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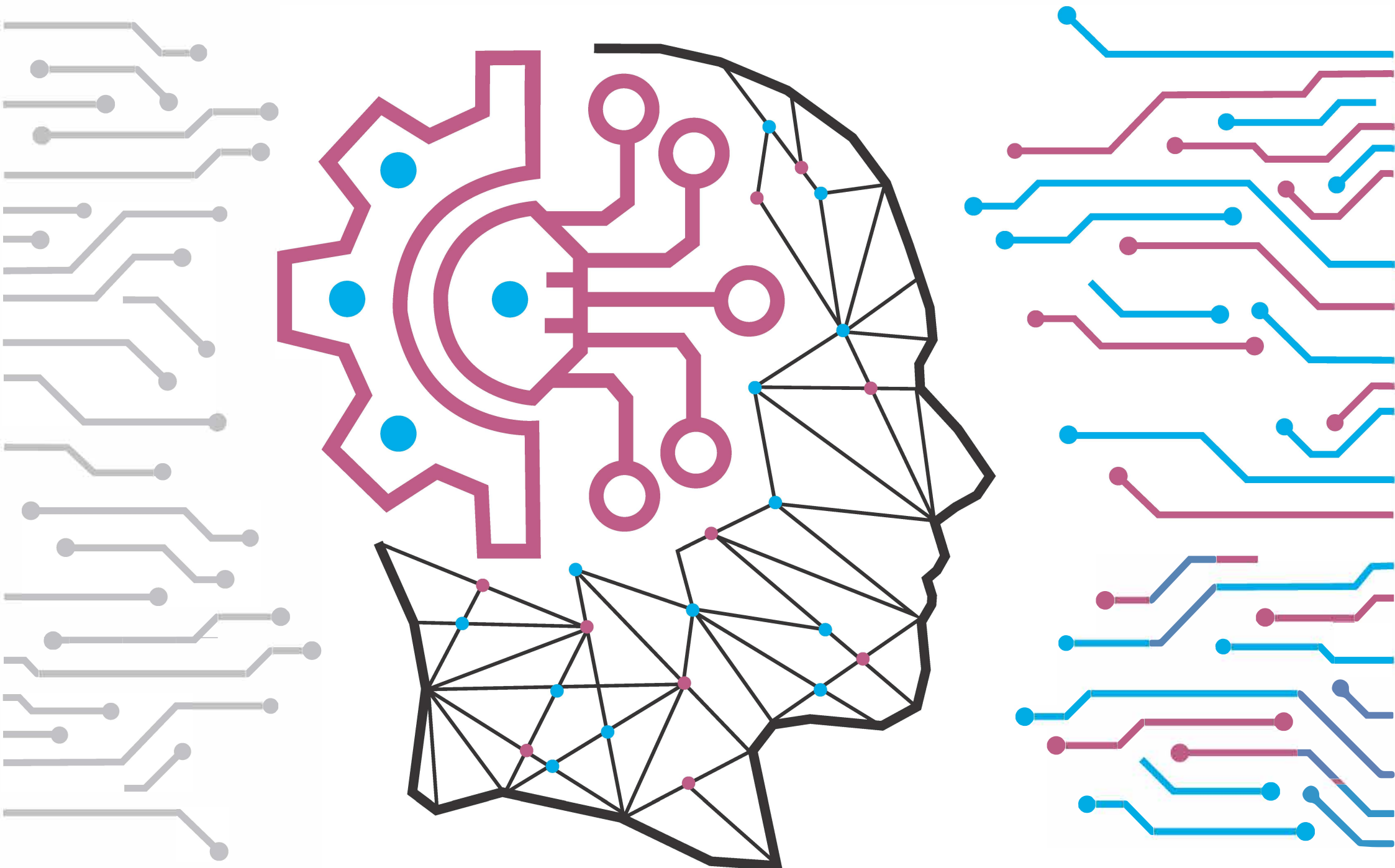
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THE 13TH INTERNATIONAL INNOVATION, INVENTION & DESIGN COMPETITION 2024

EXTENDED ABSTRACTS

e-BOOK

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THE 13th INTERNATIONAL
INNOVATION, INVENTION &
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SHUCA: ANTI-BACTERIAL TISSUE INNOVATION FROM CASSAVA PEELS AS A SUSTAINABLE LIFE PRODUCT

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ABSTRACT

Tissues are commonly utilized in daily activities such as personal hygiene, utensil cleaning, and stain removal. The extensive demand for tissue has significant environmental implications due to its primary component being wood, necessitating the daily harvesting of numerous trees. Continuous felling of trees can cause erosion, decreased oxygen quality, lack of water absorption, and global warming. Therefore, we experimented with making tissue from cassava peel, because cassava peel has a fairly high cellulose content and the tissue produced is easily decomposed, and currently cassava peel waste has not been utilized properly. Our innovation focused on creating a travel-friendly tissue for cutlery cleaning infused with antibacterial properties derived from betel leaves, green tea, mint leaves, and lime. The process of making tissue is still done manually, namely using a screen printing tool, and dried using an oven. The resulting tissue exhibits a smooth texture with minimal fibre appearance, resembling conventional tissue in both appearance and functionality.

Keywords: Sustainability, waste utilization, environmentally friendly

1. INTRODUCTION

Massive tree cutting for tissue production leads to deforestation, primarily driven by large-scale commercial logging activities. According to the Ministry of Environment and Forestry, Indonesia's net deforestation in 2021-2022 is 104 thousand ha. Meanwhile, Indonesia's deforestation in 2020-2021 is 113.5 thousand ha (Anugrah, 2023). Deforestation can impact climate change by influencing the concentration of carbon in the atmosphere (Herpita & Suranto, 2021). According to a report, the climate crisis can cause threats that hinder sustainable development (Anugrah, 2021). Therefore, to reduce damage due to deforestation, the raw material for tissue can be replaced with another alternative, namely cassava peel.

Indonesia is the fourth largest cassava-producing country in the world, with an estimated 19-20 tons of cassava produced every year (Kominfo, 2021). Cassava peel has often been underestimated and considered as waste. The outer skin waste constitutes approximately 0.5-2% of the total weight of fresh cassava, while the inner skin waste accounts for 8-15%. (Santoso, 2012). Cassava skin has a cellulose content of 57%, 22% lignin, and a fiber length of 0.05-0.5 cm (Santoso, 2012). Cellulose in the form of fiber has an important role in the production of paper and tissue. Hence, cassava peel can serve as a fundamental material for tissue production, making the "Shuca" product an innovative solution crafted from cassava peel waste to mitigate deforestation in Indonesia. This product offers several essence variants, namely betel leaf, lime, green tea, and peppermint, all of which have been proven to possess antibacterial properties (Hoque *et al.*, 2011; Liew *et al.*, 2020; Pratiwi, 2021; Setiawati, 2022).

2. METHODOLOGY

The method used is an experimental method, divided into three production stages, namely preparation of tools and materials, pulp making, and tissue printing.

In the process of making this tissue, the following tools and materials are used:

1. Tools: 1) Digital balance is used to measure the mass of materials; 2) Hot plates are used to heat materials; 3) A blender is used to process the cassava peel into a smooth consistency; 4) Screen printing is used to print tissue paper; 5) Beaker glass is used for mixing ingredients and as a heating container; 6) Glass stirrer is used in mixing materials.
2. Ingredients: 1) Cassava peel as the main ingredient in making tissue; 2) Water or distilled water, as a solvent; 3) NaOH functions to hydrolyze lignin compounds found in cassava skin; 4) Talc functions to lubricate tissue and absorb moisture in tissue; 5) Essence of lime, green tea, mint leaves and betel leaves functions as an anti-bacterial and as a tissue freshener.

The following are the stages of making Shuca:

- a. Preparation of tools and materials: 1) Prepare raw materials in the form of waste originating from cassava skin that is no longer used; 2) Dry the cassava skin; 3) Prepare clean water; 4) Prepare a large tub, screen printing screen, bench scale, pan, and bucket.
- b. Making Pulp: 1) Cassava skin is sliced into small pieces and put into a tub to be washed so that any dirt stuck to it is removed; 2) The cassava skin is put into a pan to be boiled by adding water and 10% NaOH; 3) After boiling, wash the cassava skin again until clean; 4) Boiled cassava skin is then crushed using a blender until smooth; 5) After finishing blending, transfer the resulting pulp to a container, mix the talcum and essence in the container then dilute the pulp mixture so that the resulting paper is thinner.
- c. Tissue paper printing and tissue drying: 1) Print the dough using a screen printing tool; 2) Move to a drying mat; 3) Dry the tissue using the oven.

The process of making Shuca can be seen in Figure 1.



Figure 1 Shuca-making process

3. FINDINGS

The Shuca product is the latest innovative tissue product made from cassava peel waste. This product offers several advantages, including easy decomposition, antibacterial properties, and a compact travel size. The name “Shuca” is taken from a combination of the words Tissue and Cassava which means tissue made from cassava skin. Shuca's tagline is "Safe for the Earth" because using Shuca helps protect the Earth from deforestation. It is made with special ingredients that are effective for cleaning and killing germs on eating utensils. Shuca, with its compact travel size, is beneficial for users who frequently engage in travel activities such as picnics, nature tourism, and mountain climbing, as it saves space and is easy to carry anywhere. It can also easily decompose, making it an environmentally friendly tissue product. Apart from that, Shuca has a variety of aromas, such as lime, betel leaf, peppermint, and green tea aroma. Here are examples of Shuca packaging design shown in Figure 2.



Figure 2 Shuca packaging

4. CONCLUSION

Shuca is an innovative antibacterial tissue product made from cassava peel waste, available in lime, betel, peppermint, and green tea aroma variants. Cassava peel waste is utilized as an alternative to wood as the primary raw material for producing tissue. This approach aims to decrease tree cutting in Indonesia and enhance the market value of cassava peel waste, which is typically discarded. Therefore, Shuca can serve as a viable alternative to conventional tissue products, contributing to environmental awareness and sustainability through the use of eco-friendly materials.

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