Jurnal Jamu Kusuma
Vol. 4, No 2, Desember 2024, pp. 86-94
ISSN : 2798-0332 (print)
ISSN : 2798-558X (online)

QUALITY AND ANTIOXIDANT ACTIVITY TEST OF ALBEDO WATERMELON (*Citrullus lanatus* Tunb.) COMBINATION GUAVA FRUIT COMBINATION (*Psidium guajava* L.)

M. Ali Nasikin [1)], Arum Dwi Agustin [1)], Youstiana Dwi Rusita [1)*]
[1] Department of Pharmaceutical and Food Analysis, Ministry of Health Polytechnic of Surakarta, Surakarta, Central Java, Indonesia
*email: josicanme@gmail.com

ABSTRACT

Jam is a food product with a gel or semi-solid consistency that is spread on food made from processed fruits and sugar without the addition of other food ingredients and permitted food additives. This study created a formulation of jam preparations from the albedo of watermelon rind *(Citrullus lanatus Tunb.)* in combination with guava fruit (*Psidium guajava L.*) because they contain vitamin C, which has antioxidant activity. The purpose of this study was to determine the formulation and antioxidant activity of the albedo jam preparation of watermelon rind *(Citrullus lanatus Tunb.)* and guava fruit *(Psidium guajava L.).* This study used a quantitative descriptive method with observations of jam quality according to SNI 01-3746-2008. The test parameters were jam quality tests, including organoleptic, pH, water content, colour test, and antioxidant activity tests. The organoleptic results of the jam had a bright red colour with a distinctive aroma of watermelon and red guava and had a slightly sour, sweet taste. The results of the pH test of the jam on F1, F2, and F3 were respectively 3.72 ± 0.025, 3.84 ± 0.017, and 3.85 ± 0.032. The results of the water content test of the jam on F1, F2, and F3 were respectively 29.34 ± 0.464, 29.18 ± 0.375, and 28.71 ± 0.437. The results of the jam colour test showed positive vitamin C content. The IC_{50} values of the jam preparations on F1, F2 and F3 were respectively 155.345 ppm, 145.581 ppm, and 130.241 ppm. The F1 jam preparation is a weak antioxidant, while F2 and F3 are moderate antioxidants.

Keywords: Antioxidants, Jam, Albedo Watermelon, Guava

INTRODUCTION

Watermelon is one of the fruits that is widely found in Indonesia. This fruit is widely in demand in Indonesia because of its sweet taste and diverse content. Watermelon has benefits for the body, including maintaining healthy skin, protecting the heart, and facilitating urine output (Nasrah, 2019). Watermelon fruit is usually only consumed in the part of the flesh that is brightly coloured (for example, pink, yellow, and red). In contrast, the white layer of the watermelon skin (albedo) is less popular with the public for consumption and is only thrown away as waste that is not utilized. The utilization of watermelon skin albedo is currently still less than optimal (Rochmatika *et al.*, 2012). Albedo watermelon is composed of 21.03% pectin compounds (Sutrisna, 1997)). In fact, watermelon albedo contains high antioxidants. According to Putri et al., 2020, watermelon rind albedo has an IC_{50} of 14.729 mg/L, making it a very strong antioxidant. Making jam from watermelon albedo does not have an attractive colour and thick texture; to improve the characteristics of the colour and texture of the jam, other ingredients need to be added. One of the fruits that can improve both of these things as well as a source of antioxidants is guava (Sitorus *et al.*, 2022). Based

on research of Rachmaniar & Kartamihardja 2018 stated that the IC_{50} value of guava fruit is 11.96 ppm, so it has very strong antioxidant activity.

Guava fruit has twice the amount of vitamin C found in citrus fruits and more than papaya. Iron, vitamin A, calcium, and secondary metabolite chemicals such quercetin, anthocyanins, carotenoids, polyphenols, flavonoids, lycopene, saponins, catechins, guajaverin, and guavin are also found in guava fruit (Naseer et al., 2018); Rachmaniar & Kartamihardja, 2018). Guava is beneficial for maintaining the cardiovascular system, facilitating digestion, and reducing inflammation and anaemia (Daswani *et al*., 2017). Based on previous research, namely Padang & Maliku (2017), in guava there is 42.9 mg/100 g of vitamin C, and also in Febryana, 2020, it was stated that the antioxidant activity of guava fruit is 17.12 ppm is classified as very strong.

One alternative that can be used to utilize fruit peels so that they do not become waste is to process them into jam. Jam-making has prospects for development because jam is widely preferred in various circles of society. Processed fruits, especially jams, are currently experiencing a significant increase. IBIS World Industry Report (2016) that there is a tendency to increase the fruit processing industry such as jams in the world are reviewed in terms of sales, demand, raw materials and economic value of up to US$ 4.5 billion in 2021 (Ramadhan & Trilaksani, 2017).

Based on this description, the author is interested in researching the formulation and testing of antioxidant activity in watermelon rind albedo jam combined with guava fruit. The purpose of this study was to determine the formulation and antioxidant activity of the albedo jam preparation of watermelon rind and guava fruit.

METHODS

This study uses quantitative research to analyze the antioxidant activity of watermelon rind albedo jam combined with guava fruit. The variables in this study are single, namely the formulation of watermelon rind albedo jam and guava fruit with sub-variables, namely quality, qualitative vitamin C test and quantitative test. This study used a quantitative descriptive method with observations of jam quality according to Badan Standarisasi Indonesia (2008) SNI 01-3746-2008. The test parameters were jam quality tests, including organoleptic, pH, water content, colour test, and antioxidant activity tests.

1. Tools and Materials

The tools used are pots, analytical scales (*Labex*), beaker glasses, reaction tanks, stirring rods, spoons, measuring flasks, droppers, micro pipettes, porcelain cups, cuvettes, and Uv-vis spectrophotometers (*Raptor*), filter paper. The ingredient used is albedo watermelon peel, guava fruit, granulated sugar, aquades, citric acid, 2,2-diphenyl-2-picrylhydrazyl (DPPH) (*Sigma Aldrich*), pH 4, 7, and 10 buffer solutions, standard vitamin C (*Sigma Aldrich*), ethanol p.a (*Merck*)

2. Raw Material Preparation

The raw materials used are watermelon and guava fruit obtained from Wedi Market, South Klaten. The criteria for fresh watermelon fruit are bright, bright green skin colour, and the flesh is red and sweet. Guava fruit was obtained at the market in Wedi, Klaten, with a fresh red colour in good condition, as if there had been no damage to the fruit (Karuniasari, 2022).

3. Making jam

The making of watermelon rind albedo jam combined with guava fruit begins with the selection of raw materials. The selected watermelon albedo is washed with water that flows. albedo watermelon peel is then weighed 400 g And cut into small pieces to facilitate the destruction process. Watermelon albedo pieces are crushed using Blend

with the addition of water 1:1 so that you get watermelon albedo porridge. The selected guava fruit is washed with water that flows; then, the guava fruit is split using a knife, and the flesh is taken. After that, the pulp of the fruit weighed 400 g and was cut into small pieces, then crushed using a blender with a 1:1 addition of water so that guava pulp was obtained (Asikin et al., 2017). The jam formula in this study is presented in Table 1. The formulation for making jam is in Table 1.

Table 1. Jam formulation

Material	F1(g)	F2(g)	F3 (g)
Albedo of watermelon fruit	70	50	30
Guava fruit	30	50	70
Sugar	50	50	50
Citric acid	0.3	0.3	0.3
Total	150.3	150.3	150.3

Watermelon albedo porridge and guava fruit are suitable. The treatment is mixed and heated to a boil inside a pot. Next, 50 g of granulated sugar and 0.3 g of citric acid are added. All ingredients are heated until they thicken (Asikin et al., 2017).

4. Quality Testing

a) Organoleptic Testing

Organoleptic tests are performed by observing the preparation of Albedo jam fruit peel, which is similar to the five senses. A sample is taken to taste with a clean spoon and tested with a pancake indra (Badan Standarisasi Nasional, 2008)

b) Moisture Testing

The sample is weighed by 2 g, then put in the oven at ± 105 °C for 3 hours. The cup is then taken and put into a desicator to cool for ± 15 minutes, after which it is weighed to obtain moisture content data samples, moisture content can be calculated by formula (Sigalingging *et al*., 2020). Each formulation is repeated 3 times replication.

$$\text{Moisture content (\%)} = \frac{W1-W2}{W1-W0}\ x\ 100\%$$

Information:
W0 = Weight of empty cup (g)
W1 = Cup weight + sample before oven (g)
W2 = Weight of the cup + sample after oven (g)

c) pH Testing

The pH test of the jam is measured using a pH meter. Before being used to measure the pH of the jam, the instrument is calibrated first by dipping it in a pH buffer solution 4, 7, and 10, which is then rinsed with aqua dest. The pH meter is dipped into the preparation to be tested, let stand for a while, and the result will be visible on the number that appears on the screen. Testing replication is carried out three times in each formula (Ermawati & Wahdaniah, 2021).

d) Qualitative Testing (Color Reaction)

A total of 1 mg of jam sample is diluted using aqua dest on a 10 mL measuring flask. A sample solution of 2 mL is added with 15 Benedict reagent drops. The sample is heated for 2 minutes at 70 °C. The positive result is marked by the formation of a green colour, yellowish to brick red. Testing is carried out, replicating as many as 3x in each formula (Techinamuti & Pratiwi, 2018).

e) Antioxidant Activity Testing

1) DPPH Solution Preparation
   DPPH powder was weighed as much as 12.5 mg and later put into a 250 mL measuring flask, and ethanol p.a up to the limit mark so that a concentration of 50 ppm is obtained as parent solution. Storage is carried out in a protected place, sunlight (Rasyadi *et al*., 2022).
2) Control Solution Manufacturing.
   2 mL sample of 50 ppm DPPH solution is put into a test tube, then 1 mL of ethanol p.a. is added, and the mixture is homogenized (Nathania *et al*., 2020).
3) Determination of the Maximum Wavelength of DPPH Solution
   DPPH 50 ppm solution is left for 30 minutes in a place where it is dark at room temperature. The absorbance of the solution is measured by UV-vis spectrophotometer at wavelengths 500-540 nm 1 nm interval (Rasyadi et al., 2022)
4) Determination of the Antioxidant Activity of Jam.
   Make Comparator sample Vitamin C is weighed in the amount of 10 mg, included in Measuring flask is 10 mL, then sufficient with ethanol p.a to make a parent concentration of 1000 ppm. Vitamin C solution is pipetted into a 5 mL measuring flask of 0.01 each; 0,015, 0,02, 0.025, and 0.03 mL were then supplemented with p.a ethanol to the limit mark. A total of 1 mL of vitamin C solution with concentrations of 2, 3, 4, 5, and 6 ppm is added to 2 mL of DPPH 50 ppm solution. The solution mixture is homogenized and left for 30 minutes in a dark place at room temperature. The absorbance of the solution was measured at the maximum wavelength obtained (Suwarni & Duwi Cahyadi, 2016; Ipandi *et al*., 2016).The jam to be tested is weighed in the amount of 25 mg, then dissolved with 25 mL of ethanol p.a. It is sufficient with ethanol p.a to make a parent concentration of 1000 ppm. The parent solution was pipetted in a 5 mL measuring flask of 0.25 each; 0,5; 0,75; 1; and 1.25 mL is then sufficed with ethanol p.a up to the limit mark. Total of 1 mL of samples with concentrations of 50, 100, 150, 200, and 250 ppm were added to 2 mL of DPPH 50 ppm solution. Mixture the solution is homogenized; leave for 30 minutes in a place that is dark at room temperature. Absorbance is measured with a UV-Vis Spectrophotometer at the maximum wavelength obtained (Rasyadi et al., 2022).
5) The Antioxidant Activity of Jam
   1 mL of samples with concentrations of 50, 100, 150, 200, and 250 ppm added 2 mL of DPPH 50 ppm solution. The solution mixture is homogenized and left for 30 minutes in a place that is dark at room temperature. Absorbance is measured with a UV-Vis Spectrophotometer at the maximum wavelength obtained (Rasyadi et al., 2022). The percentage of radical inhibition of DPPH is calculated by the following formula (Handayani et al., 2017):

$$\% \text{ Inhibition: } \frac{A1-A2}{A1} \; x \; 100\%$$

Information:
A1 = absorbance control
A2 = absorbance of the sample

The linear regression equation y=a+bx is determined where x is the concentration (ppm), and y is the percentage of inhibition (%). Antioxidant activity is expressed by Inhibition Concentration 50% (IC_{50}), which is a sample concentration that can reduce DPPH radicals by 50%.

RESULTS AND DISCUSSION

Organoleptic test results

The results of the organoleptic test are more albedo; the higher the albedo concentration of watermelon peel, the more the colour produced is browner.

Table 2. Organoleptic test results

Formula	Organoleptic Test			
	Form	Smell	Color	Flavor
F1	Jam	Typical watermelon fruit	Brownish red	Sweet and sour
F2	Jam	Typical of watermelon and guava	Bright Red	Sweet and sour
F3	Jam	Typical of watermelon and guava	Bright Red	Sweet and sour

The results of the organoleptic test on the three formulations of jam preparations have a distinctive aroma of watermelon and red guava, have a slightly sour sweet taste, and in F1, it is reddish brown. At the same time, F2 and F3 are bright red. The red colour of the jam is the colour of freshly processed guava juice, and the level of ripeness of the guava also affects the colour of the jam (Fitriani *et al*., 2018). The more guava is added to the jam, the redder the colour will be. The aroma produced by the three formulations is the distinctive smell of watermelon and guava. The taste produced by the three formulations is slightly sour-sweet because the ingredient used is citric acid; this taste causes the jam to be slightly sour. This is in accordance with SNI-3746-2008, which states that jam has a standard aroma, colour, and taste.

pH test results

pH testing is conducted to determine whether the jam has reached an optimal acidity level so that the gelling agent can work effectively and produce a good texture (Fitriani *et al*., 2018). Based on the pH test results in Table 3.

Table 3.pH test results

Formulation	Degree of Acidity (pH)	±SD
F1	3.72	0.025
F2	3.84	0.017
F3	3.85	0.032

The pH test on jam preparations is carried out to determine the level of acidity in a food ingredient. The pH test is carried out to find out whether the jam is at the optimum acidity level so that the gelling agent can work effectively and produce a good texture (Fitriani *et al*., 2018). According to SNI 01-3746-2008, the pH requirement of a good jam preparation is 3.50 – 4.50.

The table shows that F1 is more acidic compared to F2 and F3. Low pH results occur due to the addition of citric acid. The addition of acid aims to regulate pH so that acidic conditions suitable for gel formation are obtained. If the addition of acid is too high, synergies can occur, namely the release of water from the gel so that it can reduce the viscosity of the product produced or even the gel cannot form at all (Ahmad & Mujdalipah, 2017). The results of the pH test on F1, F2 and F3 were respectively 3.72 ± 0.025, 3.84 ± 0.017, and 3.85 ± 0.032. Based on Table 3, the three formulations meet the pH limit requirements.

Water content test results

The results of the water content test F1, F2 and F3 were respectively 29.34 ± 0.464; 29.18 ± 0.375; 28.71 ± 0.437. Water content test results Table 4.

Table 4.Water content test results

Formulation	Water content (%)	±SD
F1	29.34	0.464
F2	29.18	0.375
F3	28.71	0.437

Moisture content testing is carried out to determine the moisture content in jam preparations. This moisture content test affects the characteristics of the food, determining the freshness and shelf life of the food. High moisture content can also cause the easy growth of mould and yeast bacteria (Sari *et al*., 2020). The moisture content of food products is affected by the heating process because the moisture content of the jam will decrease during the heating process. The process that occurs is that the heat generated by heating enters the material which then replaces the water content that comes out into steam. The long heating time causes free evaporation of water, so it will reduce the moisture content. High moisture content will form the texture of the jam, but reduce its durability (Nuraini & Karyantina, 2019).

The moisture content of the jam increases with the increasing amount of watermelon peel albedo pulp and the smaller the amount of guava pulp. This is because the water content contained in the albedo of watermelon peel is higher than the water content contained in guava fruit (Megawati *et al*., 2017). This causes the moisture content of F1 to be higher compared to F2 and F3. The results of the moisture content test obtained based on Table 4 on the three formulations met the jam moisture content limit of 35%. The jam preparation has met the requirements according to SNI 01-3746-2008.

Qualitative test results of vitamin C

Qualitative test of vitamin C with color test using Benedict's reagent. The results of the qualitative test of vitamin C in jam were positive for vitamin C, according to table 5.

Table 5.Qualitative test results of vitamin C

Formulation	Test Results	Interpretation
F1	Yellowish green	Positive
F2	Yellowish green	Positive
F3	Yellowish green	Positive

The qualitative test of vitamin C is based on the colour change of the solution with the addition of Benedict's reagent, which is carried out to determine the presence or absence of vitamin C contained in a jam. In the vitamin C test, heating is carried out with the aim of changing the black cupric oxide into brick-red cupric oxide, and the reaction will run faster because the activation energy used is only small. Vitamin C is a strong reducing agent that is able to reduce Cu_2+ ions from Benedict's reagent into Cu+ ions by forming a yellowish-green to brick-red Cu_2O precipitate (Wulandari, 2021).

Results of antioxidant activity of jam preparations

Analysis of antioxidant activity was carried out using DPPH method using UV-Vis Spectrophotometry at a maximum wavelength of 516 nm. Results of antioxidant activity in jams and vitamin C comparators are shown in table 7.

Table 7. Results of antioxidant activity of jam preparations

Formulation	Concentrate (ppm)	Absorbance				% Inhibisi				Regresi Linier	IC_{50}
		R1	R2	R3		R1	R2	R3	Rata-rata		
F1	50	0,467	0,466	0,466	0,466	30,298	30,447	30,447	30,397	y = 0,1925x	155,345

	100	0,428	0,415	0,417	0,420	37,611	38,059	37,761	37,810	+ 20,104 R² = 0,9957	
	150	0,339	0,337	0,377	0,351	49,402	49,701	49,701	49,601		
	200	0,273	0,273	0,271	0,272	59,253	59,253	59,552	59,352		
	250	0,216	0,216	0,216	0,216	67,761	67,761	67,761	67,761		
F2	50	0,466	0,466	0,444	0,459	33,432	33,432	33,731	33,531	y = 0,1803x + 23,741 R² = 0,9966	145,581
	100	0,393	0,391	0,39	0,391	41,343	41,641	41,791	41,591		
	150	0,338	0,337	0,336	0,337	49,552	49,701	49,85	49,701		
	200	0,273	0,272	0,271	0,272	59,253	59,402	59,552	59,402		
	250	0,204	0,203	0,202	0,203	69,552	69,701	69,85	69,701		
F3	50	0,400	0,399	0,398	0,399	40,298	40,447	40,597	40,447	y = 0,1214x + 34,189 R² = 0,9985	130,241
	100	0,364	0,364	0,362	0,363	45,671	45,671	45,970	45,771		
	150	0,317	0,316	0,315	0,316	52,686	52,836	52,985	52,836		
	200	0,279	0,278	0,277	0,278	58,358	58,507	58,656	58,507		
	250	0,239	0,239	0,237	0,238	64,328	64,328	64,626	64,427		

The IC_{50} values of jam preparations in F1, F2 and F3 were 155.345 ppm, 145.581 ppm and 130.241 ppm, respectively. Jam preparations in F1 are weak antioxidants, and F2 and F3 are moderate antioxidants. Based on the test results, the higher the sample concentration, the higher the % inhibition. This indicates that the jam preparation can counteract more DPPH radicals (Nasikin, 2018). One of the causes of the difference in antioxidant activity test results in F1, F2 and F3 is the influence of variations in the concentration of extract added differently at each concentration. F3 has moderate antioxidant activity because it uses more guava fruit extract compared to F1 and F2. According to Padang & Maliku, (2017), guava has the highest vitamin C content compared to other fruits. Therefore, a formula containing more guava fruit extract will produce stronger antioxidant activity.

Several factors could also cause the weak antioxidant activity in this study. Based on the theory of Arung et al., 2019 explains that the cause of weak antioxidant activity results in the processing of materials, where antioxidants are easily oxidized and degraded by air and heat, which can damage their chemical content, thereby affecting antioxidant activity. Further research needs to regulate the temperature at the time of manufacture so that antioxidant activity is not damaged, as well as conduct stability tests on jam preparations.

CONCLUSION

The results of the quality test on 3 formulas of watermelon albedo jam preparation combined with guava fruit meet the requirements of the pH test, moisture content test, contain vitamin C, and organoleptic test, which is bright red color with a distinctive aroma of watermelon peel and guava and has a slightly sour sweetness. The results of the antioxidant activity test were in the medium category in formulas 2 and 3, while the antioxidant activity was weak in formula 1.

ACKNOWLEDGE

In preparing this article, the author received a lot of guidance and direction from various parties. Therefore, the author would like to thank the Department of Pharmaceutical and Food Analysis, Ministry of Health Polytechnic of Surakarta for the support that has been given.

REFERENCES

Ahmad, D., & Mujdalipah, S. (2017). Karakteristik Organoleptik Permen Jelly Ubi Akibat Pengaruh Jenis Bahan Pembentuk Gel. *Edufortech*, *2*(1). https://doi.org/10.17509/edufortech.v2i1.6174

Arung, Sundu, Supriningrum, Kuspradini, & Nurhasnawati. (2019). Antioxidant activity,

total phenolic and flavonoid content of several indigenous species of ferns in East Kalimantan, Indonesia. *Biodiversitas*, *20*(2), 576–580.

Asikin, N., Ali, A., & Harun, N. (2017). *Addition Of Fruit Jackfruit (Artocarpus heterophyllus) In Making Jam Albedo Watermelon (Citrullus vulgaris* Schard). *Jom Faperta*, *4*(1).

Badan Standarisasi Nasional. (2008). Standar Nasional Indonesia. In *SNI 3746:2008*.

Daswani, P. G., Gholkar, M. S., & Birdi, T. J. (2017). *Psidium guajava: A Single Plant for Multiple Health Problems of Rural Indian Population*. *Pharmacognosy Reviews* |, *11*(22).

Ermawati, & Wahdaniah, N. (2021). Pembuatan Dan Uji Stabilitas Fisik Sirup Ekstrak Kulit Buah Semangka (*Citrullus lanatus* Thunb.). *Jurnal Kesehatan Yamasi Makassar*, *5*(2548–8279), 14–22. http://

Febryana, S. F. A. (2020). Uji Fitokimia Dan Aktivitas Antioksidan Ekstrak Daun Dan Buah Jambu Biji Ungu (*Psidium guajava* L.) Menggunakan Pelarut Yang Berbeda. *SKRIPSI*, *8*(Program Studi Biologi Fakultas Sains Dan Teknologi Universitas Islam Negeri Maulana Malik Ibrahim Malang).

Fitriani, Panggayuh, & Tarsikah. (2018). Pengaruh Pemberian Jus Jambu Biji Terhadap Kadar HB Pada Ibu Hamil Trimester III Di Polindes Krebet Kecamatan Bululawang Kabupaten Malang. *Medicine*.

Handayani, F., Sundu, R., & Sari, R. M. (2017). Formulasi dan Uji Aktivitas Antibakteri Streptococcus mutans dari Sediaan Mouthwash Ekstrak Daun Jambu Biji (*Psidium guajava* L.). *Jurnal Sains Dan Kesehatan*, *1*(8), 422–433.

Ipandi, I., Triyasmono, L., & Prayitno, B. (2016). Penentuan Kadar Flavonoid Total dan Aktivitas Antioksidan Ekstrak Etanol Daun Kajajahi (*Leucosyke capitellata* Wedd.). *Jurnal Pharmascience*, *5*(1), 93–100.

Karuniasari, D. (2022). Phisycal Quality Analysis of Red Guava (*Psidium guajava* L.) Using Edible Coating of Carrageenan and Glycerol. *Protech Biosystems Journal*, *2*(1), 14. https://doi.org/10.31764/protech.v2i1.9476

Megawati, Johan, V. S., & Yusmarini. (2017). Pembuatan Selai Lembaran dari Albedo Semangka Dan Terong Belanda. *Jom FAPERTA*, *4*(2), 1.

Naseer, Hussain, Naeem, Pervaiz, & Rahman. (2018). *The phytochemistry and medicinal value of Psidium guajava* (*guava*). *Clinical Phytoscience*, *4*(1).

Nasikin, A. (2018). *Uji Aktivitas Antioksidan Lotion Ekstrak Tomat (Solanum lycopersicum Linn.)*.

Nasrah. (2019). Pemanfaatan Potensi Kulitbuah Semangka (*Citrullus lanatus*) Dalam Pembuatan Selai Dengan Penambahan Pewarna Alami Daging Dan Kulit Buah Naga Merah (*Hylocereus polyrhizus*). *Agricultural and Food Sciences*. https://api.semanticscholar.org/CorpusID:204103090

Nathania, Maarisit, Potalangi, & Tapehe. (2020). Uji Aktivitas Antioksidan Ekstrak Etanol Daun Kecubung Hutan (*Brugmansia suaveolens* Bercht. & J. Presl) dengan Menggunakan. *Jurnal Biofarmasetikal Tropis*, *3*(2), 40–47.

Nuraini, V., & Karyantina, M. (2019). Pengaruh Waktu Pemanasan Dan Penambahan Air Terhadap Aktivitas Antioksidan Selai Buah Bit (*Beta vulgaris* L.). *FoodTech: Jurnal Teknologi Pangan*, *2*(1), 26.

Padang, & Maliku. (2017). Penetapan Kadar Vitamin C Pada Buah Jambu Biji Merah (*Psidium guajava* L.) Dengan Metode Titrasi Na-2,6 Dichlorophenol Indophenol (DCIP). *Media Farmasi*, *8*(2).

Putri, Arumasi, & Kurniaty. (2020). Review Artikel: Uji Aktivitas Antioksidan Ekstrak Daging Buah Semangka dan Albedo Semangka (*Citrullus lanatus*) dengan Metode

DPPH dan FRAP. *Prosiding Farmasi*, *6*(2), 992–997.

Rachmaniar, & Kartamihardja. (2018). Pemanfaatan Sari Buah Jambu Biji Merah (*Psidium guajava* Linn.) sebagai Antioksidan Dalam Bentuk Granul Effervescent. *Jurnal Sains Dan Teknologi Farmasi Indonesia*, *5*(1).

Ramadhan, W., & Trilaksani, W. (2017). *Formulation of Hydrocolloid-Agar, Sucrose, and Acidulant on Jam Leather Product Development. Jurnal Pengolahan Hasil Perikanan Indonesia*, *20*(1), 95.

Rasyadi, Agustin, & Aulia. (2022). Aktivitas Antioksidan Lip Balm Ekstrak Etanol Bunga Kecombrang (*Etlingera elatior* (Jack) R.M.S.m). *Jurnal Insan Farmasi Indonesia*, *5*(1), 140–148.

Rochmatika, Kusumastuti, Setyaningrum, & Muslihah. (2012). Pemanfaatan Potensi Kulit buah Semangka (*Citrullus lanatus*) Dalam Pembuatan Selai Dengan Penambahan Pewarna Alami Daging Dan Kulit Buah Naga Merah (*Hylocereus polyrhizus*). *Seminar Nasional Penelitian, Pendidikan Dan Penerapan MIPA, Fakultas MIPA, Universitas Negeri Yogyakarta*.

Sari, R., Johan, V. S., & Harun, N. (2020). Karakteristik Selai Lembaran Kolang-Kaling dengan Penambahan Buah Naga Merah. *Jurnal Agroindustri Halal*, *6*(1), 057–065.

Sigalingging, Putri, & Iflah. (2020). Perubahan Fisik Dan Kimia Biji Kakao Selama Fermentasi (pH Tumpukan Biji, Kadar Air, Indeks Fermentasi, Kadar Abu dan Uji Grade Biji). *Jurnal Industri Pertanian*, *2*(2), 158–165. http://jurnal.unpad.ac.id/justin/article/view/24113

Sitorus, Partha, & Setya. (2022). Selai Albedo Kulit Semangka dengan Penambahan Umbi Bit. *Biofoodtech: Journal of Bioenergy and Food Technology*, *1*(1), 48–57.

Sutrisna. (1997). Ekstraksi dan Karakterisasi Pektin Albedo Semangka *(Citrullus vulgaris)*.

Suwarni, & Duwi Cahyadi. (2016). Free-Radical Scavenging Activity of Ethanol Extract Of Kecombrang Flowers (*Etlingera elatior*) *with The DPPH Method*. *Jurnal Ilmiah Medicamento*, *2*(2), 39–46.

Techinamuti, N., & Pratiwi, R. (2018). Review: Metode Analisis Kadar Vitamin C. *Farmaka Suplemen*, *16*(2), 309–315.

Wulandari. (2021). Penetapan Kadar Vitamin C Pada Bawang Putih Tunggal (*Allium sativum* Linn) dengan Metode Iodimetri. *KTI*.