

# From Kitchen Waste To Soil Health: Eggshells As A Natural Fertilizer

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**Abstract-** Repetitive use of soil for farming losses its nutritious values. As a result, to increase soil fertility and plant nutrition chemical and biological fertilizers have been added tremendously nowadays. Eggshell which is a municipal waste in our society but it is a natural source of calcium carbonate and it gained attention for its potential benefit on fertility. It's help to neutralize acidic soils and improve the soil pH level. Eggshell powder also contains other essential nutrients such as magnesium, potassium and phosphorus etc. which are important for plant growth and development. The aim of this study is to investigate the potential of eggshell as a fertilizer which can be a solution of a waste problem. Carbon, nitrogen, calcium, zinc and manganese content of standard soil containing eggshell and without eggshell have been analyzed. Study showed that the soil with eggshells powder has higher percentage of carbon than soil without eggshell powder. This experimental study proves that eggshell powder can be used as fertilizer which is a cost-effective solution of waste problem.

**Keywords:** Eggshell, Fertilizer, Nutrient Analysis, Waste.

## I. INTRODUCTION

Every living thing like, plant also needs food for their growth and development. Various nutrients, control of diseases and insects play vital role in the plant growth. Domestic waste is classified into two type i.e. dry waste and wet waste. Some of the organic waste material from households can be used to prepare fertilizer for agricultural fields. Every plant has different range of nutrient availability to soil. Generally, soil pH ranges from 6.0-7.5 is acceptable for most plants for nutrients availability. The plant requires a total of 16 essential nutrients for its optimal growth. Plant receives carbon, hydrogen and oxygen from atmosphere and soil water.

On an average a single eggshell contains  $2.07 \pm 0.18$ g of calcium which is a high calcium source. Calcium regulates many metabolic process and biochemical function. It is a chemical element for the growth and development of shoot tissue, growth of new root etc. It also has major role in formation of cell wall membrane in the plant. Calcium reduces

soil acidity which indirectly improves crop production. Many other nutrients are also required in plant growth viz. nitrogen, calcium, boron, magnesium, sulphur, iron, zinc etc. Soil minerals or organic matter or fertilizer is supplied to plant to maintain a constant level nutrition in the soil. It also improves the immunity of soil because of a high source of nutrient.

In the present an attempt has been made to investigate the potential of eggshell as a fertilizer by estimating nutrient concentration which can be a solution of a waste product of our society.

## II. MATERIALS AND METHODOLOGY

### Preparation of Eggshell Powder:

- **Collection:** Eggshells waste has been collected from restaurant, households, college canteen etc.
- **Washing:** Collected eggshells have been kept in warm water for 5 minutes to reduce its odor and then washed off with clean water.
- **Drying:** Cleaned eggshells are then firstly air dried and then sun dried for 72 hours.
- **Crushing and Grinding:** Dried eggshells are crushed into small pieces or grinded into fine powder using a motor and pestle.

### Incorporation into Soil:

After estimating soil nutrition concentrations, the soil has been mixed with prepared eggshell powder in 2:1 ratio in a container and mixed thoroughly.



Fig: A. Raw Eggshell, B. Grinded Eggshell using Motor and Pestle and C. Eggshell Powder

### Nutrient Analysis

Percentage of carbon, concentration of nitrogen, zinc, manganese and calcium have been estimated of eggshell mixed soil and soil without eggshell using standard methods.

### III. RESULT AND DISCUSSIONS

Firstly, two types of soil sample have been taken, one sample is eggshell containing soil and another soil is without eggshell. Both soil samples are examined for pH, percentage of carbon, concentration of nitrogen, zinc, manganese and calcium. The results are tabulated in table 1.

**Table 1.** Comparison in Nutrient Analysis of Soil with and without Eggshell.

Sample name	pH	%C	N (Kg/Ha)	Zn (ppm)	Mn (ppm)	Ca (ppm)
Soil with eggshell powder	8.55	0.87	625	0.79	10.65	0.56
Soil without eggshell powder	8.45	0.96	635	0.66	10.75	0.47

Study reveals that, the soil with eggshell powder has increased the ability of soil nutrients and increase the plants growth. The pH value of 8.55 suggests that eggshells are alkaline, which can help to raise the pH of acidic soil. This can be beneficial for plants that prefer slightly alkaline soil conditions. The carbon content in eggshells is relatively low, at around 0.87%. This means that eggshells are mainly composed of calcium carbonate, which is the form of calcium found in limestone and other rock sources. When eggshells are crushed and added to the soil, they slowly release calcium into the soil as they break down. The nitrogen (N) value of 625 in eggshells suggests that they can contribute to the overall nitrogen content of the soil. Nitrogen is essential for plant growth and development, particularly for leafy green vegetables that have high nitrogen requirements. The zinc (Zn) value of 0.79 in eggshells indicates that they contain a small amount of this micronutrient. Zinc is important for plant growth, enzyme activation, and hormone regulation. The manganese (Mn) value of 10.65 indicates that eggshells can also provide this essential micronutrient to plants. Manganese is important for photosynthesis, enzyme activation, and nitrogen metabolism in plants. The calcium (Ca) value of 0.56 suggests that eggshells are a good source of calcium for plants. Calcium is essential for cell wall structure, enzyme activation, and nutrient uptake in plants.

### IV. CONCLUSION

Eggshell powder can be a beneficial fertilizer due to its calcium content, which promotes plant growth. Overall, eggshells can be a beneficial fertilizer for plants due to their

nutrient content, particularly for improving soil pH, providing essential nutrients like manganese, nitrogen, zinc, and calcium. However, it's important to crush or grind the eggshells before adding them to the soil to ensure that they break down and release their nutrients effectively and thus we have found a solution towards a solid waste problem.

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