Effect of Organic Liquid Fertilizers on Soil Properties and Growth of Brinjal

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Abstract - Nowadays, the synthetic fertilizers are used in agriculture when compared with organic fertilizer. But the continuous use of chemical fertilizers will reduce the soil fertility, health threads to human, livestock and also microbial community present in the soil. Applying liquid fertilizers directly to the root zone will provide an immediate effect on plant growth because the solution of fertilizer acts quickly to make the nutrients available to the plants. The treatment of liquid fertilizer is prepared from waste materials. The different liquid organic fertilizers are Banana peel, Cow dung, Coconut cake, Groundnut cake and Vegetable waste.The main intention of this project is to compare the performance of different organic liquid fertilizers and to find out the nutrients present in the soil.With the help of following parameters are pH, electrical conductivity (EC), nutrients of soil like nitrogen, phosphorous, potassium, organic matter and plant growth.

KEYWORDS: ***Organic liquid fertilizer, pH, Electrical conductivity, nutrients.***

I. INTRODUCTION

Liquid organic fertilizers consist of essential plant nutrients and beneficial microorganisms, which recycle organic matter. Organic liquid fertilizer is natural or artificial substance containing all macro and micro essential nutrients that improve the growth and productiveness of plants, enhance the natural fertility of the soil and it replaces the chemical elements taken from the soil by previous crops or other factors and improve the essential micro-organisms in the soil. Liquid concentrates are rich in nitrogen and the fertilizers containing organic elements including sulphur and trace metal elements used in agricultural applications. Liquid concentrate provides features such as organic form of nitrogen and adds positive value, compared to typical industrial fertilizers. The fertilizer available to be used for plants are produced from completely natural raw materials without causing damage to the environment. After making necessary specifications, these fertilizers can be sold through the agency of retail or fertilizer producers. Fertilizers are simply plant nutrients applied to agricultural fields to supplement the required elements found naturally in the soil. Organic fertilizer inputs in agricultural fields in the present scenario has significant environmental benefits over the use of chemical fertilizers and the practice has gained much importance.Liquid fertilizers can offer opportunities for more efficient nitrogen use when they are applied through a drip irrigation system such an application is called fertigation. One of the advantages of using liquid organic fertilizers into plants is the easily absorbed nutrients in the fertilizers by the soil that can be readily utilized by the plants.

The main objective of the project is to

- ✓ To improve soil fertility.
- ✓ To reduce salinity.
- ✓ To prevent the soil from chemical pollution and toxic residues.
- ✓ To restore the ecological balance.

II. METHODOLOGY

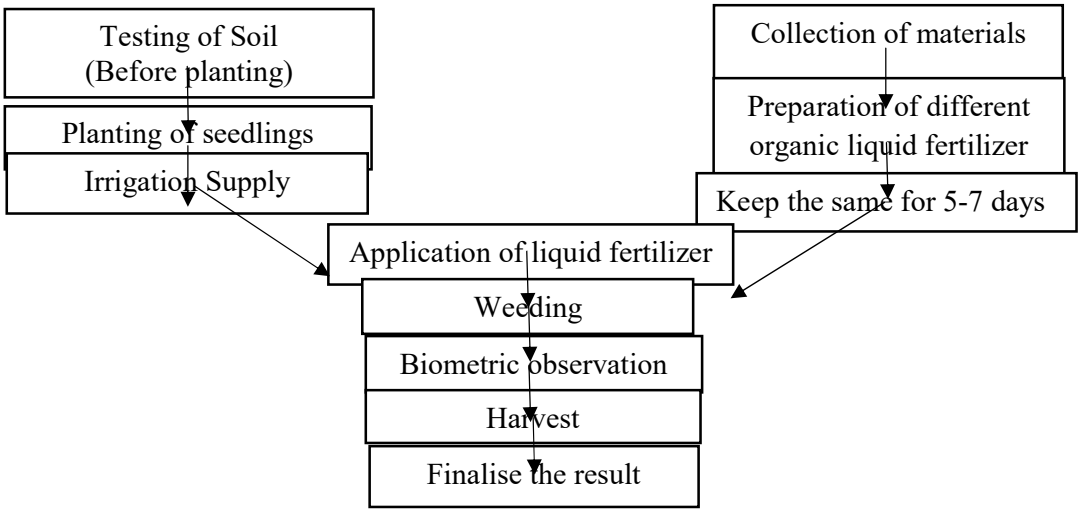

FIGURE 1: METHODOLOGY FLOW CHART

Before planting the seedlings, the soil sample was collected at the field of Paavai Engineering College at Namakkal located on latitude 11.2195158 and longitude 78.1677931. The parameters like soil pH, Electrical conductivity (EC), Organic Carbon, Nitrogen, Phosphorus and Potassiumwere tested in the laboratory. Planting two seedlings per hill in the polybag and then thin two plants per hill after 10 days. It consists of 5 treatments with two replications. Irrigation is done at weekly intervals.The materials were collected for preparing the liquid fertilizer. It can be prepared with different ratios of organic materials like Banana peel, Tea powder waste, Cow dung, Coconut cake, Neem cake, Groundnut cake, Vegetable waste. Liquid fertilizers can be applied at every 30 days intervals (i.e. 30 DAP,60 DAP, 90 DAP and 120 DAP) and the observation of plant growth can be recorded. Hand weeding can be done at every 15 days interval. Different parameters of growth attributes such as plant height, leaf length, leaf breadth and number of leaves present in the plant was recorded at 30 DAP, 60 DAP, 90 DAP,120 DAP and 150 DAP. Harvesting can be done at 70 to 85 days from transplanting. Brinjals are ready for harvest when the fruit is glossy, firm, full-coloured. Usually picking can be done once in each week; twice each week at the peak of the season.After harvesting of brinjal, the performance of organic liquid fertilizers was analyzed through the observation of plant growth and also based on the soil testing parameters like pH, EC, NPK and organic carbon.

TREATMENT PROCESS:

BANANA PEEL FERTILIZER

Take the banana peels and Chop the peels. Take some amount of tea powder waste. Add 1 litre of water and cover the container or bottle. Keep the same for 7 days. Stir the mixture once every three days. Mix with same amount of water and apply to the plants. Working cut up banana peels into the soil surrounding your plants not only feeds the plants, it also will help naturally deter green aphids and other pests. You can also spray your banana peels compost tea waste directly onto plants to help repel aphids.

COWDUNG FERTILIZER

Place the cow dung into the bucket and add 1 lit of water, stir the mixture once for first 3 days and apply to the plants.Use a drum, bucket, or other suitable container. It must have a lid or a makeshift lid. Place the dried-out cow manure into the container. Place in to about one-third of the container's height. Fill the rest of the container with water. Cover the container. This keeps out the flies and other pests. Stir the mixture once every three days. Or, stir once a day for the first three days and then only stir weekly. Leave until the smell dissipates. Once it doesn't smell anymore, it is ready for use. The odor may be smelly over the container itself but the ammonium odor should be completely gone. If not, leave longer until it has gone. Then apply to the plants.

COCONUT CAKE FERTILIZER

Take 200gms of coconut cake and 100gms of neem cake into the bucket. Add 1 litre of water and cover the bucket perfectly. Keep the same for 2-3 days or leave it until the smell dissipates. Filter the liquid from the mixture. Now mix the liquid with water. Apply the liquid fertilizer to the plants at every 30 days interval.

GROUNDNUT CAKE FERTILIZER

Take 200gms of ground nut cake and 100gms of neem cake.Put it in 1 lit of water, 100ml of curd. Add jaggery and it acts as a good promoter to increase the absorption of nutrients by plants. Keep the same for 2-3

days. After 2-3 days you can take that and mix with water and apply to the plants. You can use this once in a week, this is a very good nutrients for the health of veggies.

VEGETABLE WASTE FERTILIZER

Put the vegetable waste into the bucket, add certain amount of sugar.Cover the bucket. After 2-3 weeks, discharge the brown liquid. Then mix the brown liquid with 1-2 times of water and apply to the plants.

III. RESULT AND DISCUSSION

3.1 PLANT HEIGHT

The average height of randomly selected plant was measured with a measuring scale and results were expressed in centimetres. The plant height of selected plants was recorded at 30 days interval in each replication of different treatments. The plant height was recorded from the bottom of the plant to the highest leaf of the individual plant. The plant height recorded at 30 DAP, 60 DAP, 90 DAP, 120 DAP and 150 DAP. From this observation, maximum plant height was observed in groundnut cake treatment (89cm) followed by coconut cake (85cm) and the minimum plant height (74cm) in control treatment.

S. No	TREATMENTS	30 DAP (cm)	60 DAP (cm)	90 DAP (cm)	120DAP (cm)	150DAP (cm)
1.	Banana peel	16	31	51	71	77
2.	Cow dung	17	32	54	73	79
3.	Coconut cake	16	34	53	75	85
4.	Groundnut cake	17	36	56	78	89
5.	Vegetable waste	16	32	53	73	82
6.	Control	15	28	49	67	74

TABLE1: Plant height variation in 30 DAP, 60 DAP, 90 DAP, 120 DAP &150 DAP

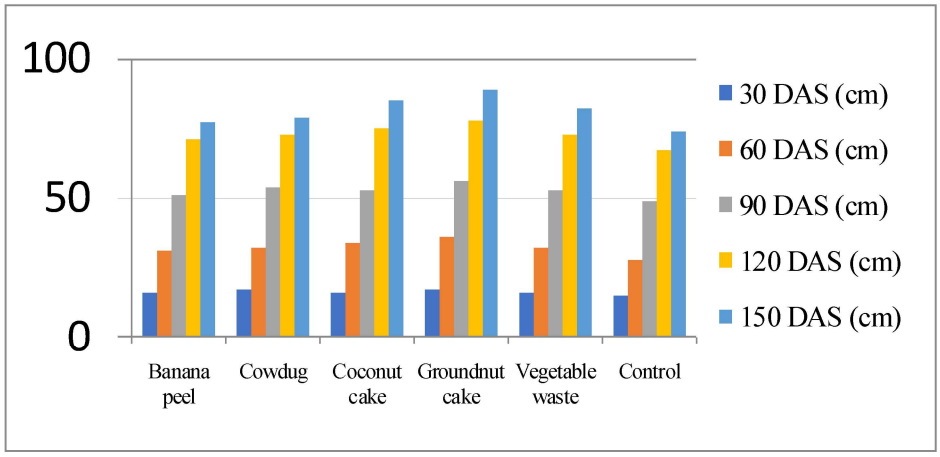

FIGURE 2: Plant height variation in 30 DAP, 60 DAP, 90 DAP, 120 DAP &150 DAP

3.2 LEAF LENGTH

The average length of randomly selected leaves from each replication was measured in cm. The leaf length of the plant was recorded at 30 DAP,60 DAP, 90 DAP,120 DAP and 150 DAP.From this observation, maximum leaf length was observed in groundnut cake fertilizer (16.5cm) and the minimum leaf length (14 cm) in control treatment.

TABLE2: Leaf length variation in 30 DAP, 60 DAP, 90 DAP, 120 DAP & 150 DAP

S. No	TREATMENTS	30 DAP (cm)	60 DAP (cm)	90 DAP (cm)	120DAP (cm)	150DAP (cm)
1.	Banana peel	9	11	12	13	15
2.	Cow dung	10	11	12	13	14.5
3.	Coconut cake	10	11	13	15	16
4.	Groundnut cake	10	12	14	16	16.5
5.	Vegetable waste	10	11	13	14	15
6.	Control	9	11	12	13	14

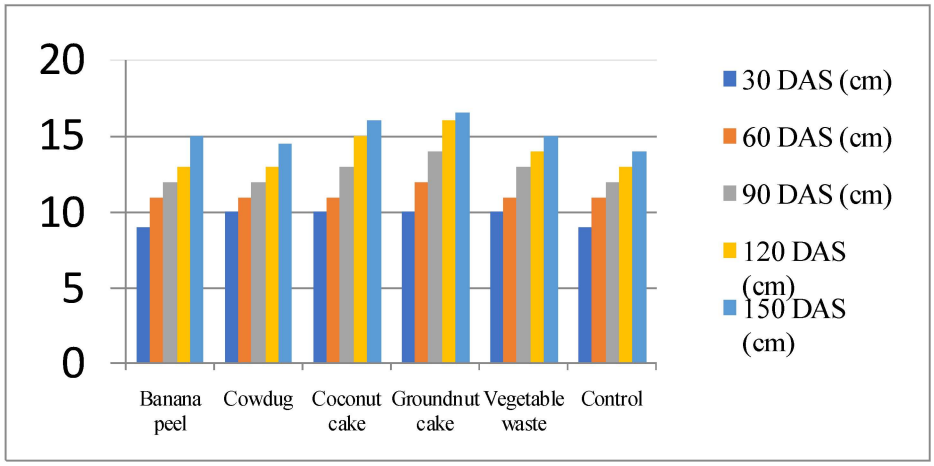

FIGURE3: Leaf length variation in 30 DAP, 60 DAP, 90 DAP, 120 DAP & 150 DAP

3.3 LEAF BREADTH

The average breadth of randomly selected leaves from each replication was measured in centimetre and the measurements are recorded at 30 days interval. The maximum breadth (12 cm) was measured under groundnut cake fertilizer whereas the lowest (10 cm) was scored under control treatment and the measurements of leaf breadth in each treatments were showed below.

S. No	TREATMENTS	30 DAP (cm)	60 DAP (cm)	90 DAP (cm)	120DAP (cm)	150DAP (cm)
1.	Banana peel	6	7	8	10	11.5
2.	Cow dung	6	7	8	10	11
3.	Coconut cake	6	7.5	9	10	11.5
4.	Groundnut cake	6.5	8	10	11	12
5.	Vegetable waste	6	7	8.5	9.5	11
6.	Control	6	7	8	9	10

TABLE 3: Leaf breadth variation in 30 DAP, 60 DAP, 90 DAP, 120 DAP & 150 DAP

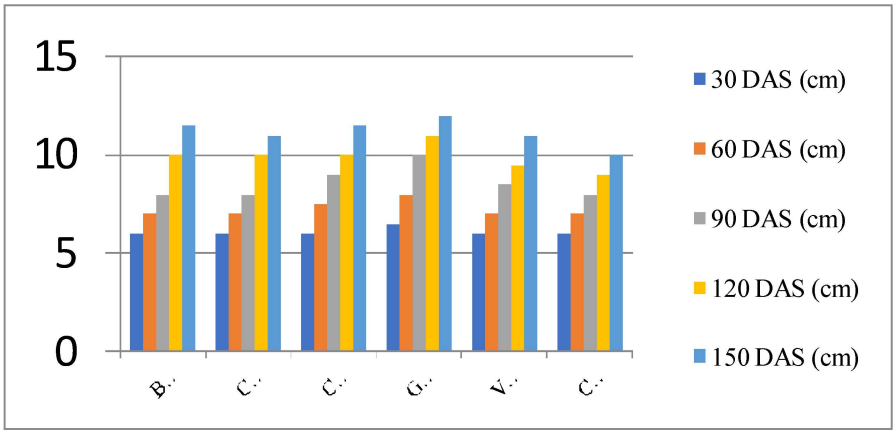

FIGURE4:Leaf breadth variation in 30 DAP, 60 DAP, 90 DAP, 120 DAP & 150 DAP

3.4 LEAF COUNT

Data on number of leaves were recorded from ten plants of two rows in the centre of each bed and results were expressed as leaf number per plant. Leaf count was observed at 30 DAP, 60 DAP, 90 DAP, 120 DAP and 150 DAP. More number of leaves formed under groundnut cake, coconut cake and control treatment were 180, 176 and 168 respectively.

S. No	TREATMENTS	30 DAP (cm)	60 DAP (cm)	90 DAP (cm)	120DAP (cm)	150DAP (cm)
1.	Banana peel	5	37	83	141	173
2.	Cow dung	6	37	84	142	171
3.	Coconut cake	5	42	87	148	176
4.	Groundnut cake	6	43	91	152	180
5.	Vegetable waste	6	39	85	145	174
6.	Control	5	33	78	138	168

TABLE 4:Leaf count variation in 30 DAP, 60 DAP, 90 DAP, 120 DAP & 150 DAP

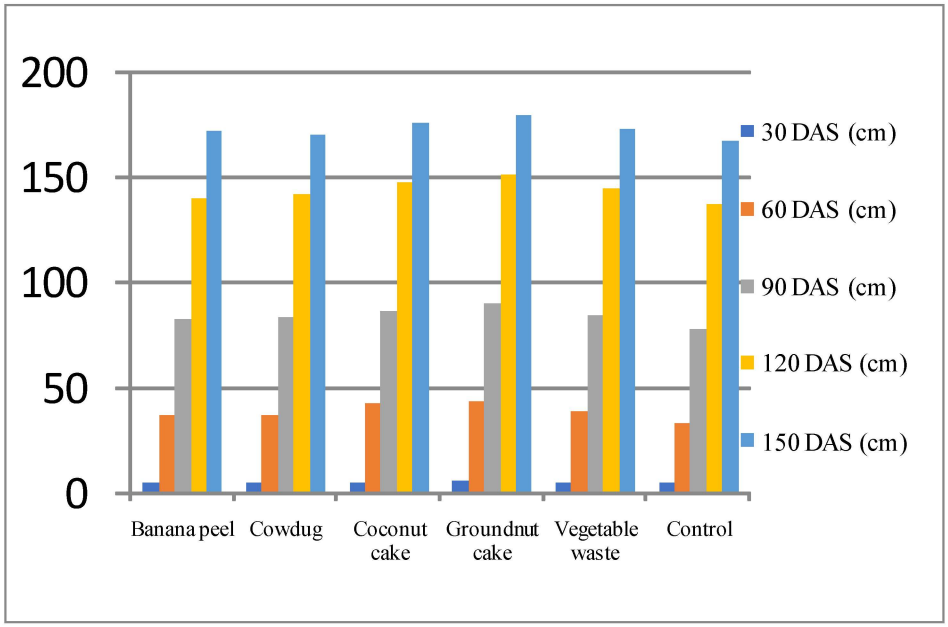

FIGURE5: Leaf count variation in 30 DAP, 60 DAP, 90 DAP, 120 DAP & 150 DAP

3.5 YIELD

The total fruit production in each treatment was recorded and yield was expressed in kilogram. It has been recorded that the higher yield of 2.10 kg was found at groundnut cake treatment, whereas lower yield 1.50 kg was recorded at control treatment. Application of different organic liquid fertilizer had resulted significantly higher yield as compare to control treatment.

Treatments	Banana peel	Cow dung	Coconut cake	Groundnut cake	Vegetable waste	Control
YIELD (kg)	1.80	1.90	2.00	2.10	1.90	1.50

TABLE 5: Yield variation in different treatments

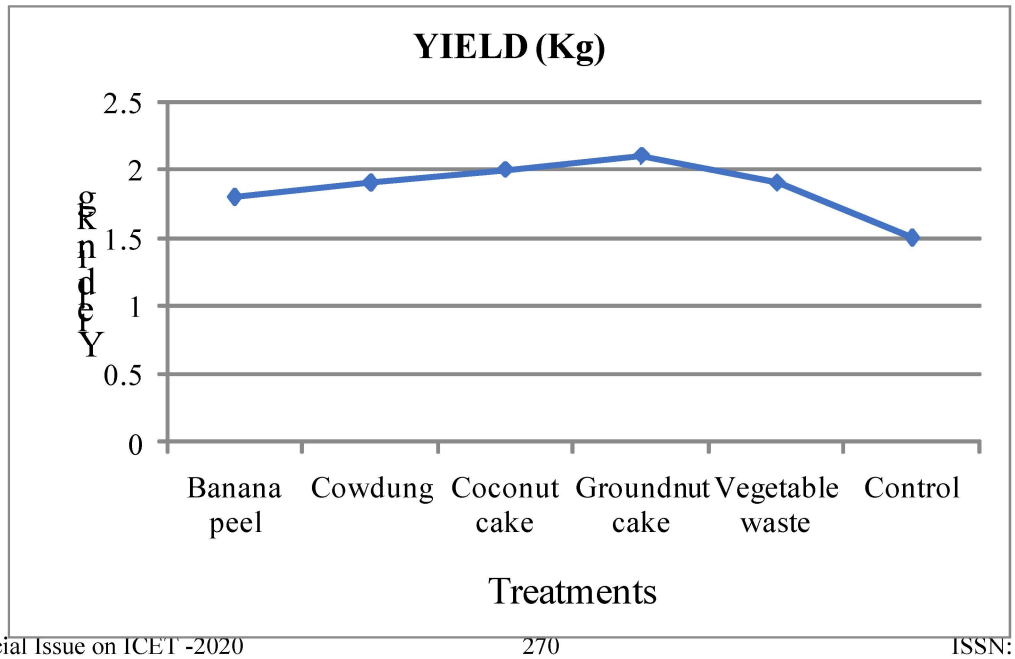

FIGURE 6: Yield variation in different treatments

3.6 SOIL TESTING ANALYSIS

S.NO	TREATMENTS	Soil Ph	EC ($dS\ m^{-1}$)	OC (%)	N ($Kg\ ha^{-1}$)	P ($Kg\ ha^{-1}$)	K ($Kg\ ha^{-1}$)
1.	Control	7.7	0.0033	0.38	258	15.9	106
2.	Banana Peel	7.10	0.30	0.41	259	23.5	114
3.	Cow dung	7.06	0.32	0.39	265	25.7	129
4.	Coconut cake	6.91	0.31	0.45	278	27.7	134
5.	Groundnut cake	6.82	0.58	0.58	284	29.6	163
6.	Vegetable waste	7.20	0.35	0.40	269	20.3	129

TABLE 6: ANALYSIS OF SOIL PROPERTIES AFTER HARVEST OF BRINJAL

Soil pH

Soil pH is a measure of the acidity or basicity of a soil. The normal pH suitable for plant growth ranges from 6.5 – 7.5.The result shows that the highest pH (6.82) was recorded with control treatment followed by vegetable waste treatment (7.20) whereas the lowest value was observed with groundnut cake treatment(6.82).

Electrical Conductivity (dSm^{-1})

Soil Electrical conductivity is a measurement that correlates with soil properties which includes soil texture, cation exchange, drainage conditions, organic matter level, salinity and subsoil characteristics. Too low EC levels indicate low available nutrients, and too high EC levels indicate an excess of nutrients.

The maximum Electrical conductivity (EC) value 0.58 dSm^{-1} was found at groundnut cake treatment and the minimum electrical conductivity value 0.0033 dSm^{-1} was recorded in control treatment. The application of various fertilizers raised the EC of the soils and the highest was recorded at treatment receiving the full dose of fertilizers.

Organic Carbon (%)

The result shows that maximum soil organic carbon (OC) of 0.58 % was observed in groundnut cake treatment and the minimum soil organic carbon of 0.38 % was recorded in control treatment.

Available Nitrogen (kg ha-1)

The maximum available Nitrogen of 284.00 kg ha^{-1} was recorded at groundnut cake fertilizer treatment and the minimum available Nitrogen was recorded at control treatment with 258.00 kg ha^{-1}.

Available Phosphorus (kg ha-1)

The maximum available P of 29.6 kg ha^{-1} was recorded at groundnut cake fertilizer treatment and the minimum available Phosphorus was recorded at control treatment with 15.9 kg ha^{-1}.

Available Potassium (kg ha-1)

The maximum available K of 163 kg ha^{-1} was recorded at groundnut cake fertilizer treatment and the minimum available N was recorded at control treatment with 106 kg ha^{-1}.

V. CONCLUSION

From the result, it can be concluded that the application of fertilizer showed that the plant height, leaf length, leaf breadth, leaf count and yield was higher in groundnut cake and followed by coconut cake treatment whereas the minimum growth was observed in control treatment .

The application of fertilizer treatment had significant effects on the soil, growth and yield of brinjal and it makes a beneficial approach towards an important source of plant nutrients in the soil. Observations on plant growth showed that the Brinjal plants in groundnut and coconut cake treatments were generally tall, more vigorous and reached 50% flowering earlier than in the control treatment. And the use of these cakes reduces the alkaline content in the soil because when they decompose, this produces organic acids. It is very low cost

process to convert waste resources into organic liquid fertilizer. These fertilizer treatments make a good addition to the soil and it makes the soil rich and ideal for plant growth. The utilization of organic liquid fertilizer in proper way not only useful in increasing soil fertility but also decrease pollution load and increase greenery, it is proving to be beneficial for human being as well as for nature. And it is an effective tool to improve the physio - chemical and biological properties of the soil with higher yield of plants in a sustained way without affecting the fertility of soil.

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