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Effect of seaweed powder (*Euchema cottonii*) as a source of fiber on preference level of puff pastry

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Abstract
This research aims to determine the effect of ratio of *Euchuema cottoonii* and wheat flour for making Puff Pastry to the level of preference of panelists. This research was held at the Fisheries Product Processing Laboratory, Faculty of Fisheries and Marine Sciences, Padjadjaran University in December 2019- February 2020. The method used in the research was the experimental method with the treatment of four ratio of *Eucheuma cottonii* powder and wheat flour use, that are 100 % wheat flour, 5% *Euchema cottonii* powder*:* 95% wheat flour, 10% *Euchema cottonii* powder*:* 90% wheat flour, 15% *Euchema cottonii* powder*:* 85% wheat flour. Data processing using Friedman Test and Bayes Test. The observations made are the hedonic test which includes appearance, aroma, texture and flavor. chemical tests that is crude fibre content test. The results showed Puff Pastry with ratio of 5% *Euchema cottonii* powder*:* 95% wheat flour use. which was most preferred by panelists with an average score of appearance was 7.60, aroma was 7.70, texture was 8.30 and flavor was 7,80. Chemical test results of fibre content was 27,12%.

Keywords: *Eucheuma cottonii*, preference level, puff pastry, ratio

1. Introduction

One of the most commonly used flour in Indonesia in both industrial and household is wheat flour. Wheat flour is a flour made from wheat grain through the milling process (Syarbini 2013) [1]. Usually, wheat flour was made into noodles, bread, cakes, and other (Rustandi 2011) [2]. Products that have the main raw material of wheat flour is a source of carbohydrates as well as having fibers that tend to be low and can cause excess weight (U.S. Department of Agriculture 2014) [3].

Fiber is a part of food that is not easily absorbed and nutritional contributions can be devoted, but food fibers have important functions that are not replaced by other nutrients. Although it is not digestible and absorbed by the human gastrointestinal tract, fiber has a very important.function to maintain health, prevention of degenerative diseases and as an important component in nutritional therapies (Suarni 2009) [4]. The average consumption of Indonesian society is 10.5 g/day is still far from the recommended fiber needs (Riskesdas 2008) [5]. The Dietary Guidelines for American recommends eating foods containing starch and fiber in exact quantities (20 – 35 g/day) to avoid excess saturated fats, sugar cholesterol, sodium and help control weight (Astawan *et al* 2004) [6].

One of the most popular flour-based products in Indonesia is Puff Pastry. Puff Pastry is a cookie dough made from wheat flour, water, and fat (butter). Puff Pastry in Indonesia is commonly processed into banana Bolen and Zuppa-Zuppa.

Fiber source is not limited only on land crops but there are alternative fiber sources that are seaweed. Seaweed has a fiber content of five times higher than cassava. (Dwiyitno 2011) [7]. One of the most easily acquired seaweed is *Eucheuma cottonii*. *Eucheuma Cottonii*, in general, has been widely used in industrial-scale among others for medicinal raw materials, cosmetic raw materials, raw materials of food processed products (Sutomo 2006) [8]. *Eucheuma cottonii* has a high content of fiber, minerals, and fatty acids that are beneficial to health (Chen *et al*. 2013) [9].

The utilization of seaweed can increase added value by making seaweed flour (Ramadhani *et al*. 2019) [10].

According to (Winarno 1997) [11] Testing of food is not only seen from its chemical aspects only but also judging from its flavor and aroma. It is therefore important to test your favorite level to find out if a new product is acceptable to the public.

2. Material and Methods

This research was held in December 2019 – February 2020 in the Fishery Technology Laboratory, Faculty of Fisheries and Marine Sciences. Materials used in this research were wheat flour, pastry butter, margarine, salt, water and *Eucheuma cottonii* powder. The tools used were scale, basin, rolling pin, food processor, oven, tray, knife, zipper bag, refrigerator and measuring cup. According to (Lugito 2013) [12], the procedure of making puff pastry starts from mixing all ingredients in food processor until dough was formed, kneading the dough until mixed well, rolling the dough, folding the dough to formed three layers, these step repeated twice, putting the dough in the refrigerator, cutting the dough and baking the dough. The experimental method was by measuring the panelist preference level which included appearance, aroma, texture, color and taste, and crude fiber content. In the hedonic test using 20 panelists as a test. In the fiber content test, the samples that used were the control treatment and the most preferenced treatment. Four treatment based on the ratio of *Eucheuma cottonii* powder and wheat flour used, i.e

Treatment A: 0% *Eucheuma cottonii* powder and 100% wheat flour

Treatment B: 5% *Eucheuma cottonii* powder and 95% wheat flour

Treatment C: 10% *Eucheuma cottonii* powder and 90%

wheat flour
Treatment D: 15% *Eucheuma cottonii* powder and 85% wheat flour
The hedonic test data will be analyzed with Friedman Test to determine which treatment is the most preferred by the panelists and The Bayes Test will be conducted to determine which parameter is the most important and the most preferred treatment.

3. Results and Discussion

3.1 Hedonic Test

Hedonic testing has a very important role as it can provide trusted data to determine the level of interest and preference for products (Kim *et al*. 2012) [13]. The parameters observed in the hedonic test are the appearance, texture, aroma, and flavor of a product.

Table 1: Appearance Test Result

Treatment	Median	Appearance Average
A	7	6,8 a
B	8	7,6 b
C	5	5,8 a
D	6	5,8 a

Notes: The value of average that followed by same letter shows non signifigant difference according to Friedman test with 5% error degree

Based on the hedonic test of puff pastry appearance, Treatment B with a ratio of 5% Eucheuma flour cottonii and 95% wheat flour has the highest average potency of 7.6. (liked) with a golden yellow color and brown at the top.Treatment C with a ratio of 10% Eucheuma flour cottonii: 90% wheat flour and D treatment with a ratio of 15% Eucheuma flour cottonii: 85% wheat flour has the same average and the lowest is 5.8 (neutral) with a light brown appearance in the bottom and dark brown with black dots on the top. The brown color of baked goods is caused by Maillard reaction (Fellows 2009) [14]. Maillard reaction is a non-enzymatic immolation reaction due to the reaction between carbohydrates, especially reducing sugar with the primary amine group (Sarastuti *et al*. 2015) [15]. Also, the content of fiber contained in Eucheuma cottonii powder produces melanoid which is one of the important indicators in the Maillard reaction (Almeida *et al*. 2013)[15]. Melanoid is a compound that forms the color of chocolate in food products that experience Maillard reaction (Markowicz *et al*. 2012)[16]. Color of Puff Pastry will be increasingly darker when the concentration of Eucheuma cottonii powder increasingly higher.

Table 2: Aroma Test Result

Treatment	Median	Aroma Average
A	7	7.1 ab
B	8	7,7 b
C	7	6.1 a
D	5	5.6 a

Notes: The value of average that followed by same letter shows non signifigant difference according to Friedman test with 5% error degree

Based on the hedonic test of puff pastry aroma, Treatment B with a ratio of 5% Eucheuma flour cottonii and 95% wheat flour has the highest average potency of 7.7 followed by Treatment B with average 7.1, Treatment C with average 6.1 and Treatment D with average 5.6. Treatment A and B have a distinctive aroma of butter and the stage that is liked by panelists and the aroma of seaweed flour can't be smell. In the treatment of C and D aroma of seaweed flour was stronger. The higher the ratio of usage of Eucheuma cottonii flour, the more smell of seaweed flour in Puff Pastry but in the treatment of C and D, the aroma of Puff Pastry is still liked by panelists. The scent of the grill is caused by heating that triggers Maillard reaction and the aroma of butter is caused by fatty acid oxidation during roasting (Fellows 2009) [14].

Table 3: Texture Test Result

Treatment	Median	Texture Average
A	6	5,7 a
B	9	8,3 b
C	7	6,2 a
D	5	5.7 a

Notes: The value of average that followed by same letter shows non signifigant difference according to Friedman test with 5% error

Treatment B with an average of 8.3 has the most liked texture because it feels crisp and not easily crushed. Treatment A with an average of 5.7 has a texture that tends to be easily crushed and there are many crumbling. Treatment C and D with an average of 6.2 and has a texture that tends to be hard. The texture of Puff Pastry is formed from gas trapped in the dough in the form of bubbles to form an elastic pore wall. When wheat flour is mixed with water, then the gluten forming viscoelastic masses that bind all the dough ingredients into one especially starch into a tissue (Shewry *et al*. 2002) [17]. Gelatinization of starch and coagulation of the gluten forming crumb and soft texture during baking. (Justicia *et al*. 2012) [18]. The texture of Puff Pastry is also influenced by the presence of protein and fat content and moisture content from the basic ingredients of Puff Pastry. The fats make the texture of Puff Pastry more tender because it prevents the CO_2 bubbles released from the dough (Nur'aini 2011) [19]. According to (Kurek 2015) [20] fiber content contained in Eucheuma cottonii powder can change the texture and density of the product.

Table 3: Flavor Test Result

Treatment	Median	Flavor Average
A	7	6,3 bc
B	7	7,8 c
C	5	4,5 a
D	4	4 a

Notes: The value of average that followed by same letter shows non signifigant difference according to Friedman test with 5% error degree

The flavor of Puff Pastry on the treatment A and B with an average of 6.3 and 7.8 liked by panelist because it has a savory flavor of butter. The taste of Puff Pastry on the treatment of C and D with an average of 4 and 4.5 is not liked by panelists because it leaves the bitter taste. Savory flavors are caused by protein and electrolyte concentrations (Romagny *et al*. 2017) [21]. Protein is found in wheat flour and electrolyte in salt, fat content also gives savory flavor to food (Noviria *et al*. 2013) [22]. The bitter taste is caused by simple proteins contained in seaweed that when degraded into amino acids can cause a bitter taste because protein is

one component of the flavor and flavor forming (Anggraini 2018) [23]. The higher the concentration of seaweed flour added it will be a strong effect on the flavor of the final product that is substituted, causing the savory flavor of Puff Pastry to decrease and the flavor of seaweed is getting stronger. Fiber content affecting Maillard reaction causes scorched flavor (Van Boekel 2006)[24]

3.2 Hedonic Parameter Decision Making

Decision making is done by multiple comparison tests (Pairwise comparison) with Bayes Test to know the value of the alternative weight of Puff pastry's appearance, aroma, texture and flavor and to decide the most influential parameter in Puff pastry's assessment

Table 4: Hedonic Paramter Bayes Test Result

Parameter	Priority
Appearance	0.17
Aroma	0.21
Texture	0.22
Flavor	0.40

Based on the calculation of the weight of the parameter to the appearance, aroma, texture, and taste of Puff Pastry obtained the result that the flavor has the highest parameter weight of 0.40 followed by a texture of 0.22, the aroma of 0.21 and the appearance with the lowest weight 0.17. This indicates that the flavor is the most influential parameter for the Puff Pastry assessment. Flavor is the most importand parameter for selecting food (Maina 2018)[25]. Flavor is also a factor to know the quality of food (O'Mahony 2007) [26].

3.3 Treatment Decision Making

Table 5: Treatment Bayes Test Result

Treatment	Alternative Value	Priority Value
A	6.8	0.27
B	7.8	0.31
C	5.9	0.23
D	4.8	0.19

Based on the results of the Bayes calculation obtained that treatment B with the ratio of use 5% Eucheuma cottonii powder : 95% wheat flour has the highest alternative value and priority value, namely 7.8 and 0.31 followed by treatment A With 100% wheat flour with an alternate value of 6.8 and a priority value of 0.27 then treatment C with a ratio of 10% Eucheuma cottonii powder : 90% flour with an alternative value of 5.9 and a priority value of 0.23.Treatment D with a ratio of 15% Eucheuma cottonii powder : 85% wheat flour has an alternative value and the lowest priority value, namely 4.8 and 0.19. This is showed Puff Pastry with treatment B or a 5% use ratio of Eucheuma cottonii flour: 95% wheat flour is the most liked treatment by panelists.

3.4 Fiber Content

Crude fiber content tested on control treatment or treatment A with the use of 100% wheat flour and the most preferred treatment, namely treatment B with a ratio of 5% use of Eucheuma cottonii powder: 95% wheat flour.

Table 6: Fiber Content

Treatment	Crude Fiber Content (%)
A	24,52
B	27,12

Based on the test results of crude fiber content, the crude fiber content of Puff Pastry with a ratio of 5% use of Eucheuma cottonii powder: 95% wheat flour is higher than that of Puff Pastry with the use of 100% Wheat Flour. This is in line with (Huang & Yang 2019)[27] which states that the higher the use of Eucheuma flour the higher the fiber content. According to (Firdaus *et al*. 2017)[28] the addition of Eucheuma cottonii powder will increase the crude fiber content because the main component of Eucheuma cottonii is the polysaccharide polymer, where crude fibers composed of polysaccharide polymer.

Dietary Reference Intake (DRI) fiber based on (National Academy of Sciences 2002) [29] suggests good fiber consumption is 19-38 grams per day according to each person's age, in children the consumption of good fiber is 19-25 grams per day, on Adult males are 30-38 grams per day, in adult women is 21-26 grams per day, therefore, consuming puff pastry with the addition of Eucheuma cottonii flour can donate a portion of fibre intake daily.

4. Conclusion

Based on the results of research on the preferrence test of Puff Pastry with the ratio Eucheuma cottonii powder and wheat flour use, it was found that the most preferred Puff Pastry by panelist was Puff Pastry with the use of 5% Eucheuma cottonii flour: 95% flour. The average value of appearance, aroma, texture and taste was 7.6; 7.7; 8.3 and 7.8. The results of crude fiber content test amounted to 27.12%.

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