 mg) recorded with variety Phule Kasturi over other varieties. The next varieties in order of sequence were Methi Extra Bold (1017.74 mg), RMT-1 (958.68 mg) and Local variety (849.47 mg).

This might be due to varietal characters. Revanappa *et al.*, (2012), Aggrwal *et al.*, (2013), Singh *et al.*, (2013), Sharma (2015), Girdhar *et al.*, (2016) and Latye *et al.*, (2016) reported similar findings.

Yield

The data pertaining to fresh foliage yield plant⁻¹(mg) and foliage yield (q ha^{-1}) in fenugreek as affected by different treatments are presented in Table 9 and depicted in Fig.8.

Foliage yield

Significant and progressive difference was observed in foliage yield of fenugreek due to different varieties and windows of sowing. It produced mean fresh foliage yield of 32.84 q ha^{-1} .

The varieties of fenugreek influenced significantly to foliage yield (q ha^{-1}). A variety Phule Kasturi produced higher yield (37.67 q ha^{-1}) than other varieties in order of yield sequence are Methi Extra Bold (33.74 q ha^{-1}), RMT-1 (31.78 q ha^{-1}) and Local variety (28.17 q ha^{-1}) foliage yield (Table 9). A variety Methi Extra Bold recorded better results than other due to its genetical characters and favourable climatic conditions. Revanappa *et al.*, (2012), Aggrwal *et al.*, (2013), Singh *et al.*, (2013), Sharma (2015), Girdhar *et al.*, (2016) and Latye *et al.* (2016) reported similar findings.

Meteorological observations

Growing Degree Days (GDD)

The growing degree days were calculated by using daily maximum, minimum and base temperatures for *kharif* fenugreek and presented in Table 10 and graphically depicted in fig.9.

Among the all varieties, Phule Kasturi induced more heat load (560.30 heat units) than rest of the fenugreek varieties because of its longer duration, whereas, variety RMT-1 showed the lowest heat load (i.e. 499.53 heat units) because of its shorter growth period (Table 10). Similar findings were reported by Bagade *et al.*, (2017) and Ghodake (2019).

Light use efficiency by fenugreek crop canopy

The data pertaining light use efficiency by fenugreek crop canopy as affected by different treatments are presented in Table 11 and depicted in Fig.10.

Among the all varieties, Phule Kasturi indicated more light use efficiency i.e. $0.73 \text{ g } \mu \text{ mole m}^{-2} \text{ s}^{-1}$ than rest of the varieties (Table 11), whereas, local variety showed the

lowest LUE i.e. $0.51 \text{ g } \mu \text{ mole m}^{-2} \text{ s}^{-1}$. Similar findings were reported by Bagade *et al.*, (2017)

On the basis of the field experimentation for a season, it could be concluded that: Among the four varieties of fenugreek, Phule Kasturi variety produced significantly higher yield (37.67 q ha^{-1}) over Methi Extra Bold (33.74 q ha^{-1}), RMT-1 (31.78 q ha^{-1}) and Local variety (28.17 q ha^{-1}).

However, above conclusions are based on one season study. For confirmation of these results, the investigation needs to be repeated.

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