



E-ISSN: 2278-4136

P-ISSN: 2349-8234

www.phytojournal.com

JPP 2021; 10(1): 2425-2431

Received: 28-11-2020

Accepted: 30-12-2020

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Effect of different sowing windows on growth of table purpose fenugreek (*Trigonella foenum – graecum* L.) varieties in *Kharif* season

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Abstract

A field experiment was conducted at Department of Agricultural Meteorology Research Farm, College of Agriculture, Pune during *kharif*, 2019 with an objective of evaluating the effect of sowing date, variety and their interaction on growth, yield of fenugreek. 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 dates (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. Among the four cultivars of table purpose fenugreek, Phule Kasturi recorded significantly higher growth components. Sowing of table purpose fenugreek during different sowing windows significantly influenced the growth and yield parameters. The growth attributing characters were favourably influenced when fenugreek sown during 26th meteorological week. From this investigation, it was concluded that table purpose fenugreek variety Phule Kasturi when sown during 26 MW (25th June -1st July) favourably influenced growth and yield contributing characters.

Keywords: fenugreek, sowing window, variety, growth parameters

1. 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) [9]. The name fenugreek came from the species name "*foenum-graecum*" means "Greek hay" (Flammang *et al.*, 2004) [6]. 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) [13]. 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) [2]. Fenugreek is also a rich source of iron, containing 33 mg per 100 g dry weight (Anonymous, 2001) [1].

Time of sowing is crucial for the vegetative growth and ultimate expressions of yield. Early or late sowing may hamper the growth, yield as well as quality of the crop. The other hand, late sowing affected the growth as well as yield and quality in an adverse way. Optimum sowing time of fenugreek may vary from variety to variety and season to season due to variation in agroecological conditions. Therefore, there must be a specific sowing time, especially in *kharif* season to obtain maximum yield at the lowest economical cost of cultivation. Delayed sowing and early sowing may be reducing yield and increased cost of cultivation of *kharif* fenugreek. Keeping in view the above, the experiment was undertaken to identify the best time of sowing which affects the growth and development of fenugreek so that farmers get proper yield and reduce the crop damage due to late sowing or too early sowing.

With these consideration in view, the investigation was planned to find out suitable sowing window for *kharif* season as well as to find out suitable fenugreek variety under *kharif* fenugreek and interaction effect between sowing windows and varieties in *kharif* season.

2. Material and Methods

A field experiment was conducted on growth and yield parameters of fenugreek at Department of Agricultural Meteorology Research Farm, College of Agriculture, and 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 different growth stages of plant and observations on yield and yield components of fenugreek were recorded after harvesting of the crop.

3. Result and Discussion

3.1 Growth Parameters

3.1.1 Plant height (cm)

The mean plant height at harvest was found to be 18.78 cm. A variety Phule Kasturi was found significantly superior over other varieties in producing taller plants up to harvest. (Fig.1a) The mean plant height of Phule Kasturi was significantly superior at harvest i.e. 19.67 cm, over varieties RMT-1, Methi extra bold and Local variety during all the growth stages. It might be due to its genetical character of variety Phule Kasturi. Girdhar *et al.* (2016) and Latye *et al.* (2016)^[11] reported similar findings.

The plant height of fenugreek was observed significantly the highest in first date of sowing i.e. S₁ (26MW) 19.01 cm at harvest than other sowing windows at all the stages of crop growth. (Fig.1b) The lowest plant height was recorded in S₄ (29MW) during all the growth stages of crop. Early sown crop had longer duration of vegetative phase and exerted favourable effect on plant height. Similar findings were reported by Halesh *et al.* (2000)^[10], Ramirez *et al.* (2004)^[15], Ghobadi and Ghobadi (2010)^[7], Patil (2012)^[14] and Bagade *et al.* (2017)^[4].

The effect of interaction between varieties and sowing windows at all the growth stages of fenugreek were found significant. When variety Phule Kasturi sown during 26MW, it has favourably influenced plant height and it was observed as 19.76 cm at harvest. (Table 1) Genetical character of variety Phule Kasturi and provision of more congenial condition during 26MW might have favoured in producing taller plants. Similar findings were reported by Rathore *et al.* (2010)^[16], Zanjurne (2012)^[19], Bobade (2016)^[5] and Mane *et al.* (2017)^[12].

3.2 Mean number of functional leaves plant⁻¹

The highest number of functional leaves recorded (18.07) with variety Phule Kasturi at harvest. (Fig. 2a) This might be due to genetical character of variety Phule Kasturi. Revanappa *et al.* (2012)^[17], Aggrwal *et al.* (2013)^[1], Singh *et al.* (2013)^[18], Sharma (2015)^[17], Girdhar *et al.* (2016) and Latye *et al.* (2016)^[11] reported similar findings.

The mean number of functional leaves plant⁻¹ in fenugreek was significantly affected by different sowing windows. During 26th meteorological week, *kharif* fenugreek produced maximum number of functional leaves plant⁻¹ (17.09) at

harvest. (Fig 2b) Congenial weather condition might have been provided to S₁ (26MW) for better germination and further growth and development of fenugreek resulted in more vegetative growth. Similar findings were reported by Halesh *et al.* (2000)^[10], Ramirez *et al.* (2004)^[15], Ghobadi and Ghobadi (2010)^[7], Patil (2012)^[14] and Bagade *et al.* (2017)^[4].

When variety the Phule Kasturi sown during 26th MW, it has favourably influenced number of functional leaves plant⁻¹ at 21, 28 DAS and at harvest (18.66). (Table 1) Similar findings were reported by Rathore *et al.* (2010)^[16], Zanjurne (2012)^[19], Bobade (2016)^[5] and Mane *et al.* (2017)^[12].

3.3 Leaf area plant⁻¹ (cm²)

A variety Phule Kasturi recorded higher leaf area (24.69 cm²) than rest of the varieties at harvest. Revanappa *et al.* (2012)^[17], Aggrwal *et al.* (2013)^[1], Singh *et al.* (2013)^[18], Sharma (2015)^[17], Girdhar *et al.* (2016) and Latye *et al.* (2016)^[11] reported similar findings. (Fig. 3a)

The crop sown during 26 MW showed the highest leaf area plant⁻¹ (24.20 cm²) in fenugreek amongst all other sowing windows. The next sowing windows in order of sequence were 28, 27 and 29MW sowing. (Fig. 3b) Similar findings were reported by Halesh *et al.* (2000)^[10], Ramirez *et al.* (2004)^[15], Ghobadi and Ghobadi (2010)^[7], Patil (2012)^[14] and Bagade *et al.* (2017)^[4]. This was also due to more interception of light and higher number of leaves.

When variety Phule Kasturi was sown during 26th MW, it has favourably influenced mean leaf area plant⁻¹ (cm²). (Table 2) Genetical character of variety Phule Kasturi and provision of more congenial condition favoured more vegetative growth thereby more leaf area plant⁻¹. Similar findings were reported by Rathore *et al.* (2010)^[16], Zanjurne (2012)^[19], Bobade (2016)^[5] and Mane *et al.* (2017)^[12].

3.4 Dry matter plant⁻¹

Mean dry matter plant⁻¹ at harvest was 442.31 mg plant⁻¹. 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.

Among varieties Phule Kasturi significantly produced maximum dry matter plant⁻¹ (476.45 mg) upto harvest, over variety Methi Extra Bold, RMT-1 and Local variety. (Fig.4a) This might be due to genetical characters of Phule Kasturi. Revanappa *et al.* (2012)^[17], Aggrwal *et al.* (2013)^[1], Singh *et al.* (2013), Sharma (2015)^[17], Girdhar *et al.* (2016) and Latye *et al.* (2016)^[11] reported similar findings.

The mean dry matter was observed significantly the highest with first date of sowing i.e. S₁ (26MW) 448.48 mg plant⁻¹ at harvest than other sowing windows at all the stages of crop growth. (Fig.4b) Congenial weather condition might have been provided to S₁ (26MW) for better germination and further growth and development of fenugreek thereby increased dry matter. Early sown crop had longer duration of vegetative phase and exerted favourable effect on the dry matter production plant⁻¹ as compared to late sown crop. Similar findings were reported by Halesh *et al.* (2000)^[10], Ramirez *et al.* (2004)^[15], Ghobadi and Ghobadi (2010)^[7], Patil (2012)^[14] and Bagade *et al.* (2017)^[4]. The lowest accumulation of dry matter was recorded with S₄ (29MW) during all the growth stages.

The interaction effect between fenugreek varieties and sowing windows was found to be significant at all stages. When variety Phule Kasturi sown during 26MW, it has favourably influenced mean dry matter plant⁻¹ at 7, 14, 21, 28 DAS and at

harvest (479.53 mg), respectively. (Table 2) Genetical character of variety Phule Kasturi and provision of more congenial condition favoured more vegetative growth thereby

more leaf area plant⁻¹. Similar findings were reported by Rathore *et al.* (2010)^[16], Zanjurne (2012)^[19], Bobade (2016)^[5] and Mane *et al.* (2017)^[12].

Table 1: Fenugreek plant height (cm) and mean number of functional leaves plant⁻¹ as influenced by interaction between varieties and sowing windows at harvest

Growth Parameters	Plant height (cm)					Mean number of functional leaves plant ⁻¹				
	V ₁ : Phule Kasturi	V ₂ : RMT-1	V ₃ : Methi Extra Bold	V ₄ : Local Variety	Mean	V ₁ : Phule Kasturi	V ₂ : RMT-1	V ₃ : Methi Extra Bold	V ₄ : Local Variety	Mean
S ₁ : 26 MW	19.76	19.57	19.12	17.58	19.01	18.66	16.27	17.77	15.67	17.09
S ₂ : 27 MW	19.64	19.49	18.63	17.35	18.78	17.87	15.87	16.53	15.13	16.35
S ₃ : 28 MW	19.65	19.46	18.93	17.44	18.87	18.00	15.93	16.67	15.53	16.53
S ₄ : 29 MW	19.61	19.29	18.41	16.55	18.46	17.77	15.73	16.40	14.75	16.17
Mean	19.67	19.45	18.77	17.23	18.78	18.07	15.95	16.84	15.27	16.53
	Factor		SE ±	CD at 5%		Factor		SE ±	CD at 5%	
	Sowing Window		0.03	0.09		Sowing Window		0.07	0.19	
	Variety		0.02	0.06		Variety		0.06	0.20	
	Interaction		0.06	0.18		Interaction		0.13	0.38	

Table 2: Fenugreek mean leaf area plant⁻¹ (cm²) and mean dry matter plant⁻¹ (mg) as influenced by interaction between varieties and sowing windows at harvest

Growth Parameters	Mean leaf area plant ⁻¹ (cm ²)					Mean dry matter plant ⁻¹ (mg)				
	V ₁ : Phule Kasturi	V ₂ : RMT-1	V ₃ : Methi Extra Bold	V ₄ : Local Variety	Mean	V ₁ : Phule Kasturi	V ₂ : RMT-1	V ₃ : Methi Extra Bold	V ₄ : Local Variety	Mean
S ₁ : 26 MW	24.82	24.21	24.47	23.28	24.20	479.53	466.95	473.54	373.69	448.43
S ₂ : 27 MW	24.65	24.08	24.39	22.17	23.82	476.81	450.30	470.73	370.69	442.13
S ₃ : 28 MW	24.74	24.14	24.42	22.93	24.06	478.00	451.05	471.48	373.40	443.48
S ₄ : 29 MW	24.54	23.98	24.34	21.88	23.68	473.74	444.45	467.15	355.45	435.20
Mean	24.69	24.10	24.40	22.57	23.94	477.02	453.19	470.73	368.31	442.31
	Factor		SE ±	CD at 5%		Factor		SE ±	CD at 5%	
	Sowing Window		0.03	0.08		Sowing Window		1.37	3.99	
	Variety		0.02	0.07		Variety		1.23	4.25	
	Interaction		0.05	0.16		Interaction		2.73	7.97	

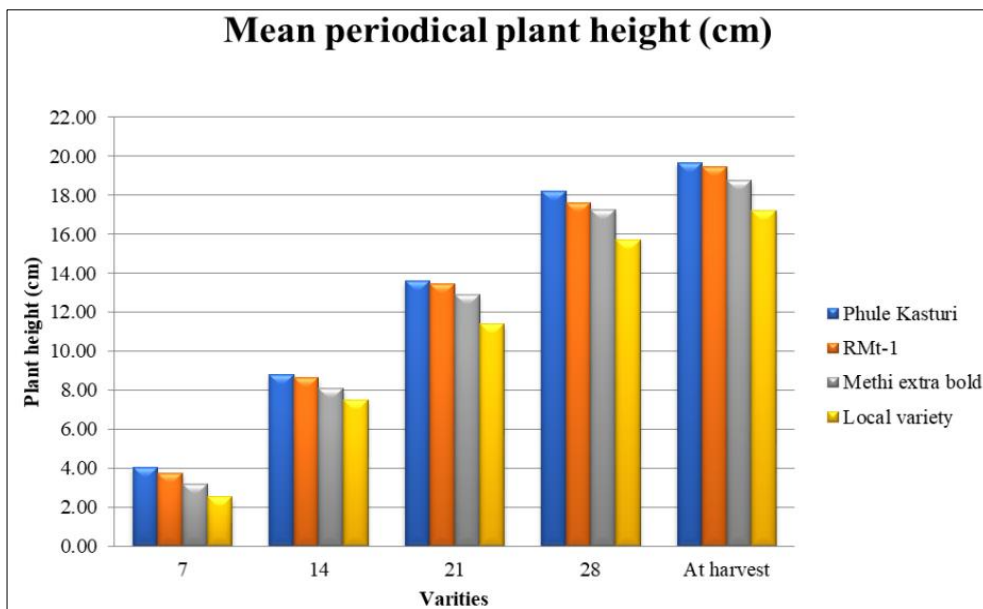


Fig 1a: Mean plant height (cm) as affected periodically by different varieties in fenugreek

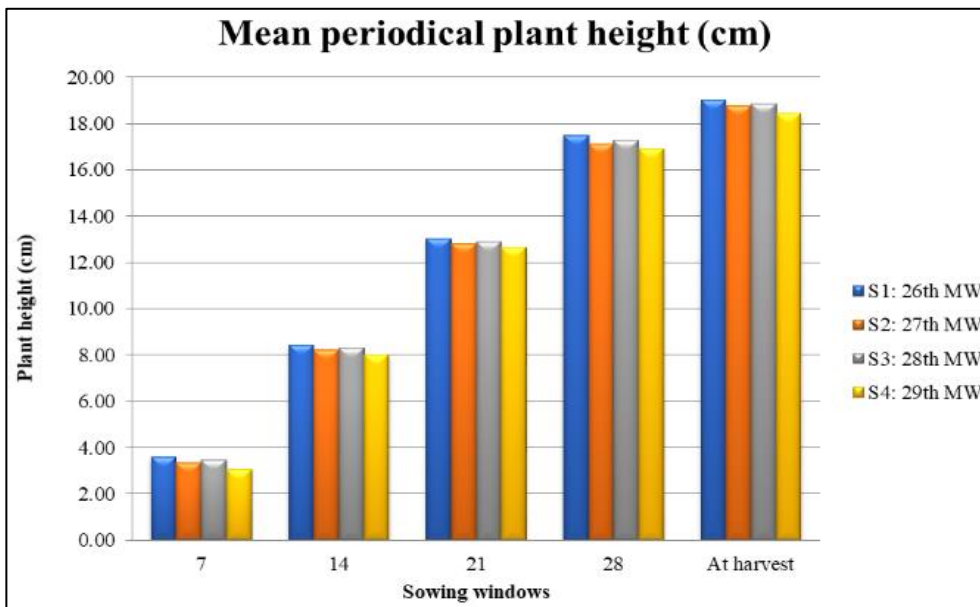


Fig 1b: Mean plant height (cm) as affected periodically by different sowing windows in fenugreek

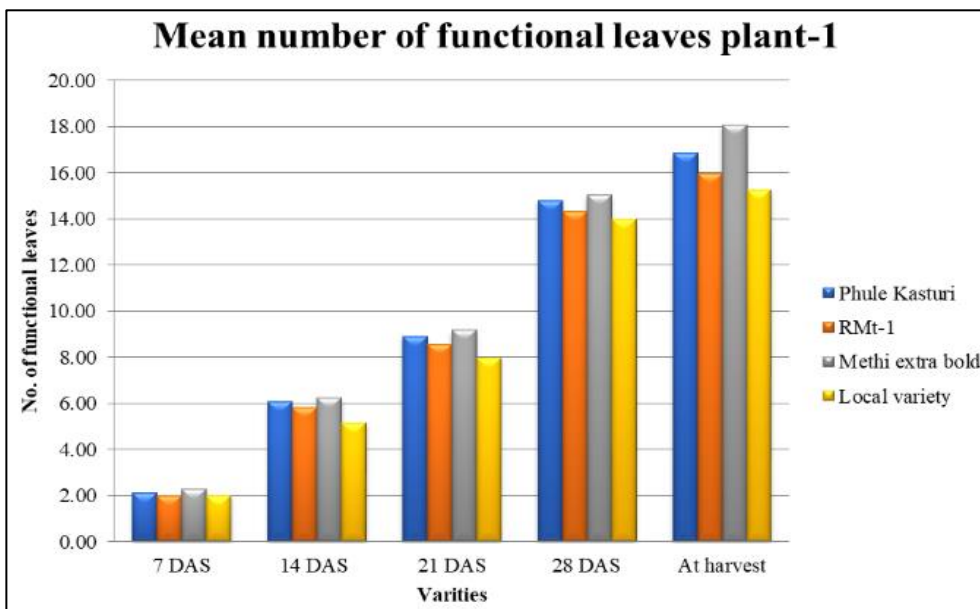


Fig 2a: Mean number of functional leaves plant⁻¹ as influenced periodically by different varieties in fenugreek

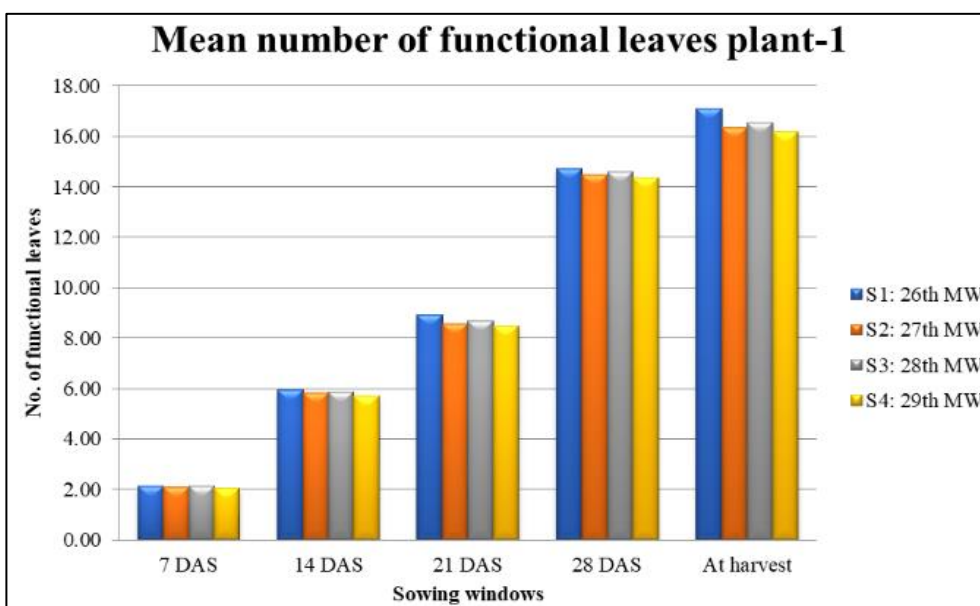


Fig 2b: Mean number of functional leaves plant⁻¹ as affected periodically by sowing windows in fenugreek

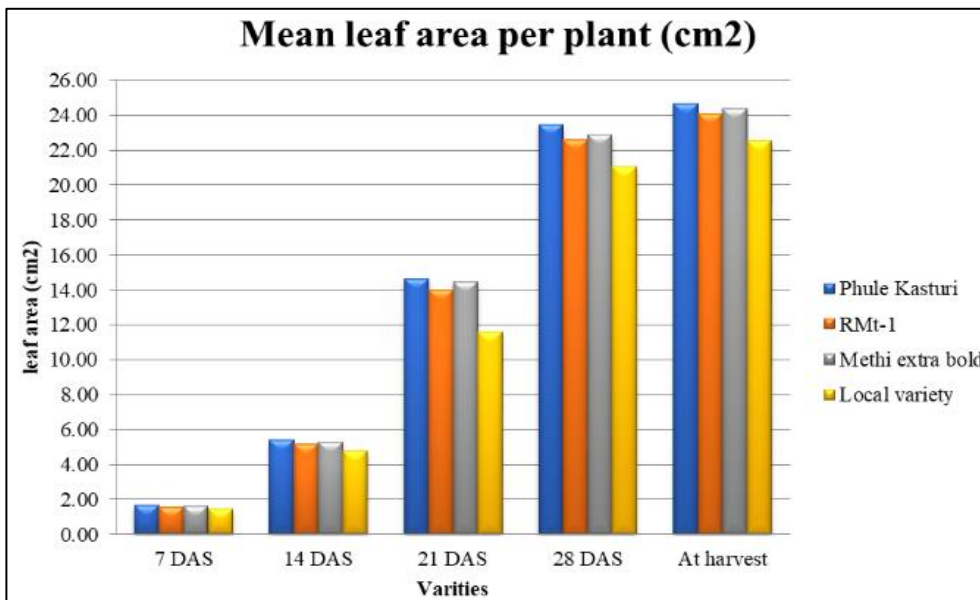


Fig 3a: Mean leaf area plant⁻¹ (cm²) as affected periodically by different varieties in fenugreek

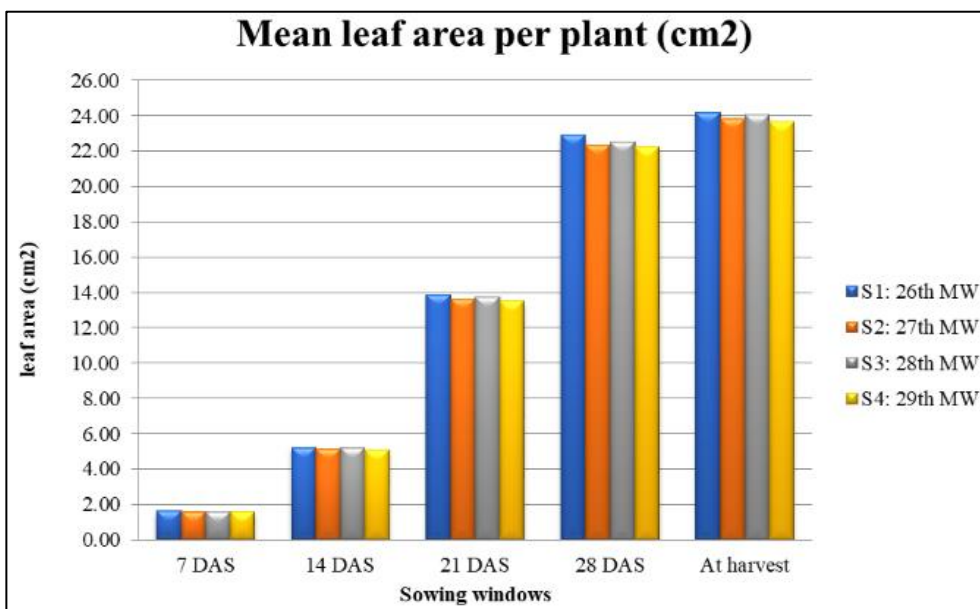


Fig 3b: Mean leaf area plant⁻¹ (cm²) as affected periodically by different sowing windows in fenugreek

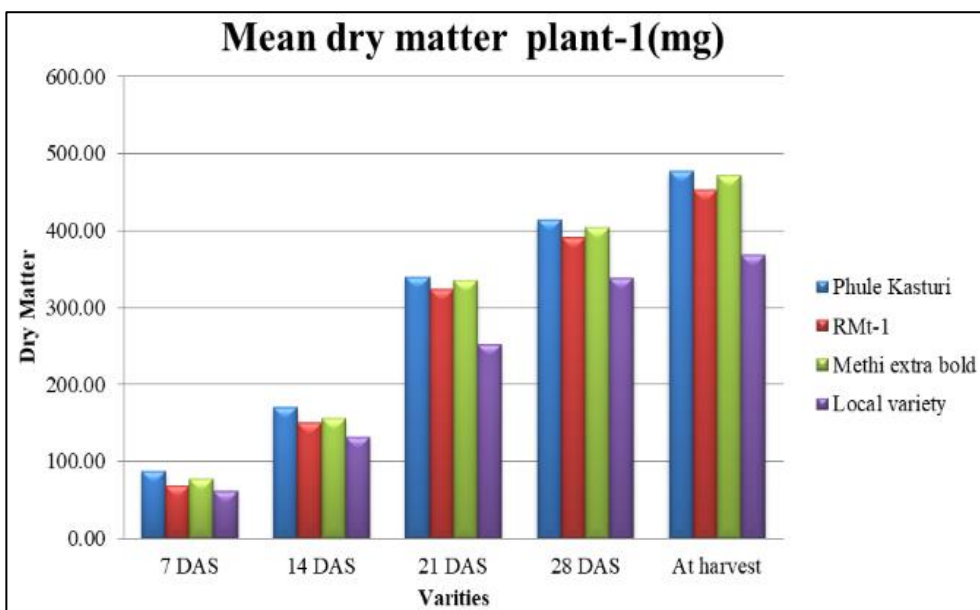


Fig 4a: Mean dry matter plant⁻¹ (mg) as affected periodically by different varieties in fenugreek

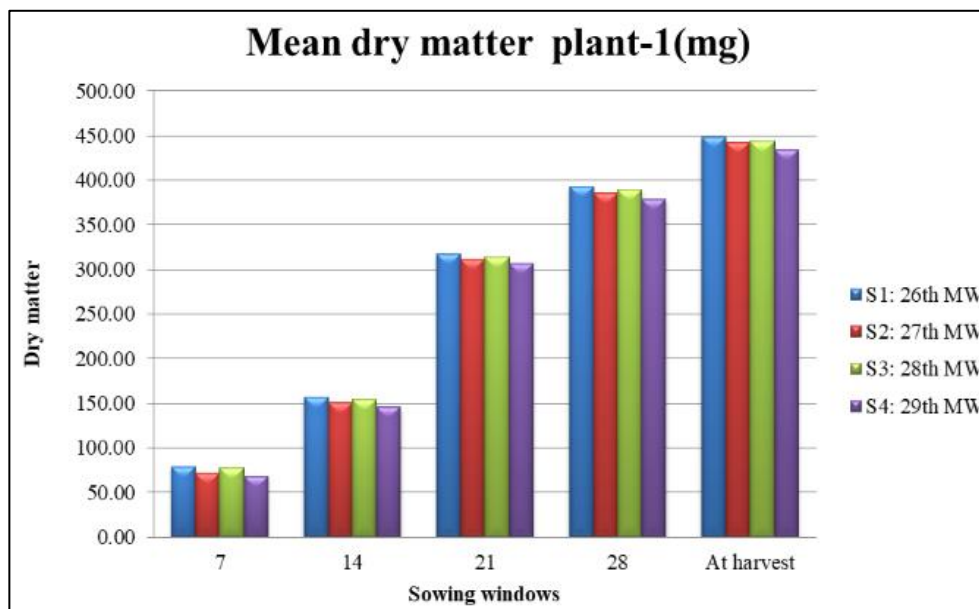


Fig 4b: Mean dry matter plant⁻¹(mg) as affected periodically by different sowing windows in fenugreek

4. Conclusion

Growth characters like plant height (19.67 cm), number of functional leaves plant⁻¹ (18.07), leaf area plant⁻¹ (24.69 cm²), total dry matter production plant⁻¹ (477.02 mg) and Yield characters viz., fresh foliage yield plant⁻¹ (1136.21g) and fresh foliage yield (37.67 q ha⁻¹) were influenced significantly with the fenugreek variety Phule Kasturi which gave best results over other varieties viz., RMT-1, Methi Extra Bold and Local variety

Growth characters like plant height (19.01 cm), number of functional leaves plant⁻¹ (17.09), leaf area plant⁻¹ (24.20 cm²) and total dry matter production plant⁻¹ (448.43 mg) were influenced significantly when table purpose fenugreek sown during 26 MW (25th June - 1st July) over 27 MW, 28 MW and 29th MW sowing windows. Thus it can be conclusively stated that fenugreek sown during 26 MW (25th June - 1st July) gave better growth characters.

Interaction effect between fenugreek varieties and sowing windows showed statistically significant difference for different growth attributes. When variety Phule Kasturi sown during 26 MW (25th June - 1st July), it has favourably influenced plant height, number of functional leaves plant⁻¹, leaf area plant⁻¹ (cm²), dry matter production plant⁻¹(mg) and fresh foliage yield plant⁻¹(1174.10 mg) and yield (38.93 q ha⁻¹). (Table 2).

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