



## GRAMMATUR AND DENSITY OF VARIOUS TYPES OF PACKAGING PAPERS

Aulia Andhikawati<sup>1,2\*</sup> and Rega Permana<sup>1,2</sup>

<sup>1</sup>K. Pangandaran Fisheries Study Program, PSDKU UNPAD Pangandaran, Pangandaran Regency, West Java

<sup>2</sup>Department of Fisheries, Faculty of Fisheries and Marine Sciences, Universitas Padjadajran, Sumedang, West Java

Corresponding author: [uli07aulia@gmail.com](mailto:uli07aulia@gmail.com)

### ABSTRACT

Paper has many functions, one of which is packaging. The goal is the same, namely to prevent food contamination by microbes around it. Paper food packaging is the type of packaging that is most often used to wrap food. This type of paper food packaging has advantages including: light weight, relatively cheap and space-saving, flexible. This advantage makes the use of paper increasing. The purpose of this study was to determine the effect of different types of paper on the grammatur and density of the paper. The types of paper used are parchment paper, newsprint, paperboard and HVS paper. Data collection was carried out with two replications. The data were analyzed by ANOVA of two factors, namely the effect of paper type on density, and the effect of paper type on grammage with 95% confidence. The results showed that different types of paper showed significant differences ( $p < 0.05$ ) on the value of density and paper grain. grammatur of parchment paper was 20 mg/m<sup>2</sup>, paperboard paper was 150 mg/m<sup>2</sup>, HVS paper was 90 mg/m<sup>2</sup>, and newsprint of 55 gr/m<sup>2</sup>. while the density value of parchment paper is 0.44 gr/m<sup>2</sup>, paperboard is 1.875 gr/m<sup>2</sup>, HVS paper is 1.08 gr/m<sup>2</sup>, and newsprint is 1.4 gr/m<sup>2</sup>.

Keywords : Grammatuur, density, newsprint, HVS paper, parchment paper, paperboard

## INTRODUCTION

Packaging is one way to provide the right conditions for food to maintain its quality in the desired period of time. The main function of packaging, among others, is to protect food products due to contamination, namely to protect food against physical damage, and to prevent quality damage. Packaging needs to be done not only to protect the product, but also to increase its aesthetic value so as to increase its attractiveness to consumers. The packaging used must be airtight to reduce the occurrence of product oxidation, the packaging must also be able to hold water vapor in order to prevent product evaporation during storage [1]. One of the packaging of food products is to use paper packaging. According to [2], paper packaging is packaging that is easy to form by following food products. As a packaging material, paper has many advantages, namely cheap, recyclable and easily degraded. However, this paper also has drawbacks related to its resistance to water. Therefore, so far, paper is mostly used to package dry products. However, paper has also begun to be developed by providing various treatments during its production, so that paper is able to pack products with high water content well. Paper packaging was the most widely used packaging before the invention of packaging using plastic and aluminum foil. However, until now it is still widely used because it is cheap, easy to use and has wide or flexible uses [3].

According to [2], the properties of paper packaging are highly dependent on the manufacturing process and additional treatment in the manufacturing process. Paper packaging can be flexible packaging or rigid packaging. Several types of paper that can be used as flexible packaging are kraft paper, grease proof paper (grease proof). Glassin and waxed paper or paper made from modifications of these papers. Rigid paper containers are available in the form of paperboard, boxes, fiber cans, drums, waterproof cups, tetrahedral packaging and others, which can be made from paperboard, laminated paper, corrugated board and various types of paper boards. special. Paper containers are usually re-wrapped with other packaging materials such as plastic and metal foil which are more protective.

Based on this description, it is necessary to conduct research on the characteristics of various types of packaging paper. Characteristics of paper in the form of density and paper grammage so that it can determine the level of paper strength. Paper as a packaging material can protect food products from contamination and can maintain the quality of packaged food products.

## METHODOLOGY

### *Research Time*

This research activity was carried out in November 2021. The activity was carried out at the tropical marine and fisheries laboratory at PSDKU UNPAD Pangandaran located in Cintaratu Village, Parigi District, Pangandaran Regency.

### *Tools and Materials*

The tool used in this study is a caliper with an accuracy of 1 mm. A caliper is used to measure the thickness of the paper, a scale with an accuracy of 0.001 g to measure the weight of the paper, a ruler with an accuracy of 1 mm to measure the length and width of the paper, scissors to cut paper, and stationery. While the materials used are newsprint, HVS paper, parchment paper, and paperboard.

### *Research Procedure*

1. Prepare tools and practicum materials
2. Each paper material is measured 10x10 cm with a writing utensil, then cut with scissors into several pieces
3. Per unit sheet of paper 10x10 of each 4 types of paper is weighed and recorded
4. Each the thickness of the paper is measured using a caliper by stacking several papers until they reach a minimum thickness and dividing by the number of paper units used to stack
5. After obtaining the results of weight and thickness, they are recorded in a book

6. Finding density and grammage using a formula based on weightpaper thickness
7. Record the results obtained from the calculation

### Testing Procedure

#### 1. Calculation of Grammatur

Grammatur paper is a value that indicates the weight of paper per unit area (g/m<sup>2</sup>), while density is the weight per unit volume (g/m<sup>3</sup>). paper measuring 10x10 cm is measured by weight as much as 2x.

$$\text{Grammatur (g/m}^2\text{)} = \frac{\text{Bobot contoh (g)}}{100 \text{ cm}} \times \frac{10000 \text{ cm}^2}{1 \text{ m}^2}$$

#### 2. Calculation of density Paper

Density is obtained by dividing the paper grain and paper thickness. The thickness of the paper was measured using a micrometer screw in five different places and the average was taken

$$\text{Densitas (g/m}^3\text{)} = \frac{\text{Grammatur Kertas}}{\text{Tebal Kertas (m)} \times 1000}$$

### Data Analysis

This research was conducted by treating various types of paper with two repetitions of the density and grammatur of the paper. The experimental design was carried out using a 4x2 factorial completely randomized design. The data were calculated using a two-way ANOVA test with a 95% confidence interval and continued with the DUNCAN test to determine the effect of paper type on paper density and grammatur.

## RESULTS AND DISCUSSION

Paper packaging was the most widely used packaging before the invention of packaging using plastic and aluminum foil. However, until now it is still widely used because it is cheap, easy to use and has wide or flexible uses [3]. Packaging is one of the important factors in a food and non-food product business. Packaging is the main attraction and characteristic of a product in attracting consumers, besides that packaging also functions to protect the product from contamination, and extend the shelf life. According to [4], the selection of packaging materials is an important consideration in a business, one of which is paper packaging. Paper materials are widely used as packaging, especially for food products. In the selection and determination of paper as packaging material, of course, it is necessary to carry out basic considerations such as the characteristics of the paper material, appearance or appearance **and the prices offered** tend to be affordable. The results of the density and paper grain test are presented in Table 1.

Tabel 1. Test of grammatur and density of packaging paper

Type of paper	Grammatur (g/m <sup>2</sup> )	Density (g/m <sup>2</sup> )
Parchment paper	20a	0,445e
Paperboard	150b	1,875f
HVS paper	90c	1,08g
Newsprint paper	55d	1,4h

Data marked lowercase letters indicate a significant difference ( $P < 0.05$ )

Based on the results above, it shows that different types of paper give significant differences in the grammaturity and density of the paper ( $P < 0.05$ ). The highest grammage and density of paper are on paperboard, while the lowest grammage and density are on parchment paper. According to SNI 8218: 2015 concerning the quality standards of paper and paperboard for food packaging, low grammage of paper is: 26-210 g/m<sup>2</sup> [5]. The thickness of the packaging material affects the protective ability of the packaging. The thicker the packaging, the higher the ability to protect [6]. Based on the results of the grammage test, it shows that each paper has different results. Research [5], states that paper grammage has a mass of raw material and adhesive concentration which significantly affects the resulting art paper grammage. The higher the mass of the raw material, the heavier the grammage of the paper produced. The density of a package has an inverse relationship with its permeability. The higher the density, the lower the permeability. Conversely, the lower the permeability, the ability of the packaging to hold air into the package [7].

Paper has characteristics based on its weight or thickness. The properties of paper packaging are highly dependent on the manufacturing process and additional treatments in the manufacturing process. Paper packaging can be flexible packaging or rigid packaging. From the four types of paper above, it can be explained that using parchment paper is safer than using newsprint, HVS paper, and paperboard. This is because it is seen from the characteristics and texture of the paper on the food product to be packaged, where the characteristics of parchment paper have a glass-like surface and are transparent, have high resistance to grease, oil and oil, even though parchment paper is not resistant to water, but in terms of the safety of the packaging, the safer the parchment paper. The surface of the packaging material greatly affects the ability of the packaging to be protected. The rougher the surface, the more damage the product appearance will be. Rough surfaces will cause friction against food products, causing food migration and damage to packaged materials. In the paper type identification stage, paper with a high strength type is used in secondary packaging such as paperboard. Whereas in the description of the paper/packaging pattern, it can be seen that the method or pattern of packaging a product with other products differs in terms of shape, size, type of paper used and the size or size used depending on the size of the product to be packaged. the use of less raw materials, lower energy consumption for paper packaging processing and good storage space efficiency [8].

The thickness of the packaging material greatly affects the ability to protect food product ingredients from being damaged. The thicker the surface of the packaging material, the higher the ability to protect the food. The thickness of the packaging material will give the impression of being rigid and not easily formed, so that the product can be protected from impact, crushed or folded. The thickness irregularities on each side of the paper are caused by the thickness of the packaging material from the material it is made of. From the results of practical observations, measuring the thickness of the paper using a caliper is more accurate and effective.

According to [9], explaining in his research that newsprint is not good enough or even unfit to be used as a packaging material for fried foods or other food products because it has a fairly high lead content. The lead content in used newsprint can actually move into fried foods which if consumed in the long term continuously can cause various indications of digestive diseases or even cancer. Newspaper has the characteristics of being light, easy to shape, and able to

absorb oil and water content in its contents. food products [10]. In addition, this paper tends to be easy to obtain and has a relatively cheap price. This is a consideration for traders to reduce processing packaging costs. HVS paper is usually used as a packaging material for dry foods, crafts, promotions and others because it is flexible or easy to create a printed form with the packaging to be packaged [11]. According to [12,] it is quite strong and easy to get at a low price. HVS packaging is considered to be of better quality than Newspaper because it does not contain ink and has a low potential for lead content

## CONCLUSION

The results of testing the physical characteristics of various types of paper showed significantly different results. Different types of paper produce different values of density and paper grain. Newsprint, HVS paper, paperboard, and parchment paper showed significant differences in density and grammaturity ( $P < 0.05$ ). grammaturity of parchment paper is 20 mg/m<sup>2</sup>, paperboard is 150 mg/m<sup>2</sup>, HVS paper is 90 mg/m<sup>2</sup>, and newsprint is 55 gr/m<sup>2</sup>. while the density value of parchment paper is 0.44 gr/m<sup>2</sup>, paperboard is 1.875 gr/m<sup>2</sup>, HVS paper is 1.08 gr/m<sup>2</sup>, and newsprint is 1.4 gr/m<sup>2</sup>.

## References

- [1] Dewi, Sri Sinto, Ethica, Stalus Norm, Rahmawati, A., Nurkuntari, Y., & Wikaasatri. "Yoghurt Packaging Training with Cup Sealer Machine for Groups". UNIMUS National Seminar Proceedings, Vol 2(1), pp. 126–130, 2019
- [2] Elisa J, and Mimi N, Packaging Technology, Textbook, Faculty of Agriculture, University of North Sumatra, 2006
- [3] Suardana, IP, Ratnawati, T., & Kusmaningtyas, A., "Packaging Axiology" Small Business And Customer Perspective in Sidoarjo". Journal of Economics & Management, pp. 97-106, 2019
- [4] Paramita, AL, "Analysis of paper selection as raw material for packaging boxes at CV. Surya Cemerlang uses the analytic hierarchy process method", Journal of Economics and Business, Vol. 20(3), pp. 163-170
- [5] Arga AF h., Yenie E, Sasmita A., "The Effect of Variations in Adhesive Concentration on the Mass of Raw Materials in Aseptic Packaging Carton Recycling", Online Journal of Engineering Faculty Students, Vo. 4(1), pp. 1-14, 2017
- [6] Apriani, E., "The Influence of Raw Material Composition and Cooking Time on Tensile Strength in Making Art Paper from Waste Corn and Used Paper", Journal of Mechanics and Thermal Systems, Vol. 1, pp. 38-42, 2016
- [7] Sukaryono, AD, and Loupatty VD, "Paper characteristic of used paper and seaweed waste *Eucheuma cottonii*", Bi-am Magazine, Vol. 14(2), pp. 81-85, 2018
- [8] Agustina, H. Practical Report on Paper Packaging and Storage Technology, Banjarbaru: Department of Cultivation, Faculty of Agriculture, University of Gastric Mangkurat, 2013
- [9] Suwaidah IS, Achyadi NS, and Cahyadi W., "The study of lead leached from waste paper packaging into fried foods", Penel Gizi Makan, Vol. 37(2), pp. 145-154, 2014
- [10] Suhartono, & Iskandar, R "The effect of the use of various types of paper packaging on the shelf life of cabbage". Journal of Siliwangi Science And Technology Series, 3(2), 222–229, 2017
- [11] Utami, MP "Use of Materials in Processed Food Packaging for MSME Products in Semarang". Journal of Visual Communication Design and New Media, Vol. 3(1), pp. 22-27, 2020
- [12] Nugraheni M., Food Packaging, Yogyakarta: Plantaxia, pp. 178, 2018