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Formulation of eco friendly biofertilizer for the benefit of formers

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Abstract:

Bio-fertilizers are the products containing living cells of different types of micro-organisms that mobilize nutrients from unusable form. The present investigation was aimed to determine the effect of biofertilizers applications on growth and yield of tomato plant. Seeds of tomato were sown under the condition to raise the seedlings. The seedlings were transplanted into field until the full growth. After transplanting, seedlings of tomato were treated with various fertilizers such as vermicompost, vesicular arbuscular mycorrhiza (VAM), Azospirillum, rock phosphate and peat. Vermicompost were produced by earthworm's species (*Eudrilus eugeniae*) on food and vegetables waste with cow dung which is used to improve the soil fertility. VAM is used to enhance the nutrients especially phosphorous (P) and also used to convert insoluble P to soluble P present in the rock phosphate. Azospirillum is an important microbial fertilizer which is used to fix the atmospheric nitrogen in the plants. Rock phosphate is used to provide right amount of nutrients to make plants strong and healthy. Peat is used as a carrier material which holds the quantities of air and water and free of weeds and diseases. In this study, observation indicates that combination of vermicompost, VAM, Azospirillum, rock phosphate and peat. Hence the results suggests that biofertilizers improves plant mineral concentration through nitrogen fixation and thereby alters the better growth of tomato plants.

Keywords: Azospirillum, biofertilizer, *Eudrilus eugeniae*, vermicompost, rock phosphate

1. Introduction

Increasing use of chemical fertilizers in agriculture make country self- dependent in food production but it deteriorate environment and cause harmful impacts on living beings. Due to insufficient uptake of these chemical fertilizers by plants, they reach into water bodies through rain water, cause eutrophication in water bodies and affect living beings (www.epa.gov). There is a risk of groundwater contamination and the environmental issue. The biggest issue facing the use of chemical fertilizer is groundwater contamination (www.pmac.net/pesticides_fertilizers). The over use of chemical fertilizers can lead to soil acidification because of a decrease in organic matter in the soil. Nitrogen applied to fields in large amounts over time damages topsoil, resulting in reduced crop yields. Sandy soils are much more prone to soil acidification than that of clay soil (Wold & Jureen, 1989). Organic farming largely excludes synthetic inputs-pesticide, herbicides and fertilizers and focuses instead on biological process such as composting and other measures to maintain soil fertility, natural pest control and diversifying crops and livestock (www.agritech.tnau.ac.in). Use of biofertilizers in the soil, makes the plants healthy as well as protect them from getting any diseases. They play

an important role in improving the nutrient supplier and their availability in crop husbandry (El- Yazeid *et al.*, 2007). Thus the present study is to determine the plant growth using various biofertilizers.

2. MATERIALS AND METHODS

2.1 Collection of raw materials

Raw materials were collected and preliminary vermicomposting trials were carried out. Raw materials required for the preparation of vermicomposting and *Vesicular Arbuscular Mycorrhiza* (VAM), *Azospirillum* is collected in and around of Madhuranthagam and Chengalpattu areas of Kanchipuram district, Tamil Nadu. Bacterial culture of *Azospirillum* was procured from Apex biotechnology research and testing laboratory, Chennai. Peat (Figure 1) material is collected from Neyveli Lignite Corporation (NLC), which is directly used as plant fertilizer. For the preparation of rock phosphate (Figure 2) locally collected rocks are used. Collected rocks are partially grinded in the grinding machine and sized.



Figure 1: Peat



Figure 2: Partially grinded rock phosphate

2.2 Preparation of vermicompost

Vermicomposting is the method of converting wastes into compost by use of earthworms. Good quality compost is produced in a short period depending on the number of earthworms like *Eudrilus eugineae* (Figure 3) or *Eisenia species*. Vermicompost (Figure 4) preparation is done by Tamil Nadu Agricultural University procedure ((TNAU) Agritech, 2016).



Figure 3: Specimen of *Eudrilus euginae*



Figure 4: Final product of vermicompost

2.3 Category of fertiliser for growing tomato plants

Testing:

Control : Sand + Soil + Water

Treatment 1 : Sand + Soil + Water + Vermicompost

Treatment 2 : Sand + Soil + Water + *Azospirillum*

Treatment 3 : Sand + Soil + Water + VAM+ Rock Phosphate + peat material

Treatment 4 : Sand + Soil + Water + VAM+ Vermicompost+ Rock phosphate + *Azospirillum* + peat material

Ratio of fertilizers

Sand: Soil: Vermicompost: VAM: Rock phosphate: *Azospirillum*: Peat material = 1:4:3:3:3:3

Determination of soil fertility

Soil fertility refers to the ability of a soil to sustain plant growth that is to provide plant habitat and result in lasting constant yields of high quality.

To screen the amount of micronutrients and macronutrients present in the soil and soil mixed with the various biofertilizer such as vermicompost, VAM, *Azospirillum*, rock phosphate, peat.

3. RESULT

Physico chemical nature of soil, & soil mixed with fertilizer was analysed. The result was shown in Table 1.

TABLE 1. PHYSICO CHEMICAL NATURE OF SOIL WITH MIXED FERTILIZER

Sl.No.	Parameters	Units	Result for soil	Result for soil with mixed fertilizer
1	pH	-	7.0	7.9
2	Moisture	%	2.79	5.44
3	Sodium as Na	mg/kg	230	331
4	Nitrogen as N	mg/kg	125	671
5	Potassium as K	mg/kg	217	669
6	Calcium as Ca	mg/kg	134	272
7	Magnesium as Mg	mg/kg	56	78
8	Phosphorous as P	mg/kg	58	1087
9	Total organic carbon	%	0.34	1.29
10	Sulphate as SO ₄	%	0.13	0.32
11	Chlorine as Cl	mg/kg	500	536
12	Boron as B	mg/kg	3.26	370
13	Conductivity	µs/cm	1374	2161
14	Iron as Fe	m/kg	2.5	1.57
15	Manganese as Mn	mg/kg	121.63	178.75
16	Zinc as Zn	mg/kg	36.78	42.05
17	Copper as Cu	mg/kg	6.34	17.74

18	Molybdenum as Mo	mg/kg	BDL (DL:2.0)	BDL (DL:10.0)
19	Nickel as Ni	mg/kg	BDL (DL:1.0)	BDL (DL:5.0)

BDL -Below detection limit; DL-Detection limit

Detection of height of the plant & number of leaves at flowering stage, number of branches of the plant, length of the root & number of fruits at harvest stage

Effects of treatments on height, number of leaves, branches, fruits and length of the root of the tomato plant was observed with different organic manure application. Plants that recorded in treatment 4 resulted in maximum. Influence of various compost treatments on plant, indicated that vermicompost with various bio fertilizer had significant influence on tomato plant over other treatments. The result of height of the plant and number of leaves at flowering stage, number of branches of the plant, length of the root and number of fruits at harvest stage was shown in Table 2.

TABLE 2. MORPHOLOGICAL CHANGES OF THE PLANT AT DIFFERENT STAGE

Treatment	MEAN± SD				
	Height (cm)	No. of leaves	No. of branches	Length (cm)	No. of fruits
Control	24.3±0.5	24.3±0.5	5.3±1.1	26.8±0.472	2.3±1.5
T1	32±0.7	32±0.7	6.2±1.2	31.6±0.650	3.6±1.6
T2	40.3±0.5	40.3±0.5	7.3±1.2	42.8±1.108	4.3±1.5
T3	50±1.0	50±1.0	9±1.2	56.7±0.642	5.4±1.5
T4	57.3±0.5	57.3±0.5	9.4±1.3	64.9±0.703	6.5±1.6

Summary and conclusion

The present study was planned in order to develop the best alternative for the chemical fertilizer to give good yield to farmers along with pollution free or pollution control. In this project, an attempt was made to produce an organic fertilizer which makes uses of selected natural resources available in the environment to stabilize the nature of the crop by increasing its efficiency and yield without affecting both the environment and the soil where the plant has been planted.

The prepared organic fertilizer is tested for its efficiency and it is found that the organic fertilizer have most efficient terms in comparing with the chemical fertilizer. Moreover, in this study it is found that the indigenously prepared organic fertilizer is pollution free while the chemical fertilizers create a haven of pollution. This organic fertilizer is of the cheapest in availability along with the maximum efficiency. From the studies the following conclusions were arrived

1. For the better production and quality of tomato, the results significantly showed that treatments using various fertilizers are good sources when compared to controls.
2. These fertilizers significantly influenced the shelf life of tomato.
3. In the quality aspects, organic fertilizers using treatment showed significant results compared to other treatments.

Reference:

[1]. www.pmac.net/pesticides_fertilizers

[2]. www.epa.gov

[3]. El- Yazeid AA, Abou- Aly HA, Macly MA, Moussa SAM(2007). Enhancing growth, 'productivity and quality of squash plants using phosphate dissolving microorganisms combined with boron foliar spray'. Res. J. Agriic. Bioll.Sci., 3(4) : 274-286.

[4]. Wold, H., and L. Jureen. 1989. Demand Analysis, 3rd. ed. New York: Macmillan Co.

[5]. www.agritech.tnau.ac.in/org_farm/orgfarm_vermicompost