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STUDY ON EGGSHELL AND FRUIT PEELS AS A FERTILIZER

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Abstract
Repetitive use of soil for farming losses its nutrients. Fertilizer is organic material added to soil to supply essential nutrients to the growth of the plant. The present study deals with the utilization of eggshell and fruit peels for effective growth of the plant. By experimenting eggshell and fruit peels formulation for assessment of pH, we can regulate the amount of eggshell powder, sweet lime powder and banana peel powder required for a particular soil. The aim of this paper is to study and analyze the carbon (C), nitrogen (N) and hydrogen (H) content from eggshell powder and fruit peels using CHNS Analyzer. The final result of this study showed that Sweet lime peel powder has a higher percentage of nitrogen (1.197% in 2.114 mg) and carbon (38.053% in 2.114 mg) whereas Banana peel powder has a higher percentage of hydrogen (6.153% in 2.256 mg) compare to remaining samples. This experimental study proves that eggshell powder and Fruit peel powder can be used as fertilizer with no cost bearing as this eggshell and fruit peels are collected from household waste

Keywords: Fertilizer, Eggshell powder, Sweet lime peel powder, Banana peel powder, CHNS Analyzer.

1. Introduction

Like every living thing, the plant also needs food for their growth and development. Cultural practices, control of diseases and insects play vital roles in the plant growth. Domestic waste is classified into two types i.e. Dry waste and wet waste. Some of the organic matter from household waste can use to prepare fertilizer for agriculture field. Every plant has a different range of nutrient requirement level. Below this requirement level, plants start to show nutrient deficiency symptoms. Soil pH indirectly affects the nutrient availability and toxicity of soil. Generally, soil pH ranges from 6.0-7.5 is acceptable for most plants as nutrients [1]. The plant requires a total of 16 essential nutrients. The Plant receives Carbon, hydrogen and oxygen from the atmosphere and soil water. The remaining required elements are nitrogen, phosphorus, potassium, calcium, magnesium, Sulphur, iron, zinc, manganese, copper, boron, molybdenum, and chlorine [2]. Soil minerals or organic matter or fertilizer are supplied to plant to maintain a constant level of nutrition in the soil. Fertilizer is one of the main sources of nutrition in the soil. It also improves the immunity of soil because of a high source of nutrition [2]. Chemical fertilizer makes soil impure and also decreases the soil immunity.

Nitrogen is biologically combined with Carbon, Hydrogen, Oxygen, and Sulphur to create amino acids, which are the building blocks of proteins. Nitrogen is a play a vital role in process of photosynthesis. Nitrogen plays a key role in agriculture by increasing crop production also improve food quality [3]. A single eggshell contains 2.07 ± 0.18 g of Ca. [4]. Eggshell has high calcium source. Calcium regulates many metabolic process and biochemical function. Calcium is chemical element for the growth and development of plant without calcium the development of shoot tissue new root stops the growth of new root calcium has major role in formation of cell wall membrane in the plant [1]. Calcium reduces soil acidity which indirectly improves crop production [5]. Basically, hydrogen comes from solidity water into hydrogen gas and oxygen. Hydrogen is required in form of carbon photosynthesis. Hydrogen plays important role in the development of the plant. Organic carbon release nutrition for plant growth, promote the structure, biological and physical health to the soil. Carbon is one of the main building blocks of plant and boosts the growth of plant and development [6].

2. Methodology

Organic waste is generated daily which can be collected from household, fruit juice vendor, Restaurants and hotels. Organic waste is mainly found to be useful in the agriculture field. Organic waste becomes one of the main sources for nutrition for agriculture field. Sweet lime can improve soil immunity due to its acidic nature also it provides porosity in the soil which help to grow good bacteria which helpful in agriculture process. Eggshell and Fruit peels can improve the stiffness of soil and provide good resistance to erosion

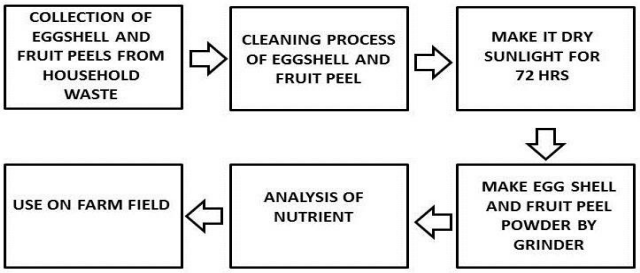

Fig 1: Process flowchart for egg shell and fruit peel for powder preparation

3. PREPARATION OF EGGSHELL AND FRUIT PEELS POWDER

Eggshells and fruit peels were collected from household wastage. To remove bacterial and viral contact, firstly eggshell and fruit peel was washed in Luke warm water. Later eggshell was treated with boil water for 5min. Eggshells and fruit peels kept in sunlight around 72hrs (14 days - 5 Peak sunshine hour) to make it dry

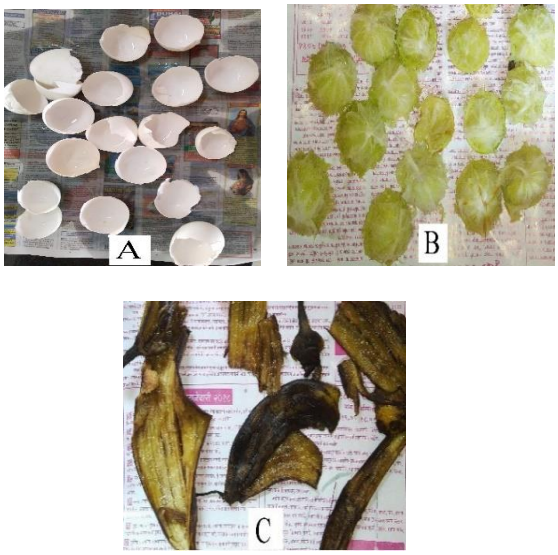

Fig 2: A. Eggshell, B. Sweet lime peel, C. Banana peel

Fruit peel was crushed to small pieces to make powder. Using grinder, fine powder was done from eggshell and crushed piece of fruit peels as shown in fig 3.

Fig 3: A. Eggshell powder, B. Sweet lime pell powder, C. Banana peel powder

4. RESULT AND DISCUSSION

Soil fertility and nutrients can be maintained by adjusting its pH value. For evaluation of pH, Glass electrode pH digital meter is used.

Table 1: Evaluation of pH of different formulation

SN.	Samples	Content	Formulation of sample (mL)	pH
1	Egg Shell	1 g	1 g + 100 mL of Water	6.8
2	Sweet Lime Peel	1 g	1 g + 100 mL of Water	6.4
3	Banana Peel	1 g	1 g + 100 mL of Water	8.1

The evaluation of pH in different formulation of samples is shown in Table 1. By this evaluation result, we can regulate the amount of eggshell and fruit peel powder required for a particular soil. All three powders are followed for analysis of nutrition content. To determine carbon, hydrogen and nitrogen proportion in the samples, CHNS analyzer is used. The CHNS Analyzer is used to determine the percentages of Carbon, Hydrogen, Nitrogen, Sulphur and Oxygen of organic compounds, based on the principle of Dumas method which involves the complete and instantaneous oxidation of the sample by flash combustion.

CHNS analysis is performed to determine for the carbon(C), nitrogen (N) and hydrogen (H) constitution in eggshell powder and fruit peel powder. Proportional combination of the elements shown below

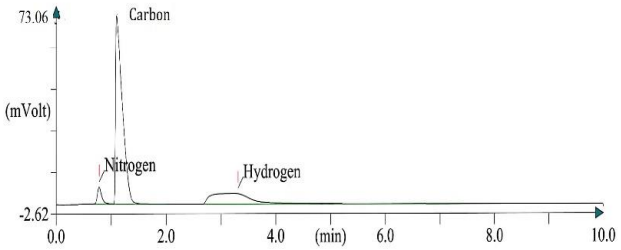

Fig 4: Proportional combination of the elements Present in Egg shell powder.

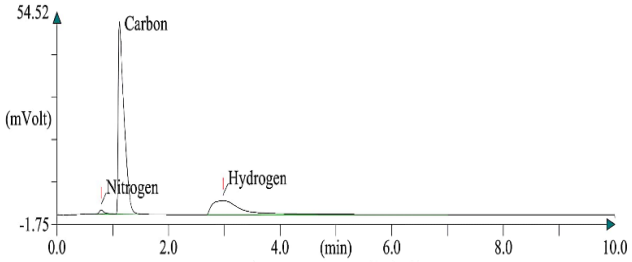

Fig 5: Proportional combination of the elements Present in Sweet lime powder.

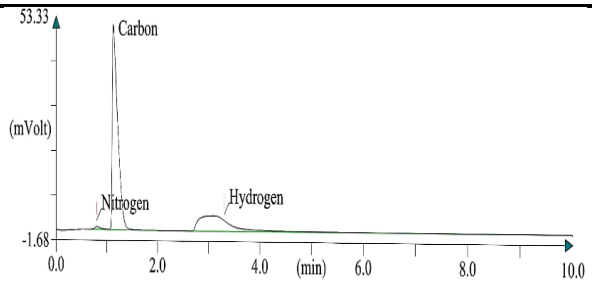

Fig 6: Proportional combination of the elements Present in Banana peel powder.

Fig.4, 5 and 6 represent the proportion combination of the elements present in given sample. Retention time is the amount of time a compound spends on the column after it has been injected in presence of sample time used to detect mass which flows through the chromatography column. Usually, retention time for nitrogen (N) is 0-1 RT/min, 1-2 RT/min per carbon (C) and 2-4 RT/min for hydrogen (H). Retention time for all samples is shown in Table 2.

Table 2: Retention Time per Minute.

SN.	Name of Sample	N	C	H
		RT/min	RT/min	RT/min
1	Egg shell	0.8	1.192	3.308
2	Sweet lime peel	0.792	1.117	2.975
3	Banana peel	0.8	1.133	3.308

Determination of the elemental concentrations in a given sample is shown in Table 3. About 12.601% carbon, 0.398% nitrogen and 0.26% hydrogen present in 2.819 mg of eggshell sample. Sweet lime powder contains 38% carbon, 5.5% hydrogen and 1.197% nitrogen present in 2.114 mg whereas Banana peel power 0.797% nitrogen, 6.153% hydrogen and 36.212% carbon present in 2.256 mg. From above observation nitrogen and carbon is more available in sweet lime peel and banana peel contains more hydrogen contain compare to remaining samples.

Table 3: Proportional combination of N, C and H in Samples

SN.	Name of Sample	Total weight	N	C	H
		(mg)	%	%	%
1	Egg shell	2.819	0.398	12.601	0.26
2	Sweet lime peel	2.114	1.1971	38.053	5.547
3	Banana peel	2.256	0.797	36.212	6.153

5. CONCLUSION

pH testing of samples shows eggshell is less acidic and banana is alkaline in nature. Sweet lime is acidic due to the availability of citric acid. By experimenting eggshell, sweet lime peel and banana peel formulation for assessment of pH, we can regulate the amount of eggshell and fruit peel powder required for a particular soil. Eggshell has high calcium source and regulates many metabolic process and biochemical function [4].

CHNS analysis shows that nitrogen and carbon is more available in sweet lime whereas banana peel contains more hydrogen contain compare to remaining samples. This experimental study proves that eggshell powder, sweet lime peel powder and banana peel powder can be used as fertilizer. All three powders have no cost bearing as this organic waste samples are collected from domestic waste.

6. ACKNOWLEGEMENT

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