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Original Research

Quality Test And Determination Flavonoid Content of Crackers Shallot (*Allium Cepa* L.) Peel Flour

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ABSTRACT

Background: *Indonesia culinary tastes are obtained from a blend of various spices used, such as shallots (Allium cepa L.). However, the use of shallots (Allium cepa L.) was limited to its meat only, meanwhile the skin is not utilized. Shallot (Allium cepa L.) peel itself contains flavonoids, polyphenols, saponins, terpenoids and alkaloids. One of the utilization of shallot (Allium cepa L.) peel is by innovating it into flour to make crackers. The aims of this study were to determine the physical test and total flavonoids content of crackers from the skin of shallot (Allium cepa L.).*

Methods: *This study used descriptive quantitative method. The observations of crackers quality was conducted in this study are in accordance with the parameters of crackers SNI 2973: 2011 and RSNI 2973: 2018, which include water content tests, acid insoluble ash content tests, organoleptic tests, hedonic tests, qualitative identification and quantitative analysis of flavonoids.*

Results: *The average percentage of water content of crackers was 2%. The average percentage of insoluble acid ash content of crackers was 0.3%. The organoleptic crackers test results have a special shallots aroma, dark brown in color, and taste delicious. The hedonic test results showed respondents liked the aroma, color, and taste of crackers. Crackers from shallot (Allium cepa L.) peel flour contain positive flavonoid compounds.*

Conclusion: *The determination of total flavonoids content in crackers shallot (Allium cepa L.) peel flour was conducted based on $AlCl_3$ method with total flavonoids expressed in QE (Quercetin equivalent) at the maximum wavelength of 435 nm. The result showed that the average content of flavonoid total is 4,5591 mgQE/g extract.*

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INTRODUCTION

Shallots (*Allium cepa* L.) are native Indonesian spices that have a high selling value in the community (Fajjriyah, 2017). So far, shallots (*Allium cepa* L.) have only been used as a slice of meat, so the peel has the potential to pollute the air and water (Arung *et al*., 2011). This is very unfortunately because according to Rahayu dkk. (2015), the extract of shallot (*Allium cepa* L.) peel contains flavonoid compounds, which have the potential to act as antioxidants that can neutralize and prevent damage caused by free radicals to normal cells, polyphenols, saponins, terpenoids and alkaloids (Waji, 2009).

Antioxidants are substances that can ward off or prevent oxidation reactions from free radicals (Miksusanti dkk., 2012). Excess free radicals can have implications for degenerative diseases, such as heart disease, cancer, atherosclerosis, inflammation, and symptoms of aging (Kusumowati dkk., 2012)

Humans do not have reserves of antioxidants in their bodies, so if there is excessive free radical exposure, the body requires an intake of antioxidants from outside (exogenous). One of them is by consuming artificial antioxidants, both natural, which are processed into functional and synthetic foods that are currently widely circulating in the market (Rahayu dkk., 2015).

This functional food can be presented in the form of crackers which are expected to be practically carried everywhere and can be consumed by all people because today's consumers tend to expect food products that are fast and practical in their presentation (Ismanto dkk., 2016).

Crackers are snacks that are often found on the market, have a savory taste, and are served in various compositions so that they can add value to these crackers. (Manley, 1983). One of the added compositions is shallot (*Allium cepa* L.) peel which has been processed into flour first, then crackers are made to substitute shallot (*Allium cepa* L.) peel flour (Ismanto dkk., 2016).

The aim of this study were to determine the effect of substitution of shallot (*Allium cepa* L.) peel powder on the flavonoid and organoleptic content of shallot peel flour crackers. The benefit obtained from this research is to substitute the raw material for flour in making crackers.

MATERIALS AND METHOD

Materials

Wheat flour, margarine, yeast, sodium bicarbonate, sugar, skim milk, shallot (*Allium cepa* L.) peel, water, methanol p.a, Mg powder, HCl concentrate, quercetin standards, $AlCl_3$ 10%, potassium acetate 1 M, ethanol p.a, dan aquadest.

Bowl, tray, napkin, flour maker, spoon, crackers mold, analytical scale, oven, stamper, mortar, porcelain evaporating disk, krus porcelain, brazier, glass funnel, test tube, dropper, bunsen fire, cotton pulp cellulose filter paper, glass volumetric flask, cuvette, centrifuge, UV-Vis spectrophotometer.

Method

This research includes the process of making crackers, water content test, ash content test, acid insoluble ash content test, organoleptic test, hedonic test, and analysis of flavonoid content.

Flour milling method of shallot peel

The peel of shallots (*Allium cepa* L.) is washed under running water and air-dried for about 2 days, then mashed or milled and the sieving process is carried out using 80 mesh flour sieve. The remainder of the sieving is then ground again (Teru dkk., 2017)

Crackers Making

Mixing flour, shallot (*Allium cepa* L.), peel flour baking soda, sugar, skim milk, yeast, and water to form a dough, then add margarine, stir until a smooth dough forms. The dough is then covered with a napkin, then fermented. Flattening is carried out using a cracker mold with various thicknesses, then printed in uniform sizes and baked at 110 °C for 55 minutes (Ismanto dkk., 2016).

Table 1. Crackers Formula

Material	Formula
Margarine	19 %
Yeast	0,7 %
Sodium bicarbonate	0,3 %
Sugar	3 %
Skim milk	4 %
Wheat flour	38 %
Shallot peel flour	4 %
Water	31 %

Analysis of nutritional content includes water content, ash content, and acid insoluble ash content (Apriyani, 2014). The hedonic test is carried out by giving a score on the parameters of taste, color, and aroma according to SNI 01-2346-2006 (Badan Standarisasi Nasional, 2006). The hedonic test assessment score can be seen in Table 2.

Table 2. Hedonic Test Parameter

Hedonic scale	Numeric scale
Most like	6
Little bit like	5
Like	4
Little bit dislike	3
Dislike	2
Most dislike	1

Flavonoid Qualitative Test

A total of 0.5 g of shallot peel flour (*Allium cepa* L.) and 0.5 g of crushed crackers were put into a different test tube, then dissolved in 1-2 mL of 50% hot methanol, plus Mg powder and HCl concentrated. The results are positive if a red or orange solution is formed (Rahayu dkk., 2015).

Total Flavonoids Content

Total flavonoids in crackers were determined using the aluminum chloride colorimetric method of Chang *et al.* (2002). The crackers extract was made with a concentration of 0.15% w / v with ethanol p.a solvent, then 1 mL of the pipette of the filtrate was then added 1 mL of 2% $AlCl_3$, 1 mL of 120 mM potassium acetate. Incubated for 60 minutes at room temperature, the absorbance of the reaction mixture

was measured at 435 nm. The flavonoid content was calculated using a standard calibration of rutin solution and expressed as micrograms of rutin equivalent (RE) per gram of sample.

RESULTS

Crackers formula

Modification of the composition of the crackers formula needs to get the best results. Changes in the amount of sugar, wheat flour, and shallot peel flour from 7 grams, 100 grams, and 10 grams to 30 grams, 110 grams, and 15 grams. During the trial and error process using an unmodified formula, it was found that the less sweet and less characteristic crackers were made from shallot (*Allium cepa* L.) peel flour. Furthermore, modification of the concentration of sugar, wheat flour, shallot peel flour was carried out.

Test of Water Content and Ash Content Shallot (*Allium cepa* L.) Peel Flour

This test carried out to measure the value of the water and ash content in the shallot (*Allium cepa* L.) peel flour. The following is the data on the results of the water content test and ash content test for shallot (*Allium cepa* L.) peel flour:

Table 3. Result of shallot (*Allium cepa* L.) peel flour Analysis

Parameter	Replication			Average
	1	2	3	
Water content (%)	9	10	10	9,6 ± 0,58
Ash content (%)	0,6	0,3	0,3	0,5 ± 0,17

Test of Water Content and Acid Insoluble Ash Content Crackers Shallot (*Allium cepa* L.) Peel Flour

This test carried out to measure the value of the water and acid insoluble ash content in the crackers shallot (*Allium cepa* L.) peel flour. The following is the data on the results of the water content test and acid insoluble ash content test for crackers shallot (*Allium cepa* L.) peel flour:

Table 4. Result of shallot (*Allium cepa* L.) peel flour crackers Analysis

Parameter	Replication			Average
	1	2	3	
Water content (%)	2	3	1	2 ± 1,0
Acid insoluble ash content (%)	0,25	0,5	0,25	0,3 ± 0,14

Organoleptic Test of Flour and Crackers from Shallot (*Allium cepa* L.) Peel

This test is carried out using the five senses, namely describing the aroma, color, and taste of flour and crackers from shallot (*Allium cepa* L.) peel. Following are the organoleptic test results of flour and crackers from shallot (*Allium cepa* L.) peel:

Table 5. Result of Organoleptic Test of Flour and Crackers from Shallot (*Allium cepa* L.) Peel

Type	Aroma	Colour	Taste
Shallot peel flour	Distinctive of Shallot	Brown	Tasteless
Crackers	Distinctive of Shallot	Dark Brown	Savory taste

Hedonic Test of Crackers Shallot (*Allium cepa* L.) Peel Flour

This test was conducted to assess the level of acceptance of crackers in the community, especially students of the Department of Pharmaceutical and Food Analysis, Poltekkes Kemenkes Surakarta. The hedonic test carried out included assessment of aroma, color, and taste of shallot (*Allium cepa* L.) peel crackers. The following is the data on the results of hedonic test of shallot (*Allium cepa* L.) peel crackers:

Table 6. Result of hedonic test of Shallot (*Allium cepa* L.) Peel Crackers

Parameter	%							
	Most dislike	**Dislike**	**Little bit dislike**	**Ordinary**	**Little bit like**	**Like**	**Most like**	**Total**
Colour	0	0	0	30	30	36.67	3.33	100
Odour	0	0	3.33	0	16.67	56.67	23.33	100
Taste	0	0	0	0	16.67	43.33	43.33	100

Qualitative Test of Flavonoid on Flour and Crackers from Shallot (*Allium cepa* L.) Peel

This test was conduct to determine the presence of flavonoid compounds in the flour and crackers from shallot (*Allium cepa* L.) peel. Following are the qualitative test results of flavonoids flour and crackers from shallot (*Allium cepa* L.) peel:

Table 7. Result of Flavonoid Content Test of Shallot (*Allium cepa* L.) Peel Flour and *Crackers*

Type	Colour	Standart
Shallot peel flour	Red	Red or orange
Crackers	Orange	Red or orange

Quantitative Test of Flavonoid on Crackers Shallot (*Allium cepa* L.) Peel Flour

This test was conducted to determine the content of flavonoid content in the crackers shallot (*Allium cepa* L.) peel flour. The following is the data on the quantitative test results of flavonoid content on crackers shallot (*Allium cepa* L.) peel flour:

Table 8. The absorbance of quercetin

Concentration (ppm)	Absorbance
6	0.288
8	0.388
10	0.457
12	0.565
14	0.639

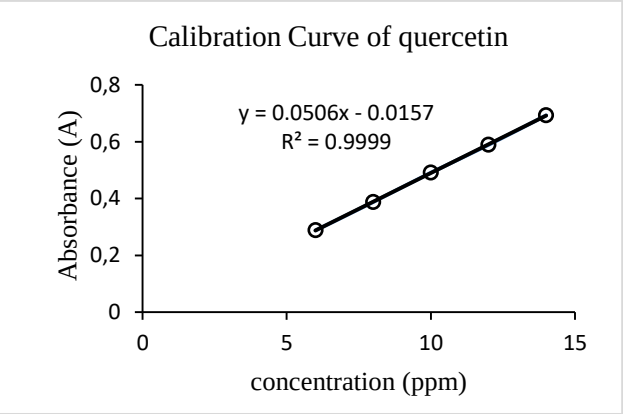

Figure 1. Calibration curve of quercetin

Table 9. Result of flavonoid content Test (% w/w)

Replication	Abs	Flavonoid content		
		Initial Total mg/L	Total mgQE/g	Average mgQE/g
1	0.329	6.8126	4.5417	4.5591
2	0.327	6.7727	4.5151	±
3	0.335	6.9308	4.6206	0.0549

DISCUSSION

Shallot Peel Flour

The result of shallot (*Allium cepa* L.) peel flour (Table 3) showed that the average of water content and ash content were 9.6% and 0.5% resperctively. The result considerate on SNI 3751:2009 was maximum 14,5% for water content and 0.7% for ash content (Badan Standarisasi Nasional, 2009). Water content on beverages means participate on determination of refreshness and time storage the foodstuff. The high water content cause bacteria, carn and khamir easy to multiply so that there will be changes in foodstuffs (Sandjaja & Amarita, 2009). Measurement of ash content aims to find out the amount of mineral content contained in food (Sandjaja & Amarita, 2009).

Crackers

The results of the test of water content and ash content of insoluble acid on shallot (*Allium cepa* L.) peel crackers (Table 4), shows an average water content of 2%. This result is in accordance with the parameters of SNI 2973:2011, which is not more than 5% (Badan Standarisasi Nasional, 2011). This is obtained because in the manufacture of crackers carried out the roasting process aimed at lowering the water content of crackers to 3-5% (Ismanto dkk., 2016). Moisture contents of crackers were assessed to determine storability of the products. The results indicated that the moisture contents among samples had a significantly lower. The low moisture content of the products is important for prolonging their shelf life. In addition, water content of baked products is of interest in the degree of crunchiness as well as stability of phenolic compounds. It has been suggested that hydrolysis may have a role in phenolics degradation, and cleavage of isoflavones esters to glucosides occurs via hydrolysis (Patras *et al.*, 2010). The loss of water in the form of steam may have consequences in the ability of oxygen to intercept and oxidize phenolics (Ahmed & Abozed, 2015). Test results of insoluble ash content of shallot (*Allium cepa* L.) peel crackers obtained an

average value of 0.3%. This result is not accordance with the parameters of RSNI 2973:2018, which is a maximum of 0.1% (Badan Standarisasi Nasional, 2018). This is allegedly due to the addition of shallot (*Allium cepa* L.) peel flour contaminated with other powders during the milling process or flour filtrating process (Rudianto dkk., 2013). Hedonic test results or preferred levels were conducted with 30 untrained respondents (Table 6). Test results for aroma showed that the most dominant respondents chose the impression of likes on shallot (*Allium cepa* L.) peel flour crackers. This is because the smell is a combination of the smell of butter and distinctive shallots. According to Winingsih (2019), the aroma will affect the favorite level of panelists because it can attract consumers to be interested in shallot (*Allium cepa* L.) peel crackers. Test results for color showed respondents chose the most likes, because the brown color on shallot (*Allium cepa* L.) peel crackers gave the impression of delicious. This is in accordance with the research of Nurlina dkk. (2015), which stated that the first thing a person tastes when tasting food, especially food that has not yet been tasted, is how it looks. A person tends to choose foods with an attractive appearance. The savory taste of shallot (*Allium cepa* L.) peel crackers makes respondents choose the impression of likes. Taste is the most important factor to determine the level of liking for crackers successfully received by respondents or not (Winingsih, 2019).

Organoleptic Test of Flour anad Crackers from Shallot (*Allium cepa* L.) Peel

Organoleptic testing of shallot (*Allium cepa* L.) peel flour and crackers was conducted by observing the aroma, color, and taste. Shallot peel (*Allium cepa* L.) flour has a distinctive aroma of shallots (*Allium cepa* L.), brown in color, and tasteless. Crackers from shallot (*Allium cepa* L.) peel flour has a distinctive aroma of shallots (*Allium cepa* L.), dark brown, and savory (Table 5). This is obtained because in the manufacture of crackers done the roasting process. According to Ismanto dkk. (2016), roasting aims to provide a crisp texture, color, aroma, and distinctive taste.

Qualitative Test of Flavonoid on Flour and Crackers from Shallot (*Allium cepa* L.) Peel

Qualitative test was conducted to find out the presence of flavonoid compounds in the sample of shallot peel flour and crackers, which is presented in Table 7. Qualitative test results of flavonoids on shallot (*Allium cepa* L.) peel flour and crackers are proven by the formation of red and orange color in the solution. It is said to be positive contain flavonoids in accordance with the research of Rahayu dkk. (2015), which states positive results if a red or orange solution is formed indicating the presence of flavonoids.

Quantitative Test of Flavonoid Crackers Shallot (*Allium cepa* L.) Peel Flour

Determination of flavonoid contents was conducted by UV-Vis Spectrophotometry method due to the presence of conjugated aromatic compounds in flavonoids so as to show a strong absorption tape in the spectrum area of ultraviolet and visible rays (Harborne, 1987). The first step is make series of concentrations of standard solution because the method used in determining the levels uses the standard curve equation, so that linear equations are needed that can be used to calculate the content. The use of quercetin as a standard solution because quercetin is a flavonoid of flavonol group that has keto group in atom C-4 and hydroxyl group in atom C-3 or C-5

neighboring flavon and flavonol (Azizah dkk., 2014). The next step is the measurement of maximum wavelength (λ max) carried out in the range of 400-450 nm, which based on the running results obtained λ max 435 nm, which will later be used to measure absorbance (A) in the concentration series of standard solutions and samples. The results of absorbance measurement for the standard solution can be seen in Table 8 and the calibration curve of the quercetin standard solution can be seen in Figure 1.

Based on the results of these measurements, the higher concentration show the higher the absorbance. Linear regression equation obtained, i.e. y = 0.0506x – 0.0157. The equation of the calibration curve will be used to determine the total concentration of flavonoid compounds in the sample extract. According to Basset dkk. (1994), the determination of content by using UV-Vis spectrophotometry used blank solution as a control that serves as a zero maker compound that does not need to be analyzed. The function of adding $AlCl_3$ is as a complex ligand, which is characterized by discoloration of the solution to be yellower, so that the wavelength will shift towards visible, and to maintain the wavelength to remain in the visible area, it is added potassium acetate (Chang *et al*., 2002). Incubation function for 1 hour at room temperature is to maximize the intensity of the resulting color, so that the reaction can run optimally (Azizah dkk., 2014). The average of flavonoid total content of shallot (*Allium cepa* L.) peel flour crackers was 4.5591 mgQE/g that can be seen on Table 9.

CONCLUSION

Based on this research can be conclude that the average percentage of water content of crackers was 2%. The average percentage of insoluble acid ash content of crackers was 0.3%. The organoleptic crackers test results have a special shallots aroma, dark brown in color, and taste delicious. The hedonic test results showed respondents liked the aroma, color, and taste of crackers. Crackers from shallot (*Allium cepa* L.) peel flour contain positive flavonoid compounds and total flavonoid content of shallot (*Allium cepa* L.) peel crackers was 4.5591 mgQE/g.

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