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FORMULATION AND ANTIOXIDANTS EVALUATION OF LIQUID SOAP OF SALACCA ZALACCA (GAERTN.) VOSS. PEELS ETHANOL EXTRACT 96%

by
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Abstract: *Background: Free radicals are compounds that can adversely affect the skin, so antioxidants are needed to maintain healthy skin. Salacca zalacca (Gaert.) Voss. peels extract contains flavonoids which are potential as antioxidants. To maximize the role of topical antioxidants from extracts of Salacca zalacca (Gaert.) Voss. Peels against free radicals that expose the skin, therefore an acceptable preparation is needed, one of which is soap. Objective: this study aims to determine the antioxidant activity of the 96% ethanol peels extract of Salacca zalacca (Gaert.) Voss. and the formulated soap which containing the fruit peels extract. Method: Antioxidant activity was determined by DPPH test (1,1-diphenyl-2-picrylhydrazyl). Results: IC_{50} of Antioxidants values of the extract are 62.08 ppm. Antioxidants IC_{50} of the formulated soap are 139.65 ppm for Formula 1 (F1); 73.2 ppm for Formula 2 (F2); and 55 ppm for Formula 3 (F3). The results show that the 96% ethanol extract of Salacca zalacca (Gaert.) Voss has the potential as source of natural antioxidants that can be developed in liquid soap preparations. Conclusions: Peels and the soap formulated containing the extract of the fruit peels has antioxidant potency. The antioxidant activity of liquid soap preparations increases with the increase in ethanol extract 96% of Salacca zalacca (Gaert.) Voss in the liquid soap. Formula 3 (FIII) contained 3% of Salacca zalacca (Gaert.) Voss ethanol extract 96% is the best Formula against free radicals with 62.08 ppm of IC_{50} which is categorized as moderate anti-oxidant*

INTRODUCTION

Free radicals are a form of reactive compound that has unpaired electrons so that it is destructive. Free radicals through the mechanism of oxidation can cause skin damage which

is characterized by wrinkles, scaly, dry, and cracked. To reduce the impact of free radicals, antioxidant compounds are needed [1]. Flavonoids are one of the natural antioxidant compounds derived from the phenolic group, where the mechanism of action of these compounds is to donate hydrogen atoms to free radicals [2].

One of the many tropical plants in Indonesia with flavonoid content is *Salacca zalacca* (Gaert.) Voss [3]. The peels of the salak fruit, which is usually discarded and thought to be useless, was found to have strong antioxidant activity with an IC_{50} value of 99.1 ppm (g/mL) and secondary metabolites contained in this fruit peels are alkaloids, flavonoids, tannins, and saponins [4]. The results showed that the ethanol extract of the bark of this plant also contains flavonoids and acts as an antioxidant (Aralas et al., 2009) . However, the peels of this plant has not been maximally utilized as a source of antioxidants. To optimize the use of *Salacca zalacca* (Gaert.) Voss peels as an antioxidant on the skin, one alternative is to formulate liquid soap preparations. Soap is a skin cleanser that is often used and the liquid form is preferred because it is more practical and more hygienic [7]. Liquid soap is currently in high demand because it is more convenient and appealing to consumers than other types of soap. The advantages of liquid soap over solid soap are that it is easier to transport, store, is not easily damaged or dirty, and has a unique packaging appearance [8]. Determination of potential antioxidant activity can be done using the DPPH method (1,1-diphenyl-2-picrylhydrazyl), where this method is one of the methods that is easy to do, accurate, and widely used [9].

This study aims to formulate the ethanol extract of Salacca zalacca (Gaert.) Voss peels into liquid soap preparations and compare the antioxidant activity between soaps formulated with *Salacca zalacca* (Gaert.) Voss peels extracts using DPPH method.

MATERIAL AND METHODS

Materials

Aluminum foil, Analytical scales (Precisa®), aquades, Carbopol 940 (Intraco®, Makassar), chopper machine (Miyako®), Cocamidopropil betain (Intraco®, Makassar), concentrated HCl, cuvette, digital scales (KERN®), desiccator, Dragendroff reagents, DPPH, Ethanol 96%, Ethyl Diamin Tetra Acetate (EDTA) (Intraco®, Makassar), ethanol p.a (pro analyst), FeCl3 1%, filter paper, glassware (Pyrex®), Glass jars, spatulas, hair dryers (Pyrotx) Philips®), incubator, label paper, Mg, parfumes (Intraco®, Makassar), pH meter (Jenway®), porcelain cups, Potassium hydroxide (KOH), refrigerator (Sharp®), rotary evaporators (Buchi®), Sodium lauryl sulfate (SLS) (Intraco®, Makassar), stopwatch, stockpots, tissues, UV-Vis spectrophotometer (Genesys®), Viscometer (Rion Viscotester VT-04F®), water bath.

Methods

Preparatino of Ethanol Extract of Pondoh (Salacca zalacca (Gaertn.) Voss) peels

Salacca zalacca (Gaertn.) Voss peels was taken from Silea Village, Onombute District, Konawe Regency, Southeast Sulawesi-Indonesia. The peels were washed with running water then dried in an oven at 400 and blended to become a coarse powder [10]. A total of 500 grams of simplicia was macerated with 2.0 liters of 96% ethanol for 3 days and then stirred and replaced with solvents every 24 hours. Maserat was evaporated using a rotary evaporator at 55^0C until thick concentrared extract was obtained [10].

Liquid Soap Formulation Ethanol Extract 96% of (Salacca zalacca (Gaert.) Voss.) peels

The concentration of ethanol extract of *Salacca zalacca* (Gaert.) Voss. peels that varied was 1% (F1), 2% (F2) and 3% (F3). Making begins with mixing SLS, Cocoaminido propyl betaine and EDTA add a little aquadese stirred until homogene, let stand until the foam disappears. In other containers, carbopol is slowly dispersed into distilled water at 70 ° C and stirred until homogene. KOH as a carbopol neutralizer is dissolved with distilled water and added to the carbopol, then combined with a SLS mixture and stirred until homogeneous, add coloring and scent as a soap base. Furthermore, *Salacca zalacca* (Gaert.) Voss. Peels extract was added, stirred until homogeneous and then added with distilled water up to 100 mL.

Table 1. The formulas of the liquid soap 96% ethanol extract of (Salacca zalacca (Gaert.) Voss.) peels

Ingredients	**Concentration of Ingredients**			**e**
Extract of (Salacca zalacca (Gaert.) Voss.) peels	1%	2%	3%	Antioxidant
Carbopol	6%	6%	6%	Thickener
KOH	0,15%	0,15%	0,15%	Neutralizing base
Cocamido propil betain	5%	5%	5%	*Soft surfactant*
Sodium lauril sulfat	4%	4%	4%	Surfactant
EDTA	0,1%	0,1%	0,1%	Chelating
Parfume	q.s	q.s	q.s	Fragrance
Aquadest	ad 100 ml	ad100 ml	ad 100 ml	Solvent

Antioxidant Activity

DPPH stock solutions are made at 100 ppm in ethanol. The ethanol extract test solution 96% of *Salacca zalacca* (Gaert.) Voss peels and liquid soap preparations were each made of variations in the concentration of 50 ppm, 100 ppm, 150 ppm and 200 ppm. Each test solution was pipetted as much as 1 mL with 1 mL ethanol added and 1 mL of DPPH solution, incubated at room temperature for 30 minutes. Furthermore, it was measured using a UV-Vis spectrophotometer at a wavelength of 517 nm. IC_{50} determination of antioxidant activity is calculated based on the equation [11]:

$$\% \text{ inhibition} = \frac{absorbance\ of\ DPPH - absorbance\ sampel}{absorbance\ of\ DPPH} \times 100\ \%$$

The percentage inhibition and concentration of the extract were plotted respectively on the x and y axes, and the obtained line equation was used to calculate the 50% inhibitory concentration (IC_{50}) [11].

RESULTS AND DISCUSSION

Based on the research that we have done previously (**Table 2**), the physical characteristics of liquid soap have been carried out including evaluation variables, namely organoleptic, pH, foam height and viscosity. Liquid soap has the characteristics of a brownish

yellow liquid with a rose aroma. The standard for the organoleptic test of liquid soap set by SNI is liquid and has a distinctive odor and color. From the test results obtained pH is 10.46. The results show that the preparation meets the Standards of SNI for the permissible pH of liquid soap, which is between 8-11. Foam stability reaches 85%. Based on the standard of good foam stability, it is around 60-90%. viscosity is 600 cPs Viscosity value based on SNI standard for liquid bath soap is 400-4000 cPs [12].

Table 2. Physical Properties of Liquid Soap Salacca Zalacca (Gaertn.) Voss. Peels Ethanol Extract 96%

Physical characteristics	**Results**	**SNI Standard**
Organoleptic	Liquid, brownish yellow	Distinctive Color and Odor
pH	10,46	8-11
Viscosity	600 cPs	4000-4000 cPs
Foam stability	85%	60-90%

Source: [12]

Percentage value (%) inhibition describes the activity of a compound in inhibiting free radicals which in this experiment is DPPH. The higher the value of percent inhibition, the greater the antioxidant activity of the compound. The soap base has the lowest inhibitory percent against DPPH which is below 20%, where the value is very significantly different compared to the percent inhibition of soap and extract. Line equation data obtained to calculate the IC_{50} of inhibition value of Soap Base (BS), F (1), F (2), F (3), and Ethanol Extract of Salacca zalacca (Gaert.) Voss. peels are presented ini **Table 2.** The concentration of 1% extract in the soap preparation in formula 1 (FI), showed an increase in the value of percent inhibition. Formula 2 (FII) has almost the same inhibitory power of Ethanol Extract of *Salacca zalacca* (Gaert.) Voss. peels against DPPH radicals (**Table 2**).

Table 3. Inhibition (%) Soap Base (BS), F (I), F (II), F (III), and Ethanol Extract of *Salacca zalacca* (Gaert.) Voss. peels Each solution of 1 mL was added 1 mL of ethanol and 1 mL of DPPH solution, incubated at room temperature for 30 minutes and absorbance was measured at a wavelength of 517 nm.

Formula	Concentration (ppm)	Absorbance (λ517 nm)*	Inhibition (%)	Line equation
Soap Base	50	0,678	7.123	y = 0,054x + 4,999; r^2 = 0,9699
	100	0,649	11.095	
	150	0, 632	13.424	
	200	0,618	15.342	
FI	50	0,387	46,986	y = 0,029x + 45,95; r^2 = 0,9331
	100	0,368	49,589	
	150	0,364	50,136	
	200	0.353	51.643	
FII	50	0,378	48,219	y = 0,104x + 42,39 r^2 = 0,9905
	100	0,351	52,054	
	150	0,309	57,671	
	200	0.265	63.698	

FIII	50	0.370	49.315	y =0,106x + 44,17 r^2 = 0,9929
	100	0,331	54,657	
	150	0.283	61.232	
	200	0.256	64.931	
Ethanol Extract of Salacca zalacca (Gaert.) Voss. peels	50	0.371	49.178	y = 0,096x + 44,04 r^2 = 0,9959
	100	0.340	52.424	
	150	0.306	58,082	
	200	0.265	63.698	

Percent inhibition (% inhibition) of formula 3 (FIII) soap to DPPH is higher than inhibition of *Salacca zalacca* (Gaert.) Voss peels Extract Ethanol. This is likely influenced by the content of EDTA as chelating in soap preparations can increase the antioxidant effectiveness of the flavonoids contained in the extract [13]. Chelating mechanism of EDTA as its ability to react with multivalent metal ions to form complex compounds that makes EDTA especially useful in tying up the metal ion in an inactivated state. These common chelating agents are formed from an organic amine backhone that is carboxylated to form the chelating agents [14]. By this mechanism, EDTA helps flavonoids effectively to chelate trace metals which are important in oxygen metabolism. These metals have the potential to enhance the formation of reactive oxygen species by the reduction of hydrogen peroxide, which results in the generation of the highly aggressive hydroxyl radical [15].

Based on **Table 3.** It can be seen that the more concentrated extract increases by 1%, 2%, and 3% in the liquid soap supply, the more the value of percent inhibition increases. Ethanol Extract of *Salacca zalacca* (Gaert.) Voss. peels contain flavonoids which act as anti-free radicals. Flavonoids have been shown to inhibit all enzymes involved in reactive oxygen species generation, including cyclooxygenase, lipoxygenase, microsomal monooxygenase, glutathione S-transferase, mitochondrial succinoxidase, and NADH oxidase, as well as the enzymes responsible for superoxide anion production, such as xanthine oxidase [16] and protein kinase C [17]. A variety of flavonoids effectively chelate trace metals such as free iron and copper, which are important in oxygen metabolism. These metals have the potential to enhance the formation of reactive oxygen species by the reduction of hydrogen peroxide, which results in the generation of the highly aggressive hydroxyl radical [15]. It can be concluded that the concentration of extract increases the higher the antioxidant activity obtained [18].

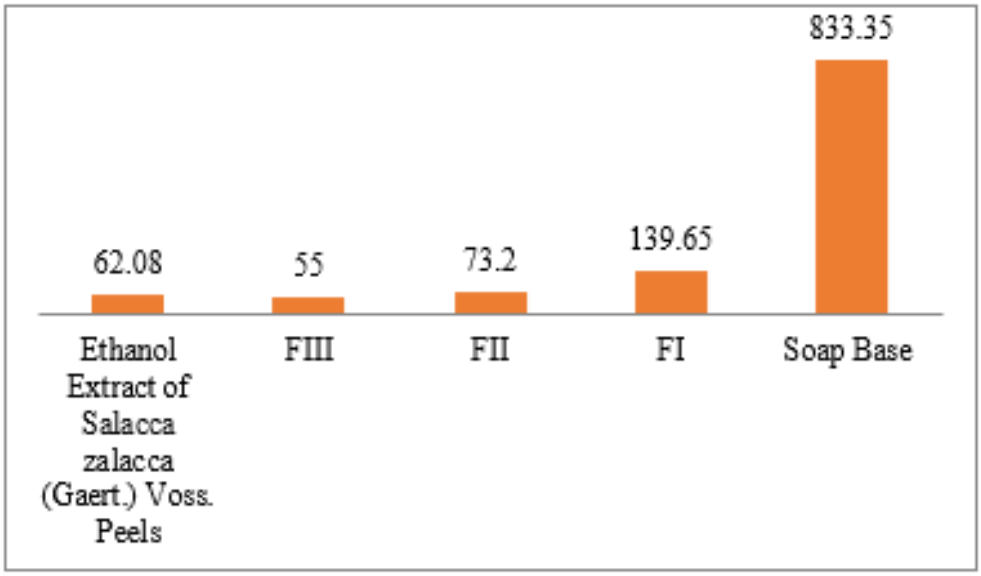

Figure 1. IC_{50} (ppm) Ethanol Extract of *Salacca zalacca* (Gaert.) Voss. peels, F (3), F (2), F (1) and Soap Base on DPPH radical. The higher the IC_{50} value, the lower the antioxidant activity.

The IC_{50} value describes the level of a compound needed to inhibit 50% of DPPH free radicals. The antioxidant value categories of IC_{50} consist of very strong <10 ppm, strong between 10-50 ppm, moderate range of 50-100 ppm, weak 100-250 ppm and not active when> 250 ppm [19]. IC_{50} value is inversely proportional to the value of inhibition, where the higher the IC_{50} value, the lower the value of % inhibition.

Figure 2 shows that the soap base is not anti-free radical because it has an IC_{50} value> 250 ppm which is 833.35 ppm. IC_{50} liquid soap extract concentration of 1% (F1) is 139.65 ppm which is categorized as a weak antioxidant because the antioxidant value is between 100-250 ppm. Extract concentration in soap is one of the determinants of antioxidant activity. the higher the concentration of the extract, the higher the antioxidant capacity. IC_{50} value of formula 2 (2%), formula 3 (3%), and ethanol extract of *Salacca zalacca* (Gaert.) Voss peels were 73.2 ppm and 62.08 ppm which are included in the category of moderate anti-oxidant, which is between 100 to 250 ppm. Although F3 with extract concentration of 3% has the highest IC_{50} value of 55 ppm, the preparation is still included in the category of moderate antioxidants. Chelating mechanism of EDTA as its ability to react with multivalent metal ions to form complex compounds by this mechanism, EDTA helps flavonoids effectively to chelate trace metals which are important in oxygen metabolism [15].

CONCLUSION

Ethanol extract of *Salacca zalacca* (Gaert.) Voss peels has the potential as source of natural antioxidants that can be developed in liquid soap preparations. The antioxidant activity of liquid soap preparations increases with the increase in ethanol extract 96% of *Salacca zalacca* (Gaert.) Voss in the liquid soap. Formula 3 (F3) contained 3% of *Salacca zalacca* (Gaert.) Voss ethanol extract 96% is the best Formula against free radicals with 62.08 ppm of IC_{50} which is categorized as moderate anti-oxidant.

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CONFLICT OF INTEREST
The authors declare have no known competing financial or personal relationships that influence the study reported in this paper.

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