Eco-friendly packaging design made from teak leaf as the outer packaging layer for brownies

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Abstract. This study aimed to seek a packaging design concept using environmentally friendly material. There are lots of dried teak leaves that pollute the yard. Without proper management, these leaves become garbage or rot and pollute the environment. This research applied qualitative descriptive method which is supported by quantitative analysis to determine the effectiveness of the environmentally friendly packaging design and market interest strategy for brownies. The creative design of environmentally friendly packaging from teak leaves was created to cover plain cardboard. The goal is to avoid the use of chemicals, namely kerosene, thinner, or printing ink. Instead of printing the cardboard, it is coated with dried teak leaves. This practice is environmentally friendly and has aesthetic values. It is expected to attract potential consumers who care for the environmental preservation.

1. Introduction

The use of plastic packaging can have a serious impact on the environment. According to data, almost every person uses 100 kg of plastic per year, and 100,000 tons of plastic waste will end up in waterways and into the ocean. If people do not take action on this matter, plastic pollution can threaten the marine wildlife and contaminate their food chain. Switching to eco-packaging is the most viable solution to minimise this problem. Packaging manufacturers and business entities have a huge role to play in putting environment-friendly packaging in the mainstream. With plastic pollution growing at an alarming rate, industries need to reduce its use and turn to the alternatives. There are also some types of packaging that can be recycled and not all of them will cause environmental damage. However, the procurement of raw materials used to produce these environmentally packaging still requires considerable energy. Being eco-friendly has become a buzzword for both companies and consumers. It indicates that individuals or companies can make changes to minimize the negative impact of plastic waste in the world.

Packaging is used as a medium to convey product attributes and brand image [1]. Product packaging displays the product’s quality, prestige and selling values. It also differentiates a product from its competitors. Product quality is an important aspect in influencing consumers’ purchasing intention and satisfaction [2]. Buying interest of a product is influenced by consumer’s behaviour which includes psychology, sociology, anthropology, history and economics. The economic level of consumers has a significant effect in determining the products consumed [3]. At this time, the demand for green products increases significantly. The issues of global warming and the increasing amount of waste in the environment are some of the factors that affect consumers. Many consumers are more aware of the
importance of protecting the environment. With consumers who understand green behaviour, the demand for green products increases. These demands include green products and environmentally friendly packaging [4].

The concept of green products has a significant effect on consumer perceptions. Consumers assume that green products have a higher quality compared to other products in general. Companies can also develop eco-friendly packaging in line with their eco-friendly products. Some of the eco-friendly material that are commonly used as packaging are banana leaves and corn husks. The green packaging offers a different packaging concept compared to product packaging in general. In this study, the author conducted a research related to teak leaves that can be used as the outer packaging of brownies product. This study aimed to process teak leaf waste into an environmentally friendly packaging design. The goal is to avoid chemicals, namely kerosene, thinner, printing ink. The inner cardboard is not offset printed but coated with dry teak leaves.

2. Methods
This study was conducted by giving training and mentoring to brownies business owners using a participatory and collaborative approach to develop innovations. The researcher team provided direction, guidance and coaching to brownies business owners so that they can be developed more professionally in terms of quality standardization, product hygiene, and safe packaging procedures using unique packaging from teak leaf waste as the outer layer. The research focused on the development of packaging made from dried teak leaves as the outer packaging according to eco-friendly principles. This research was conducted using action research and descriptive qualitative research approaches. The data were collected through several methods, including field observations, in-depth interviews with the brownies company owners, and literature and document study. The sampling was carried out using purposive sampling technique. The data were analysed using an interactive analysis model. The action conducted was designing a prototype of packaging outer layer using teak leaf waste for brownie packaging. In addition to action research analysis, this study also assessed the potential of utilizing teak leaf waste to support the development of environmentally friendly packaging. The teak leaf waste packaging was used as outer cover of plain paperboard packaging.

3. Results and discussion
The study developed a packaging design innovation and promotion through social media for small food business in rural communities. By developing a visual branding identity, a product will be more attractive and in line with the market demand, thus increasing the selling value of brownies. Brownies are made from flour, butter, sugar, eggs, melted chocolate, and almonds. The basic recipe for brownies has not changed much for hundreds of years. Nowadays, brownies have undergone many modifications with various additional flavours such as cheese brownies, bananas, blueberries, strawberries, nuts, coffee, and many other variations. Likewise, the production process is not only limited to baking, but it can also be steamed, which is known as steamed brownies. This flavour variant was also adjusted to the colour of the outer packaging. The waste layer of teak leaves was chosen in a different colour, because dry teak leaves have colour variants such as light brown, yellowish brown and light brown. The concept of green packaging will be a unique packaging concept and strategy to enhance the appearance of brownie products.

Consumer knowledge about environmentally friendly products affects their decision in buying green products. Some studies show that the green packaging has a positive and significant effect on consumer perceptions. Consumers assume that using and consuming green products means participating in contributing to protecting and preserving the environment [5]. Green products usually have a more expensive price when compared to other products in general. Thus, it is necessary to pay attention to the target market of green products [6]. Green products generally use selected raw materials that have good quality and benefits for consumer health and environmental sustainability. Good quality green products will give satisfaction to customers [7]. Green packaging has a direct effect on buyer’s interest in a product and consumers are faced with many choices of products [8]. By considering consumer interest
and the concept of green packaging or eco-friendly product design, the research was carried out to create an eco-friendly brownie packaging designs using teak leaf waste. The dried teak leaves was used as the outer layer of the brownies packaging.

3.1. Layers of packaging.
Product packaging has three layers namely inner layer, outer layer, and the packaging itself. You may need one or all three of these depending on the product type. Inner layer keeps the product safe. It usually fits the product’s shape and texture. It can be wrapper paper or other material. It can also be a sealed bag that aims to preserve the freshness of product. Outer layer the first thing a customer will see. It protects of products from external elements. This can be a box in which the product is shipped or a shopping bag used to contain the item at store. And the product packaging is the presentation that a customers will remember the product.

![Diagram of packaging process](image)

**Figure 1.** Packaging process

3.2. Layers of teak leaf waste
The teak leaf waste will become the outer packaging after the cardboard packaging. The initial process done was pasting dry teak leaves on a plain cardboard. The pasting process used natural glue, without chemicals, that does not affect the quality of the brownies. Teak leaves have a long shelf life, with an estimated 2-3 months. Brownies it only lasts 5 days. So the comparison of the duration of shelf life is that the outer packaging will last longer than the product. Figure 1 shows the stages and processes of brownies production process to packaging, from the cardboard box process, teak leaf coating, wood glue coating, and moulding process. After brownies are cooked and ready to be put in the packaging, (Figure 2) the teak leaf waste is sorted and prepared. The selected leaves are those that are good and not damaged. After that, the next step was to eliminate bacteria and fungi (Figure 3). Brownies packaging design from teak leaf waste design is ready for packaging (Figure 4).

![Image of brownies](image)

**Figure 2.** Brownies
Conclusion

The research results conclude that eco-friendly packaging using green packaging concept has a significant effect on consumer perceptions. It is because consumers tend to select products with environmentally friendly and recyclable packaging. Green packaging also has a significant effect on consumer perceptions on protecting the environment. Utilization of teak leaves as the outer layer of brownie packaging will increase sales and product value. Another value is that using dried teak leaves as a cover to plain non-printed cardboard prevents the use of chemicals, namely kerosene, thinner, and printing ink. Further research related to the utilization of teak leaf waste to reduce waste and develop the concept of green packaging is necessary.

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