Natural Bleach Using Lemon Peel

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ABSTRACT

Commercial bleach, as indicated by Yosi Santika Silitonga et al. in 2020, contains chemicals designed to eliminate dirt and stains. In light of this, a solution involving natural bleach derived from lemon peel has been suggested for cleaning purposes. This natural bleach can be produced by synthesizing lemon peel as the primary ingredient and combining it with ethanol and vinegar. The blend of lemon peel, ethanol, and vinegar forms an effective natural bleach agent. Experimental tests were carried out to assess the bleaching efficiancy of lemon peel extract on cotton fabric by varying the amounts of lemon peel in each mixture. Seven different doses of natural agents were tested for each bleach mixture. The findings demonstrated that lemon peel extract is proficient in lightening fabric color and removing stains while preserving fabric integrity, owing to the presence of citric acid in lemon peel which acts as a natural cleaning agent. Citric acid aids in dirt and grime removal, as well as providing a bleaching effect on fabrics, while ethanol functions as an additional cleaning agent and solvent. Additionally, vinegar with its acidic properties contributes to the bleaching process. The study also examined various parameters such as pH levels, the duration needed for lemon peel to eliminate stains on cotton fabric, and the toxicity of the bleach. Time measurements were taken during cotton cloth stain removal tests using natural bleach, based on the quantity of doses applied. Consequently, the bleach testing revealed that the most effective dose for dirt removal is a hundred grams of lemon peel, achieving stain removal within two minutes. It was observed that increasing the amount of lemon peel led to faster dirt removal, showcasing accelerated stain elimination on fabric and delivering a notably clean outcome. In summary, lemon peel extract presents a sustainable alternative with potent bleaching properties. The advantages of natural bleach encompass efficient cleaning without residual harmful chemicals, promoting environmentally conscious practices.

KEYWORDS

Bleach; lemon peel

1. INTRODUCTION

The traditional textile industry has faced significant criticism for its negative impact on the environment, primarily due to excessive water and energy consumption, as well as the release of environmentally harmful wastewater. To address these concerns and promote sustainable practices, there is an urgent need to transform and upgrade the conventional textile industry towards more advanced and environmentally friendly approaches (Ahmad et al.,2015). According to a report in 2018, cotton is a prominent textile substrate known for its moisture absorption and comfortable wearability. It accounts for more than 80% of the total production of natural fibers, totaling 32 million (Ahmed and Mondal 2021).

Bleaching is an indispensable step that aims to achieving required whiteness by removing the intrinsic colored impurities from cotton fibres available for the following processes such as coloration, printing and functionalization. Commercial bleach contains chlorine which can harm aquatic ecosystems and human health. (Dessie et al., 2019).No matter how dangerous the chemical or chlorine pollution is to the environment or public health, it can contaminate water. The use of chemical bleaching agents, particularly chlorine bleach, raises significant health and environmental concerns. Despite its effectiveness in whitening and cleaning, chlorine poses risks due to its strong oxidizing chemicals. Inhaling chlorine fumes may lead to chronic respiratory issues like asthma and bronchitis. (ATSDR, 2004) The release of toxic fumes during bleach is a concern. Besides that, chlorine bleach also produce harmful by-product including dioxins and repeated exposure to dioxins increases cancer and reproductive risks. (EPA, 2018) Due that, by using natural ingredient as an alternative to produce natural bleach like citrus peel extract for cleaning. These alternative are eco-friendly and pose fewer health risks. The natural bleach from lemon peel is one of the eco-friendly product.

Since that, natural bleach from lemon peel was proposed to evalute the effectiveness as a bleach. The main component of this study is lemon peel as organic material. The objective of the study are to evaluate the potential of lemon pees as a suitable material in the production of natural bleach and determine the effectiveness of dirt removal based on the optimal dose of lemon peel.

Natural bleach from lemon peel is a product eco-friendly which containing natural egent , ethanol and vinegar. Jamuna and Kumaravel, 2019 highlighted that lemon peel contain citric acid, limonene, flavonoids and antioxidants that's help as natural bleach. Its may help in breaking down the stains and safe for fabrics and skin. From all this, its shown that natural bleach from lemon peel can classified as environmental flriendly to be use.

The purpose of this study is to evaluate the effectiveness of the natural bleach, which involves the manufacture of natural bleach from lemon peel and another component, namely ethanol . The main component of this study, lemon peel, is a good material for the production of natural bleach. This study will examine its quality and shows how natural bleach works well to remove stains from fabric. The scope of study also want evaluate the influence of pH on the bleaching effect of natural bleach between commercial bleach

In addition, this study will be as a awareness of the harmful in use of chemcial or commercial bleach that contain a high chemical content. Due that, it will show by using natural bleaching will be effective as commercial bleach.

2. METHODOLOGY

In making natural bleach was conducted with the combination of lemon peel, vinegar and ethanol. Smith et. al. (2016) explained that citric acid from lemon peel functions through

chelation, where metal ions causing stains on fabrics are bound and neutralized. Acetic acid in vinegar dissolves dirt by breaking down ionic and hydrogen bonds in dirt, while its acidic nature also kills microorganisms that may cause odors and discoloration.Furthermore, ethanol plays a crucial role in the bleaching process by speeding up the extraction of active components from lemon peel and aiding in fabric drying. Koh, Chia and Goh (2015) demonstrated that ethanol can accelerate water evaporation from fabrics, reducing drying time and minimizing the risk of damage to fabric fibers. Due all the function of the material, its combined all the material in production of natural bleach by using lemon peel. **Figure 1** shown that the parameter study involve in production of natural bleach.

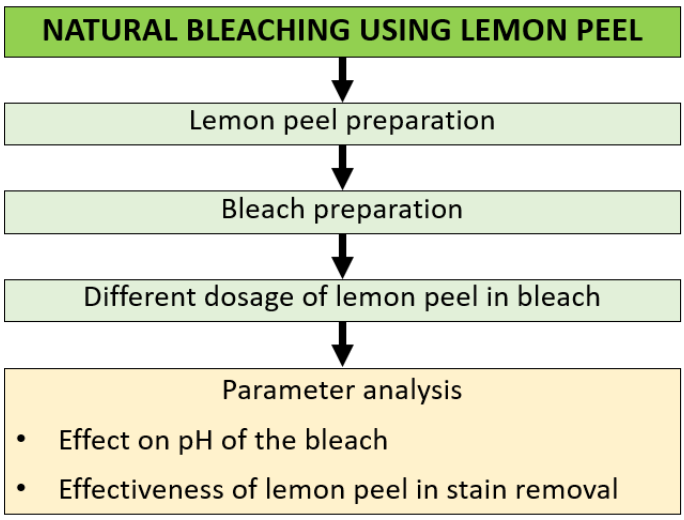

Figure 1. The parameter study of the natural bleach by using lemon peel

Lemon peel is obtained from food waste and separated from the fruit. Lemon peel must cleaned and washed in sterile distilled water and dried in the dry oven for 12hours in 60°C of temperature to remove most of the moisture. After that, it is packed in a steel envelope to be dried in hot air oven at 200°C for 120 minutes. Once it dried, the lemon peel was ground into a fine powder using a grinder.

Next, the natural bleaching preparation involved combining lemon peel powder with ethanol and vinegar as additional ingredients. The dosage of lemon peel varied in different amounts (40 grams, 50 grams, 60 grams, 70 grams, 80 grams, 90 grams, and 100 grams) to examined for its specific effect on the initial pH of the bleach and stain removal from fabrics.

The initial pH of the natural bleach was measure to analyze the optimal or suitable dosage of lemon peel in remove the dirt and stain. By adjusting the amount of peel, its can identify the ideal concentration for achieving the desired pH range in bleach production. Besides that, the optimal contact time of natural bleaching process using lemon peel was measured to achive maximum bleaching results. This analysis is not only to enhance the effectiveness of the bleaching process but also to minimize unnecessary exposure, providing a deeper understanding of the kinetics of the bleaching process with lemon peel (Dessie et al.,2019).

3. RESULTS AND DISCUSSION

This study aimed to identify the optimal pH for effective natural bleaching and to evaluate the effectiveness of lemon peel in removing stains from fabric. Various quantities of lemon peel, namely 40 grams, 50 grams, 60 grams, 70 grams, 80 grams, 90 grams, and 100 grams, were used to investigate this matter, each with different pH levels. This variety in dosage allowed for an in-depth exploration of the potential of lemon peel as a bleach, capable of meeting various cleaning needs and preferences (Kamli et al., 2021).

The effectiveness of lemon peel in removing stains was assessed by measuring the time required to remove stains from fabric samples. This analysis provided insights not only into the efficiency of lemon peel as a cleaning agent but also helped determine the most suitable dosage for optimal performance. This multidimensional approach allowed for a comprehensive understanding of the bleaching capabilities of lemon peel and its potential as a safer alternative to conventional chemical bleaches.

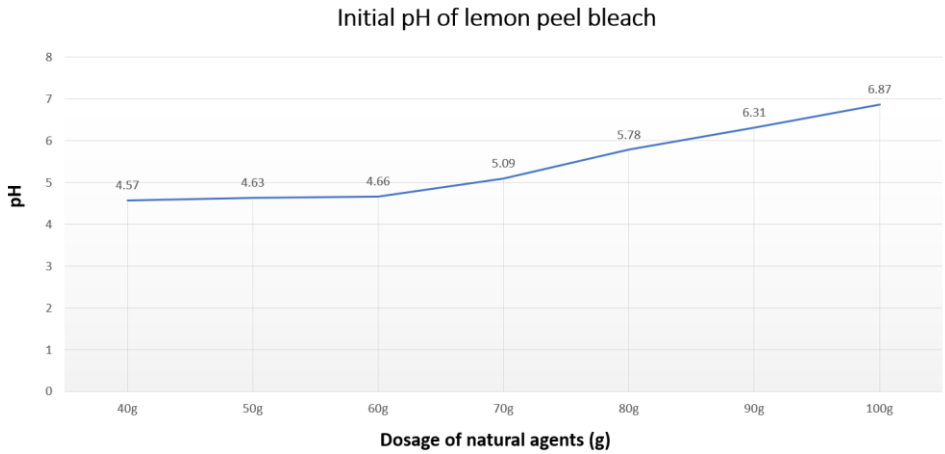

Figure 2. The intital pH of bleach with different dosage of lemon peel

The analysis in Figure 2 show the initial pH data from natural bleaches derived from lemon peel and other organic sources reveals varying values ranging approximately from 4.5 to 7. The acidic nature of lemon peel contributes to lower pH values due to its abundance in citric acid. On the other hand, commercial bleaches have higher alkaline levels with pH ranges often spanning from 10 to 13 (Chandra et al., 2017). These differences reflect variations between natural substances and synthetic chemicals used in commercial bleaches. In the case of natural bleaches, such as those derived from lemon peel, the acidity levels are primarily determined by the concentration of organic acids present. As more lemon peel is added, the overall acidity may increase slightly due to higher concentrations of citric acid, but the pH values generally remain within a relatively narrow range.In contrast, commercial bleaches rely on synthetic chemicals with predetermined alkalinity levels to achieve desired stain removal and whitening effects. The addition of these alkaline chemicals leads to higher pH values in the bleach solution, which correlates with increased effectiveness in stain removal.

Lemon peel contains natural bleaching agents, including citric acid, which can remove and remove dirt through oxidation or other chemical reactions. With a dose of 40 grams, the initial pH may experience a mild increase as the compounds in the lemon peel interact with the solution. However, the lemon peel is providing an acidic environment effect that can start the natural bleaching process, especially effective in removing dirt. When the dose of lemon peel increases to 100 grams, the concentration natural bleaching agents are intensified. This enhanced organic content can cause even more a significant reduction in the initial pH, increasing the bleaching effect on the solution.

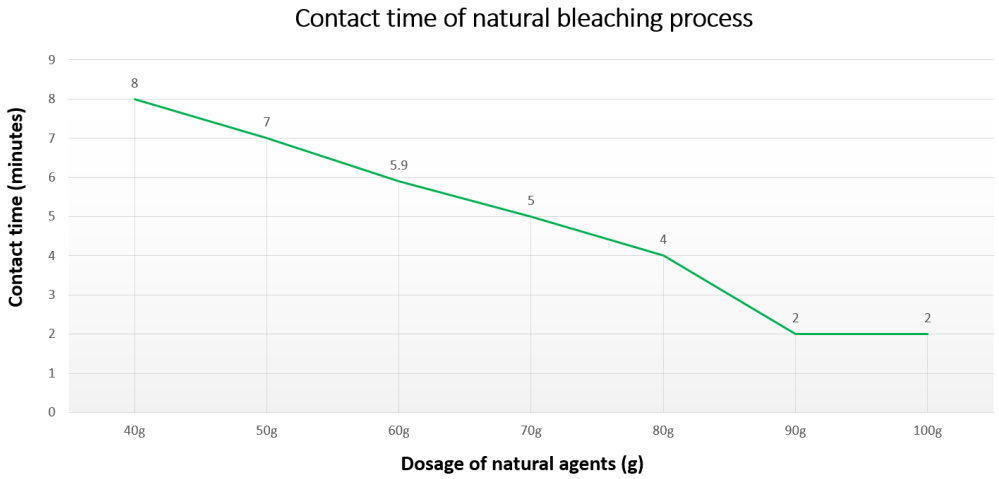

Figure 3. The contact time of bleach with different dosage of lemon peel

The graph in Figure 3 provides an overview of the time comparison of the effectiveness of bleach in removing stains from cotton fabric using various doses of lemon in the cleaning process. The data clearly indicate that as the dose of lemon increases, the time required for the bleach to effectively remove stains decreases. This observed trend can be attributed to the presence of citric acid in lemon peel, which possesses stain-breaking properties. Citric acid initiates a chemical reaction that produces chlorine gas and other compounds, enhancing the bleach's ability to break down stains on fabric. Consequently, higher doses of lemon peel result in increased concentrations of citric acid, leading to more efficient stain removal.

The findings of this study underscore the positive correlation between the dosage of lemon peel and the effectiveness of stain removal from cotton fabric. The results suggest that higher doses of lemon peel yield quicker and more efficient stain removal, emphasizing the potential utility of lemon peel as a natural and effective alternative to conventional chemical bleaches.

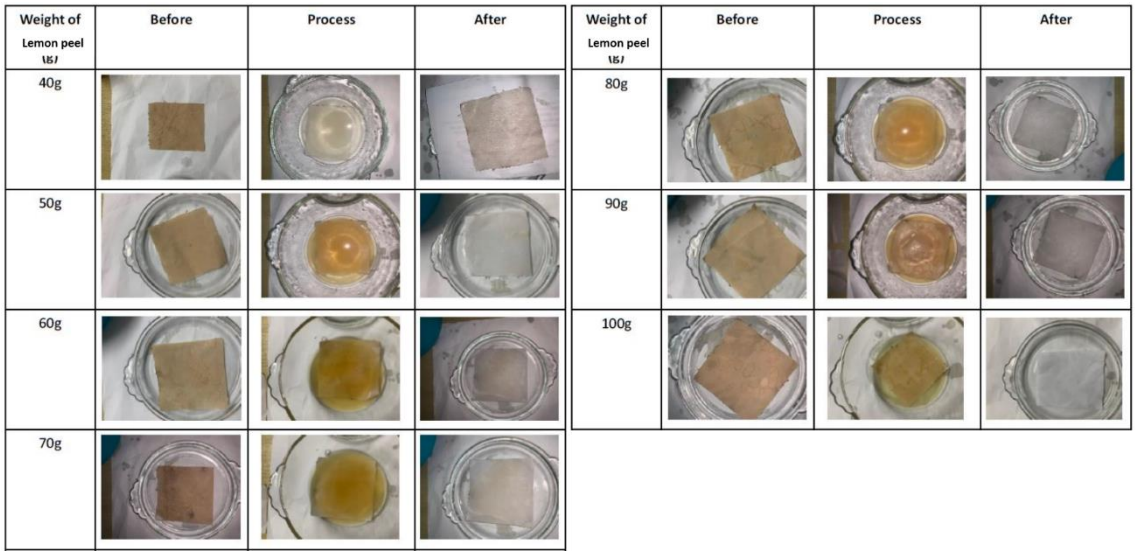

Figure 3. The effectiveness of natural bleach in removal dirt and stain on cotton fabric

The figure 4show the effectiveness of natural bleach in removal dirt and stain on cotton fabric. The findings of the study showed that a higher dose of lemon peel resulted in a more

suitable pH value for bleaching, while the time required to remove stains from the fabric also decreased significantly with higher doses, directly affecting the effectiveness of the bleaching product. An in-depth discussion of the dose-effect relationship on the efficacy and reliability of bleaching products reaffirms the conclusion that lemon peel has great potential as a substitute for conventional chemical bleaches, emphasizing safety, efficacy and positive environmental impact.

Based on a comprehensive analysis of the data and results presented in this study, it can be conclusively concluded that the use of lemon peel as a natural bleaching agent promises an effective and sustainable approach to address cleaning needs safely and efficiently.

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