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A STUDY ON THE EFFECT OF NATURAL SUBSTARTE COMPOST ON THE GROWTH & DEVELOPMENT OF BEANS PLANT (PHASEOLUS VULAGARIS L)

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Abstract: Natural substrate compost on the growth of beans plant is one of the most important factors for determining the suitability of any type of compost for agriculture use and control of environmental contamination. During the present study, the preparation of compost by using various natural substrates was done. The natural substrates used for the study, includes, Fermented fruit juice, lactic acid, oriental herbal nutrient, amino acid, cow dung and born meal powder. All the ingredients are mixed in the ratio of 1:1 to the garden soil. For the experiment study, four beans' seeds were used and observed for 2 months to study the changes in the overall growth parameters. One control was also maintained to observe the changes for the comparison. From the experimental results, it can conclude that, 75 gm and 50 gm natural substate compost treatments were found to be effective on overall growth of beans plant in comparison with the control. From the study, it suggests that, the appropriate ratio of soil and natural substrate compost will helps in the effective transformation of crop yield in the agronomy sector.

Index Terms - *Natural substrates compost, Beans seeds, Germination Index, plant growth.*

I. INTRODUCTION

Natural farming is a process that involves the utilization of organic substrates to soil to enhance the plant growth & development. The yield of crops is typically increased by natural compost [1]. Natural farming can be defined as ‘’chemical free farming and livestock based’’. Natural farming is defined as a sustainable farming method that relies on natural materials, by observing the laws of nature while respecting the rights of crops and livestock. Often referred to as the day natural farming. This approach holds the promise of not only enhancing farmers' income but also contributing to soil fertility restoration, environmental health, and the reduction of greenhouse gas emissions. In Southern India, it is promoted as 'Bharathi Prakriti Krishi Paddhati [BPKP]' under the centrally sponsored scheme Paramparagat Krishi Vikas Yojana. Natural farming revolves around soil microbiology, involving chemical-free farming and livestock-based methods. It is a diversified farming system that integrates crops, trees, and livestock, optimizing functional biodiversity [2]. The method harnesses indigenous soil microbes, distinguishing it from organic farming, which may involve externally purchased inputs like natural compost [3].

Modern agriculture, rely on replenished chemical nutrients, the natural farming acknowledges the hindrance of the natural process to foster microbial growth. Locally prepared cow dung-based bio-stimulants, fermented with cow urine, jaggery, and pulses flour, supply essential nutrients to the soil, promoting plant health [4]. Other interventions include treating seeds with cow dung-based stimulants to protect against diseases, using crop residues as mulch during main crop cultivation to retain soil moisture and prevent weed growth, and growing multiple crops in the same area to enhance soil fertility [5]. Shifting to natural farming benefits the small and marginal farmers by improving income, reducing credit dependence, offering flexibility compared to organic farming, ensuring safe and affordable food, promoting high carbon fixation into the soil, and contributing to the reduction of ocean acidification based on the above compost, the present work has been undertaken to study the effect of natural substrate compost on growth of beans plant.

II. Materials and Methods: For the present study, various natural substates were used for the preparation of natural compost [6]. The substrates used and its preparation are presented in the following table-1

1.Preparation of compost by various natural substrates are as follows:

SI. No	Compost Type	Preparation
1	Fermented fruit juice	Material used: yellow colour fruits 1 Kg, Jaggery 1 Kg and 2 L capacity glass jar. Procedure: 1. Take a clean glass jar. 2. Wash the glass jar with soap water & rinse with normal water. 3. After wash, keep in sunlight for dry. 4. Chop pineapple and crush the jaggery and mix the ingredients thoroughly in a glass jar and cover it with a white paper tightly. 5. Keep it for observation for 5 days under shade place.
2	Oriental herbal nutrients	Materials used : 1Kg ginger, 1Kg jaggery, 2 L capacity glass jar Procedure 1. Take a clean glass jar. 2. Wash the glass jar with soap water & rinse with normal water. 3. After wash, keep it in sun light for complete removal of moisture. 4. Add chopped ginger and crushed jaggery powder in to glass jar. 5. Mix it well and cover it with white paper tightly and place it for 5 days under shaded place.
3	Fish amino acid	Material used: 2 Kg black colour fish, 1 Kg jaggery, 1 Kg charcoal powder, 2L capacity glass jar. Procedure: 1. Take a clean glass jar. 2. Wash the glass jar with soap water & rinse with normal water. 3. After wash, keep in sunlight for complete removal of moisture. 4. Cut fish into fine pieces and crush jaggery and charcoal powder and transfer to glass jar. 5.Mix it well and cover it with white paper tightly and place it under shaded place for 7 days.

4	Lactic acid bacteria	Material used : washed rice water, milk, glass jar. Procedure: 1. Take a glass jar of 2L capacity glass jar. 2. Wash the glass jar with soap water & rinse with normal water. 3. After wash keep it in sunlight for complete removal of moisture. 4. To a clean dry jar, take soaked rice water and cover it with white sheet of paper and close tightly. 5. Keep it in shaded place for 3 days. 6. After 3 days collect the plain liquid and add 1L of fresh milk and keep it for 3 days and observe for yellow color layer. 7. A semi soild white layer will form on the top of the yellow layer, This liquid is enriched with lactic acid bacteria culture.
5	a, Indigenous microorganism 1(IMO1	Material used : 1Kg cooked rice , wooden box, cloth. Procedure : 1. Take the clean glass jar. 2. Wash the glass jar with soap water & rinse with normal water. 3. After wash, keep it in sun light for complete removal of moisture. 4. Put the cooked rice in a wooden box cover the box with colth. 5. Immerse the box in soil at ¾ depth. 6. Cover it for 3 days.
	b, Indigenous Micro Organism 2 (IMO2)	Material used: 1 Kg IMO1 and 1 Kg jaggery. Procedure: 1. Mix indigenous Micro Organism 1 and crush jaggery powder into box. 2. Close the box for 6 hours.
	c,Indigenous micro organism 3 (IMO3).	Material used : 1 Kg IMO2 ,1 Kg charcoal powder and 1L lactic acid bacteria. Procedure: 1. Take indigenous micro organism 2 and mix characoal powder and lactic acid bacteria. 2. Close it and keep it for 7 days.
6	Cow dung.	It is a natural waste product extracted from cow excreta.
7	Neem powder	Neem powder is made neem leaves.
8	Born meal	Born meal made from dead animals.

2 2. INGREDIENTS MIXING WITH SOIL:

The Mixing all the ingredients in the soil are as follows, Cow dung 1 kg, Neem powder 1 kg, Born meal 1 kg, Indigenious micro organism 1 kg, fermented fruit juice 1, lactic acid bacteria 1L, fish amino acid 1L and oriental herbal nutrients IL.

2.3 Experimental set-up:

For the experimental set up seven grow bags were selected and used to fill the soil. The soil sample used for the study was a garden soil sample. The collected soil sample was grinded and sieved to get the uniform size. The soil and natural substrate compost were used in grow bags at 1:1 proportion, the bean seeds [Phaseolus vulgaris L] were collected from the agrochemical shops from city market. The collected seeds were placed in each of the grow bags below 1cm of the soil. The ratio of the soil and natural substrate compost added in the grow bags are presented as follow.

Ratio of natural compost

- 25 gm soil and 25 gm natural compost
- 50 gm soil and 50 gm natural compost
- 75 gm soil and 75 gm natural compost
- Control (no natural compost)

2.4 EXPERIMENTAL SECTION:

The beans seeds (Phaseolus vulgaris) were placed in all the grow bags (4seeds/ each grow bag). For each concentration two trails were maintained for accuracy. For all the treatments, labelling was done. After the preparation of grow bags, it is kept for observation for seeds germination. Frequent watering was done to maintain optimum moisture level in the grow bags. After two days, the seed germination was started and the number of seeds germinated was recorded to calculate the germination Index. After 2 months, the complete growth of beans plant was observed and it was removed from the grow bags to measure all the growth parameters.

2.5 Caculation of Germination Index:

After 2 days, the seeds began to germinate. The total number of seeds gerimated was counted on 10^{th} day. Based on the number of seeds germination, the percentage of germination Index was calculated by using fallowing equation.

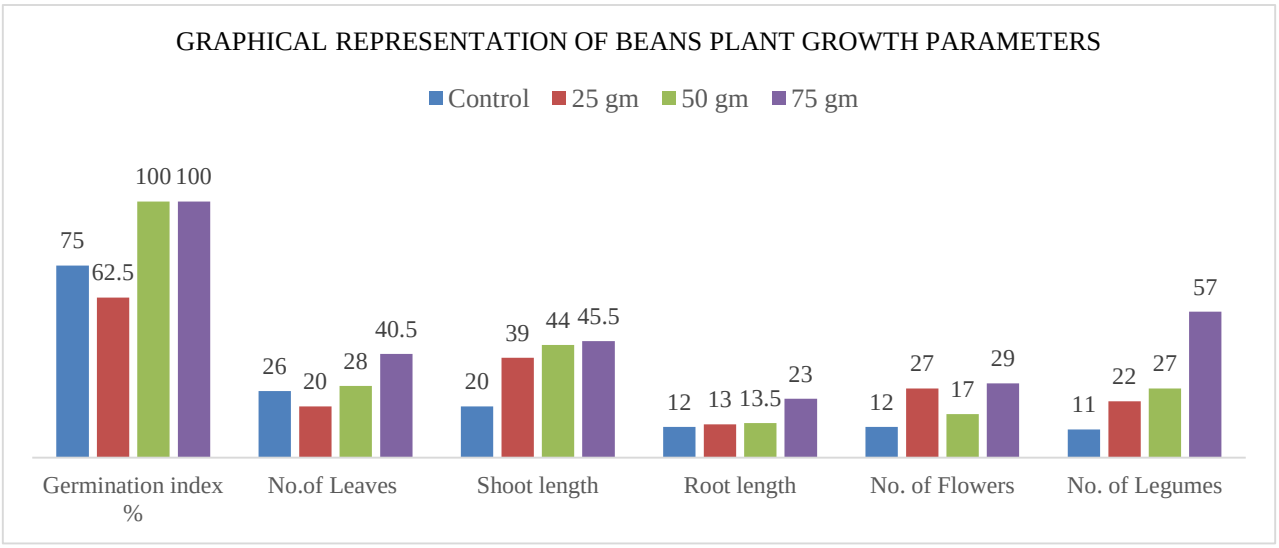
Germination Percentage Index % (GI) = number of seeds germinated /total no. of seeds sowed x100.

- **Measurement of shoot length:** The shoot length was measured from top to the tip of the shoot using centimeter scale. The average shoot length was taken by the mean of two trials.
- **Measurement of root length:** The length of root from the tip of the root collar region was measured by using centimeter scale. The average root length was recorded by taking mean of two trials.
- **Number of leaves:** The total number of leaves in plant were counted, the average value was calculated by taking mean of two trials of all the plants.
- **Number of flowers:** The total number of flowers in the plants was counted and the average values was calculated by considering the values of two trials.
- **Number of legumes:** The total number of legumes in plants was counted, and the average value of two trials was recorded.

III. RESULTS AND DISSCUSSION

Table 3.1 Experimetal results of Growth Parameter of Beans Plant

Treatments	Trials	Germination Index (%)	Number of leaves	Shoot length [cm]	Root length [cm]	Number of flowers	Number of legumes
control	1	75	26	20	12	12	11
25 gm soil+25 g natural compost	T-1	50	25	42	12	16	15
	T-2	75	15	36	14	22	14
	Average	62.5	20	39	13	27	22
50 gm soil+50 g natural compost	T-1	100	26	46	13	18	25
	T-2	100	30	42	14	16	29
	Average	100	28	44	13.5	17	27
75 gm soil + 50 g natural compost	T-1	100	44	47	16	33	39
	T-2	100	37	44	14	25	36
	Average	100	40.5	45.5	23	29	57



3.2 Variations in germination index (GI)

For the experimental study, the total number of beans seeds added to the grow bags are 4 and the variation in seed germination was observed in all the treatments**.** In control the Germination Index was found to be 75% and in 25 gm treatment the average GI was found to be is 62.5%. In 50 gm and 75 gm treatments, the average GI was found to be 100%. This suggests that, 50 g and 75 g natural substrate compost treatments, supports effective germination in beans plant.

3.3 Variation in number of leaves

The number of leaves was counted manually. The total number of leaves in plants were counted, by taking the average and it was recorded. It was observed that, the number of leaves were varied in each plant. The average number of leaves produced in control was 26. The average number of leaves produced in 25 gm treatment was 20. The average number of leaves produced in 50 gm treatment was 41. The average number of leaves produced in 75 gm treatment was 45.5. During the present study, in comparison with the control, the higher number of leaf formation was observed in 75 gm and 50 gm natural compost treatments.

3.4 Variation in shoot length

The length of the shoot was measured from the base to the tip of the shoot using centimeter scale. The average value was considered based on the two trials. Based on the experimental study, it was found that, in comparison with the control, the shoot length was found to be higher in 75 gm treatment followed by 50 gm natural compost treatment.

3.5 Variation in root length

The length of the root was measured from the tip to root collar. The length of root in the control was found to be 12 cm. In comparison with the control, the higher value of root length was observed in 50 gm treatment followed by 75 gm natural compost treatment.

3.6 Variation in number of flowers

During the experimental duration, a variation in the number flower formation was observed. In comparison with the control, the average value of number of flowers formed were found to be higher in 75 gm and 25 gm natural compost treatments.

3.7.Variation in number of legumes

During the present investigation, a variation in legumes formation was observed in all the treatments. The number of legumes in control was 11 and number of legumes in 25 gm was found to be 14. The number of legumes in 50 gm treatment was 27 and number of legumes in 75 gm is 57. In comparison with the control, the higher value of legumes was observed in 50 g treatment followed by 75 gm natural compost treatment.

IV. SUMMARY AND CONCLUSION

From the results obtained, the overall observations can be summarised as follows. For the Study, 4 beans seeds were used, and higher GI was observed in 75 gm and 50 gm natural compost treatments. In comparison with the control greater values were reported for growth parameters like root length, shoot length, legumes and flower formations was observed in 75 gm and 50 gm natural substrate treatments. This indicates 75 g and 50 g of natural substate with soil in 1:1 proportion can give beneficial effects on the overall growth parameters of beans plant. From the study, one can conclude that, appropriate ratio of soil and natural substrate helps in effective transformation to produce high crop yield to the farmers in the agronomy sector.

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