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Article

**Kolang-Kaling Leather as Raw Material for Making Paperboard**Yudi Primatama<sup>1\*</sup>, Neti Wulandari<sup>2</sup>, Ulfa Nur Uswatun Hasanah<sup>3</sup><sup>1, 2, 3</sup> Institut Agama Islam Negeri Ponorogo, Ponorogo\*Corresponding Address: [yudiprimatama@gmail.com](mailto:yudiprimatama@gmail.com)**Article Info**

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**ABSTRACT**

Kolang-kaling has become one of the superior commodities in Indonesia by contributing to kolang-kaling skin waste that has not been absorbed properly. Kolang-kaling skin contains high cellulose so it has the potential as raw material for making cardboard paper. So it is necessary to modify the raw materials of cardboard, one of which is kolang-kaling skin waste, kolang-kaling leather waste in the Ngebel area is not used, and even has the impact of polluting the surrounding environment and harms the community. This study aims to introduce kolang-kaling leather waste innovations modified by cardboard raw materials as an alternative to quality papermaking. The method used in this study is an experimental method that begins the planning, design, and data collection stages (physical characteristics test, durability, compressibility test, and organoleptic hedonic test). The results of the physical characteristics test that the product is brightly colored, odorless, and easy to bend while the durability test results that the product has higher resistance are weighed by other papers, and the results of the comprehension test that the product is elastic and easy to form and the results of the organoleptic hedonic test that the product can be accepted by the public because it is easy to apply. Based on these results, it can be concluded that cardboard from kolang-kaling waste is good quality and is suitable for use.

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**INTRODUCTION**

Kolang-kaling has become one of the superior commodities in Indonesia by contributing to kolang-kaling skin waste that has not been absorbed properly. Kolang-kaling also called palm fruit is usually used for additional processed drinks. Kolang kaling processing is increasing in various regions along with the increase in public demand for kolang kaling fruit in Ramadan, one of which is in Ngebel Village. The abundant supply of kolang-kaling resulted in a large number of skin piling up due to the lack of utilization and innovation of kolang-kaling skin waste. Public attention to kolang kaling skin waste which is very low causes environmental pollution. Kolang kaling skin contains high, lignin, hemicellulose, ash, abstract,

water, and oxalate which can be used properly, one of which is as a material for making cardboard (Fitriani, 2021).

Based on data from the Ministry of Industry of the Republic of Indonesia in 2022, paper consumption in Indonesia reached 18.26 million tons per year, occupying the 8th position in the world. The cellulose content made from wood is used as the main material for making paper, proven by its use in more than 90% of the pulp industry in Indonesia. Cellulose (C<sub>6</sub>H<sub>10</sub>O<sub>5</sub>) is characterized by white color, large tensile skin, and more than 50% contained in wood (Susi & Wijaya, 2008). Cellulose as a polysaccharide is a substance forming the skin of plant cells that are insoluble in water (Fengel, 1995).

Cardboard is a material that is commonly used for packaging raw materials such as cardboard, cigarette product packs, and household products (Jamilatussholihah & Ahda, 2021). Technological developments influence the increasing demand for paperboard, where the production of 1 kg of paper requires trees which at least have a 2-3 times heavier impact on the availability of green forests in the world and drain the availability of fresh water. The advantages of using cardboard include easy recyclability, lightweight, quite sturdy, practical, and economical (Ihwah & Ekatama, 2019). Modification of paperboard raw materials, namely using kolang-kaling leather waste, can minimize the impact of environmental pollution. This study aims to introduce kolang-kaling leather waste innovations modified by cardboard raw materials. Therefore, this study tries to find more value from materials that are usually ignored by the public, namely kolang-kaling leather as an alternative material for making quality paper through several test parameters.

## **METHODS**

The utilization of kolang kaling skin waste is carried out through qualitative research methods with experimental-based action research models. This method is supported by a material exploration approach through theoretical and practical studies to explore the potential value contained in kolang kaling skin as raw material so that it can have novelty value, to be developed into products that have high quality. Therefore, special treatment is needed to break the attractiveness of the community to utilize the kolang kaling skin waste. There are many alternative outcomes of these material exploration activities, one of which is in the form of modules.

### **Tools and Materials**

The tools needed in this study include hammers, containers, coopers, blenders, blacu cloth, 80 mesh sieves, spoons, and screen printing. While the materials needed are kolang-kaling leather, waste paper, wood glue, and water.

### **Manufacturing Method**

#### **1. Making Kolang-Kaling Skin Powder**

The initial stage of the process of making kolang-kaling skin powder by washing sterilizing and drying with the help of direct sunlight. The estimated drying time is adjusted to the intensity of the sun's heat. The drying process determines the quality of the skin and can reduce itching on the skin of the kolang-kaling. The dried skin is crushed into small pieces of kolang-kaling skin, so a smoothing process is needed again using a cooper to become powder. The powder produced at the grinding stage requires sieving using an 80 mesh sieve to obtain a fine particle size.

#### **2. Pulp Making**

Waste paper is torn into pieces to blend by adding water. Making waste paper pulp is like a process in general by soaking and grinding with the help of water.

#### **3. Making Koka-Paper**

The best Koka-Paper formulation is obtained from the ratio of the use of kolang-kaling skin powder with 3:1 paper pulp. Making waste paper pulp is like a process in general by

soaking and grinding with the help of water. Mixing kolang-kaling bark powder with waste paper pulp with a blender. Wood glue is melted or more diluted with the help of water in a ratio of 2:1. Thawing glue can be done by any method, in general, it will not reduce the quality of glue. The diluted wood glue is mixed into the Koka-Paper dough and stirred manually using a stirrer. The dough made is certainly not too thin or excess water to facilitate the printing process. The next process is printing using screen printing with the help of blacu cloth and a sponge. A flat blacu cloth is prepared on the screen printing screen. Koka-Paper dough is poured over blacu cloth of the desired thickness of 1 mm, 2 mm, or more. The dough is flattened using a spoon or other tool with a sponge as a moisture content lifter. Once flattened, the top of the dough is covered again with blacu cloth to give it the same texture-smoothing characteristics as the bottom. The mold is dried in the sun in direct sunlight.

## **Test Methods**

### **1. Test the Physical Characteristics of Koka-Paper**

The physical characteristics test of Koka-Paper was carried out with the parameters of paper surface smoothness, foldability, color, and tear power of Koka-Paper with similar paper comparators. The physical characteristics test of Koka-Paper aims to determine the level of quality and feasibility of developing Koka-Paper as cardboard in general (Fatkurrahman et al., 2012).

### **2. Koka-Paper Durability Test**

The Koka-Paper durability test is carried out by immersion process of parameters that are used as references, namely buoyancy, tear power, and color. The Koka-Paper durability test aims to determine the effect of kolang-kaling skin composition as raw material on the durability of Koka-Paper (Jarupan et al., 2022).

### **3. Koka-Paper Compressibility Test**

The Koka-Paper Compressibility Test is tested by mass load treatment to measure the elasticity and plasticity of Koka-Paper products. The compressibility test aims to determine the sensory properties of Koka-Paper to meet paper quality standards by adjusting the runway of the paper (Akbar & Febriani, 2019).

### **4. Koka-Paper Organoleptic Hedonic Test**

Organoleptic hedonic tests were conducted on more than 150 people ranging in age from 12-57 years from students, entrepreneurs, general workers, paper producers, and the wider community. This aims to determine the magnitude of quality and level of liking for innovative products with similar products.

## **RESULTS AND DISCUSSION**

Testing the physical characteristics of Koka-Paper resulting from a mass production, innovation, and recycling process needs to go through the visual physical observation stage (Marwan, 2017). The results of visual observations were carried out with parameters of paper surface smoothness, folding power, color, and tearability of paper with similar paper comparisons (Sukaryono & Loupatty, 2018). Koka-Paper is a cardboard innovation that has good quality in terms of physical test parameters (Figure 1).



**Figure 1.** Koka-Paper

Based on Figure 1, the physical characteristics of Koka-Paper are high quality from various aspects. The color of Koka-Paper tends to be bright without any bleaching process in the manufacturing process. The surface texture of Koka-Paper is suitable for cardboard standards in general. The characteristic smell of kolang-kaling skin is lost or odorless compared to factory cardboard. Koka-Paper bends easily and wrinkles less easily, so the folding data is better. The sun's heat with regular heat intensity will support Koka-Paper into better quality paper, Koka-Paper is easy to cut and can be torn. The physical characteristics of Koka-Paper obtained are still on an experimental scale with simple tools. Of course, the quality of Koka-Paper will be better when the process is carried out in factory production with more sophisticated tool construction.

Based on the test results, the paper resistance index is influenced by grammar, moisture content, cellulose fiber, and humidity (Prabowo, et al; 2021). Grammar is reviewed based on paper mass and moisture content affects the tear strength of the paper so that the higher the paper mass, the stronger the tear resistance (Ariyani & Hidayati, 2012; Indriati & Elyani, 2018). Conversely, the more the amount of moisture content is on the paper, the paper will be easily torn. Paper sheets with high cellulose content have high tear resistance, and vice versa (Nairfana et al., 2023; Ahmadi et al., 2018). Koka-Paper was tested with water to prove the tear resistance index by the ratio of factory cardboard (Figure 2).



**Figure 2.** Koka-Paper (left) and cardboard (right) soaked in water

Based on figure 2, Koka-Paper has a higher resistance than cardboard in general. Koka-Paper stays afloat for 15 minutes, while cardboard lasts less than 10 minutes after sinking. The color of the marinade changes equally, but Koka-Paper is superior in tearing power.

The plastic and elastic properties of Koka-Paper are tested through compressibility tests. Plastic means easy to shape and elastic means flexible with superior quality if after pressing or pulling does not change the original character of the paper. Based on the results of compressibility testing, Koka-Paper is strong enough to withstand a mass of about 500 grams for 1 hour of testing. The compressive force of the load does not change the original character

of Koka-Paper in the slightest. This is in accordance with the characteristics of Koka-Paper which is easy to bend, easy to cut, and not easily wrinkled (Figure 3).



**Figure 3.** Koka-Paper compressibility test

Organoleptic hedonic tests were conducted on more than 150 people ranging in age from 12-57 years from students, entrepreneurs, general workers, paper producers, and the wider community. This aims to determine the magnitude of quality and level of liking for innovative products with similar products. Koka-Paper has a very fond interpretation of the parameters of texture, color, smell, and uniqueness. Many people are interested in the innovation of Koka-Paper which is easy to apply to the manufacturing process and has a uniqueness in its physical characteristics. The difference in the quality of Koka-Paper compared to cardboard in general as a whole is acceptable to the public. Koka-Paper innovation gives people have a relatively high appeal.

Koka-Paper is an innovation in the use of kolang-kaling waste as an alternative raw material for making cardboard paper. However, with various experimental formulations that can be carried out with various methods, of course, the usefulness of Koka-Paper can be developed in the realm of innovation of other broader ideas. Koka-Paper as a substitute for cardboard can be used or used like cardboard in general. This paper can be scribbled, cut freely, shaped anything, and become an idea for various craft tasks. With the production of Koka-Paper that is more constructed and facilitated, of course, various types of paper will be produced that can be used as usual. Kolang-kaling leather waste that is abundant in the archipelago with a low utilization rate will be a high opportunity to be used as a suitable item like our innovative Koka-Paper (Figure 4).



**Figure 4.** Application of Koka-Paper

Koka-Paper has a uniqueness that distinguishes it even better than cardboard competitors in general. Simple techniques can be applied by low society and paper producers so that it becomes a profitable business idea. The quality of Koka-Paper can be like cardboard in general even superior with the right processing method. This innovative idea can increase people's

interest and knowledge to turn valueless goods into valuable goods. The introduction and implementation of Koka-Paper can be applied through community service activities, especially by students in a work program, which will make community acceptance higher with technical arrangements and appropriate guidance. The existence of this innovation is expected not only to be a written idea but can be concretely applied by the wider community.

## CONCLUSION

Koka-Paper as an innovation in the use of kolang-kaling waste, an alternative raw material for making paperboard, has a quality that is suitable for use like cardboard in general. Physical characteristics tests prove the quality of Koka-Paper has better quality. Koka-Paper has a higher resistance than cardboard in general according to durability tests. The compressibility test provides elastic and plastic power Koka-Paper can withstand a mass of 500 grams. With organoleptic hedonic testing, it reinforces innovation ideas, can be accepted by the community, and becomes a high-profit business opportunity.

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