

Application of Household Generated Floral Wastes (Tagetes Spp.) as Biofertilizer for the Tulsi (Ocimum Tenuiflorum) Plant

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Abstract— The present work focuses on using Marigold flowers (discarded from households after offerings to God) as a biofertilizer for the commonly grown Tulsi plant (*Ocimum tenuiflorum*). A comparative study was conducted using Pot Experiment. Floral wastes were mixed in the soil of Tulsi plant directly and in powdered form. Untreated Tulsi plant was kept as a control. The chlorophyll content in the leaves of the Tulsi Plant and soil parameters (pH, conductivity, organic matter and NPK values) were calculated for all the three plants during study period of three months. The soil provided with powdered floral wastes showed better plant growth without any side effects as compared to that of the other two plants. This shows that soil with powdered floral wastes improved soil fertility to a large extent and hence acted as a Biofertilizer. Hence, the present work can be used as an ecofriendly and cost effective alternative for use of household generated floral wastes as a biofertilizer for the potted plants at houses itself. This reuse of floral wastes will in turn reduce its discharge in the water bodies and hence will reduce water pollution due to anthropogenic activities to some extent.

Key words: Biofertilizer, Tulsi Plant, Soil Parameter, Plant Parameter

I. INTRODUCTION

In India, the use of flowers during worshipping is a common practice. These flowers are replaced every day with fresh flowers which leads to the generation of lots of floral wastes on a daily basis from temples, houses, etc. The floral wastes generated from households are collected in polythene bags and are mostly discarded in the water bodies for holy reasons. The discharge of such wastes has led to various water related issues like Eutrophication which are affecting both mankind and aquatic life. The floral wastes are degraded at slower rate as compared to kitchen wastes [3]. In India, approximately 80,00,000 tonnes of floral wastes are dumped in rivers every year [1].

The fertilizers made using biological substances are termed as Biofertilizers. The biofertilizers do not contain any toxic substances which may affect the soil, rather they improve the soil fertility and prevent the soil from precipitating chemical fertilizers. Hence biofertilizers are environmental friendly [2][3]. Several works are reported on the conversion of floral wastes into usable products. [7] explained the use of floral wastes to make vermicompost, biogas generation, and extraction of essential oils and dyes. Another study carried out by [5] showed successful extraction of natural dye from Marigold and Rose flowers using different mordants.

At the Mankameshwar temple in Lucknow, flowers are converted into incense sticks using indigenous methods under a project named 'Mission Sakshama' which are

initiated by the Lucknow based CSIR's premier laboratory Central Institute of Medicinal and Aromatic Plants (CSIR-CIMAP).

II. MATERIALS AND METHODS

A. Selection of the Plant

Three Tulsi plants of similar age and heights were selected for the study due to the following reasons:

- 1) This plant is easily available in the market.
- 2) It is one of the cheapest plant.
- 3) This plant is widely used as an ornamental plant.
- 4) It can be easily grown even in the small pots.
- 5) This plant has various medicinal uses.
- 6) The growth rate of this plant is fast.

B. Preparation of Powdered Floral Wastes

The Marigold flower (*Tagetes* spp.) is commonly used in floral offerings. The petals of the discarded Marigold flowers were collected and fragmented manually. The petals were then washed with distilled water thrice to remove adhered dust particles present if any. The petals were then sundried for a week to remove the moisture present in the flower petals. The dried petals were then powdered using kitchen grinder. The powdered flower was then stored in polythene bags at room temperature till further use.



Fig. 1: Sundried and Powdered Floral Wastes

C. Treatment of the soil

Test Plant 1: The soil was treated with powdered flower in the ratio of 3:1.

Test plant 2: The soil was treated with discarded fragmented fresh flower in the ratio of 3:1.

Control Plant: Untreated Plant to observe normal growth.

D. Plant parameters under study

The height, leaf count of all the three plants were measured manually on the monthly basis. The total chlorophyll content in the leaves were extracted using Acetone and it was measured Spectrophotometrically at 663 nm and 645 nm.

E. Soil Parameters under study

All the reagents and chemicals used were of analytical grade having more than 99% purity. Soil samples from all the three pots were collected at the depth of 5cm below the surface of soil on the monthly basis. The soil was oven dried to remove moisture content, sieved and stored in polythene bag for further use. The pH, electrical conductivity of the soil was estimated using pH meter and conductivity meter respectively. The phosphorus content was estimated using Olsen’s Colorimetric Method, Organic matter content was estimated by Black and Walkey Method [6]. Potassium in the soil was estimated using Flame Photometer whereas Total nitrogen were estimated using Kjeldahl method [4].

III. RESULT AND DISCUSSION

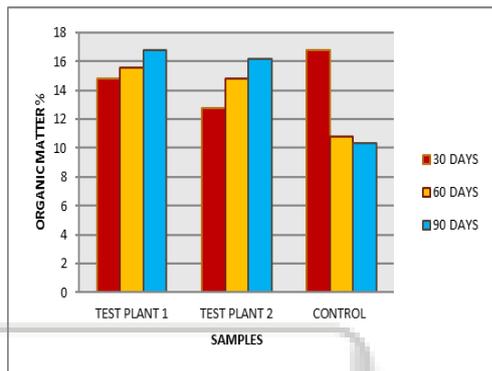


Fig. 2: Effect of floral wastes on Organic Matter (%) in soil with time

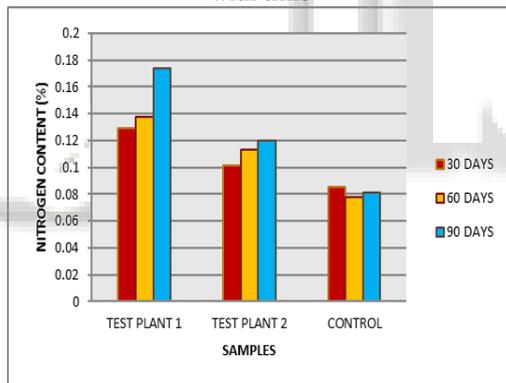


Fig. 3: Effect of floral wastes on Nitrogen content (%) in soil with time

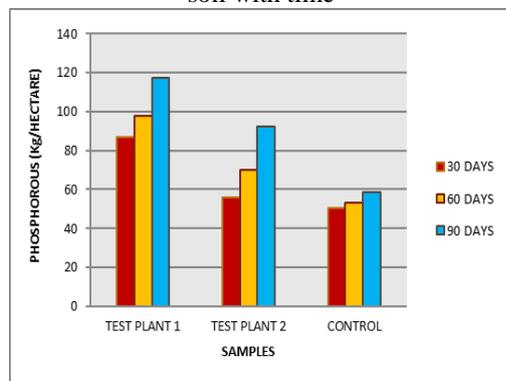


Fig. 4: Effect of floral wastes on Phosphorus content (kg/hect) in soil with time

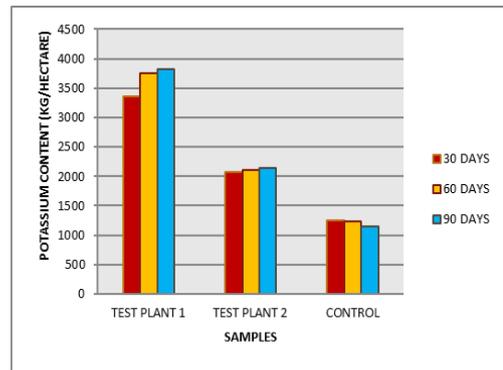


Fig. 5: Effect of floral wastes on Potassium content (kg/hect) in soil with time

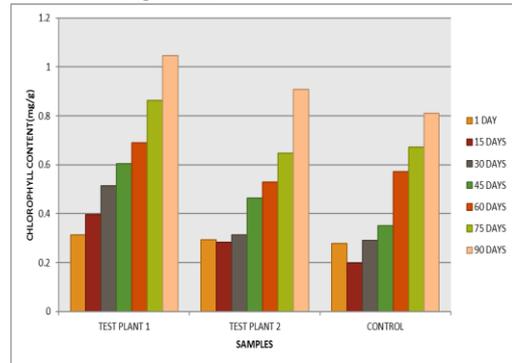


Fig. 6: Effect of floral wastes on Chlorophyll content (mg/g) in plant leaves with time

A. Effect on pH

The pH of the soil samples from all the three pots varied between 8 to 8.3 during the study period of three months. There was no noticeable change in pH of the soil by addition of floral wastes to the soil.

B. Effect on Electrical conductivity

The electrical conductivity in the soil were not affected by addition of floral wastes to the soil during the study period.

C. Effect on the Organic matter

The Organic matter content in the Control plant decreased over a period of three months whereas it showed increase in both the test plants. It was observed that the organic matter content showed more increase in test plant 1 as compared to test plant 2 during the second month of study period. This may be because the test plant 1 was treated with powdered floral wastes which may have degraded and mixed with soil very fast whereas test plant 2 may have taken more time for degradation since the floral waste were directly added into the soil.

D. Effect on Nitrogen-Phosphorous

Potassium values The NPK values in the soil samples increased in both the test plants over the time period of three months. The NPK values in the control plant did not show much difference. Bio fertilizers enhance the nutrient availability to crop plants (by processes like fixing atmosphere N or dissolving P present in the soil); and impart better health to plants and soil thereby enhancing crop yields in a moderate way.

E. Effect on the Height of the Plant

The height of the control plant increased more as compared to test plants whereas the canopy of test plant 1 was denser as compared to test plant 2 followed by control plant during the study period. Too much increase in the height of the potted plants may cause problems in the storage of the plants at houses like in the balcony and more increase in the height with sparse canopies is not attractive whereas short height with dense canopy is more attractive.

F. Effect on Leaf count

The number of leaves increased in all the potted plants over the study period. The leaf growth was more fast in test plant 1 followed by test plant 2 and control plant. Increased in the number of leaves in test plant 1 showed good growth of plant. This may be because the bio fertilizer in test plant 1 was more effective for the plant growth.

G. Effect on Chlorophyll content

The chlorophyll content had increased in the leaves of all the plants over the period of three months. The rate of increase was more in plant with powdered floral wastes as compared to other two plants. The increase in the chlorophyll content is a good sign of plant growth.

IV. CONCLUSION

- Increasing population increase the demand for agricultural products. Crop production is generally increased by using fertilizers. Use of chemical fertilizers causes its bio magnifications in the food chain. Continuous use of chemical fertilizers may decrease the soil fertility. They may also result hazards occasionally. Bio/Organic fertilizer is therefore on increasing demand.
- The discharge of used flower leads to solid waste generation and also it affects the water body on a large scale. Therefore, a study was conducted to study the use of floral waste as a bio fertilizer for the potted plant.
- The fertilizer thus prepared is Eco-friendly, which is free from pollutants, toxic products. It does not cause any harm to humans as well as animals. It is cost effective and easy to prepare.
- The powdered floral waste can also be used to increase the fertility of soil bearing curry leaves, tomato, green chilly, etc and ornamental plants.
- The direct application of floral waste to soil led to some fungal growth on the surface of the pot after one month of its application to the soil. Hence direct application of floral waste may not be a better option.
- Since powdered floral waste was sundried, it did not attract any fungal growth. Also, storage of this powdered fertilizer is easy and can be preserved for more than three months.
- The reuse of floral wastes at houses itself (source of generation) may reduce dumping of such wastes into waterbodies which in turn will reduce water pollution. Also, such fertilizers may reduce use of chemical fertilizers and thus its impact on the environment.

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