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Organic compost: An eco-friendly approach to restore soil nutritional profile

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ABSTRACT:

This review paper focused on the composting of organic waste. Organic wastes are wastes that easily biodegradable and these wastes are produced from many sources such as agricultural waste, market waste, kitchen waste, urban solid food wastes and municipal solid waste. Although without proper management, these waste could create several environment problem. Therefore, composting is the best low cost alternative solution to solve this problem.The use of chemical fertilizer is increasing day-by day to increase production but excess use of it, the fertility of soil and health also deteriorate. Hence the use of organic manure is one of the alternative ways for enhancing production and improves the soil health. Organic compost are natural products to enhanced sustainable crop production and there is a number of organic fertilizers such as farm yard manure, green manures, crop residues and other farm wastes, vermicom post, oil cakes, and biological wastes. Organic fertilizers are natural products used by farmers to improve sustainable agriculture production, organic manures increase the organic matter in the soil and these manures also enable a soil to hold more water and also help to improve the drainage in clay soils. Organic fertilizer provide organic acids that help to dissolve soil nutrients and make them available for the plants and also reduces the risk of pollution.

KEYWORDS: Organic compost, eco-friendly, nutritional profile.

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INTRODUCTION:

Plants require a variety of soil nutrients such as nitrogen, phosphorus and sulphur for its growth, however soil nutrient levels may reduce over time when the cultivated plants are harvested, since the nutrients are not returned to plant. Therefore, these vital nutrients must be provided through the natural decomposition process.[1] Composting is a natural process that transforms organic material into a rich dark substance. This substance, called compost or humus, is an excellent conditioner for soil. Organic matter is known as "the soul of healthy soil". The organic matter in compost helps the soil retain nutrients and water as well as reduce the risk of contamination.[2]

It is difficult to predict about the origin of composting. The ancient Akkadian empire in Mesopotamia valley referred to the use of manure in agricultural soil . There is evidence that the Romans, Greeks and tribes of Israel ware aware about composting. The Bible and the Talmud contain various references to the use of straw in manure and organic compost. References related to compost are found in the Arabic and writings of the tenth and twelfth centuries. It is also mentioned in the texts of the medieval church and in renaissance literature by famous writers such as William Shakespeare, Sir Francis Bacon and Sir Walter Raleigh. At the beginning of the 20th century a new "scientific" cultivation method was developed. Justus vonleiby in 1840 a famous German scientist, showed that plants obtained nutrients from some chemical substances. After that discovery increased use of chemicals become common in agricultural practices for farmers in many areas of the world, chemical fertilizers have replaced compost. Sir Albert Howard, a British agronomist, spent nearly 30 years experimenting with gardening and organic farming in 1905 in India. In 1943, Sir Howard published the book. “The Agricultural Testament” This book has renewed interest in organic farming due to which sir Howord got recognition as a modern father of organic farming and gardening.[3]

 [4]

Fig.1: Figure showing preparation of compost from fruit wastes.

Composting is the process of transforming waste into organic matter which is beneficial. Basically organic materials like vegetable wastage (anything except animal based) is kept in a suitable container is allow to decompose. After few weeks, these materials convert into a nutritional rich form of soil that will tremendously improve plant growth and plants nutritional composition.[5] In addition to this fruits wastes can also serve as an excellent compost because fruits are rich in nutrients.

Most fruit waste, include peels, kernels, citrus peel and melon peel, grape stalks, remaining pulp of gelatine or fruit juice and any uneaten portion of raw or cooked fruit. Fruit waste is a particularly balanced composting material. Ideally, the compost containers or stacks contain carbon and nitrogen in the ratio of 25:1.Materials with a high carbon content, such as leaves or straw, have a ratio of 80 to 1, while materials with high nitrogen content, such as cut grass or manure, have a ratio of 20 to 1. Fruit waste, although fall into the category of high nitrogen content, but they contain a ratio of 35 to 1, which is almost ideal.[6]

Table 1: List of usable and non-usable materials in organic compost

Usable	non-usable
❖ Leaves ❖ Grass trimmings ❖ fertilizer (preferably organic) ❖ Any non-animal food scraps: fruits, vegetables, peelings, bread, cereal, coffee grounds and filters, tea leaves and tea bags ❖ Old wine ❖ Dust from sweeping and vacuuming ❖ Old herbs and spices	❖ Coal Ash ❖ Colored Paper ❖ Diseased Plants ❖ Inorganic Materials ❖ Meat, Bones, Fish, ❖ Fats, Dairy ❖ Pet Droppings ❖ Synthetic Chemicals

Compost v/s chemical fertilizer:

- ❖ It enriches the soil, helps retain moisture and eliminates pests and plant diseases.
- ❖ Reduces the need of chemical fertilizers.
- ❖ Encourages the production of beneficial bacteria and fungi that break down organic matter to create humus, a material rich in nutrients.
- ❖ Reduces methane emissions from landfills and reduces carbon.[8]
- ❖ The pH of the soil is altered by the addition of compost. Optimum pH for the cultivation of most fruits, vegetables and the herbaceous ornamental plants are usually between 6.0.and 7.5. If the soil is too alkaline (about pH 7.5), the compost can help you lower it. If the soil is too acid (which is not common in Wyoming), compost can help solve it.

- Compost improves the soil structure. Wyoming the soils tend to be clayey or sandy. When organic matter, like compost, is added, the soil structure has improved and leads to improved nutrient and moisture storage capacity.[9]

Disadvantage Of Chemical Fertilizer

Compost is substances used to add nutrients to the soil to enhance soil fertility and increased plant growth. Today synthetic fertilizer has become essential for modern agriculture to feed the growing population. Use of chemical fertilizers, have brought blessings to humanity, which has helped to satisfy hunger and decrease death in different corners of the world. Synthetic fertilizers enhance agricultural production; However its excessive use has contain harmful effect such as hardening of soil, decreased fertility,reduce strength and release of contaminated pesticides. It has already been proven by various studies that chemical fertilizers pose serious challenges for a balanced and sustainable growth.

- Salt content is one of the most critical characteristics of synthetic fertilizers. Salts are harmful for both plants and soil due to the continuous use of this chemical fertilizers. Its eliminates essential nutrients from the soil and naturally occurring minerals in fertile soil.
- Alkaline fertilizers like sodium nitrate develops alkalinity in the soil, reducing its fertility and making it barren.
- Although chemical fertilizers will help plants grow faster but the plants will not be healthy and strong because plants grown that way do not have sufficient time to mature to develop good root growth while strong stems or fruits and vegetables nutritious.
- Chemical fertilizers can cause burns to the roots of plants. Chemical fertilizers do not allow a adequate amount of water store in plants. Chemical fertilizers are rich in nitrogen salts and when the nitrogen is absorbed too rapidly in the soil; it dehydrates and dry the plant. Nitrogen fertilizers decompose into nitrates and reach easily to the ground. It is soluble in water so it can remain in groundwater for decades. [10]

Application of organic compost-

Recycling of wastes

Domestic garbage is usually made up of food wastes, both cooked and raw, and garden garbage like cut grass or bushes. Household kitchen waste is often mixed with non-organic materials, such as plastic containers, which cannot be composted. It is advantageous if this type of waste can be separated at the source, which makes recycling of both types of waste much easier. household waste is generally produced in relatively small quantities. There is a much higher organic content. In developing countries, composting will also help reduce the amount of waste going to our landfills.

This insures reduction in the concentration of toxic leachates and methane gas that is released into the atmosphere. Therefore, it is helpful in the reduction of the overall contamination. Composting also reduces the use of chemical fertilizers, which are harmful to our water supply. Food wastes generally thrown on the road side usage and recycling for preparing can also help in of this wastage compost maintaining cleanliness around us.[11]

12,13,14,15,16

Fig.2: Flow chart showing the recycling of fruit waste

Decline in soil pollution: World Soil Day was established in 2002 by the International Union of Soil Sciences (IUSS) to celebrate the importance of soil and its vital contribution to human health and safety. The soil is fundamental for human life on Earth. The soil is a vital part of the natural environment including plants, animals, rocks, geographical features, lake and rivers. Soil pollution is the result of many activities of humans that pollute the soil.

Soil pollution is often associated with the indiscriminate use of agricultural chemicals, such as pesticides, fertilizers, etc. Some of the harmful chemicals in fertilizers (such as cadmium) can accumulate above their toxic levels, which ironically leads to crop poisoning. Heavy metals can enter the soil through the use of contaminated water in irrigating crops or through the use of mineral fertilizers. Defective dumps, explosion of underground deposits and the filtration of faulty sewage systems could cause toxins to leak into the surrounding soil. The inadequate and continuous use of herbicides, pesticides and fungicides to protect crops from pests, fungi can also result in soil pollution. It alters the basic composition of soils and makes the soil toxic for plant growth. Organic insecticides such as DDT, aldrin, hexagonal benzene chloride, etc. are used against pests transmitted from the ground. They accumulate in the soil as they degrade very slowly from soil and water. As a result, they have a very damaging effect on plant growth, these by delaying their growth and reducing fruit yield and size. It can also reach animals and humans through food chains and will ultimately lead to biomagnifications. Organic fertilizers and organic pesticides consist of natural

substances, are biodegradable and do not damage the natural balance of the soil. Thus organic compost should be proffered over pesticides and chemical fertilizers.[17]

Increased level of micronutrients in soil

Literature most researchers have proved that composting could improve soil physical, chemical and biological characteristics, organic matter and nutrient status. All long-term compost tests give rise to an increase in SOM concentrations. However, mature compost increases SOM much better than fresh and immature compost due to its higher stable carbon level. It has numerous positive effects on the physical, chemical and biological properties of the soil. Therefore use of compost contributes to the increased stabilization and increase of productivity and crop quality.[18]

Bioremediation

Bioremediation is defined as the use of biological processes to degrade, decompose, transform and / or essentially eliminate contaminants or damage in soil and water quality. Bioremediation is a natural process that relies on bacteria, fungi and plants to alter contaminants as these organisms perform their normal vital functions. The metabolic processes of these organisms can use chemical pollutants as an energy source, which makes contaminants harmless or less toxic in most cases. Many substances known to have toxic properties have been introduced into the environment through human activity. These substances vary in toxicity and danger to human health. Many of these substances come into contact with the soil immediately or permanently and are seized by it. Conventional methods to eliminate, reduce or attenuate toxic substances introduced into the ground or aquifers through anthropogenic activities and processes include pumping and treatment systems, soil vapor extraction, incineration and containment. The usefulness of these conventional methods of treating contaminated soils and / or waters has recognizable drawbacks and may involve a certain level of risk. The emerging science and technology of bioremediation offers an alternative method to detoxify contaminants. Some of the substances which are normally utilized by the micro organism are as follows.[19]

- Hydrocarbons
- Halogenated organic solvents
- Halogenated organic compounds
- Non-chlorinated pesticides and herbicides
- Nitrogen compounds
- Metals (lead, mercury, chromium)
- Radionuclides[19]

Table 2: Table showing different types of compost and their benefits

Scientist name & Year	Place	Organic compost material	Crop/plant	Enhance nutrient in soil	Enhance nutrient/ physical property of crop
Adekiya, A. O., & Agbede, T. M. et al (2017)	southwest Nigeria	Poultry manure	Tomato		leaf N, P, K, Ca, Mg, Plant growth [20]
Adnan Anwar Khan et al (2017)	Pakistan	agricultural waste , N, P, K, fertilizer	Tomato	N, P, K	Uptake of N, P, K, vtamin C [21]
Anwar et al (2017)	Pakistan.	cow manure, leaf litter	spinach	N	P and K [22]
J.K et al .(2018)	Gujarat, India	FYM, castor cake	Fenugreek	P,K, Ca	N,P,K [23]
Benabderrahim et al (2018)	North Africa	cow manure, palm leaves compost	alfalfa		Growth rate, P, K, N [24]

CONCLUSION:

Organic fertilizers are not like chemical fertilizers, they are slow release and give time to microbial activity to break down into organic materials which include insects, fungi and bacteria in the soil and it is are very useful for a healthy soil and plants growth. The use of chemical fertilizers will kill ecofriendly microorganisms. Chemical fertilizers are greatest hazard to the environment, animals and human health; chemical fertilizers will eventually drip into water bodies like ponds, waterways, groundwater, etc. and pollute the water supply as a result of which humans and animals can suffer numerous short-term and long-term hazardous effects on health . In response to this, organic fertilizers will be the right solution .

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