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Effect of Panchgavya and Jeevamrita on growth and seed yield of fenugreek

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Abstract
The present study entitled "Effect of Panchgavya and Jeevamrita on Growth and Seed Yield of Fenugreek (*Trigonella foenum-graecum* L.)" was carried out during the year 2023-24 in the Research and Instructional Farm at Bharregaon under Pt. Kishori Lal Shukla College of Horticulture and Research Station, Rajnandgaon, (C.G.). The investigation was framed in Randomized Block Design with three replication and nine treatment consisting a control *viz.* T_1 (Control), T_2 (Panchgavya @ 3% at seed treatment), T_3 (Panchgavya @ 3% at pre flowering), T_4 (Panchgavya @ 3% at pod setting), T_5 (Panchgavya @ 3% at pre flowering and pod setting), T_6 (Jeevamrita @ 3% at seed treatment), T_7 (Jeevamrita @ 3% at pre flowering), T_8 (Jeevamrita @ 3% at pod setting), T_9 (Jeevamrita @ 3% at pre flowering and pod setting).
The finding of the present investigation clearly indicated that the foliar application of T_5 (Panchgavya @ 0.3%) at pre flowering and pod setting gave significantly better performance at growth parameters like maximum plant height i.e. (15.06 cm, 37.02 cm and 51.97 cm) at 30 DAS, 60 DAS and at harvest time, maximum number of primary branches per plant (6.50) at maturity, maximum number of secondary branches per plant (18.29) at maturity, days of first pod formation (50.82) weight of per plant at maturity (48.32) and as well as yield parameters like maximum number of pod plant (29.54), length of pod (12.53), maximum number of seed per plant (18.92), maximum seed yield per plant (4.81 g), maximum seed yield per plot (0.81 kg), maximum seed yield per hectare (13.53 q), maximum 1000 seed weight (12.02 gm) maximum harvest index (48.40%).

Keywords: Fenugreek, Panchgavya, Jeevamrita, growth, seed and yield

Introduction
India**,** 'The land of spices' is the world's largest producer, consumer and exporter of seed spices in the world. Fenugreek (*Trigonella foenum-graecum* L.) Commonly known as 'methi' is multipurpose crop growing during winter season in northern India. It is an annual herb belonging to the family-Fabaceae and sub family-Papilionacea. It is one of the of the important major seed spice in the country. Fenugreek is cultivated as leafy vegetable, spice, condiment and medicine. Fenugreek is mainly grown in India, Pakistan, China, Nepal and Bangladesh. In India, it is commercially grown in Rajasthan, Gujarat, Madhya Pradesh, Haryana, West Bengal, Punjab and Maharashtra. Rajasthan occupies 80% of area and production (Babaleshwar and Shetty, 2017) [2]. In India, fenugreek cultivated in an area of about 120 thousand hectares with a production of 188 thousand tonnes (Anonymous, 2019-20) [1]. Mostly confined to Rajasthan (84%) and Gujarat (15%) states followed by Uttar Pradesh (1%).
Panchgavya and Jeevamrita are fermented liquid organic manure or Bio-enhancer which are cheaper and eco-friendly. It is prepared from cow product namely dung, urine, milk, curd, and ghee. It is used as a soil treatment, seed treatment and foliar spray along with irrigation water. Panchgavya significantly effect on seed germination, seedling length, seedling vigour index and significantty highest germination percentage (99%) were noticed in the seeds treated from Panchgavya. Likewise, Jeevamrita also rich in various microorganisms like Azospirillium, PSM, pseudomonas, trichoderma, yeast and mould which promotes immense biological activity in soil and makes the nutrients available to crop (Devakumar *et al.*, 2008) [5]. The presence of many beneficial microorganisms viz. nitrogen fixers, phosphorus solubilizers, actinomycetes and fungi in Janchgavya and Jeevamrita. (Sreenivase, *et al.* 2010) [15].

The application of liquid organic inputs like Panchgavya and Jeevamrita results in increase in number of beneficial microbes and also shows profound effect on soil enzymic activity. Thus, they enhance the growth of crop and can help in sustaining of safe environment and crop productivity.

Materials and Methods

The investigation was carried out at Pt. K.L.S. College of Horticulture and Research Station, Pendri, Rajnandgaon (C.G.) during *Rabi* season 2023-24. The field experiment was conducted in Randomized Block Design with three replications having nine different treatments with Panchgavya and Jeevamrita *i.e.* T_1 (Control), T_2 (Panchgavya @ 3% at seed treatment), T_3 (Panchgavya @ 3% at pre flowering), T_4 (Panchgavya @ 3% at pod setting), T_5 (Panchgavya @ 3% at pre flowering and pod setting), T_6 (Jeevamrita @ 3% at seed treatment), T_7 (Jeevamrita @ 3% at pre flowering), T_8 (Jeevamrita @ 3% at pod setting), T_9 (Jeevamrita @ 3% at pre flowering and pod setting). The soil was made to fine tilth by continuous harrowing after the area had been carefully ploughed, weeds, stubbles, stones etc., were completely removed. Application of FYM at 100 q/ha or compost at 60 kg/ha, and the recommended fertilizer dosage for fenugreek is 40:40:20 kg/ha (N:P:K). During field preparation, potassium, phosphorus and In order to assure adequate germination and the establishment of the crop seedling, a light irrigation was administered six days following the initial irrigation depending upon need of crop nitrogen were added as murate of potash, urea, and single superphosphate respectively. One month after seed sowing, a top dressing of 12 grams of nitrogen per plot is also administered.

Results and Discussion

A. Growth parameters of Fenugreek

1. Plant height at 30 DAS, 60 DAS and at the harvesting time

At 30 days, the maximum plant height (15.06 cm) was reported in T_5 (Panchgavya @ 3% at pre flowering and pod setting), which was at par with T_2 (Panchgavya @ 3% at seed treatment) (14.40 cm) and T_9 (Jeevamrita @ 3% at pre flowering and pod setting) (13.91cm), while the minimum plant height (10.99 cm) was reported in T_1 (Control water).

At 60 days, the maximum plant height (37.02 cm) was reported in T_5 (Panchgavya @ 3% at pre flowering and pod setting), which was followed by with T_9 (Jeevamrita @ 3% at pre flowering and pod setting) (33.56 cm), T_2 (Panchgavya @ 3% at seed treatment) (33.54 cm), T_8 (Jeevamrita @ 3% at pre flowering) (32.62 cm) and while the minimum plant height (26.73 cm) was revealed in T_1 (Control water).

At the time of harvesting, the maximum plant height (51.97 cm) was recorded in T_5 (Panchgavya @ 3% at pre flowering and pod setting), which was followed by with T_9 (Jeevamrita @ 3% at pre flowering and pod setting)) (50.99 cm), while the minimum plant height (40.20 cm) was recorded in T_1 (Control water).

The increase in plant height as a result of Panchgavya @ 3% pre flowering and pod setting application might be due to the nutrient in Panchgavya, which include macro and micronutrients and smaller amount of growth hormones like IAA and GA_3 present stimulation of cell elongation while increasing the plasticity of the cell wall and rapid cell division in the growing portion, leading to an increased length of internodes. A similar result was obtained by Patel *et al.* (2013) [12] and Choudhary *et al.* (2014) [4], in fenugreek.

2. Number of primary branches per plant

The maximum number of primary branches was recorded in T_5 (Panchgavya @ 3% at pre flowering and pod setting) (6.50), which was at par with T_9 (Jeevamrita @ 3% at pre flowering and pod setting) (6.20) and T_2 (Panchgavya @ 3% at seed treatment) (5.94), it was observed lowest number of primary branches (5.07) was recorded in T_1 (Control water).

Application of Panchgavya increases the lateral buds, breaks apical bud dormancy and physiological development may be the reason for the increased number of branches per plant. Similar result were also reported by Patel *et al.* (2013) [12] and Yadav and Tripathi *et al.* (2013) [17] and Gowthamchand *et al.* (2019) [7] in fenugreek.

3. Number of secondary branches per plant of Fenugreek

The maximum number of secondary branches was recorded in T_5 (Panchgavya @ 3% at pre flowering and pod setting) (18.29), which was at par with T_9 (Jeevamrita @ 3% at pre flowering and pod setting) (17.20) and T_2 (Panchgavya @ 3% at seed treatment) (17.07), while the minimum number of secondary branches (14.03) was reported in T_1 (Control water).

The use of Panchgavya may increase the number of branches per plant by increasing lateral buds, breaking apical bud dominance, and promoting physiological growth. Similar findings were recorded by Patel *et al.* (2013) [12], Yadav and Tripathi *et al.* (2013) [17] and Gowthamchand *et al.* (2019) [7] in fenugreek.

4. Days of first pod formation

The days of first pod formation ranged from 50.82 (T_5) to 55.03 (T_1). The minimum days of first pod formation (50.82 days) was recorded in T_5 (Panchgavya @ 3% at pre flowering and pod setting) which was at par with T_9 (Jeevamrita @ 3% at pre flowering and pod setting) (51.20 days) and T_2 (Panchgavya @ 3% at seed treatment) (51.62 days), while the maximum days of first pod formation (55.03 days) was reported in T_1 (Control water).

The application of Panchgavya and Jeevamrita had non-significant effect on the days to first pod formation. Observation on days to first pod formation was statistically analyzed and presented. Similar findings were recorded by Patel *et al.* (2013) [12] and Gowthamchand *et al.* (2019) [7] in fenugreek.

5. Weight of per plant at maturity (g)

The highest weight of per plant at maturity was recorded in T_5 (Panchgavya @ 3% at pre flowering and pod setting) (48.32 g) which was at par with T_2 (Panchgavya @ 3% at seed treatment) (47.49 g) and T_9 (Jeevamrita @ 3% at pre flowering and pod setting) (47.38 g), while the minimum weight of per plant at maturity (42.04 g) was recorded in T_1 (Control water).

The application of Panchgavya @ 3% pre flowering and pod setting increase in plant height and notable increase in number of branches per plant due to nutrient delivery via foliar application of Panchgavya. Similar findings were recorded by Patel *et al.* (2013) [12] and Gowthamchand *et al.* (2019) [7] in fenugreek.

B. Yield parameter of Fenugreek

1. Number of pod per plant

The significantly number of pod per plant was reported in T_5 (Panchgavya @ 3% at pre flowering and pod setting) (35.78), which was followed by with T_9 (Jeevamrita @ 3% pre flowering and pod setting) (34.36), while the minimum number of pod per plant was reported in treatment T_1 Control (water) (26.26).

Increase in pods per plant might be due to availability and optimum supply nutrients from foliar application of Panchgavya to plant favourably influenced the flowering and seed formation which ultimately increase the number of branches per plant provided basic plant infrastructure for the development of more number of reproduction parts and there by increased the sink size in terms of more number of pods per plant. Similar result were also reported by Yadav *et al.* (2013) [17], Gowda *et al.* (2018) [6], Gowthamchand *et al.* (2019) [7], Sutar *et al.* (2019) [16].

2. Length of pod (cm)

The maximum length of pod was reported in T_5 (Panchgavya @ 3% at pre flowering and pod setting) (12.53 cm), which was at par with T_9 (Jeevamrita @ 3% at pre flowering and pod setting) (11.62), while the minimum length of pod (8.42 cm) was reported in treatment T_1 (Control water).

A higher length of pod may have resulted from improved vegetative growth brought on by the administration of gibberellic acid and IAA present in Panchgavya when applied have created stimulation in the plant system, increased photosynthesis, and increased mobilization of photosynthesis towards reproductive areas and the increased length of pod. Similar results were also noted by Kumar *et al.* (2011) [9].

3. Number of seed per pod

Among the applied treatment T_5 (Panchgavya @ 3% at pre flowering and pod setting) was recorded significantly higher number of seed per pod (18.92) which was followed by with T_9 (Jeevamrita @ 3% at pre flowering and pod setting) (18.17), while the minimum number of seeds per pod (11.70) was reported in treatment T_1 (Control water).

The increase in the number of seeds per pod might be attributed to the nutrient in Panchgavya, which include macro nutrient such as nitrogen, phosphorus and potassium as well as micro nutrients required for plant growth and development enhanced physiological activities like photosynthesis and translocation of nutrients and photosynthesis. Similar result were also observed by Mohammed *et al.* (1975) [11], and Saxena *et al.* (1989) [13] in fenugreek.

4. Seed yield per plant (g)

The highest seeds yield per plant was recorded in T_5 (Panchgavya @ 3% at pre flowering and pod setting) (4.81 g), which was at par with T_9 (Jeevamrita @ 3% pre flowering and pod setting) (4.32 g), Significantly minimum seed yield per plant was recoded in treatment T_1 (Control water) (0.42 g).

Seed yield per plant was significantly increased by T_5 Panchgavya @ 3% pre flowering and pod setting, which might be due to an increase in the number of pod in per plant, length of per pod, number of seeds per pod and which in turn due to increased number of branches. These results were per pod in conformity with the findings of Singh and Singh *et al.* (2012) [14], Patel *et al.* (2013) [12], Yadav and Tripathi *et al.* (2013) [17] and Choudhary *et al.* (2014) [4]

5. Seed yield per plot (kg)

The highest seeds yield per plot was recorded in T_5 (Panchgavya @ 3% at pre flowering and pod setting) (0.81 kg), which was at par with T_9 (Jeevamrita @ 3% at pre flowering and pod setting) (0.76 kg) and T_2 (Panchgavya @ 3% at seed treatment) (0.71 kg), while the minimum seed yield per plot (0.42 kg) was revealed in treatment T_1 (Control water).

The increase seeds yield per plot might be due to increase yield per plant and per unit area. The above results were in accordance with the findings of Singh and Singh *et al.* (2012) [14], Patel *et al.* (2013) [12], Mehta and Patel (2011) [10], Yadav and Tripathi *et al.* (2013) [17] and Choudhary *et al.* (2014) [4] in fenugreek.

6. Seed yield per hectare (q)

The maximum seed yield per was recorded in T_5 (Panchgavya @ 3% at pre flowering and pod setting) (15.53 q/ha), which was followed by T_9 (Jeevamrita @ 3% at pre flowering and pod setting) (12.71 q/ha) and T_2 (Panchgavya @ 3% at seed treatment) (11.58 q/ha), while the minimum seed yield per hectare was revealed in treatment T_1 (Control water (7 q/ha).

This increase in seed yield per hectare could be attributed to an increase in yield attributing characters such as number of pod per plant, number of seed per plant, seed yield per plant and an increase in growth parameters like number of branches (primary and secondary) per plant. The above results were in conformity with the findings of Singh and Singh *et al.* (2012) [14] and Mehta and Patel (2011) [10] in fenugreek.

7. 1000 seed weight (g)

The maximum 1000 seed weight (12.02 g) was reported in T_5 (Panchgavya @ 3% at pre flowering and pod setting), which was followed by with T_9 (Jeevamrita @ 3% at pre flowering and pod setting) (11.86 g), T_2 (Panchgavya @ 3% at seed treatment) (11.58 g) and T_8 (Jeevamrita @ 3% at pod setting) (11.45 g), while the minimum 1000 seed weight (9.34 g) was revealed in treatment T_1 (Control water).

Application of plant Panchgavya had a significantly higher effect on the 1000 seed weight of the seed (Table 1). The reason of higher test weight in fenugreek sown plants is due to the fact got sufficient time for its growth, favourable climatic condition. Similar results were reported by Bhawariya *et al.* (2022) [3] and Mehta and Patel (2011) [10] in fenugreek.

8. Harvest index (%)

The maximum harvest index was recorded in T_5 (Panchgavya @ 3% at pre flowering and pod setting) (48.40%), which was at par with T_9 (Jeevamrita @ 3% at pre flowering and pod setting) (45.01%), T_2 (Panchgavya @ 3% at seed treatment) (44.14%) and T_8 (Panchgavya @ 3% at pod setting) (42.89%), while the minimum harvest index was revealed in treatment T_1 (Control water) (28.05%).

The maximum harvest index was with Panchgavya @ 3% at pre flowering and pod setting, due to the higher seed yield. The increased harvest index might be attributed to increased seed yield with less biological yield. The beneficial effect of

Panchgavya application on fenugreek with respect to harvest index is in accordance with the findings of Kumar *et al.* (2018) [8] in fenugreek.

Table 1: Effect of Panchgavya and Jeevamrita on Growth and Seed Yield of Fenugreek

Treatment	Treatments details	Plant height (cm)			Number of primary branches	No of secondary branches	Days of first pod formation	Weight of per plant at maturity	No of pod per plants	Length of pod (cm)	No of Seed per pod	Seed yield per plant (g)	Seed yield per plot (kg)	Seed yield per hectare (q.)	1000 seed weight (g)	Harvest Index (%)
T_1	Control	10.99	26.73	40.24	5.07	14.03	55.03	42.04	26.26	8.42	11.70	2.39	0.42	7.00	9.34	28.05
T_2	Panchgavya @ 3% at seed treatment	14.40	33.54	44.64	5.94	17.07	51.62	47.49	31.44	11.07	14.76	4.24	0.71	11.86	11.58	44.14
T_3	Panchgavya @ 3% at pre flowering	13.22	32.40	43.03	5.53	16.32	52.39	44.54	29.73	9.84	14.47	3.82	0.64	10.75	11.36	39.27
T_4	Panchgavya @ 3% at pod setting	11.90	28.69	41.43	5.15	15.44	53.77	43.00	26.93	8.79	13.04	3.21	0.62	10.43	9.67	31.34
T_5	Panchgavya @ 3% at pre flowering and pod setting	15.06	37.02	51.97	6.50	18.29	50.82	48.32	35.78	12.53	18.92	4.81	0.81	13.53	12.02	48.4
T_6	Jeevamrita @ 3% at seed treatment	12.47	31.29	42.89	5.27	15.98	52.54	45.02	29.54	9.78	14.34	3.55	0.61	10.21	11.03	36.42
T_7	Jeevamrita @ 3% at pre flowering	11.96	30.11	41.83	5.21	15.89	52.64	43.02	29.49	9.48	13.50	3.34	0.59	8.30	10.37	33.86
T_8	Jeevamrita @ 3% at pod setting	13.83	32.62	44.36	5.81	16.42	51.93	45.86	30.20	10.78	14.56	4.13	0.66	11.13	11.45	42.89
T_9	Jeevamrita @ 3% at pre flowering and pod setting	13.91	33.56	50.99	6.20	17.20	51.20	47.38	34.36	11.62	18.17	4.32	0.76	12.71	11.86	45.01
SE(m)		0.57	1.59	2.13	0.26	0.80	1.65	1.03	1.63	0.56	0.91	0.14	0.03	0.6	9.96	2.10
C.D.		1.71	4.77	6.39	0.78	2.38	4.95	3.09	4.90	1.67	2.72	0.43	0.09	1.79	0.6	6.29
C.V.		7.43	8.67	8.28	7.97	8.45	5.43	3.94	9.30	9.41	10.59	8.2	8.38	10.39	1.79	9.36

Conclusion

On the basis of the observations recorded, it may be concluded from the present investigation that the growth parameters like plant height, number of primary branches per plant, number of secondary branches per plant, days to 1st flowering, days to 50% flowering, number of pod per plant and number of seed plant were significantly superior with the treatment T_5 (Panchgavya @ 3% at pre flowering and pod setting) cultivation as compared to other treatments tried in this experiment to future crop planning.

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