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Feasibility of Banana (*Cardava banana*) Pseudo-Stem and Snake Plant (*Sansevieria trifasciata*) as Non-Wood Fiber Sources in Pulp and Paper Production

2023

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ABSTRACT

Paper is one of the products that is used for many purposes. In line with this, increasing demand for paper causes the threat of deforestation and environmental problems that can be resolved by using non-wood fiber resources for making paper like agricultural biomass wastes. The objective of this study is to utilize non-wood biomass wastes like banana pseudo-stem and snake plant as alternative sources of fiber raw materials that are easily accessible and convertible into pulp and paper. The experimental design was utilized in developing the paper. The results indicate that on the basis of thickness, the combination of 50% banana pseudo-stem fibers and 50% snake plant fibers produced a thick and usable paper that can be considered to.

Background of the study

Deforestation is one of the most critical global issues as p roven by the 15 billion trees cut down every year from the roughly 3 trillion trees on Earth, the tallied number of trees by international scientists (Subagyo & Chafidz, 2018). The 42% of this depletion is attributed to the production of paper goods from the global wood harvest (Suraj & Khan, 2015). According to a study, a single tree can produce 16.67 reams of paper and almost thirty million trees are used for this (Roisin, 2022). Apparently, this deforestation would eventually incite further environmental catastrophes that can affect people and animals if it will continue to persist (Shukla et al., 2012).

Internationally, 140 billion metric tons of agricultural biomass wastes are recorded and considered to be convertible into new and raw materials. As new ones, they have potential in large-scale industries and local enterprises (United Nations Environment Programme, 2009). These non-wood raw materials can be used for eco-friendlier papermaking instead of continuously utilizing trees that process with higher chemical charges (Azeez, 2018).

Bananas are abundant globally, for 72.5 million amounts of these are planted annually. As they are produced, byproducts such as their leaves, pseudo-stems, rotten fruits, and rhizomes are also generated. These crop wastes can be recycled, specifically the pseudo-stems, as they are a good fiber source. They have the qualified properties for pulp production, namely good modulus of elasticity, stiffness, tensile strength, low density, and strong and fast absorption quality (Subagyo & Chafidz, 2018). Furthermore, 200,000 tons of banana fibers can create 165,000 tons of handmade papers. *Cardava banana*, which is a type of banana, is a promising fiber material and has high amounts of the said qualities, especially its growth rate that reaches up to a height of 4.5 meters and a diameter of 68 centimeters (Ploetz et al., 2007).

Like bananas, snake plants, or *Sansevieria trifasciata* plants are also rich in fiber. A snake plant's fiber scraps' diameter is calculated as 50.76 microns, fineness of 19.45 denier, and tensile and elongation strength of 5.97 gm/denier. Due to their durability and similarity with the traditional raw materials used for paper production, snake plants can be used for wider applications and that includes pulp and paper production (Kant & Alagh, 2013).

The study aims to conduct a feasibility study of the banana (*Cardava banana*) pseudo-stem and snake plant (*Sansevieria trifasciata*) that can be used for general purposes. The researchers are now focused on the use of the combination of two proven fiber source biomass wastes to create a handmade paper, which can be a resourceful solution for tree depletion and environmental pollution. Lastly, this study can contribute to researches and broaden the knowledge about the fiber properties and capabilities of banana (*Cardava banana*) pseudo-stem and snake plant (*Sansevieria trifasciata*) and would probably lead to the use of biomass waste fiber that is accessible and green.

be of the same thickness as the commercial paper's thickness. Thus, these variables have the potential and are feasible non-wood fiber sources in pulp and paper production.

Statement of the Hypothesis

The following are the research hypotheses employed in this study:

1. **Null Hypothesis**: If the Banana (*Cardava banana*) Pseudo-Stem and Snake Plant (*Sansevieria trifasciata*) are not feasible as fiber sources, then usable paper cannot be created with these variables.

Alternative Hypothesis: If the Banana (*Cardava banana*) Pseudo-Stem and Snake Plant (*Sansevieria trifasciata*) are feasible as fiber sources, then usable paper can be created with these variables.

METHODOLOGY

There are two independent variables used in the experiment which are the banana pseudo-stem fibers *(Cardava banana)* and snake plant fibers *(Sansevieria trifasciata)*. One set-up of 100% pure snake plant fibers *(Sansevieria trifasciata)* and one set-up of 100% pure banana pseudo-stem fibers *(Cardava banana)* serve as the control set-up.

The investigation involves five phases namely: Phase I - Manual Retting, Phase II - Chemical Retting with Sodium hydroxide solution, Phase III - Drying the Extracted Fibers, Phase IV - Evaluating the Banana Pseudo-Stem Fiber and Snake Plant Fiber Paper, and Phase V - Proper Disposal of Materials Used.

PHASE I - Manual Retting

a. Manual Retting of Banana Stem Fiber

The retting of banana stem fiber is done by manually separating the stem from the sheath to remove the minor non-cellulosic gummy substances from the pseudo-stem.

b. Manual Retting of Snake Plant Fiber

The hand scraping of snake plants is the easiest and shortest way of fiber extraction. It is done by repeatedly scratching the plant with the use of a knife until the fiber becomes visible.

PHASE II - Chemical Retting with Sodium hydroxide solution

a. Chemical Retting of Banana Stem Fiber

The experiment requires chemical retting since the gummy substances of the banana pseudo-stem are not yet completely removed after the mechanical retting. It is done by immersing the cut stems in boiling water with a chemical solution, specifically an alkali solution sodium hydroxide, a chemical used in the pulp and paper industry because it has a high dissolution ability and strength in lignin and pectin separation. The last stage will be washing the mixture with water for neutralization.

b. Chemical Retting of Snake Plant Fiber

The extracted fibers from the leaf are mercerized in the water with alkali solution of sodium hydroxide. Then, they will be washed with water to remove the excess sodium hydroxide solution.

PHASE III – Drying the Extracted Fibers

After the extracted fibers are washed with water, they will be blended using a blender to become fine. Then, they will be strained, followed by drying them indoors overnight to reduce their moisture. The researchers will apply the drying for all set-ups.

PHASE IV - Evaluating the Banana Pseudo-Stem Fiber and Snake Plant Fiber Paper

The researchers will observe and examine the thickness of the papers using a micrometer after drying them. The thickness is the only paper factor that is used to test the usability of the product because of the limited resources available.

PHASE V – Proper Disposal of Materials used.

After the experiment, the researchers will sanitize and decontaminate the utensils/equipment by using disinfectants or bleach, followed by sterilizing the utensils/equipment used in the experiment for at least an hour.

Set-ups

The experimental design of this study of pulp and paper production from banana pseudo-stem fiber and snake plant fiber is composed of set-ups and combinations of dependent and independent variables.

Table of Set-ups

	Trial 1	Trial 2
Set-up A	50.83 grams of Banana Pseudo-stem Fiber	50.83 grams of Banana Pseudo-stem Fiber
	25.4 grams of Sodium hydroxide	25.4 grams of Sodium hydroxide
	101.5 mL of Water	101.5 mL of Water
Set-up B	20.33 grams of Snake Plant Fiber	20.33 grams of Snake Plant Fiber
	25.4 grams of Sodium hydroxide	25.4 grams of Sodium hydroxide
	101.5 mL of Water	101.5 mL of Water
Set-up C	25.41 grams of Banana Pseudo-stem Fibers 10.16 grams of Snake Plant Fibers	25.41 grams of Banana Pseudo-stem Fibers 1 0.16 grams of Snake Plant Fibers

	25.4 grams of Sodium hydroxide	25.4 grams of Sodium hydroxide
	101.5 mL of Water	101.5 mL of Water

RESULTS AND DISCUSSIONS

This chapter summarizes the collected data and presents the results. The results and implications of this study were presented in a data table that included all of the outcomes of the researchers' prior studies. The following are the results of the thickness testing of the paper set-ups of Banana (*Cardava banana*) Pseudo-Stem Fibers and Snake Plant (*Sansevieria trifasciata*) Fibers. The micrometer is the tool used to measure the thickness of the paper in this experiment.

Set-ups	Trial 1 (thickness)	Trial 2 (thickness)
Set A (100% Banana Pseudo-stem Fibers)	0.014 mm	0.016 mm
Set B (100% Snake Plant Fibers)	0.035 mm	0.042 mm

Set C (50% Banana Pseudo-stem Fibers and 50% Snake Plant Fibers	0.062 mm	0.091 mm

The table shows the results/product according to thickness. In the first trial, set-up A, the entire 100% banana pseudo-stem fibers produced a paper that has a thickness measurement of 0.014 mm. Set-up B or the 100% snake plant fibers of the same trial, produced a paper that has a thickness measurement of 0.035 mm. Set up C or the combination of 50% banana pseudo-stem fibers and 50% snake plant fibers of the same trial again, produced a paper that has a thickness measurement of 0.062 mm. As for the second trial, set-up A, the entire 100% banana pseudo-stem fibers produced a paper that has a thickness measurement of 0.016 mm. Set-up B or the 100% snake plant fibers of the same trial, produced a paper that has a thickness measurement of 0.042 mm. Set-up C or the combination of 50% banana pseudo-stem fibers and 50% snake plant fibers of the same trial again, produced a paper that has a thickness measurement of 0.091 mm.

Based on the data, the set-up A (100% banana pseudo-stem fibers) and B (100% snake plant fibers) of both trials can create a usable paper of thin thickness measurement. Yet, the set-up C (50% banana pseudo-stem fibers and 50% snake plant fibers) of both trials, can make a paper but of a greater thickness measurement compared to the papers of set-ups A and B in both trials. The combination of two materials produces a better paper with improved quality based from appearance and thickness. Based from the handmade paper standards, the paper produced in set-up C can be considered to be usable as its thickness falls under the standard thickness of a bond type of paper, which is 0.090 mm (Holding, 2018). The result proves the feasibility of banana pseudo-stem fibers and snake plant fibers in the production of usable papers.

CONCLUSION

Based on the results, the Banana (*Cardava banana*) Pseudo-stem Fibers and Snake Plant (*Sansevieria trifasciata*) Fibers successfully produced a usable paper which has the greatest thickness measurement among all the set-ups. The paper's thickness is also qualified to be of a bond paper's thickness. Therefore, these variables are feasible and have the potential of being non-wood fiber sources in puland paper production. The researchers also found out that they could create a thicker paper using these combined variables than papers made out of pure banana pseudo-stem fibers and snake plant fibers.

Feasibility of Dried Banana Leaves (*Musa acuminata*) and Wastepaper as a Fuel Briquette

2023

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ABSTRACT

Fuel Briquettes can be used for thermal applications, especially when cooking the traditional way. People who are deprived enough to purchase LPG or electric stoves continue to use the traditional method of cooking, which involves the use of expensive wood fuel, one of the causes of deforestation. The objective of this study is to utilize easily-accessed and non-wood biomass wastes like dried banana leaves and waste paper that can be converted to fuel briquettes. The viability of using waste paper and dried banana leaves as fuel briquettes was examined by the researchers using an experimental setup. The study concluded that out of all set-ups, it is made out of both dried banana leaves and waste paper burns the hottest and fastest out of all the set-ups, being deemed as the most effective and feasible fuel briquette. The researchers recommend to future researchers make a thicker binder to ensure compaction, dry the

briquette two weeks prior to testing, to test many briquettes all together in one set-up rather than only testing one briquette, to discover and consider more methods and factors in evaluating briquettes; and to test other variables which composition is qualified in making briquettes.

Background of the study

People who do not have access to LPG or electric stoves continue to use the traditional method of cooking, which burns wood for fuel. However, wood fuel used for cooking is now expensive and also leads to deforestation, one of the planet's main environmental issues. Natural resources on the planet are limited, therefore if we continue to use them, we will ultimately run out of them (Blackman and Baumol, 2022). Problems are exacerbated by destructive human behavior, such as cutting down trees for fuel.

Internationally, research states that organic materials can be mixed with paper to produce briquettes which is a safer and much more environmentally friendly alternative than wood fuel (Huang, 2014). Researchers from Africa made use of Agri-industrial waste by turning them into briquettes, with coconut waste as a variable. The researchers have stated that they wanted to find a solution to the huge smoke that is produced when the wood is used, to a charcoal briquette from coconut waste which was smokeless. The experiment of the researchers was a success and it was proved that coconut waste can be used to make briquettes.

Nationally, a research was made about paper waste as a variable to make a briquette. “Fire Blocks: Paper as a Renewable Source of Kindle for Fires” by Emily Comedis, Randonn Belen, Johann Sebastian Bucks, Christian Carawana, Darwin Japeth Costales, Joshua Embalzado, Jericho Lugtu. At De La Salle University, Manila, Philippines on June 20-22, 2017. “Briquettes are better than loose biomass since they are compressed. This compression allows them to burn for a lot longer than if it was loose. Also, it does not take too much money to compress these so it will be inexpensive for people to attain with the research

being put into biomass briquettes for energy, we can expect that soon the world will have a new source of energy. It is a big step in making our lives eco-friendlier and protecting our world." This research encourages people to make their own paper briquettes on helping reduce world pollution and saving money.

Banana is abundant in the Philippines. In recent years the Philippines has been in the top five banana exporters in the world, and the top ten in production, exporting around 3.5 million tonnes of bananas annually (Bananalink, 2022). Dried Banana Leaves, or *Musa acuminata*, show thermal behavior and physicochemical characteristics similar to others biomass already used as fuel for energy generation, making dried banana leaves suitable for briquette making. In addition to that, banana leaf waste has a relatively high content of lignocellulose. The compaction of the lignocellulosic waste provides better energy utilization of biomass when used as fuel for power generation (AIDIC, 2014).

On the other hand, paper waste is a severe problem in many industries and offices. With much of the attention focused on plastic disposal, the impact of paper waste is often overlooked. Yet, improper paper waste disposal and recycling can impact the economy and the environment as the other waste products (Baleforce, 2021). Paper, when utilized as a variable in the production of briquettes, also demonstrates strong mechanical durability and density, and their rupture requires a relatively large force. The paper has significant mechanical robustness when employed as a briquette-making variable. It also has a high density and requires a sizable amount of force to break.

The study aims to conduct a feasibility study of Dried Banana Leaves (*Musa acuminata*) and waste paper as a fuel briquette that can be used for general purposes. The researchers are now focused on the use of the combination of two variables namely the Dried Banana leaves and Paper waste to produce briquettes which can be a resourceful solution for tree depletion and environmental pollution. Lastly, this research

can further our understanding of the thermal behavior, physical, chemical, and functional properties of waste paper and dried banana leaves (*Musa acuminata*) and may pave the way for the development of briquettes that emit less smoke when burned.

Statement of the Problem

This study seeks to find out the feasibility and compatibility of dried Banana Leaves (*Musa acuminata*) and waste paper as fuel briquettes and possible alternatives for wood fuel. Specifically, it is sought to answer the following questions:

1. Can dried Banana Leaves (*Musa acuminata*) and waste paper be made to fuel briquettes?

2. Can dried Banana Leaves (*Musa acuminata*) and waste paper be alternatives to wood fuel and charcoal?

3. Will it be equally effective and beneficial as other briquettes?

4. Will the production of this fuel briquette help to reduce deforestation?

METHODOLOGY

Two independent variables were used in the experiment: dried banana leaves (*Musa acuminata*) and paper waste. One set-up of 100% pure dried banana leaves (Musa acuminata) and one set-up of 100% pure waste paper will serve as the control set-up.

The investigation involves six phases namely: Phase I – Preparation of Materials, Phase II – Blending and Cutting, Phase III – Making Cassava Starch Mixture, Phase IV -Mixing and Compressing all the Ingredients; Drying, Phase V – Evaluating the fuel briquettes, and Phase VI – Proper Disposal of Materials Used

Materials/Ingredients

- Dried Banana Leaves
- Waste Paper
- Water
- Wood sawdust
- Cassava Starch
- Basin
- Blender
- Measuring Cup
- Scale
- Scissors/Knife

PHASE I – Preparation of Materials

The waste paper will come from the researcher's unused, dispersed papers from previous academic pursuits, while the dried banana leaves will come from the farms in Barangay Subasta with the permission of the banana landowners. In addition, the wood saw dust will be from a woodworking shop/establishment and the cassava starch will be store-bought. The different ratios will be prepared by the researchers: 20 grams of dried banana leaves : 60 grams of cassava starch dilute in 60 mL water : 20 grams of sawdust, 20 grams of waste paper : 60 grams of cassava starch diluted in 60 mL water : 20 grams of sawdust,

and 10 grams of dried banana leaves : 10 grams of waste paper : 60 grams of cassava starch diluted in 60 mL water : 20 grams of sawdust.

PHASE II – Blending and Cutting

The dried banana leaves and waste paper will be cut into smaller pieces. To further break down the banana leaves into smaller pieces, it will be placed in a blender.

PHASE III – Making Cassava Starch Mixture

After breaking down the independent variables, the researchers will then heat up 10 mL of water in a pan using a stove and then add 60 grams of cassava starch. The researchers will stir the mixture until it thickens.

PHASE IV – Mixing and Compressing all the Ingredients; Drying

In a basin, the ingredients in each set-up given the following ratios will be mixed. After which, will be compressed by hand into a shape of a circle. It will be followed by drying them outdoors under the heat of the sun. The researchers will apply the drying for all set-ups.

PHASE V - Evaluating the fuel briquettes

The researchers will observe and examine the duration of time that the briquette will burn and how long each set-up of fuel briquette made the water boil. The following factors mentioned

are the only factors to test the usability of the product because of the limited resources available.

PHASE VI – Proper Disposal of Materials Used

Following the experiment, the utensils and equipment will be sterilized for at least an hour after being cleaned and decontaminated with bleach or disinfectants by the researchers. All trash made because of the experiment will be thrown in proper trash bins.

Set-ups

The experimental design of this study of fuel briquettes from dried banana leaves and waste paper is composed of set-ups and combinations of dependent and independent variables.

	Trial 1	Trial 2	Trial 3
Set-up A	20 grams of Dried Banana Leaves	20 grams of dried banana leaves	20 grams of dried banana leaves
	60 grams of Cassava Starch	60 grams of Cassava Starch	60 grams of Cassava Starch
	60 mL of Water	60 mL of water	60 mL of Water
	20 grams of sawdust	20 grams of sawdust	20 grams of sawdust
Set-up B	20 grams of wastepaper	20 grams of wastepaper	20 grams of wastepaper
	60 grams of Cassava Starch	60 grams of Cassava Starch	60 grams of Cassava Starch
	60 mL of Water	60 mL of Water	60 mL of Water
	20 grams of sawdust	20 grams of sawdust	20 grams of sawdust

Set-up C	10 grams of dried banana leaves	10 grams of dried banana leaves	10 grams of dried banana leaves
	10 grams of waste paper	10 grams of waste paper	10 grams of waste paper
	60 grams of Cassava Starch	60 grams of Cassava Starch	60 grams of Cassava Starch
	60 mL of Water	60 mL of Water	60 mL of Water
	20 grams of sawdust	20 grams of sawdust	20 grams of sawdust

RESULTS AND DISCUSSIONS

This chapter summarizes the collected data and presents the results. The results and implications of this study were presented in a data table that included all of the outcomes of the researchers' prior studies. The following are the results of the duration of time that the briquette burned and how long each set-up of fuel briquette made the water boil. The researchers also tested the heat temperature of the pot and water in each set-up and trial with the use of an infrared thermometer due to limited resources.

Set-ups		Trial 1	Trail 2	Trial 3
Set A	Duration of time the briquette burned	3 minutes	4 minutes 36 seconds	2 minutes 57 seconds

(waste paper briquette)	Duration of time the briquette took to make the water boil	No boiling of water observed	No boiling of water observed	No boiling of water observed
	Heat temperature of the pot	32.5 °C	33.7 °C	30.1 °C
	Heat temperature of the water	35.6 °C	40.2 °C	33.7 °C
		Trial 1	Trial 2	Trial 3
Set B (dried banana leaves briquette)	Duration of time the briquette burned	2 minutes 24 seconds	4 minutes 19 seconds	4 minutes 6 seconds
	Duration of time the briquette took to make the water boil	No boiling of water observed	No boiling of water observed	No boiling of water observed
	Heat temperature of the pot	36.0 °C	36.1 °C	36.6 °C

	Heat temperature of water	42.6 °C	45.1 °C	41.4 °C
		Trial 1	Trail 2	Trial 3
Set C (dried banana leaves and waste paper briquette)	Duration of time the briquette burned	5 minutes 20 seconds	3 minutes 21 seconds	5 minutes 10 seconds
	Duration of time the briquette took to make the water boil	No boiling of water observed	No boiling of water observed	No boiling of water observed
	Heat temperature of the pot	40.0 °C	39.1 °C	43.5 °C
	Heat temperature of water	50.1 °C	50.4 °C	55.1 °C

The table shows the results according to the duration of time the briquette took to make the water boil, the duration of time the briquette burned, and the heat temperature of the pot and water. In the first trial,

Set-up A, the briquette made out of waste paper burned for 3 minutes, and with the use of the infrared thermometer, the heat temperature of the pot measured 32.5 °C and 35.6 °C for the heat temperature of the water. Set-up B or the briquette made out of dried banana leaves burned for 2 minutes and 24 seconds, the heat temperature of the pot being 36.0 °C, and the heat temperature of the water measuring 42.6 °C. Set-up C or the briquette made out of both waste paper and dried banana leaves burned for 5 minutes and 20 seconds, the heat temperature of the pot being 40.0 °C and the heat temperature of the water being 50.1 °C. No boiling was observed in all set-ups for trial 1.

As for the second trial, set-up A or the waste paper briquette burned for 4 minutes and 36 seconds, the pot's heat temperature being 33.7 °C and the water heat temperature being 40.2 °C. Set-up B or the dried banana leaves briquette burned for 4 minutes and 19 seconds, the pot's heat temperature being 36.1 °C and the water heat temperature being 45.1°C. Set-up C or the briquette made of waste paper and dried banana leaves burned for 3 minutes 21 seconds, the pot's heat temperature being 39.1°C and the water heat temperature being 50.4 °C. Lastly, as for the third trial, set-up A or the waste paper briquette burned for 2 minutes and 57 seconds, 30.1 °C was measured for the heat temperature of the pot and the heat temperature of the water being 33.7 °C. Set-up B or the briquette made of dried banana leaves burned for 4 minutes and 6 seconds, 36.6 °C was measured for the heat temperature of the pot, and the heat temperature of the water being 41.4 °C. Set-up C or the briquette made out of both waste paper and dried banana leaves burned for 5 minutes and 10 seconds, the heat temperature of the pot being 43.5 °C and the heat temperature of the water being 55.1 °C.

Based on set-up A, Because of the thin thickness, the compact paper quickly ignited. But, as easily as it ignites and spreads is just as easy as how its fire is extinguished since it has more access to oxygen than

the other variable. Therefore, the water only had a slight reaction to the brief fire originating from the paper briquette. The set-up B, composed of starch and dried leaves, also burns fast but slower than paper, though ignites stronger than the other. Thus, the slower it burns the longer is the water exposed to heat and the higher the temperature is. Lastly, according to Set-up C, composed of both materials from set-ups A and B, burns the hottest and fastest out of all the set-ups, with the combination of the properties of paper and dried leaves, the fire can easily move around the other briquettes, furthermore, because of the thickness of the leaves, they burn stronger and is in a much-prolonged state. In conclusion, paper and dried leaves, can no doubt be an alternative for wooden charcoal.

Conclusion

Based on the results, the waste paper and dried banana leaves (musa acuminata) successfully produced a briquette that burns the hottest and fastest among all the set-ups. The tests done by the researcher further proved the similarities of the product to various fuel briquettes having the ability to heat up. Therefore, these variables are feasible and have the potential of being alternative charcoal/wood fuel. The researchers also found out that they could create a much more effective briquette using these combined variables than briquettes made out of pure waste paper and dried banana leaves.

The Effectiveness of Using Lemongrass *(Cymbopogon citratus)* Extract as Natura l Pesticide for Black Bugs *(Scotinophara coarctata)*

2023

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ABSTRACT

Rice is the most important food crop of the developing world. One fifth of the world's population, more than 1 billion people, depends on rice cultivation for livelihoods. In line with this, one of the biggest agricultural issues today are rice black bug infestations in rice fields. The study aims to conduct an effectivity study of the lemongrass as an organic pesticide for black bugs with a formulation that won't harm rice crops. The results indicate that when utilized as a pesticide, lemongrass extract was only effective in repelling black bugs, rather than killing them. Thus, considering its effectivity in repelling, it is determined that lemongrass has the potential to be a natural pesticide for black bugs that won't damage the crops when applied. The future researchers are recommended to use extracted lemongrass oil instead of lemongrass boiled in water to have a stronger effect against black bugs, to asses other organic pesticide quality factors for a better evaluation, and to increase the number of trials to further analyze strong differences.

Background of the study

One of the biggest agricultural issues today are rice black bug (*Scotinophara coarctata*) infestations in rice fields. One fifth of the world's population, more than 1 billion people, depends on rice cultivation for livelihoods. (American Society of Plant Biologists, Williams, 2017). Rice is the most important food crop of the developing world. In developing countries alone, more than 3.3 billion people depend on rice for more than 20% of their calories. These black bug (*Scotinophara coarctata*) infestations destroy the crops and causes big problems to a country's agricultural state.

According to the International Rice Research Institute, Black bugs (Scotinophara coarctata) remove the sap of the plant. They can cause browning of leaves, deadheart, a condition of the plant wherein the damaged tillers center leaves turn brown and die and bugburn, a condition of the plant wherein the leaves turn reddish brown, resulting in crop loss. Their damage also causes stunting in plants, reduced tiller number, and formation of whiteheads.

Among the major cereals, rice is the primary staple of more than two billion people in Asia and hundreds of millions of people in Africa and Latin America. Insects reduce yields substantially, especially in tropical Asia. Cramer estimated the rice yield losses caused by insects by reviewing the literature up to l966. He estimated losses ranging from 31.5% in Asia to 2% in Europe. (Heinrichs, 2013). Insect infestations especially Black Bug infestations cause yield losses and risk the livelihood of one fifth of the world's population.

The Philippines is a deeply agrarian country. Agriculture, specifically Rice farming is one of the greatest factors of the Philippines" economy. The Philippines too, have suffered from black bug infestations. Black bug (*Scotinophara coarctata*) Infestations have greatly affected the country, the livelihood of the people, especially the farmers.

According to officials of the Mindanao Science and Technology Centrum Foundation Inc., Black bug infestation has also been reported in Davao Oriental and the Agusan and Surigao provinces. Due to rice being destroyed, farmers have smaller incomes, and rice production is slower.

The lemongrass plant is known to be an effective mosquito and house fly repellent. According to a study conducted in 2013, Lemongrass oil (*Cymbopogon citratus*) is an effective repellent against mosquitoes (Diptera: Culicidae) and house flies (Diptera: Muscidae). Lemongrass is a tropical perennial plant which yields aromatic oil. Geranial (α-citral) and neral (β-citral) are the two main active components of lemongrass oil, but other compounds, such as geraniol and citronellol, which are known repellents, are also present in small amounts (Baldacchino, 2013). Lemongrass essential oil has previously shown a repellent effect, alone or in combination, against different species of disease-transmitting mosquitoes (Diptera: Culicidae) and the house fly (Musca domestica Linnaeus, Diptera: Muscidae), and is already present in commercially available products. (Baldacchino, 2013).

The study aims to determine the effectivity of the lemongrass as a natural pesticide for black bugs. Further, the researchers have not come across a study that proves how effective lemongrass is as a natural pesticide which can be a solution for the black bug infestation within the Calinan community. Therefore, this study is an effort to fill the gap in the existing literature and to better understand the repellent properties and capabilities of lemongrass plant that would lead to the use of organic pesticides that are accessible and safe for the environment.

Statement of Problem

This study determined the efficacy of lemongrass extract as black bug repellant. Specifically, this study answered the following questions:

Can lemongrass extract repel or kill black bugs?

Can lemongrass extract be a natural alternative for black bug repellants?

Statement of the Hypothesis

Null Hypothesis: If the Lemongrass *(Cymbopogon citratus)* extract is not effective in killing/repelling Black Bugs *(Scotinophara coarctata),* then it can't be used as natural pesticide.

Alternative Hypothesis: If Lemongrass *(Cymbopogon citratus)* extract is effective in killing/repelling Black Bugs *(Scotinophara coarctata),* then it can be used as natural pesticide

Significance of the Study

This study will help uncover new information about using lemongrass extract as an organic pesticide for black bugs with a formulation that won't harm rice crops. If the results of this study were favorable, they would be substantial for:

Rice Farmers – This would help rice farmers control the infestation of black bugs for successful crops leading to higher income.

Community – Rice being a major source of energy that we consume on daily basis, controlled infestation of black bugs that poses a threat to not only agricultural methods but also to humans will greatly help the community.

Future Researchers – This study might contribute useful information to research and serve as a foundation for additional study.

Scope and Delimitation

This study focuses on the efficacy of lemongrass extract as natural pesticide for black bugs and was conducted at the residence of Mr. Philip T. Andrew. The lemongrass extract in a spray bottle, container where the black bugs are contained, and five black bugs were prepared for each of three trials. The

experiment period is estimated to be limited to half day only with two hours preparation and another one hour for the experiment. The study was done through experimentation and observation for one hour in order to ensure that the field trial measures accurately the effectivity as botanical control. Also, the study did not cover other problems aside from black bugs.

Definition of Terms

Lemongrass *(Cymbopogon citratus)* – is a widely used herb in tropical countries, especially in Southeast Asia. In post-harvest management and as an insect repellant, it serves largely as an anti-fungal agent and a pesticide active component.

Black Bugs *(Scotinophara coarctata)* – are sap feeding insects that attack rice plants in irrigated areas in almost all stages of growth. Also known as rice pests.

Extract – is a substance obtained or derived from a plant.

Pesticide – any substance used to kill, repel, or control certain forms of plant or animal life that are considered to be pests.

METHODOLOGY

The investigation involved three phases: Phase I – Plant Extract Preparation, Phase II – Experimentation Set-up and Phase III – Data Gathering and Analysis. All experimental procedures were conducted at Purok 1, Balite, Peñano Street, Calinan, Davao City.

Phase I- Plant Extract Preparation

Lemon grass leaves were collected from Purok 1, Balite, Peñano Street, Calinan, Davao City. The leaves were washed using distilled water and mince into pieces. After boiling in 1000 mL of distilled water, the stock solution underwent cooling process. After cooling, it was transferred to an empty spray bottle.

Phase II- Experimentation Set-up

The researchers used an empty spray bottle as the container for the lemongrass extract. The specimens were collected at Purok 1, Peńano Street, Balite, Calinan, Davao City. After specimens were gathered, the researchers started conducting the experiment. First, the lemongrass extract was prepared. Then, they prepared the container where the specimen or the black bug was placed. The specimens were placed in the container by means of using gloves and with the help of an adult. This is also, where the treatment was sprayed accordingly.

Phase III- Experimentation

Three trials were conducted with two set-ups each. The black bugs were gathered in one area within the container. For Set-Up A, nothing was applied, and in Set-Up B, the black bugs were exposed to three consecutive sprays of lemongrass extract. Then, their behavior was observed for five minutes. The experiment was repeated in three trials.

Phase IV- Data Gathering and Analysis

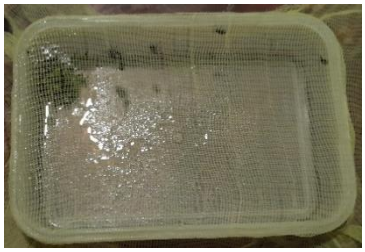
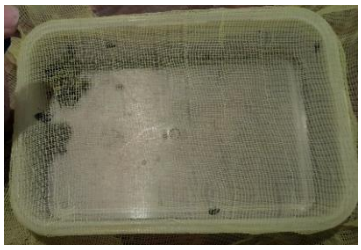
After administering the treatment, the data then was gathered each trial. It was monitored whether the black bugs were killed, repelled, or unaffected during the observation period.

Phase V- Proper Disposal

The black bugs were killed using a commercialized insecticide as it has no further purpose now while, the plastic container used was properly cleaned and kept in a place for recyclable materials.

RESULTS AND DISCUSSIONS

The findings, interpretation, and analysis of the experimentation in the research are presented in this chapter. The observation of the use of lemongrass extract on the black bugs is shown in the table below.

No. of Trials	Set-Ups	
	Set-Up A: Without lemongrass extract	**Set- Up B: With lemongrass extract**
Trial 1		
Trial 2		
Trial 3		

Three trials were conducted for the study, each having two set-ups, both having five minutes allotted for the observation: Set-Up A where nothing was applied and Set-Up B where the lemongrass extract was applied. For the Set-Up A, in the first trial, the five black bugs were gathered in a corner with little leaves to stay onto. Their behavior was observed for five minutes. During the five minutes of observation, the black bugs were seen to behave neutrally. The black bugs just wandered at any side within the container. For the second trial, following the same procedure, five black bugs were gathered again in the same side or area; and, after five minutes of observation, the black bugs were observed to have the same neutral behavior. To make sure of the results, in the third trial, the five black bugs were gathered again on the same area. With 5 minutes of observation, the same result was observed. The black bugs were seen wandering at any side within the container.

As of the Set-Up B, three trials were also conducted. In the first trial, after 5 minutes of observation after the spraying the lemongrass extract, the black bugs were seen to be repelling away from the sprayed area. In the second trial, with the same result as the first trial, after 5 minutes of observation after spraying, the black bugs were also seen repelling away from the sprayed area. To make sure of the results, the third trial was done. Confirming the result, the same observation resulted. After 5 minutes of observation after spraying, the five black bugs were again seen repelling away from the sprayed area.

CONCLUSION AND RECOMMENDATION

Conclusion

According to the findings, spraying lemongrass extract on black bugs did not kill them; rather, it repelled them. More evidence was gathered to confirm that lemongrass does, in fact, effectively repel insects. When utilized as a pesticide in the trial, lemongrass extract was only effective in repelling black bugs, not at really killing them. However, since the lemongrass was boiled in distilled water to create an extracted lemongrass, water was infused with lemongrass. Thus, making it have a higher concentration

than the lemongrass extract which may be a factor in its efficacy. In light of this, it is determined that lemongrass has the potential to be a natural pesticide for black bugs that won't damage the crops when applied.

Recommendations

The researchers recommend to the future researchers:

1. To use pure lemongrass extract to have a stronger effect against black bugs;
2. To assess other organic pesticide quality factors for a better evaluation; and
3. To increase the number of trials to further analyze strong difference.


HOLY CROSS COLLEGE OF CALINAN, INC.
TO CHRIST THROUGH MARY
CALINAN, DAVAO CITY

2022

The Comparative Study Between Plastic Container and Resealed Zip Lock (Ziplock) as Food Storage

2022

Proponents:

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Maravilla, Marloraine Sabrina

ABSTRACT

This study aims to compare which food storage between plastic food containers and resealed zip-locks can increase the shelf life of food using sliced apples. The study used the experimental method to compare the two independent variables and the observational method to come up with a conclusion. There are four phases of procedures which are: preparation of the food storage containers and sliced apple, placing the sliced apple into containers, observing the appearance of the apple, and proper disposal of materials. The result of the experiment shows that the apple placed in the zip-lock got rotten and discolored first. From the observed result, the researchers concluded that plastic container is better than zip-lock as food storage in increasing the shelf life of a sliced apple. From the conclusion formulated, the researchers recommended that when storing food, especially apples, use plastic food containers. To future researchers, conduct a similar experiment involving different food products like other fruits, aside from apples, vegetables, and viands. Moreover, an experiment that would include putting the variables in the refrigerator to check if the result will be different in lower temperatures can also be conducted by the future researchers.

Background of the Study

According to Science, one of the most essential things our body needs is food which provides nutrients that give the body energy, growth, etc. Given its importance, food's life would not last for a very long time and will result in spoilage due to bacteria, mold, yeast, moisture, light, and temperature and eventually lead to rotting(McCurdy, Peutz, & Wittman,2009). The type of food, length of time displayed in the store before you bought it, the temperature of the food packaging, and how efficient refrigerators are the factors that need to be considered about the shelf life of the food(Garden,-Robinson,2020). To prevent foods from the mentioned biological processes, they can be stored and put in a refrigerator, but there are some instances when refrigerators are not available and so should look for another way. As Kendall and Dimond (2012) mentioned that proper food storage helps to preserve the nutritional and quality of the food and can help you save from preventing it from earlier spoilage, it provides an idea that proper food storage includes proper choice of food storage material. Fruits like sliced ripened apples can only be of good quality for 1 to 2 days when not refrigerated(Food Marketing Institute, Washington, 2005). The length of the quality of a sliced apple is shorter than unsliced and can be visibly seen. When the sliced apple is exposed to oxygen, it will undergo enzymatic browning(Let's Talk Science-Rebecca Fox,2019).

Foods should be placed in airtight containers when not in the refrigerator for long-term usage (Nummer, Washbun & Hunsaker, 2013). A study conducted by Husain et al., (2015) in Saudi Arabia said that plastic food containers made people's life easier because aside from its cheap price, it can be carried out without any fear of breakage. Plastic containers play an important role and that includes preservation and increasing the lifespan of food (Yates et al.,2019).On the other hand, a Zip-lock bag can be food storage also, can extend foods' shelf-life, and an FDA-approved for long term usage(Kitchenseer,*n.*

Shelf life does not only depend on time and temperature but also on the storage atmosphere. Seven percent water loss of water in apple's weight loss can be a result of the product losing its value(Park et

al.,2018). Apples, when stored in a pantry, should be in a moisture-resistant bag(Garden-Robinson,2020). The apple's respiration like temperature, relative humidity, exposure to oxygen, and carbon dioxide must be reduced and limited to prolong the life shelf of it. According to Bastin,(2007) proper food storage results in improved nutritional quality, reduced waste from spoilage, and fresher and better-tasting food.

However, even though several international studies have said that proper storing of food will increase the shelf life of food, no national and local studies can support and can show which food containers and Zip-lock is better for food storage. Due to this gap, the researchers decided to conduct this experiment to which is better. Sliced apple is used as a representation of food for it easily react when exposed to oxygen.

Hypothesis

H_1: If Plastic Container is better than Zip-lock as food storage, then sliced apple's shelf life will be longer.

H_2: If Zip-lock is better than Plastic Container as Food storage, then sliced apple's shelf life will be longer.

Significance of the Study

Many foods each year are wasted mainly because of food spoilage. Instead of these foods being consumed by humans, it is being thrown away in the trash the landfills and wasted for flies to feast with. Once we find out which container is best for preventing early spoilage, we might be able to help other people in choosing a good container that'll prevent the early spoilage of food which involves microbial spoilage, physical spoilage, and chemical spoilage, etc. This information can be a great help if emergencies will occur and with the absence of electricity.

Scope and Delimitation

The focus of this experiment is to identify which food storage between food containers and Zip-lock is better in increasing the shelf-life of apples. Apple is used in the experiment for it easily gives a visible reaction when sliced. The other indicators in identifying the quality of the apple will not be included and be limited only to the physical factor. Health impacts of the food storage used will not also be included.

Methodology

There are two independent variables used in the experiment which are the Plastic Container and the Zip-lock. The shelf life of the apple will serve as the dependent variable.

The investigation involves 4 phases namely: Phase I – Preparation of food storage containers and apple, Phase II – Placing the sliced apple into the containers, Phase III – Observing the appearance of the apple, Phase IV- Proper disposal of the materials used.

Materials

Apple

Zip-lock

Plastic container

Gloves

Phases/Procedures

Phase I - Preparation of the food storage containers and apple

The Plastic container is designed to hold the food product, the Zip-lock is designed as a reusable storage zipper bag, while the Apple is bought from the supermarket and the apple is only the variable used in the experiment. The Apple will be sliced in half and it will be placed in the two containers. Each container will have one-half apple per container.

Phase II – Placing the sliced apple into the containers

The researchers used gloves in placing the apples into the containers so as not to affect the study results and is then sealed properly. The apples are both placed in the Zip-lock and the Plastic container at the same time, 8:00 am, and at the same place which is on the kitchen table. After placing the sliced apple in both containers, it will be placed in the same spot to receive the same amount of sun exposure.

Phase III - Observing the appearance of the apple

When the apple is placed in the containers it already showed a reaction which is called oxidation. The apple inside the containers showed different appearances each day. Each day all the observations are noted by the researchers.

Phase IV – Proper disposal of the materials used

After the experiment, the researchers will dispose of the materials used. For the apples, they will be thrown into the compose pit since apples, like practically all other organic waste, are ideal for composting. The containers will be then thrown into the trash cans.

Research Method

The method of this experiment is comparative experimental because the researchers will use experimentation to compare the result from two independent variables. Comparative experimental design is a method used to describe similarities and differences in variables (Bailey,2008).

Results and Discussions

The following are the pictures taken each day by the researchers to see the difference between the apples in both storages.

Trial 1

Figure 1

Food Storage	Day 1	Day 2	Day 3	Day 4
Plastic Container				
Zip-lock				

Figure 1 shows that there are changes in apples from both food storage each day. It shows that apple that after four days of observation, the sliced apple from Zip-lock looks more spoiled than the sliced apple from a plastic container.

Trial 2

Figure

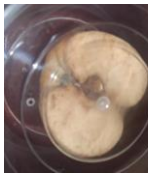
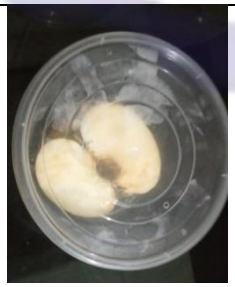
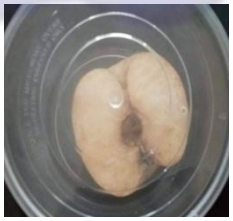
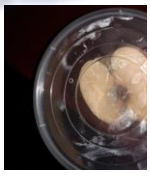
Food Storage	Day 1	Day 2	Day 3	Day 4
Plastic Container				
Zip-lock				

Figure 2 shows that there are changes in apples from both food storage each day. It shows that apple that after four days of observation, the sliced apple from Zip-lock looks more spoiled than the sliced apple from a plastic container.

Trial 3

Figure 3

Food Storage	Day 1	Day 2	Day 3	Day 4
Plastic Container				

Zip-lock				

Figure 3 shows that there are changes in apples from both food storage each day. It shows that apple that after four days of observation, the sliced apple from Zip-lock looks more spoiled than the sliced apple from a plastic container.

Conclusion and Recommendation

Conclusion

After the experiment and observation, the researchers found out that the sliced apple in the Zip-lock rotted faster than whereas in the plastic container. After days of the experiment, the same result for each trial was observed. The sliced apple shows a clear result that helps the researchers for the conclusion. The first hypothesis was proven and accepted as the plastic container is better than Zip-lock as food storage that can increase the shelf life of food.

Recommendation

The researchers, therefore, recommend after the conduction of their experiment, to conduct another experiment that involves different food and more food storage. Future researchers may use different types of fruits, vegetables, and viands. The researchers also recommend having the same experiment but it is on the refrigerator to know the shelf life of food from different containers in a low temperature.

The Level of Effectivity of Saluyot (*Corchurus oliturios*)

Leaf Extract as Larvae Killer on Household Mosquito (*Culex pipiens*)

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ABSTRACT

This experimental research was conducted to determine the level of effectiveness of Saluyot (*Corchorus olitorius*) leaf extract as a larvae killer on household mosquitoes (*Culex pipiens*). It further looked into whether there is no significant difference in the level of effectiveness of Saluyot leaf extract as larvicide at different concentrations. A total of 555 household mosquito larvae (*Culex pipiens*) were taken as samples treated with Saluyot (*Corchorus olitorius*) leaf extract. Five treatments were used which include 0%, 25%, 50%, 75%, and 100% of Saluyot leaf extract. To determine the level of effectiveness of Saluyot leaf extract as a larvicide, the Mean of the total terminated larvae for each sample was described as less effective, moderately effective, effective, and very effective. The study showed that 50%, 75%, and 100% concentration of the extract was very effective in killing household mosquito larvae (*Culex pipiens*), while 25% concentration was found only effective. The ANOVA was used to determine the significant difference in the level of effectiveness of different concentrations of Saluyot leaf on household mosquito larvae (*Culex pipiens*) set at 0.05 level of significance. The results showed that there is a significant

difference in the level of effectiveness of Saluyot leaf extract as larvicide at different concentrations. Thus, it was concluded that Saluyot leaf extract can be a potential natural larvicide on mosquitoes and can be an alternative substitute to commercial mosquito pesticides. The researchers recommend using Saluyot leaf extract as a natural larvicide on household mosquitoes to avoid the negative side effects of commercial pesticides particularly in areas where the Saluyot plant grows abundantly.

***Keywords**: Saluyot* (*Corchorus olitorius*) *leaf extract, household mosquito* (*Culex pipiens*)*, level of effectiveness of Saluyot leaf extract, significant difference of different concentrations, alternative larvicide*

Background of the study

Mosquito Dengue fever is a mosquito-borne viral infection that has expanded fast throughout all regions in recent years. It has become much more common in recent decades all across the world. The exact number of cases is underestimated because the vast majority of patients admitted are asymptomatic or mild and self-managed. The disease is now endemic in more than 100 countries, with Asia representing ~70% of the global burden of disease (World Health Organization [WHO], 2022).

In the Philippines, dengue fever is a severe public health concern where it is endemic in all regions, and outbreaks are typically seasonal, with most cases occurring during the rainy season. It was reported that there were 79,872 dengue cases recorded from January 1 to December 31, 2021, with 285 deaths (CFR 0.4%) which were 12% lower than in 2020 but still alarming (Herriman, 2022). In August 2019, the Department of Health (DOH) in the Philippines declared a national dengue outbreak as instances of the tropical virus continue to grow across the area. Following the outbreak, the Department of Health upholds a permanent ban on Dengvaxia due to the controversy surrounding the company's inability to submit post-marketing data, including risk management strategies (Philippine News Agency [PNA], 2019).

Mosquito larvae thrive in small cavities that collect water, such as potholes, dirt depressions, buckets, wood grooves, and similar locations (McCarty, 2019). To nurture their eggs, female mosquitoes need blood in order to breed, and transmit diseases by sucking blood. The most frequent viruses spread by mosquitoes are dengue fever, yellow fever, and malaria (Cleveland Clinic, 2021). To reduce the spread of mosquito-borne diseases, the 4 o'clock habit became a part of the government's 4-S plan, which stands for seek and remove mosquito breeding sites, use self-protection measures, seek early consultation, and support fogging/spraying in hotspot regions with reported dengue cases. The City Health Office (CHO) has advised Dabawenyos to continue practicing the 4 o'clock Habit or the 4-S approach to prevent the spread of mosquito-borne diseases (PNA, 2021).

Dengue infection has no specific treatment. The greatest strategy to prevent mosquito bites is to limit the mosquito population (WHO, 2021). Cleaning gutters and removing standing water from plant saucers are some ways to avoid mosquito breeding (Canny, 2020).

To prevent the spread of diseases and to promote environmental and public health, the researchers are now directing their attention on the use of natural substances, particularly Saluyot (*Corchorus olitorius*) leaf extract as a larvicidal agent to address environmental concerns, the adverse effects of synthetic pesticides on human health and other non-target population concerns (Lorenz, 2017). Research shows that the continuous use of synthetic insecticides leads to vector species developing resistance, biological multiplication of hazardous compounds via the food chain, and negative consequences for environmental quality and non-target creatures, including human health (Ghosh et al., 2012).

In a similar 2014 study, Madre de cacao (*Gliricidia sepium*), that was found to contain active phytochemicals such as tannins and flavonoid was proven to be highly effective in eradicating household mosquito (*culex pipiens*) (Antonio et al., 2014).

The use of Saluyot leaves *(Corchorus olitorius)* as a potential insecticidal ingredient is the focus of the study. The herbaceous plant tossa jute (Corchorus olitorius), also known as Jew's mallow, bush okra, nalta jute, or jute mallow, is a member of the mallow family (Malvaceae) and is grown throughout tropical Asia and Africa (Petruzzello, 2018). Alkaloids, phenolics, flavonoids, and steroids are common phytoconstituents found in plants belonging to the same taxonomic family, Malvaceae, and are commonly associated with ethnopharmacological activity (Abat et al., 2017). Research shows that flavonoids, coumarins and tannins have insecticidal properties and are used as alternatives to synthetic pesticides (Palma-Tenango, et al., 2017). Flavonoids suppress an enzyme called Nobo, which is involved in the production of ecdysone, a crucial hormone in the insect life cycle. Desmethyl Glycitein (DMG), the most effective flavonoid tested, has the ability to kill larvae Aedes aegypti (University of Tsukuba, 2022). Tannins are bitter polyphenols that discourage many insect pests from feeding. They have an impact on insect growth and development by binding to proteins, limiting nutrition absorption efficiency, and producing midgut lesions (Rao, et al., 2017). Many plant-derived substances coumarins (1,2-Benzopyrone) found in clover, sweet woodruff, and grasses, have shown pesticidal capabilities (Brooker, et al., 2007). Glycosides, triterpenes, ionones, phenolics, phytosterols, organic acids, lignins, and alkaloids have also been isolated and identified from jute plants (Mahabub, et al., 2012).

Statement of the Problem

The main objective of the study is to determine the level of effectiveness of Saluyot (*Corchorus olitorius*) leaf extract in killing mosquito larvae. Specifically, this study aims to answer the following questions:

1. What is the level of effectiveness of Saluyot leaf extract as a mosquito larvicide?

2. Is there a significant difference in the level of effectiveness of Saluyot leaf extract as larvicide in different concentrations?

Hypothesis

H1: If the level of concentration is higher, then the level of effectiveness of killing larvae is higher.

H2: If the level of concentration is lower, then the level of effectiveness of killing larvae is lower.

Scope and Limitations

This study determined the level of effectiveness of Saluyot leaf extract on household mosquitoes (*Culex pipiens*). The study was conducted at Purok-6 Subasta, Calinan, Davao City. The experimental period lasted for 24 hours and 30 minutes. Five treatments with different concentrations of Saluyot leaf extract were used and each treatment contained three replicates with thirty-seven larvae arranged in Parallel Group Design.

To determine the level of effectiveness of Saluyot leaves as a larvicide, the Mean was used and is described as less effective, moderately effective, effective and very effective. The One Way Analysis of Variance (ANOVA) was used to determine whether there is a significant difference in the level of effectiveness of Saluyot leaf extract at different concentrations and tested at a 0.05 level of significance.

Significance of the study

This study aims to discover the potential use of Saluyot (*Corchorus olitorius*) leaf extract in eradicating mosquito larvae by putting Saluyot (*Corchorus olitorius*) leaf extract in a water container loaded with mosquito larvae. The researchers believed that this study will be beneficial to the following:

Medical Practitioners - Results of this study will offer these individuals fundamental knowledge and information on the potential usage of natural pesticides, notably Saluyot leaves, in eradicating mosquito larvae and other similar pests that may cause diseases.

Government - The result of this study will help reduce government spending on mosquito eradication.

Community - This study will provide a cheaper and more effective mosquito larvae repellent, and the community will be made aware of the usefulness of Saluyot leaves as an alternative larvicide.

Future Researchers - This study will provide baseline of information for those who wish to conduct further research into the problem, increase their awareness of the important value of the Saluyot (*Corchorus olitorius*) plant as an alternative larvicide, and demonstrate how simple organic materials that are easily accessible elsewhere can be transformed into something useful as a mosquito larvicide.

METHODOLOGY

One independent variable used in the experiment is the concentration of Saluyot (*Corchorus Olitorius*) leaf extract (0%, 25%, 50%, 75%, and 100%). The level of effectiveness of Saluyot leaf extract as natural larvicide is the dependent variable.

Materials Used

Graduated Cylinder - used to measure the amount of extract and its percentage concentration.

Mortar and Pestle - used in pounding the Saluyot leaves to obtain the extract.

Petri Dish - used as a container for the set up and treatments.

Strainer - it is used to separate any particles from the Saluyot leaf extract, leaving a pure extract mixture.

Equipment Used

Blender - is an electrical equipment with revolving blades that is used to chop, mix, or liquefy foods. It is used in the experiment to ground and blend the pounded Saluyot leaves further.

Procedure

The investigation involves 5 phases: Phase I - The preparation of Saluyot leaf extract. Phase II - Preparation of mosquito larvae, Phase III - Applying the concentration into the bowls that have been contaminated with mosquito larvae, Phase IV - Calculating the number of larval fatalities to determine the insecticidal activity, Phase V - Proper disposal of materials used.

PHASE I - Preparation of the Saluyot Extract

The leaves of the Saluyot Plant were collected at Purok-6 Subasta, Calinan, Davao City, where it was planted. Before the experiment, the leaves were first rinsed to remove any dirt particles that had adhered to the leaves. The leaves were then smashed with a mortar and pestle, blended, and the extracts collected with a sieve (Antonio et al., 2014). The leaf extract has a slight viscosity, but this only impairs movement patterns and sensory capacities for a short time and does not harm larvae (Menden-Deue et al., 2016)

PHASE II - Preparation of Mosquito Larvae

One of the researchers has a neighbor who raises fish and uses cultured mosquito larvae as feed. The researchers purchased mosquito larvae that were already 1 day old after the neighbor cultivated them.

The batch of larvae purchased were all cultured on the same day. The small larvae were then cared for until they reached the desired larval stage for the experiment. The larvae matured into the required larvae for experiments when they were 6 days old. The larvae appeared like lengthy insects that wiggled when disturbed at this stage. The experiment then begins, with the larvae put in different petri dishes and given different concentrations. The table below shows the number of larvae in each treatment.

Table 1. Experimental Design showing treatment, level of concentration of Saluyot leaf extract and replicates.

Saluyot Leaf Extract Treatment	Replicates indication number of larvae used.			Total number of larvae
	1	2	3	
T1 (0%)	37	37	37	111
T2 (25%)	37	37	37	111
T3 (50%)	37	37	37	111
T4 (75%)	37	37	37	111
T5 (100%)	37	37	37	111
Total				555

This table of interpretation was based from the study of Antonio, Antoy, and Lumogda (2014) about "*Larvicidal effect of madre de cacao (gliricidia sepium) leaf extract on household mosquito (culex pipiens)*."

The target population was 125 mosquito larvae in each treatment. This was computed using the formula Ss = $\frac{NV + [Se2(1- p)]}{NSe + [V2 (p) (1- p)]}$. Since there were five treatments and replicated three times, fifteen petri dishes and a total of 111 mosquito larvae were used for each treatment. Each replicate for the five treatments contained thirty-seven mosquito larvae placed on a petri dish.

PHASE III - Applying the concentration into the bowls that have been contaminated with mosquito larvae

1) Prepare the container filled with mosquito larvae for relocation for the experiment.
2) Prepare fifteen (15) petri dishes. Since we have three trials, each trial should include a total of five petri dishes for experimentation.
3) Label the petri dishes with the number of trials, the concentration to be used: A for control, B for 25% concentration, C for 50% concentration, D for 75% concentration, and E for 100% concentration. Note the date of the experiment.
4) Place thirty-seven (37) mosquito larvae in each petri dish using an old spoon.
5) Measure the volume of the concentration in a graduated cylinder and place it in the petri dish according to the concentration indicated below:

   a.) Treatment (1) is the control with zero percent (0%) concentration of the extract and 40 ml of distilled water.

   b.) Treatment (2) used (25%) concentration containing 10 ml of extract and 30 ml of distilled water.

c.) Treatment (3) used (50%) concentration containing 20 ml of extract and 20 ml of distilled water.

d.) Treatment (4) used (75%) concentration containing 30 ml of the extract and 10 ml of distilled water.

e.) Treatment (5) used (100%) concentration containing 40 ml of extract with no distilled water.

The use of distilled water in the experiment ensures that the test results are fair since distilled water contains almost nothing and is inert, therefore it will not affect the results of the science experiment. (Brenner, 2022)

6.) Leave the petri dishes for 24 hours at room temperature, then observe. The mosquito larvae should be kept at room temperature because raising environmental temperature throughout the larval stages reduces larval survival (Christiansen-Jucht, 2014). In addition, low temperatures during the larval stages have an impact on adult survival (Ezeakacha, 2019).

PHASE IV - Calculating the number of larval fatalities to determine the insecticidal activity

The researchers initially inspected the petri dishes for 30 minutes after keeping them at room temperature for 24 hours after the concentration extraction to determine if the larvae would grow into pupa (Antonio et al., 2014). Following that, the researchers counted and recorded the number of larvae that died in each petri dish, noting if any larvae developed into pupa. The larvae were considered dead if they were unable to move after they were removed from the test container (Tomé, et al., 2014).

Statistical Tools

1. Mean - the mean was used to determine the level of effectiveness of Saluyot leaf extract as a larvicide for mosquitoes. The Mean was obtained by adding the number of mosquito larvae that died in three replicates divided by three. The following descriptions were used:

Descriptions	Mean Rating (Number of mosquito larvae died)
Less effective	0 - 9.24
Moderately effective	9.25 - 18.49
Effective	18.50 - 27.74
Very effective	27.75 - 37

This table of interpretation was based from the study of Antonio, Antoy, and Lumogda (2014) about "*Larvicidal effect of madre de cacao (gliricidia sepium) leaf extract on household mosquito (culex pipiens)*."

2. ANOVA - the One Way Analysis of Variance (ANOVA) was used at 0.05 level of significance, to determine if there is a significant difference in the level of effectiveness of Saluyot leaf extract in killing household mosquitoes at different concentrations.

PHASE V - Proper Disposal of Materials Used

The researchers will disinfect the bowls used after the experiment by washing it and disinfecting it with isopropyl alcohol. After that, any traces of mosquitoes in the vicinity will be entirely eradicated in the area where the investigation will occur. To discourage mosquito breeding, the researchers will also change every water container in the area and loot for possible breeding places

RESULTS AND DISCUSSIONS

This chapter examines the effectiveness of Saluyot leaf extract as a mosquito larvicide. It also looked into if there is a significant difference in the effectiveness of Saluyot leaf extract as a larvicide when different concentrations were used.

Research Question #1: **What is the level of effectiveness of Saluyot leaf extract as a mosquito larvicide?**

Table 2. The treatment, number of mosquito larvae that died in each replicate, and the level of effectiveness.

Treatment	**Number of mosquito larvae died**				**Level of effectiveness**
	Replicate 1	Replicate 2	Replicate 3	Mean	
1 (0%)	0	0	0	0	Less effective
2 (25%)	25	27	26	26	Effective

3 (50%)	35	34	35	35	Very effective
4 (75%)	35	37	36	36	Very Effective
5 (100%)	37	37	37	37	Very Effective

After 24 hours of treatment with Saluyot leaf extract at a concentration of 25%, 25 mosquito larvae died in Trial 1, 27 mosquito larvae died in Trial 2, and 26 mosquito larvae died in Trial 3, with a mean of 26. This indicated that Saluyot leaf extract is an effective mosquito larvicide at this concentration. With a 50% concentration, 35 mosquito larvae died in Trial 1, 34 in Trial 2, and 35 in Trial 3, with a mean of 35. At this concentration, the results showed that Saluyot leaf extract is a very effective treatment for killing mosquito larvae. When 75% concentrations were used, 35 mosquito larvae died in Trial 1, 37 in Trial 2, and 36 in Trial 3, for a mean of 36. At this concentration, the Saluyot leaf extract is very effective in killing mosquito larvae.

In Trials 1, 2, and 3, all 37 mosquito larvae perished at 100% concentration, with a mean of 37. This implies that Saluyot leaf extract is very effective in destroying mosquito larvae at this concentration. However, no mosquito larvae died in Trials 1, 2, or 3 in the control group, with a mean of 0.

Research Question #2: **Is there a significant difference in the level of effectiveness of Saluyot leaf extract as larvicide at different concentrations?**

The researchers use an extension from Google Sheets called the XLMiner Analysis ToolPak to run statistical analysis and retrieve the ANOVA findings (Analysis of variance). The One Way Analysis of Variance (ANOVA) was performed, with the significance level set at 0.05. It is set to 0.05 because p less

than 0.05 became a standard for scientific inference because of the advantage it provided at the time and how it was interpreted (Kennedy-Shaffer, 2019). The data were shown in Table 4.

Table 3. Mean Standard Deviation and Standard Error at Different Concentration of Saluyot Leaf Extract.

T	N	M	SD	SEM	95% Confidence Interval for mean		Min	Max
					LB	UB		
Control	3	0	0	0	0	0	0	0
25%	3	26	1	0.5773502692	23.51586229	28.48413771	25	27
50%	3	34.6667	0.5773502692	0.3333333333	33.23244909	36.10088424	34	35
75%	3	36	1	0.5773502692	33.51586229	38.48413771	35	37
100%	3	37	0	0	37	37	37	37
Total	15	26.7333	14.4245	3.7243940	18.7453	34.72136	0	37

			1617	6				

Definition of abbreviations:

T - Treatments

N - No. of replicates

M - Mean

SD - Standard Deviation

SEM - Standard Error of Mean

LB - Lower Bound

UB - Upper Bound

Min - Minimum

Max - Maximum

Table 4. Results of the ANOVA computations showing th*e Significant Differences in the Level of Effectiveness of Saluyot leaves at Different Concentrations*

No. of dead larvae	Sum of Squares	df	Mean Square	F	P-value	F-crit
Between groups	2908.266667	4	727.0666667	1558	0	3.478049691
Within groups	4.666666667	10	0.4666666667			
Total	2912.933334	14				

If the F value is larger than F critical value, it means there is something significant. Furthermore, if the P-value is less than the alpha level which is the 0.05, the result is statistically significant (Glen, 2022). Based on the result, it shows that there is a significant difference in the level of effectiveness of Saluyot leaf extract as larvicide at different concentrations. Since the F statistic is greater than the F critical and the p-value is less than the alpha level which is 0.05.

CONCLUSION AND RECOMMENDATION

Conclusion

The study demonstrated that Saluyot *(Corchorus olitorius)* leaf extract concentrations of 50%, 75%, and 100% were very effective in killing household mosquito larvae (*Culex pipiens*), but extract concentrations of 25% were only as effective. According to the findings, Saluyot leaf extract could be a potential natural mosquito larvicide and a suitable alternative to commercial insect pesticides. This study found that extracting the juice from the leaves of the Saluyot plant is an excellent method of eradicating mosquito larvae. And, as concentrations increase, the efficiency of Saluyot leaf extract in killing household mosquito larvae increases.

Recommendation

The following recommendations were made based on the study's findings and conclusion:

1. Considering Saluyot leaf extract is an effective larvicide, it is highly recommended for eradicating and killing household insects, especially in moist areas where mosquitoes thrive.
2. The usage of Saluyot leaf as a natural larvicide is recommended to reduce the side effects of using commercial pesticides to kill mosquitoes.
3. A larger number of larvae and other parts of the Saluyot plant should be used in a similar study to examine the effectiveness and validate the accuracy of the study.


HOLY CROSS COLLEGE OF CALINAN, INC.
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2020

Effectiveness of *Averrhoa carambola* Against the Inhibition Growth of *Staphylococcus aureus* and *Pseudomonas aeruginosa*

2020

Proponents:

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ABSTRACT

Pseudomonas aeruginosa is one of the main problems in health care. A total of 120,000 Staphylococcus aureus bloodstream infections and 20,000 associated deaths have occurred (Kourtis, Hatfield, et.al., 2019). Scientists and doctors found a solution regarding this problem with the use of anti-biotics. However, the anti-biotics prescribed by the doctors are way too expensive and deemed to disrupt the formation of the bacterial cell wall, commonly induce a potential allergic response. With this, the researchers were motivated to see the potential of Averrhoa carambola as an inhibitor against Staphylococcus aureus and Pseudomonas aeruginosa due to the phytochemicals present on it such as Saponins, Steroids, Tannins, Flavanoids, Phenols which can be used as anti-fungal and anti-bacterial. Moreover, the researchers utilized an experimental research design to come up with an answer where they used nutria agar as a medium and performed the Lawn's technique during the experimentation. Consequently, the researchers found out that the Averrhoa carambola was not effective upon inhibiting the growth of Staphylococcus aureus and Pseudomonas aeruginosa. Hence, the researchers suggest the testing of other fruits which contain phytochemicals and exploration of other techniques to further investigate this research topic.

Background of the study

Diseases caused by Pseudomonas aeruginosa is one of the main problems in health care. It is the leading cause of pneumonia, a top 3 cause of urinary tract infections (UTI), the top 8 leading contributors to bloodstream infections and more death rate compared to other pathogens. It is possible to spread rapidly since it is found widely in soil, water, and plants and can easily inflict people with weak immune systems (Rogers, 2016). Pseudomonas aeruginosa inflicted already 141 people in the USA, 120 in France, 113 in Germany and 108 people in Spain (Micek, 2015). In the year 2017, a total of 32, 600 were hospitalized due to the said bacteria. This implies that Pseudomonas aeruginosa infection is rapidly increasing. It was also stated that nearly 2, 700 deaths recorded in the United States from 2017 – 2019 due to the rapid increase of Pseudomonas aeruginosa infection (AR Threats Report, 2019).

In the Philippines, a study from the Local Tertiary Hospital in Bacolod City showed that 646 people were isolated due to Pseudomonas aeruginosa, 60.99% came from respiratory illness, 23.33% urinary tract infection and 2.01% from transudates and exudates (Juayang, Lim, Bonifacio 2017). Furthermore, Dr. Villafuerte reported that there are 14, 966 cases of Pneumonia and 1, 577 deaths cases in Davao City caused by Pseudomonas aeruginosa (Borromeo, 2016) Staphylococcus aureus or "staph" is the leading cause of skin, soft tissues in the human, body bacteremia, infective endocarditis (Tong, Davis, et.al., 2015). About 30% of the population that carries Staphylococcus aureus is commonly carried by children than adults. Thus, it spreads easily (Armstrong, 1976; Ridley, 1959; Wertheim, 2005). In the United States of America, a total of 120,000 Staphylococcus aureus bloodstream infections and 20,000 associated deaths have 1 occurred (Kourtis, Hatfield, et.al., 2019). The same case is also observed in the Philippines, a report from the Makati Medical Center states that 236 people were isolated due to Staphylococcus aureus infection (Nubel, Roumagnac, Feldkamp, et.al., n.d.). Moreover, in Davao City, there are 1.9% of patients

inflicted due to the said bacteria (Bongcawil, 2018). Scientists and doctors found a solution regarding the rapid spread of diseases caused by Staphylococcus aureus and Pseudomonas aeruginosa with the use of anti-biotics. However, the antibiotics prescribed by the doctors are way too expensive and some people cannot afford and these have been associated to several health issues as this tend to disrupt the formation of the bacterial cell wall, commonly induce a potential allergic response (Chandel, & Budinger, 2014). Moreover, the antibiotics used in treating the infections are causing more problems in terms of health care. The more antibiotics are used, the more resistant the bacteria become because sensitive bacteria are killed, stronger bacteria resist the treatment grow and multiply (Cunha n.d). Antibiotics resistance leads to higher medical costs, prolonged hospital stays and increased mortality (Antibiotics resistance, 2018) Hence, the researchers are now focused on the use of fruits as a potential inhibitor against Staphylococcus aureus and Pseudomonas aeruginosa to prevent expected resistance.

On the other hand, Averrhoa carambola commonly known as starfruit or "balimbing" is a genus of Averrhoa (Fruit family list A-Z, n.d) belonging to the nightshade family and can only be seen at warm and subtropical regions throughout the world (Which fruit is also known as physalis, 2015). The fruit is a good source of fiber, protein, vitamins C and B5, folate, copper, potassium and magnesium (Gunnars, 2019). Averrhoa carambola does not only have nutritional benefits, it also has phytochemicals present on it such as Saponins, Steroids, Tannins, Flavanoids, Phenols which can be used as anti-fungal and anti-bacterial agents. It is also a good source of 2 antioxidants and was used traditionally in different kinds of disease cases (Dhanashri, Rohini, 2018). A study from Dhanashri and Rohini (2018) shows that the extract of Averrhoa carambola fruit has stronger antimicrobial activities on Bacillus cerues which is a gram-positive bacterium and Escherichia coli a gram-negative bacterium. Learning the deemed gaps in the topic, this study aims to explore and investigate whether Averrhoa carambola extracts can inhibit the growth of Staphylococcus aureus and Pseudomonas aeruginosa. It also aims to discover if Averrhoa carambola

extracts can be a substitute prescription in anti-biotics. The researchers want to add more knowledge to the public and to recommend the better alternative to inhibit the said bacteria, which is affordable and more available or common around our community. The researchers also wanted to aid future researchers in their research if their research relates to this study.

Methods and Materials

Research Design

This study is an experimental research wherein the researchers would determine the effect of Averrhoa carambola against the inhibition growth of Staphylococcus aureus and Pseudomonas aeruginosa. Experimental research focuses on constructing research that is high in causal validity. Randomized experimental designs provide the highest levels of casual validity (Ojmarrh, 2015). The independent variable used in the experiment is the Averrhoa carambola fruit. While the dependent variables are the Staphylococcus aureus and Pseudomonas aeruginosa. The investigation involved three phases, namely: Phase 1 – Collection of Averrhoa carambola; Phase 2- Fruit Extract Preparation; and Phase 3 – Data gathering. Phase I -Collection of Averrhoa carambola Averrhoa Carambola fruits were freshly picked from Barangay Talomo River, Calinan, Davao City. The weighed mass of ripe and unripe fruit was 500 mg. Phase II -Fruit Extract Preparation The ripe and unripe Averrhoa Carambola fruits were washed thoroughly with water and sliced into small pieces. The juice was extracted using a blender. Afterward, it was placed into a beaker and was filtered for purification. The crude extract bromelain was centrifuged for 4 minutes at 2,000 rpm and 8 minutes at 4,000 rpm consecutively at 4°C and autoclaved at 121°C for 15 minutes to obtain microorganism – free starfruit juice. Finally, it was transferred into a sterile container separately.






Phase III- Data gathering

Nutri agar Preparation

1. Dissolve the dehydrated medium in the appropriate volume of distilled water (23 g in 1000 ml distilled water).

2. Heat with frequent agitation and boil for one minute to completely dissolve the powder. 3. Sterilize the medium through autoclaving (121°C for 15 minutes).

4. Dispense the medium into the tube. Preparation on the Experiment

1) Label the agar plates with the name of organism and product used. Also, mark dots on where you will put the disk.

2) The disks should be a minimum of 20 mm apart. Disks should not be placed near the edge of the plate

3) Inoculate one plate with your first bacterium as follows: Using aseptic technique, wet a swab with the bacterial broth culture. Thoroughly swab the surface of the plate, making sure to cover the entire surface. Use the Lawn Technique 5 Turn the plate approximately 60 degrees and repeat the previous step (2nd swabbing). Repeat the previous step (3rd swabbing). Use the following pattern for swabbing Discard the swab in a bleach-containing beaker. Place one disk onto the surface of the agar, using aseptic technique as follows: Heat the tips of the forceps by placing them in an alcohol lamp. Cool the forceps by waving them

in the air for about 10 seconds. Carefully pick up your test disk with the forceps, and gently place it in the appropriate spot on the agar surface. To ensure that the disk is flat on the agar, gently push it down with the forceps. Reheat the tips of the forceps as above to kill any bacteria.

4) Repeat the procedure with the second extract soaked-disk. Repeat the procedure until all the 2 extracts are placed well. Repeat steps 1 – 3 on a new agar plate with your second bacterium.

5) Incubate plates at 30 degrees for 24 hours.

6) After 24 hours, observe the agar plates.

7) Measure the diameter of the zone of inhibition in mm and record your results in the table.

8) If there is no zone present, record your result as 6 mm (same size as disks).

Results and Discussion

The researchers found out that the Averrhoa carambola was not effective in inhibiting the growth of Staphylococcus aureus and Pseudomonas aeruginosa. There were two trials tested and the results for each trial were all the same.

Table 1 ORGANISM: Staphylococcus aureus

Sample (Concentration)	**Trial 1**		**Trial 2**	
Positive Control (Gentamicin)	15mm	**Susceptible**	15mm	**Susceptible**
Negative Control (Distilled water)	6mm	**Resistant**	6mm	**Resistant**
Averrhoa carambola extract (Ripe) 100%	6mm	**Resistant**	6mm	**Resistant**
Averrhoa carambola (Unripe) 100%	6mm	**Resistant**	6mm	**Resistant**

Interpretation: **Susceptible** = >15mm; **Resistant** = <12mm

Table 1 shows that both ripe and unripe Averrhoa carambola extracts are resistant against Staphylococcus aureus the same with the negative control which is the distilled water having a constant diameter of 6mm (same size of the disk). This means that the organisms do not respond or react to the

extract (Washington, n.d). While on the other hand, the positive control which is the Gentamicin, an antibiotic show that it is susceptible having a diameter of 15mm. It implies that the organism can be terminated to a given drug (Bruce 2007). In the study conducted by Abdullah Rahman, Islam, et.al., (2013) using Averrhoa bilimbi extract, result showed that the extract is resistant against Staphylococcus aureus and Escherichia coli with the same diameter of 6mm. 7.

Table 2 ORGANISM: Pseudomonas aeruginosa

Sample (Concentration)	**Trial 1**		**Trial 2**	
Positive Control (Ceftazidime)	18mm	**Susceptible**	18mm	**Susceptible**
Negative Control (Distilled water)	6mm	**Resistant**	6mm	**Resistant**
Averrhoa carambola (Ripe) 100%	6mm	**Resistant**	6mm	**Resistant**
Averrhoa carambola (Unripe) 100%	6mm	**Resistant**	6mm	**Resistant**

Interpretation: **Susceptible** = >18mm; **Resistant** = <14mm

The table 2 shows that both ripe and unripe Averrhoa carambola extracts are resistant against Pseudomonas aeruginosa the same with the negative control which is the distilled water having a constant diameter of 6mm (same size of the disk). This means that the organisms do not respond or react to the extract (Washington, n.d). While on the other hand, the positive control which is the Ceftazidime, an antibiotic show that it is susceptible having a diameter of 18mm. It implies that the organism can be terminated to a given drug (Bruce 2007). In the study conducted by Mokhtar and Aziz (2016) using Averrhoa bilimbi extract, result showed that the extract is resistant against Pseudomonas aeruginosa, Escherichia coli and Bacillus cereus with the same diameter of 6mm.

Conclusion and Recommendation

In this chapter, it contains the conclusion and recommendation of the researchers Conclusion Based on the results of the experiment it shows that Averrhoa carambola extract was not effective upon

inhibiting the growth of Staphylococcus aureus and Pseudomonas aeruginosa indicating that it is resistant to the extract with a constant diameter of 6mm (same size of the disk). Recommendation The researchers recommend the future researcher to do the following: Use another fruit with other phytochemicals that can inhibit the growth of Staphylococcus aureus and Pseudomonas aeruginosa since the result of the study was not effective. Use advance laboratory equipment especially the centrifuge upon doing the experiment in order to filter properly the extract of Averrhoa carambola and to have fewer mistakes on the process and accurate result (Wood, 2017). Add more fruits with more phytochemicals that has the capability to inhibit the said bacteria. According to Khameneh (2019) plant having more phytochemicals exerts more antimicrobial activities against sensitive and resistant pathogens.


HOLY CROSS COLLEGE OF CALINAN, INC.
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CALINAN, DAVAO CITY

2017

A Comparative Study on the Effectiveness of Aloe Vera (*Aloe barbadensis miller*) Extract and Malunggay (*Moringa oleifera)* Extract in Preventing Molds Formation on Lakatan Banana s (*Musa acuminate*)

2017

Proponents:

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Ganzon, Kate Rhea Mae

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ABSTRACT

Some fruits have only short shelf life especially bananas. Too ripened fruits can attract molds and molds in fruits are dangerous, some of it can produce mycotoxins that can make us sick. Aloe Vera (Aloe barbadensis miller) and Malunggay (Moringaoleifera) extract have antifungal properties that is why the researchers test which of the two extract is more effective to inhibit mold growth in bananas. The two extract were applied to 2 bananas and were then observed. Results came out that the aloe vera extract can prevent mold formation longer than malunggay extract. Another results also tells that Aloe Vera extract is also more effective than malunggay extract. The results showed that Aloe Vera extract and Moringa extract, with different effectivity can prevent molds and can be a safer way than using chemicals.

Background of the Study

Fruits are more delicious when they are ripened fully and sometimes when they are at a certain level of ripening, but after this, the fruit will start to deteriorate (Karthikeyan, 2014). Some fruits like the bananas produce chemicals like ethylene that increases the ripening process of the fruit.

Because of this, bananas that are left uneaten will attract molds and fungi such as *Colletotrichum musae* that affects the genus Musa, which includes bananas and plantains. It is best known as a cause of anthracnose or the black and brown spots on bananas when it ripens. Another thing is that molds are also dangerous to our health, some molds cause allergic reactions and respiratory problems. And a few molds, in the right conditions, produce "mycotoxins," poisonous substances that can make you sick

Therefore, the researchers would like to find another source on preventing molds formations on bananas which can be found on Aloe Vera (*Aloe barbadensis miller*) and malunggay (*Moringa oleifera*) which both have anti-fungal properties.

Statement of the Problem

This study aimed to test the property of aloe vera(*Aloe barbadensis miller)* and Malunggay(*moringa oleifera*) extract if it can inhibit the growth of molds. Also, this study sought to answer the following questions:

1. How long can Aloe Vera extract prevent molds from growing in the bananas compared to the Moringa extract in the span of 15 days?
2. Is Aloe vera extract more effective than malunggay extract?

Hypothesis

If bananas with aloe vera extract have less molds than bananas with malunggay extract, then aloe vera extract is more effective than malunggay extract in preventing molds.

Scope and Limitations

This study only use the gel from the Aloe Vera and leaves from the Malunggay tree for the experiment. In observing the experiment, the researchers make use of a simple method instead of a more complicated way due to the small amount of time given. The researchers also limit their experiment in using only one kind of banana which is the Lakatan banana (*Musa acuminate*).The molds that the researchers are trying to prevent from growing is specifically *Colletotrichum musae*. The researchers also used visible characteristics in evaluating the experiment and recorded the surface area of the molds that are only visible.

Significance of the Study

This study can contribute in prolonging the freshness of bananas. Thus, this study can significantly become an alternative to other dangerous preservatives. In line with this, it could help those who are into banana industry to maintain and prolong the freshness of their products.

MATERIALS AND METHODS

This chapter covers the materials used or research instrument, the research design in conducting the study, and the research procedures done by the researchers.

This study is composed of 3 phases: Phase I – Aloe Vera and Malunggay Extraction and Preparation, Phase II – Application of Extract on the bananas, and Phase III – Data Collection and Analysis. All the

experiments were done at the researchers' house. The researchers used 2 lakatan (*Musa acuminate)* bananas as their unit of analysis in this experiment.

Phase I – Aloe Vera and Malunggay Extraction and Preparetion

Collection of Materials and Ingredients

The materials that were used in the experiment were the following: 1 knife, 2 bottle containers used for the dipping of the bananas, 2 clean dry containers that were used to store the bananas, a blender, a cheese cloth or filter paper and a graphing paper. These these materials were sterilized except for the graphing paper to avoid contaminations. The main ingredients of the research were Aloe Vera specifically the Gel and Malunggay leaves, both were found at the researchers' backyard

*Aloe Vera (*Aloe *barbadensis miller) Extraction Process*

The researchers first cleaned the freshly picked leaves with tap water. After that, they separated the gel from the leaves using the knives.The gel were then crushed at room temperature (25 °C) in commercial high speed grinder. The crushing or grinding was completed within 10–20 min.

Malunggay (Moringa oleifera) Extraction Process

The first thing that the researchers did was to air dry the leaves including the stalks for 3 days. Next, separate the leaves from the stalk, after that, the moringa leaves were sautéed in a large fry pan at medium heat for 3 minutes. The researchers then used a blender to grind the leaves. The moringa powder were macerated in 70% ethanol at room temperature for 24hrs. After 24hrs the extract was filtered using filter paper or cheese cloth.

Phase II – Application of Extracts on the Bananas

The fresh fruits were dipped completely into the coating solutions at room temperature for 15 minutes. They were allowed to drain and then dried at room temperature with forced air drying to allow a thin film layer to form on the fruits.

Pgase III – Data Collection and Analysis

After the extracts were applied, the researchers began their daily observation starting from the 8th day up to the 15th day because molds in bananas usually showed up in a time of 6-7 days. They used the graphing paper to count how many square units of molds had grown in the surface of the banana, since it is only the visible characteristics that the researchers will observe.

Data Analysis

In comparing the gathered data of the researchers, the researchers used a table and graph in interpreting their gathered data. This graph was adapted from other research.

Research Design

The study employed an experimental design because the researchers conduct an experiment on the bananas with two setups namely the banana with Aloe Vera extract and banana with Moringa extract.

RESULTS AND DISCUSSIONS

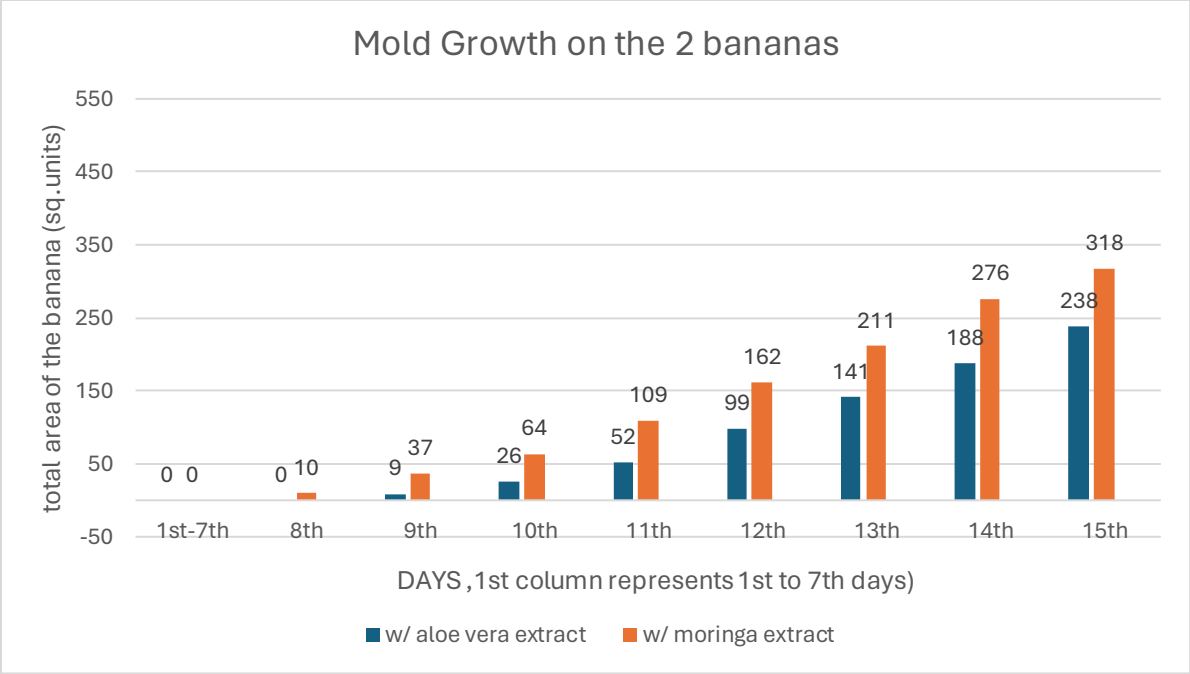
In this chapter, all the information and data gathered were interpreted into graphs and tables below in order to answer the questions on the first part of the research.

Table 1. Days of observation with mold growth data.

Day	Mold growth on banana with Aloe Vera extract (sq. units)	Mold growth on banana with Moringa extract (sq. units)
1st – 7th day	0	0
8th day	0	10 sq. units
9th day	9 sq. units	37 sq. units
10th day	26 sq. units	64 sq. units
11th day	52 sq. units	109 sq. units
12th day	99 sq. units	162 sq. units
13th day	141 sq. units	211 sq. units
14th day	188 sq. units	276 sq. units
15th day	238 sq. units	318 sq. units

Table 1 shows the comparison of the mold growth between the 2 bananas with different extracts applied. The table also shows that the banana with Moringa extract started growing molds on the 8th day compared to the banana with the Aloe vera extract who started to grow molds on the 9th day. Due to this, we could say that Aloe vera extract can prevent molds formation up to the 9th day of the experiment duration.

Graph 1. Mold growth comparison between Aloe Vera and Moringa extracts



Graph 1 shows the comparison of the effectiveness between the two extracts by getting the surface area of mold growth every day. Based on the chart, the banana with the moringa extract has the highest surface area of mold growth starting from the 8th day up to the last day. With these findings, the researchers could say that aloe vera extract is more effective in preventing molds formation in bananas.

CONCLUSION

Based from the results of the study, the researchers found out that aloe vera extract can prevent molds formation up to 8 days compared to the moringa extract, up to 7 days. Another result also shows that, in terms of mold growth in the surface area, the aloe vera extract is more effective in preventing mold growth since there is only an accumulated surface area of mold growth up to 238 sq. units compared to the moringa extract with the surface area of mold growth measuring 318 sq. units. To sum it up, among the two extracts, the aloe vera extract has a more effective property inhibit mold growth in bananas.

RECOMMENDATION

After completing this study, the researchers come up with some recommendations. First, they could try comparing the effectiveness of the extracts with a chemical or commercial food preservative. Second, they could try testing the effectiveness of the extract on different types of fungi and test it into different kinds of foods. Lastly, they could use a better and more precise way in analyzing the data.

A COMPARISON OF THE EFFECTIVENESS OF MADRE DE CACAO AND LEMON GRASS AS MOSQUITO LARVAE REPELANT

2017

Proponents:

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ABSTRACT

The importance of this study is to help the people to lessen the number of mosquito larvae and to help us prevent them. With the growing number of mosquito-inflicted diseases today, the necessity of looking for insecticides that are definitely effective in killing mosquitoes. Madre de cacao and lemon grass, being locally available product in our backyard or planted anywhere, can be used as a raw material to be utilized in making concoction that prevents the growth of mosquito population.

Our problem is entitled: A Comparison of the effectiveness of Madre de Cacao and lemon grass as mosquito Larvae Repellant. Our research is an experimental design in which the study is made or done in order to see how well it works shortly it is relating to, or based on experiments The ways or procedures are the following. You must get 14 leaves of Madre

de Cacao and Lemon Grass, and 200mL of water. Boil the 200mL of water in two casserole each boil it for 45 minutes and wait until there is scent. While waiting get at least 72 mosquito larvae and two containers, and divide the mosquito larvae into 2 so each container must contain 36 mosquito larvae. Name each container as A and B, A for Madre de cacao and B for lemon grass. After that wait until the lemon grass and the Madre de cacao syrup becomes look warm. And put the syrup simultaneously in each container. The results during the experiments shows that Madre De Cacao had the greatest capability to kill mosquito larvae rather than lemon grass.

Background of the study

Mosquitos are harmful or dangerous to the people because they bring illnesses to us like dengue, malaria, and etc. As people turn on our television, we see people afflicted by illness from mosquito bites that may causes them to suffer or pain.

As we all know, ***"prevention is better than cure***". (studymode, 2012) Being protective to one's health is very important. The people can prevent mosquito bites when they put mosquito patches at our shirts, using long sleeve shirt, mosquito net, and other things.

Insecticides are widely used to kill or destroy mosquito eggs or larvae. However, some of these insecticides being sold in the market have very strong ingredients that pose danger to our environment as well as to us. Moreover, these insecticides sold in the market are expensive.(studymode, 2012)

Some plants around, can be used in preventing mosquitos. Madre de Cacao and lemon grass are examples of these plants. Madre de Cacao is a nitrogen-fixing tree. The tree is referred by many people as a quick-stick due to the characteristic of growing almost right away just by cutting it and directly planting

it in the ground and killing mosquitos with its extract. Lemon grass is used in cooking and research had been conducted in using it as an insect repellant because of its smell.

Both where researched as insect repellants and this study will show which among of them is the most effective mosquito larvae repellant that can kill the mosquito larvae directly.

Statement of the Study

This study was made to find out the effectivity of Madre de cacao and lemon grass as insect repellents. It also aimed to answer the question:

1. What was the most effective insect repellant Madre de Cacao or lemon grass (specific problem).

Hypothesis

If Madre de cacao has the greatest capability to kill the larvae of the mosquito faster, then Madre de Cacao shall be used as an alternative mosquito larvae repellant.

If the Lemon grass is proven that has the greatest capability to kill mosquito larvae, then Lemon shall be used as an alternative mosquito larvae repellant.

Significance of the study

The importance of this study is to help lessen the number of mosquito larvae. The one who will benefit in this study are the people who lived in some places with stagnant water. The researchers can benefit from this study by helping in killing the mosquito larvae. With the growing number of mosquito-inflicted diseases today, the necessity of looking for insecticides that are definitely effective in killing mosquitoes. Madre de cacao and lemon grass, being locally available product in our backyard or planted anywhere, can be used as a raw material to be utilized in making concoction that prevents the growth of mosquito population. As well as helping the mother earth because we are using the natural insect repellent

that cannot affect our health or any other harm that can be encountered when we are using the insect repellent that had a strong chemical.

Moreover, this Madre de cacao and lemon grass insecticide as an insect repellant are effective in eradicating mosquitoes but un-harmful to our environment and other animals like our pets.(studymode, 2012) And we are using natural mosquito repellant rather than the mosquito repellant that were sold at the market that had a strong ingredients that may cause infliction or harm to our body especially to our health.

Scope and Delimitation

This study is limited only in the use of Madre de cacao and lemon grass as mosquito repellant. In addition, the mosquito larvae is used in the test rather than adult mosquitoes.

Research Design

The study is an experimental research since it is composed of experimental set-ups. Further, given the nature of the study, the researchers actively try to test the effectiveness of Madre de cacao and lemon grass in relation to the length of period of its effectiveness.

Data Gathering Procedure

In a two casserole put at least 200 ml of water. Put 14 leaves of Madre de cacao in the first casserole. Put another 14 leaves of lemon grass in another casserole. Boil it for 45 minutes. Until there is scent. While waiting prepare the mosquito larvae. At least 72 mosquito larvae for experimentation. Divide the 72 mosquito larvae into 2. So each container must contain 36 mosquito larvae. Mark the containers A and B. A for Madre de cacao and B for lemon grass. After boiling the Madre de cacao and lemon grass for 45 minutes, strain the leaves of Madre de cacao and lemon grass and throw it away. Get a dropper or any measuring cups. Each dropper or measuring cups must contain at least 15 ml of lemon grass and Madre

de cacao decoction. Wait until Madre de cacao and lemon grass decoction to be lukewarm. As you get 15 ml of lemon grass and Madre de cacao syrup in each measuring cups. Pour them simultaneously into the mosquito larvae. Observe what happens in next 15 minutes. After observing in 15 minutes. Count the number of deaths of the mosquito larvae in each container.

the relationship can be a possible phenomenon or a solution to a problem, because it answers the hypothesis correctly.

Data Analysis

Table analysis was used to discover if the Hypothesis will support the study, in testing the difference between Madre de cacao and Lemon grass.

RESULTS AND DISCUSSION

In this chapter it contains the result, interpretation, and also data analysis of the experimentation of the study.

Table 1- The number of mosquitoes eliminated using Madre de Cacao Leaf extract

Madre de cacao leaf extract	**mL of Madre de Cacao**	**Number of mosquito larvae used**	**Minutes**	**Observations after 5 minutes**
Test 1	5 ml	12	5 minutes	6 deaths found
Test 2	5 ml	12	5 minutes	8 deaths found
Test 3	5 ml	12	5 minutes	11 deaths found
Total:	15 ml	36	15 minutes	25 deaths found

Based on the result in Table 1, it shows that in each container that contains 5mL of Madre de cacao can kill 25 mosquito larvae in 15 minutes.

Table 2- The number of mosquitoes eliminated using Lemon grass leaf extract

Lemon grass leaf extract	mL of lemon grass	Number of mosquito larvae used	Observations after 5 minutes
Test 1	5 ml	12	4 deaths found
Test 2	5 ml	12	6 deaths found
Test 3	5 ml	12	10 deaths found
Total:	15 ml	36	20 deaths found

Based on the results in Table 2, it shows that each container that contains 5mL of lemon grass syrup can kill 20 mosquito larvae in 15 minutes.

Based on the result above, it shows that Madre de Cacao is the most effective mosquito larvae repellant rather than Lemon grass, even if there are some mosquito larvae that are dizzy, due to its strong ability to kill mosquito larvae's.

Conclusions

Based on the experiment the most effective mosquito repellant was the madre de cacao because of the greatest capability that killed the larvae of mosquito faster than the lemon grass. The relationship had become possible because it answers the hypothesis correctly.

Recommendations

The researchers recommend the following: It is very important to choose or pick the young leaves, fresh leaves so that you can get a lot of extract. A guide or older person to help us in preparing and getting extract so that nothing will be spilled out. Conduct more test trials using different quantity of the repellant. Another study to compare the effectivity of using fresh extract of the Madre de cacao and lemon grass from a decoction as an insect repellant.

ANTIFUNGAL ACTIVITY OF EXTRACTS FROM MALUNGGAY (*Moringa oleifera*) LEAVES, POMELO (*Citrus maxima*) PEELS AND CALAMANSI (*Citrus macrocarpa)* PEELS AGAINST *Colletotrichum musae* v. Arx IN BANANAS (*Musa*)

2017

Proponents:

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ABSTRACT

The Banana, (Musa paradisiacal), is the world's largest herbaceous perennial plant, and is the leading fruit grown in the Philippines and a consistent top dollar earner. However, Anthracnose, caused by the fungus (Colletotricum musae), is one of the major postharvest diseases in bananas (Jinasena, Pathirathna, Wickramarachchi and Marasinghe, 2011). Hence, this study is conducted to find an alternative to commercial fungicides in the extracts from Malunggay (Moringa oleifera) leaves, Pomelo (Citrus maxima) peels and Calamansi (Citrus microcarpa) peels. It was conducted using the Paper Disc method with four treatments replicated three times. The results showed that, out of the three extracts used, only the Pomelo (Citrus maxima) peels, with a mean of 18.82mm zone of inhibition, and Calamansi (Citrus microcarpa) peels, with a mean 20.36mm zone of inhibition, showed inhibition against Colletotricum

musae v. Arx. And the most effective extract is the Calamansi (Citrus microcarpa) peels with a mean of 20.36mm zone of inhibition.

Background of the Study

The Banana, (*Musa paradisiaca*,) is the world's largest herbaceous perennial plant which belongs to the family Musaceae. The fruit is the most widely used part of the plant and can be eaten fresh or cooked or processed into starch, chips, puree, beer, vinegar or dehydrated to produce dried fruit (Plant Village, n.d.). As a matter of fact, in 2010, world production of bananas totaled 102,114,819 MT with an area of 4,771,944 hectares. Banana is the leading fruit grown in the Philippines and a consistent top dollar earner. The prospect of Philippine bananas in the domestic and foreign market is still promising (Department of Agriculture, 2013).

However, postharvest diseases posted a great challenge to the farmers that affect the shelf life of bananas. Anthracnose, caused by the fungus *Colletotricum musae* v. Arx, is one of the major postharvest diseases in bananas (Jinasena, Pathirathna, Wickramarachchi and Marasinghe, 2011).This fungus can be controlled and treated by chemical fungicides that have harmful side effects to the plant and humans.

It is therefore imperative to explore alternative fungicides to treat this disease. Thus, the researchers would like to find an alternative to these commercial fungicides in the extracts from Malunggay (*Moringa oleifera*) leaves, Pomelo (*Citrus maxima*) peels and Calamansi (*Citrus microcarpa)* peels.

Statement of the Problem

The researchers want to test the inhibition property of the extracts from Malunggay (*Moringa oleifera*) leaves, Pomelo (*Citrus maxima*) peels and Calamansi (*Citrus microcarpa)* peels against Anthracnose. This study aimed to answer the following questions:

1. Do extracts of malunggay leaves, pomelo peels, and calamansi peels able to inhibit the organism *Colletotrichum musae* v. Arx?

2. Which extract is the most effective against *Colletotrichum musae* v. Arx?

Significance of the Study

For many years, growers and farmers rely on commercial and chemical fungicides to treat the anthracnose disease of bananas but these fungicides have harmful side effects to the plants and humans. This research is carried out to help the local farmers to get rid of this postharvest disease. Also to provide basis to future researches.

Hypothesis

If the extracts from Malunggay (*Moringa oleifera*) leaves, Pomelo (*Citrus maxima*) peels, and Calamansi (*Citrus microcarpa)* peels inhibit the growth of the fungi then it is effective against *Colletotrichum musae* v. Arx in Bananas (*Musa*).

Scope and Limitations

The experiment only utilized the leaves of malunggay and the peels of pomelo, and calamansi for the extraction. And only *Colletotrichum musae* v. Arx fungus was used in the experiment. In addition, the set-up of the experiment can be easily contaminated. Extra carefulness is needed in doing the experiment

Research Design

A Complete Randomized Design (CRD) was used in this study with four treatments replicated three times.

The treatments were as follows:

Malunggay leaves extract

Pomelo peels extract

Calamansi peels extract

Control (Sterile distilled water)

Procedures

There are two main procedures in the study: the preparation of the ingredients, which consists of making the Potato-Dextrose Agar and the extraction process, and the laboratory experiment. In making this experiment, it is very important to wear proper protective gears and equipments. Also, making sure of safety and having no contamination by having a clean environment while conducting the experiment

Phase I: The Preparation

Isolation of Pure Culture

The pure culture of *Colletotrichum Musae* v. Arx which was obtained and isolated from and at the Department of Plant Pathology, College of Agriculture, University of Southern Mindanao, Kabacan, North Cotabato.

Preparation of Culture Medium

Potato Dextrose Agar (PDA) was used as a culture medium and prepared following the procedure prescribed by Riker and Riker (1936). In making the agar, prepare potato infusion, boil 200 g sliced, unpeeled potatoes in 1 liter distilled water for 30 min. Filter through cheesecloth, saving effluent, which is potato infusion (or use commercial dehydrated form). Mix in other ingredients and boil to dissolve. Dispense 20-25 ml portions into sterile 15 x 100 mm petri dishes. Final pH, 5.6 ± 0.2.

Sterilization of Materials

All the materials used in the bioassay were sterilized at 120^0C or 15 psi for 20 minutes. The isolation room was disinfected with 10% sodium hypochlorite.(Hauser, 2006)

Making of Plant Extracts

As for Malunggay extract, dry leaves were grinded to powder and macerated in 70% ethanol at room temperature for 24hrs. After 24hrs, the extract was filtered using filter paper. For Pomelo and Calamansi Peel extract, the fruits were rinsed with running water, then peeled and hanged for air drying. The extracts were prepared by immersing each peel in 1L of 95% ethanol and set for 48 hours. The extracts were filtered using filter paper.

Phase II: Laboratory Experiment

The laboratory experiment is conducted at the Department of Agriculture DARCES Manambulan, Tugbok District, Davao City. The experiment was facilitated by Mrs. Maureelyn Dalam.

Paper Disc Method

One ml suspension at about 40,000 to 50,000+ spores of the pathogen was added to each petridish with 20 ml melted PDA and rotated to ensure thorough mixing and allowed to congeal. Then with a flame sterilized forceps, sterilized paper discs were dipped individually into the test extracts and planted at the center of the dish. All Petri dishes were labeled and incubated in an inverted position. Measurement of the zone of inhibition of the pathogen was done 48 hours after incubation.

Data Analysis

Zone of Inhibition (mm)

Observation of the clear zone of inhibition was done 24 hours of incubation. Efficacy of three (3) extracts against the causal pathogen was evaluated after 48 hours

of incubation by measuring the zone of inhibition. (Chan-Dalam, 2016)

Zone of Inhibition	Efficacy	Rate
11-20	Effective	(E)
21-30	Moderately Effective	(ME)
31-above	Very Effective	(VE)

Statistical Tool

The statistical tool used is Mean, computed by the quotient of the sum of three trails and the number of trials made per treatment, presented in tables

RESULTS AND DISCUSSION

Efficacy of the Test Plant Extracts Against *Colletotrichum musae* v. Arx *in vitro*

Table 2. Zone of inhibition (mm) of *Colletotrichum musae* v. Arx as affected by three plant extracts after 48 hours of incubation.

Treatments	I	II	III	Mean	Efficacy Rating[a/]
Malunggay Leaves	8.11	7.22	6.5	7.30	NE
Pomelo Peel	15.67	21.24	19.56	18.82	E
Calamansi Peel	18.43	21.69	20.97	20.36	E
	0.00	0.00	0.00	0.00	NE

Table 2 shows the zone of inhibition of *Colletotrichum musae* v. Arx applied with three plant extracts after 48 hours of incubation.Of the three plant extracts tested, Calamansi and pomelo peel extracts showed

significant zone of inhibition mean of 20.36 mm and 18.82 mm and was rated effective (E). Not effective treatment was observed in Malunggay extract with mean of 7.30 mm respectively while SDW

(untreated control) had no zone of inhibition after 48 hours of incubation.

The results above coincide with Cancico, et al's findings, that the extracts from pomelo and calamansi peels exhibit antifungal growth against *Colletotrichum spp*. in mangoes. However it contradicts with Cajucom's (2003) finding that extract from malunggay have antifungal activity against anthracnose in onions.

Table 3. Mean one of inhibition (mm) of *Colletotrichum musae* v. Arx as affected by three plant extracts after 48 hours of incubation.

Treatments	**Mean**
Malunggay Leaves	**7.30 NE**
Pomelo Peel	**18.82 E**
Calamansi Peel	**20.36 E (most effective)Control (SDW) 0.00 NET**

Table 3 shows the difference of mean between the different extracts (with SDW). Of the three plant extcracts used, The Calamansi Peels Extract showed the widest zone of inhibition, with the mean of 20.36 mm, and is the most effective out of the three treatments.

The findings are supported by Cheong, et al.'s (2012) findings that the Philippines' calamansi peel contained the highest amout of phenolic acids, acids present in plants that have a defensive and protective role in plants.

CONCLUSION

The results of the study shows that three treatments exhibited various degree of efficacy *in vitro* against *Colletotrichum musae* v. Arx causing anthracnose of banana. Of the three treatments tested, calamansi

peel and pomelo peel extracts showed high zone of inhibition mean of 20.36 mm and 18.82 mm and were rated effective (E) while malunggay leaf extract exhibited zone of inhibition mean of 7.30 mm and was rated not effective (NE). And the most effective extract that inhibited the growth of *Colletotrichum musae* v. Arx *in vitro* is the Calamansi extract (20.36mm). The results of the experiment justifies that the hyphotesis, mentioned in the introduction, is accepted.

RECOMMENDATIONS

The researchers recommend to the next researchers to use other parts of the utilized plants. Or use other plant extracts that can inhibit the growth of *Colletotrichum musae* v. Arx. Or use other fungi to treat, to discover the different fungi that these extracts can treat.

I

Coconut (*Cocosnucifera*) sap and liquid detergent alternative fly repellant

2017

Proponents:

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ABSTRACT

The purpose of the study is to investigate on how effective is the coconut sap and liquid detergent as a cheap fly repellant, knowing that many people experiencing fly problems. The experimental study having 2 set-ups: experimental and controlled, tests the effectiveness of the coconut sap and liquid detergent in repelling flies. Through applying the experimental fly repellant and commercial fly repellant in the house surfaces, the researcher gather the data by recording the number of flies present in the certain surface. According to the researchers' data, in the whole time of experiment, the experimental fly repellant has the total of 166 number of flies present, while the commercial one has the total number of 184 flies present. Therefore the experimental fly repellant is effective because it has the least number of flies present in the applied surface. In general the palm sap and liquid detergent as fly repellant is effective because it can repel flies and environmental friendly

Background of the study

Our society is currently experiencing fly problems. In order to get rid with fly problem people must use fly repellant. Fly repellant is used to repel flies from acquiring certain surfaces. Fly repellant is important to the community because it protects an individual from acquiring certain diseases that flies can transmit. Coconut is the fruit produced by the coconut palm (Cocosnucifera) which belong to the family of Arecaceae (Satlabayan, 2003). It contains the necessary elements that improve eyesight, fight cancer, reduce risk of cardiovascular diseases, promotes lactation and maintain a healthy hair, skin and nails. Also valuable source of sugar, protein, carbohydrate, amino acid, Vitamin C, Potassium, Zinc, Magnesium, Iron, Vitamin B1, B2, B3, B6 and alcohol. Flies hate the smell of alcohols. However, the coconut sap contains bacteria. Therefore the substitute for killing the bacteria that is present in coconut sap is an anti-bacterial liquid detergent. Anti-bacteria liquid detergent contains surfactants that helps kills bacteria and germs. The fact encourage the researchers to find out if coconut sap and liquid detergent is effective in repelling flies.

Statement of the Problem

The study aimed to investigate on the effectiveness of the mixture of is coconut sap and liquid detergent as a cheap fly repellant. Specifically it aimed to answer the following questions.

1. Does coconut sap and liquid detergent effective in repelling flies?
2. Does the experimental fly repellant is comparable to the commercial fly repellant in terms of effectiveness?

Hypothesis

If the coconut sap and liquid detergent as fly repellant will be applied in the house surfaces, then the flies will repel.

Significance of the Study

People are experiencing fly problems and it cause irritation upon initial identification. Infestations of the flies can multiply exponentially within a brief period of time. Also flies transmit bacteria that can bring diseases to individuals. Thus, this study was conducted to determine the effectiveness of coconut sap and liquid detergent to repel flies.

Scope and limitation

The study has only eight hour experimentation. The study only utilize coconut sap and liquid detergent in experimentation.

MATERIALS AND METHODS

This chapter consists the detailed materials, ingredients and procedure needed to conduct the research.

Research Design

The study is an experimental research having an experimental set-up and controlled set up which was treated differently for the comparison with the factors that are kept constant.

Data Gathering Procedure

Collect 90 ml of coconut sap and 90 ml of liquid detergent. Then gather a container and a spray battle. Mix the ingredients into a container. Transfer it to a clean spray bottle. Apply the researcher-made fly repellant in the house surfaces every hour and count the numbers of fly present. The researcher-made fly

repellant will be compared to a commercial fly repellant. The commercial fly repellant will serve as the controlled set-up of the experiment.

Data Analysis

Table analysis was used to discover if the hypothesis will support the study specifically in testing the significant difference in the two set-ups. The researcher-made fly repellant is the experimental set-up while the controlled set-up is the commercial fly repellant. The data will be compared and recorded in the table.

RESULTS AND DISCUSSIONS

This chapter contains the results, interpretation and analyses of the experimentation in the study.

The researchers analyze the observations from their own made fly repellant.

According to their 8 hour observations, the effectiveness of fly repellants will differ in how many flies repels from the applied surface. The lesser the flies present means the fly repellant is more effective. The table below shows the numbers of flies present in each hour of the experiment.

Table 1.Number of flies present in each kind of fly repellant for 8 consecutive hours.

Hours	**Number of flies present in the Experimental Fly repellant**	**Number of flies present in the Commercial Fly repellant**
1st hour	40	40
2nd hour	36	36
3rd hour	31	33

4th hour	25	28
5th hour	19	22
6th hour	10	15
7th hour	5	8
8th hour	0	2

The table from the previous page shows the effectiveness of each kind of fly repellant through means of the number of flies present in the applied surfaces. It also shows that in the number of flies present in the experimental and commercial fly repellant that in the 1st hour has the highest number of flies p 6 while in the 8th hour hast the lowest. According to the researchers' data, in the last hour of experiment the experimental fly repellant has no flies present while in the commercial fly repellant there are 2 flies present. In the whole time of experiment, the experimental fly repellant has the total of 166 numbers of flies present; while the commercial one has the total number of 184 flies present. Therefore the experimental fly repellant is effective because it has the least number of flies present in the applied surface.

CONCLUSION

After the experiment and observation, the researchers found out that the coconut sap and liquid detergent as fly repellant is effective. Based from the data gathered from the eight hour experiment, the researchers therefore say that the alternative fly repellant is more effective than the commercial fly repellant. Moreover, the thing that make the coconut sap and liquid detergent better is that it is eco-friendly because it is made up of coconut sap.

RECOMMENDATION

The researcher therefore recommend after the conduction of their experiment, to use coconut sap and liquid detergent as fly repellant ingredients since it is effective, cheap and user friendly. To apply the said

fly repellant in the house surfaces especially to the place which has many flies. Also the future researchers may use any liquid detergent that will fit to the user's taste. The future researchers must use an equal amount of coconut sap and liquid detergent.

COMPARING THE EFFECTIVITY OF COMMERCIALLY-PREPARED ANTI – BACTERIAL PRODUCTS

2017

Proponents:

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ABSTRACT

The purpose of this study is to test the effectivity of commercially prepared anti-bacterial products by comparing the zone of inhibition of different products that are diluted and exposed to *E. coli* and *S. Aureus.* The study also aimed to give information to the general public and to prove the different claims of the different anti-bacterial products. The study also serves as a gateway of opportunities to other researchers that would want to create a product that could potentially be an anti-bacterial product that has capabilities to diminish all kinds of bacteria. The researchers gathered the data by using a ruler and measuring the zone of inhibition in terms of millimeters. Therefore, based from the data gathered, Product A (Linear Alkykbenzene Sulfonate) is the most effective anti – bacterial product, while, Product E (Alcohol) is the least effective out of all the products tested.

Background of the Study

In its broadest definition, an antibacterial is an agent that interferes with the growth and reproduction of bacteria. While antibiotics and antibacterials both attack bacteria, these terms have evolved over the years to mean two different things. Antibacterials are now most commonly described as agents used to disinfect surfaces and eliminate potentially harmful bacteria. Unlike antibiotics, they are not used as medicines for humans or animals, but are found in products such as soaps, detergents, health and skincare products and household cleaners. (Alliance for the Prudent Use of Antibiotics, 2014)

All products that claim to kill bacteria and/or viruses have some kind of antibacterial agent but consumers tend to get confused on which of these agents are more efficient and tend to go to cheaper ones but does not get the desired result microscopically. Seeing with the naked eyes does not give any information on what is really happening in the micro environment.

With a lot of emerging products with different purposes and claims of their efficiency in dealing with cleaning and shielding, consumers are not aware of the contents of the product which makes it really effective against microbes. Each of this products contains different active ingredients such as Linear alkylbenzene sulfonate, Sodium hypochlorite, Hydrochloric acid, Benzalkonium chloride and Alcohol which could harm not just the organisms but including humans.

Microorganisms are vital to humans and the environment, but some are harmful to us. These are commonly referred to as germs. "Germ" is a catch-all term for these invisible organisms – mainly bacteria, fungi and viruses – which cause disease. (NHS Choices, 2014). In the household this microorganisms tend to be present everywhere and does not choose any surface. Common to this organisms are *Staphylococcus aureus* and *Escherichia coli* or commonly known as *E.coli.*

Escherichia coli or *E. coli* for short is a common type of bacteria that normally live in the intestines of healthy humans and animals. here are some strains such as E. coli O157:H7 which damage the lining

of the small intestine. E. coli O157:H7 can cause severe abdominal cramps, bloody diarrhea and vomiting (Yapchiongco, 2015). In tropical countries, EPEC is an important cause of childhood diarrhea. ETEC causes 11-15% of cases of traveler's diarrhea in persons visiting developing countries and 30-45% of cases of traveler's diarrhea among those visiting Mexico. EAggEC causes 30% of cases of traveler's diarrhea. (Frank et.al, 2011)

Staphylococcus aureus or *S. aureus* may occur commonly in the environment. *S. aureus* is transmitted through air droplets or aerosol. When an infected person coughs or sneezes, he or she releases numerous small droplets of saliva that remain suspended in air. These contain the bacteria and can infect others. Another common method of transmission is through direct contact with objects that are contaminated by the bacteria or by bites from infected persons or animals. Approximately 30% of healthy humans carry *S. aureus* in their nose, back of the throat and on their skin. (Mandal, 2012).

This prompted the researches to compare the credibility of commercially-prepared anti – bacterial products with different active ingredients. The results of the study will not only contribute information to proper usage of products, to add knowledge with the different active ingredients found in this products but also to know more which is effective thus saving more human lives and money.

Statement of the Problem

The study aimed to compare the credibility of commercially – prepared Anti-bacterial products available in stores or supermarket. To recommend effective products that with anti-bacterial properties to consumers and to clarify the existing confusion on which product to use better with low cost. More specifically, it sought to answer the following questions:

1. What is the Zone of Inhibition of the test organisms when exposed to the following products:
    a. Products A, B, C, D, and E at 3000 uL, 500 uL and 250 uL after 24hrs,

       48 hrs, and 72 hours of exposure;

b. Positive control (Amphicilin and Erythromycin)

c. Negative control (normal saline solution)

2. What is the Minimum Inhibitory concentration of each products?

3. Which product shows the greatest zone of inhibition which means greater antibacterial ability?

Hypotheses:

Alternative:

- Product A with Linear alkylbenzene sulfonate is more effective compared to the others.
- Product B with Sodium hypochlorite is more effective compared to the others.
- Product C with Hydrochloric acid is more effective compared to the others.
- Product D with Benzalkonium chloride is more effective compared to the others.
- Product E with Alcohol is more effective compared to the others.
- There a significant difference in the Minimum inhibitory concentration (MIC) of the test organisms when exposed to the different products, product concentration, and time of exposure?

Null:

- Product A with Linear alkylbenzene sulfonate is not that effective compared to the others.
- Product B with Sodium hypochlorite is not that effective compared to the others.
- Product C with Hydrochloric acid is not that effective compared to the others.
- Product D with Benzalkonium chloride is not that effective compared to the others.
- Product E with Alcohol is not that effective compared to the others.
- There a significant difference in the Minimum inhibitory concentration (MIC) of the test organisms when exposed to the different products, product concentration, and time of exposure?

Scopes and Limitation of the Study

Although this research was carefully prepared, the researchers are still aware of their limitations. First of all, the research was conducted at the Department of Agriculture Laboratory which is 12km away from Calinan where the researchers reside that made the study a bit difficult to perform due to distance and time constraints. Second, the test organisms of the study are not that many. If the test organisms would be added, then there would be a good comparison with the products' efficacy in dealing with a wide range of microorganisms. Third, financial constraints are also present since procurement of the test organisms would be costly since these are cultured organisms, the agar plate used, materials and the products used in the study. The researchers wanted to promote knowledge to the community and to diminish or prove the claims of different anti – bacterial products. The researchers also would like to open opportunities for other researchers and aid their research with information.

METHODS AND MATERIALS

Research Design

The researchers conducted an experimental design – this is an experiment where the researchers manipulate one variable, and control the rest of the variables.

Hypothesis Draft Comparing the credibility of commercially prepared anti – bacterial products.	
Independent Variable Types of product and product concentration of Products A, B, C, D, E, at 3mL, 0.50mL, 0.25mL. NSS Time of Exposure (24 hours, 48 hours, 72 hours.)	**Background Questions** What products will be used? How will you acquire the test organism? Are all the product's claims reliable and true?

Dependent Variable Zone of Inhibition and Minimum Inhibitory Concentration (MIC)	**Constants** All the test organisms are cultured on the same time.		
Experimental Groups	Product A (Linear Alkylbenzene Sulfonate) at 3ml, 0.50 ml, and 0.25 ml	Product B (Sodium Hypochlorite) at 3ml, 0.50 ml, and 0.25 ml	Product C (Hydrochloric Acid) at 3ml, 0.50 ml, and 0.25 ml

The procedures that the researcher conducted are, first, the researchers submitted letters to the laboratories to ask approval to do our experiment there. Second, we procured the different commercially-prepared products and at the same time we acquired the test organisms. Third, we identified the different active ingredients of the products and identified the organism and at the same time we confirmed its eligibility. Fourth, the researchers prepared the Mueller Hinton Agar Plate and then proceeded to streak test organism in the plate. Fifth, we prepared the different concentrations then put them on the different test organism streaked plates. Sixth, the researchers incubated the plates at 24hrs, 48hrs, and 72hrs. The researcher then gathered the data and analyzed and interpreted the results. Lastly, we properly disposed the materials used.

Procedure:

Materials needed:

- Test tubes/ Test Tube rack
- Forceps
- 10 Petridish with MHA
- 0.5 McFarland Standard
- Autoclave
- Sterile swabs
- Antibiotic-free disks
- Micropipette

- Normal Saline Solution - Alcohol lamp

Stock broth cultures of:

- Escherichia coli (Gram negative)
- Staphylococcus aureus (Gram positive)

Preparation of the Mueller Hinton Agar

Muller Hinton Agar Medium **(**1 L**)**

The medium was prepared by dissolving 33.9 g of the commercially available Muller Hinton Agar Medium in 1000ml of distilled water. The dissolved medium was autoclaved at 15 lbs. pressure at 121°C for 15 minutes. The autoclaved medium was mixed well and poured onto 100mm Petri plates (25-30ml/plate) while still molten.

Agar Diffusion Test Procedure

First, Label the agar plates with the name of organism and product used. Also mark, using dots, where you will put the disk. The disks should be a minimum of 20 mm apart. Disks should not be placed near the edge of the plate. Inoculate one plate with your first bacterium by using aseptic technique, wet a swab with the bacterial broth culture. Thoroughly swab the surface of the plate, making sure to cover the entire surface. Use the Lawn Technique. Turn the plate approximately 60 degrees and repeat the previous step (2nd swabbing). Repeat the previous step (3rd swabbing). Use the following pattern for swabbing:

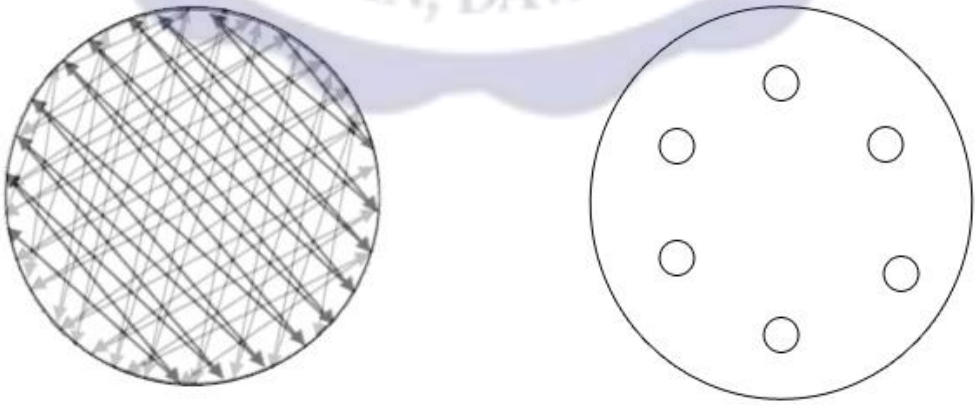

Figure 10. Lawn Technique of Streaking (Left) Marker for disk position (Right)

Discard the swab in a bleach-containing beaker. Place one disk onto the surface of the agar, using aseptic technique as follows, Firstly, Heat the tips of the forceps by placing them in an alcohol lamp. Secondly, Cool the forceps by waving them in the air for about 10 seconds. Thirdly, carefully pick up your test disk with the forceps, and gently place it in the appropriate spot on the agar surface, Fourthly, to ensure that the disk is flat on the agar, gently push it down with the forceps. Lastly, Reheat the tips of the forceps as above to kill any bacteria. Repeat the procedure with the second product soaked-disk. Repeat the procedure until all 5 products are placed as well as Repeat steps 1 – 6 on a new agar plate with your second bacterium. Incubate plates at 37 degrees for 24, 48 and 72 hrours. After 24 hours, observe the agar plates. Measure the diameter of the zone of inhibition in mm and record your results in the table. If there is no zone present, record your result as 6 mm (same size as disks). Observe the plates after 48 and 72 hours of incubation.

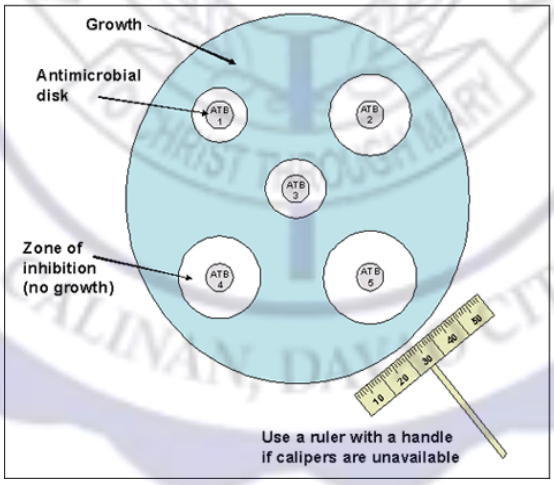

Figure 11. Measuring the zone of inhibition

Data Analysis

Table 1. Antibiotic disc reading and interpretations.

Antibiotic	Amount on disc	Susceptible	Intermediate	Resistant
Amphicillin	10ug	14mm or more	12mm-13mm	11mm or less
Erythromycin	15ug	18mm or more	14mm-17mm	13 or less

Incomplete – no clear zone of inhibition

Interpretations

Susceptible

The "susceptible" category implies that isolates are inhibited by the usually achievable concentrations of antimicrobial agent when the recommended dosage is used for the site of infection. (CLSI definition)

Resistant

The "resistant" category implies that isolates are not inhibited by the usually achievable concentrations of the agent with normal dosage schedules, and/or that demonstrate zone diameters that fall in the range where specific microbial resistance mechanisms (e.g. beta-lactamases) are likely, and clinical efficacy of the agent against the isolate has not been reliably shown in treatment studies. (CLSI definition).

Intermediate

The "intermediate" category includes isolates with antimicrobial MICs that approach usually attainable blood and tissue levels and for which response rates may be lower than for susceptible isolates. The intermediate category implies clinical efficacy in body sites where the drugs are physiologically concentrated (e.g. quinolones and beta-lactams in urine) or when a higher than normal dosage of a drug can be used (e.g. betalactams). This category also includes a buffer zone, which should prevent small,

uncontrolled, technical factors from causing major discrepancies in interpretations, especially for drugs with narrow pharamacotoxicity margins. (CLSI definition)

RESULTS AND DISCUSSION

Presented in this chapter are the data gathered in the effectivity assessment of commercially-prepared anti – bacterial products against *Escherichia coli* and *Staphylococcus aureus*.

Table 1.1 Linear alkylbenzene sulfonate against *Escherichia coli*

Time of Exposure	Product A with Linear alkylbenzene sulfonate			Amphicillin	Normal Saline Solution
	3000uL	500uL	250uL		
24 hours	20mm	12mm	6mm	20mm	6mm
48 hours	20mm	12mm	6mm	20mm	6mm
72 hours	20mm	12mm	6mm	20mm	6mm
Interpretation	Susceptible	Intermediate	NZI	Susceptible	NZI

Table 1.1 presents the Linear alkylbenzene sulfonate against *Escherichia coli.* This shows that within 72 hours exposure of 3000uL concentration of treatment, no changes occurred with its zone of inhibition of 20mm it is interpreted as susceptible. At 500uL concentration less zone of inhibition was noted with no significant changes and can be interpreted as intermediate based on Table 1. However at 250uL, there was No Zone of Inhibition (NZI).

Table 2 Sodium hypochlorite against *Escherichia coli*

Time of Exposure	Product B with Sodium hypochlorite			Amphicillin	Normal Saline Solution
	3000uL	500uL	250uL		
24 hours	14mm	7mm	6mm	20mm	6mm
48 hours	14mm	7mm	6mm	20mm	6mm

72 hours	14mm	7mm	6mm	20mm	6mm
Interpretation	Susceptible	incomplete	NZI	Susceptible	NZI

Table 2 presents the Sodium hypochlorite against *Escherichia coli.* This shows that within 72 hours exposure of 3000uL concentration of treatment, no changes occurred with its zone of inhibition of 14mm it is interpreted as susceptible. At 500uL concentration incomplete inhibition was noted maybe due to low concentration in the product before being diluted for the study. However at 250uL, there was No Zone of Inhibition (NZI).

Table 3 Hydrochloric Acid against *Escherichia coli*

Time of Exposure	Product C with Hydrochloric Acid			Amphicillin	Normal Saline Solution
	3000uL	500uL	250uL		
24 hours	13mm	11mm	6mm	18mm	6mm
48 hours	13mm	11mm	6mm	18mm	6mm
72 hours	13mm	11mm	6mm	18mm	6mm
Interpretation	Intermediate	Resistant	NZI	Susceptible	NZI

Table 3 resents the Hydrochloric Acid against *Escherichia coli.* This shows that within 72 hours exposure of 3000uL concentration of treatment, no changes occurred with its zone of inhibition of 13mm it is interpreted as intermediate. At 500uL concentration an 11mm zone of inhibition was noted that can be interpreted as resistant . However at 250uL, there was No Zone of Inhibition (NZI).

Table 4 Benzalkonium chloride against *Escherichia coli*

Time of Exposure	Product D with Benzalkonium chloride			Amphicillin	Normal Saline Solution
	3000uL	500uL	250uL		
24 hours	10mm	8mm	6mm	18mm	6mm
48 hours	10mm	8mm	6mm	18mm	6mm
72 hours	10mm	8mm	6mm	18mm	6mm
Interpretation	Resistant	incomplete	NZI	Susceptible	NZI

Table 4 presents the Benzalkonium chloride against *Escherichia coli.* This shows that within 72 hours exposure of 3000uL concentration of treatment, no changes occurred with its zone of inhibition of 10mm it is interpreted as resistant. At 500uL concentration incomplete inhibition was noted maybe due to low concentration in the product before being diluted for the study. However at 250uL, there was No Zone of Inhibition (NZI).

Table 5 Alcohol against *Escherichia coli*

Time of Exposure	Product E with Alcohol			Amphicillin	Normal Saline Solution
	3000uL	500uL	250uL		
24 hours	6mm	6mm	6mm	20mm	6mm
48 hours	6mm	6mm	6mm	20mm	6mm
72 hours	6mm	6mm	6mm	20mm	6mm
Interpretation	NZI	NZI	NZI	Susceptible	NZI

Table 5 presents the Alcohol against *Escherichia coli.* This shows that within 72 hours exposure of 3000uL, 500uL and 250uL concentration of treatment, no changes occurred with its zone of inhibition of 6mm. This thus show that the treatment of alcohol which is used for antiseptic is not effective against the test organism used in the study.

Table 6 Linear alkylbenzene sulfonate against *Staphylococcus aureus*

Time of Exposure	Product A with Linear alkylbenzene sulfonate			Erythromycin	Normal Saline Solution
	3000uL	500uL	250uL		
24 hours	18mm	16mm	6mm	26mm	6mm
48 hours	18mm	16mm	6mm	26mm	6mm
72 hours	18mm	16mm	6mm	26mm	6mm
Interpretation	Susceptible	Intermediate	NZI	Susceptible	NZI

Table 6 presents the Linear alkylbenzene sulfonate against *Staphylococcus aureus.* This shows that within 72 hours exposure of 3000uL concentration of treatment, no changes occurred with its zone of inhibition of 18mm it is interpreted as susceptible. At 500uL concentration less zone of inhibition was noted with no significant changes and can be interpreted as intermediate based on Table 1. However at 250uL, there was No Zone of Inhibition (NZI).

Table 7 Sodium hypochlorite against *Staphylococcus aureus*

Time of Exposure	Product B with Sodium hypochlorite			Erythromycin	Normal Saline Solution
	3000uL	500uL	250uL		
24 hours	14mm	12mm	6mm	26mm	6mm
48 hours	14mm	12mm	6mm	26mm	6mm
72 hours	14mm	12mm	6mm	26mm	6mm
Interpretation	Intermediate	Resistant	NZI	Susceptible	NZI

Table 7 presents the Sodium hypochlorite against *Staphylococcus aureus.* This shows that within 72 hours exposure of 3000uL concentration of treatment, no changes occurred with its zone of inhibition

of 14mm it is interpreted as intermediate. At 500uL concentration an 12mm zone of inhibition was noted that can be interpreted as resistant. However at 250uL, there was No Zone of Inhibition (NZI).

Table 8 Hydrochloric Acid against *Staphylococcus aureus*

Time of Exposure	Product C with Hydrochloric Acid			Erythromycin	Normal Saline Solution
	3000uL	500uL	250uL		
24 hours	15mm	12mm	6mm	30mm	6mm
48 hours	15mm	12mm	6mm	30mm	6mm
72 hours	15mm	12mm	6mm	30mm	6mm
Interpretation	Intermediate	Resistant	NZI	Susceptible	NZI

Table 8 presents the Hydrochloric Acid against *Staphylococcus aureus.* This shows that within 72 hours exposure of 3000uL concentration of treatment, no changes occurred with its zone of inhibition of 15mm it is interpreted as intermediate. At 500uL concentration an 12mm zone of inhibition was noted that can be interpreted as resistant . However at 250uL, there was No Zone of Inhibition (NZI).

Table 9 Benzalkonium chloride against *Staphylococcus aureus*

Time of Exposure	Product D with Benzalkonium chloride			Erythromycin	Normal Saline Solution
	3000uL	500uL	250uL		
24 hours	16mm	7mm	6mm	26mm	6mm
48 hours	16mm	7mm	6mm	26mm	6mm
72 hours	16mm	7mm	6mm	26mm	6mm
Interpretation	Intermediate	incomplete	NZI	Susceptible	NZI

Table 9 presents the Benzalkonium chloride against *Staphylococcus aureus.* This shows that within 72 hours exposure of 3000uL concentration of treatment, no changes occurred with its zone of inhibition of 16mm it is interpreted as intermediate. At 500uL concentration incomplete inhibition was noted maybe due to low concentration in the product before being diluted for the study. However at 250uL, there was No Zone of Inhibition (NZI).

Table 10 Alcohol against *Staphylococcus aureus*

Time of Exposure	Product E with Alcohol			Erythromycin	Normal Saline Solution
	3000uL	500uL	250uL		
24 hours	7mm	6mm	6mm	26mm	6mm
48 hours	7mm	6mm	6mm	26mm	6mm
72 hours	7mm	6mm	6mm	26mm	6mm
Interpretation	incomplete	NZI	NZI	Susceptible	NZI

Table 10 presents the Alcohol against *Staphylococcus aureus.* This shows that within 72 hours exposure of 3000uL incomplete inhibition was noted maybe due to low concentration in the product before being diluted for the study while at 500uL and 250uL concentration of treatment, no changes occurred with its zone of inhibition of 6mm. This thus show that the treatment of alcohol which is used for antiseptic is not effective against the test organism used in the study.

The study was conducted to assess the efficacy of the commercially-prepared antibacterial products. The results of the study didn't much show any significant different in their zone of inhibition. The products that claimed to have antimicrobial property showed satisfactory results in different concentration. However, the lowest concentration for all products showed no zone of inhibition which could be due to the fact that antibacterial products do not contain pure concentration of active ingredients hence when

diluted showed no effect at all. The time of exposure also did not vary from different concentration and treatment.

Among all the products tested against the organism *Escherichia coli* Product A with Linear Alkylbenzene sulfonate showed the greatest zone of inhibition of 20mm almost the same with the positive control of Amphicillin. On the other hand, Product A with Linear Alkylbenzene sulfonate against *Staphylococcus aureus* gave the greatest zone of inhibition of 18mm but quite lower than the positive control of 26mm.

Across all products except for Alcohol, the 500 ul of treatment still showed zone of inhibition which is why it is the Minimum Inhibitory concentration of the products in the study.

Based from the results, the efficacy of commercially prepared antibacterial products depends on the concentration contained in the agent. However, the products were not that effective when diluted into quite lower concentrations. One factor that affected the result was the amount of antibacterial agent contained with the products. According to the studies done before, some of these agents could harm the skin of the consumers so it should be within the allowable limit. Therefore, the products used do not have the same concentration before being diluted. Another factor to be considered is the property of agent used. Different antibacterial agents have different actions on microorganisms thus has different effects which varies from one organism to the other. During the experimentation, the even spread of the test organisms might have also affected the results since too thick growth in the media renders the product not that effective.

CONCLUSION

The researcher concludes that Product A with Linear alkylbenzene sulfonate is more effective compared to the others with its zone of inhibition being the greatest among the test organisms. The rest of the products are on the same range of efficacy based on the result. However, Product E with Alcohol is

not that effective among all the products showing no clear zone of inhibition. There was a significant difference in the Minimum inhibitory concentration (MIC) of the test organisms when exposed to the different products and product concentration with different values on the 500uL concentration. The time of exposure did not affect any of the results.

RECOMMENDATION

The researcher recommends for the future researchers that they determine the exact concentration of antibacterial agents contained in the commercially prepared products to allow uniform concentration and also use more test organisms for the study to test wider range of efficacy

Cow manure (*Bovine feces)* as an Alternative Source of Electricity

2017

Proponents:

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Morgia, Karl Welkins

Fermendoza, Jonnah Faer

ABSTRACT

This study entitled "Cow manure (Bovine feces) as an alternative source of electricity" was conducted to find other source of electricity. With that, they conducted a research if cow manure can possess any electrical property. In their experimentation, the researchers used various types of chemicals such as alkaline catalyst (NaOH) and ethanol as add ons towards the cow manure. They made a biofuel out of the manure and the add ons and used this for their battery cells. After series of test, the researchers found out that the cow manure (Bovine feces) do not possess any electrical property. Therefore, cow manure cannot be utilize as an alternative source of electricity.

Background of the Study

Electricity plays an important role in our daily lives. People depend a lot on electricity. However, modern energy services are crucial to human well-being and to a country's economic development; and yet globally over 1.3 billion people are still without access to electricity (Energy for all, 2011). Producing enough electricity for these people can be attained though tyrannous dependence towards nature and systematic process of finding alternative producer of electricity.

In producing electricity, its productivity depends on the ingredients being used. However, the different sources of electricity in the environment is affected by different abusive human activities. According to Gardner, H. (2014) the world is heading for natural source depletion due to the demand of a growing population. In accordance with the depletion of natural source of electricity, the researchers would like to find another effective source of electricity like Bovine feces or locally known as cow manure.

Statement of the Problem

The researchers would like to test the ability of cow manure (*Bovine feces*) in producing electricity in order to provide a cheaper source of electricity. This study aims to answer the following questions;

1. Does cow manure contain electrical property that is effective in producing a large amount of electricity?
2. Does the amount of electricity affected by the amount glycerol and ethanol?
3. How many amperes does the solution can produce?

Hypotheses

If cow manure (*Bovine feces*) is capable in producing electricity, then it can be an alternative source of electricity.

Scope and Limitation

The researchers utilize the whole cow manure in the experiment. There are certain parts of the research that needs accurate results. In mixing process, measuring the catalyst should be done quickly because according to Wen et al (n.d), “Catalysts absorbs water from the atmosphere rapidly and the water can interfere with the transesterification reaction." In transesterification, simple boiling should only be used due to the sensitive boiling point of the chemicals.

Significance of the Study

All of us can't deny the fact that due to the abusive human activities, natural resources of electrical energy slowly decrease. The result of this study will provide answers that will be for the benefit of the community considering the essential role of electricity tht play in our lives. The constant increase of population means a greater demand of electricity.

Phase I: Making Biodiesel

- Mixing ethanol and lye

Measure 3.5 gram (0.12 ounce) of NaOH or 5 gram (0.18 ounce) of KOH.

(Measure quickly since the catalyst absorbs water from the atmosphere rapidly and this water can interfere with the transesterification reaction). Measure the catalyst on the scales using a small lightweight plastic bag, and then close the lid of the lye container firmly and close the plastic bag so air contact with the lye is minimized. Then, mix the lye with 200 ml(0.21 quart or 40 teaspoons) of ethanol in a sturdy, heat proof glass bottle with a narrow neck to prevent splashing. Constantly mix or stir the solution to quickly dissipate the heat given off by the reaction. The mixing process takes about 15 minutes.

- Transesterification

When mixing the ethanol and lye as described before, pour 1 liter (0.26 gallon) cow manure in the HDPE container, and heat the container to about 50oC-60oC (120-140 oF). Keep the temperature below 60oC (140oF) since ethanol will boil at 65oC (148.5oF) and will be lost. Be careful to avoid sparks or open flames near your reactor; methanol vapors are explosive. Stir the heated oil well, and carefully add the ethanol-catalyst mixture to the manure. The reaction starts immediately, the mixture rapidly transforms into a clear, golden liquid. Keep stirring for an hour, while keeping the temperature at ~

60oC (~140 oF). Then allow the mixture to settle overnight. The system should be closed to the atmosphere to prevent loss of ethanol during the reaction.

- Separation:

As soon as the reaction is completed, pour the mixture from the mini processor into a glass or PET bottle for settling and screw on the lid tightly. Allow the mixture to settle 12-24 hours. After settling, there will be two phases in the bottle with a clear interface. Dark-colored glycerol by product will collect at the bottom, with crude biodiesel on top. The biodiesel varies in color depending on the manure used, but is usually pale yellow. Decant the top layer of biodiesel into a clean jar or PET bottle. Be sure to not inadvertently mix up the glycerol layer with the biodiesel. However, if you do disturb the glycerol, simply allow the mixture to resettle and decay again.

- Crude biodiesel washing

The crude biodiesel still contains contaminants such as soaps, excess methanol, residual catalyst, and glycerol. It can be purified by washing with warm water to remove residual catalyst or soaps. The washing procedure is effective because the residues are more readily dissolved in water. After washing, you will get a clear amber-yellow liquid with a viscosity similar to petroleum diesel. This product is fuel-grade biodiesel. The washing procedure involves using two one-gallon PET bottles in succession as follows: Pierce a small hole in the bottom corner of each bottle and cover the hole securely with duct tape; pour the biodiesel into one of the wash bottles; add the half-gallon of fresh water then use bubble washing

a. Bubble-washing. Use a small aquarium air-pump and an air-bubbler stone. After washing and settling, drain off the water from the bottom of the bottle by removing the duct tape from the hole. Block the flow of water with your finger when the biodiesel begins to flow out the hole.

Phase II: Making the battery

- Electrodes

    a. Copper Electrodes

Cut the wire into 5 sections of 4 inches each. Strip 2 inches of insulation off one end of each of the 5 pieces and strip 1 inch of insulation off on another end of each piece. (This will leave 1 inch of insulation to hold the bundles of wires together.) Twist the strands at the 1 inch part tightly together. Then separate the strands at the 2 inches so that it will look like a broom.

    b. Aluminum Electrodes

Cut 5 pcs. of aluminum foil each about 4 inches x 4 inches. Fold each piece in half, and then again in half, parallel to the first fold(so it ends up 4 layers thick).

- Battery proper

    a. Let the biodiesel be your electrolyte solution. Fill each cup about ¾ full of the electrolyte solution. Put the copper (broom like part) and aluminum electrodes in the solution. Connect the cells in series by clipping alligator clips by clipping alligator clips starting from the copper electrode of one cup down to the aluminum electrode of the second cup and so on, until all 5 cells are connected. When this is done, the aluminum electrode of the first cup and the copper electrode of the last cup should remain unconnected.

Phase III: Testing the ability of the battery

Connect the batteries by using alligator leads to connect the aluminum electrode in the first cup to one of the tips voltmeter and the copper electrode of the last cup on another tip of the voltmeter.

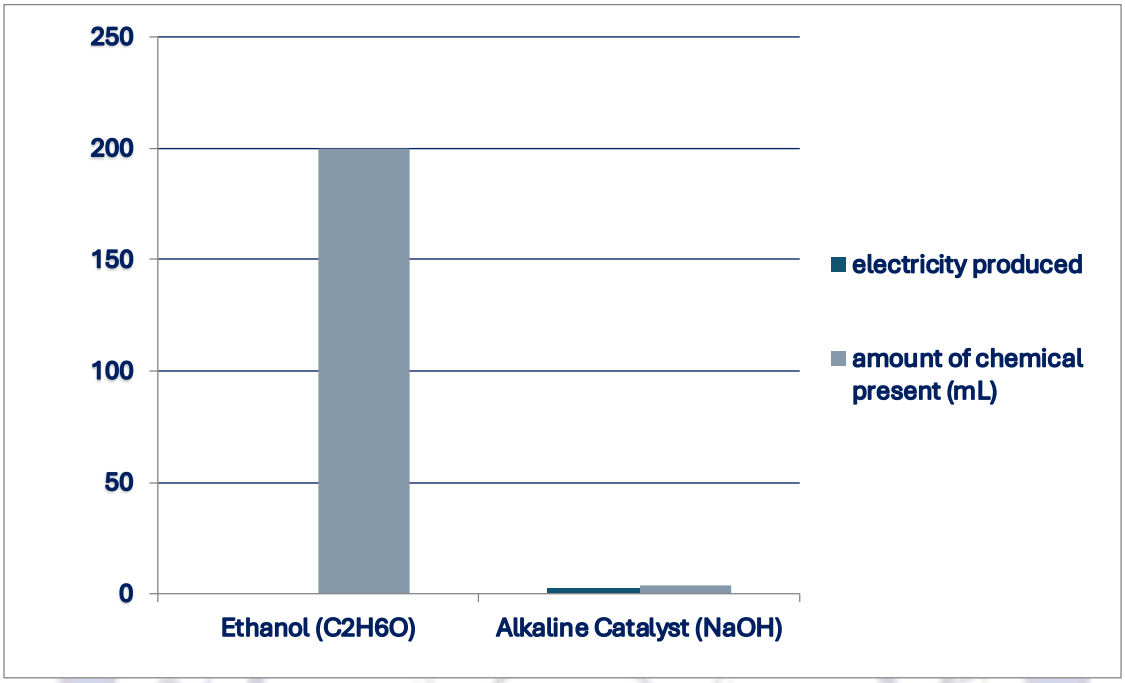
RESULTS AND DISCUSSION

1. Table I. Electricity Possessed by the Battery

	Voltage
Trial 1	0
Trial 2	0
Trial 3	0

Table I shows the amount of Voltage produced by the battery in every trial. Since the manure doesn't have any electrical property that is effective in producing any amount of electricity, the voltage possessed in every trial remained zero.

2. Graph I. Amount of chemicals and the effects it produced.



Graph I shows the different chemical used in the conducted study and the electricity it produced. In the table, the lighter color shows the amount of chemicals. While the amount of electricity it produced is represented by the darker color. Since no electricity is produced, the darker one is at zero.

3. Table I. shows the amount of the voltage in every trial. And since it do not possess any electrical property, the voltage will remain zero remarking that the manure cannot produce any amount of electricity.

CONCLUSION

The researchers took actions towards the problem about shortage of electricity. With that, they conducted a research if cow manure can produce any electrical property. However, the cow manure (*Bovine feces*) cannot possess any electrical properties, therefore, Cow manure cannot be an alternative source of electricity.

RECOMMENDATION

The cow manure cannot produce any amount of electricity, then it cannot be an alternative source of electricity or alternative battery. Researchers should explore on the possible factors that `hindered cow manure from producing electricity and what are the other factors that the urine have like the level of acidity which may affect the result.

Dwarf Santan (*Ixora coccinea*) with Coconut Water as Perfume

2017

Proponents:

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ABSTRACT

Perfume is a mixture of fragrant essential oils and aroma compounds, fixatives, and solvents used to give the human body, animals, objects, and living spaces a pleasant scent. Fragrance made from natural ingredients such as essential oils absolutes. The researchers want to test the fragrance of Ixora Coccinea combining the coconut water with it. The extraction made by the researchers without using an expensive material.

Background of the Study

Perfume is a mixture of fragrant essential oils and aroma compounds, fixatives, and solvents used to give the human body, animals, objects, and living spaces a pleasant scent. Fragrance made from natural ingredients such as essential oils absolutes.

Ixora Coccinea is a species of flowering plant in the Rubiacea family; it grows in tropical areas with in medium annual rainfall in well drained soils. It is a low-growing tropical shrub notable for its

bright colored flowers which are composed of many bloom massed together into dense, flat-topped flower heads. Ixora Coccinea was obtained by Hydro Distillation that gives its scent.

Cocobut water is the clear liquid inside young green coconuts. Naturally refreshing coconut water has a sweet nutty taste.it contains easily digested carbohydrates in the form of sugar and electrolytes. Not to be confused with high-fat coconut milk or oil, coconut water is a clear liquid in the fruit's centre that is tapped from green young coconuts.

Statement of the Problem

The researchers want to test the fragrance of Ixora Coccinea combining the coconut water with it. This study aims to answer the question:

1. Is the use of Ixora Coccinea with coconut water effective and suitable to become a perfume?

Hypothesis

If Ixora Coccinea and coconut water mix, then it will create an organic perfume with a better and fresh fragrance.

Scope and Limitation

The experiment only utilizes the flower or petals of Ixora Cocinnea for the extraction process. Aslo, only coconut water is used in the experiment. The researchers only used a blender instead of advance process of extraction like extraction machines and alcoholic or maceration extraction top avoid spending big amount of money.

Significance of the Study

Our study is an eco-friendly; we made this study to make the body cool, fresh and give the body a good scent. Nowadays as you can see many people now don't have their proper hygiene. Also our study can make you safe from bacteria.

Research Design

This study is an experimental research to study the different components and to know if the combination is effective.

Materials & Ingredients

The materials used in the experiment are the following; Blender, 1 empty glass (dark colored) Measuring cup. The primary ingredients in the study are; Dwarf Santan (*Ixora Coccinea*) and coconut water which will be found at your backyard or in farms.

Procedures

Process; Extract the Dwarf Santan (Ixora Coccinea) petals and get coconut water inside its shell. In extracting the Dwarf Santan, the researchers get first some petals of Dwarf Santan from its branch after getting the petals the researchers need to put it inside a blender together with 1 cup of coconut water. Then blend it for 15-20 minutes. When blending has done put the blended Dwarf Santan petals and coconut water inside an empty bottle, close it tightly and put it in a dark place for at least 24-48 hours, where the light of the sun cannot reach it.

Data Gathering

The researchers will get two t-shirts, in the first t-shirt the researchers will put a proven perfume and in the second t-shirt will be putted the conducted experiment, then the researchers will observe the

fragrance of the two t-shirts if which perfume last its fragrance longer.

Testing

The researchers gave criteria or a survey test to people who will test the product based on the time the perfume has put on the shirt. (Survey test sample in the Appendix).

There will 2 categories: Fragrance Category and the Fragrance Duration Category.

The Fragrance will be rated by:

3-Very Good 2-Good 1- Bad

The Fragrance Duration will be rated by:

A- 1 to 5 minutes B- 6 to 10 minutes C- 11 minutes and above

Statistical Tool

The mean of each category will presented in tables.

RESULTS AND DISCUSSION

Table 1. The results of the survey conducted with computed mean

Category	Person 1	Person 2	Person 3	Person 4	Person 5	Mean
Fragrance	1	1	1	1	1	1
Fragrance Duration	C	C	C	C	C	C

Table 1 shows the survey results; all the surveyed persons rated the fragrance of the Dwarf Santan (ixora coccinea) with Coconut Water Perfume 1, which results to a mean of 1 and also all of them rated

the duration of the Dwarf Santan (ixora coccinea) with Coconut Water Perfume C, which results to a mean of C.

These data shows that the Dwarf Santan (ixora coccinea) with Coconut Water Perfume has a Bad fragrance and its duration of its fragrance lasts longer than 11 minutes.

CONCLUSION

The results of the study shows that Dwarf Santan (ixora coccinea) with Coconut Water mixture is not effective as aperfume because of its bad smell, even though its fragrance lasts long.

RECOMMENDATIONS

The researchers recommend the next researchers to use other flower extracts that are possible to be used as perfumes. Or find other uses of the Dwarf Santan (ixora coccinea) flower extract other than a perfume.

Rose (Rosa) Essential Oil and Coconut (Cocos Nucifera) Carrier Oil as an Air Freshener

2017

Proponents:

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Canedo, Pedrito

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Sarillana, Kenneth Dave

ABSTRACT

This research aims to make an air freshener using natural components. The ingredients were brought to proceed to the extraction process. The researchers first extracted the rose to get its essential oil. We started from putting it to the pressure cooker and began to boil it from 100 °C. And the oil exact but unfortunately was not in good quality. When we began to combine our essential and carrier oil, the result was saddening because it turns out to be very stinking and unpleasant.

Background of the Study

Air Fresheners are commonly used in offices and comfort rooms. It gives people convenience to use such facilities for it gives a fragrant smell. Besides of the advantage, the commercial air freshener gives also some disadvantage because it is being manufactured in other countries and in big companies therefore it is expensive.

Roses hide a few secrets in their lush blooms. Their fragrance can be mysterious, evocative, romantic and even surprising. No two rose-lovers experience their scent in quite the same way, a difference that is due not only to our individual noses, but also to the genetic make-up and growing conditions of the roses

themselves. Luckily, learning their secrets doesn't detract from their allure in any way; it only makes them even more special.

Coconut is a great example of carrier oil. Carrier oil, also known as base oil or vegetable oil, is used to diffuse the scent of essential oils.

Thus, the researchers would like to find another combination used in making air freshener like Rose' essential oil and Coconut's carrier oil.

Statement of the problem

The researchers aimed to test another combination in making air freshener. This study aims to answer the question:

1. Does Coconut oil and Rose Essential oil effective as an air freshener?

Hypotheses

If the Coconut oil is able to diffuse the scent of Rose' essential oil, then it will create an air freshener.

Significance of the study

The researcher's desire is to make a good-smelling air freshener which does not have a bad effect in our environment. The benefits involve the environment, health of the people and economy of the Philippines. It will not use much harmful chemicals used in other air freshener. It has natural component. It will also expand the market of the Filipino farmer because this will enhance their rural economic development.

MATERIALS & METHODS

Procedure

Essential Oil Extraction Process:

According from WikiHow, Pour clean water into the pressure cooker and add your plant matter. Fit as much plant matter as the tank can contain, just make sure that they don't block the steam outlet in the lid of the pressure cooker. Bring the pressure cooker to a boil at 100˚C. Seal the lid so that the only steam that escapes must travel through the pipe that's attached to the steam valve. It should be completely submerged when the basin is filled with cold water. After a while, the distillate should begin to come through your condenser. If the hot pipe warms up the water, replace it with fresh cold water or ice so that the cooling process continues to work. Once your distillation is complete, you might choose filter oil through cheesecloth or similar dry cotton fabric. Make sure that the cloth is dry and clean. Detergent residues and dirt can contaminate the oil. Pour the oil into a container for storage as quickly as possible. Keep it in a dark glass bottle.

Research design

This study is an experimental research to study the different components and to know if the combination is effective.

Data gathering

The researchers will make a survey test to the respondents. We will handle two of our products to two people and they will be the one who will test our product and give the points.

Survey Questionnaire

Question	5	4	3	2	1
Did the Air Freshener smells good?					
Are you convenient to use this Air Freshener?					

Do you think our product is effective?					

Scale Table

Rating	Description
1	Very Bad
2	Bad
3	Moderate
4	Good
5	Very Good

RESULTS AND DISCUSSION

Product Testing Results

This shows the summary of the points given by our respondents.

Question	5	4	3	2	1
Did the Air Freshener smells good?					✓
Are you convenient to use this Air Freshener?					✓
Do you think our product is effective?					✓

Mean: 1 Interpretation: From the scale 1-5 the product is very bad.

Question	5	4	3	2	1
Did the Air Freshener smells good?					✓
Are you convenient to use this Air Freshener?					✓
Do you think our product is effective?					✓

Mean: 1 Interpretation: From the scale 1-5 the product is very bad.

Conclusion

Based on the data and interpretation, the combination of Coconut carrier oil and Rose' essential oil is not effective. Therefore, it is not capable of making it as an air freshener.

Recommendations

The researchers must properly execute the process and strictly follow the materials needed for the experiment.

The Sugar Level of Miraculin Berry Fruit *(Synsepalum dulcificum)* and Sugar Cane *(Saccharum officinarum)*

2017

Proponents:

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Mandawe,, Jessa Erika Mae

ABSTRACT

The taste-modifying protein, miraculin, has the unusual property of modifying a sour taste into sweet taste. The researchers found that this Miraculin Berry is composed of Amino acid, Glucosamine, Mannose, Galactose, Xylose, Fucose, and protein. The extracted solution is colorless and shows the strong sweet-convincing activity. The miraculin contained as much 139 mg/dl of sugars compared to sugarcane which contains 170 mg/dl amount of sugar produced. This explains that Miraculin Berry is healthier and a good alternative for sugarcane or commercial sugar that is currently used by the people these days as sweetener.

Background of the Study

People associate taste most strongly with expectations of pleasure on food. Obesity and especially severe and morbid obesity, affect many organs and physiological processes. Most of us are bound by our innate desire for foods high in both sugar and fat, and given the opportunity to consume in excess. Diabetes is exceeding in projected rates worldwide (Cruz, 2016).

Miraculin Berry Fruit (Synsepalum dulcificum), sometimes known as the Miracle Berry, is a plant native to West Africa. The berry has a mildly sweet flavor; however, the fruit is treasured not for its own taste, but for the fruit's unique effect on the taste buds.

Miracle Fruit contains a glycoprotein called miraculin, which binds to the tongue's taste buds when the fruit is consumed. Miraculin acts as a sweetness inducer when it comes in contact with acids, causing bitter and sour foods to taste sweet, temporarily. This effect usually lasts between 30 minutes and 2 hours. Miracle Fruit has no known adverse effects. Western civilization has known about the fruit for over 275 years and no harmful effects have been documented. (Greyhound, 2011)

Miracle fruit contains a protein called miraculin that tastes sweet enough to redo the effect of sugar. Thus, the researchers want to measure the sugar level between the commercial sugar we use and the miraculin berry.

Statement of the Problem

This study aims to compare the sugar level between Sugar Cane and Miraculin berry. Also, it seeks to answer the following questions:

1. Miraculin berry fruit is healthier than commercial sugar?
2. Is the use of Miraculin berry fruit effective and suitable as a healthy Alternative for sugar?

Hypothesis

If Miraculin Berry has low sugar level, then it can be used as alternative sweetener.

Scope and Limitation

This study utilizes the Miracle berry for the process and also only used in the experiment. There were certain parts in the study that need enhancement for a well and more precise result. Miracle berry is very rare in the Philippines; it can be found only in some places in the said country. In testing the sugar level of the Miracle berry, an experiment will be conducted at a laboratory to test its sugar level.

Significance of the Study

Sugar products have contributed significantly towards food industry. However, the total toll on the healthcare system from related illnesses, like diabetes and heart diseases are also increasing. The outcome

of this study will help eliminate sugar from our diet which lies in the protein known as miraculin. Thus, this will help to eliminate the risk of having a disease and also it is the way in balancing sugar in take in our body.

MATERIALS AND METHODS

This chapter covers the materials used, the research design in conducting the study, and the research procedure done by the researchers.

Research Design

This kind of research is experimental one. The researchers will use Table for analysis to compare a measured value with either a known value or another measured value. There are two general ways of designing such an experiment. One possibility is to set up replicates of experimental systems under one condition and an independent set of replicate experimental systems that are observed under the other condition. The average of the measured dissolution rates from each set would be assumed to represent the dissolution rate under the respective condition. In this case, the experimentalist would be interested in comparing the two averages and inferring the extent to which the two values differ. Alternatively, a series of experimental systems could be set up all with one condition and the dissolution rates measured.

Phase I- Miraculin Berry Fruit Extraction and Preparation

Materials and Ingredients

The materials that were used in the experiment were for the testing of the sugar level includes, tube, and sugar level tester (glucose meter) that could be found in laboratory. The main ingredient of the research was Miraculin Berry Fruit (Synsepalum dulcificum). Extract of Miraculin Berry Fruit and Sugar Cane.

Extraction

The materials were sterilized including the tube to avoid contamination. First, prepare the Miracle Berry fruit and sugarcane. After that, bring water to boil to make the berry soft. Then squeezed the berry to get the extract. The extracted solution of the Miraculin Berry is colorless.

Phase II - Testing

Use sugar level tester (Glucose meter) to measure the amount of sugar, or glucose of both Miraculin Berry and Sugarcane extract.

RESULTS AND DISCUSSIONS

This chapter contains the results, interpretations and analyses of the experimentations in the study.

Table I. Miraculin Berry and Sugarcane Sugar Level

	Sugar Level (Mg/dl)
Miraculin Berry (Synsepalum dulcificum)	139 mg/dl
Sugar Cane (Saccharum officinarum)	170 mg/dl

Table I. A shows the comparison of sugar levels between Miraculin Berry and Sugarcane or the Commercial sugar that is currently used by the people nowadays. That table explains the amount of sugar or glucose produced by the miraculin and sugarcane. Therefore, the Miraculin berry is a good alternative for sugar because it has low sugar level compared to commercial sugar or sugarcane that is currently use by the people for sweetener

Table II. Miraculin Berry and Sugarcane components

	Components
Miraculin Berry (Synsepalum dulcificum)	Amino acid, Glucosamine, Mannose, Galactose, Xylose, Fucose, Protein

Sugar Cane (Saccharum officinarum)	Carbohydrates, fructose, Galactose, Glucose, Lactose, Maltose, Sucrose, Polyols,

It shows the comparison of the components between Miraculin Berry and Sugarcane. That table explains the components produce by Miraculin and Sugarcane. Based, on the table it concludes that miraculin berry's shelf life is healthier than sugarcane.

CONCLUSION

Based from the data gathered from the experiment, Miraculin Berry was proven that it has a low sugar level compared to sugarcane. Miaraculin has 13% of sugar produced while the sugarcane produced 17%. Thus, Miraculin Berry is a good alternative for Commercial sugar based on the results.

Recommendation

In the process the future researchers may use Miraculin Berry as Alternative sugar by making it into powder to provide the people a healthy alternative sweetener for a healthy diet. Also, future researchers may test and gather more information about the benefits of Miraculin berry towards the human health.


HOLY CROSS COLLEGE OF CALINAN, INC.
TO CHRIST THROUGH MARY
CALINAN, DAVAO CITY

2015

Testing the Inhibition Property of Climbing Hempweed (*Mikania scandens*)

2015

Proponents:

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ABSTRACT

The purpose of the study is to find an abundant, cheaper and natural source of ingredient for antibiotic medicines, knowing the arising problem of natural resource depletion. The experimental study having 2 set-ups: experimental and controlled, tests the inhibition property of Climbing Hempweed (*Mikania scandens*) in wound bacteria particularly the *Staphylococcus Aureus* bacteria. Through modified extraction, the plant extract was applied to the bacterial colony and then gram stained using a primary stain, then a mordant, a decolorizer then followed by a counter stain. The different slides were observed under a microscope to observe the results. It is proven that Climbing Hempweed contain antibacterial properties.

Background of the Study

Medicines play a big role in human survival. In order to survive, people need to have the essential needs that according to Sleight K. (2014), "mainly includes oxygen, food, shelter, sleep, water and the status of well-being". This can be obtained through the absolute reliance to the environment and through

the use of medicines. Since 1220, the systematic training of physicians gave way to the production of medicines up to the present and people become dependent with it for healing and wellness purposes.

Antibiotic, a drug used to kill harmful bacteria is one of the common medicines nowadays. Its use in medical treatment is widely used to prevent bacterial infections.

In making medicines, from the extraction of natural resources to the processing of the raw material to different products, its effectiveness is mainly affected by the ingredients used. However the endless supply of plants in the environment which is one of the main components of medicines today is slowly being affected by global warming and other human activities. According to Gardner H. (2014), the world is heading for natural source depletion due to the demand of a growing population.

Thus, the researchers would like to find another source of ingredient for antibiotic that has antibacterial properties like the Mikania scandens or the Climbing Hempweed.

Statement of the Problem

The researchers want to test the inhibition property of Mikania scandens in order to provide cheaper source of ingredient for antibiotics. This study aim to answer the following questions:

1. Does Climbing Hempweed contain antibacterial properties?
2. Is the use of Climbing Hempweed effective and suitable for medicinal purposes?
3. Does the plant extract of Climbing Hempweed able to inhibit the Staphyloccocus aureus bacteria?

Hypotheses

The guess was derived from the scientific problem which gives way to the formulation of the two contradicting idea.

Ha: Climbing Hempweed contains antibacterial properties that can be another source of ingredient in making antibiotics.

Ho: Climbing Hempweed does not contain antibacterial properties that can be a source of ingredient for antibiotics.

Scope and Limitation

The experiment only utilizes the leaves of Climbing Hempweed for the extraction process. Also, only Staphylococcus aureus bacteria was used in the experiment. There were certain areas in the study that need improvement for a better and more accurate result. In the sterilization process, a simple boiling of materials was only used due to the lack of equipment like microwave oven. Also in the extraction process, a modified extraction was used instead of a more complex and advanced process like aqueous, alcoholic or maceration extraction.

Significance of the study

Natural products like plants have contributed significantly towards the development of modern therapeutics. Due to the abnormalities in the weather conditions and human population, sources of medicinal ingredients nowadays are slowly decreasing. All of us, including the researchers can't deny that people today are not able to sustain the level of natural resource the population increase will demand especially the use of medicines. The finding of this study will redound to the benefit of the society considering that medicine plays an important role in human survival. The greater demand for medicines justifies the need of having an abundant source of natural ingredients. Thus, paves the way to the continual use of medicines in the future.

Methods

This chapter contains the materials, ingredients and experimentations conducted in the study.

Research Design

This study is an experimental research having a controlled set up which was treated differently for comparison with factors that are kept constant.

Materials

The materials used in the experiment are the following: 1 Beaker (pyrex if possible to withstand extreme temperature), Water bath, distillation flask, 4 medicine droppers, 6 glass slides, 1 Bunsen burner, Tongs, Squeeze bottle, Safranin (at least 20 ml), distilled water, Iodine (at least 20 ml), Crystal Violet (at least 20 ml), Ethanol 95% (at least 20 ml), and Personal Protective Equipments (gloves, mask, lab gown, eye goggles)

Ingredients

The primary ingredients in the study are: Climbing Hemp weed leaf (*Mikania scandens*) and *Staphyloccocus Aureus* bacteria which was bought from the Department of Science and Technology Office located at Dumansal St., Bajada, Davao City.

Procedures

There are two main procedures in the study: the extraction process and the testing of the inhibition property of the plant extract. The most important thing in these experimentations is to wear proper protective equipment and the cleanliness of the place and materials to ensure safety and no contamination.

Extraction:

The materials were sterilized to avoid contamination. Make sure that proper attire (lab gown, mask, gloves) was observed. First, the plant leaf was air-dried for two days then was immersed in 95% ethanol for another 2 days. In order to separate the plant extract from the ethanol, a distillation flask was used. The extract was boiled using a water bath to let the alcohol evaporate to the distillation flask until only the plant extract remained in the flask.

Testing:

6 slides were properly labelled as set ups 1 (experimental) and 2 (controlled), 3 for each set up. Using the heated inoculating needle, a very small amount of the bacterial colony was then mixed with the plant extract on the experimental slide. Same procedure with the controlled set up except that instead of the plant extract, distilled water was used. The slides were air-dried and then heated by passing the slide over the Bunsen burner three times. In order to be observed under a microscope, the slides were then gram stained to dye the bacteria thus, making them easy to see under a microscope. The slides were observed under the microscope using the 10x, and 40x objective lenses.

Gram Staining

The air-dried bacteria (in both set ups) were dyed with crystal violet for 1 minute. Then, the slide was flooded with distilled water using the squeeze bottle to gently remove the dye. Grams iodine was applied in the slide for another 1 minute. To remove excess iodine, the slide was again flooded with distilled water. The slide was held at 45° angle and was flooded with the decolorizer until the dye was completely washed. The slide was then counterstained using safranin for 1 minute. Again, distilled water was used to remove the dye. The slides were then air-dried.

Results and Discussions

This chapter contains the results, interpretations and analyses of the experimentations in the study.

Interpretation of Data

It is shown in the table the different pictures of bacterial presence in both set-ups. In the controlled set-ups, it shows some strange shapes that suggests bacterial presence. While in the other set-up, there were only small amount of black spots. Observing in the results, we can say that the plant extract is able to inhibit bacterial growth.

Discussion

Applying the Climbing Hempweed extract was proven to have an effect in the bacterial growth of *Staphylococcus aureus* and we can conclude that Climbing Hempweed contains antibacterial properties. In line to Dey P., Chandra S., Chatterjee P. & Bhattacharya S. (2011) the natural components of climbing Hemp weed like friedelin and milkanolide have proven effective to inhibit bacterial growth. If this plant will be used into making medicines, this might be suitable for society use thus, answering the 1st, 2nd, and last questions in the statement of the problem. Using the plant extract, this will lead to a continual use of antibiotics in the future due to its abundance in the wild which was supported by Cowan M. (2001)'s study stating "this can be found in many places and used as traditional medicine by people."

Conclusion

Based on the experimentation, Climbing Hempweed (*Mikania scandens*) was proven to possess antibacterial properties which can be a ground for accepting the alternative hypothesis which states: Climbing Hempweed contains antibacterial properties that can be another source of ingredient in making antibiotics. The researchers rejected the null hypothesis because it is already proven through the

experimentations that the plant extract is able to inhibit the bacterial growth of *Staphylococcus aureus.* Considering the development of modern technology, there is a possibility of utilizing the plant as new antibacterial ingredient in the future.

Recommendation

In the making of the study, it is important to be accurate which also observes safety measures. In sterilization process, future researchers can use microwave ovens for the equipments to be completely sterile. Also, future researchers can utilize other parts of Climbing Hempweed like roots and stem other than the leaves. In the extraction process, it is important to use more accurate way of extraction which can be a bit more complex than the others but this can lead to a successful outcome. Other than *Staphylococcus aureus* bacteria, future researchers can also use other types of bacteria in the experimentation. Lastly, future researchers can observe the slides under a 100x objective lens using oil immersion to fully differentiate both set-ups.