International Journal of Science and Research Archive
eISSN: 2582-8185
Cross Ref DOI: 10.30574/ijsra
Journal homepage: https://ijsra.net/

(Research Article)

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Sabango charcoal: A basis for a proposed community extension program

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International Journal of Science and Research Archive, 2024, 11(02), 1809–1815

Publication history: Received on 04 March 2024; revised on 15 April 2024; accepted on 17 April 2024

Article DOI: https://doi.org/10.30574/ijsra.2024.11.2.0636

Abstract

Numerous negative environmental impacts result from deforestation brought by the production of charcoal can be seen on news, and experienced by certain communities. Due to the high demand for traditional charcoal made from wood, there is also a high demand for cutting trees resulting in soil erosion, biodiversity loss, and modifications to regional climatic patterns are all consequences of deforestation. The researchers conducted the study to propose a solution to these problems by promoting sabango charcoal made from organic waste, such as dried mango leaves and saba banana peels. The researchers aimed to assess the acceptability level of sabango charcoal compared to traditional charcoal and used as a basis for a community extension program. Based on the analysis of statistical data, it showed that there is a significant difference between sabango charcoal and traditional charcoal in terms of smoke, ignition, and longevity. The gap between sabango charcoal and traditional charcoal can be determine to the smoke it produces, the time it takes to ignite, and the burning time. It can also be reused multiple times and offers a more environmentally friendly product.

Keywords: Sabango Charcoal; Traditional Charcoal; Smoke; Ignition; Longevity.

1. Introduction

Up to this day, Filipinos still use traditional charcoal for cooking despite the advances in technology such as electricity, Liquefied Petroleum Gas (LPG), and kerosene. Due to the high demand for charcoal in the market, there is also high demand for cutting trees which leads to deforestation, soil erosion, and on a larger scale, global warming.

Natural resources can be found everywhere, but it has its limitation. To preserve and balance the delicate nature, humans should be wise and responsible in consuming resources in order to survive. One example can be humans may use organic waste such as banana peels and dried mango leaves in a more purposeful way. It can be utilized as a sustainable organic charcoal that could lessen the wood charcoal production that brought negative environmental impacts seen all over the news, such as, forest degradation, air pollution, and the release of high levels of carbon emissions.

In this study, the researchers' main focus is to utilize "sabango charcoal" made from saba banana (Musa acuminata x balbisiana) peels and dried mango (Mangifera indica) leaves as a basis for a proposed community extension program. The researchers aimed to assess the acceptability level of organic charcoal made from saba banana peels and dried mango leaves compared to traditional charcoal.

2. Materials and Method

This study used correlational-experimental research, a type of comparative analysis where participants are observed while being subjected to one or more circumstances and two or more variables are being studied. It is possible to

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identify correlations between the factors used and the implications on each group by evaluating the findings of this type of study (Lorraine, 2021). This experimental type of research assessed the acceptability level of sabango charcoal as organic charcoal compared to traditional charcoal in terms of smoke, ignition and longevity.

The researchers used a purposive sampling technique, also known as selective sampling. It is a type of non-probability sampling in which researchers pick selected individuals from Famy, Laguna to take part in the survey questionnaire. Since this research is about the sabango charcoal made from saba banana peels and dried mango leaves that was used as a basis for a proposed community extension program, the targeted respondents were fifteen (15) households who were using traditional charcoal for various activities in their hometown, Famy, Laguna.

The process of the study was divided into five (5) sections. First is the preparation of the raw materials for making sabango charcoal. It undergoes the process of collecting, cleaning, and sun-drying, storing, carbonizing, mixing, molding, and sun-drying the charcoal. Second is the trial and error in making sabango charcoal, which includes looking for the best measurements of each raw material to finalize the procedures. The third is the data gathering procedure. It includes the utilization of sabango charcoal by the fifteen (15) respondents in Famy, Laguna, and compares it with traditional charcoal in terms of smoke, ignition, and longevity. Fourth is computing and analyzing the data from the respondents. The computation includes the mean and t-test to find out the level of acceptability of sabango charcoal compared to traditional charcoal. The results of the computation of the level of acceptability will be used to determine if there is a significant difference between sabango charcoal as organic charcoal and traditional charcoal in terms of smoke, ignition, and longevity. The last section is the analysis and interpretation of the results of the statistical procedures applied to the gathered data to make a final conclusion.

2.1. Research Procedures

2.1.1. Collecting of saba banana peels and dried mango leaves.

Saba banana peels were collected by the researchers from banana cue vendors from Nagcarlan, Laguna, and from the banana plantation. On the other hand, the fallen dried mango leaves were collected by the researchers from the residential areas and Laguna University's backyard.

2.1.2. Cleaning, sun drying and storing of saba banana peels and dried mango leaves.

The collected saba banana peels and dried mango leaves were cleaned and undergone sun-drying within 3 days, and stored in a clean container.

2.1.3. Carbonization of saba banana peels and dried mango leaves.

Carbonization of saba banana peels and dried mango leaves were done using improvised pyrolysis equipment using the tin can of Minola Coconut Cooking Oil. Organic waste was burned in a container with very little air. It is a stable form of carbon that is difficult for it to escape into the atmosphere and is created during the pyrolysis process from the organic material (Spears, 2018). In this experiment, saba banana peels and dried mango leaves burn with little to no production of polluting gases.

2.1.4. Mixing with flour and hot water.

The carbonized 500 grams of saba banana peels and 200 grams of dried mango leaves were mixed with 1/4 cup of flour and 200 ml of hot water.

2.1.5. Molding using the silicone charcoal molder.

The carbonized saba banana peels and dried mango leaves were mixed with flour and molded using the silicone charcoal molder.

2.1.6. Sun-drying of the sabango charcoal.

After molding the charcoal, it was placed on a flat surface to dry under the sun within 3 days.

The researchers designed a survey questionnaire using the Five-Point Likert scale to gather the necessary data for the study. It was used to assess the acceptability level of sabango charcoal as organic charcoal compared to traditional charcoal used by the households in terms of smoke, ignition and longevity.

In conducting and gathering data, the researchers complied with the necessary permits for the respondents. The researchers finalized the questionnaire and conducted a face-to-face survey that was answered by the households that are using traditional charcoal. When the questionnaire was accomplished, the researchers compiled all the answers of the respondents from the questionnaire provided. After the data collection, all the information was organized and analyzed. It was analyzed by computing the variables using statistical treatment. Through the help of the questionnaire, the researchers assessed the acceptability level of sabango charcoal as organic charcoal compared to traditional charcoal used by households in terms of smoke, ignition, and longevity.

3. Results and Discussion

This section summarizes the findings of the statistical analysis that led to data interpretation.

Table 1 Computed Weighted Mean on the Acceptability Level of Sabango Charcoal in terms of smoke, ignition, and longevity

Indicators	General weighted mean	Interpretation
Smoke	4.83	Highly Acceptable
Ignition	4.13	Acceptable
Longevity	4.68	Highly Acceptable

Legend: Mean on Scale: 4.21 – 5.00 = highly acceptable, 3.41 – 4.20 = acceptable, 2.61 – 3.40 = neither acceptable nor not acceptable, 1.81 – 2.60 = not acceptable, 1.00 – 1.80 = highly not acceptable

Table 1 presents the acceptability level of Sabango Charcoal as organic charcoal in terms of smoke, ignition, and longevity.

The general weighted mean of 4.83 signifies that the respondents approved that the smoke emitted by the charcoal made from sabango or organic charcoal was *Highly Acceptable.* This means that sabango charcoal produce minimal smoke, does not cause headache, runny nose or watery eyes.

The findings for the sabango charcoal as organic charcoal is supported by Department of Science and Technology (2022), that the charcoal briquettes are more efficient than ordinary charcoal because it burn longer, easier to ignite, produce intense heat, and with very little smoke.

In terms of ignition, the general weighted mean of 4.13 signifies that the respondents approved that the ignition of sabango charcoal made from saba banana peels and dried mango leaves was *Acceptable.* This means that sabango charcoal ignites consistently, requires less fuel or kindling, has higher ignition, and quickly ignites.

The findings for the sabango charcoal as organic charcoal is supported by the study of Adam et al. (2021), briquettes demonstrated an identical ability to burn, although the tapioca starch briquettes burned at a slightly faster rate. When utilizing various types of binders, the ignition time and burning rate of these charcoal briquettes were improves over time.

In terms of longevity, the general weighted mean of 4.68 signifies that the respondents approved that the duration by the charcoal made from sabango or organic charcoal was *Highly Acceptable.* This means that sabango charcoal can lasts longer and maintain a consistent burning time and can be easily extinguish after usage.

The findings for the Sabango charcoal as organic charcoal in terms of longevity is supported by Adam et al. (2021), the study found that different kinds of briquettes demonstrated an identical ability to burn, although the tapioca starch briquettes burned at a slightly faster rate. When utilizing various types of binders, the ignition time and burning rate of these charcoal briquettes were only marginally impacted.

Table 2 Computed Weighted Mean on the Acceptability Level of Traditional Charcoal in terms of smoke, ignition, and longevity

Indicators	General weighted mean	Interpretation
Smoke	1.43	Highly Not Acceptable
Ignition	2.81	Neither
Longevity	2.87	Neither

Legend: Mean on Scale: 4.21 – 5.00 = highly acceptable, 3.41 – 4.20 = acceptable, 2.61 – 3.40 = neither acceptable nor not acceptable, 1.81 – 2.60 = not acceptable, 1.00 – 1.80 = highly not acceptable

Table 2 presents the acceptability level of Traditional Charcoal in terms of smoke, ignition, and longevity.

The general weighted mean of 1.43 signifies that the respondents approved that the smoke emitted by the charcoal made from traditional charcoal was *Highly Not Acceptable.* This means that traditional charcoal produce a vast amount of smoke and can cause runny nose, watery eyes and coughing.

The findings for the traditional charcoal in terms of smoke is supported by the study of Guma-os and Villarino (2019), charcoal grilling is a common outdoor cooking practice in the Philippines that has a certain health risks associated with it, including compounds called PAHs (Polycyclic Aromatic Hydrocarbons), and heterocyclic amines (HCAs) that lead to certain respiratory diseases.

In terms of ignition, the general weighted mean of 2.81 signifies that the respondents approved that the ignition of the traditional was *Neither Acceptable nor Not Acceptable.* This means that traditional charcoal somehow can ignite in specific time frame. The findings for the traditional charcoal in terms of ignition is supported by (Danganan, 2019). He cited that; unlike commercial coal, bio-coal made from santol leaves and coco peat burns well, has the greatest ignition and has less severe damage to its hardness. However, neither bio-coal nor industrial charcoal is water resistant. Compared to commercial charcoal, bio-coal ignites more quickly in terms of combustibility.

In terms of longevity, the general weighted mean of 2.87 signifies that the respondents approved that the duration by the traditional charcoal was *Neither Acceptable nor Not Acceptable*. This means that traditional charcoal requires more frequent fanning compared to organic charcoal and somehow can be extinguish after usage as well as can maintain its burning time. The findings for traditional charcoal in terms of duration is supported by Royal Botanic Gardens (2019), cited in their article that the amount of time it takes to burn charcoal depends on its size and form, with smaller pieces burning more quickly than bigger ones.

Table 3 Significant Difference between Sabango Charcoal as organic charcoal and Traditional Charcoal in terms of smoke, ignition and longevity

Acceptability Indicator	Mean	SD	Mean Diff.	*t*	*p*	Remarks
Smoke						
Sabango Charcoal Traditional Charcoal	4.83 1.43	0.38 0.57	-3.40	29.033	2.145	Significant
Ignition						
Sabango Charcoal Traditional Charcoal	4.13 2.81	0.64 0.59	-1.32	18.903	2.145	Significant
Longevity						
Sabango Charcoal Traditional Charcoal	4.68 2.87	0.47 0.58	-1.81	26.313	2.145	Significant

Note. Hypothesis tested at α =.05.

Table 3 presents the significance of difference between the sabango charcoal as organic charcoal and traditional charcoal in terms of smoke, ignition and longevity.

As reflected in the table 3, the difference between the sabango charcoal as organic charcoal (M=4.83, SD=0.38) and traditional charcoal in terms of smoke (M=1.43, SD=0.57) was statistically significant at .05 level of significance as revealed by t=29.033, p=2.145. In terms of ignition, the sabango charcoal (M=4.13, SD=0.64) and traditional charcoal (M=2.81, SD=0.59) was found to be significant as well as shown by t=18.903, p=2.145 while in terms of its longevity, the sabango charcoal (M=4.68, SD=0.47) and traditional charcoal (M=2.87, SD=0.58) was also found to be statistically significant as revealed by t=26.313, p=2.145.

This implies that the sabango charcoal performed better than the traditional charcoal and was well-liked by the respondents. This also means that the respondents approved of its usage over that of the traditional charcoal that was commonly used and available in the market.

These findings for the significant difference between the sabango charcoal as organic charcoal and traditional charcoal were supported by Department of Environment and Natural Resources (2022), that the use of charcoal briquettes from organic wastes can reduce wood charcoal consumption of poultry farms, households and domestic enterprises which is about 590 tons/year or an equivalent of 26,970 m3 fuel wood. The gap between organic charcoal and traditional charcoal is based on the source of the material, the production process, and the resulting quality of the charcoal. Organic charcoal is often denser and burns hotter and longer than traditional charcoal. It also tends to produce less ash, can be reused multiple times, and offers a more environmentally friendly product.

The gathered data from the survey questionnaire showed that the sabango charcoal made from saba banana peels and dried mango leaves received positive feedback from the respondents. The acceptability level of sabango charcoal in terms of smoke and longevity is highly acceptable compared to traditional charcoal. For ignition, it is acceptable compared to traditional charcoal. On the other hand, the acceptability level of traditional charcoal in terms of smoke is highly not acceptable compared to sabango charcoal. For ignition and longevity, it is neither acceptable nor not acceptable compared to sabango charcoal. These findings show that there is a significant difference between sabango charcoal and traditional charcoal in terms of smoke, ignition, and longevity.

The null hypothesis of the research and summary of the analysis of statistical data, which postulated that there would be no significant difference in smoke, ignition, and longevity between sabango charcoal made from dried mango (Mangifera indica) leaves and saba banana (Musa acuminata x balbisiana) peels and traditional charcoal, was rejected. This implies that there is indeed a significant difference between sabango charcoal and traditional charcoal. It was supported by the findings of Zulueta et al. (2022), who stated that by turning waste materials—primarily banana peelings—into charcoal, this study hopes to address these environmental problems by determining if they can replace traditional charcoal. In addition, the results were supported by the Department of Environment and Natural Resources (2022) that the use of charcoal briquettes from organic wastes can reduce wood charcoal consumption. It means that organic charcoal offers a more environmentally friendly product compared to the traditional charcoal.

4. Conclusion

The study showed that there is a significant difference between sabango charcoal as organic charcoal and traditional charcoal in terms of smoke, ignition, and longevity.

In the light of the foregoing findings and conclusions, the following are recommended:

- Future researchers can conduct this study to develop and improve the sabango charcoal.
- Future researchers can use other varieties of banana peels and any kind of leaf to make the organic charcoal more effective.
- Future researchers can use other binding agents as alternatives to flour and try other igniters that can be used to easily ignite the sabango charcoal.
- The researchers recommend to future researchers to test the product on a larger number of respondents to promote eco-friendly products and lessen the use of traditional charcoal.
- The researchers recommend to future researchers to have scientific testing for this study.

Compliance with ethical standards

Acknowledgements

The researchers would like to express their most profound gratitude to all the people behind this research for their valuable assistance which caused the realization and accomplishment of this study. It is a pleasure to convey gratitude to all of them in this humble acknowledgment.

To Mr. King Leonard Nograda, the research adviser for his constructive analysis and suggestions that pushed the researchers to strive harder and achieve their goal to make this research possible;

To Ms. Leah E. Perez, for rendering her constant supervision, guidance, and trust and for the ideas she gave for the improvement of this study;

To Ms. Rose Nannette J. San Juan, a member of the ethics review committee, for the advice, support, and constructive criticism that greatly led to the accomplishment of this research;

To the panelists Ms. Jasmin F. Velasco, Mr. Jhonie Castro, Mr. Jhon-Jhon Zotomayor, Mr. Mark Stephen Ravelas, and Ms. Jovelle M. Reyes for their valuable suggestions and criticism which help the researchers to make this research successful;

To Mr. Richard I. Tuala for imparting his knowledge in statistics which made the research more reasonable;

To Ms. Audrey Lou Dimasaca, the editor of this research for her immense knowledge, keen interest, unwavering patience, and great effort in editorial correction of this research;

To Ms. Dian Richell Cruz, for her inspiring guidance, cooperation, and advice for the best outcome of the study;

To Hon. Lorenzo Rellosa, the Mayor of Famy, Laguna for giving them the permission to conduct this study in their town and for his moral support and words of encouragement; and

To the selected households in Famy, Laguna, who voluntarily participated and cooperated in the research study.

Disclosure of conflict of interest

The authors declare no conflicts of interest.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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