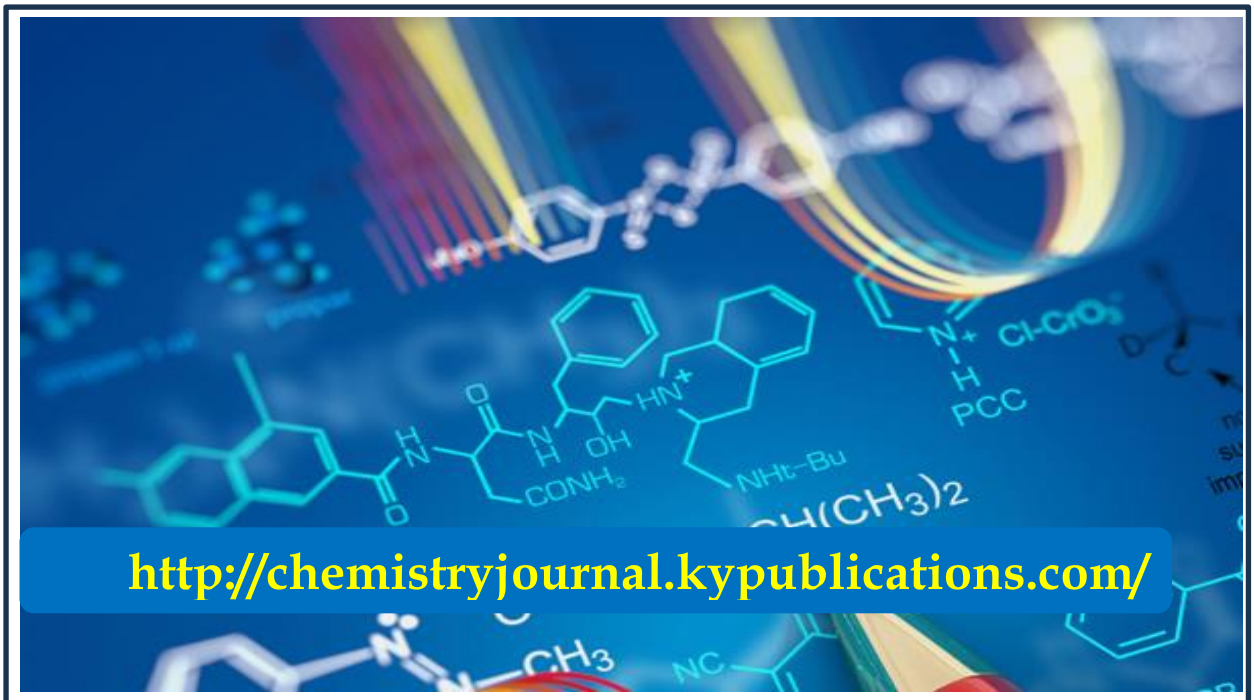

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QUALITATIVE ANALYSIS AND QUANTITATIVE ESTIMATION OF MACRO AND MICRONUTRIENTS OF ORGANIC FERTILIZERS (Compost)

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ABSTRACT

The primary cause of heavy metal contamination in agroecosystems is chemical fertilizers, which are extremely hazardous to both human health and other living things. At lower quantities, heavy metals are vital nutrients that aid in plant growth and development; but, at greater concentrations, they have many negative impacts. Since the application of elevated levels of heavy metals in the compost poses a potential hazard to plants and animals, the content of heavy metals in the compost with animal manure is important to know if it is as a fertilizer. Measurement of heavy metals content in the compost by chemical methods usually requires suitable number of reagents, skilled labor, and expensive analytical equipment. The current study is an effort to study the qualitative and quantitative methods for the estimation of these nutrients present in the organic fertilizers (compost). Kitchen wastes with trench method of composting resulted in higher particle density. The physiochemical properties and nutrient contents of compost was better when prepared from kitchen wastes by trench method of composting. Composts originated from small-scale composting programs including home, community and canteen waste composts have been studied. Heavy metals concentration indicated compliance with current regulations for conventional and organic agriculture.

Key words: Home and small-scale composters, nutrients, heavy metals, stability, biological properties, sustainability.

INTRODUCTION

Compost is the decomposed organic matter and the process by which compost is prepared is known as composting. Composting is a controlled biological process where decomposition of complex organic wastes by the microbial activities of both mesophilic and thermophilic bacteria and finally

produce an adequately stable product and it has no adverse effect on the soil and environment. Compost is generated from the decomposition of organic materials like plants (yard wastes), food (kitchen wastes), crop residues, on-farm and off-farm residues and wastes.

Composting is one of the most effective biological processes in which the organic matter degrades and turns into a humus-like material called compost. This process is also considered the best way to manage and recycle organic waste of several types – food, garden, forestry, agricultural, etc. [1, 2]

Inorganic chemicals, such as fertilizer, are used to revive dying plants quickly because they are easier for plants to absorb and release into the soil than other nutrient sources. However, they also contribute to soil pollution by releasing heavy metals, such as copper (1749 Recent Advances in Agricultural Sciences and Technology), iron (Fe), manganese (Mn), chromium (Cr), lead (Pb), and cadmium. Detailed investigations have demonstrated that the primary origin of heavy metals derived from fertilizers in soils is phosphatic fertilizers, which are made from phosphate rocks that have minor metal content in their ores. The excessive use of these chemicals is currently having a negative impact on the environment in many ways [3,4].

Earlier studies have also shown that that fertilizers were implicated in raising some heavy metal concentrations in food crops and since then researchers have been urged to investigate the impact of impurities in fertilizers on crop uptake of potentially toxic elements [5].

The biological process of composting involves the sanitary conversion of organic wastes into a homogenous, plant-available material in the presence of oxygen, at the right temperature and moisture content. Aside from a maturation period, the three primary stages of composting have been determined by the temperature fluctuations [6].

Composting and vermicomposting are recognized as appropriate methods for handling organic waste since they provide organic fertilizer and assist in addressing the issue of trash disposal. When it comes to processes, vermicomposting is often better than composting. This is because the result from vermicomposting has higher nutrient contents and a faster rate of organic matter decomposition [7].

Both in conventional and organic agriculture, organic fertilizers and composts are important nutrient sources that are widely utilized. According to them regular application of fertilizers and compost can raise the amount of soil organic matter (SOM) and soil fertility, which in turn supports or enhances soil health [8]. Beyond organic agriculture, there is growing interest in using organic amendments, particularly compost, due to their beneficial impact on soil health [9]. All organic wastes, including fruits, vegetables, plants, yard wastes, and others, can be broken down using the composting method. The content of organic waste that can be utilized as soil amendment, crop nutrient, and environmental control material. The quality of compost products is subject to several conditions, as different forms of organic wastes have varying percentages of major macronutrients found in fertilizers, namely potassium, phosphorous, and nitrogen (N, P, K) [10].

MATERIALS AND METHODS

Various Techniques were used to analyze the compost samples. Colorimeter was used to determine composition of Iron, Flame emission spectrophotometer was used to determine the composition of Sodium & Potassium, Calcium was used determined by using UV-Visible spectrophotometer and finally Cu, Fe & Zn were determined by using Atomic Absorption Spectrophotometer. The collected samples were analyzed for major physicochemical parameters (pH, Electrical conductivity, Moisture, Organic carbon, Nitrogen, Phosphorous, Potassium, (N, P, K) & Chlorides.

RESULTS AND DISCUSSION

Qualitative analysis of Physicochemical parameters: For qualitative analysis of physicochemical parameters based on standard procedures were used to (pH, Electrical conductivity, Moisture, Organic carbon, Nitrogen, Phosphorous, Potassium, (N, P, K) & Chlorides **(Table-1)**

Table :1. Phytochemical components of Compost

Physicochemical parameters	**Sample-1**	**Sample-2**	**Sample-3**
pH	5.82	4.64	4.82
Electrical conductivity (ms/cm)	14.0	31.5	25.0
Moisture content (%)	3.46	5.86	4.61
Total Organic carbon (%)	37	46	57
Amount of Nitrogen %	4	2.7	3.2
Amount of Phosphorous (%)	0.65	0.48	0.84
Amount of Chlorides (mg/L)	212.7	3119.6	744.45
Porosity (%)	68	72	74

Metal composition studies of compost samples the presence of high concentrations of Potassium, calcium, sodium, copper and zinc and low percentages of iron. **(Table-2)**

Table :2. Metal composition of Compost samples

Name of the metal (ppm)	**Sample-1**	**Sample-2**	**Sample-3**
Amount of Calcium	2.38	2.56	0.856
Amount of Sodium	2.8	2.1	4.4
Amount of Potassium	2.33	4.08	11.33
Amount of Iron	0.68	0.49	0.962
Amount of Copper	4.04	1.58	3.23
Amount of Zinc	2.18	1.4	2.66

DISCUSSION

The analysis of chemical composition of the three types of compost studied in terms of nutrient content indicates that compost sample 1 and 2 has more calcium than sample 3. Potassium and potassium and Iron is more in sample 3 compared to sample 1 and 2. Copper and zinc is more in sample in sample 1 compared to sample 1 and 2. It was found that all types of compost materials have an acidic one.

CONCLUSION

No contamination of heavy metals in compost from all composters were found. The composts did not exceed the limits of heavy metals.

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