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Comparative Effect of Chemical, Organic Fertilizer and Panchamrit Bio Fertilizer on Growth and Yield of Fenugreek (*Trigonellafoenum-Gracum*)

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Abstract

The Field trial was conducted at Botanical garden of Gujarat University, to assess the comparative effect of Chemical, Organic fertilizer and Panchamrit (As a bio fertilizer) on the growth and yield production. Fenugreek was planted in pots and was watered and maintained regularly over 66 days' periods. The study was conducted to assess the potential of Panchamrit as viable alternatives to Chemical and Organic fertilizer. The experiment was laid out in experimental design with four treatments and three replications. T_1 = Control, T_2 = Chemical fertilizer T_3 = Organic fertilizer and T_4 = Panchamrit. In Panchamrit treatment, Fenugreek plant indicates superior significance on whole dry weight, macro, micro nutrients and rhizobium bacteria. The results of this study provide useful information to farmers and policymakers.

Keywords: Panchamrit, Organic fertilizer, Rhizobium bacteria, Policymakers.

Introduction

The application of fertilizers is one of the primary methods for improving the availability of soil nutrients to plants; applying Fertilizer can change rates of plant growth, maturity time, size of plant parts, and phytochemical content of plants and seed capabilities. High-input practices such

as heavy use of chemical fertilizers have created a variety of economic, environmental, ecological and social problems. Furthermore, the increasing costs of chemical inputs have left farmers helpless, resulting to decreasing seed quality of certain crops and resulting in the fall of commodity prices and consequently reducing farm income .Farmers have become increasingly dependent on off-farm supplies, which requires cash and may not always be available on time (1). Fenugreek (*Trigonella foenum-graecum*) belonging to the family Leguminosae. It is an important minor spice regularly grown for its seeds and leaves. Seeds of Fenugreek (*Trigonellafoenum-graecum*) are used as a condiment for flavoring of foods regularly and leaves are used as vegetable. It has medicinal value in our daily life (2). Main goal of sustainable agriculture in present days is to maintain the production at the level essential to meet the increasing aspiration of expanding country population without degrading the quality of the environment (3).The main objective of this study is to evaluate the effect of different fertilizers on the growth of selected plants and assessment of changes in physio-chemical properties of soil and bacterial growth in soil treated with different fertilizers after harvesting.

Materials and Methods

For this experiment, Local variety of Fenugreek seeds were collected from the grocery shop these seeds were grown in the pots in Botanical Garden of Botany Department, Gujarat University.

Experimental Design: An experiment was conducted with 4 treatments and 3 replicates. Treatment 1: Control = No fertilizer added, Treatment 2: Chemical fertilizer = Readymade Urea which contain 45% nitrogen, Treatment 3: Organic fertilizer = Readymade market product fertilizer which content minerals, Treatment 4: Panchamrit (As a Bio fertilizer) = Local cow dung(10kg), Cow urine(10liters), Jaggery/sugar cane juice(1kg), Gram flour(any pulses flour,1kg), Water(200liters).Mix all these components and keep it under the shadow for one week to allow fermentation process. Whenever need for usage filter with muslin's cloth and then apply it. It is used in different forms such as foliar spray, soil application along with irrigation water, seed or seedling treatment etc.

Data collection: Seeds were sown in 12 pots on 2nd January, 2017 in winter season and the fertilizer treatments were given by every 10 days of interval. Data of growth and yield of Fenugreek were taken from tagged pots. Observations were recorded after four leaf stage and first reading was taken at 25th January, 2017, then each interval of 7 days till 8th March.

Fig. 1: General view of experimental design of Fenugreek (Trigonella *foenum-graecum*) vegetable

Parameters studied: To evaluate the effect of different fertilizer on fenugreek plant growth several parameters had been studied. Yield components such as root length, shoot length in cm and leaves weight, shoot weight, root weight(fresh and dry) in mg were recorded at alternation of 7 days. From this further RGR, NAR and LWR were calculated.

Soil Nutrient Analysis: The uptake or accumulation of the Macro nutrients is direct reflection of the yield production. So, for Nutrient analysis soil test was conducted in the soil laboratory of IFFCO, Kalol and in this laboratory several parameters had been studied like, Electric conductivity, Macro and micro nutrients.

Microbial Analysis: To evaluate Bacterial growth of Nitrogen fixing bacteria (Rhizobium) in the soil which were treated of different fertilizer was conducted in Gujarat Laboratory, Sahibag, Ahmedabad.

Results & Discussion

Results obtained in present investigation are discussed below**.**

A) Germination Parameter's study in presence of selected fertilizers, in comparison with control.

PARAMETERS	CONTROL	CHEMICAL	ORGANIC	PANCHAMRIT
Leaves dry weight (mg)	40.7±5.7	59.9±7.6	57.4±9.16	56.7±7.8
Shoot dry weight (mg)	65.9±10.06	62.4±16.6	83.6±5.5	101.6±9.7
Root dry weight (mg)	7.2±2.02	9.1±2	9.9±2.6	22.2±9.6
Pod dry weight (mg)	27.15±11.8	9.8±0.3	21.15±0.95	62.8±4.8
Whole plant dry weight (mg)	133.5±3.2	139±27.8	165.2±19	233.5±13.9
RGR	0.01	0.001	0.001	0.002
NAR	0.35	0.005	-0.009	-0.004
LWR	335.18	4.8	6.73	28.24

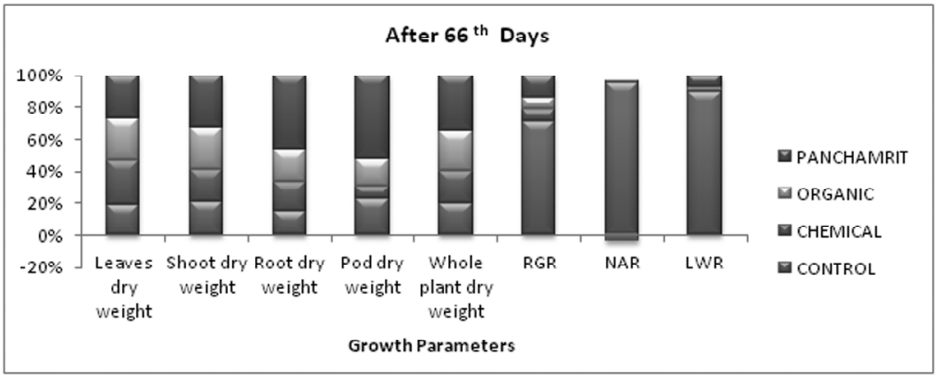

Table.1 Effects of fertilizers treatment on fenugreek (Trigonella *foenum-graecum*) after 66thdays.
Fig.2 Graph indicating effect of selected fertilizers treatment on vegetative growth parameters of Trigonella*foenum graecum L*. after 66th days.

Whole plant dry weight of Panchamrit treatment was higher and lower in control compare to the other treatment. **Panchamrit > Organic > Chemical > Control**.

B) Soil Nutrient Analysis

Sr. No	Name of Element	Unit	Soil sample analysis result				
			Chemical	Organic	Panchamrit	Control	Blank
1	pH	---	7.4	7.2	7.1	7.4	7.5
2	Electric Conductivity	Mille Mohs/cm	0.30	0.29	0.47	0.34	0.24
3	Organic Carbon	In %	0.93	0.60	0.82	1.18	0.46
4	Nitrogen	In %	0.08	0.05	0.07	0.10	0.03
5	Phosphorus	ppm	3.13	6.02	6.98	7.47	6.74
6	Potash	ppm	13.98	13.89	65.54	13.51	11.27
7	Cu	ppm	1.34	1.44	2.18	0.8	1.04
8	Zn	ppm	1.06	0.64	2.44	0.7	1.54
9	Mn	ppm	10.22	9.74	12.12	10.8	7.44
10	Fe	ppm	12.92	12.98	28.00	24.00	16.24
11	Boron	ppm	0.750	0.773	0.540	0.447	0.290
12	Sulphur	ppm	5.10	3.99	6.77	4.44	3.10

Table.2 Physical and Chemical based parameters of soil for different kind of fertilizers.
(Blank = soil sample of before sowing seeds of fenugreek and no treatment applied in it)

C) Nitrogen fixing bacteria (Rhizobium) Analysis

Sr. no.	Sample Name	Result	Test Method
1)	Blank	1.0×10^{6} cfu	BAM
2)	Control	3.4×10^{5} cfu	BAM
3)	Organic fertilizer	5×10^{5} cfu	BAM
4)	Chemical fertilizer	5.6×10^{5} cfu	BAM
5)	Panchamrit	1.0×10^{7} cfu	BAM

Table.3 Data representing the actual no. of Rhizobium bacteria in different fertilizers treated soil through BAM (Bacteriologiacal Analytical Manual) Method.

(Blank = soil sample of before sowing seeds of fenugreek and no treatment applied in it)

The overall Bacterial Analysis indicate that Rhizobium Bacteraia were highly present in the Panchamrit treated soil and lowest in the Control. These Results demonstrate that Microbial Population and their effectiveness were increased by inoculation with Panchamrit.

Conclusion

From the Results obtained, it can be concluded that the Growth parameters data collected during field experiment, In Panchamrit treatment like whole dry weight of Fenugreek plant was higher in compare to other fertilizer treatment. RGR, NAR and LWR also increased throughout six week but in last week it was decreased (**Panchamrit > Organic fertilizer > Chemical fertilizer > Control)**

Result of soil samples analysis showed significant a change In Panchamrit treatment soil chemical and physical properties like pH level was nearly neutral and macro and micro nutrients were increasing. It is goof efficient amendment for improving nutritional properties of soil and increasing crop yield (**Panchamrit > Control > Chemical fertilizer > Organic fertilizer > Blank)**

Based on bacterial analysis, Growth of fenugreek and increase in soil properties have been affected by the inoculation of Rhizobium, because it can fix the atmospheric nitrogen in soil. Presences of these bacteria have increased fenugreek growth factors (**Panchamrit > Chemical fertilizer > Organic fertilizer > Control> Blank)**

Refernces

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