

TO ASSESS THE ROLE OF NATURAL PESTICIDES MADE FROM TULSI *OCIMUM TENUIFLORUM*, TURMERIC *CURCUMA LONGA* AND NEEM *AZADIRACHTA INDICA* ON CULINARY CROPS AND ITS MATURING SOIL

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ABSTRACT

Objective: Our research plans on creating natural pesticides to serve the same along with keeping it sustainable, effective and healthy. Our project aims to find the effects of natural pesticides like neem, tulsi and turmeric on plants like mung bean, chickpea, methi (fenugreek) and other varieties. We also aim to provide a solution from all the other techniques that have been exhaustively implied and are being created to ensure the fulfillment for the future generations, e. g. GMO

Methods: The extracts of neem, tulsi and turmeric are made by grinding and mixing it with water in 1:1 ratio and are then categorically sprayed over a range of 12 pots separated according to different types of plants namely mung, methi and channa. The growth of the plants and the soil analysis (by serial dilution) is done over the microbial growth, resistance to fungal infections and other pest infestations.

Results: We came up with a positive result showing less chance of infections and decrease in the colonies of harmful bacteria and pathogens with the help of serially diluting the soil sample under the effect of natural pesticides and pore plating it on the media.

Conclusion: The plants exposed to the natural pesticides showed better resistance and growth overall.

Keywords: Bioaccumulation, Biological magnification, GMO, Carcinogenic, Serial dilution

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INTRODUCTION

Agriculture was developed in the ancient ages for the production of food by growing crops and rearing of farm animals for the human consumption. However, to serve the growing demands of the increasing population, it's important to check the quantity of food produced [1, 5].

To manage this high loss in crop production, people often resort to pesticide usage. Pesticides are chemicals which are meant to eliminate, lyse or manage the pest population in some way or the other. These days various types of pesticides are available. Herbicides and insecticides are most frequently used, which kill or manage unwanted plants and insects. The impairment caused by agricultural pests is a global issue, and as the years have passed, the amount of pesticides used has grown manifold. Over the years, the excessive usage of pesticides though has had several yield benefits but has also caused many problems [2, 4].

Pesticides or insecticides do not necessarily confine to their specific location where they are applied. They often transport themselves through water, air or soil and are found to be mobile in the environment. The property of being mobile permits these pesticides to come in contact with other organisms, causing harm. This also results in disrupting the ecosystem other environmental balances. Many a times, pesticide usage also results in killing of the non-pest organisms causing drastic affect in the natural ecosystem balance. This leads to an even greater problem where by removing non-pest organisms, the environment changes to favor the unwanted pests instead [7-9].

Apart from significantly affecting the wildlife, mobile pesticides that move to other locations are seen to also harm humans. Pesticide exposure on humans has caused poisonings, lead to development of cancer and the deaths of about 20,000 to 40,000 people all over the globe, annually. Issues like bioaccumulation and biological magnification have also become a matter of concern due to over usage of pesticides, which is why the need of implementing natural methods has become the need of the hour.

Bioaccumulation is a common phenomenon with respect to pesticide intake and occurs when a specific substance which enters the body,

keeps getting accumulated due to the absence of appropriate mechanisms by the body to remove or detox it. Most of the synthetic pesticides cannot be catabolized or broken down, and are permanently stored in the body once they enter.

Instead, if we come up with a formulation of natural pesticides to face the problem, taking care of it being adequately efficient and in power with those of the synthetic origin, the above issues can be effectively sorted and turn out nontoxic, apart from having other cost and health benefitting factors.

Putting herbs in the soil enhances the soil potency and quality from within. Like in the case of Tulsi, this in the soil provides it with increased vitality and protection from invaders and same goes for other natural herbs like neem and turmeric, which have a great potential in getting rid of such pests.

Pyrethrum flower, Tobacco leaves, Nuxvomica seeds, Sabadilla seeds, Ryania root and stem, Derris root, Diatomaceous Earth are some of the plants that have been used as natural pesticides earlier [10].

MATERIALS AND METHODS

Collection of samples

The research was conducted in VIT University, Vellore, India.

The samples of turmeric, neem and tulsi leaves were obtained from Vellore. The plants were identified native to south India and were authenticated to be scientifically named as:

- Tulsi *Ocimum tenuiflorum* (Rama type) having green leaves.
- Neem *Azadirachta indica*
- Turmeric *Curcuma longa*

Preparation of the insecticide

A weighed quantity of fresh neem and tulsi leaves and turmeric fruit were grinded into powder with a mortar in separate bowls.

The extraction was used to make the insecticide, by mixing it uniformly with water in a 1:5 ratio, to obtain a homogenous mixture.

5 ml of distilled water was mixed with 1 ml of pure extract of neem, tulsi and similarly turmeric separately obtaining 3 different natural pesticide solutions.

Manifesting on plants

In 3 clean test tubes, 2 gm. of soil was taken from pots manifested with tulsi, in second test tube with neem and third turmeric respectively. One additional test tube had the normal soil having none of the natural pesticides.

In total we had 12 pots distributed under 3 types of plants namely:

1. Mung bean *Vigna radiata*
2. Methi (fenugreek) *Trigonella foenum-graecum*
3. Chick pea (channa) *Cicer arietinum*

The plants were selected for the study for the reasons as follows:

1. Fast germination
2. Fall under the "crop type" to be consumed by humans
3. Quick growth or maturing period
4. Leafy and attaining optimum height required for experimental analysis

Statistical analysis

Each plant consisted of 4 pots with one having normal soil, second tulsi manifested, third turmeric and fourth neem.

Hence $3 \times 4 = 12$, we had 12 pots to analyse the natural pesticides and effect on plants on a comparative basis with respect to the normal soil type.

Standard procedure

1. All the materials for planting the soil are obtained and organized.
2. The pots are prepared by layering them with stone, sand and nutrient-rich soil, which is further moistened.
3. This is followed by planting the seeds into this soil by pushing it one inch deep into the moist soil.
4. The pots are watered regularly and provided necessary conditions.
5. Once the plants grow sufficiently, soil samples are taken for Serial dilution to find bacterial count and pore plating.
6. Observations are recorded for the experiment.
7. The plants are further treated with extracts of neem, tulsi and turmeric in order to observe pesticidal as well as bactericidal effects.
8. The same experiments as before are carried out with the plants again.
9. Observations are noted down again, and changes are to be found out and categorically analysed.

RESULTS

Prepared insecticide results were closely monitored and carried out experiments showed decreased pest infestations and fungal infections on the experimental plants followed by healthier growth of the plant as compared to the original soil sample plants.

Prominent decrease in the number of harmful bacterial colonies, in the testing soil sample after manifesting with natural pesticides.

Table 1: Distribution of pots and effects on them

| | Mung bean plant pot | Methi plant pot | Channa plant pot | Effect |
|----------|---------------------|-----------------|------------------|---|
| Normal | 1 | 2 | 3 | |
| Tulsi | 4 | 5 | 6 | Antibacterial, antifungal, antipyretic, antioxidant, antiseptic and anticancer. |
| Neem | 7 | 8 | 9 | Antifeedant |
| Turmeric | 10 | 11 | 12 | Insect repellent. |

DISCUSSION

The results make it clear that the soil after manifesting with neem, tulsi and turmeric make it more immune and resistant to the possible causative plant pathogens and pests and also results in an effective and better yield.

CONCLUSION

The research has shown that the use of natural insecticides is effective and such natural pesticides can be manifested on large scale crop growing fields and achieve greater yields similar to the synthetic ones. If successful, this can prove to be extremely cost effective to farmers and more eco-friendly, but more importantly it will prove to be the best sustainable method to deal with the pests and an important resource exclusively for organic farming along with being a long term healthy option for the consumers. It will avoid the hazards of encountering bioaccumulation and biological magnification if used in the procedural way.

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CONFLICT OF INTERESTS

Declared none

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