FORMULATION AND EVALUATION OF BREAST MILK ETHANOL EXTRACT FRUIT MEAT *(Psidium Guajava* L.) BY USING VARIATIONS OF EMULGATOR CONCENTRATION

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ABSTRACT

Preparations cream is a semisolid dosage forms containing one or more ingredients dissolved or dispersed in the base material which one of the plants that is used as a face cream is guava, because it contains vitamin C which is quite high and has the potential as an excellent antioxidant. This study aims to determine the effect of emulsifier concentration on cream preparations and which formulas show stable results.

This research is an experimental study with a *posttest only design.* The population in this study was guava fruit (Psidium *guajava* L.) from guava trees in Dulomo Selatan Village, Kota Utara District, Gorontalo.

The results showed that in formula I (F1) and formula III (F3) there was a rancid odor, for texture and appearance there had been a change from formula I (F1), namely soft and dense texture and formula II (F2) and formula III (F3). to a soft and fluid texture. The result of measuring the pH of cream preparations in formula 1 (F1) is 7, formula (F2) is 7 and formula (F3) is 7, the test for spreadability of cream preparations in Formula 1 (F1) is 5.25 cm, Formula 2 (F2) 4 .5 cm and Formula 3 (F3) 5.25 cm, the centrifugation test for cream preparations in Formula 1 (F1), Formula 2 (F2) and Formula 3 (F3) separated for 2 hours.

Keywords: preparation of creams, antioxidants, extracts of guava

INTRODUCTION

Skin is an organ that covers the entire human body and serves to protect the body from external influences, so the skin needs to be protected and maintained its health. The process of skin damage is characterized by the appearance of wrinkles, scales, dryness, and cracks. One of the causes of skin damage is free radicals. Free radicals become stable if they bind to electrons from other molecules. Antioxidants are chemical compounds that can donate one or more electrons to free radicals, so that these free radicals can be removed [14]. The human body does not have an excessive amount of antioxidant reserves, so that if there is excessive exposure to radicals, the body needs exogenous antioxidants.

Of all these factors, the free radical theory is a theory that is often referred to as one of the causes of premature aging. Free radicals are atoms or molecules that have reactive properties with unpaired electrons. Compounds that are able to ward off free radicals are antioxidants. As one of the active ingredients, antioxidants are often used to protect the skin from damage caused by oxidation so as to prevent premature aging [12].

Antioxidants have a small molecular weight, but can inactivate the development of free radicals. Antioxidants are compounds that can also inhibit

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the oxidation reaction, to scavenge free radicals and molecules which are highly reactive, consequently ker usakan be able inhibited cells [23]. One of the plants that has antioxidant activity is guava fruit (Psidium *guajava* L.) from the *myrtaceae* family which is a tropical plant and is easy to find.

One of the plants that has antioxidant activity is guava fruit (Psidium *guajava* L.) from the *myrtaceae* family which is a tropical plant and is easy to find. J ambu seed has been clinically proven to have various pharmacological effects, including analgesic, anti-mutagenic, anti-diarrhea, anti-cough, anti-bacterial, anti-fungal, anti-plaque, pressing inotropism heart muscle, anti-diabetic, anti-hypertensive, hepatoprotective, anti-coagulants, and anti-oxidants. Previous research has shown that three active flavonoids from guava leaf ethanol extract, namely quercetin, quercetin-3- *O*- glucopyranosi-de and morin, have activity as free radical scavenging agents (antioxidants). The results of quantitative analysis showed that the value of IC activity (50% *Inhibitor Concentration)* of 96% purified (delipidated) ethanol extract was 35.98 ppm, while the IC value of gel preparations containing a concentration of 1xIC $_{50}$ was 466 ppm [11].

Guava fruit has a different flesh color, some are white, and some are red. The nutritional content of these guavas is also different, guava with white flesh has a more complete nutritional content with a higher vitamin C content [15].

The process of fruit ripening can be influenced by the presence of acetylene gas formed during fruit respiration. The higher the respiration of the fruit, the greater the acetylene gas formed and the maximum respiration time (climacteric). At that time the acetylene gas formed will start the ripening process. In this process, biochemical changes occur, including the overhaul of chemical compounds, including chemical substances that are antioxidants. Based on this, the maturity level of guava fruit can affect the antioxidant activity contained in the fruit. The antioxidant activity of guava fruit can be seen from several parameters.

Untuk determine the level of antioxidant fruits such as guava, do some tests including total ascorbic acid, total phenols, antioxidant activity, and the activity of ion chelating Fe $^{2+.}$ The antioxidant activity of guava fruit can be influenced by several factors. The antioxidant activity of guava fruit is influenced by the level of maturity, fruit parts and guava varieties [23]. Guava fruit has been clinically proven to have a pharmacological effect as an antioxidant. E kstrak guava white meat with a concentration of 20% and a maximum storage period for storage at a low temperature until the 10th day, the number of microbes 6.3 x10 ^{6} cfu / g, a pH of 6.86 and a weight loss of 9.3 % so that it can be used as an antioxidant [1].

The content of vitamin C in guava fruit can reach its peak just before ripe. This is due to differences in levels of vitamin C and other chemicals. Based on these data, this plant can be used as a cosmetic preparation in the form of a cream.

The addition of guava fruit extract in saturated salt solution with a concentration of 6 and 12% during salting was able to inhibit the oxidation of salted catfish fat which was reflected in the inhibition of increasing levels of fluorescent products and inhibition of damage to unsaturated fatty acids during 2 months' storage [3]. Based on the consideration of chemical and sensory results, guava fruit extract treatment at a concentration of 6% can be used as an antioxidant.

Antioxidant activity showed that on the sixth day of incubation the guava fruit

extract had a large percentage of inhibition on the oxidation of krengseng coconut oil. The percentage inhibition of guava fruit extract concentration was 0.01%; 0.05%; and 0.1% can inhibit the oxidation of krengseng coconut oil [4].

M elakukan research on determining the vitamin C content in guava fruit with ripeness level comparison. The method used is the Iodimetric method. The yield obtained on ripe guava fruit was 56.3266 mg while in half-ripe guava it was only 38.3 mg [17].

Guava fruit (Psidium *guajava.* L.), has the potential to be developed as a natural sunscreen preparation. The sunscreen activity of ethanol extract from guava pulp (Psidium *guajava.* L.) can be done but by using an in vitro method using a UV-Vis spectrophotometer. In vitro sunscreen activity can be determined by calculating the value of % transmission of erythema (% Te), the value of % transmission of pigmentation (% Tp), and the value of *Sun Protection Factor* (SPF) [22].

Antioxidant activity in guava flesh can be influenced by several factors. The antioxidant activity of guava fruit is influenced by the level of maturity, fruit part and guava variety. on the antioxidant activity of guava showed that the ripe guava had a higher antioxidant activity than the half-ripe guava fruit.

The ethanolic extract of *Psidium guajava* L. contains many phenolic compounds as antioxidants obtained with 70% ethanol and the extract is considered stable at temperatures below 60°C [6]. Showing Ethanol 70% gave their guava polyphenols, including flavonoids and the like which show antioxidant activity. It was also mentioned that 70% ethanol was the most effective solvent for extracting antioxidant-containing compounds from guava fruit [18].

Preparations with the use of antioxidants on the skin are usually found in cosmetic preparations. One of the cosmetic dosage forms used is cream. Cream is a semi-solid preparation containing one or more drug ingredients dissolved and dispersed in a suitable base material. The reason for making cream preparations is for physical effects, namely the ability to work as skin protectors, lubricants, softeners, drying agents and others, or for the special effects of existing medicinal ingredients [22].

Guava juice can be formulated in a cream dosage forms. The cream preparations produced were all homogeneous and had a pH of 6-7. Guava (*Psidium Guajava L.)* can be formulated into a cream dosage form with an oil/water emulsion type [8].

Based on the foregoing, researchers are interested in conducting research related to the formulation and evaluation of physical preparations of guava pulp ethanol extract using variations in the concentration of TEA and Stearic acid emulsifiers.

METHOD

Research Location and Time

The research took place at the Phytochemical Laboratory and Pharmaceutical Preparation Technology Laboratory, Bina Mandiri University, Gorontalo. In implemented in October-November 2020.

Types of research

The type of research used is quantitative experimental research with *Posttest Only Design* method to measure the effect of emulsifier on the preparation of guava fruit extract cream (Psidium *Guajava* L.).

Research variable

Research variables are subjects or objects that are the target of research:

1. The independent variable (free) is the variable that affects or causes the change or the emergence of the dependent variable (bound). In this

study, the independent variable was the use of variations in the concentration of emulsifiers in the physical formulation of the ethanol extract of guava pulp.
2. The dependent variable (bound) is the variable that is influenced or which is the result of the independent variable (free). In this study, the dependent variable was the physical stability of the ethanol extract of guava pulp which included Organoleptic, Homogeneity, pH, Viscosity, Spreadability, Adhesion and Stability Test.

Operational definition

1. Guava fruit (Psidium guajava L.) is a fruit that is used as a functional food ingredient because it has a function for health. The functional properties of guava are caused by the presence of high enough vitamin C.
2. In guava fruit there are other chemicals that can affect antioxidant activity, such as flavonoid compounds, a combination of saponins with oleanolic acid, guaijavarin and quercetin.
3. Extract is a viscous preparation obtained by extracting the active compound from vegetable simplicia or animal simplicia using a suitable solvent, then all or almost all of the solvent is evaporated and the remaining powder mass is treated so that it meets the specified standard.
4. Emulsifiers are surface active agents that reduce the interfacial tension between oil and water and surround the dispersed droplets in a strong layer that prevents coalescence and separation of the dispersed phase.

Research subject

Population: Guava (Psidium *guajava* L.)

Sample : The sample is obtained by meeting the criteria that are good enough for used in research.

Population and Research Sample

1. Population, p opulasi in this study is the guava (Psidium *guajava* L.) of guava in the Village of South Dulomo, North City District, Gorontalo.
2. Samples, s Ampel in this study is the guava (Psidium *guajava* L.) taken part ripe guavas from a tree branch around the yard of existing homes in the Village of South Dulomo, North City District, Gorontalo.

Research Tools and Materials

The tools used in this study include: *rotary evaporator,* mortar and pestle, stirring rod, analytical balance, filter paper, beaker, Petri dish, Dropper Dropper, Erlenmeyer, Spatula, Blender, Oven, pH indicator and water bath. While the ingredients include: guava pulp (Psidium *guajava* L.), 70% ethanol, stearic acid, alpha tocopherol, propyl paraben, methyl paraben, triethanolamine, propylene glycol, glycerin and aquadest.

Research procedure

1. Extract preparation, d isiapkan guava (Psidium *guajava* L.) mature as much as 2 kg, Washed guava (*Psidium guajava* L.) with clean running water, then chopped meat guava (*Psidium guajava* L.) and discarded seeds fruit. After that, the fruit flesh is dried in the sun to dry. Next, blend the dried fruit slices to a powder. The next step is maceration of the powder with 70% ethanol solvent for 72 hours, stirring occasionally. The macerated powder was filtered using filter paper. The filtrate was concentrated using a *rotary evaporator* at a temperature below 70 ^{0}C until a thick extract was obtained. The final step is to extract the viscous stored at a temperature of room 26-28 ^{0}C.
2. Cream Formulation Design, in 30 grams of cream preparation contains, as follows:

Table 1. Cream Formula Content

Material	F1 (%)	F2 (%)	F3 (%)
Guava fruit extract	22.50	22.50	22.50
Stearic Acid	10	15	20
Triethanolamine(TEA)	2	3	4
Glycerin	15	15	15
Propylene glycol	5	5	5
cetyl alcohol	5	5	5
Methyl Paraben	0.2	0.2	0.2
Propyl Paraben	0.02	0.02	0.02
Alpha Tocopherol	0.05	0.05	0.05
Aquadest	*ad* 100	*ad* 100	*ad* 100

Source: Mardikasari, Jurnal Farmasi Sains dan Kesehatan, ISSN 2442-9791.

3. Cream Preparation Process, first of all the ingredients to be used are weighed. The heated oil phase, namely acid stearate, cetyl alcohol, and Propyl Paraben at 70 ^{0}C above the *water bath* using a porcelain cup to melt. After melting, add Alpha Tocopherol. Furthermore, the aqueous phase is heated, namely Methyl paraben, TEA, glycerin, propylene glycol and aquadest at a temperature of 70 ^{0}C above the water *bath* using a porcelain cup until it melts. Then, put it in the mortar of the water phase and add the oil phase. The next step is homogenized until a cream base is formed. And the last step is added little by little ethanol extract of guava fruit (Psidium *guajava* L.) when the base has been formed and then homogenized.
4. Physical Evaluation of Cream Preparations
   a. Organoleptic, done by looking at changes in color, odor, and the presence of phase separation.
   b. pH, pH measurements are carried out using a pH meter. Previously the pH meter was calibrated with a standard *buffer* solution at pH 4 and 7.
   c. Spreadability, 0.5 g of cream was weighed, placed in the middle of the glass, and the cover glass, which was first weighed, was then placed on the base, left for 1 minute. The diameter of the spread of cream was measured after 1 minute by taking the average length of the diameter from several sides, the load was added weighing 20 g then measured again after 1 minute, the weight was added every 20 g until the added weight was less than 150 g, the diameter of the spread was recorded every added weight.
5. Adhesiveness, weighed as much as 0,5gram *body butter* ethanol extract of guava was built at the *object glass* and covered with *objects of glass* more. Place the 500-gram load for 5 minutes on the *object glass* cover. Both ends of the *object glass are* attached to the clamp on the adhesive test equipment, then release the support load. Record the length of time the two *object glasses are* released as the attachment time of the preparation.

DATA ANALYSIS

The data from this research will be processed using the *Statistical Product and Services Solution* (SPSS) program. The data in the analysis of quantitative wherein, the measured results of Formulation and Evaluation Preparations Ethanol Extract Cream Guava Fruit Meat Variations Using emulsifier concentrations.

RESULT

The results of the formulation of the ethanol extract of guava pulp using various concentrations of emulsifier are as follows:

Table 2. Remnants

Sample weight (g)	Extract yield (gr)	Extract soak (%)
600	40	6.66

Source Practicum Report

The guava extract (Psidium *guajava L)* produced was 600 grams of powder and 40 grams of extract. The weight of the empty pot before adding the extract was 13.2 grams, pot 2 13.2 grams and pot 3 13.1 grams. After adding the extract of each pot, 35.3 grams of formula 1 (F1), 37.25 grams of formula 2 (F2) and 30.07 grams of formula 3 (F3).

The result of guava extract (Psidium *guajava L)* obtained was 6.66 %. The greater the yield produced, the more efficient the treatment applied without compromising other properties.

Organoleptic Test Measurement

Formula	Organoleptic test			
	Smell	**Color**	**Texture**	**Appearance**
F1	Rancid	dark chocolate	Soft and dense	Homogeneous
F2	Not too rancid	Light brown	Soft and liquid	Not homogeneous
F3	Rancid	Light brown	Soft and liquid	Somewhat homogeneous

(Source: Primary Data, 2020)

pH Test Measurement

Based on the results of measuring the pH of the cream preparation in formula 1 (F1) is 7, formula (F2) is 7 and formula (F3) is 7.

Spreadability Test Measurement

Based on the results of the extraction of guava fruit (Psidium *guajava* L) the results of the dispersion test measurement were obtained, namely, formula I had a spread of 5.25, formula II was 4.5, and formula III was 5.25.

Centrifugation Test Measurement

Based on the results of research on the extraction of guava fruit (Psidium *guajava* L) obtained the results of the centrifugation test measurement, namely, all formulas separated for 2 hours.

***Mann Whitney* test**

Based on the test results *Mann Whitney* showed ba hwa value A. Symp. Sig = 0.480 or shows 0.480> 0.05 so it can be concluded that there is no difference in the spread of cream.

DISCUSSION

Based on the results of organoleptic test measurements of cream preparations in Formula 1 (F1), Formula 2 (F2) Formula 3 (F3) based on smell, color, texture and appearance. In formula (F1) and formula (F3) a rancid odor occurs because the oil phase in the cream water has been oxidized. In terms of texture and appearance, there has been a change from the formula (F1) which is a soft and dense texture and formula (F2) and formula F (3) to a soft and liquid texture. This is due to a decrease in viscosity in the formula (F2) and formula (F3).

In formula (F1) and formula (F3) a rancid odor occurs because only a small amount of alpha tocopherol is used so that the oil phase in the cream water has been oxidized. The rancid odor is caused by the polyphenolic compounds present in guava fruit which will oxidize and condense further to produce high molecular weight components that are brown in color [7].

The viscosity of semi-solid preparations is one of the factors that need to be considered because it is related to the convenience of use. The cream should be easy to apply and adhere to the skin. The cream should not be too hard and too runny because it relates to the desired therapeutic effect and comfort of use [10].

Organoleptic examination aims to determine the appearance of the cream in the form of shape, color, smell and appearance which is done visually. This test needs to be done because it relates to the comfort of use.

Creams based on oil in water have properties that are more comfortable and tend to be liked by the public, because they provide an oily consistency and tend to be sticky, but many active ingredients

are hydrophobic which release more easily, and increase the concentration of water-soluble ingredients when using this type of base. Oil-in-water creams are often used to provide an emollient effect on the skin, are used as ointments and are easier to spread when applied [2].

The results of this study are in line with research conducted by [9], it was found that the organoleptic test of guava extract cream preparations (Psidium *guajava L)* was Formula 1 (F1) and Formula 2 (F2) had a distinctive aromatic odor, green color, and solid texture.

Based on the results of the measurement of the pH of the cream preparation in formula 1 (F1) is 7, formula (F2) is 7 and formula (F3) is 7. This is in accordance with the regulation of the Head of the Food and Drug Supervisory Agency of the Republic of Indonesia number HK.03.1.23.23 .08.11.075517 of 2011 concerning the technical requirements of cosmetic ingredients, namely 4.5-8.0, meaning that the cream produced is safe for pH measurement.

Variations in concentrations of stearic acid and triethanolamine affect the pH of the cream preparations produced, but all preparations have a pH value that is included in the pH requirements of human skin [19].

If the pH of the preparation is outside the pH interval of the skin, it is feared that it will cause scaly skin or even irritation, while if it is above the pH of the skin, it can cause the skin to feel slippery, dry quickly, and can affect skin elasticity [21].

The results of this study are in line with research conducted by [11]. The pH test of guava extract cream preparations (Psidium *guajava L)* is Formula 1 (F1) as much as 6.67, Formula 2 (F2) as much as 6.60 and Formula 3 (F3) as much as 6.55 with a significant value in the three formulas is 0.004 ($\alpha < 0.05$).

Based on the results of the test of the spreadability of the cream preparations in Formula 1 (F1) 5.25 cm, Formula 2 (F2) 4.5 cm and Formula 3 (F3) 5.25 cm. The results show that Formula (F1) and Formula (F3) have the highest dispersing ability which includes soft and slightly liquid cream, while Formula (F2) has the ability to spread in the range of 4.5 cm which includes soft and dense cream. This shows that the resulting cream preparations are not easily damaged due to extreme temperatures so that the physical properties of the preparations are also good.

Formula (F1) and Formula (F3) have met the standard of good dispersion, which is around 5-7 cm. The higher the spreadability, the faster the absorption of the cream into the skin because the contact between the skin and the cream becomes wider [13].

The use of addition of emulsifier (emulsifier) stearic acid and triethanolamine (TEA) as an emulsifier can affect the spreadability of the cream preparation so that each formula has a different level [16]. The variation in the concentration of triethanolamine and stearic acid affects the spreadability of the resulting cream preparation. The higher the concentration of stearic acid will increase the viscosity of the cream so that the spreadability becomes smaller. The gradual addition of the load will provide better dispersion so that the cream penetration is more optimal.

One of the polymers used as a base in cream preparations is TEA and stearic acid. In addition, stearic acid can function as an emulsifier in the manufacture of cream if it is reacted with a base (KOH) or triethanolamine can be used to neutralize cream. Use of anionic emulsifiers such as triethanolamine (TEA) and stearic acid, given that the cream is intended for external use. The addition of triethanolamine (TEA) will form an O/W

emulsion (oil in water) which is very stable when combined with free fatty acids. A suitable fatty acid combined with TEA is stearic acid because stearic acid does not change color like oleic acid. Cream preparations using stearic acid and triethanolamine were stable during storage [5].

Preparations that have a lower viscosity (more dilute) produce a larger dispersion diameter because they are easier to flow. Besides, because of the lower viscosity, the diameter of the distribution is wider. The important parameter is the viscosity test which has a big influence on the extract preparation where if the concentration of the two extracts changes slightly, the viscosity also changes. The adhesion test was related to the ability of the extract to adhere. While the dispersion test affects the pharmaceutical quality of the preparation and is related to the spread on the skin surface [19].

The spreadability test of the cream was carried out to determine the ability of the cream to spread on the skin surface when applied. Good base spreading ability will provide ease of application on the skin surface. In addition, the distribution of active ingredients on the skin is more evenly distributed so that the effects of the active ingredients become more optimal [20].

The results of this study are in line with research conducted by [13]. It was found that the spreadability test for guava extract cream preparations (Psidium *guajava L)* was Formula 1 (F1) between 6-7 cm, Formula 2 (F2) between 5-6 cm and Formula 1 (F1) between 6-7 cm. 3 (F3) between 4-5 cm. with a significant value in the three formulas is 0.001 ($\alpha <$ 0.05.

Based on the measurement results of the centrifugation test, the separation occurred for 2 hours while preparing the cream in Formula 1 (F1), Formula 2 (F2) Formula 3 (F3), indicating that the cream by centrifugation was unstable. This is because the bond formed between the oil globules and water is unstable due to the centrifugal force which causes the particles to separate according to their specific gravity [3]. The specific gravity is directly proportional to the rate of deposition, the specific gravity of the oil phase is smaller than the water phase, which causes the sedimentation rate to be negative and it is sent upwards.

Centrifugation test is a mixture separation technique that is carried out by utilizing centrifugal force. Molecules with a greater density will be focused on the walls of the centrifugation tube while molecules with a lower density will be collected in the center (axis). Molecules that gather on the tube wall will form a larger mass and are attracted by gravity so that they gather at the bottom of the tube, while molecules that have a lower density are at the top [3].

The results of this study are in line with research conducted by (Nining et al., 2019) it was found that the centrifugation test for guava extract cream preparations (Psidium *guajava L)* was Formula 1 (F1), Formula 2 (F2) and Formula 3 (F3) where separation occurred.

Based h acyl Mann Whitney test showed ba hwa value A. Symp. Sig = 0.480 or shows 0.480 > 0.05 so it can be concluded that there is no difference in the spread of cream.

The use of addition of emulsifier (emulsifier) stearic acid and triethanolamine (TEA) as an emulsifier can affect the spreadability of the cream preparation so that each formula has a different level [9].

The variation in the concentration of triethanolamine and stearic acid affects the spreadability of the resulting cream preparation. The higher the concentration of stearic acid will increase the viscosity

of the cream so that the spreadability becomes smaller. The gradual addition of the load will provide better dispersion so that the cream penetration is more optimal.

CONCLUSION AND SUGGESTIONS

After conducting research on the formulation and evaluation of cream preparations of guava pulp ethanol extract using various emulsifier concentrations, it can be concluded that variations in emulsifier concentration showed no significant effect on changes in the spreadability of cream preparations and the results of the three cream formulas did not show stable results.

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