

# Malunggay bark extract as a source of electricity



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The 21st century trend is an era in which technologies become part of human lives. In this age, efforts and time are exhausted by many individuals or groups in order to create technologies that can be utilized in any human endeavour. Conversely, for most of these innovations and inventions to function, electricity is required. In the Philippines, a country that is abreast with technologies, majority of the electricity requirement is derived from electric power plants that are run by fossil fuels such as petroleum and coal. Moreover, batteries which are portable source of the said energy are also in use. However, due to rapid increase in technologies that require electricity, some problems arise. At present, since there is a huge demand for electricity, fuel required to generate such energy becomes scarce. People have realized that most of processes and materials for electricity generation have negative effect on the environment and on health of human. Hence, researches are conducted to discover green (clean, natural, derive from biological source), low cost, and readily available alternative source of electricity. In line with this view, Filipinos actively participate to achieve this purpose by introducing malunggay (*Moringa oleifera*) as an important source of not only nutrition and medicine but of electricity as well.

Malunggay is a tree that preferably grows in countries with tropical climate such as the Philippines. This tree can be easily propagated since malunggay can be grown from seeds or mature stem cuttings. In the country, this tree is commonly found in household backyard, aligned with perimeter fences, since the edible and nutritious flowers, fruits, and leaves of malunggay are part of the diet of Filipinos. Aside from the nutritional value of some parts of malunggay, all parts of this tree are used in herbal medicine to cure some

diseases. Given that this tree can serve several purposes, malunggay becomes in demand.

In light of the discussion of the environmental problems and characteristics of malunggay, a group of researchers conducted a study entitled “ MOB Electricity: Malunggay Bark Extract as Alternative Source of Electricity”, to show that malunggay (*Moringa oleifera*) bark extract is a viable alternative source of electricity; consequently, providing an environment friendly, inexpensive and accessible source of electricity.

At this point in time, since there is a strong desire to improve way of living, great attention is given to technologies. Due to this interest, innovations and inventions which require electricity are continuously developed. Thus, electricity must be continuously generated. On the contrary, most of the processes and materials for electricity generation pose hazards to the environment and human health. Therefore, a clean, low cost, and readily available source of electricity is needed, a reason that motivated the researchers to engage in this investigatory project.

## **B. Statement of the Problem**

This study entitled “ MOB Electricity: Malunggay Bark Extract as Alternative Source of Electricity” intends to investigate the feasibility of Malunggay (*Moringa oleifera*) bark extract as an alternative source of electricity.

Specifically, this study sought to answer the following questions:

1. Is there a significant difference on the amount of voltage measured from liquid form of malunggay bark extract obtained through crude and ethanol extraction?
2. Is there a significant difference on the amount of voltage measured from jelly form of malunggay bark extract obtained through crude and ethanol extraction?
3. Is there a significant difference on the amount of voltage measured from liquid and jelly form of malunggay bark extract obtained through crude and ethanol extraction?
4. Is there a significant difference on the amount of voltage measured from varying amounts of malunggay bark extract?

### **C. Hypotheses**

1. Ho: There is no significant difference on the amount of voltage measured from liquid form of malunggay bark extract obtained through crude and ethanol extraction.

Ha: There is a significant difference on the amount of voltage measured from liquid form of malunggay bark extract obtained through crude and ethanol extraction.

2. Ho: There is no significant difference on the amount of voltage measured from jelly form of malunggay bark extract obtained through crude and ethanol extraction.

Ha: There is a significant difference on the amount of voltage measured from jelly form of malunggay bark extract obtained through crude and ethanol extraction.

3. Ho: There is no significant difference on the amount of voltage measured from liquid and jelly form of malunggay bark extract obtained through crude and ethanol extraction.

Ha: There is a significant difference on the amount of voltage measured from liquid and jelly form of malunggay bark extract obtained through crude and ethanol extraction.

4. Ho: There is no significant difference on the amount of voltage measured from varying amounts of malunggay bark extract.

Ha: There is a significant difference on the amount of voltage measured from varying amounts of malunggay bark extract.

## **D. Significance of the Study**

This study will provide the energy sector in the country a green alternative source of electricity which will reduce the use of materials that have hazardous effects to human and environment. Hence, minimizing occurrences of diseases and slowing the rate of environment degradation. Furthermore, the positive result of this study could also assure people with inexpensive and accessible source of electricity.

Moreover, this study introduces a new application of malunggay, thus, further increasing the demand for this tree. In this effect, farmers in the

country could have extra income by providing the needed supply of malunggay.

## **E. Scopes and Limitations**

The focal point of this study is the feasibility of malunggay (*Moringa oleifera*) as an alternative source of electricity. In order to assess the said feasibility, malunggay bark extract obtained through crude and ethanol extraction was utilized. Subsequently, voltage was measured for different set-ups and treatments.

However, the researchers were unable to determine the component of the extract responsible for electricity generation since the material was not subjected to chemical analysis. This restriction might be an additional recommendation for future researches.

The researchers conducted this study from January 9, 2012 to August 23, 2012. All experiments and observations were done at JICA laboratory of Sapang Palay National High School.

## **F. Operational Definition of Terms**

Gelatin Powder – used to create a firm form of extract.

Carbon Rod -served as the positive electrode (anode) of the external circuit connected to malunggay bark extract.

Zinc Plate – served as the negative electrode (cathode) of the external circuit connected to malunggay bark extract.

Multi-tester – used to measure the amount of voltage from malunggay bark extract.

## **CHAPTER II**

### **REVIEW OF RELATED LITERATURE**

#### **I. Introduction**

In the onset of the 21st century, negative effects of environmental issues such as pollution, ozone depletion, and global warming become notable. Thus, these problems gained the attention of people around the world. Among these negative effects are development and widespread of diseases, development of skin cancer, increase in temperature, heavy rains, heavy floods, strong typhoons, and climate change. In response, organizations are created, and conventions and researches are conducted to deal with these issues.

Today, as data are continuously gathered; various human activities that involve emission of gases, chemicals, and radiations are considered as one of the large contributor to environmental degradation. Such human activities include generation of electricity. However, since electricity is vital in operating technologies which advances human lives, search for clean alternative source of electricity should be conducted to prevent further degradation of the environment.

#### **II. Electricity Generation**

Electricity is the form of energy that has the highest demand at this point in time. This energy form is required to operate technologies that people created for life advancement. Thus, energy industries are in continuous

search to supply the needed demand of electricity. Today, there are different sources from which this energy is derived. These sources include fossil fuels (petroleum and coal), nuclear energy, hydropower, solar energy, and wind energy. These sources are used to drive turbines in electric power plants which will generate electricity. Electricity generated from these sources is the one supplied in wall sockets of houses and buildings. Another source of electricity is battery, a source that is in portable form. (Bose, 2010)

In the Philippines, a country that is abreast with technologies, majority of the required electricity is derived from electric power plants that are run by fossil fuels such as petroleum and coal. Moreover, batteries which are portable source of the said energy are also in use. However, emissions from such electric power plants are composed of gases which cause air pollution and contribute to global warming. Likewise, batteries have chemical components that can leak and pollute land, water and air. In addition to these negative effects to the environment, human can also acquire diseases due to said contamination. (Petrina, 2007)

### **III. Green Electricity**

People are now aware of the harmful effects of conventional electricity generation to human health and environment. Consequently, efforts and time are spent in order to discover alternative green – clean, natural, biological – sources of electricity, an action that would minimize presence of harmful chemicals and gases in the environment. In connection to this notion, researchers have considered different plants, different parts of plants, and organisms as potential source of green electricity. (U. S Environmental Protection Agency, 2012)

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Basic example of green energy is electricity from fruits and vegetables. Many people, during childhood, have done classroom experiments to derive electricity from lemon and potato. Results of these experiments proved that these materials can generate electricity because juices of fruits and vegetables act as electrolytes which initiate reaction to free and move electrons. (Renico, 2012)

On the other hand, another related research was conducted by scientists of Stanford University which harness electricity from algae. The concept behind this project is the process of photosynthesis involved in food production of plants. According to the scientists, in this process, electrons from water are given with high energy by sunlight. These electrons are the one the scientists captured using electrodes. (Stanford University, 2010)

Lastly, researchers of Arizona State University study the possibility for bacteria to generate electricity through the use of a microbial fuel cell (MFC) which contains waste water and bacteria dwelling on the material. In this research, the persons involve relate electricity generation to metabolic activity of bacteria. (Arizona State University, 2008)

#### **IV. Malunggay Tree**

Malunggay (*Moringa oleifera*) tree, which commonly grows in tropical countries such as Philippines, is characterized by long, straight, white trunks; small, green, compound leaves; and seasonal white flowers that yields long pods. This tree propagates easily and does not require much attention. In fact, malunggay seeds or matured stem cuttings can be planted in any kind of soil and does not require regular maintenance. (Asia Green Group, 2012)

In the Philippines, malunggay can be found in most household backyards because edible parts of this tree (flowers, pods, and leaves) are part of Filipino cooking. Moreover, these parts of malunggay tree provide people with vitamins and minerals needed by the body. Aside from providing nourishment, this tree also has medicinal value. Based on numerous studies, malunggay contains chemicals that have antibacterial, anticancer, and anti-inflammatory properties. (Fahey, 2005)

## **CHAPTER III**

### **METHODOLOGY**

#### **Gathering of Materials/Equipments**

Among the materials gathered by the researchers were malunggay (*Moringa olifera*) bark, gelatin powder, ethyl alcohol, filter paper, gloves, face mask, and old batteries. Equipment as well was borrowed from the school laboratory. These equipments include beakers, reagent bottles, funnel, stirring rod, thermometer, mortar and pestle, alcohol lamp, triple beam balance, strainer, tripod, and wire gauze.

#### **Collection of Zinc Plate and Carbon Rod**

Researchers collected old batteries. Subsequently, these batteries were uncovered and electrolyte inside was removed. Since electrolyte component of battery is composed of slightly toxic chemicals, researcher wore gloves and face mask. In this manner, zinc plates and carbon rods were obtained.

## **Preparation of Malunggay Bark Extract**

### **A. Crude Extraction**

Malunggay barks were collected and cut into small pieces by the researchers. Afterwards, the barks were placed in a blender. Finally, in order to obtain pure extract, minced barks were placed in soft cloth and squeezed.

### **B. Ethanol Extraction**

Malunggay barks were collected and cut into small pieces. Then, barks were placed in a blender to mince the material. Next, minced barks were oven-dried for 5 minutes and were pulverized with mortar and pestle. After this process, 100 grams of pulverized bark was placed in a reagent bottle in which 250 ml of ethyl alcohol was poured afterwards. Lastly, extract which was rested for 10 hours for purification purpose was filtered through a funnel with filter paper.

### **Varying the Amount of Bark Extract**

Amount of bark extract obtained through crude and ethanol extraction was varied for each treatment. 5 ml of extract was allotted to Treatment I, 10 ml for Treatment II, and 15 ml for Treatment III.

### **Preparation of Jelly Form of Malunggay Bark Extract**

In a beaker, constant volume (5 ml) of water was poured and heated to 70°C. When water reaches the specified temperature, constant amount (10 g) of gelatin powder was added into the water. Then, the solution was continuously stirred. Before the solution solidifies, the assigned amount of extract per treatment was poured without stopping the stirring process.

Material was immediately removed from heat.

## **Measuring Voltage**

Zinc plate and carbon rod were installed to each treatment. From these electrodes, multimeter was connected to measure voltage. Measurement was done for five times. Subsequently, voltage measured from each treatment was recorded.

## **METHODOLOGICAL FLOWCHART**

### **Gathering of Materials/Equipments**

### **Collection of Zinc Plate and Carbon Rod**

### **Preparation of Malunggay Bark Extract**

#### **Set-up 1**

#### **Liquid Form of Extract**

#### **Set-up 2**

#### **Jelly Form of Extract**

#### **Crude Extraction**

#### **Ethanol Extraction**

#### **Crude Extraction**

#### **Ethanol Extraction**

#### **Treatment I: 5 ml Extract**

#### **Treatment II: 10 ml Extract**

#### **Treatment III: 15 ml Extract**

#### **Treatment I: 5 ml Extract**

#### **5 ml Water**

#### **10 g Gelatin Powder**

#### **Treatment II: 10 ml Extract**

#### **5 ml Water**

#### **10 g Gelatin Powder**

#### **Treatment III: 15 ml Extract**

**5 ml Water**

**10 g Gelatin Powder**

**Measuring Voltage per Treatment**

**Data Gathering**

**Tabulation and Statistical Analysis of Results**

**CHAPTER IV**

**RESULTS AND DISCUSSIONS**

The researchers conducted several experiments. Subsequently, data and results obtained from these experiments were recorded in tabulated form in this chapter. After each table of data, interpretations of these results were discussed. In the aid of these interpretations, the researchers could have initial assessment of the hypotheses presented in this paper.

**Table 1. 0**

**Set-up 1**

**Crude vs. Ethanol Method of Extraction**

**(Liquid Form of Extract)**

**Treatment**

**Amount of Extract**

**Trial**

**Crude Extraction**

**Ethanol Extraction**

**Voltage (V)**

**Voltage (V)**

**Liquid Form of Extract**

**I**

5 ml

1

1. 0

1. 2

2

1. 6

1. 8

3

1. 6

1. 8

4

1. 6

1. 2

5

1. 6

1. 2

## **II**

10 ml

1

2. 6

1. 2

2

2. 7

1. 1

3



2.7

1.0

4

2.6

1.0

5

2.7

1.0

### **III**

15 ml

1

2.7

1.0

2

2.7

1.0

3

2.7

1. 0

4

2. 7

1. 0

5

2. 7

1. 0

Table 1. 0 shows that liquid form of crude bark extract generated higher and more uniform amount of voltage than liquid form of ethanol bark extract. In addition, for crude bark extract, amount of voltage increases as amount of extract increases.

**Table 2. 0**

**Set-up 2**

**Crude vs. Ethanol Method of Extraction**

**(Jelly Form of Extract)**

**Treatment**

**Amount of Gelatin Powder (g)**

**Volume of Water (ml)**

**Volume of Extract (ml)**

**Trial**

**Crude Extraction**

**Ethanol Extraction**

**Voltage (V)**

**Voltage (V)**

**Jelly Form of Extract**

**I**

10

5

5

1

2. 0

1. 0

2

2.0

1.0

3

2.0

1.2

4

2.0

1.2

5

2.0

1.2

## **II**

10

5

10

1

1.8

1. 4

2

1. 8

1. 2

3

1. 8

1. 4

4

1. 5

1. 2

5

1. 2

1. 2

### **III**

10

5

15

1

2.5

1.8

2

2.5

1.8

3

2.4

1.8

4

2.4

1.8

5

2.5

1.8

Table 2.0 shows that jelly form of extract from crude extraction yielded higher amount of voltage than jelly form of extract from ethanol extraction. However, more uniform voltage reading is obtained from jelly ethanol bark extract than jelly crude bark extract; as the amount of extract increases, amount of voltage reading increases.

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**Table 3. 0**

**Liquid vs. Jelly Form of Extract**

**(Crude Method of Extraction)**

**Treatment**

**Amount of Extract**

**Trial**

**Liquid form of Extract**

**Jelly Form of Extract**

**Voltage (V)**

**Voltage (V)**

**Crude Method of Extraction**

**I**

5 ml

1

1. 0

2. 0

2

1. 6

2. 0

3

1. 6

2. 0

4

1. 6

2. 0

5

1. 6

2. 0

## **II**

10 ml

1

2. 6

1. 8

2

2. 7

1. 8

3

2. 7



1. 8

4

2. 6

1. 5

5

2. 7

1. 2

### **III**

15 ml

1

2. 7

2. 5

2

2. 7

2. 5

3

2. 7

2. 4

4

2. 7

2. 4

5

2. 7

2. 5

Table 3. 0 shows that both form of crude bark extract generated relatively high amount of voltage. Even so, jelly crude bark extract yielded fluctuating amount of voltage as the amount of extract increases.

**Table 3. 1**

**Liquid vs. Jelly Form of Extract**

**(Ethanol Method of Extraction)**

**Treatment**

**Amount of Extract**

**Trial**

**Liquid form of Extract**

**Jelly Form of Extract**

**Voltage (V)**

**Voltage (V)**

**Ethanol Method of Extraction**

**I**

5 ml

1

1. 2

1. 0

2

1. 8

1. 0

3

1. 8

1. 2

4

1. 2

1. 2

5

1. 2

1. 2

## **II**

10 ml

1

1. 2

1. 4

2

1. 1

1. 2

3

1. 0

1. 4

4

1. 0

1. 2

5

1. 0

1. 2

### **III**

15 ml

1

1. 0

1. 8

2

1. 0

1. 8

3

1. 0

1. 8

4

1. 0

1. 8

5

1. 0

1. 8

Table 3. 1 shows that as amount of liquid ethanol bark extract increases, amount of measured voltage decreases. For jelly form of bark extract from ethanol extraction, voltage reading increases, as the amount of said extract increases.

## **CHAPTER V**

### **SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS**

#### **Summary:**

This study entitled “ MOB Electricity: Malunggay Bark Extract as Alternative Source of Electricity” aspires to prove if malunggay bark extract could be a possible source of electricity and to ascertain if there would be a significant difference when the method of extraction, form of extract, and amount of extract are varied.

In order to test the feasibility of malunggay bark extract as alternative source of electricity, the researchers prepared two different set-ups and under each set-up there are three treatments. For the second set-up, <https://assignbuster.com/malunggay-bark-extract-as-a-source-of-electricity/>

amount of gelatin powder and amount of water used in each treatment were controlled. Then, voltage was measured in each treatment per set-up for five times using a multi-tester.

The results obtained from different set-ups were analyzed using Two-Factor ANOVA with Replication. The results are summarized as follows:

On the first set-up, statistical analysis showed that there is significant difference in the amount of voltage measured from liquid form of malunggay bark extract when method of extraction and amount of extract were varied.

On the second set-up, statistical analysis showed that there is significant difference on the amount of voltage measured from jelly form of malunggay bark extract when obtained through different extraction method.

Furthermore, statistically significant difference also exists on the amount of voltage reading when the amount of said form of extract was varied.

Statistical analysis of Tables 3. 0 and 3. 1 indicate that there is significant difference on the amount of voltage measured when the form of extract and amount of extract were varied.

### **Conclusion:**

Based on the results of statistical analysis and observations, the researchers conclude that malungggay bark extract could be a viable alternative source of electricity. Moreover, the people behind this study were able to discover that the 15 ml liquid form of extract obtained through crude extraction yielded the highest and most stable amount of voltage among all the treatments done.

**Recommendations:**

In this study the researchers encountered some hindrances which limited the scope of the investigation. Hence, only test for the feasibility of malunggay bark extract as an alternative source of electricity was conducted.

Nonetheless, the study does not end with this objective. There are other factors related to electricity generation in malunggay bark extract that should be considered.

Researchers would like to propose the following to other people who consider pursuing this project:

Further increase volume of extract in order to obtain higher voltage reading.

Convert the extract in a form that will facilitate easier and more stable voltage measurement.

Subject the extract to chemical analysis to determine the component responsible for electricity generation.

Develop a way to harness electricity from the extract.