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COMPARATIVE STUDY OF THE EFFECTS OF ORGANIC AND INORGANIC FERTILIZERS ON GROWTH OF SPINACIA OLERACEA L.

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ABSTRACT

The comparative effects of organic and inorganic fertilisers on spinach are the basis of this study. Biological insecticides and fertilisers made from plant or animal waste are used in organic farming as a farming method. Inorganic fertilisers such as muriate of potash, urea, urea-ammonium nitrate mixtures, and anhydrous ammonia (potassium chloride). The experiment was conducted on Spinacia olearcea L. and various parameters such as root length, shoot length, leaf length, root weight, shoot weight, leaf weight and number of leaves were considered in this experiment. After meticulous observations and study, it was concluded that organic farming showed better results in terms of growth as compared to inorganic farming of spinach with chemical fertiliser.

Key words: Spinacia oleracea L., Organic farming, Inorganic farming

1. INTRODUCTION

Diets high in fruits and veggies have been shown to be protective against many common chronic diseases, including cancer, obesity, and cardiovascular disease. Particularly leafy green vegetables are known to have significant health-promoting properties that are ascribed to the functional characteristics of their nutrients and non-essential chemical compounds [1]. Spinach (Spinacia oleracea L.) is one of the most popular leafy vegetable crops grown in India. It can be used with raw, canned, or frozen goods. It has few calories and is an excellent source of iron, vitamin C, and vitamin A [2]. When spinach is fresh, steamed, or quickly boiled, it is particularly high in antioxidants and has a high biological value [3]. The significant impact of bio-fertilizers may be attributable to the effects of various strain groups, such as nitrogen fixers and nutrient mobilisation microorganisms, which help to increase the availability of minerals and their forms in composted materials and increase levels of extractable macro- or micronutrients [4]. Spinach can be produced using organic fertilisers instead of inorganic ones by using farmyard dung, poultry and other animal manures, as well as biofertilizers [5]. The soil aggregation is improved by using organic fertilisers, which changes the soil's physical properties, such as its ability to retain water and its aeration [6]. The use of urea as a nitrogen fertiliser has grown significantly over the past 25 years, and it is now the most significant N fertiliser used globally in agriculture. Therefore, there is an obvious and pressing need to find solutions to the issues associated with using urea fertiliser, which include harm to seeds, seedlings, and young plants, NO_2 toxicity, phytotoxicity of urea applied topically, and volatilization of urea N as NH_3. Because it can surpass 50% of the N applied, urea fertiliser N gaseous loss as NH_3 is particularly concerning [7]. The objective of this research was to use organic and inorganic fertilisers to find out which fertiliser gives better growth of Spinacia oleracea L.

2. MATERIALS AND METHODS

2.1 Material
2.1.1 Plant material: seed of spinach (Spinacia Oleracea L.)
2.1.2 Glass wares: Measuring cylinder, beaker, conical flask, Petri dishes.
2.1.3 Organic fertiliser: Cow dung
2.1.4 Inorganic fertiliser: Urea

2.1.5 Miscellaneous: Blotting papers, Distilled water, Spatula, Forceps.
2.1.6 Instruments: Distiller, Electronic weighing balance (mg)
2.1.7 Garden Tools: Hoe, Water can, Spray bottle
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2.2 Methodology

2.2.1 Seed collection

➢ Spinacia oleracea L. plant seeds were purchased from polytechnic horticulture centre, Ahmedabad.

2.2.2 Place of Work

➢ The entire research work was done at the botanical garden of the Department of Botany, University School of Sciences, Gujarat University, Ahmedabad.

2.2.3 Soil Preparation and Parameters

➢ For this experiment, different soil medium such as Control, Organic soil (Used bio fertilizer) and Inorganic soil (Used Urea) were used. After that various parameters were measured for the selected plant such as Shoot length, Root length, Leaf length, Number of leaves, Root weight, Leaf weight and Shoot weight.

2.2.4 Preparation of Control soil

➢ In the control series not any treatment was given. Seeds were soaked for 8 hours in water. Then the pit was dug of 42”x19” and scattered the seeds around the ground area. After that covered it with half an inch of soil and sprinkled some water on a regular manner and measured various morphological parameters on a weekly basis.

2.2.5 Preparation of Organic soil

➢ Seeds were soaked for 8 hours in water. Then the pit was dug of 42”x19” and scattered the seeds around the ground area. After that, covered it with half an inch of soil and sprinkled water on a regular manner and after 2 days bio fertiliser was added in the selected area. Then measures of various morphological parameters on a weekly basis.

2.2.6 Preparation of Inorganic soil

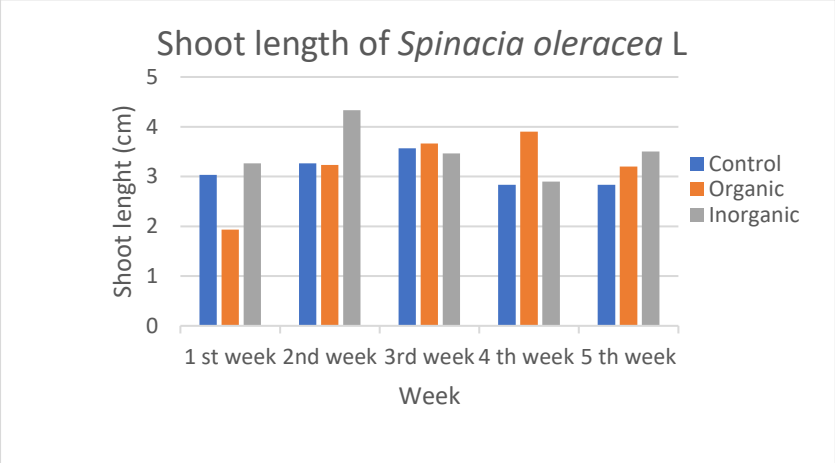
➢ Seeds were soaked for 8 hours in water. 5gm Urea was dissolved in 1500 ml of distilled water. After that, a pit of 42" x 19" was dug and scattered the seeds around the ground area. After that, cover it with half inch of soil and sprinkled water on a regular manner and after 3 days of germination, sprayed 750ml Urea on the area. Then again sprayed 750ml Urea after 1 week. Then measures of various morphological parameters on a weekly basis.

3. RESULTS AND DISCUSSION

➢ Control, Organic and inorganic soils were used in this experiment. A total of seven parameters selected as key parameters. In this experiment data collection of seven parameters was taken on a specific day every week. In which data collection was taken for a total of five weeks.

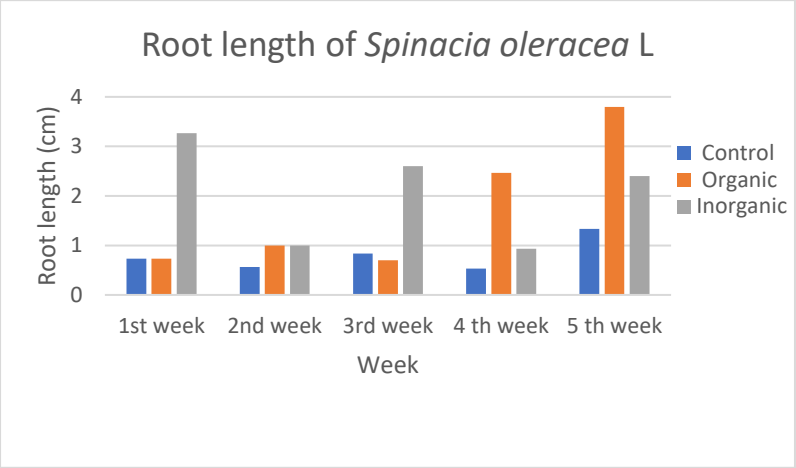
Photo plate2. Showing the result

3.1 Shoot length of Spinacia oleracea L.



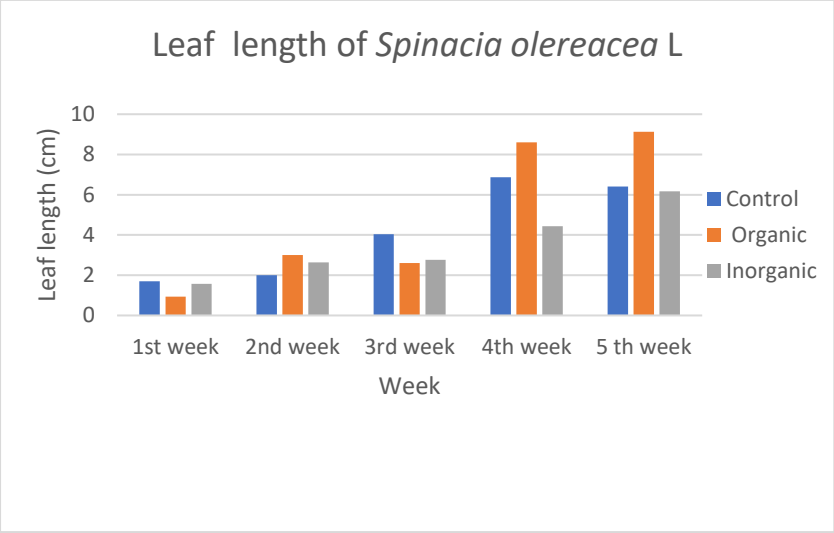
➢ This graph shows the shoot length of Spinacia oleracea L. in Control, organic and inorganic on weekly basis. The higher shoot length was observed in Inorganic farming (4.3 cm) as compared to Control (3.4cm) and Organic farming (3.9 cm) plants.

3.2 Root length of Spinacia oleracea L.



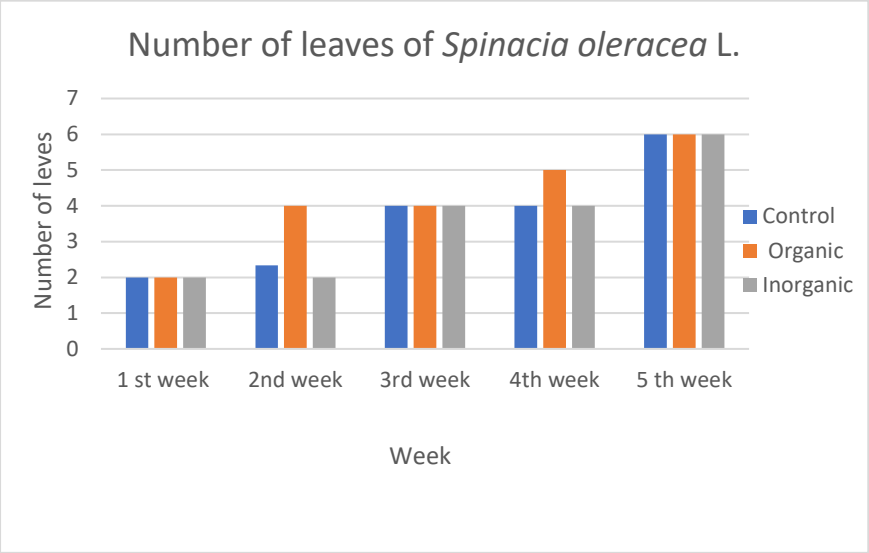
➢ This graph shows the root length of Spinacia oleracea L. in Control, Organic and Inorganic on weekly basis. The higher shoot length were observed in Organic farming (3.8 cm) as compared to Control (1.3cm) and Inrganic farming (3.2 cm) plants.

3.3 Leaf length of Spinacia oleracea L.



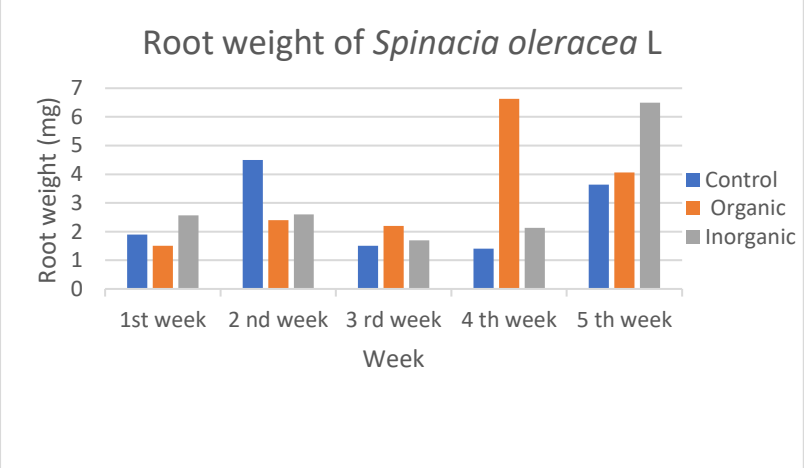
➢ This graph shows the Leaf length of Spinacia oleracea L. in Control, Organic and Inorganic on weekly basis. The higher shoot length were observed in Organic farming (9.1cm) as compared to Control (6.8cm) and Inrganic farming (6.1 cm) plants.

3.4 Number of leaves of Spinacia oleracea L.



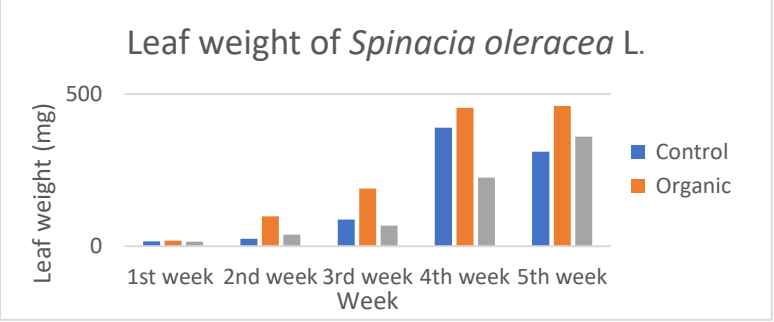
➢ This graph shows the number of leaves of Spinacia oleracea L. in Control, organic and inorganic on weekly basis. The Number of leaves were same in all type of soil.

3.5 Root weight of Spinacia oleracea L.



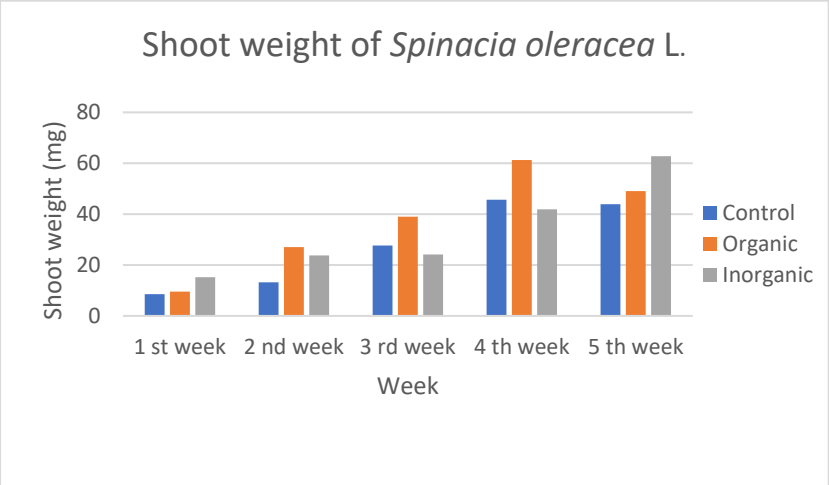
➢ This graph shows the Root weight of Spinacia oleracea L. in Control, organic and inorganic on weekly basis. The higher root weight was observed in Inorganic farming (6.5mg) as compared to Control (4.5mg) and Organic farming (6.3mg) plants.

3.6 Leaf weight of Spinacia oleracea L.



➢ This graph shows the Leaf weight of Spinacia oleracea L. in Control, Organic and Inorganic on weekly basis. The higher Leaf weight were observed in Organic farming (461.4mg) as compared to Control (389.5mg) and Inoganic farming (360.46mg) plants.

3.7 Shoot weight of Spinacia oleracea L.



➢ This graph shows the Shoot weight of Spinacia oleracea L. in Control, Organic and Inorganic on weekly basis. The higher Shoot weight were observed in Inorganic farming (62.76mg) as compared to Control (45.66mg) and Organic farming (49.06mg) plants.

4. CONCLUSION

In this research work, Spinacia oleracea L. was grown in three types of media. In which seven parameters have been studied. In which the number of leaves is found to be the same in all three mediums. When in shoot length, root weight and shoot weight, better results are seen in Inorganic medium than the other two mediums. While in root length, leaf length and leaf weight in organic medium good results are seen in the other two mediums. Thus, it is concluded that the use of organic fertilizers can increase crop production. Organic fertilizer is the best alternative to inorganic fertilizer.

5. REFERENCES

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Useful web links

1) https://dutchmeadowsfarm.com/blog/fresh-organic-spinach-faq-facts-benefits-and-6-recipes#:~:text=Spinach%20is%20a%20wonderful%20source,system%20and%20give%20you%20energy
2) https://mowbot.com/blog/organic-fertilizer-vs-inorganic/#:~:text=Both%20organic%20and%20inorganic%20fertilizers,slower%2C%20more%20naturally%20and%20healthily.
3) https://www.mdpi.com/20770472/10/11/544#:~:text=The%20continuous%20and%20steady%20application,8%2C9%2C10%5D.