ASH SOAP PRESERVING THE ENVIRONMENT

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ABSTRACT

This work investigates the production of soap from wood ash and residual vegetable oil, focusing on the environmental and social benefits of this practice. The problem addressed considers the negative impact caused by the improper disposal of frying oils on the environment, and the research seeks to assess how soap production can mitigate these damages and promote sustainability. The overall objective is to analyze the benefits of recycling waste vegetable oil for soap making, highlighting its efficiency and potential as an eco-friendly alternative. The final considerations indicate that the production of soap from waste oil and ashes is a viable practice, with the potential to be expanded and adopted in needy communities, contributing to the reduction of environmental impacts and the promotion of sustainable practices. In addition, the research suggests that the implementation of this technique can generate economic benefits, by transforming waste into valuable products, and social benefits, by promoting environmental awareness and education.

Keywords: Ash Soap. Oil Recycling. Sustainability. Ecological Saponification. Environmental impact.

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INTRODUCTION

The improper production and disposal of waste, such as vegetable oil used in frying, has raised growing concerns about the environmental impact and risks to public health. With the advance of industrialization and the increase in the consumption of fried foods, the amount of oil incorrectly disposed of in the environment has been growing alarmingly, polluting water bodies and compromising the quality of water resources. This scenario challenges the search for sustainable solutions that not only minimize these impacts, but also promote the reuse of this waste in an efficient and affordable way (Freitas and Salvalaio, 2023).

In this context, the production of soap from ashes and waste vegetable oil emerges as a viable and ecological alternative. Before the advent of caustic soda, ancient civilizations already used bleach – an alkaline solution obtained from the mixture of ash and water – to make soap. This traditional practice, combined with the reuse of frying oil, offers a double solution: the use of waste that would otherwise be discarded and the provision of a sustainable and low-cost cleaning product (Gaio, 2023).

Research on the production of ash-based soap and waste vegetable oil offers significant theoretical contributions, by revisiting ancient practices and relating them to contemporary principles of sustainability and circular economy. From a practical point of view, this work presents an affordable solution for low-income communities, promoting the use of waste in an efficient and environmentally responsible manner. In addition, by addressing soap production as a sustainable practice, the study also contributes to raising awareness about the importance of proper waste management and the promotion of viable alternatives to improper disposal.

The theme outlined in this research aims to investigate the soap production process using ashes and residual vegetable oil, analyzing its benefits both from an environmental and economic point of view. The research problem that arises is: how can the production of soap from ash and waste oil contribute to the reduction of environmental impacts and promote sustainability in low-income communities?

The general objective of this work is to analyze the benefits of soap production from ash and waste vegetable oil, considering its environmental, economic and social impacts, and to evaluate how this practice can be implemented effectively in different contexts.

DEVELOPMENT

The production of soap from waste vegetable oils has been explored as a viable solution for the reuse of waste that would otherwise be improperly disposed of in the

environment. The reuse of vegetable oils, especially those used in frying, in the manufacture of homemade soap offers a sustainable alternative that contributes to the preservation of water resources and to the reduction of negative environmental impacts associated with the disposal of these oils. Studies such as the one by Santos *et al*. (2022) demonstrate that soap production from vegetable oils is not only possible, but also efficient, providing a high-quality product with cleaning properties comparable to conventional soaps.

The manufacture of soap using wood ash and residual frying oil is a process that has been rediscovered and valued in different contexts, especially in solidarity economy and environmental sustainability initiatives. According to Silva *et al*. (2022), the implementation of school factories that use this methodology has enabled the integration between teaching, research, and extension, allowing students to learn in practice about the benefits and challenges of sustainable soap production. This practice not only promotes environmental education, but also empowers communities to develop their own solutions for waste treatment.

Calanca and Grossi (2019) emphasize the importance of popular awareness in the cooking oil recycling process, especially for the homemade manufacture of bar soap. Through educational campaigns and community workshops, the population is informed about the damage that improper disposal of oil can cause to the environment and is encouraged to actively participate in recycling. These initiatives have shown that education is a crucial factor for the success of recycling programs and for the adoption of sustainable practices in everyday life.

The use of wood ash as an alkaline source in the saponification process, replacing caustic soda, is a practice that has been successfully explored. Freitas and Salvalaio (2023) point out that the lye obtained from wood ash has sufficient alkaline properties to trigger the saponification reaction, resulting in a soap with good cleaning properties. In addition, this approach reduces the need for industrialized chemical inputs, promoting a more natural and less aggressive form of production to the environment.

Recent studies, such as that of Martins *et al*. (2022), investigate the potential of different types of vegetable oils, such as andiroba oil, combined with aqueous ash extracts for soap production. These studies expand the range of options for the manufacture of ecological soaps, exploring the specific properties of different oils and their interaction with bleach. Research has shown that the use of oils such as andiroba, which have emollient and medicinal properties, can add value to soap, making it not only a cleaning product but also a cosmetic with therapeutic properties.

Gaio's (2023) research on the production of biodiesel from waste oil from the food industry, pre-treated with boiler ash, offers valuable insights for the development of new recycling technologies. Although the focus of the study is on biodiesel, oil pretreatment and purification techniques can be adapted to improve soap production, ensuring a high-quality final product with a lower environmental impact. This demonstrates that technological innovation is key to advancing sustainable practices.

Almeida *et al*. (2018) present a similar approach, where cooking vegetable oils are used in the production of soaps with phytotherapeutic properties. In this context, waste oil, which is often considered a worthless waste, is transformed into a value-added product, promoting the health and well-being of users. Reusing these oils reduces waste and pollution, while generating a product that can be marketed or distributed in underserved communities, contributing to the local economy.

The efficiency in producing soap from waste oil depends on several factors, including the quality of the oil used and the saponification process. Santos *et al*. (2022) emphasize that the content of free fatty acids present in the residual oil can influence the final quality of the soap. Oils with a high content of free fatty acids are more suitable for saponification, as they react more easily with bleach, resulting in a soap with better texture and cleaning power.

In addition, Santos, Fernandes and Carvalho (2018) discuss how the by-products generated from the recycling of waste oil, such as glycerol, can be reused in different applications. Glycerol, for example, can be used in the production of cosmetic and pharmaceutical products, creating a sustainable and low-waste production cycle. This approach not only maximizes the use of waste, but also diversifies the possibilities of products derived from cooking oil recycling.

Before the discovery of "caustic soda", as Sodium Hydroxide (NaOH) is popularly called, ancient people used a solution resulting from the mixture of ashes with water to make soap. Wood ashes have a composition that switches into organic and inorganic compounds, among them, calcium, potassium and silicon oxides are mainly found. Wood ashes are not sufficient for soap production, but its aqueous extract, in addition to having a chemical composition that allows the saponification reaction to take place, is also highly alkaline (pH= 13). Studying the development of wood ashes for soap production is an alternative to the use of aggressive products, in addition to influencing conscious consumption and reducing the use of pure raw materials, such as caustic soda (Martins *et al.,* 2022).

The present method proposes to obtain the alkaline substance from the residual ash resulting exclusively from the burning of wood mixed with water. This alkaline mixture is also known as lye and replaces NaOH in the saponification reaction. The bleach used was prepared with 5L of water added to 300g of ash obtained from burning wood. For the manufacture of the soap, 500mL of lye was proportionally used for 80mL of residual oil obtained from frying. In an appropriate container, with the exception of aluminum (which reacts with the alkaline substance), the lye and vegetable oil were mixed and heated slowly for approximately 2 hours so that the saponification reaction occurred, which can be observed when the mixture reaches a pasty appearance and with a dark, almost black color. The yield of the reaction was approximately 90%.

Oliveira (2015) contributes to the discussion by proposing the design of frying oil recycling systems for the production of soap and polymeric resins. The study suggests that with proper sizing and the implementation of appropriate technologies, it is possible to scale soap production efficiently and sustainably, serving both small communities and larger markets. The integration of recycling systems can therefore be an effective solution for the management of urban and industrial waste.

FINAL CONSIDERATIONS

The production of soap from wood ash and residual vegetable oil proved to be a sustainable and effective alternative for waste management, answering the research question that sought to verify whether this practice could contribute to the reduction of environmental impact and generate economic and social benefits. The results obtained confirm that the reuse of these materials, in addition to reducing pollution, can become an important educational tool in raising awareness about responsible consumption and recycling, especially in poor communities.

From a social and academic point of view, the results of this research offer a solid basis to foster the integration of waste reuse techniques in educational programs and community initiatives. Academic research can benefit from this study by exploring new ways to apply this type of technology in practical teaching contexts, involving both students and society in sustainability projects. For society, the practice discussed can not only improve waste management, but also create opportunities for income generation and environmental awareness.

However, it is important to highlight some limitations of the research. The study was conducted in a specific context and on a reduced scale, which may limit the universal applicability of the results. Additionally, logistical issues such as access to raw materials and

community engagement can pose challenges in large-scale implementation. For future work, it is recommended to expand the study to other regions and contexts, in addition to investigating the impact of different types of ashes and oils on the final quality of soap. The inclusion of more advanced technologies and the study of economic feasibility on a larger scale are also promising avenues for future research.

REFERENCES

1. ALMEIDA, L. G. G. et al. (2018). Preparação de sabão com propriedades fitoterápicas e emolientes a partir do óleo vegetal de cozinha.

2. CALANCA, C. G., & GROSSI, S. de F. (2019). Conscientização popular a partir da reciclagem do óleo de cozinha para a fabricação caseira de sabão em barra. *Revista Interface Tecnológica*, 16(1), 417-426.

3. FREITAS, I. D., & SALVALAIO, L. H. (2023). Desenvolvimento e formulação de sabão utilizando cinzas de madeira a partir da reciclagem do óleo residual de fritura.

4. GAIO, G. R. de S. (2023). Produção de biodiesel a partir de óleo residual da indústria alimentícia pré-tratado com cinzas de caldeira.

5. MARTINS, L. de S. et al. (2022). Utilização do óleo de andiroba (Carapa guianensis) para a produção de sabão em combinação com extrato aquoso de cinzas.

6. OLIVEIRA, S. da C. (2015). Dimensionamento de um sistema de reciclagem de óleo de fritura para produção de sabão e resinas poliméricas.

7. SANTOS, P. V. S., FERNANDES, C. H. de A., & CARVALHO, L. F. (2018). Subprodutos alternativos gerados a partir de óleo residual: uma prática sustentável. In *IX Simpósio de Engenharia de Produção da Região Nordeste*. Bahia.

8. SANTOS, S. G. R. et al. (2022). Estudo da produção de óleo vegetal e sua reutilização para obtenção de sabão.

9. SILVA, G. D. S. et al. (2022). Fábrica escola de detergentes como forma de possibilitar a indissociabilidade entre ensino-pesquisa-extensão. *Revista Difusão*, 1(9).