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Effect of media and pre-sowing seed treatments on performance of Fenugreek (*Trigonella foenum- graecum* L.) microgreens under shade net

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Abstract
The present investigation was conducted at No. 4 Nursery, College of Horticulture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth Dapoli, Dist. Ratnagiri, during the academic year 2024-25. The experiment was laid down in Factorial Randomized Block Design (FRBD) with twelve treatment combinations and three replications. The experiment consists of two factors. Factor A consists of three growing media: M_1- Sand, M_2- Soil + FYM (3:1) and M_3- Soil + Cocopeat (1:1) while factor B consists of four pre-sowing seed treatments: S_1-Cattle Urine @ 100 ml/litre, S_2-Vermiwash @ 100 ml/litre, S_3-Humic acid @ 2 ml/litre and S_4-Water soaking. Among the three growing media M_3 [Soil+ cocopeat (1:1)] found superior in some of the growth parameters like days for germination (avg. 3.43), seedling height (7.46 cm) and root length (avg. 3.83 cm) while yield parameters *viz*., days required for harvest (avg. 8.15), number of cycles per month (avg. 2.75), total cycles in 6 month (avg. 16.49) and yield/m^2 (863.65 g). The treatment S_1 (Cattle Urine 100ml/litre) was found superior in growth parameters *viz*., days required for germination (avg. 3.58 days), seedling height (avg. 6.48 cm), root length (avg. 3.47 cm) and yield parameters like days required for harvest (avg. 8.31 days), number of cycles per month (avg. 2.65), total cycles in 6 month (15.49), yield/m^2 (avg. 769 g). In interaction, treatment combination M_3S_1 [Soil+ cocopeat (1:1) + Cattle Urine 100ml/litre] recorded significant superiority over the other combinations in respect of growth and yield parameters *viz*., days to germination (avg. 2.96), seedling height (avg. 7.46 cm), root length (avg. 4.27 cm), days required for harvest (avg. 7.80), number of cycles (avg. 2.95) in a month, number of cycles (17.74) in 6 months and yield (avg. 951.80 g/m^2). The data recorded in present investigation revealed that growing media and pre-sowing seed treatments influenced the growth and yield parameters of fenugreek microgreens.

Keywords: Fenugreek microgreens, media, pre-sowing seed treatments, growth, yield

1. Introduction
Fenugreek (*Trigonella foenum-graecum* L.) is a leafy vegetable that is also an important seed spice (Govindaraj *et al.*, 2019) [13]. It is a self-pollinated annual plant from the Leguminosae family that is widely cultivated throughout Asia and the Mediterranean region (Khorshidian *et al.*, 2015) [15]. It is grown commercially in North Africa, the Middle East, Argentina, France, Spain, Turkey, Iran, Nepal, India, Pakistan, Afghanistan and Morocco (Altuntas *et al.*, 2005) [3]. Currently, there are over 260 species in the genus Trigonella. One diploid species with (2n=16) chromosomes is *Trigonella foenum graecum* L. (Acharya *et al.*, 2014) [1]. Fenugreek contains two economically important species: *T. corniculata* (Kasuri methi) and *T. foenum-graecum* (common methi) (Ghadge *et al.*, 2021) [11]. Fenugreek can grow in a variety of conditions and is more adaptable than other plants. It can withstand frost and freezing temperatures and prefers a chilly environment. Low temperatures are necessary for early crop development (Singh *et al.*, 2020) [24].
The small, fragile seedlings of various crop species that are consumed raw or partially cooked are known as "microgreens." The plant is composed of three parts: a central stem, two cotyledon leaves and the first pair of true leaves, which can be as young as 4-14 days depending on the species. The first two genuine leaves are either partially or entirely produced and the

cotyledonary leaves have reached their full size (Mishra *et al.*, 2021). [18]

Microgreens come in a variety of colours, textures and tastes. These plants are harvested between 7 to 21 days and consumed fresh, depending on the type planted (Bhaswant *et al.*, 2023) [7]. Microgreens are delicate, immature greens that are larger than sprouts but smaller than baby greens (Paradiso *et al.*, 2018) [20]. Microgreens, also known as "Vegetable Confetti," are produced from the seeds of many crops, including legumes, grains, oilseeds, vegetables and herbs (Ebert 2022) [10]. Microgreens are often eaten fresh in salads, sandwiches and soups. They are useful as garnishes, toppers, spices and stuffings (Riggio *et al.*, 2019).

Several variables impact microgreen development, including the growing media. One of the most important aspects of producing microgreens is choosing the right growth substrate, which affects the microgreens quality, productivity and sustainability (Gioia *et al.*, 2017) [12].

2. Materials and Methods

Experimental site

The experiment was carried out at No. 4 Nursery, College of Horticulture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli during the year 2024-25 from September 2024 to February 2025. The altitude of this place is about 280 m above MSL. Geologically, it is located in subtropical region with 17°45' North Latitude and 73°12' East Latitude.

There were two factors and total 12 treatment combinations replicated three times using the Factorial Randomized Block Design (FRBD). The experiment consists of two factors. Factor A concerned with growing media: M_1: Sand; M_2: Soil + FYM (3:1) and M_3: [Soil + Cocopeat (1:1)] whereas factor B is composed of four pre-sowing seed treatments: S_1: Cattle urine @ 100ml/litre, S_2: Vermiwash @ 100ml/litre, S_3: Humic acid @ 2ml/litre and S_4: Water soaking (control). The 12 treatment combinations are: M_1S_1- Sand + Cattle Urine @ 100 ml/litre, M_1S_2- Sand + Vermiwash @ 100 ml/litre, M_1S_3- Sand + Humic acid @ 2 ml/litre, M_1S_4- Sand + water soaking, M_2S_1-[Soil + FYM (3:1) + Cattle Urine @ 100 ml/litre], M_2S_2-[Soil + FYM (3:1) + Vermiwash @ 100 ml/litre], M_2S_3-[Soil + FYM (3:1) + Humic acid @ 2 ml/litre], M_2S_4- [Soil + FYM (3:1) + Water soaking], M_3S_1- [Soil+ Cocopeat (1:1) + Cattle Urine @ 100 ml/litre], M_3S_2-[Soil+ Cocopeat (1:1) + Vermiwash @ 100 ml/litre], M_3S_3-[Soil+ Cocopeat (1:1) + Humic acid @ 2 ml/litre] and M_3S_4- [Soil+ Cocopeat (1:1) + Water soaking].

Seed Treatment

Cattle urine, Vermiwash and Humic acid seed treatments were mixed with distilled water to obtain the necessary percent of concentrated solution and seeds were soaked in treatments for the entire night. The seeds were air dried under the shade to restore the moisture content to its original state.

Seed sowing

After seed treatment, soaked seeds were spread on beds with various growing medium at a spacing of 10-15 cm between two lines. After being sown at a depth of 2 cm, the seeds were gently covered with the thin layer of media. Irrigation was done on a regular basis. Microgreens were harvested within 8-12 days after the cotyledon leaves fully open, regardless of whether the first pair of genuine leaves have emerged. For six months, the repeated sowings were carried out. Five plants from each treatment were randomly chosen as observational plants to record harvesting observations.

Different growth-promoting factors, such as the number of days needed for germination and the height of the seedlings (cm), root length (cm) as well as yield parameters like days needed for harvest, number of cycles in a month, total cycles in 6 months and yield (g/m^2) were noted. The data obtained during experiment was statistically analysed as per the procedure and design suggested by Panse and Sukhatme.

3. Results and Discussion

3.1 Days Required for Germination:

The effect of media and pre-sowing seed treatments on days required for germination in microgreens is given in Table 1. Among various growing media treatment M_3 [Soil + Cocopeat (1:1)] recorded the minimum number of days to germination in month of September (3.20 days), October (3.35 days), November (3.38 days), December (3.53 days), January (3.48 days) and February (3.66 days).According to Kolambe *et al.*, (2024) [16] found that the minimum number of days required for germination (3.33 days) was found in the [Soil+ Cocopeat (1:1)] medium in fenugreek microgreens. Archana and Lal (2021) [5] also noted that mung bean and coriander microgreens took a minimum of 2-4 days to germinate in cocopeat media. In the months of September (3.22 days), October (3.43 days), November (3.55 days), December (3.69 days), January (3.66 days) and February (3.97 days) the minimum number of days needed for germination was recorded in treatment S_1 (Cattle Urine @ 100 ml/litre), whereas the maximum number of days was found in S_4 (Water soaking). It might be due to a combination of factors such as the presence of growth-promoting chemicals in urine, increased moisture, and nutrient availability. According to Magar *et al.* (2025) [17], priming cucumber seeds with cow urine yields the quickest mean germination time (3.65 days). Same results were also reported by Shreesty *et al.* (2019) [23] in karonda seedlings, Sharma and Parmar (2023) [22] in custard apple seedlings. In case of interaction minimum number of days needed for germination was noted in treatment combination M_3S_1-[Soil+ Cocopeat (1:1) + Cattle Urine @ 100 ml/litre] in month of September (2.60 days), October (2.86 days), November (3.00 days), December (3.34 days), January (3.00 days) and February (3.00 days) whereas the maximum number of days was found in treatment combination M_1S_4- (Sand + water soaking) in the months of September (4.50 days), October (4.32 days), November (4.35 days), December (4.45 days), January (4.63 days) and February (5.23 days). It might be due to improved physical and chemical properties of the media cocopeat, such as its porosity, soil aeration, water-holding capacity and substantial supply of nutrients, particularly nitrogen and micronutrients for robust seedling development and also due to the presence of growth-promoting chemical compounds in cattle urine that increased moisture and nutritional availability.

3.2 Seedling height (cm)

The data in Table 2 showed that the maximum seedling height occurred in treatment M_3 [Soil + Cocopeat (1:1)] in September (6.59 cm), October (6.75 cm), November (6.91 cm), December (6.93 cm), January (6.95 cm) and February (6.97 cm), while the minimum seedling height was observed in M_1 (Sand) in September (5.04 cm), October (5.24 cm), November (5.52 cm), December (5.32 cm), January (4.59 cm) and February (4.67 cm). Similar findings were reported by Arya and Kutty (2022) [6] recorded maximum microgreen height (5.8 cm) of amaranthus in cocopeat media, Naik *et al.* (2022) [19] in mustard microgreens and Hazarika *et al.* (2022) [14] in cabbage. Treatment S_1 (Cattle

urine @ 100 ml/litre) recorded the maximum seedling height in month of September (6.27 cm), October (6.44 cm) November (6.56 cm), December (6.70 cm), January (6.49 cm) and February (6.43 cm) whereas, the minimum seedling height in September (5.36 cm), October (5.72 cm), November (6.07 cm), December (5.69 cm), January (5.37 cm) and February (5.58 cm) was observed in treatment S_4 (Water soaking). Ambika and Balakrishnan (2015) [4] found that soaking of seeds in cow urine 2% recorded highest shoot length (16.05 cm) in cluster bean. Tagore and Shankar (2017) [26] observed highest shoot length (8 cm) in cluster bean for 3 hrs when seeds soaked in cow urine (2%). In case of interaction, the highest seedling height was recorded in treatment combination M_3S_1 [Soil + Cocopeat (1:1) + Cattle urine @ 100 ml/litre] in September (7.30 cm), October (7.31 cm), November (7.29 cm), December (7.68 cm), January (7.58 cm), and February (7.65 cm), while the lowest seedling height was recorded in treatment combination M_1S_4 (Sand + Water soaking) in September (4.83 days), October (5.07 cm), November (5.59 cm), December (4.83 cm), January (4.04 cm) and February (4.36 cm). It might be due to improved physical and chemical properties of the media, as well as cocopeat's beneficial characteristics such as porosity, soil aeration, water-holding capacity, and a significant supply of nutrients, particularly nitrogen and micronutrients for healthy seedling growth.

3.3 Root length (cm)

Table 3 represents the impact of media and pre-sowing seed treatments on microgreens. The maximum root length in month of September (4.05 cm), October (3.86 cm) November (3.55 cm), December (4.31 cm), January (3.55 cm) and February (3.68 cm) was recorded in treatment M_3 [Soil + Cocopeat (1:1)], whereas the minimum root length in month of September (3.11 cm), October (2.05 cm), November (2.14 cm), December (2.36 cm), January (2.30 cm) and February (2.18 cm) was recorded with treatment M_1 (Sand). According to Kolambe *et al.* (2024) [16], fenugreek microgreens grown in cocopeat medium had the longest roots (avg. 4.93 cm). Parallel results were noted Yanti *et al.* (2020) [28] in kale, Chhetri *et al.* (2022) [8] in Chinese cabbage. The maximum root length in month of September (3.65 cm), October (3.28 cm), November (3.38 cm), December (3.87 cm), January (3.44 cm) and February (3.22 cm) was recorded from the treatment S_1 (Cattle urine @ 100 ml/litre), whereas the minimum root length in month of September (3.19 cm), October (2.74 cm), November (2.36 cm), December (2.74 cm), January (2.73 cm) and February (2.56 cm) was recorded with treatment S_4 (Water soaking). Tiwari *et al.* (2018) [27] found that chickpea seeds treated in 6% cow urine had the longest roots (21.03 cm). In the interaction, the maximum root length was observed in M_3S_1 [Soil + Cocopeat (1:1) + Cattle urine @ 100 ml/litre] in September (4.47 cm), October (4.32 cm), November (4.08 cm), December (4.85 cm), January (3.86 cm) and February (4.07 cm). The minimum root length was observed in M_1S_4- (Sand + water soaking) in September (2.95 cm), October (2.00 cm), November (2.00 cm), December (2.05 cm), January (2.00 cm) and February (2.18 cm). Improved aeration qualities in the media may have contributed to increased potassium absorption, which in turn helped to sustain larger root growth. Additionally, seeds soaked in cattle urine have longer roots, likely due to the nutrients and growth-promoting substances in the urine.

3.4 Days required for harvest

Table 4 presents the effect of media and pre-sowing seed treatment on fenugreek microgreens. During the month of September (7.41 days), October (7.59 days), November (8.29 days), December (8.39 days), January (8.68 days) and February (8.59 days) media M_3 [Soil + Cocopeat (1:1)] observed minimum number of days to harvest. Whereas, media M_1(Sand) recorded maximum number of days to harvest in September (8.39 days), October (8.77 days), November (8.77 days), December (9.16 days), January (9.57 days) and February (9.29 days). According to Kolambe *et al.* (2024) [16], fenugreek microgreens grown in [Soil + Cocopeat (1:1)] medium needed a minimum number of days to harvest (avg. 8.90 days). Similar results were observed by Sinha and Thilakacathy (2021) [25] in fenugreek and amaranthus microgreens, Dalal *et al.* (2022) [9] in spinach and carrots microgreens. Treatment S_1 (Cattle urine at 100 ml/litre) recorded minimum number of days needed for harvest in September (7.63 days), October (7.85 days), November (8.40 days), December (8.50 days), January (8.81 days) and February (8.68 days), whereas S_4 (Water soaking) noted maximum number of days to harvest in September (8.22 days), October (8.65 days), November (8.72 days), December (9.08 days), January (9.37 days) and February (9.20 days). In the case of interaction, treatment combination M_3S_1 (Soil + Cocopeat (1:1) + Cattle urine @100 ml/litre) recorded minimum number of days needed for harvest in September (7.00 days), October (7.00 days), November (8.00 days), December (8.00 days), January (8.50 days) and February (8.33 days), whereas treatment combination M_1S_4 (Sand + Water soaking) noted maximum number of days to harvest in September (8.67 days), October (9.00 days), November (9.00 days), December (9.33 days), January (10 days) and February (10 days). This might be due to combination of soil and cocopeat which increased seed germination, possibly due to improved root aeration, water retention and nutrient availability. Cattle urine includes essential nutrients (nitrogen, phosphate and potassium), natural growth hormones (auxins and gibberellins), enzymes and good microorganisms that promote quicker and more uniform germination.

3.5 Number of cycles per month

The data presented in Table 5 reported that treatment M_3 [Soil + Cocopeat (1:1)] recorded maximum number of cycles (avg. 2.75), whereas M_1 (Sand) observed minimum number of cycles (avg. 2.02) in a month. The maximum number of cycles (avg. 2.65) were observed in treatment S_1 (Cattle urine at 100 ml/litre), however minimum number of cycles (avg. 2.22) were observed in treatment S_4 (Water soaking).The interaction showed that treatment combination M_3S_1 (Soil + Cocopeat (1:1) + Cattle urine @100 ml/litre) recorded maximum number of cycles (avg. 2.95) and treatment combination M_1S_4 (Sand + Water soaking) recorded minimum number of cycles (avg. 2).

3.6 Total cycles in 6 month

Table 6 presents that the media M_3 (Soil + Cocopeat (1:1)) had the highest number of cycles in 6 months (16.49), whereas M_1 (Sand) had the lowest number of cycles (12.80). Treatment S_1 (Cattle urine @100 ml/litre) had the highest number of cycles in 6 months (15.91), whereas S_4 (Water soaking) had the lowest number of cycles in 6 months. (13.23).The maximum number of cycles in 6 months (17.74) was observed in treatment combination M_3S_1 [Soil + Cocopeat (1:1) + Cattle urine @ 100 ml/litre]. The minimum number of cycles in 6 months (12.00) was found in the treatment combination M_1S_4 (Sand + Water soaking). Along with micronutrients, the medium Soil + Cocopeat had higher levels of N, P and K than Cocopeat. This may have increased the availability of necessary nutrients for

growth, resulting in more cycles in Soil + Cocopeat compared to other medium. Soaking seeds in cow urine enhanced the development and early germination of fenugreek microgreens, resulting in the highest number of cycles in six months.

3.7 Yield (g/m^2)

According to the data in Table 7 and Fig. 1, the highest yield was recorded in treatment M_3 (Soil + Cocopeat (1:1)), which was in September (946.67 g), October (946.92 g), November (910.63 g), December (819.42 g), January (788.31 g) and February (770.00 g). The lowest yield was recorded in treatment M_1 (Sand), which was in September (470.50 g), October (498.00 g), November (499.36 g), December (425.69 g), January (344.59 g) and February (250.46 g). Kolambe *et al.* (2024) [16] found that the soil + cocopeat (1:1) media produced the highest yield (1086.03 g/m^2) of fenugreek microgreens. Priyadarshini and Kumari (2021) [21] reported a maximum yield of 7.68 g in cocopeat medium. The findings are consistent with those of Allah *et al.* (2023) [2] in mustard microgreens, Arya and Kutty (2022) [6] in green gram, and Naik *et al.* (2022) [19] in mustard microgreens. Among the various seed treatments S_1 (Cattle urine @100 ml/litre) had the highest yield, which was observed in September (836.81 g), October (857.78 g), November (845.89 g), December (727.59 g), January (693.94 g) and February (654.72 g) whereas, S_4 (Water soaking) had the lowest yield, which was observed in September (591.07 g), October (598.41 g), November (588.81 g), December (520.30 g), January (473.48 g) and February (442.56 g). In the case of interaction, the highest yield was observed in treatment combination M_3S_1 [Soil + Cocopeat (1:1) + Cattle urine @ 100 ml/litre] in September (1053.78 g), October (1020.44 g), November (977.00 g), December (893.44 g), January (879.50 g) and February (886.67 g). The lowest yield was observed in treatment combination M_1S_4 (Sand + Water soaking) in September (248.44 g), October (350.78 g), November (358.78 g), December (314.11 g), January (210.01 g) and February (210.01 g). Soaking seeds in cattle urine resulted in early germination and development, whereas the Soil + Cocopeat medium contained higher concentrations of N, P, K and micronutrients, resulting in increased growth and maximum yield. Thus, the combination of [Soil + Cocopeat (1:1) + Cattle Urine @ 100 ml/litre] produced the highest yield as compared to the control.

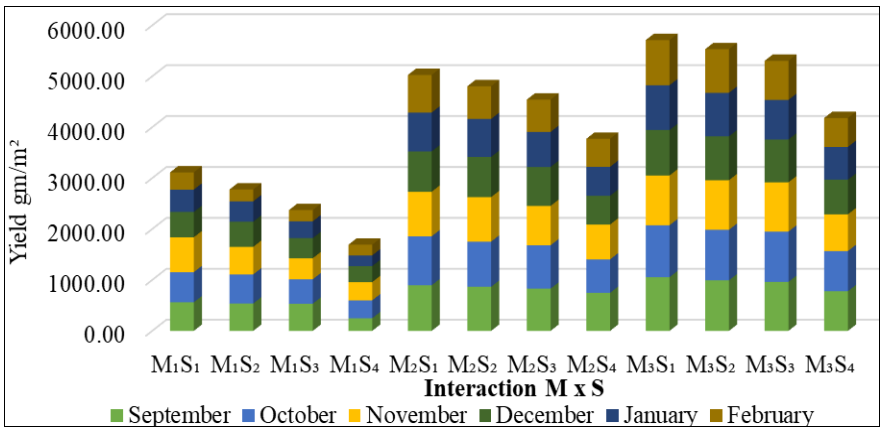

Fig 1: Effect of media and pre-sowing seed treatments on yield (g/m^2) of fenugreek microgreens

Factor A: Growing media	Factor B: Pre-sowing seed treatments	
M_1 - Sand	S_1 - Cattle urine @ 100 ml/litre	S_2 - Vermiwash @ 100 ml/litre
M_2 - Soil + FYM (3:1)	S_3 - Humic acid @ 2 ml/litre	S_4 - Water soaking (control)
M_3 - Soil + Cocopeat (1:1)		

Table 1: Monthwise variation in days required for germination of fenugreek microgreens as affected by media and pre-sowing seed treatments

Treatment	September					October					November				
	S_1	S_2	S_3	S_4	Mean	S_1	S_2	S_3	S_4	Mean	S_1	S_2	S_3	S_4	Mean
M_1	3.71	3.82	4.00	4.50	4.01	4.00	4.07	4.15	4.32	4.13	4.20	4.28	4.28	4.35	4.28
M_2	3.36	3.48	3.54	3.70	3.52	3.44	3.45	3.59	3.93	3.60	3.44	3.55	3.68	4.00	3.67
M_3	2.60	3.30	3.34	3.55	3.20	2.86	3.33	3.41	3.82	3.35	3.00	3.27	3.32	3.92	3.38
Mean	3.22	3.53	3.63	3.92	3.58	3.43	3.62	3.72	4.02	3.70	3.55	3.70	3.76	4.09	3.77
	S.Em.±	CD at 5%		'F' test		S.Em.±	CD at 5%		'F' test		S.Em.±	CD at 5%		'F' test	
S	0.04	0.11		SIG		0.05	0.13		SIG		0.03	0.08		SIG	
M	0.04	0.13		SIG		0.05	0.16		SIG		0.03	0.10		SIG	
SXM	0.08	0.23		SIG		0.09	0.27		SIG		0.06	0.17		SIG	
	December					January					February				
Treatment	S_1	S_2	S_3	S_4	Mean	S_1	S_2	S_3	S_4	Mean	S_1	S_2	S_3	S_4	Mean
M_1	4.23	4.33	4.44	4.45	4.37	4.20	4.40	4.59	4.63	4.45	4.92	5.00	5.15	5.23	5.08
M_2	3.50	3.60	3.80	4.03	3.73	3.78	3.83	3.95	4.07	3.91	4.00	4.17	4.50	4.88	4.39
M_3	3.34	3.35	3.43	4.00	3.53	3.00	3.35	3.56	4.00	3.48	3.00	3.35	3.56	4.73	3.66
Mean	3.69	3.76	3.89	4.16	3.88	3.66	3.86	4.03	4.23	3.95	3.97	4.17	4.40	4.95	4.37
	S.Em.±	CD at 5%		'F' test		S.Em.±	CD at 5%		'F' test		S.Em.±	CD at 5%		'F' test	
S	0.03	0.08		SIG		0.05	0.15		SIG		0.06	0.17		SIG	
M	0.03	0.09		SIG		0.06	0.17		SIG		0.07	0.20		SIG	
SXM	0.05	0.16		SIG		0.10	0.29		SIG		0.12	0.34		SIG	

Factor A: Growing media	Factor B: Pre-sowing seed treatments	
M_1 - Sand	S_1 - Cattle urine @ 100 ml/litre	S_2 - Vermiwash @ 100 ml/litre
M_2 - Soil + FYM (3:1)	S_3 - Humic acid @ 2 ml/litre	S_4 - Water soaking (control)
M_3 - Soil + Cocopeat (1:1)		

Table 2: Monthwise variation in seedling height (cm) of fenugreek microgreens as affected by media and pre-sowing seed treatments

Treatment	September					October					November				
	S_1	**S_2**	**S_3**	**S_4**	**Mean**	**S_1**	**S_2**	**S_3**	**S_4**	**Mean**	**S_1**	**S_2**	**S_3**	**S_4**	**Mean**
M_1	5.37	5.00	4.95	4.83	5.04	5.56	5.17	5.15	5.07	5.24	5.66	5.47	5.35	5.59	5.52
M_2	6.15	6.02	5.84	5.49	5.87	6.43	6.40	6.11	6.00	6.23	6.72	6.62	6.50	6.27	6.53
M_3	7.30	6.73	6.59	5.75	6.59	7.31	7.00	6.58	6.10	6.75	7.29	7.20	6.81	6.35	6.91
Mean	6.27	5.92	5.80	5.36	5.84	6.44	6.19	5.95	5.72	6.07	6.56	6.43	6.22	6.07	6.32
	S.Em.±	**CD at 5%**		**'F' test**		**S.Em.±**	**CD at 5%**		**'F' test**		**S.Em.±**	**CD at 5%**		**'F' test**	
S	0.04	0.13		SIG		0.06	0.16		SIG		0.07	0.20		SIG	
M	0.05	0.15		SIG		0.06	0.19		SIG		0.08	0.23		SIG	
SXM	0.09	0.26		SIG		0.11	0.33		SIG		0.14	0.40		SIG	
	December					**January**					**February**				
Treatment	**S_1**	**S_2**	**S_3**	**S_4**	**Mean**	**S_1**	**S_2**	**S_3**	**S_4**	**Mean**	**S_1**	**S_2**	**S_3**	**S_4**	**Mean**
M_1	5.81	5.45	5.18	4.83	5.32	5.30	4.57	4.46	4.04	4.59	4.99	4.81	4.51	4.36	4.67
M_2	6.61	6.10	6.26	6.08	6.27	6.59	6.52	6.46	6.00	6.39	6.65	6.62	6.56	6.20	6.50
M_3	7.68	7.27	6.64	6.15	6.93	7.58	7.55	6.60	6.06	6.95	7.65	7.25	6.79	6.18	6.97
Mean	6.70	6.27	6.03	5.69	6.17	6.49	6.21	5.84	5.37	5.98	6.43	6.23	5.95	5.58	6.05
	S.Em.±	**CD at 5%**		**'F' test**		**S.Em.±**	**CD at 5%**		**'F' test**		**S.Em.±**	**CD at 5%**		**'F' test**	
S	0.04	0.13		SIG		0.07	0.21		SIG		0.07	0.21		SIG	
M	0.05	0.15		SIG		0.08	0.24		SIG		0.08	0.25		SIG	
SXM	0.09	0.26		SIG		0.14	0.42		SIG		0.15	0.43		SIG	

Factor A: Growing media	Factor B: Pre-sowing seed treatments	
M_1 - Sand	S_1 - Cattle urine @ 100 ml/litre	S_2 - Vermiwash @ 100 ml/litre
M_2 - Soil + FYM (3:1)	S_3 - Humic acid @ 2 ml/litre	S_4 - Water soaking (control)
M_3 - Soil + Cocopeat (1:1)		

Table 3: Monthwise variation in root length (cm) of fenugreek microgreens as affected by media and pre-sowing seed treatments

Treatment	September					October					November				
	S_1	**S_2**	**S_3**	**S_4**	**Mean**	**S_1**	**S_2**	**S_3**	**S_4**	**Mean**	**S_1**	**S_2**	**S_3**	**S_4**	**Mean**
M_1	3.26	3.22	3.02	2.95	3.11	2.00	2.13	2.08	2.00	2.05	2.33	2.15	2.07	2.00	2.14
M_2	3.53	3.43	3.37	3.28	3.40	3.53	3.61	3.37	3.08	3.40	3.73	3.23	3.00	2.45	3.10
M_3	4.47	4.37	4.00	3.35	4.05	4.32	3.98	4.00	3.15	3.86	4.08	3.82	3.67	2.64	3.55
Mean	3.65	3.67	3.46	3.19	3.52	3.28	3.24	3.15	2.74	3.10	3.38	3.07	2.91	2.36	2.93
	S.Em.±	**CD at 5%**		**'F' test**		**S.Em.±**	**CD at 5%**		**'F' test**		**S.Em.±**	**CD at 5%**		**'F' test**	
S	0.06	0.18		SIG		0.04	0.12		SIG		0.06	0.18		SIG	
M	0.07	0.21		SIG		0.05	0.15		SIG		0.07	0.21		SIG	
SXM	0.13	0.39		SIG		0.09	0.27		SIG		0.12	0.36		SIG	
	December					**January**					**February**				
Treatment	S_1	S_2	S_3	S_4	Mean	S_1	S_2	S_3	S_4	Mean	S_1	S_2	S_3	S_4	Mean
M_1	2.76	2.54	2.10	2.05	2.36	3.00	2.12	2.07	2.00	2.30	2.17	2.12	2.00	2.18	2.18
M_2	4.00	3.90	3.22	3.00	3.53	3.45	3.31	3.15	3.05	3.24	3.41	3.46	3.23	2.67	3.19
M_3	4.85	4.65	4.56	3.16	4.31	3.86	3.56	3.64	3.15	3.55	4.07	4.00	3.67	3.00	3.68
Mean	3.87	3.70	3.29	2.74	3.40	3.44	3.00	2.95	2.73	3.03	3.22	3.19	3.11	2.56	3.02
	S.Em.±	**CD at 5%**		**'F' test**		**S.Em.±**	**CD at 5%**		**'F' test**		**S.Em.±**	**CD at 5%**		**'F' test**	
S	0.10	0.29		SIG		0.06	0.18		SIG		0.07	0.21		SIG	
M	0.11	0.33		SIG		0.06	0.18		SIG		0.08	0.24		SIG	
SXM	0.20	0.58		SIG		0.11	0.33		SIG		0.14	0.42		SIG	

Factor A: Growing media	Factor B: Pre-sowing seed treatments	
M_1 - Sand	S_1 - Cattle urine @ 100 ml/litre	S_2 - Vermiwash @ 100 ml/litre
M_2 - Soil + FYM (3:1)	S_3 - Humic acid @ 2 ml/litre	S_4 - Water soaking (control)
M_3 - Soil + Cocopeat (1:1)		

Table 4: Monthwise variation in days required for harvest of fenugreek microgreens as affected by media and pre-sowing seed treatments

Treatment	September					October					November				
	S_1	**S_2**	**S_3**	**S_4**	**Mean**	**S_1**	**S_2**	**S_3**	**S_4**	**Mean**	**S_1**	**S_2**	**S_3**	**S_4**	**Mean**
M_1	8.12	8.22	8.56	8.67	8.39	8.60	8.63	8.83	9.00	8.77	8.80	8.75	8.54	9.00	8.77
M_2	7.75	7.83	7.60	8.00	7.80	7.94	8.00	8.17	8.52	8.16	8.39	8.43	8.50	8.67	8.50
M_3	7.00	7.20	7.46	8.00	7.41	7.00	7.32	7.62	8.43	7.59	8.00	8.28	8.39	8.50	8.29

Mean	7.63	7.75	7.87	8.22	7.87	7.85	7.98	8.21	8.65	8.17	8.40	8.48	8.48	8.72	8.52
	S.Em.±	**CD at 5%**		**'F' test**		**S.Em.±**	**CD at 5%**		**'F' test**		**S.Em.±**	**CD at 5%**		**'F' test**	
S	0.06	0.19		SIG		0.04	0.12		SIG		0.04	0.12		SIG	
M	0.07	0.22		SIG		0.05	0.13		SIG		0.05	0.14		SIG	
SXM	0.13	0.38		SIG		0.08	0.23		SIG		0.08	0.24		SIG	
	December					**January**					**February**				
Treatment	**S_1**	**S_2**	**S_3**	**S_4**	**Mean**	**S_1**	**S_2**	**S_3**	**S_4**	**Mean**	**S_1**	**S_2**	**S_3**	**S_4**	**Mean**
M_1	9.05	9.12	9.15	9.33	9.16	9.22	9.32	9.75	10.00	9.57	9.33	8.83	9.00	10.00	9.29
M_2	8.44	8.50	8.75	9.00	8.67	8.70	8.75	8.80	9.11	8.84	8.39	8.44	8.51	8.60	8.49
M_3	8.00	8.28	8.39	8.90	8.39	8.50	8.53	8.68	9.00	8.68	8.33	8.44	8.60	9.00	8.59
Mean	8.50	8.63	8.76	9.08	8.74	8.81	8.87	9.08	9.37	9.03	8.68	8.57	8.70	9.20	8.79
	S.Em.±	**CD at 5%**		**'F' test**		**S.Em.±**	**CD at 5%**		**'F' test**		**S.Em.±**	**CD at 5%**		**'F' test**	
S	0.04	0.11		SIG		0.04	0.10		SIG		0.07	0.19		SIG	
M	0.05	0.13		SIG		0.04	0.12		SIG		0.08	0.22		SIG	
SXM	0.08	0.23		SIG		0.07	0.21		SIG		0.13	0.39		SIG	

Factor A: Growing media	**Factor B: Pre-sowing seed treatments**	
M_1 - Sand	**S_1** - Cattle urine @ 100 ml/litre	**S_2** - Vermiwash @ 100 ml/litre
M_2 - Soil + FYM (3:1)	**S_3** - Humic acid @ 2 ml/litre	**S_4** - Water soaking (control)
M_3 - Soil + Cocopeat (1:1)		

Table 5: Number of cycles per month of fenugreek microgreens as affected by media and pre-sowing seed treatments

Treatment	**September**					**October**					**November**				
	S_1	**S_2**	**S_3**	**S_4**	**Mean**	**S_1**	**S_2**	**S_3**	**S_4**	**Mean**	**S_1**	**S_2**	**S_3**	**S_4**	**Mean**
M_1	2.33	2.33	2.00	2.00	2.17	2.50	2.50	2.33	2.00	2.33	2.00	2.00	2.00	2.00	2.00
M_2	3.00	2.80	2.50	2.43	2.68	2.87	2.87	2.50	2.50	2.68	3.00	2.80	2.50	2.43	2.68
M_3	3.00	3.00	3.00	2.80	2.95	3.00	3.00	3.00	2.50	2.88	3.00	3.00	3.00	2.43	2.86
Mean	2.78	2.71	2.50	2.41	2.60	2.79	2.79	2.61	2.33	2.63	2.67	2.60	2.50	2.29	2.51
	S.Em.±	**CD at 5%**		**'F' test**		**S.Em.±**	**CD at 5%**		**'F' test**		**S.Em.±**	**CD at 5%**		**'F' test**	
S	0.03	0.10		SIG		0.03	0.08		SIG		0.01	0.04		SIG	
M	0.04	0.11		SIG		0.03	0.09		SIG		0.01	0.04		SIG	
SXM	0.07	0.19		SIG		0.05	0.16		SIG		0.03	0.08		SIG	
	December					**January**					**February**				
Treatment	**S_1**	**S_2**	**S_3**	**S_4**	**Mean**	**S_1**	**S_2**	**S_3**	**S_4**	**Mean**	**S_1**	**S_2**	**S_3**	**S_4**	**Mean**
M_1	2.50	2.50	2.33	2.00	2.33	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
M_2	2.80	2.60	2.50	2.43	2.58	2.50	2.50	2.43	2.00	2.36	2.50	2.50	2.43	2.00	2.36
M_3	3.00	3.00	3.00	2.43	2.86	2.87	2.70	2.33	2.00	2.48	2.87	2.70	2.33	2.00	2.48
Mean	2.77	2.70	2.61	2.29	2.59	2.46	2.40	2.26	2.00	2.28	2.46	2.40	2.26	2.00	2.28
	S.Em.±	**CD at 5%**		**'F' test**		**S.Em.±**	**CD at 5%**		**'F' test**		**S.Em.±**	**CD at 5%**		**'F' test**	
S	0.03	0.09		SIG		0.04	0.12		SIG		0.04	0.12		SIG	
M	0.04	0.11		SIG		0.05	0.14		SIG		0.05	0.14		SIG	
SXM	0.06	0.18		SIG		0.08	0.24		SIG		0.08	0.24		SIG	

Factor A: Growing media	**Factor B: Pre-sowing seed treatments**	
M_1 - Sand	**S_1** - Cattle urine @ 100 ml/litre	**S_2** - Vermiwash @ 100 ml/litre
M_2 - Soil + FYM (3:1)	**S_3** - Humic acid @ 2 ml/litre	**S_4** - Water soaking (control)
M_3 - Soil + Cocopeat (1:1)		

Table 6: Effect of media and pre-sowing seed treatments on total cycles in 6 month of fenugreek microgreens

Treatment	**S_1**	**S_2**	**S_3**	**S_4**	**Mean**
M_1	13.32	13.22	12.64	12.00	12.80
M_2	16.67	16.07	14.86	13.53	15.28
M_3	17.74	17.40	16.66	14.16	16.49
Mean	15.91	15.56	14.72	13.23	14.86
	S.Em.±	CD at 5%		'F' test	
S	0.11	0.33		SIG	
M	0.13	0.38		SIG	
SXM	0.22	0.65		SIG	

Factor A: Growing media	**Factor B: Pre-sowing seed treatments**	
M_1 - Sand	S_1 - Cattle urine @ 100 ml/litre	S_2 - Vermiwash @ 100 ml/litre
M_2 - Soil + FYM (3:1)	S_3 - Humic acid @ 2 ml/litre	S_4 - Water soaking (control)
M3 - Soil + Cocopeat (1:1)		

Table 7: Monthwise variation in yield (g/m^2) of fenugreek microgreens as affected by media and pre-sowing seed treatments

Treatment	September					October					November				
	S_1	S_2	S_3	S_4	Mean	S_1	S_2	S_3	S_4	Mean	S_1	S_2	S_3	S_4	Mean
M_1	561.22	538.78	533.56	248.44	470.50	592.00	570.11	479.11	350.78	498.00	684.78	540.89	413.00	358.78	499.36
M_2	895.44	866.22	829.56	746.33	834.39	960.89	885.78	851.22	656.33	838.56	875.89	875.22	773.78	685.11	802.50
M_3	1053.78	993.00	961.44	778.44	946.67	1020.44	991.78	987.33	788.11	946.92	977.00	974.52	968.44	722.56	910.63
Mean	836.81	799.33	774.85	591.07	750.52	857.78	815.89	772.56	598.41	761.16	845.89	796.88	718.41	588.81	737.50
	S.Em.±	**CD at 5%**		**'F' test**		**S.Em.±**	**CD at 5%**		**'F' test**		**S.Em.±**	**CD at 5%**		**'F' test**	
S	2.70	7.92		SIG		3.16	9.28		SIG		2.88	8.46		SIG	
M	3.12	9.14		SIG		3.65	10.72		SIG		3.33	9.77		SIG	
SXM	5.40	15.84		SIG		6.33	18.56		SIG		5.77	16.91		SIG	
	December					**January**					**February**				
Treatment	S_1	S_2	S_3	S_4	Mean	S_1	S_2	S_3	S_4	Mean	S_1	S_2	S_3	S_4	Mean
M_1	497.66	495.33	395.67	314.11	425.69	438.67	400.00	329.67	210.01	344.59	338.67	231.83	221.33	210.01	250.46
M_2	791.67	790.44	765.44	566.33	728.47	763.67	744.09	686.83	567.33	690.48	738.82	643.22	635.00	550.33	641.84
M_3	893.44	861.78	842.00	680.44	819.42	879.50	854.67	776.00	643.09	788.31	886.67	856.67	769.33	567.33	770.00
Mean	727.59	715.85	667.70	520.30	657.86	693.94	666.25	597.50	473.48	607.79	654.72	577.24	541.89	442.56	554.10
	S.Em.±	**CD at 5%**		**'F' test**		**S.Em.±**	**CD at 5%**		**'F' test**		**S.Em.±**	**CD at 5%**		**'F' test**	
S	2.53	7.41		SIG		3.21	9.42		SIG		7.31	21.44		SIG	
M	2.92	8.56		SIG		3.71	10.87		SIG		8.44	24.76		SIG	
SXM	5.06	14.83		SIG		6.42	18.83		SIG		14.62	42.88		SIG	

Factor A: Growing media	Factor B: Pre-sowing seed treatments	
M_1 - Sand	S_1 - Cattle urine @ 100 ml/litre	S_2 - Vermiwash @ 100 ml/litre
M_2 - Soil + FYM (3:1)	S_3 - Humic acid @ 2 ml/litre	S_4 - Water soaking (control)
M_3 - Soil + Cocopeat (1:1)		

Conclusion

Based on the results, it concluded that media and pre-sowing seed treatments affected the fenugreek microgreens' development and yield. Among the three growing media, treatment M_3 [Soil+ cocopeat (1:1)] found superior in some of the growth parameters like days for germination and root length while yield parameters like days required for harvest, number of cycles per month, total cycles in 6 month and yield/m^2. In case of pre-sowing seed treatments, treatment S_1 (Cattle Urine 100ml/litre) have shown highest performance in growth parameters *viz*., days required for germination, seedling height, root length and yield parameters like days required for harvest, number of cycles per month, total cycles in 6 month and yield/m^2. Among all the treatment combination M_3S_1 [Soil+ cocopeat (1:1) + Cattle Urine 100ml/litre] shows significant effect on most of the growth parameters and yield parameters. However, the study needs to be repeated for two to three seasons in order to confirm these findings

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