

An Organic Fertilizer via Mixtures of Chicken Manure as the Main Materials For Okra Plant Growth

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Abstract: Many modern farmers used chemical fertilizer as their main way to fertilize their crop and vegetation, but this type of fertilizer contain harmful substance which can leads to environmental issues and human health problems. In this study, the main purpose of this study was to produce the organic fertilizer made up of chicken manure, eggshell powder and washed rice water. The substance are chicken manure that contain nitrogen (N) and eggshell powder with phosphorus (P) and washed rice water waste provide the potassium (K). All this material are used to find the best mixture and ratio. Chicken manures are proven to have all the beneficial nutrient needed for plant growth as other materials will help the effectiveness of the fertilizers. Six bottles are prepared with each of them are labelled A-F. Bottled A, B and C are prepared with different ingredient while bottle D, E and F are prepared with all the material added but different ratio with each bottle. From the observation, it is included that the best fertilizers for the plant are the from bottle F which have (4:2:1:10) the best ratio of all plus the material needed for plant to grow.

Keywords: Chicken Manure, Eggshell Powder, Okra Plant, Washed Rice, Water Waste.

1. Introduction

The usage of chemical fertilizers in agriculture have increase in last decade. Even though it can help the farmers to produce good number of vegetables, it can bring harm to nature as it can cause soil and water pollution .he usage of chemical fertilizer can cause the pH of the soil to become too acidic for plant and the ability for plant absorb nutrient drop when the usage of chemical fertilizer are use in long term [1]. The usage of chemical fertilizer can bring harm to nature as it can cause soil, water, and air pollution [2]. The chemical will make the water dirty and cause unpleasant smell [3].

To organic fertilizer are more eco-friendly and brings more crop yield to farmers [4]. Help to prevent soil pollution because by using this organic fertilizer, the acidity and pH of the soil can be remain natural because it is biodegradable organic matter [5]. Organic fertilizer can supply nutrient for plant, its are rich in organic matter, humus and beneficial microorganisms [6]. Design an organic fertilizer with natural ingredients that are both environmentally safe and good to plant growth [7]. When

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using organic fertilizers, the soil composition will get better as the material are based on natural composition. It will help the soil to hold water and nutrient. The usage of organic fertilizer can cost efficient because farmers does not have to use the fertilizer as frequently because organic composition are hard to decompose, and its nutrient can be provided continuously [5].

The elements in an organic fertilizers must exist naturally in nature in order to be classed as such [8]. Organic materials that can be use are chicken manure as it can provide the complete nutrient for the plant [9]. Next phosphorus the eggshell which can provide a high amount of phosphorus that can help plant to create new cell [10]. Lastly, the example for organic material is water waste from organic materials like rice which according to research can be the source for potassium for plant [6]. Plant need this macro nutrient as for them to grow as for this project are for the okra plant. The nutrient are nitrogen, phosphorus and potassium or as well known for NPK.

The aim of this project is to produce an organic fertilizer from chicken manure, eggshells, and washed rice water waste to produce the fertilizer by mixing all the ingredient using water and with correct ratio and put them in a suitable bottles that can be readily use. In observing the effectiveness of the fertilizer, the growth of the plant will be observed. The parameter will be the number of leaves, the height of the plant and the number of okra produced. The growth readings will be recorded everyweek.

2. Materials and Methods

2.1 Material

Chicken manure, eggshell, and wastewater from washed rice water are the main ingredients in making organic fertilizer from organic waste. This experiment for preparing sampling functioned as the parameter that can be measured to see the effectiveness of the fertilizer for the okra plant.

Table 1: Sample of specimen for set 1

Formulation	Chicken manure (g)	Eggshell powder (g)	Washed rice water wasted (g)	Water (ml)
Bottle A	100	-	-	1000
Bottle B	100	100	-	1000
Bottle C	100	100	100	1000

Table 2: Sample of specimen for set 2

Formulation	Chicken manure (g)	Eggshell powder (g)	Washed rice water wasted (g)	Water (ml)
Bottle D	100	100	100	1000
Bottle E	200	100	100	1000
Bottle F	400	200	100	1000

From **Table 1**, Set 1 are set to known the effectiveness of each material. For the bottle A, mixture is poured into pot containing okra sapling with 1:10 ratio of chicken manure and water. Bottle B in turn has a ratio of 1:1:10 containing, chicken manure, eggshell powder and water. The contents in bottle C have a 1:1:1:10 ratios, with chicken manure, eggshell powder, washed rice wasted and water.

From **Table 2**, set 2 are set to know about the optimum ratio for each nutrient in fertilizer for okra plant growth. Each sample contains chicken manure, eggshell powder, washed rice wasted and water but at the sample setup it contained different ratio. For bottle D, the ratio used is 1:1:1:10. Bottle E in turn has a ratio 2:1:1:10 while Bottle F are 4:2:1:10.

The materials are gathered from waste that is readily available in the research location. For chicken manure, ingredients are gathered from the local poultry farm and purchased cheaply. The chicken excrement received is typically dark in colour and solid in form. The manure is clumpy so that it dissolves quickly in water. Using an agricultural hand fork, the chicken dung was shredded and torn to make it more manageable. For eggshell powder, eggshells gathered simply in cafeterias. The eggshell was then cleaned and allowed to air-dry. They are ground into a powder using a mortar and pestle.

Finally, when the rice is rinsed, the washed rice water wastes are collected. The wastewater is different from regular water because it contains plant nutrients that have been taken out of the water that was used to wash the plants. **Figure 1** shows the summary of process flow in preparing the fertilizer.

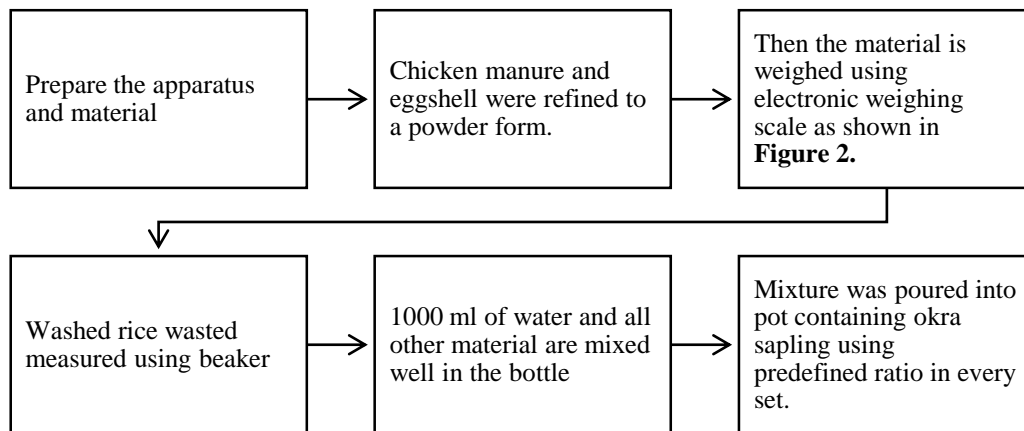


Figure 1: Procedure of preparing fertilizer.



Figure 2: Material weighed using electronic weighing scale.

2.2 Process of Planting

A field test was done with okra standing as the study's subject. Planting six okra trees within the UTHM area yielded six research samples. The research sample was separated into two groups. Set 1 is designed to determine the efficacy of each element, while Set 2 is designed to determine the optimal ratio of each nutrient in the fertilizer for okra tree development.



Figure 3: The process of fertilizing on the tree.

A month is allocated to observe the tree's transformation. Free area for tree planting has been secured in the surrounding region. At least twice every week, the created fertilizer will be put into flower pots of 150 ml for each sample of okra as shows in Figure 3. The trees are watered every day with 600 ml of water in order to maintain their health and prevent them from dying or not growing.

Estimating okra growth characteristics were evaluated once every week measurements of growth parameters (cm), number of leaves using the formula provided by [11] $Y = 115X - 1050$, where X is the length of the plant (cm plant⁻¹). Also measured on okra are the quantity of pods, as well as the pod yield.

2.3 Analysis sample

Every flowerpot that included an okra plant provided six soil samples from the layer underneath the pot. All of the soil samples were promptly packed in containers that were sealed up, and then they were sent to a laboratory. In order to remove plant remnants and debris from soil samples, a filter with a 2 mm opening was used. After adding a trace amount of water and using a pH meter to perform the analysis, the initial pH of the soil is determined. The final pH of the soil was determined through measurement and analysis.

For measuring the exact value of substance in this solution within each beaker, FTIR is utilized. Fourier Transform Infrared Spectroscopy, often known as FTIR Analysis or FTIR Spectroscopy, is an analytical method used to detect organic polymeric and inorganic compounds, as well as to identify contaminants and unknown components in solutions. Infrared light is used to scan test materials and examine chemical characteristics using the FTIR analysis technique. As a result, it is an appropriate approach for identifying the correct ingredient in organic fertilizer [12].

3. Results and Discussion

3.1 Observation and Growth of Okra Plant

The six different samples from the control experimental setup were then evaluated by measuring three separate parameters. The objective of this analysis is to examine the usefulness of each element fertilizer produced toward the growth rate of the plants from set 1 and to determine the best ratio of each nutrient in the fertilizer for the growth of the okra tree from set 2. According to the weeks were observed, the data were collected, as shown in **Figure 5** to **Figure 7**.

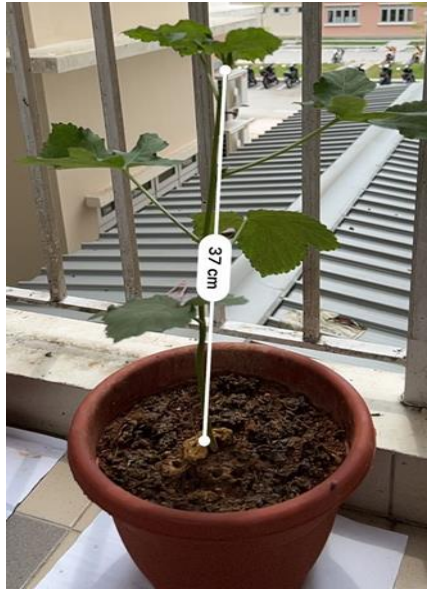


Figure 4: Measured the height of an okra plant.

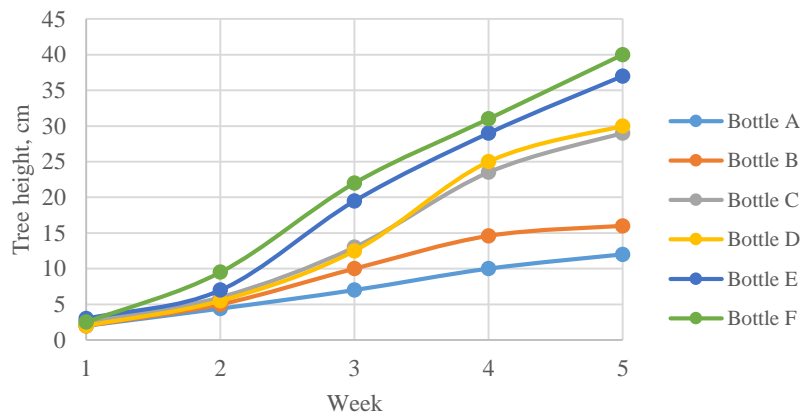


Figure 5: Graf analysis of Tree Height.

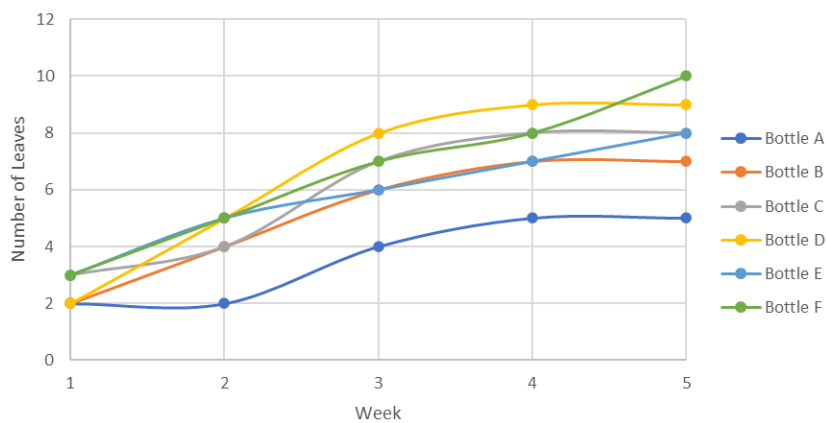


Figure 6: Graf analysis Number of Leaves.

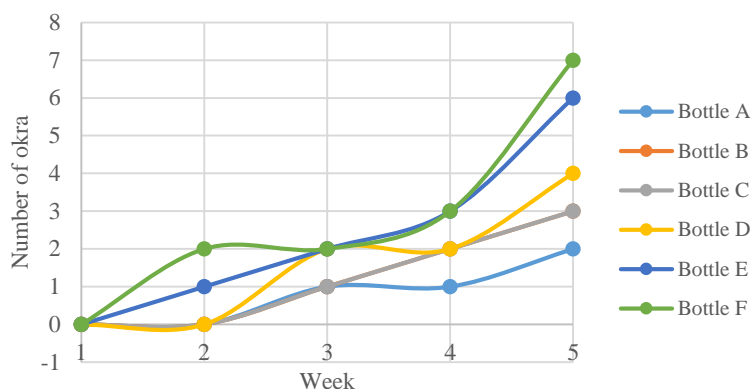


Figure 7: Graf analysis number of okra.

From set 1, it shows that the plant that is fertilized bottle C has the highest plant in terms of height, number of leaves, and fruits. Based on **Figure 5**, it demonstrates that plant C in the sample has the maximum height from set 1. **Figure 6** shows that plant A has 5 leaves at the end of the week, plant B has 7, and plant C has the most leaves from set 1 with 8. Next, the observation table for okra is linear based on **Figure 7**. In the graph, plant A displays the lowest number, while plant C displays the maximum number of okras, which is 3. Based on the observations, the ratio of 1: 1: 1: 10 (bottle C) is the most suitable fertilizer according to the element that contain chicken dung, eggshells, and rice waste water. Nitrogen, phosphorus, and potassium are all found in all three of these components, which are essential for plant health and growth.

From set 2, it shows that plant F has the highest in terms of height, number of leaves, and fruits from all of the plant. According to **Figure 5**, plant D was 30 cm tall at the end of week 5, whereas plant F, from set 2, was the tallest at 40 cm. Next, a balanced and linear graph representing the observed number of leaves is given in **Figure 6**. The final results of the plant analysis revealed that plant F had the most leaves, up to a total of 10. **Figure 7** displays a week 1 ascending graph that demonstrates that there was no fruit on any of the plants. By the conclusion of the fifth week, plant F had produced the most fruits that is seven. The ratio of 4:2:1:10 (bottle F) shows that it has the best ratio in set 2. Plant F, which was treated with chicken dung, eggshells, and rice washing water, gave the best results in terms of plant height as shown in **Figure 4** and produces the most fruits. This is because it has the best fertilizer ratio, which has the potential to create a rich supply of nutrients.

3.2 FTIR Analysis

Utilizing FTIR analysis, the functional group of the manufactured fertiliser was determined. The FTIR spectra of water, chicken manure, eggshell powder, and washed rice water waste are depicted in **Figure 8**. Three of these samples exhibited the functional group with infrared absorption band signals between 3400 and 1700cm^{-1} . The substance and functional group of chicken manure and rice water waste can be identified. For eggshell powder, the functional group and group intensity varied depending on the area. This is due to the region's intensity. This is due to the fact that the band's strength relies on the magnitude of dipole change during vibration. The greater the shift during the vibration, the stronger the absorption bands will be.

The band in the first position with a peak of 332 cm^{-1} represents the alkynes group. The terminal alkyne C-H can be validated by a weak C-C triple bond stretch recorded near 2109cm^{-1} . Due to the sample's composition, this powerful band can be deduced. The three bands at 1634cm^{-1} have been assigned to the C=O vibration of the amides group. A functional group containing a nitrogen atom and a carbonyl group is an amide.

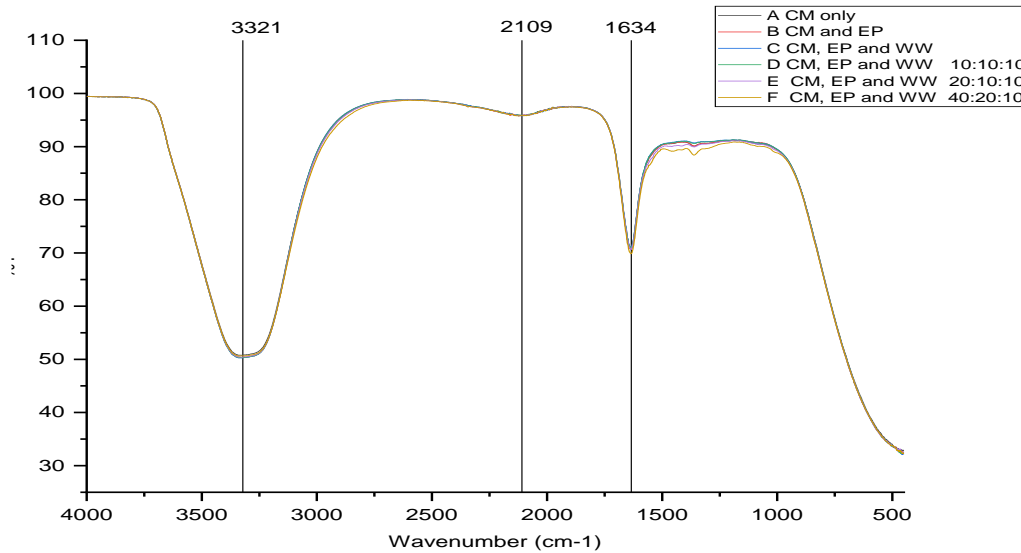


Figure 8: Analysis of fertilizer using FTIR.

3.3 pH Analysis

pH analysis had been conducted to know the optimum pH for the okra plant to grow. On first week or when the soil was not yet poured by the fertilizer, the reading of the pH meter are the same for all six bottle of fertilizer. The optimum pH for planting achieved as the pH for the soil are above 5.0 which are the suggested value of pH [13].

Table 4: pH of the soil in five week expand of fertilizing

Formulation	First week	Week-5
Bottle A	5.50	5.42
Bottle B	5.50	5.47
Bottle C	5.50	5.41
Bottle D	5.50	5.41
Bottle E	5.50	5.33
Bottle F	5.50	5.25

4. Conclusion

According to the research, the application of numerous organic fertilizers has a positive impact on plants. It was found that using okra to perform factor analysis provided good results in our investigation. Okra plants grown with the most chicken manure, rice washing water, and eggshell fertilizer grew taller and had more leaves than other okra plants. The first and final p analyses were both significantly different. Through this project, chicken manure is beneficial because it helps to keep nutrients in the soil for a long period. It also enriches the soil with potassium, sulphur, zinc, and copper. Using egg shells for deoxidation is more convenient than using chalk or lime. Decomposition of the eggshell will offer nutrients to the growing plant. Rice water comprises a variety of chemicals and fatty acids that contribute to its distinctive taste. Rice water may be utilized as a fertilizer, increasing crop output while also nourishing the plant roots. Chicken manure, eggshell, and wastewater from washed rice water are the main ingredients in making organic fertilizer from organic waste. The materials are collected from waste that be easily fine within the area of study. Additionally, using organic fertilizers can help to repair soil structure. The texture and aeration qualities of the soil are enhanced by organic fertilizers. The activity of beneficial bacteria can also be increased by it. Both soil microbes and organic materials are abundant in organic fertilizers. Lastly, organic fertilizer is a sustainable product. Both people and the environment may utilize organic fertilizers without risk. Finally, organic fertilizers are also readily available and cost effective. It is because the material obtained is from a reusable waste source.

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