



## The progressive growth of *Capsicum frutescens* using organic fish silage use as bio- stimulants

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### Abstract

An urban Indian citizen produces a lot of kitchenette wastes per-day. It contains wet wastes like unused fish parts. Because it evokes foul odor its disposal reasons foremost environmental troubles. The present observe become done to make use of fish wastes by using ensiling with lactic acid and molasses, to supply natural fertilizer which can be utilized in kitchen garden. As it is produced through fermentation, fish silage can be stored for long term use without harm. This natural fertilizer enriches the soil excellent and is a cost-powerful fertilizer. The work is supported out with an aim to make eco-friendly organic fertilizer from fish parts, ensuring fresh vegetable. Liquid fish silage produced from fish is rich in protein, amino acids and minerals. Silage is made by biological method (Palekar, 2009), Leaf, Root and Shoot treatments were prepared at 4 different concentrations (2.5 %, 5.0 %, 7.5 %, 10%). Each treatment was compared with plant growth fertilized with commercial fertilizer using recommended dose. The results were tabulated and graphically analysed and concluded.

**Keywords:** flower pots, soil, NPK commercial fertilizer, fish parts waste (sardine) and PH paper

### Introduction

Indian Council of Agricultural Research (ICAR) has performed a significant function in knowing the modern growth in agricultural manufacturing with advances in varietal improvement of field and horticultural crops in conjunction with their production and protection technologies. The destiny demanding situations in agriculture are a lot more ambitious, which need brief solutions to cope with the problems related to sustainability, weather resilience, worthwhile commercialization, export advertising, import substitution and enhancing competitiveness of our agriculture and allied area's produce in the worldwide markets (ICAR annual report 2022-23).

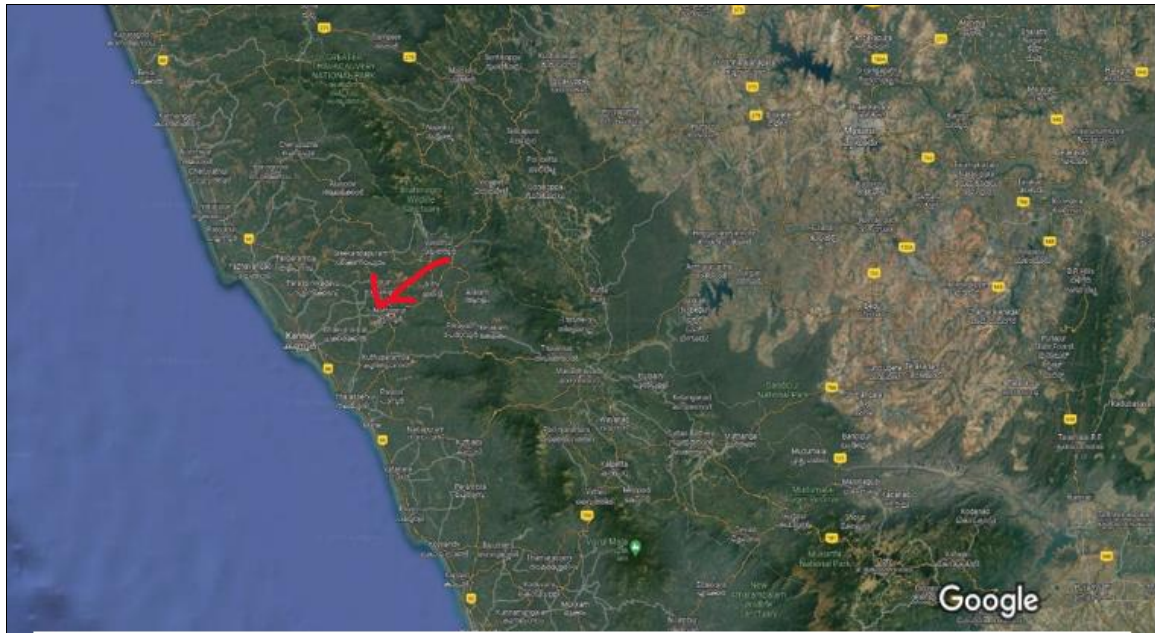
India is an agriculture-based totally nation in which nearly 65 percent of human beings are either without delay or indirectly related to agriculture or its associated occupations. Animal husbandry plays an important function in diversification of agriculture region. Farm animals farming now best provides a boost to the agricultural financial system however additionally offers dietary safety. Among all types of livestock farming is the main subsidiary occupation (Munish Kumar *et al.*, 2022) <sup>[10]</sup>.

To lessen the number of poisonous nitrates in the soil, the European Council Directive of 12 December 1991 concerning the protection of waters towards pollution because of nitrates from agricultural resources (91/676/EEC) known as for a great reduction within the number of nitrogen-containing fertilizers utilized in agriculture and horticulture. As an end result, natural farming the use of herbal preparations that enhance the

overall fitness, vitality, and increase of flora and do now not pose many environmental and ecological dangers at the moment are the favored choice (Pylak *et al.*, 2019) <sup>[7]</sup>. As an alternative to chemical fertilizers, bio- stimulants may be used to stimulate plant boom and increase yields (Drobek *et al.*, 2019) <sup>[8]</sup>. Bio-stimulants are merchandise able to act on the metabolic and enzymatic methods of plant life enhancing productiveness and crop. Bio-stimulants may assist flora to cope with stressful environmental conditions which includes drought, abiotic strain and cold (Xu *et al.*, 2018) <sup>[9]</sup>. Plant bio-stimulants are described as products that stimulate plant nutrition approaches independently of the product's nutrient content material, with the only intention of improving any of the plant or plant rhizosphere nutrient use performance, tolerance to abiotic strain, pleasant and availability of limited vitamins in soil or rhizosphere. Bio-stimulants can be any mixture of substances, organic in nature from herbal or microbial sources that could improve crop situations without /inflicting detrimental aspect-outcomes.

Organic farming emphasizes the usage of renewable resources, land management that keeps natural soil fertility, water conservation and rich biodiversity, and lengthy-time period sustainability as stated through (Plotto & Narciso, 2006) <sup>[11]</sup>. The rapid increase in organic food over time has been attributed to extended client self-belief and superior consciousness about the possible health dangers and environmental impacts of conventional meals manufacturing implement. The call for natural products will increase as human beings choose more healthy life-style, along with meals options inclusive of end result and greens which might be chemical/pesticide-unfastened.

**Study area**



**Fig 1:** Topographic Map of Mattannur, Kannur District, Kerala, India

**Materials and methods**

**1. Preparation of Molasses**

Take 3 medium sized rotten pomegranates. Put it in a mixer and squeeze the juice. Filter it and pour this juice into a pan. Now boil it in low flame for upto 10-20 mins. Add 2 tablespoons of sugar to it. Stir well. After about 20 minutes slowly increase the flame and you can see bubbles forming. Keep stirring it. After a while you can see the juice changing its consistency. It becomes more of like a viscous fluid, also it turns out to be brownish in colour. Then it's ready. It takes upto 30-40 mins to be made. Also, no water should be added while juicing.



**Fig 2:** Molasses

**2. Preparation of fish silage**

Take 500gms of sardine discarded parts (which includes head, gut, scales and fins). Mince it thoroughly. For preparing four different concentration of fish silage (2.5%, 5%, 7.5% and 10% respectively). At first, equally add 125g

of minced fish in four different containers. Then molasses is added in each container at different proportion 3.1g (2.5%), 6.2 (5%), 9.3 (7.5%), 12.5 (10%) respectively. The mixture (minced fish and molasses) is stirred well and boil in water bath for 15minutes. Immediately cool this at the room temperature. Add 2.5gms each, of curd (lactic acid) to initiate fermentation and stir with a sterilized spoon. Pour the content in 4 different plastic air tight container and labeled them as 2.5%, 5%, 7.5% and 10% concentration and keep in a dark place for fermentation. Fish silage is ready. Initial and final pH of silage is noted with pH meter and pH paper.



**Fig 3:** Minced Fish      Fish waste



**Fig 4:** Fish silage in four different concentrations (2.5%, 5%, 7.5%, 10%)

**3. Setting of soil and filling in flower pots**

Required soil (2.5 kg) is prepared and sun dried for 3 days. 6 flower pots of equal size are labeled as C (Control), C1 (with commercial fertilizer), C2 (Fish silage 2.5%), C3 (Fish silage 5%), C4 (Fish silage 7.5%) and C5 (Fish silage 10%).

**4. Sowing seeds**

Sowing healthy seeds 8-10 in each pot.

**5. Application of NPK and silage preparation**

The soil from all the respective flower pots were dried, packed and sent to NPK lab Kannur, for testing its NPK content. Since C is control, did not add NPK and Fish silage.

C1- NPK (commercial fertilizer)

C2- 2.5% (fish silage)

C3- 5% (fish silage)

C4- 7.5% (fish silage)

C5- 10% (fish silage)

**6. Watering (equal amount of water only)**

Equal amount of water is sprinkled daily.



**Fig 5:** Commercial fertilizer treated plants C, C1, C2, C3, C4 and C5

**Results and discussion**

The results of the present study reveal that it is evident from the Figures:1,2,3,4 and 5. Tables:1,2, and 3 showed and Graphs:1,2, and 3 shown in growth pattern is almost similar in commercial fertilizer treated plants (C1) and fish silage 5%, 7.5%,10% treated plants. In Control(C), the growth of plants is very less because it is devoid of any fertilizer. Similarly, in sample (C2) the silage concentration is very less (2.5%) and the growth rate is noted minimum.

Urbanization leads to many unseen issues in everyone’s life. Due to urbanization, the agricultural field diminishes day-by-day, whereas the population increases. This leads to high demand in crops and low production of crops. We effectively use minimum land to produce maximum yield using chemical fertilizers, pesticides etc. The continuous use of non-natural manure and pesticides gradually destroy quality of the soil. As a result, government and agriculture department started encourage public to grow terrace farming and small-scale farming using bio fertilizer, manure and thus everyone started organic farming method. Here comes the need of organic manure that won’t cost anything and moreover becomes a great help in kitchen waste management. Kitchen waste especially fish waste which causes foul smell is a big nuisance to every house hold. We

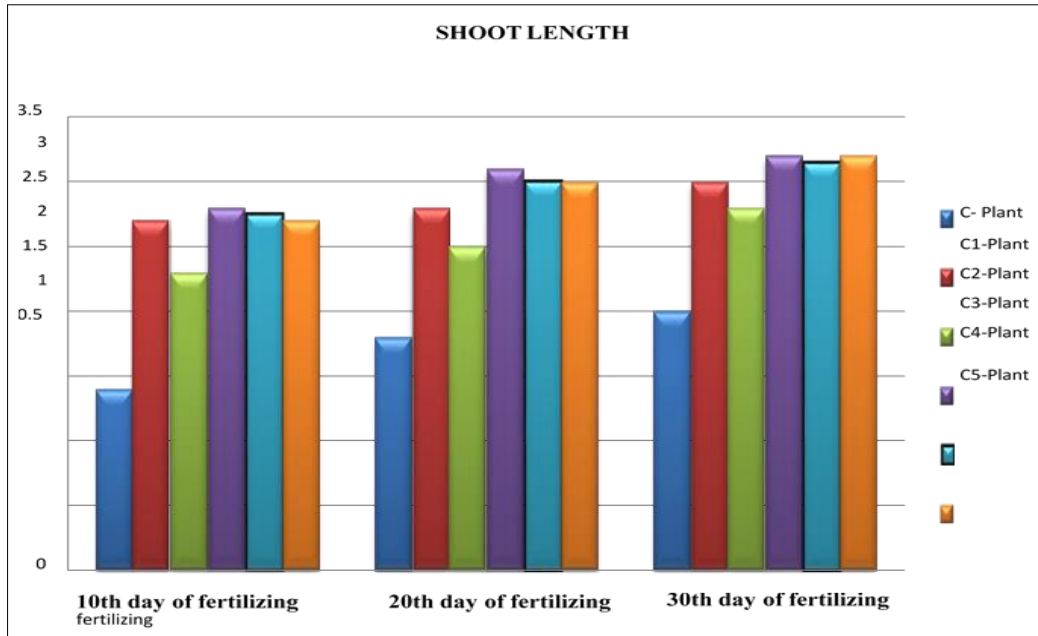
follow a method to turn fish waste into a good fertilizer. We have made a thorough study about fish waste that we usually throw away and the common women’s headache to manage this. Out of 1kg sardine, when it is cleaned, at least there remains 400g of waste. This will effortlessly, decay and leads to terrible stinky foul smell. To get rid of this crisis, we have developed a method and that leads to grow vegetable garden that provide unbelievable yield. This is surely a double-edged weapon fighting against the crisis of fish waste and low yield in the kitchen garden.

With the growing call for to fulfill the dietary requirements of a growing population and massive patron recognition of environmentally-friendly agricultural practices in addition to strict policies on the use of chemical fertilizers, there’s an urgent need to discover opportunity strategies of sustainable horticultural production via technical and technological innovations. Using plant bio-stimulants from fish by way of-products can improve nutrient uptake, dietary performance, plant yields and the high-quality of merchandise and is a promising opportunity to traditional chemical fertilizer use. This has caused a boom within the demand for plant bio-stimulants and an exponential marketplace boom, which is set to preserve with the identical growth trajectory over the next few years (Moses Madende and Maria Hayes, 2020) [12].

**Table 1**

Shoot Length						
Days	C (cm)	C1 (cm)	C2 (cm)	C3 (cm)	C4 (cm)	C5 (cm)
10 <sup>th</sup> day of fertilizing	5.0	6.2	6.0	6.45	6.35	6.3
20 <sup>th</sup> day of fertilizing	5.4	6.75	6.4	7.0	6.9	7.0
30 <sup>th</sup> day of fertilizing	6.5	7.6	7.2	8.3	8.2	8.25

**Graph 1**

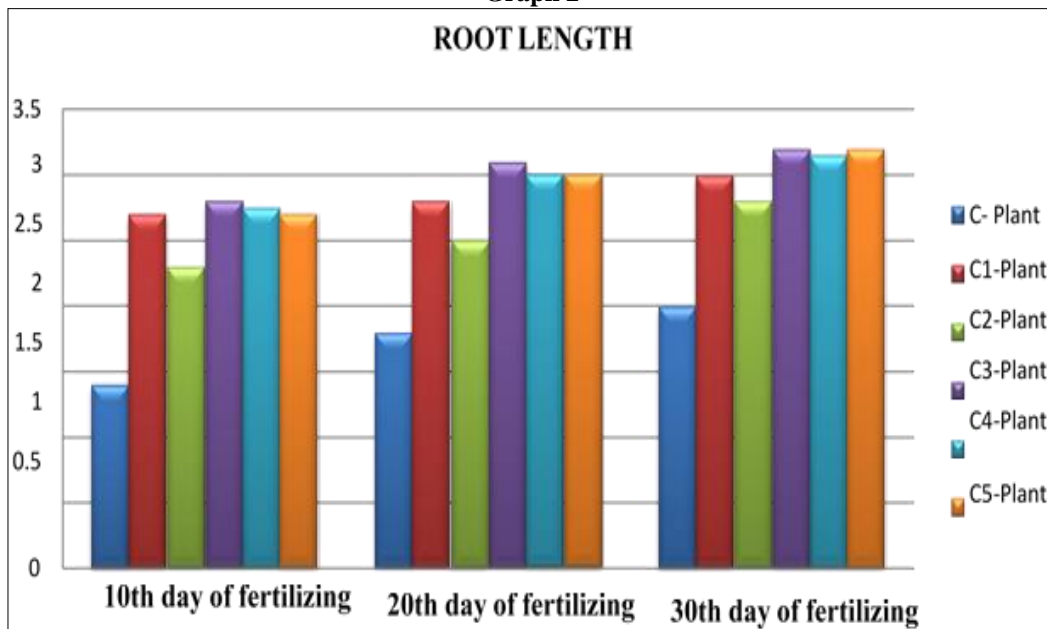


**Graph 1:** Measurement of different shoot length

**Table 2**

ROOT LENGTH						
Days	C (cm)	C1 (cm)	C2 (cm)	C3 (cm)	C4 (cm)	C5 (cm)
10 <sup>th</sup> day of fertilizing	1.8	2.1	2.0	2.1	2.2	2.1
20 <sup>th</sup> day of fertilizing	2.1	2.6	2.2	2.6	2.5	2.6
30 <sup>th</sup> day of fertilizing	2.4	2.9	2.6	2.9	2.9	2.9

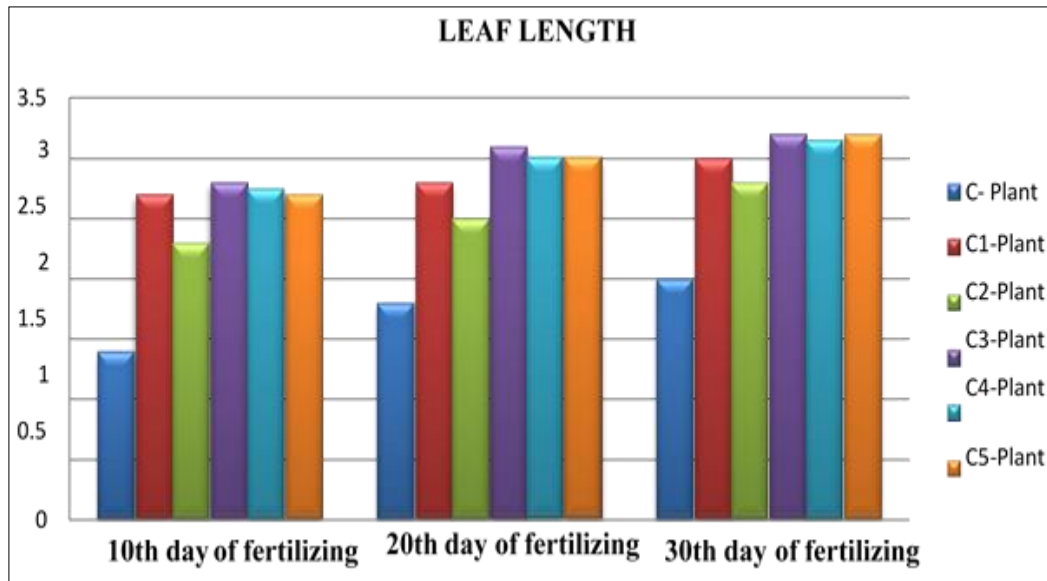
**Graph 2**



**Graph 2:** Measurement of different root length

**Table 3**

Leaf Length						
Days	C (cm)	C1 (cm)	C2 (cm)	C3 (cm)	C4 (cm)	C5 (cm)
10 <sup>th</sup> day of fertilizing	1.4	2.7	2.3	2.8	2.75	2.7
20 <sup>th</sup> day of fertilizing	1.8	2.8	2.5	3.1	3.0	3.0
30 <sup>th</sup> day of fertilizing	2.0	3.0	2.8	3.2	3.15	3.2

**Graph 3****Graph 3:** Different measurement of leaf length**Conclusion**

From the results it is evident that use of 5% organic fertilizer silage can be recommended. 7.5% and 10% also showed same results. Use of fish silage as fertilizer helps to minimize pollution, is a solution for kitchen waste disposal, encourages production of cost-effective fertilizer and minimize soil quantity. Fish silage is rich in NPK. Following applications of silage treatments helps in easy absorption of nitrogen. When compared to other organic fertilizer produced from fish waste (e.g.: Fish amino acid called mathichakara) fish silage has advantages. Since it is produced by fermentation, fish silage has no foul smell and also it can be used for long term purposes. So, it can be recommended and it can be encouraged to enrich kitchen garden.

**Conflict of interest**

The authors declare that there is no conflict of interest, financial or otherwise.

**Acknowledgements**

It is a matter of pleasure to thank all those who offered their help to us to do this project. We wish to express our deep gratitude to our head mistress Smt. Sujatha. M.M, project co-ordinator Smt. Sheema M.C and Smt. Bhagya Lakshmi for their encouragement and support. Our special thanks to Mrs. Haritha Satheesh who willingly offered valuable suggestion, her patience, unflinching guidance and assisting us throughout for the competition of this project. Our thanks to our family for their affectionate help and dedication to fulfill this project. We wish to place on record the service rendered by our friends in this institution.

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