Production of Organic Fertilizer from Garden Waste

[1]Satyansh Shukla, [2]Kajal Waghe, [3]Mrs. Samatha Singh, [4]Mr. Rahul Gupta

[1] Student, [2] Student, [3] Associate Professor, [4] Assistant Professor
[1,2,3,4] Department of Chemical Engineering,
[1,2,3,4] Indore Institute of Science & Technology, Indore, India

Abstract: The mostly used fertilizers in agriculture field are chemical fertilizers, the longer exposures of these, Soil reduces its quality and diminishes the protein and carbohydrate content of the plant. For these reason, we produce organic fertilizer with the help of garden waste which is available in abundance amount nearby our society. The conversion of waste into organic manure by continuous cycle of mixing and moisture addition, we get good quality of fertilizer in period of 10 days. For good conversion, shredding and dosing of chemical required for sample. The NPK percentage in our sample is found to be 1.85%, 2.21%, 0.56% respectively, which reflects good quality of fertilizer as per the F.C.O 1985 standards**.**

Key Words **- Chemical fertilizers, Compost, Garden Waste, Nutrients, Organic Fertilizers.**

I. INTRODUCTION

India is a under developing country and about 70% of the population of the country lies in rural region. The main source of income for these people is agriculture and also arise lots of fertilizer requirement for sustain the soil quality and conditioning. India ranks second in the production of nitrogenous fertilizers and third in phosphate fertilizer whereas the requirement of potash is met through imports since there are limited reserves of potash in the country. [8]

It is essential to provide them good manure which improves their crop productivity Therefore the need of organic fertilizers is necessary because these fertilizers will increase the productivity and quality of crops than any other conventional means, which are obviously harmful for the human health, environment, land etc.[7]

According to the food and agriculture report, world demand for total fertilizer nutrients is estimated to grow at 1.8% per annum 2014 to 2018. The demand for nitrogenous, phosphate and potash is forecasted to grow annually by 1.4%, 2.2%, and 2.6% respectively, during the period. Over the next five years, the global capacity of fertilizer products, intermediates, and raw materials will increase further. The global demand for nitrogenous fertilizers is expected to grow around 5.6% to 119.4 MT in four years through 2018, according to the food and agriculture organization of the United Nations. Asian Nations, led by China and India, are expected to account for 58% of this increase.

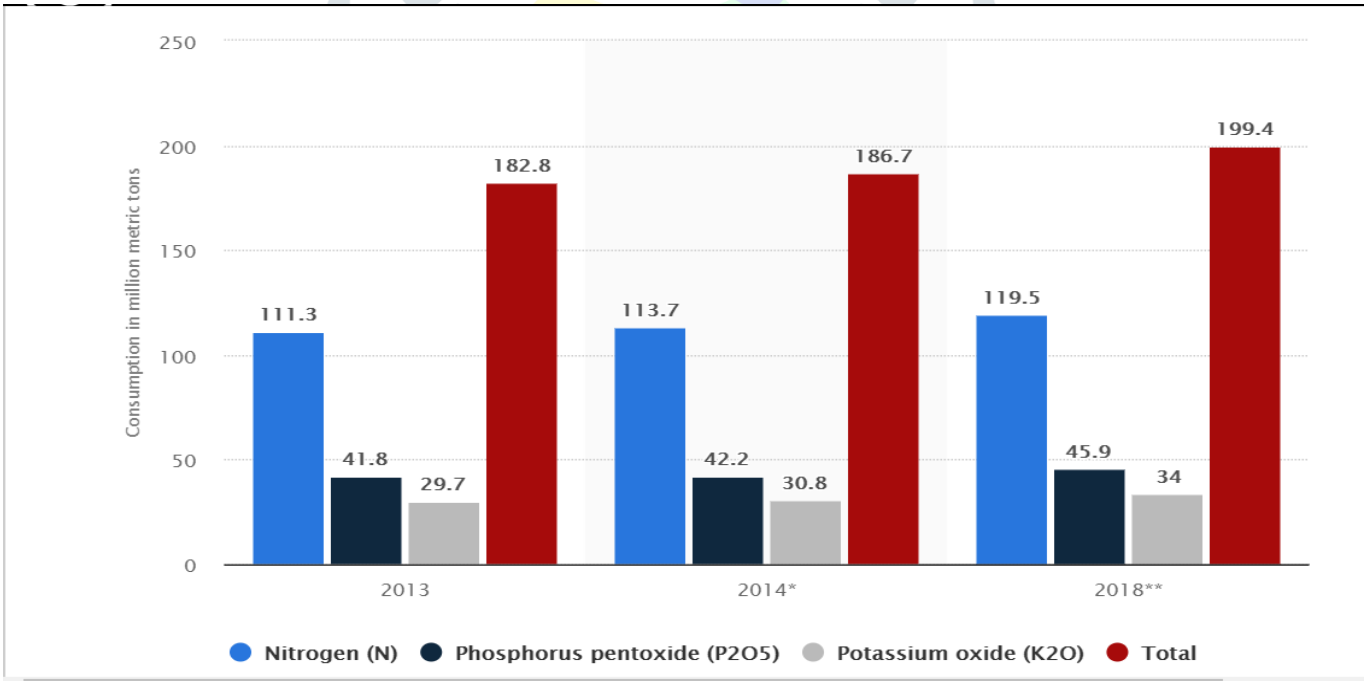

Fig.1:- Global Consumption of Agriculture Fertilizer by Nutrient from 2013 to 2018 (In Million Metric Tons) [2]

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1.1 Fertilizer:–

Fertilizers are organic or inorganic substances that help to make the soil fertile and provide the necessary nutrients such as Nitrogen, Potassium and Phosphorus for the growth of plants. A good fertilizer is that which provides substantial quantity of nutrients to plants. These nutrients are classified as primary nutrients, secondary nutrients and micronutrients.[5]

Table 1:- Elements necessary for plant growth

Primary Nutrients	Secondary Nutrients	Micronutrients
Nitrogen	Calcium	Boron
Phosphorus	Magnesium	Chlorine
Potassium	Sulphur	Boron, Chlorine, Copper, Iron, Manganese, Molybdenum, Zinc

1.2 Types of fertilizer:-

i. Organic fertilizer
ii. Inorganic or Chemical fertilizer

i. Organic fertilizer: Organic fertilizer is a dark brown, coarse powder made from biodegradable organic substance, vegetable waste, garden waste and kitchen waste etc., through microbial conversion process. It is free from smell, live weed seeds, plastics, glass, and also free as a source for spreading pests and diseases.[1] The use of organic waste products as the nutrients source is beneficial as it represents a productive method of using waste products in a manner that preserves nutrients. Organic fertilizers are obtained from a waste of plant or animal origin. One of the advantages of organic fertilizers is that, from composting, it recycles organic waste of urban and agricultural origin, the disposal of which would cause environmental impacts. It is a rich source of plants nutrients growth promoting substances and the bacteria present in organic fertilizer help in fixing atmospheric Nitrogen and in making Phosphorus available to the plants, ultimately leading to increased productivity of better quality.

ii. Chemical fertilizer: Chemical fertilizer is an inorganic material which is fully or partially synthesized artificially that is added to the soil to support plant growth. It contains all the nutrients required for plant growth such as Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Sulphur, Boron, Chlorine, etc.[3] They may contain ingredients that may be toxic to the skin or respiratory system. These fertilizers can be synthesized from petroleum products and sometimes using organic sources. Chemical fertilizers contain acids, including sulphuric and hydrochloric acids. These acids dissolve soil crumbs, the material that holds rock particles together. When these fertilizers are used for prolonged duration, the soil gets damaged as the trace nutrients are not replenished in the soil.[6]

1. Organic fertilizers Vs Chemical fertilizer: - [9]

Organic fertilizer	Chemical fertilizer
Organic fertilizers are cheap in cost.	Chemical fertilizers are very expensive.
They contain ingredients which are non toxic.	They contain ingredients which are toxic to the skin or respiratory system.
They increase the friability and quality of soil.	Chemical fertilizers destroy the friability of soil.
They do not show any effect on microorganism living in the soil.	They effect micro-organism living in the soil.

Organic fertilizers are the quintessential necessity in this era of growing demand for agriculture and plantation. It is not just an Eco- friendly approach for innovation for forth-coming, less polluted world but also a great alternative for expensive fertilizers in a present scenario. Organic fertilizers provide a variety of good nutrients that are needed for soil i.e. why they are also called as “Soil Conditioners”. They are also slow release fertilizers, thus there is little to no possibility of over fertilizing of plants.

From a long period of time the method used for the production of fertilizers is composting. Compost is organic matter that has been decomposed and recycled as a fertilizer and soil amendment and the process of making that compost is known as composting. It is a biochemical process in which aerobic and anaerobic microorganism decomposes organic matter into valuable manure called as compost.

1.3 Benefits of Compost:-

Compost improves the quality of soil, and for this reason it is considered as a soil conditioner. It has a variety of basic nutrients required for healthy growth of plants. It improves texture of soil and enables them to retain nutrients, moisture and air for the betterment of growth of plants.[4]

Microorganism involved in composting:-

Two types of microbes which help in composting process are:-

- Aerobes (which decompose organic matter in presence of oxygen)
- Anaerobes (which decompose organic matter in absence of oxygen)

II. PROBLEM STATEMENT

Chemical fertilizer reduces the protein content and carbohydrate quality of crop. Excess potassium content on chemically over fertilized soil decreases Vitamin C, and antioxidant compounds in vegetable and the cost of the chemical fertilizer is also high. For this reason, we need to produce organic fertilizer with waste material like garden waste because of organic fertilizers recycles organic waste of urban and agricultural origin, the disposal of which would cause environmental impacts.

III. EXPERIMENTAL METHODOLOGY

3.1 Experimental Setup & Requirements: -

- Grass – 750gm
- Wood chips – 250gm
- Sanitreat – 1.0gm
- Bioculum – 2.0gm

3.2 Procedure: -

We take the 750 gm of fine shredded grass sample in open plastic drum and add 250 gm of wood husk in grass sample on the basis of moisture content in it. Wood husk helps to maintain the moisture content by soaking the excess amount of moisture present in the sample. We cover the plastic drum with the help of wet green net so that the mixture gets decompose well. Then we add 1gm of Bioculum and 1gm of Sanitreat with our sample and mixed well. Now on daily basis moisture is added and mixed with the sample twice a day and we repeat this process up to 10 days. The color of this mixture changes in 2-3 days and in about 10 days it will turn into brown color like fertilizer, its weight gets reduced by weight of raw material. During these days the conversion of garden waste into organic manure recorded, which observation given below.

Day -1

Day -4

Day -10

Day-7

IV. RESULTS AND DISCUSSION

4.1 Results of Descriptive Statics of Study Variables

Table 2: NABL ACCREDITED LAB (ISO/IEC 17025:2005) (ISO 9001, 14001 & BS 18001 (OHSAS) CERTIFIED LAB

Sr. No.	Test Parameter	Result	Specification as per F.C.O	Test Method
1.	Nitrogen as N	1.85%	Min. 0.5%	F.C.O 1985
2.	Potassium as K_2O	2.21%	Min. 0.5%	F.C.O 1985
3.	Phosphate as P_2O_5	0.56%	Min. 0.5%	F.C.O 1985
4.	C: N Ratio	27.3%	Less than 20	F.C.O 1985

The table 2 shows the minimum composition of Nitrogen, Phosphorus, Potassium % required in an organic fertilizer is 0.5%, 0.5% and 0.5% respectively (according to F.C.O specification) while in our fertilizer the Nitrogen is 1.85% which is good for the plants because Nitrogen is major component of chlorophyll, it is the compound which uses sunlight to produce sugar from water and carbon dioxide by the process of photosynthesis, the Phosphorus is 2.21% which is essential for the growth and maturity of a plant. Similarly the Potassium is 0.56% which is necessary for plants because it regulates the opening and closing of stomata and carbon dioxide. It is also triggers activation enzymes which is essential for production of Adenosine Triphosphate (ATP).

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