PRODUCTION APPLICATION AND COMPARISON OF SOLID–LIQUID FERTILIZERS FROM VEGETABLE WASTE

1*Monisha J. N. and 2Dr. G. N. Rameshaiah, Ph.D. (IITM)

1*Department of Chemical Engineering, BMS College of Engineering, Bengaluru-560019.
2Associate Professor and HOD, Department of Chemical Engineering, BMS College of Engineering, Bengaluru-560019.

ABSTRACT
Vegetable wastes are produced in large quantities in the markets across the world, to make use of this waste and to reduce the pollution they can be used to produce biofertilizers. Since biofertilizers are one of the best tool that is used in the agricultural field, which is applied as a replacement of conventional fertilizers. The nutrients present in the fertilizers were determined and comparative study was undertaken to evaluate the efficiency of produced fertilizers. The different crops like green gram, horse gram and soya bean were grown and bioassay of the plants was performed to compare the efficiency of fertilizers. The main objective of this work is to build a platform that biofertilizers obtained from vegetable waste are better than the conventional fertilizers.

KEYWORDS: Fertilizer, comparison, application, bioassay.

INTRODUCTION
Vegetable waste gives great measure of supplements to occupying microorganisms; they are neither pathogen nor worried with human wellbeing. Nonetheless they are inclined to solid smells while decaying. The high dampness contain of vegetable waste causes costly to arrange it off. The vegetable waste containing lettuce and onion waste has high measures of sulfur 0.2% and 0.7% separately; their dampness substance is of 96.2% and 91.1% individually. The separating of natural material of manure is oxygen consuming and performed by microbes, parasites, creepy crawlies and creatures which occupy the dirt. These living beings use the mind boggling supplements of the manure and discharge the key minerals and components into soil which are accessible effectively for harvests and improve...
their yield and give solid and nutritious nourishment to the humanity.\cite{1,15} Consequently delivering natural manures from vegetable will increment in the dirt ripeness and upgrades the compound segments that are available in the dirt which helps in supplying appropriate supplements and sustenance to the plants that create crops. The waste created locally for a valuable practice and by changing over the waste into fertilizer helps in reduction of the contamination and the waste that is delivered in the business sector. The usage of compound manure bit by bit diminish which eventually builds the dirt fruitfulness which thus additionally considers the change of nutritive estimations of sustenance furthermore change of strength of humanity.\cite{2,4} The present work is carried out to explain the uses of Biofertilizers that are produced naturally from the vegetable waste which are produced in two different ways and its comparison to select the better source for further application. Henceforth application of these fertilizers too few selected crops, results are compared and resulted for the large scale production of fertilizers which helps in reduction of vegetable wastes to some extent.

**MATERIALS AND METHODS**

**Preparation of fertilizers**

Five different types of vegetable waste were collected and subjected to decomposition process for both solid and liquid fertilizers. For solid fertilizer 500grams of each waste sample were added containing ½ kg of soil in it and allowed for decomposition.\cite{5} For liquid fertilizer 500grams of each waste sample were added and approximately 3litres of water was added depending upon the requirement and they were subjected to aerobic decomposition process for 1month. After 1 month of decomposition process, the solid fertilizer sample was air dried and finely powdered and stored for further analysis. The liquid fertilizer sample was filtered and centrifuged at 10,000 rpm for 10 minutes and stored for further analysis.\cite{14}

**Application of Fertilizer samples to the Crop grown**

The fertilizer samples that are produced are applied to the plants depending upon the requirement. Solid fertilizers are mixed with the soil when the plantations were done and the liquid fertilizers were mixed with water in 1:3 ratios and sprayed on top of the plants.\cite{12,13} Since the liquid fertilizers are mixed with water they are sprayed to plants once in a week to obtain the better results. Since solid fertilizers are slow in releasing they are mixed with approximate amount and added directly with the soil.
Bioassay
Different plants like green gram, soya bean and horse gram were grown and fertilizers were applied to them. The bioassays are performed to check the components present in the plants and the growth of the plants were checked, followed by total carbohydrates\(^7\), total protein\(^8\), total lipid\(^9\), total phenol\(^10\), total chlorophyll and total carotenoids\(^11\) were also estimated. The results obtained are tabulated and presented in the figures.

RESULTS AND DISCUSSIONS
The application of solid and liquid fertilizers to the plant helped in comparing the fertilizers efficiency. These plants were subjected to bioassay of different parameters which resulted in its components composition and their benefits. The plants grown will differ in their height, color and the constituents of carbohydrates, lipids, proteins, phenols, chlorophyll and carotenoid content will vary from plant to plant. The green gram, horse gram and soya bean plant which grown from liquid fertilizer is better than compare to the one which is grown from solid fertilizers. The plants which are grown from liquid fertilizers appears to be dark green in color and the one which are grown from solid fertilizers are light yellow greenish in color.

![Image 1(a)](image1a.png) ![Image 1(b)](image1b.png) ![Image 1(c)](image1c.png)

Figure 1: 1(a), (b), (c) is the view of plants obtained from application of solid – liquid fertilizer
Carbohydrates are the most inexhaustible natural mixes in the plant world. Carbohydrates make up around three fourths of the dry weight of plants. Animals (including people) get their starches by eating plants, however they don’t store a lot of what they expend.\textsuperscript{[4]} Proteins are large atoms made up of amino acids fortified together by peptide linkages. The support of body tissue is vital on the grounds that the body is always experiencing wear and tear and proteins and amino acids give nonstop repairs. Proteins are imperative for the development of administrative mixes.\textsuperscript{[3]}

Lipids are a fundamental constituent of all plant cells. The vegetative cells of plants contain \textasciitilde5 to 10\% lipid by dry weight and every one of this weight is found in the films. Some plant cells deliver a great deal more lipid than does a leaf mesophyll cell. Lipids are the significant type of carbon stockpiling in the seeds of numerous plant species, constituting up to 60\% of the dry weight of such seeds.\textsuperscript{[19]}
Figure 2: 2(a), (b), (c), (d), (e) & (f) are the graphical representation of different bioassays performed from the plants grown [■ -control, ■ - solid fertilizer(T1), ■ - liquid fertilizer(T2)]

Phenolic components are optional metabolites which blend in plants. Phenolics are components having one or more aromatic rings with one or more hydroxyl gatherings. They are extensively conveyed in the plant kingdom and are the richest auxiliary metabolites of plants, with more than 8,000 phenolic structures at present referred to, running from basic atoms.\textsuperscript{[18]} Chlorophyll content estimation yields direct data on photosynthesis potential and essential efficiency. Chlorophyll-a is perceived as the principle colors which change over light vitality into compound vitality. Chlorophyll-b as extra shades acts in an indirect way in photosynthesis by exchanging the light it ingests to chlorophyll-a.\textsuperscript{[16]} Carotenoids are a group of pigment compounds that are integrated by plants and microorganisms but not creatures. In
plants, they add to the photosynthetic apparatus and secure them against photo damage. Carotenoids are available as microcomponents in foods grown from the ground and are in charge of their yellow, orange and red colors.[17] Figure 1 shows the graphical representation of the crops that are grown and figure 2 show the graphical representation different bioassays performed for the crops and their comparison. The comparison of these crops when subjected to different estimations liquid fertilizers were high in the results on average of all Biossays because they act directly with soil and result in better yield.

CONCLUSION
Fertilizing the soil is not another innovation. Manure, a supplement rich, natural compost and soil conditioner, is a result of humification of natural matter. The upsides of these procedures are that they minimize harm to the earth and deliver financially important items from wastes. Treating the soil is by and large characterized as the natural oxidative decay of natural constituents in wastes under controlled conditions which permit improvement of high-impact smaller scale living beings that change over biodegradable natural matter into a last item adequately stable for capacity and application without unfavorable ecological impacts.

REFERENCES


