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8

STUDY OF BIO-FERTILIZERS ON TRIGONELLA FOENUM-GRAECUM (FENUGREEK)#

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Abstract

Present investigation was undertaken to study the efficiency of biofertilizers on growth and yield attributes of fenugreek .For this, a field experiment was carried out in pot with five replications. The experiment was conducted at the department of Botany of Dada Patil Mahavidyalaya, Karjat, Ahmednagar during July-August on sandy loam soil at Karjat. The results revealed that significantly greater values of growth parameters viz., plant height, number of branches, number and dry weight of root nodules, dry matter production, crop growth rate as well as yield attributes.

Keywords: Biofertilizers, Yield, Fenugreek, Growth parameters.

#Research Article

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Introduction

Biofertilizer the term refers to preparations containing living cells of efficient of N2 fixing, phosphorous solubilizing or cellulolytic microorganisms which have the capacity to enrich soil fertility either as for living or in the association with the host plants. Simply the term biofertilizer denotes all the nutrient input of biological origin for plant growth. (Subba Rao, 1982). Biofertilizers are the preparation containing living cells or spores, which can supply one or few plant food elements on inoculation now a day's farming community show's much interest in the use of bio-inoculants in a single packet as Biomix of *Azopus*or *Rhizopus,* instead of supplying it as individual organisms several field studied on dual inoculation indicated the compatibility of N2 fixing and 'P' solubilizing microorganisms (Subba Rao,1982).

The types of microorganisms as biofertilizers are available to the farmers in India: Nitrogen fixer, e.g. *Rhizobium,Bradyrhizobium,Azospirillum*, *Azatobacter, Acetobacter, Azolla* and *BGA*. Phosphorous solublizier e.g*. Bacillus*, *Pseudomonas* and *Aspergillus, Phosphate* mobilizer, e.g. *VA- mycorrhiza* (VAM) like Glomus.K-solubilizer, e.g. *Frateuriaaurantia*.Silicate solubilizer, e.g*. Thiobacillusthiooxidans.*Plant growth promoting biofertilizers, e.g. *Pseudomonas sp.* (Muratecdharan, 2010; Mishra and Arora,2016).

Vermicomposting define as the growth of earthworms in organic wastes has been termed vermiculture and the processing of organic wastes by earthworms is known as vermicomposting. Vermicomposting, which involves the composting of organic waste through earthworm activity, has proven to be successful in processing sewage sludge and solids from waste water (Neuhouser et. al. 1998, Dominguez et.al. 2000) this vermiwash would have enzyme secretions of earthworms which would stimulate the growth and yield of agriculture crops and even develop resistance capacity in crop (Shivsubramanian and Ganeshkumar 2004).

The drilosphere is the soil system influenced directly or indirectly by earthworm activities, whether in the gut of the earthworm (internal processes), or in its burrows and casts (external processes). As a Consequence, the entire soil invertebrate community plays an important role in degradation through its interactions with soil microorganisms. (Lavelle 1988).

Cow dung can be define as the undigested residue of consumed food material being excreted by herbivorous bovine animal species. (Garg and Mudgal. 2007; Randhwa and Kullar 2011). Cow dung in India is also used as a co- product in agriculture, such as manure, biofertilizer, biopesticides, pestrepellent and as a source of energy (Dhama et.al.2005a). Cow urine could be a potent source to improve soil fertility, Crop production and quality. This can also be a potential alternative for fertigation which is becoming common in most of the crops (Pathak and Ram,2013).

The seed cake mechanisms involved in its tolerance and toxicity can lead to distinct responses in sequester and accumulate pb in the cell wall and / or vacuole, thus restricting its toxicity (Kopittke et. al, 2005; Meyers et. al 2008; Chandra & Kumar, 2017). In addition, antioxidant enzyme activity in plants cultivated under pb stress is reportedly a relevant defense mechanism against this element (Kumar et.al. 2012; Hamdouche et.al. 2012). On the other hand, plants susceptible to pb toxicity exhibit visual symptoms such as reduced dry matter production (Karimi et. al.2012).The plant selected is *Trigonella foenu-gracum*

which having medicinal properties.Trigonella used as alternative source for contraception.(Kadam A.B.et al.,2014)

Aim and Objective

"Study of Biofertilizers on *Trigonella foenu- graecum* (Fenugreek)".
To study effect of various Biofertilizers on Trigonella foenum-graecum (Fenugreek).

Material and Method
Experiment Site

Department of Botany, Dada Patil mahavidyalaya Karjat, Dist- Ahmednagar (MH). The present experiment was laid in the Department of Botany Dada Patil Maha Soil type; the soil of the experiment in use for a Black soil collected from Karegoan farm.

Fenugreek Seed Variety

The Fenugreek seed variety was collected from local market shop.

Vermi Wash

Vermiwash was collected from Zoology department in Dada Patil Mahavidyalaya, Karjat.

Cow Dung

Cow dung collected from karegoan.

***Ricinus communis* (Errand Seed Cake Fertilizer)**

Errand seed cake fertilizer collected from Koregoan.

Seed Germination Method (Fenugreek):

Take Petri dishes and treatment in the water on fenugreek seeds by germinate in germination paper.

Sowing of Fenugreek Seeds

Take soil and add in pot about 6 seeds were sown in each pot and allowed to germinate.Add water daily.

Treatment Details

Table 1: Treatment of Vermiwash, Cow Dung, Errand Seed Cake, and V+CD+ESC Mixture on Fenugreek plant. The Ratio of Experiment is 3:4:8.

Variety	Treatment	Vermicompost (V)	Cow dung (CD)	Errand seed cake (ESC)	V+CD+ESC
Gayatri	T_1-control	V_1-6gm	CD_1-6gm	ESC_1-6gm	$V_1+CD_1+ESC_1$ - 6gm
	T_2-control	V_2-12gm	CD_2-12gm	ESC_2-12gm	$V_2+CD_2+ESC_2$ - 12gm
	T_3-control	V_3-16gm	CD_3-16gm	ESC_3-16gm	$V_3+CD_3+ESC_3$ - 16gm

Treatment	Control	Vermi-compost	CD	ESE	V+CD+ESC
6gm	15	17	14	17	22
12gm	12	16	17	15	18
16gm	13	9	12	16	19

Observations and Result

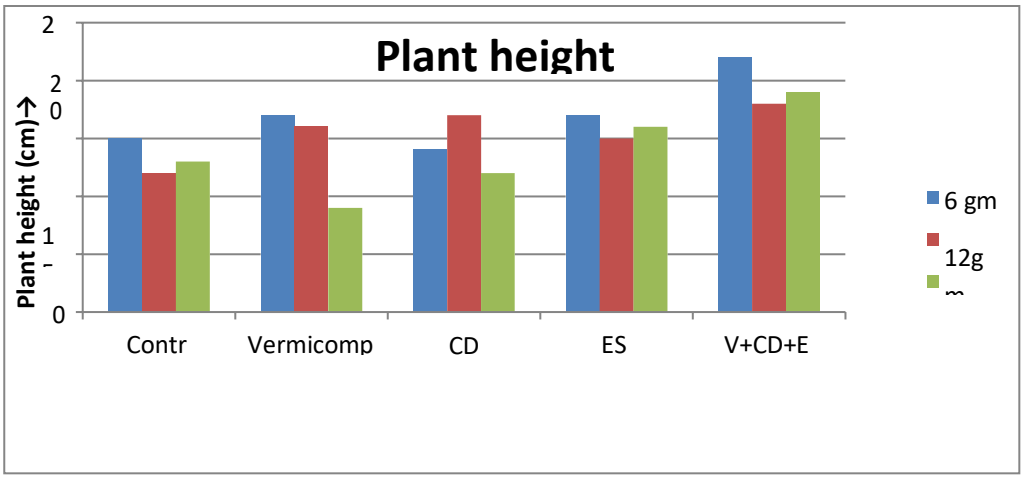
Sampling was done at 30 days interval for growth parameter one plant was randomly selected from each treatment and replications for the study.

Growth Parameter

One plant were selected randomly and tagged in each pot for recording various morphological observations at 30 days after sowing.

Plant Height (cm)

Height is randomly selected plants in each pot was measured byscale from the ground level of the plant to the tip of main stem of plant at 30days.Observation Table no: 2. Effect of Various Biofertilizers on Plant Height (cm) of Fenugreek.



Graph 1: Effect of Various Biofertilizers on Plant Height (cm) of Fenugreek

The result shows plant height at 30 days the data represent in table -no 2 and graph no.1 revealed that maximum plant height after 30 days was observed in the treatment (ESC+v+CO) and in treatment (ESC) plant height was moderate whereas minimum plant height was observed in control.

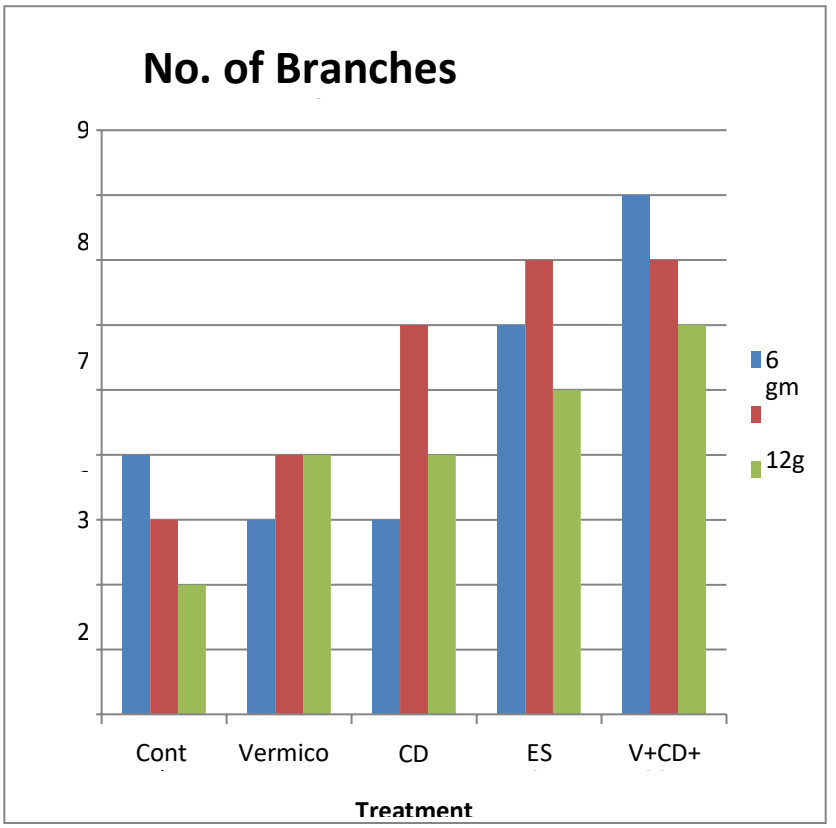
Number of Branches per Plant

The number of primary branches arising on the main stem in one randomly selected and tagged plant were recorded at 30 days. The number of branches plants was worked out and expressed innumber.

Table 2: Effect of Various Biofertilizers on Number of Branches Plant of Fenugreek

Treatment	Control	Vermicompost	CD	ESC	V+CD+ESC
6gm	4	3	3	6	8
12gm	3	4	6	7	7
16gm	2	4	4	5	6

The result shows numbers of branches of 30 days. The data represent in table –no 3 and graph no 2 After 30 days the higher no. of branches was observed in the treatment (ESC+V+CD) and in treatment (ESC) no of branches was observed in control.



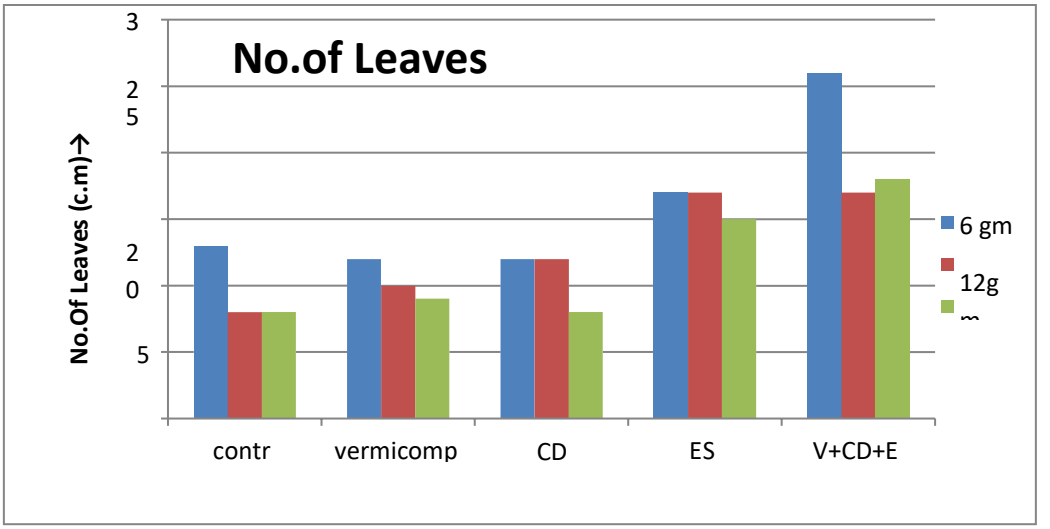
Graph 2: Effect Of Various Biofertilizers on Number of Branches Plant of Fenugreek.

Number of Leaves per Plant

The number of leaves arising on the branches in the randomly selected and tagged plants were recorded at 30 days.The number of leaves plant was worked out and expressed in number.

Table 3: Effect of Various Biofertilizers An Number of Leaves Plant of Fenugreek.

Treatment	Control	Vermicompost	CD	ESC	V+CD+ESC
6gm	13	12	12	17	26
12gm	8	10	12	17	17
16gm	8	9	8	15	18



Graph 3: Effect of Various Biofertilizers on Number of Leaves Plant of Fenugreek.

The result shows number of leaves at 30 days. The data represent in table- no 4 and graph no.3 after 30 days the higher no. of leaves was observed in the treatment (ESC+V+CD). And in treatment (ESC) no. of leaves was moderate. Whereas lowest no. of leaves was observed in control.

Result and Discussion

The study of Biofertilizers on fenugreek (*Trigonella foenum graecum* L.) variety of fenugreek is Gayatri. All the parameters like plants height, number of branches & numbers of leaves of fenugreek shows much more better result in mixture biofertilizers as compare to single fertilizers and lowest result was shown in the control as compare to both biofertilizer treatment.

Hamad (2004) reported that by bio-fertilizers along with chemical N fertilizer (180kg.ha-application, the highest plant height, number of tillers and grain yield of rice (oryza sativa) were achieved. Boraste.A, et.al. (2009) conclude that bio-fertilizer almost alkaline in nature, after moisture estimation we conclude that biofertilizer have very good capacity to hold water, which give indication of standard bio-fertilizer. Mohammad K. and Yousef sohrobi (2012) concluded that Biofertilizer help in increasing crop productivity by way of increased BNF, increased availability or uptake of nutrients through solubilisation or increased absorption stimulation of plant growth through hormonal action or Antibiosis, or by decomposition of organic residues.

K.S. Gomare, M. Mese and Y. shetkar (2013) concluded that the productivity and quality of fenugreek than gram seed can be substantially increased by Rhizobial seed coating inoculation for legume crops. Vyomendra chaturvedi and kumar Nikhil (2016) concluded that algal biofertilizers employ process. For adding nutrients in to the soil and thus has led to the decrease in the pollution and soil contamination.

Lopes et.al, (1996) reported significant increase in nodulation in cowpea with the application of vermicompost up to 10t/ha. Mathur (2003) observed that the application of 20kg N/ha through vermicompost significantly increased number and dry weight of nodules per plant over rest of treatment in green gram. Prabhakaran (2003). Reported by the increase in yield with application of vermicompost in tomato. Kamaleshet et.al, (2006) reported by effect of vermicompost in grain yield of fenugreek. Swain et.al, (2012). Studied by the recent areas where caw dung microorganisms are being used are in promoting soil fertility to improve crop yield. Jandaik et.al, (2015) reported that the nutritional effect of cow urine on *Trigenella foenum graecum* (Methi) and *Abelmoscbus esculentus* (Bhindi) plants showed increased chlorophyll and protein content with increased concentration of urine as compared to control. Vakili et.al, (2015) observed that addition of cow dung to biomass generated from palm oil industries improves the physical and chemical properties including nutritional composition of compost.

Radwanski and Wickens, (1981) seed cake not only provides nutrition to the plant, but increases the population of earthworms and produces organic acids, helps in the reduction of soil alkalinity. Parmar (1986) reported that seed cake exhibits insecticidal properties nitrification retordation and inhibitor of pesticide degradation. Singh et.al, (1986) observed that seed cake increased the number of branches, root length and dry matter weight of crops after ten months compared to the control.

McCormick et.al, (2001), Compared growth, yield and nitrogen (N) inputs of fenugreek with field pea, faba bean, lentil, vetch and medic. Four fenugreek accessions flowered at a similar time to faba bean, but earlier that other species. Faba bean produced the highest grain yield. Nehara et.al, (2006) examined the response of fenugreek (*Trigonella foenum-graecum* L.) under different levels of phosphours. Significantly increased the yield – attributing characters; the seed, straw and biological yields; and the net returns of fenugreek. Verma et.al. (2013). Conducted an experiment during rabi season of 2011-2012 to study the effect of vermicompost and sulphur on growth yield and nutrient uptake of fenugreek and found that application of sulphur up to 40 kg ha-1 resulted in significantly higher plant height and branches / plant at 60,90 DAS Ramkishor et.al. (2015). Examined the effect of clay maxing, irrigation and sulphur on growth and yield of fenugreek. Jasim et.al. (2016). Studied the effect of 5 soil fertilization treatments on growth and yield of fenugreek and found that chemical fertilizer superior significantly compared to other treatment in plant height, number of leaves, leaf area and wet and dry weight, while urea spray was superior in plant height, leaves no. and soft weight.

Conclusion

In current agriculture practices, chemical fertilizers have reduced the fertility of soil, making it unsuited for raising crop plants. Additionally, the excessive use of these inputs has also led to severe health and environmental hazards such as soil erosion, water contamination, pesticide poisoning, falling ground water table, water logging and depletion of biodiversity. Bio-fertilizers spontaneously activates the microorganisms found in the soil in an effective and eco-friendly way, thereby gaining more importance for utilization in crop production, restoring the soils fertility and protecting it against drought, soil diseases and thus stimulate plant growth.

Bio-fertilizers lead to soil enrichment and are suitable with long-term sustainability.

Further, they pose no danger to the environment and can be substituted with chemical fertilizers. The application of bio-fertilizers can minimize the use of chemical fertilizers, decreasing environmental hazards, enhance soil structure and promote agriculture. Bio-fertilizers are cheaper and remarkable in affecting the yield of cereal crops.

Bio-fertilizers being important components of organic farming play a key role in maintaining long term soil fertility and sustainability by fixing insoluble P in the soil into forms available to plants, thus increasing their effectiveness and availability.

In context of both the cost and environmental impact of chemical fertilizers, excessive reliance on the chemical fertilizers is not a useful strategy in the long run due to the cost, both in domestic resources and foreign exchange; participate in setting up of fertilizer plants and maintaining the production. Biofertilizers are the alternative sources to meet the nutrient requirement of crops. Biofertilizer can also make plant resistant to unfavorable environmental stresses.

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