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Used Cooking Oil as Component of Shoe Shiner with *Cocos nucifera* L. Shell Coal

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ABSTRACT

Food waste is one of the growing contaminants in our biological system of soil and water. Under this peak of world economy, most people live and enjoy the savor of food but unconsciously entail the metric of environmental impact of food production and waste disposal. This research generally aimed to recycle used cooking oil and reduce domestic waste disposal detrimental to our environment of soil and water. Specifically, this research intended to test the effectiveness of shoe shiner with used cooking oil in black shoes, and produce cheaper shoe shiner from used cooking oil. The polishing property and price of shoe shiner was also compared to the commercial product in the market. The materials used in the production of shoe shiner were used cooking oil, coconut shell coal, kerosene and candle wax. Used cooking oil was purified and deodorized through wood charcoal filtration. Coconut shell coal was grinded and pulverized into thin pieces. Melted candle, kerosene, coconut shell coal, and used cooking oil were mixed together under different trials. Glutinous state of shoe shiner was obtained upon mixing and tested its shines in a black leader shoes. Results showed that adding used cooking oil to the mixture enhanced the polishing quality of the shiner with coconut shell coal. It was recommended to study the level of toxicity of the shoe shiner from used cooking.

Key Words: *Shoe Shiner, Used Cooking Oil, Coconut Shell Coal*

INTRODUCTION

Shoe shiner is a solid or liquid mixture applied in the shoes to make it look contusion, brand new and clean as before. Shoe shiner is one of the important applications that most people need to maintain and protect leather shoes. Polishing leather shoes made it fascinated and shiny. Shiner also protects the leather shoes from cracking. Shoe shiner often contains neurotoxin petroleum that can be absorbed by our skin. This can cause allergic sensitization and serious irritation of kidneys (Courtney, 2007). Stoddard solvent (also an irritant) and heptanes are also used in the manufacture of commercial shoe shiner. Most shoe shiner in the market uses by products of chemical reaction that contains highly toxic components of petroleum and lead oxide. Kerosene is extracted from petroleum chemicals, commonly used as fuel or solvent such as making shoe shiner (Hassan, 2002).

In metro manila, grease and oil were found as one of the causes of clogged drainage. This scenario was mainly observed in Tomas Morato due to grease accumulation in the drainage coming from the kitchen of some restaurants and food chains in the area (Fabunan et. al., 2015). It was observed that used cooking oil was disposed carelessly even in household sinks which run through drainage systems. Studies also showed that enjoining grease and oil in the drainage system increase the community health risk factors as it controls the normal water flow. Stocked water in the drainage system embody the accumulation of more waste, mosquito larvae, growth of microorganism such as bacteria that threatens people's health living around the place. Findings revealed that majority of restaurant employees and eaters are not aware on how to dispose used cooking oil (Balarita et. al., 2021). They also found out that most food service operators dispose the used cooking oil directly to the sewer and are not aware of the effects of this waste in the surroundings or environment. Commercial and household wastes are substantially considered threat to our ecology (Travis, 2002). Most of these wastes matter is disposed and found in the bodies of water such as creeks, rivers and lakes. Some are also disposed through the soil which occupies the body of water towards the end. Creating used cooking oil disposal system in the community is currently an important concern, which is yet to be properly addressed. Nowadays, municipalities do not use collection yards, that handle the collection of

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used cooking oil. Cities have low expectations regarding the amount of waste that people would recycle. On the other hand, it has been shown that cities, at some point, created used cooking oil collection network, are, in most cases, pleased with the result and pursue to extend its network due to the increase of waste produced and collected (Food Safety Council, 2011). In most local communities, it is observed that used cooking oil disposal is not regulated. Households do not have proper disposal system.

Used cooking oil, UCO, may not totally considered as threat to our environment, in fact several studies have been conducted to recycle UCO. One of which is to purify UCO and utilize it as biofuel, a green energy. Used cooking oil can be purified in several ways. Activated carbon with durian peel can be used to reduce the harmful effect of UCO prior to disposal. The high cellulose of durian peel served as activated carbon absorbent within a timeframe of 150 minutes (Miskah, 2019). Sedimentation is another way of purifying UCO. Using three different set-up of sedimentation, used cooking oil can be purified in terms of its color, odor, and purity. The process involves sedimentation once in set-up 1, two times sedimentation in set-up two, and three times sedimentation in set-up 3. Result showed that the purified UCO using the sedimentation process in set-up 3 has no significant difference with the commercial cooking oil in terms of color, odor, and purity (Cornello, et.al., 2017).

Coconut shell is composed of 36% Lignin, 53% Cellulose and 6% ash. Lignin is a product with many uses. It refers to a group of phenolic polymers that confer strength and rigidity to woody cell wall of plants. Ligno sulfate stabilize emulsion of immiscible liquid such as oil and water, making them highly resistant to breaking. Ligno sulfates are at works as emulsion in pigments pesticides and wax emulsion (Madakson, 2011). One of the most important components of coconut shell is lignin. It serves as a binder, dispersant, and emulsifier. Lignin is commonly used in the industries as effective and economical adhesive which act as binding agent. It prevents clamping and settling of undissolved particles in a suspension and stabilizer emulsions of immiscible liquids such as oil and water, making them highly resistant to breaking (Blazkova E., 2011).

Coal contains mainly of carbon and some other elements such as oxygen, hydrogen and nitrogen. The absorption parameter of carbon was calculated, Anders (2012) which depends on the properties such as micropore, macrospore, hardness, ash, water, water soluble ash, dust reactivation, apparent density and iodine number. It was also stated that carbon has an apparent parameter of 110 iodine number that can be used to measure carbon activity level, wherein coconut shell has greater carbon range and cast-off a standard measurement of liquid phase application. This value clearly paved way to use coconut shell coal as component of shoe polish for effective shining action. The solubility of coconut shell coal to water was also an essential consideration to establish chemical bond framework. Also, color pigments can be easily suspended in oil, making it suitable as supporting medium for paints. It is hydrophobic but soluble in organic substance such as kerosene. Oil dry slowly which facilitates realistic style and keep shining appearances (Friedrich, 1990).

Waxes are used to make wax paper. It impregnates and coat paper and card for water proofing, or make it resistant to staining (Flint, 2013). Wax can also modify surface properties. In making shoe shiner, wax is found to be an effective leather coating agent against oxidative reaction that stain and scratch the surface. Chemically, wax is a type of lipid that contain variety of long chain alkanes, esters and hydroxyl esters of long chain primary alcohols and fatty acids (Gui, 2016). Wax is also needed in making shoe polish to protect the leather from oxidative and corrosive agent that fastly devaluate the quality of shoes. Oil enhances the effectiveness of the polish by making the shoes shinier and water or moisture resistant when applied. Kerosene serves a solvent of wax and oil and prevents solidification at room temperature.

Considering the foregoing stand point, this research generally aimed to recycle used cooking oil and reduce domestic waste disposal detrimental to our environment of soil and water. Specifically, this research intended to test the

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effectiveness of shoe shiner with used cooking oil in black shoes, and produce cheaper shoe shiner from used cooking oil. The price of shoe shiner was also compared to the commercial product out in the market by the time this research was conducted.

The materials used in the production of shoe shiner were used cooking oil, coconut shell coal, kerosene and candle wax. The components of shoe shiner were mixed together at different quantities. Four trials were conducted to obtain the effective shining of shoes. Qualitative analysis was tested through the comparison of color, texture, and shining effect under each trial. The process introduced in this research were simple and do not require complex procedure and large capital to produce a shoe shiner.

MATERIALS AND METHODS

Materials

Used cooking oil was collected from households in the community. The collected used cooking oil was stored in a sealed container to prevent faster oxidation and prevent further degradation. Coconut shell was also obtained from some households in the community. Coconut shell is usually used as fuel in most rural areas. It is abundant specially during coconut baking or compiled after removal of meat during cooking as it is used as food ingredient, the coconut milk. Used candle was also collected in the nearby chapel upon the permission of the caretaker. Used candles in the chapel are commonly collected and sold at a cheaper price for recycling.

Procedure

Residues of the used cooking oil was removed through filtration. Cotton cloth was used to filter the used cooking oil to remove food particles. This process was conducted three times using three different pore layers to ensure that food particles were removed. The filtered used cooking oil was transferred to container with chunks of wood charcoal for discoloration and smell removal. After three to five hours, the used cooking oil was filtered again for wood charcoal disintegration. The process was done three times to ensure impurities exclusion and smell removal.

Coconut shell coal was pulverized into thin pieces and used as a component of shoe shiner. The pieces of coconut shell coal were strained at different pore layers to remove lager particles that may cause scratches on the leather shoes.

Using a medium heat, candle wax was melted. While candle wax was melting, pulverized coconut shell coal was slowly added and thoroughly mixed. When the initial mixture of candle wax and pulverized coconut shell coal totally mixed together, under low heat, used cooking oil was introduced. In the absence of heat, an amount of kerosene was added into the mixture and continuously stirred until a glutinous state was achieved as it cools. Four different trials were done and observations were recorded.

Table 1. Different Trials in making Shoe Polish from Used Cooking Oil

Trials	Candle (grams)	Coconut Shell Coal (grams)	Used Cooking Oil (mL)	Kerosene (mL)
1	30	10	5	5
2	30	15	10	10
3	30	20	15	20
4	30	30	20	30

Table 2 shows the different amounts of components used to make the shoe shiner. For trial 1, 10 g of finely grinded coconut shell coal was mixed with 5 ml kerosene, 5 grams of used cooking oil and 30 g melted candle. In Trial 2, 15 grams of coal combined with 10 ml of kerosene, 10 mL of used cooking oil and 30 g of melted candle. In trial 3, 20 grams of coconut shell coal, 20 ml of kerosene, 00 g of melted candle and 15 ml of used cooking oil were combined together. For trial 4, 30 grams of grinded coconut shell coal was mixed with 30 ml kerosene, 20 ml used of used cooking oil and 30 g of melted candle.

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RESULTS AND DISCUSSIONS

Table 2. Qualitative Analysis of Shoe Shiner from Used Cooking Oil

Trial	Materials	Color	Texture	Shine Effectiveness	Other Effect
1	Grinded coconut shell coal, melted candle, kerosene, used cooking oil	Gray	Rough	Mildly shiny	Shoes became slightly gray and produced scratches.
2	Grinded coconut shell coal, melted candle, kerosene, used cooking oil	Black	Rough	Slightly shiny	Produced some scratches on the shoes.
3	Grinded coconut shell coal, melted candle, kerosene, used cooking oil	Black	Slightly Smooth	Slightly shiny	None
4	Grinded coconut shell coal, melted candle, kerosene, used cooking oil	Black	Purely Smooth	Effectively Shiny	None

Table 2 shows that effective shoe shiner from used cooking oil can be attained in trial 4. The shiner slowly formed colloidal mixture after the combination of the substances. Semi-solid mixture was formed as it cooled. When the shoe shiner was applied to the surface of leather shoes it dominated shinier black colored shoes. Combination of the components in trial 4 was considered the yardstick of its effectiveness. Results showed that material used were effective and can sustain production since mostly are recycled waste. Used oil can be collected at home, and food chains for further use such as use it in making shoe shiner instead of disposing them in soil and run off water which cause environmental pollution.

Table 3. Price Comparison of Shoe Shiner from Commercial Shoe Polish (As of January 2022)

Volume mL	Shoe Shiner from Used Oil (Cost, Php)	Commercial Shoe Polish Ave. Existing Price (PhP)	Commodity Variance	Ave. Savings (%)
50	8	45	37	77.80
75	12	68	56	82.35
120	15	132	127	88.63

Table 3 shows the price comparison of shoe shiner made from used cooking oil with commercial shoe polish. The competitiveness of the product in the market is indicative of the commodity variance of shoe polish average savings. The indicated cost of production depends mainly on the existing price of the components.

Conclusion

Filtration of used cooking oil at different pore layers removed its impurities. Wood charcoal deodorized the used cooking oil before mixing with other components. Pulverized coconut shell coal provided black color to the shoe shiner while candle wax and used cooking oil enhanced the shining effect of shoe shiner.

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Mixing the right amount of used cooking oil, coconut shell coal, used candle wax, and kerosene was made to attain a glutinous state of the mixture which is a common physical characteristic of a shoe shiner. Recycled used cooking oil as component of shoe shiner with coconut shell coal was affluent since the mixture effectively shine the leather shoes without notable scratches or other effect. The shoe shiner from used cooking oil with coconut shell coal was also economically competitive since it is cheaper than commercial shoe shiner. Average savings were found to be high based from the cost of its production against the different prices of commercial shoe shiner. Collection and recycling of used cooking oil to make a shoe shiner will potentially reduce its disposal which cause environmental degradation of soil and water. Drainage system will also be freed from clogging due to grease disposal if used cooking oil will be collected from the household and other establishments such as eateries and food chains.

Recommendation

The shining effect of shoe shiner was tested based on the qualitative evaluation of the mixture. Although the main purpose of this study was to recycle used cooking oil, test the effectiveness of the shoe shiner, and reduce domestic waste disposal, it is highly recommended that further studies should be done to assess the degree of toxicity of the mixture and formulate further studies to improve the quality of shoe shiner from used cooking oil. Feasibility study may also be conducted to determine the shoe shiner's market potential.

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