RESEARCH ON PRODUCTION OF FORTIFIED VERMICASTING

EP No: 46/2005-06; **Research centre:** Harur Modern Nursery Centre, **Range:**Dharmapuri Modern Nursery Range, Modern Nursery Division, Dharmapuri; **Scheme:-**JA Research scheme

Introduction:

Vermicasting is an organic material widely used in sustainable agriculture and afforestation programs due to its rich microbial composition and nutrient availability. This experiment aimed to enhance the efficacy of vermicastingby fortifying it with beneficial microorganisms such as Azospirillum, Phosphobacteria, and Potash-mobilizing bacteriaat varying concentrations. This study assessed the impact of microbial fortification on the nutrient composition of vermicasting over a storage period of two months.

Objectives:

To produce fortified Vermicasting

Materials and Methods

Materials

The study was conducted from 2005 to 2006 at the Modern Nursery Centre, Harur. Three 35 kg bags of freshly prepared vermicasting were selected and enriched with bio-fertilizers. The microbial additions viz. Azospirillum (Nitrogen-fixing bacteria), Phosphobacteria (Phosphate-solubilizing bacteria) and Potash-mobilizing bacteria (K-mobilizing bacteria) were used in the treatments. The details of treatments are as follows:

Treatments:

- **T1:** 50g of each bio-fertilizer (Azospirillum, Phosphobacteria, Potash-mobilizing bacteria)
- **T2:** 100g of each bio-fertilizer(Azospirillum, Phosphobacteria, Potash-mobilizing bacteria)
- **T3:** 200g of each bio-fertilizer (Azospirillum, Phosphobacteria, Potash-mobilizing bacteria)

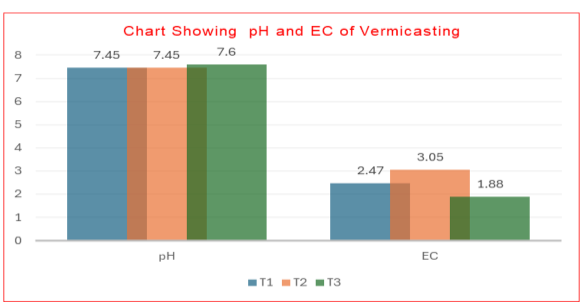
Methods:

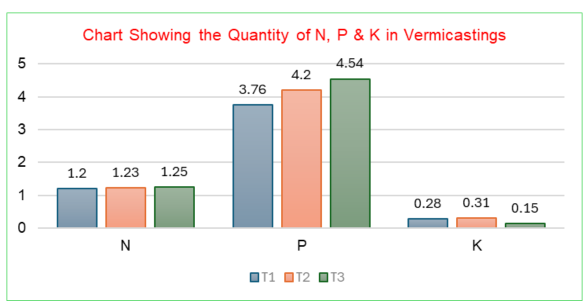
The bio-fertilizers were thoroughly mixedas per the treatment details into the vermicasting; an initial sample was collected and analyzed. The nutrient composition of the fortified vermicasting was then assessed at one-month intervals over a two-month period. Analysis was conducted at the CPR Environmental Education Centre, Chennai. Parameters measured included pH, electrical conductivity (EC), organic carbon, nitrogen, phosphorus, potassium, calcium, magnesium, and micronutrients such as iron, zinc, boron, manganese, and copper.

Analysis of Data:

The nutrient composition of vermicasting under different treatments is summarized below:

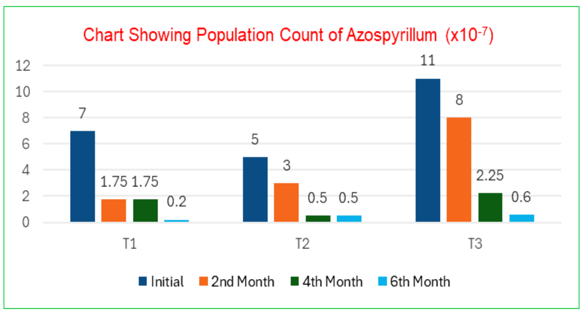
Parameter	**Unit**	**T1**	**T2**	**T3**
pH	-	7.45	7.45	7.60
EC	mmhos/cm	2.47	3.05	1.88
Organic Carbon	%	11.30	11.70	11.30
Total Nitrogen	%	1.20	1.23	1.25
Phosphorus	%	3.76	4.20	4.54
Potassium (K2O)	%	0.28	0.31	0.15
Calcium	%	12.00	12.00	12.00
Magnesium	%	3.60	4.80	2.40
Iron (Fe)	mg/kg	30000	23750	18250
Zinc (Zn)	mg/kg	175.40	161.40	210.50
Boron (B)	mg/kg	68.00	70.00	65.00
Manganese (Mn)	mg/kg	245.00	270.00	200.00
Copper (Cu)	mg/kg	36.50	40.00	25.00

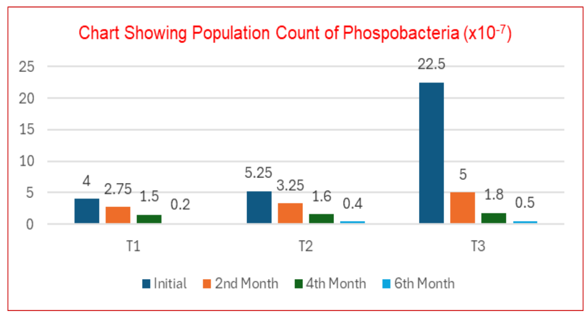




The population count of Microorganisms invermicasting under different treatmentsis summarized below:

Population count of microorganism ($x10^{-7}$)									
Month	Azospyrillum			Phospobacteria			Potash Mobilizing Bacteria		
	T1	T2	T3	T1	T2	T3	T1	T2	T3
Initial	7	5	11	4	5.25	22.5	4.5	5	9.8
2nd Month	1.75	3	8	2.75	3.25	5	5	4.8	4.7
4th Month	1.75	0.5	2.25	1.5	1.6	1.8	0.5	0.8	2.5
6th Month	0.2	0.5	0.6	0.2	0.4	0.5	0.2	0.3	1





Results and Discussion:

The experiment on fortified vermicasting revealed significant variations in nutrient composition and microbial population. Initially, the vermicasting exhibited a balanced pH across treatments, with slight variations observed in electrical conductivity (EC) and organic carbon content. The nitrogen, phosphorus, and potassium levels showed an increasing trend with higher bio-fertilizer concentrations, indicating enhanced nutrient availability due to microbial activity.

Over the storage period, microbial populations declined across all treatments. The initial microbial counts were relatively high, particularly in **T3**, which had the highest concentration of bio-fertilizers. However, by the **6th month**, the populations of **Azospirillum, Phosphobacteria, and Potash Mobilizing Bacteria** had significantly decreased. This decline is due to several factors, including **nutrient depletion**,

competition among microbes, **environmental stress**, and **accumulation of toxic metabolites (Gonzalez, 2023)**. The reduction in microbial activity may have also influenced nutrient solubilization rates, affecting the overall nutrient composition of the vermicasting.

The phosphorus content showed a steady increase across treatments, with **T3** exhibited the highest compared to other treatments. This suggests that **Phosphobacteria** played a crucial role in phosphate solubilization, enhancing phosphorus availability. Similarly, nitrogen levels increased slightly, indicating sustained nitrogen fixation by **Azospirillum**. However, potassium levels fluctuated, with **T3** showing a decline, due to microbial interactions affecting potassium mobilization.

The micronutrient analysis revealed variations in **iron, zinc, boron, manganese, and copper** concentrations. **T2** exhibited higher magnesium levels, suggesting enhanced microbial-mediated nutrient release.T1 exhibited the highest concentrations of iron (30,000 mg/kg) and calcium (12%), suggesting its potential role in fortifying soil mineral content. T2 recorded superior levels of organic carbon (11.70%), potassium (0.31%), magnesium (4.80 mg/kg), boron (70 mg/kg), manganese (270 mg/kg), and copper (40 mg/kg), indicating its suitability for improving soil organic matter and micronutrient availability.

Recommendations:

Based on the findings, vermicastings fortified with 200g of each bio-fertilizer (Azospirillum, Phosphobacteria, Potash-mobilizing bacteria) is recommended for the production of fortified vermicasting due to its superior nitrogen and phosphorus content, which are essential for enhancing soil fertility and microbial activity. For maximum effective usage, fortified vermicasting should be utilized within two months, as microbial populations decline over time, reducing its bioavailability and nutrient efficiency