© IJARW | ISSN (O) - 2582-1008
January 2024 | Vol. 5 Issue. 7
www.ijarw.com

ANALYSIS OF GRAMMAGE AND DENSITY VALUES OF VARIOUS TYPES OF PAPER AS PACKAGING

Aulia Andhikawati[1], Rega Permana [2]

Tropical Marine Fisheries Study Program, PSDKU UNPAD Pangandaran, Padjadjaran University, West Java, Indonesia

ABSTRACT

Packaging is a material used to protect a product. In addition to protecting a product, packaging can also be used for the identity of the product itself. The method used in this article uses laboratory experiments and literacy studies from reliable sources. The purpose of this article is to calculate the grammage and density values of several paper packaging materials such as oil paper, cardboard, newsprint and HVS paper. The result of this article is that grammage and density affect the packaging material of a product. The more the weight value of the paper, the higher the grammage of the paper material, if the grammage value is high, it will affect the density value of the packaging material. The highest grammage is paperboard with a value of 144.73 g/m2, while the lowest grammage is oil paper with a value of 31.47 g/m2. The highest density value is oil paper with a value of 10.85 g/m3 and the lowest is newsprint with a density value of 6.12 g/m3.

Keyword: paper, packaging, grammage, density

1. INTRODUCTION

Packaging is a technique to protect products from being damagedaffect the quality of the product. Packaging is a method for protecting and preserving both food and non-food products (Rahmawati 2013). According to Agustina et al. (2011), packaging is the process of wrapping, packaging or containing products using certain materials so that they can protect the products contained therein. On the other hand, product packaging is the packaging or wrapping part of a product. The function of packaging is as a container or place, protector, facilitate storage to support transportation, and as a marketing tool (Rahmawati 2013).

Paper is a medium that is needed in many activities. Paper is not only used for writing, but can be used as packaging, invitations, banknotes, and so on. Paper is made from wood fiber as raw material, so making paper requires lots of trees to support it (Damayanti et al. 2022). Packaging is a material that has the ability to protect food. Apart from protecting foodstuffs, packaging is also a means of promotion and information regarding the foodstuffs being packaged (products), there are many different types of packaging with various different packaging materials circulating on the market, starting from plastic packaging, paper, glass, cans, and wood (Indraswati 2017). One type of packaging material that is most widely used to package foodstuffs, namely paper, is a sheet structure made from pulp and other materials as additional materials with certain functions.

Packaging requirements in Suwaidah et al. (2014), namely that packaging materials are not toxic and must guarantee sanitation and health requirements. Packagers themselves have various types of packaging materials that can be used depending on the type of product to be packaged. One type of packaging material is paper. Paper is a material that can absorb ink and is made from cellulose fiber, besides that paper can be used for writing, packaging and wrapping (Rahmawati 2013). Paper is often used for primary packaging and is the cheapest and easiest type of packaging to obtain. Paper is usually used for food that can be consumed directly in solid form. Apart from that, paper is also susceptible to damage, especially if exposed to oil and water (Suwaidah et al. 2014).

Paper is grouped into two, namely cultural or fine paper and industrial or rough paper. Cultural paper consists of printing paper and writing paper. Printing paper, for example, is white paper, paper colored printing, drawing paper and so on and examples of writing paper such as notebook paper, check paper and typewriter paper.

Meanwhile, industrial paper generally consists of paper for packaging and wrapping, for example Manila paper, kraft paper, greaseproof paper, glazed paper, pouch paper and so on. Paper is considered flexible packaging because its shape can be changed according to the shape of the product being packaged. The packaging form of the packaging material influences the efficient use of storage space, storage methods, production methods, and consumer appeal (Rahmawati 2013). The aim of this research is to determine the type and use of paper as packaging material, the properties and characteristics and advantages of the paper used.

2.MATERIALS AND METHODS

This research was carried out at the Tropical Fisheries and Marine Laboratory, PSDKU UNPAD Pangandaran Campus, in November 2023. The tools used were an analytical balance for weighing test paper, a ruler for measuring, scissors for cutting paper, calipers for measuring thickness, and writing tools. The materials used are paper consisting of oil paper, cardboard, HVS paper and newsprint.

The research process was carried out in several stages, namely measuring each paper to the same size, namely 10 x 10 cm using a ruler. Then cut out one sheet of paper of each type that has been measured and weighed. After that, measure the thickness of each sheet of paper of the same type until it reaches 0.1 cm using a caliper. Then calculate the grammage and density of each type of paper and record the results. The measurement results in the form of quantitative data are then analyzed descriptively.

Paper grammage is a value that shows the weight of paper per unit area (g/m^2). Formula used to calculate paper grammage, namely: Paper weight (g) multiplied by 10,000 cm2 and divided by 100 cm2. While Density is the weight per unit volume (g/m3), the formula for calculating density is: grammage weight divided by paper thickness (cm) multiplied by 1000.

3. RESULTS AND DISCUSSION

Grammage is a value that shows the weight of the material per unit area of the material. The higher the valueThe weight of the paper, the higher the grammatical value. This grammage value is also related to thickness. Meanwhile, the paper density value is influenced by the grammage value and thickness value. Paper density is obtained by dividing the grammage of the material by the thickness of the material. The density of a packaging has an inverse relationship with its permeability. The lower the permeability, the higher the ability of the packaging to prevent air from entering the packaging (Sukaryono and Loupatty 2019). Paper grammage will affect all the properties of the paper.

Table 1. Paper Grammage Measurements

Paper Type	Weight (g)	Thick	Grammage (g/m2)
Oil Paper	0.1347	0.0029	31.47 ± 2.25
Cardboard	1.4473	0.02	144.73 ± 3.05
Newspaper	0.4899	0.0080	48.99 ± 4.4
HVS	0.8676	0.0125	86.76 ± 2.15

Table 2. Paper Density Measurement

Paper Type	Weight (g)	Thick	Density (g/m3)
Oil Paper	0.1347	0.0029	10.85 ± 1.15
Cardboard	1.4473	0.02	7.24 ± 0.13
Newspaper	0.4899	0.0080	6.12 ± 1.05
HVS	0.8676	0.0125	6.94 ± 2.20

The highest grammage, namely 144.73 g/m^2, is cardboard paper which also has the largest weight and thickness values, while the lowest grammage is oil paper with the smallest weight and thickness values, namely only 31.47 g/m^2. The results of density calculations showed that the highest density value was oil paper with a value of 10.85 g/m3 and the lowest was newsprint with a density value of 6.12 g/m3.

Grammage can be known as the weight of the paper. The grammage value of paper is related to the thickness value of the paper (Damayanti et al. 2022). Grammage is the mass of a sheet of paper or cardboard in g divided by the unit area of paper or cardboard in square meters, measured under standard conditions (Warsiki 2017).

The highest grammage results were found on cardboard paper while the lowest grammage results were oil paper. The higher the weight value of the packaged sample, the higher the

grammage value. The higher the grammage value will be the better the physical strength of the paper such as tensile strength, tearing and tensile strength (Ariefta et al. 2019). High strength paper is used as secondary packaging such as cardboard and HVS (Pauline 2019). Secondary packaging, namely packaging whose main function is to protect other packaging groups (Fathimahhayati et al. 2019). Meanwhile, paper with low strength is used as primary packaging such as oil paper and newspapers. Primary packaging, namely packaging that directly contains or wraps food ingredients (Fathimahhayati et al. 2019).

The density results show that newspaper has the lowest density value while oil paper has the highest density because the nature of the type of paper used and the thickness of the packaging influence the density value of the packaging (Kaihatu 2014). Oil paper has a high-density value, because the short fibers of oil paper can fill the gaps formed by long fibers so that the fibers are evenly distributed (Ayunda 2013).

In packaging a product, it requires how much paper is used to wrap the product. The water content in the relative humidity of the air around the paper affects the grammage of the paper (Casey, 1981). Water content is included in the total weight of paper, the measurement of which must be in a standard condition expressed as grammage. Oil paper can be used as a packaging material, one of which is as a packaging material for diamond products. Oil paper is used as packaging material for diamonds, because this packaging material is easily available on the market and at an affordable price. Apart from being easy to obtain and affordable, oil paper has disadvantages such as paper, which is not waterproof, tears easily and is affected by environmental humidity. So, if this packaging material is used it can cause the product to be easily damaged (Novita et al. 2019)

4.CONCLUSION

Paper has different grammages and densities. The highest paper grammage is cardboard and the lowest is oil paper and the highest paper density is oil paper and the lowest is cardboard. The highest grammage is cardboard with a value of 144.73 g/m^2, while the lowest grammage is oil paper with a value of 31.47 g/m^2. The highest density value is oil paper with a value of 10.85 g/m3 and the lowest is newsprint with a density value of 6.12 g/m3. There are two key reasons for understanding the importance of this ratio. The competition between microorganisms and plants increases when high C:N ratios are added to the soil. This leads to N deficiency in plants as explained in the graphic. The ratio helps to determine the rate of decay of residues added to the soil and hence how

REFERENCES

[1] Rahmawati, F, "Packaging And labeling", Biomaterials, 29(34), 4471-4480. 2013

[2] Agustina, W, "Packaging Technology, Design and Labeling Food Products" Indonesian Institute of Sciences (LIPI). Subang, 2011.

[3] Damayanti, S., Daningsih, E., & Tenriawaru, AB Comparison of the Quality of Composite Paper from Sugarcane Bagasse and Newsprint Based on Concentration Different NaOH. Bioscientist: Biological Scientific Journal, 10(2), 620-630. 2022

[4] Indraswati, D. Food packaging. In Health Scientific Forum: Jakarta. Kaihatu, T.S. (2014). Packaging Management. Andi Publisher. 2017

[5] Suwaidah, IS, Achyadi, NS, & Cahyadi, W, Study of lead heavy metal contamination from used paper packaging into fried foods. Nutrition and Food Research (The Journal of Nutrition and Food Research), 37(2), 145-154. 2014

[6] Warsiki, E. Identification Of Indicators And Materials For Product Shelf Life Recorder Smart Label. Indonesian Fod Science and Technology, 1(1), 41-51, 2017.

[7] Ariefta, R., Dewi, EN, & Romadhon, R, "Potential of Eucheuma Cottonii Seaweed as Raw Material for Making Kraft Paper Bags (Eucheuma cottonii Seaweed has a good Potential as Raw Material for Making Kraft Paper Bags)", Saintek Fisheries: Indonesian Journal of Fisheries Science and Technology, 14(2), 81-85. 2019

[9] Pauline, E. A, Quality Assurance for Packaging Safety at the Jogja Packaging Center (Doctoral Dissertation, Atma Jaya University Yogyakarta). 2019

[10] Fatimahayati, LD, Halim, CI, & Widada, D, Fish Cracker Packaging Design Using the Kansei Engineering Method. Journal of Recavation, 7(2), 47-58. 2019

[11] Kaihatu, TS Packaging Management. 2014, Jakarta, Andi Publisher, Indonesia

[12] Ayunda, V, "Making and characterization of paper from pineapple and water hyacinth leaves", Saintia Physics, 2(1), 221257. 2013

[13] Casey, JP, Pulp and Paper, vol.II Second Ed. 1981, International Publishers Inc. New York

[14] Novitasari, E., Restuhadi, F., & Efendi, R., Estimation of the shelf life of diamonds packaged in oil paper and tapioca edible film using the accelerated method. Student Online Journal (JOM) in Agriculture, 6, 1-15. 2019

[15] Indraswati, D, Food packaging, In Health Scientific Forum, 2017, Jakarta.

[16] Hariyadi, P, Food Packaging: You Don't Get a Second Chance to Make a First Impression. Indonesian Packaging Industry Directory. Bogor, 2018

[17] Mukhtar, S., & Nurif, M, The role of packaging in increasing production results for consumers. Journal of social humanities (JSH), 8(2), 181-191. 2015