Global Journal of Science Frontier Research: D
Agriculture and Veterinary
Volume 18 Issue 8 Version 1.0 Year 2018
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-4626 & Print ISSN: 0975-5896

"Seed Germination & Seedling Growth of Fenugreek (Methi) (*Trigonella Foenum Graecum* L.) Influenced By Water Extract of Eucalyptus Leaf Litter Vermicompost & Compost"

By Ritu Nagar, Anurag Titov & Praveesh Bhati
Govt. Madhav Science PG College

Abstract- Germination of seed is the fore most requirement of plant growth which influenced by several physical and chemical parameters. This factor either naturally found in the surrounding environment or some time added into the soil. Such supplementation is done either in the form of chemical or by an organic compound. Present study done to find out effect of different types of vermicompost and compost of Eucalyptus leaf litter on seed germination and seedling growth of Fenugreek seeds. The Result of present work indicated that there were > 97 % seeds were germinated treated by both vermicompost and compost. It has also found that dry, and green vermicompost of either 100 % or 50 % leaf litter significantly affect seedling growth more dominantly than compost treatment, and outcome also revealed that green vermicompost more significantly affect seedling growth than dry vermicompost . The average growth of the first, the second and the third day was 0.22 cm, 0.61 cm, and 1.29 cm respectively. Result also explore that second day growth was 5.3time higher than first day while 2.2 time higher in third day than second day. Population Standard Deviation, population Standard Variance and geometric mean were also determined at first (0.0335, 0.0011, 0.2162), second day (0.0716, 0.0051, 0.8246) and third day (0.2024, 0.0410, 2.1082) respectively.

Keywords: *germinating seed, Fenugreek (Methi), vermicompost, compost, Eucalyptus leaf litter.*

GJSFR-D Classification: *FOR Code: 300302*

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"Seed Germination & Seedling Growth of Fenugreek (Methi)(*Trigonella Foenum Graecum* L.) Influenced By Water Extract of Eucalyptus Leaf Litter Vermicompost & Compost"

Ritu Nagar [α], Anurag Titov [σ] & Praveesh Bhati [ρ]

Abstract- Germination of seed is the fore most requirement of plant growth which influenced by several physical and chemical parameters. This factor either naturally found in the surrounding environment or some time added into the soil. Such supplementation is done either in the form of chemical or by an organic compound. Present study done to find out effect of different types of vermicompost and compost of Eucalyptus leaf litter on seed germination and seedling growth of Fenugreek seeds. The Result of present work indicated that there were > 97 % seeds were germinated treated by both vermicompost and compost. It has also found that dry, and green vermicompost of either 100 % or 50 % leaf litter significantly affect seedling growth more dominantly than compost treatment, and outcome also revealed that green vermicompost more significantly affect seedling growth than dry vermicompost . The average growth of the first, the second and the third day was 0.22 cm, 0.61 cm, and 1.29 cm respectively. Result also explore that second day growth was 5.3time higher than first day while 2.2 time higher in third day than second day. Population Standard Deviation, population Standard Variance and geometric mean were also determined at first (0.0335, 0.0011, 0.2162), second day (0.0716, 0.0051, 0.8246) and third day (0.2024, 0.0410, 2.1082) respectively. The results of this experiment revealed that treatment of vermicompost weather 100% or 50 % Eucalyptus leaf litters had significant effects on seed germination and seedling growth of Fenugreek seeds.

Keywords: germinating seed, Fenugreek (Methi), vermicompost, compost, Eucalyptus leaf litter.

I. Introduction

The fenugreek (*Trigonella foenum-graecum* L.) is an erect annual herb crop that belongs to a member of the *Leguminosae* family. It is a self-pollinating monocotyledonous plant with branched stems, trifoliate leaves, which bears white flowers and produces golden yellow seeds (Acharya et al. 2010a; Petropoulos 2002). It is one of the oldest cultivated plants which is native to Southern Europe but although cultivated in Asia and the Mediterranean region (Fotopoulos 2002). However, the seeds are bitter in taste due to the presence of bitter saponins, which limit their acceptability in foods (Sharma 1986; Udayasekhera and Sharma1987) but due to great value regarding the medicine, it has widely cultivated in India. India has produces about 80% of the total world's production of fenugreek seed. Thus our country is one of the major producers and exporters of fenugreek legume in the world.

The success of fenugreek farming is only possible when its seed starts geminate. Usually seed starts germination after soaking of water inside the soil. Water holding capacity of soil plays a significant role. Despite that, availability of plant growth hormone and other chemicals also enhance the rate of germination. It has been proved that addition of organic fertilizer such as vermicompost and compost inside the soil, increases the water-holding capacity as well as crop producing power (Tester *et al.,* 1999; Werner 1997). Vermicompost produced from cattle dung, pigs manure as well as food wastes contains significant quantity of humic acid than compost which increase the rate of germination of a range of ornamental and vegetable seedlings (Atiyeh et al.,2000a; 2000b; 2000c).

Vermicompost and compost are prepared from different organic waste with the addition of cattle dung (Shouche et al. 2011; Nagar, et al. 2018). Leaf litters of eucalyptus tree are one of the sources of organic waste using in preparation of vermicompost (Nagar et.al.2017). Eucalyptus plant is well known for their beauty and rapid growth. Although, Eucalyptus is evergreen plant but some of their tropical species lose their leaves at the end of the dry season (Kumar and Sahoo, 2011). Although leaf litters provided shelter and food to the terrestrial life and when it undergoes decomposition to produce nutrients that nourish the soil. Eucalyptus litter considered as poor quality and slow breakdown rate due to a high content of phenolic and tannins, but it is also having the antifungal activity which

Author α: Research Scholar, Govt. Madhav Science PG College, Ujjain, (M.P.), India._e-mail: ritunagar021@gmail.com
Author σ: Asst. Professor, Govt. Madhav Science PG College, Ujjain, (M.P.), India. e-mail: anurag.singh1961@gmail.com
Author ρ: Scientific Officer, DNA Finger Printing Unit, State Forensic Science Lab, Sagar, (M.P.), India. e-mail: bhati_p212@yahoo.co.in

prevents seed against fungal disease inside the soil (Boulton, 1991).

The goal of the present study was to elucidate different water extract of Eucalyptus leaf litter Vermicompost and compost on the germination of fenugreek and also compare their effect. Such information will be beneficial when planning for sowing fenugreek seeds near or beneath of Eucalyptus trees. It will be also helpful to selection of vermicompost or compost during the seed treatment before sowing seeds. Therefore present study was conducted to investigate the potential of Eucalyptus leaf litter vermicompost and compost on seed germination and radicle length.

II. Materials And Methods

a) Collection of Fenugreek seed

Fenugreek (*Trigonella foenum-graecum* L.) seeds which had used in the present study obtained from Agriculture Research canter Kothi road Ujjain (M.P.) India. The seeds were cleaned and directly used.

b) Preparation of Vermicompost and compost

Vermicompost and compost were prepared by both green and dry Eucalyptus leaf litters-cattle dung mixture according to the Windrow's method (NRAES, 1992). Both were prepared in 50% and 100 % ratio with or without earthworm.

c) Preparation of extracts

Hundred grams of Eucalyptus leaf litter vermicompost and compost of each proportion were used for extraction in the experiment. This 200 gm quantity of either vermicompost or compost suspend in 200 ml distilled water and allow to shaken for one hour at room temperature at 100 RPM to the preparation of suspension. This mixture was filtered through sterilized filter paper (Whatman no. 1), and the filtrate collected in measuring cylinders. The extract volume was adjusted to 200 ml with distilled water for bioassay, and this was considered as a stock solution (Roy et al. 2006).

d) Setup for germination

Sterilized Whatman no. 1 paper was placed in glass Petri's dishes (10 cm diameter) as a base for germination and subsequent seedling growth. The 6 ml extract of vermicompost was add to moisten the paper. There were four seeds of Fenugreek placed over the surface of paper by forceps with three replications and were kept in the dark at room condition. Germination (seed that emerged about 2 mm radical considered as germinated) was record daily. At every 24 h interval, the radical length of the germinated seed of each plate was measured using a millimetre ruler and taken their mean value. After measurement of replica plates of each treatment, their mean was also taken and was put on table. (Ancuta *et.al*. 2013).

e) Statically analysis of measured value

A different value of the seedling length of Fenugreek at different treatment of vermicompost and compost of Eucalyptus leaf litter were analyzed by different spastically formulas.

- *Mean Difference*

$$MD = P - E$$

Whereas P = Value of Previous reading, E= Value of Existing reading

- *Mean*

$$\overline{X} = \frac{\Sigma X}{n}$$

Where X = value of individual number, n = total sample number,Σ = summation

- *Population Standard Deviation*

$$\sigma = \sqrt{\frac{\Sigma (x - \overline{x})^2}{n}}$$

σ = standard deviation

Σ = sum of

x = each value in the data set

$\overline{x}$ = mean of all values in the data set

n = number of value in the data set

- *Population Standard Variance*

$$\sigma^2 = \frac{\sum (x - \mu)^2}{N}$$

Whereas σ2 = population variance, μ = mean of the population data set N = size of the population data set

- *Geometric Mean*

$$\left(\prod_{i=1}^{N} x_i \right)^{1/N} = \sqrt[n]{a_1 a_2 \cdots a_n}$$

III. Result and Discussion

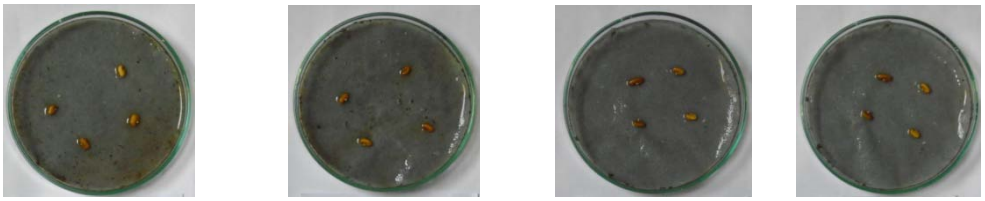
Germination of Fenugreek seeds influenced by vermicompost and compost of Eucalyptus leaf litters and measured values in successive three days is depicted in table no. 1 and fig. no.1. Result regarding the effect of vermicompost and compost of green Eucalyptus leaf litters of different composition are given in photograph no.1 while an effect of dry Eucalyptus leaf litters vermicompost and compost treated seed germination given in photograph no.3. Along with these sets, control was also set (plain water) which depicted in photograph no.2. Result obtained showed that after

placed of Fenugreek seeds on Petri's dish, almost placed seeds were germinating (> 97 %) in all treatment sets. Our results are agreement with the finding of work of Dhanalakshmi et al. (2014) found that, 96% germination in Okra seed in their study. A part from that its ominously stimulated seed germination were also reported in several plant species such as tomato plants (Atiyeh et al. 2000; Zaller 2007), petunia (Arancon et al. 2008) and pine trees (Lazcano et al., 2010). Such result clear that neither compost nor vermicompost extracts of Eucalyptus leaf litter and their different concentration stalled the germination. When seedling length was measure after 24 hours (First day), then found that highest length was measured (0.25 cm) in treatment of 50 % dry Eucalyptus leaf litter vermicompost followed by 100 % (0.25 cm) and 50 % (0.25 cm) green Eucalyptus leaf litter vermicompost. In case of compost (without earthworm) treated seed, highest length was measured in 50 % dry Eucalyptus leaf litter (0.24 cm) followed by 100 % (0.19 cm) and 50 % (0.18 cm) green Eucalyptus leaf litter compost as compared to plain water control (0.16 cm) (Fig no.2). In second day of germination, it was found more raised seedling length which is showing in fig.no.3.The highest seedling length (0.92 cm) was measured in 100% green Eucalyptus vermicompost followed by 50% dry Eucalyptus leaf vermicompost treated seeds (0.90 cm). In case of compost treated seed, the highest growth (0.90) was seen in 100 % green Eucalyptus leaf litter treated seed. In the third day, highest growth (2.40 cm) was seen in 100% green Eucalyptus leaf litter and 50% green Eucalyptus leaf litter vermicompost while in compost treated seed, the highest growth was seen in 100 % green Eucalyptus leaf litter (Fig.no.4). These finding clearly indicate that highest seedling length increased in vermicompost treated seed because of its growth promoting agents. The highest seed germination growth seen in vermicompost treated seeds due to the availability of macro elements (Bhawalkar and Bhawalkar 1993), micro elements and plant growth hormones (Bano *et al.,* 1987)

During measurement, difference means was also taken from two successive day's seedling growth. The average mean of Zero to first day 0.22 cm, first to second day 0.61 cm and second to the third day were 1.29 cm. After treatment, at first day it average means difference increased 0.22 cm. In next day it was increased 0.39 cm which was 5.3 times greater than first day growth while third day it was 0.68 which was 2.2 times more than second day growth. At the first day, difference mean value, standard deviation was found in a range between -0.4 (50 % dry Eucalyptus compost treated seed) to +0.4 (50 % dry vermicompost treated seed), at the second day, it found standard deviation between -0.9 (100 % dry compost treated seed) to +0.9 (100 % dry compost treated seed) while at the third day, range was between -0.22 (100 % dry compost treated seed) to +0.27 (50 % green vermicompost treated seed). (Table no. 2). Population Standard Deviation of a seedling length of fenugreek seeds at first, a second and the third day were 0.0335, 0.0716 and 0.2024 respectively while a value of population Standard Variance determined were 0.0011, 0.0051 and 0.0410 respectively. The value of geometric mean also recorded that were 0.2162, 0.8246 and 2.1082 at respective days (table no.3).

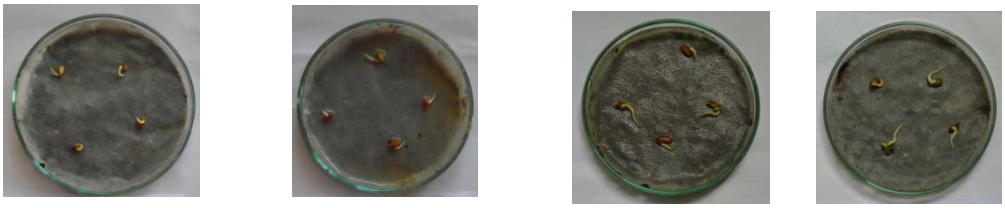
100% Earthworm100% without Earthworm50% Earthworm50% without Earthworm

Zero Day



First Day

Second Day

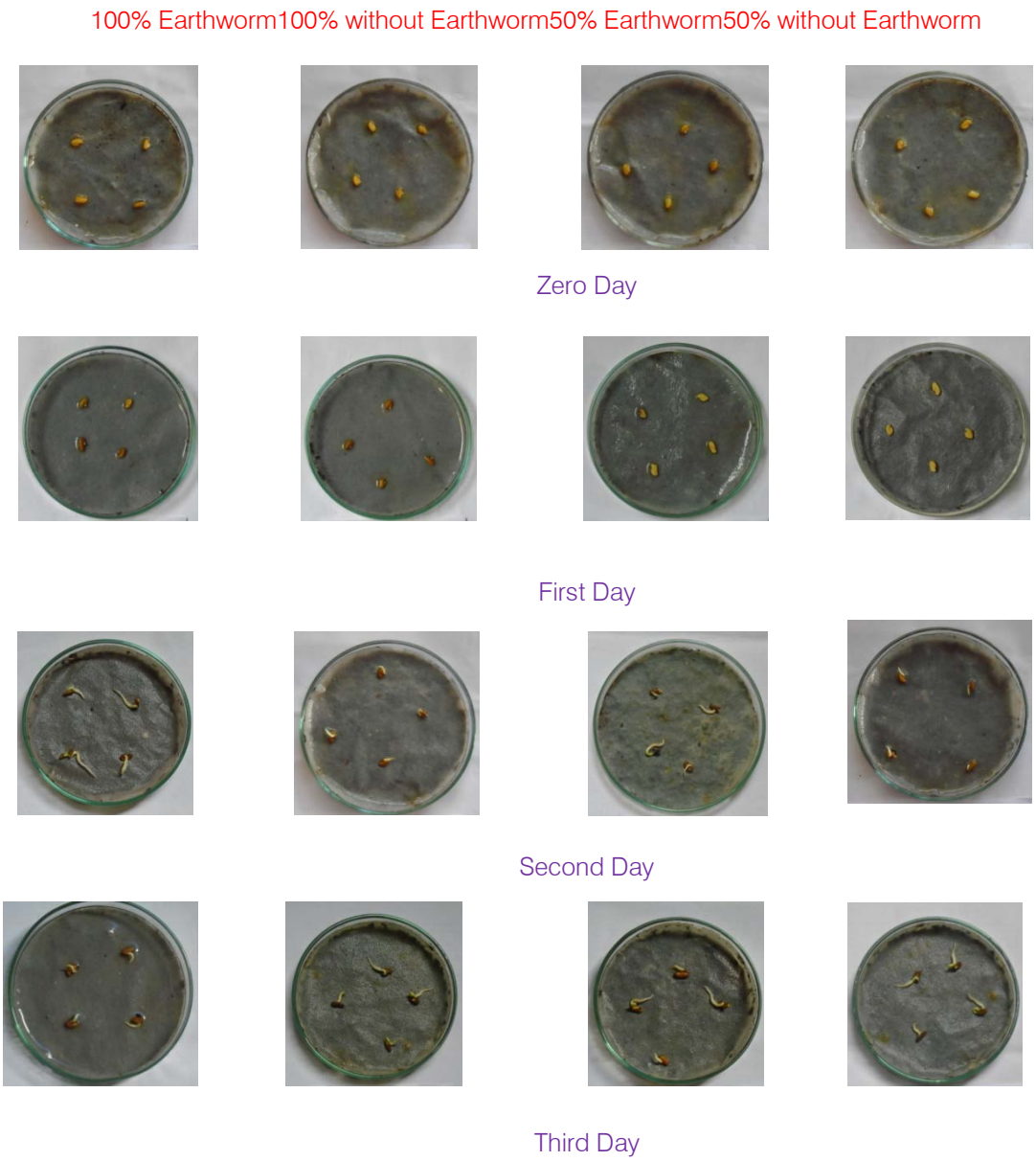


Third Day

Photograph 1: Effect of water extract of green Eucalyptus leaf litter vermicompost and compost on the germination seedling growth of Fenugreek seed

Zero day First day Second day Third day

Photograph 2: Effects of plain water on the germination of Fenugreek seed



Photograph 3: Effect of water extract of dry Eucalyptus leaf litter vermicompost and compost on the germination seedling growth of Fenugreek seed

Table 1: Measurement of seedling length in (mm) of Fenugreek seed treated with plain water, Vermicompost, and compost Eucalyptus leaf litter

S. No.	Compost	Zero day (length in cm)	First days (length in cm	Second day (length in cm	Third day (length in cm
1	100% green Eucalyptus leaf with EW.	00	0.25	0.92	2.40
2	100% green Eucalyptus leaf without EW.	00	0.19	0.89	1.99
3	50% green Eucalyptus leaf &50% C.D with EW.	00	0.25	0.84	2.40
4	50% green Eucalyptus leaf &50% C.D without EW.	00	0.18	0.70	2.08
5	100% dry Eucalyptus leaf with EW.	00	0.23	0.79	2.34
6	100% dry Eucalyptus leaf without EW.	00	0.21	0.73	1.80
7	50% dry Eucalyptus leaf & 50% C.D with EW.	00	0.26	0.90	2.10
8	50% dry Eucalyptus leaf & 50% C.D without EW.	00	0.24	0.82	1.98
9	Plain water (Control) Fenugreek seed	00	0.16	0.86	1.97

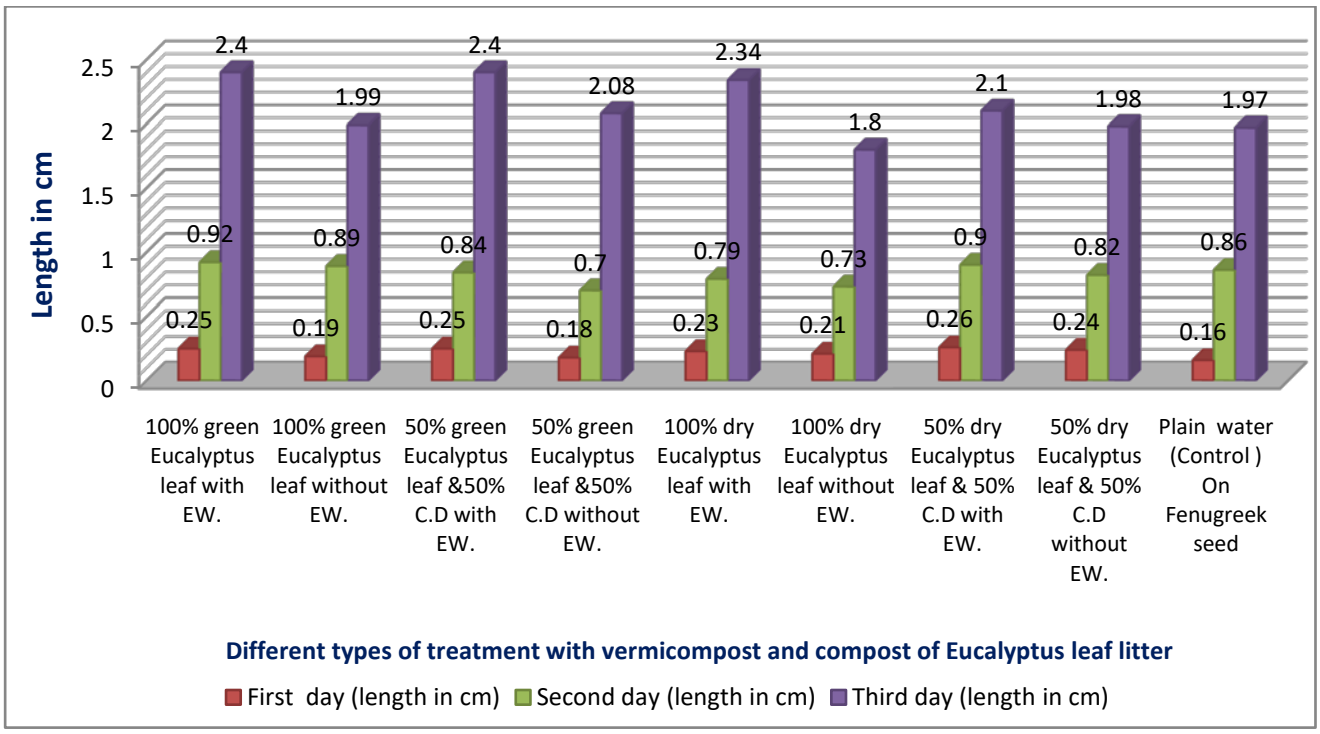


Figure 1: Effect of different types of vermicompost and compost treatment on seedling growth of Fenugreek seed at three successive days

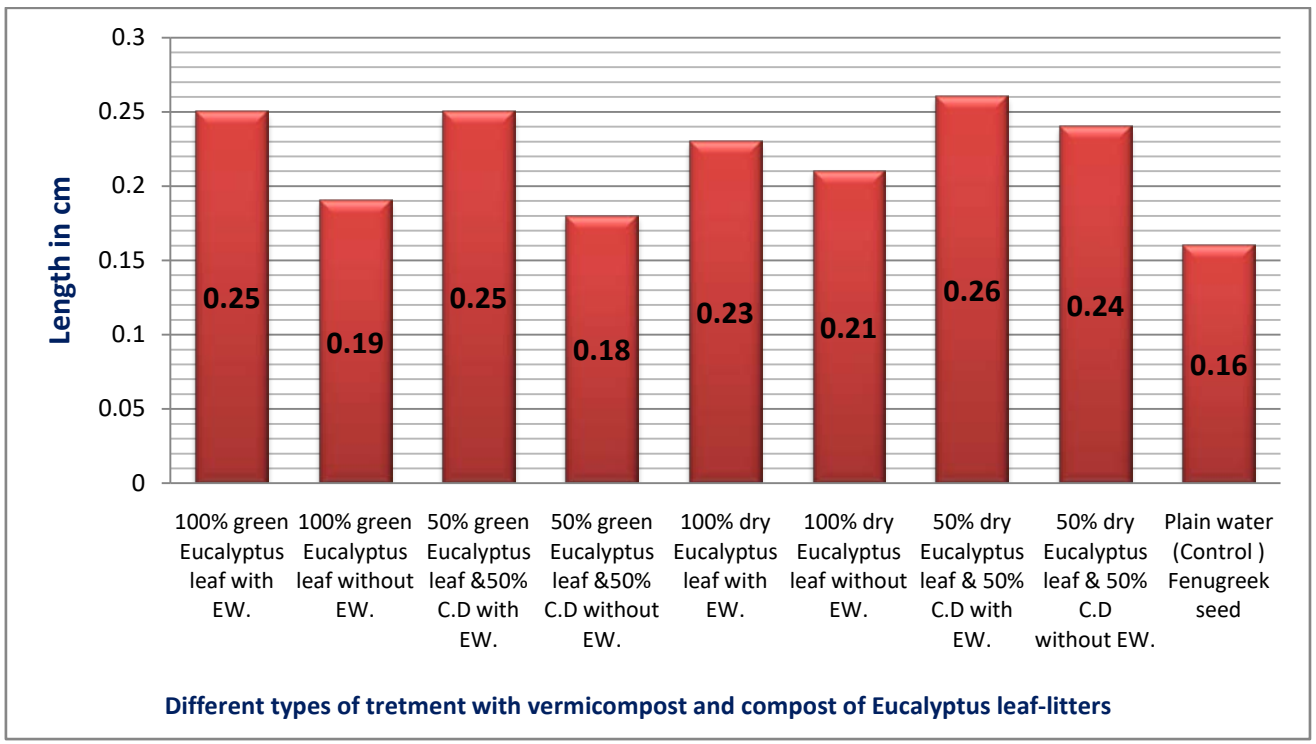


Figure 2: Measurement of seedling growth of Fenugreek seed at first day

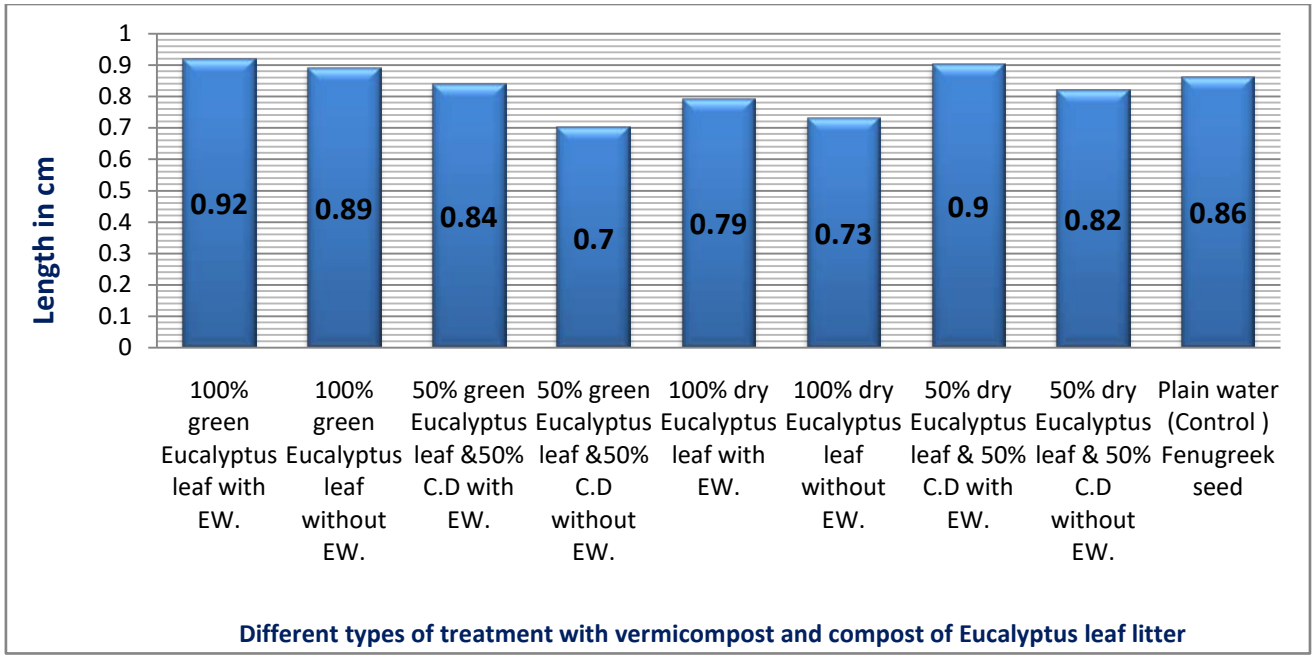


Figure 3: Measurement of seedling growth of Fenugreek seed at Second day

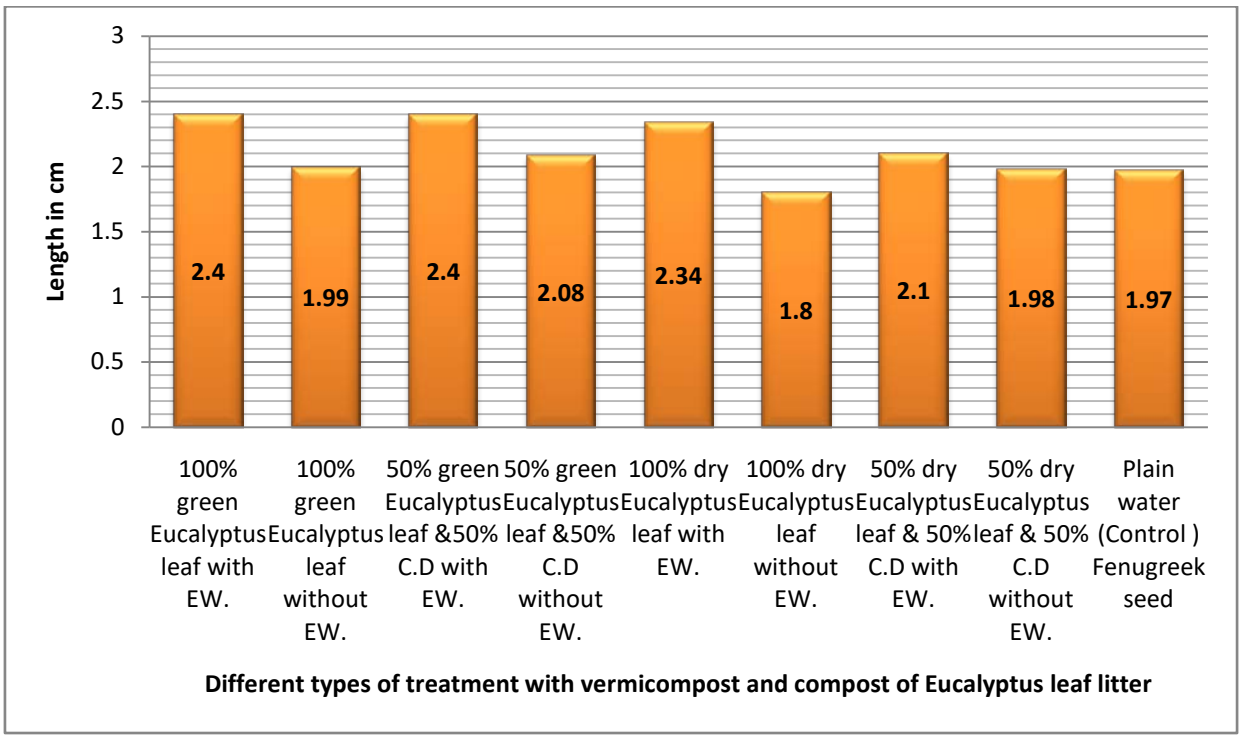


Figure 4: Measurement of seedling growth of Fenugreek seed at Third day

Table 2: Mean difference of seedling length in (mm) of Fenugreek seed treated with plain water, vermicompost and compost Eucalyptus leaf litter

S. No.	Compost	Difference Mean At First Day (cm)		Difference Mean at Second Day (cm)		Difference Mean at Third Day (cm)	
		DM	SDV	DM	SDV	DM	SDV
1	100% green Eucalyptus leaf with EW.	0.25	+0.3	0.67	+0.6	1.48	+0.19
2	100% green Eucalyptus leaf without EW.	0.19	-0.3	0.7	+0.9	1.1	-0.19
3	50% green Eucalyptus leaf &50% C.D with EW.	0.25	+0.3	0.59	-0.2	1.56	+0.27
4	50% green Eucalyptus leaf &50% C.D without EW.	0.18	-0.4	0.52	-0.9	1.38	+0.09
5	100% dry Eucalyptus leaf with EW.	0.23	+0.1	0.56	-0.5	1.55	+0.26
6	100% dry Eucalyptus leaf without EW.	0.21	-0.1	0.52	-0.9	1.07	-0.22
7	50% dry Eucalyptus leaf & 50% C.D with EW.	0.26	+0.4	0.64	+0.2	1.2	-0.09
8	50% dry Eucalyptus leaf & 50% C.D without EW.	0.24	+0.2	0.58	-0.3	1.16	-0.13
9	Plain water (Control) Fenugreek seed	0.16	-0.6	0.7	+0.9	1.11	-0.18
10	Average	0.22		0.61		1.29	

Note: DM = Difference mean, SDV= Standard Deviation value

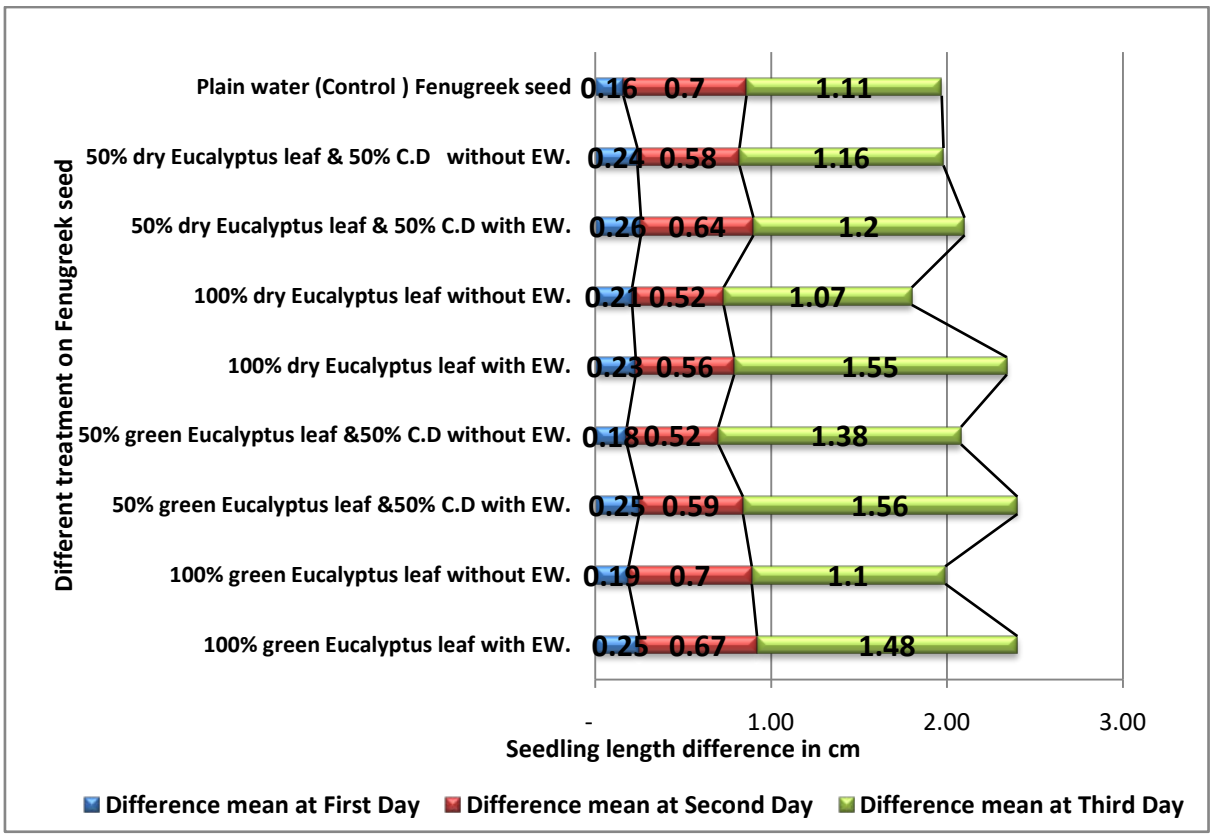


Figure 5: Difference means of seedling growth of Fenugreek seed at three successive days

Table 3: Statically data of a seedling length of Fenugreek seed at three different days

Different Statically parameters	Seedling Length Value at First day	Seedling Length Value at Second day	Seedling Length Value of at Third day
Sum, Σx	1.9700	7.4500	19.0600
Mean (Average), x	0.2189	0.8278	2.1178
Sum of the Square of the Values, Σx^2	0.4413	6.2131	40.7334
Mean of the Square of the Values, x^2	0.0490	0.6903	4.5259
Population Standard Deviation, σ	0.0335	0.0716	0.2024
Population Standard Variance, σ^2	0.0011	0.0051	0.0410
Sample Standard Deviation, s:	0.0355	0.0760	0.2146
Sample Standard Variance, s^2	0.0013	0.0058	0.0461
Geometric Mean	0.2162	0.8246	2.1082

IV. Conclusion

Seed germination is the prime stage of plant development which instigates after sowing of seed inside the soil. Percentage of germinate seed mark the crop production as well as the final expansion of a finished product. Therefore, it has a very decisive part in agricultural practices. Although there are several chemical treatments are available to augment the rate of seed germination but with consideration of its cast and soil health, eco-friendly practices play a crucial role. Present work was done to keep this entire thing. Obtain result suggested that eucalyptus leaf litter waste either 100% or 50 % mixed with cattle dung treated by earthworm (vermicomposted) causes respectable outcome on fenugreek seed germination. It has also a clear that leaf litter either green or dry causes all most equal effects on seed germination. Exist study suggests that by using the farm yard waste treated with the earthworm will not only reduce the problem of organic waste but also increase the fertility, soil conditioning crop production with a cost effective manner.

Acknowledgment

We are thankful to the Principal, Govt. Madhav Science College for providing permission for conducting vermicomposting of leaf waste. The authors also wish to express their warm gratitude to the Department of Botany, Biotechnology & Microbiology for accompanying laboratory experiment.

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