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Case Report Paper

Formulation Test of Preparations Face Mist Combination of Pomegranate Peel Extract and Mangosteen Peel as an Antioxidants

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Abstract: Face mist is one of the cosmetics in the form of a spray, which functions as a refresher and moisturizer with the use of being directly sprayed onto the facial skin. Combining two antioxidants that work to increase the activity of preventing the effects of radiation and free radicals. Face mist is made from a combination of pomegranate peel extract (*Punica granatum L.*) and mangosteen peel (*Garcinia mangostana L.*).To obtain a formulation and evaluate the physical stability of apreparation with a face mist combination of pomegranate peel extract (Punica granatum L.) and mangosteen peel (*Garcinia mangostana L.*) as an antioxidant. Experimental research with One-Shoot Case Study design. Made three combination formulations of pomegranate peel and mangosteen peel extract. Then the formulation was seen from the results of the evaluation of its physical stability including organoleptic tests, homogeneity, pH, viscosity, facial moisture, spraying patterns, dry time, and antioxidant tests using the DPPH method. Analysis data One Way Anova showed that there was no significant difference in the pH, viscosity and skin moisture test. Evaluation and physical stability 21 days organoleptic test, homogeneity obtained all formulas meet the standards, pH test and dry time formula II most meet the standards, viscosity test formula III most meet the standards, formula I meets the standards for spraying pattern test, skin moisture and % inhibition highest in the antioxidant test. The preparation face mist most optimalis formula I with a ratio of pomegranate peel extract and mangosteen peel (10:15).

Keywords: Face Mist, Mangosteen Peel, Pomegranate Peel.

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1. Introduction

The high level of population activity, particularly in densely populated areas, makes us vulnerable to air pollution and free radical compounds. One of the reactive oxygen compounds is free radicals. Free radical reactivity can harm cells and tissues, causing accelerated aging, hyperpigmentation, dull skin, autoimmune illnesses, and degenerative diseases [1].

In Indonesia, the cosmetics sector is booming. According to Nielsen global measurement and information agency study from 2013, the Indonesian region had a 9.4% growth in cosmetic consumption in urban areas and a 27.5 percent increase in rural areas in 2013 [2]. Indonesia has emerged as a viable market for cosmetic businesses, based on the number of rises. Serums, lotions, creams, and facial mists are among the products that cosmetic companies are competing to produce that can support antioxidant activity. A face mist is a type of cosmetic that comes in the form of a spray. Face mist is frequently used since it has the benefits of being a facial refresher and moisturizer. Although many facial mists already include antioxidants, but few combine two antioxidants that work together to increase activity.

Pomegranate peel (Punica granatum L.) and mangosteen peel are two antioxidant-rich plants (Garcinia mangostana L.). When natural ingredient compounds are combined, they will compliment each other and result in greater efficacy. Thasin et al [3] research, which used two combinations of natural plant compounds, produced good results. The skin of the red pomegranate contains polyphenol antioxidants, especially punicalagin (elagitanin), which has been proven in multiple studies to have high antioxidant, anti-inflammatory, and antihyperpigmentation properties [4]. According to Wattimena [5] has created a peel-off gel formulation with pomegranate peel extract (Punica Granatum L.) concentrations of 10%, 15%, and 20%. It was discovered that a concentration of 10% offered the optimum dosing outcomes in the peel-off gel preparation. Mangosteen fruit, like pomegranate, contains a significant amount of antioxidants. The IC50 value of mangosteen peel extract exhibits a very strong antioxidant activity, namely 5.545 microgram/mL, when tested using the DPPH (Diphenylhydrazylpicryl) technique in the formation of nanoemulsion gel formulations. Formulated an organic lotion with mangosteen peel extract with a concentration of 5%, 10%, and 15%, respectively, of which 10% had the best formulation [6].

The researcher wanted to develop and test a facial mist combining pomegranate peel extract (Punica granatum L.) and mangosteen peel (Garcinia mangostana L.) as antioxidants, based on the preceding description.

Based on the problems above, then this research was conducted to obtain practical formulation of face mist preparations maybe as an antioxidant. Besides that, this research can also be used to know other benefits of purple cabbage and Jicama is as an antioxidant. Parameter observed in this study are physical properties from the face mist preparation formula and the potency of Pomegranate and Mangosteen as antioxidants

2. Literature Review

2.1. Pomegranate

Pomegranate is a fruit whose positive health effects have been extensively studied. This fruit is rich in bioactive compounds such as ellagitannins and anthocyanins content, which are protective toward degenerative diseases. Pomegranate fruit, because of its high nutritive value, health benefits, and antioxidant bioactive compounds, is considered as a food medicine. In fact, pomegranate has been considerably used in herbal medicine for several pathologies including flu and infections of the upper respiratory tract. All parts of the pomegranate fruit, i.e., peel and seeds, considered as waste products, can be processed for value-added products having industrial, medicinal, and cosmetic value.

Pomegranate wastes are produced in all the phases of fruits life cycle, i.e., during agricultural production, industrial manufacturing, and processing. It is possible to take advantage of pomegranate by-products as they are a rich source of bioactive compounds such as flavonoids, phenolic acids, and tannins. Moreover, many researchers have described that pomegranate extracts, made from by-products of the processing factories, have an effective free radical scavenging activity and antioxidant capacity.

2.2. Mangosteen

Mangosteen (Garcinia mangostana L.) is an endemic evergreen tree species grown in tropical countries, such as Malaysia, Thailand, and Indonesia. Mangosteen belongs to the Clusiaceae (Guttiferae) family and is widely cultivated for its fruit, which is commonly termed the ‘‘Queen of

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Fruits" because of its unique sweet–sour taste. Harvest of this fruit results in a major economic impact with nearly 700,000 tons produced worldwide in 2017. The fruit contains bioactive compounds, such as xanthones (Fig. 1a–g) and anthocyanins (Fig. 1h–i), which are mainly extracted from the fruit pericarp. Additionally, it possesses high antioxidant and anti-inflammatory properties. Mangosteen has been used to treat various diseases, including tumors, diabetes, bacterial infections, hypertension, and arthritis. These applications suggest the usefulness of the fruit extract in medicinal and pharmaceutical contexts [7].

Mangosteen is one such superfruit that is produced by Garcinia mangostana L. The genus Garcinia is native to Asia and Africa and includes more than 300 distinct species from which several families of bioactive compounds such as xanthones, flavonoids, triterpenoids, and benzophenones have been isolated and characterized. Although many Garcinia species including G. mangostana, G. schomburgkiana, G. dulcis, G. cowa, G. atroviridis, G. hanburyi, G. bancana, G. xanthochymus, G. thorelii, G. hombroniana, and G. speciosa bear edible fruits, mangosteen has captured the most attention in the market. The mangosteen tree is mainly cultivated in Indonesia, Malaysia, the Philippines, and Thailand. Mature mangosteen trees range from 6 to 25 m. Production of the fruit generally requires 10 or more years with a yield of around 400 fruits per tree that is increased in older trees. Mangosteen fruit is round, dark purple or reddish, and has a white juicy pulp possessing a slightly acidic and sweet flavor that is enjoyed by many, and has resulted in it being referred to as the "queen of fruits". The pericarp of mangosteen fruit has been used in traditional medicine in Southeast Asia for centuries to treat infection, wounds, inflammation and diarrhea.

2.3. Face Mist

Face mist is included in cosmetics skin freshener (freshener). Main function of refresher is to refresh facial skin, lift the remaining skin oil that is still possible available, as well as a mild disinfectant and at the same time can help close the pores again. Fresheners are produced according to the type of cleaner which refers to the type of facial skin. Freshener included in the preparation of lotions. According to National Formulation Edition II, the lotion is preparations in the form of solutions, suspensions, emulsions for use on the skin [8].

3. Methodology

3.1. Tool

Tools used in this research are analytical scales (mettle Toledo type new classic MF), glass tools (Pyrex), hot plate, spray bottle, moisture skin analyzer, viskometer Ostwald, pH meter (Lutron), piknometer, and spektrophotometry Uv-Vis.

3.2. Materials

Pomegranate peel extract, mangosteen peel extract, glycerin, PVP and aquadest.

3.3. Face Mist Formulation

The face mist preparation is made into 3 formulas. Each face mist formula has different levels of extract. The formula used is a modification of the research Apristasari et al., 2018 which is used as a reference in this study can be seen in the following Table 1.

Table 1. Formulation of Face Mist

Ingredients	Formulation (mg)			Function
	I	II	III	
Pomegranate peel extract	10	15	20	Active Substance
Mangosteen peel extract	15	10	5	Active Substance
Glycerin	20	20	20	Moisturizer and Emollient
PVP	4	4	4	Additional Ingredients
Aquadest	Ad 100 ml	Ad 100 ml	Ad 100 ml	Base

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3.4. Making Face Mist

In the making face mist with pomegranate peel and mangosteen peel exract, the pomegranate peel extract (Punica Granatum L.) and mangosteen peel (Garcinia Mangostana L.) were put into a mortar and stirred until homogeneous. After that, the dissolved PVP with hot water was slowly put into a mortar containing a mixture of extracts, then ground again until homogeneous. Put the formula mixture into a spray bottle, then add 100 ml of distilled water. Face mist is made in 3 formulations, with different concentrations of extract combinations in each formulation.

3.5. Evaluation Face Mist

Steps in the evaluation of face mist:

1. Oranoleptis test by observing the shape, color, and smell of the finished preparation [9]. Then a physical stability test was carried out for 21 days.
2. Homogeneity test was tested using a piece of glass preparation and visually observed the particles, mixed homogeneously or separated [10]. Each spray formula test was replicated 3 times. Then a physical stability test was carried out for 21 days.
3. pH test is measured using a pH meter that has previously been calibrated using a standard buffer solution of pH 4 and pH 7. The skin pH criteria for face mist preparations is in the interval of 4.5-6.5. Then a physical stability test was carried out for 21 days.
4. The viscosity test is measured with an Ostwald viscometer. A total of 3 ml of the preparation was tested for viscosity with 2 replications [11]. Then a physical stability test was carried out for 21 days.
5. Facial moisture is measured using the Skin Moisture Meter with a time range of 1 minute, 30 minutes, 1 hour, 2 hours, 5 hours, and 8 hours. Then compare the facial moisture before and after spraying the face mist.
6. Test the spraying pattern The face mist spray preparation is sprayed on the mica plastic at a distance of 5 cm by following the following standards:
   Bad 1 : not spraying out
   Bad 2 : sprays out, but not in the form of particles but in the form of droplets.
   Bad 3 : sprays out, but the particles are too large.
   Well : sprays out uniformly and forms small particles [9].
7. Dry time is done by means of the preparation made and applied to the inside of the forearm of the volunteer. Then calculate the time it takes for the sprayed liquid to dry [9].

3.6. Antioxidant Activity Test

Steps in the Antioxidant Activity Test:

1. Preparation of DPPH
   DPPH 10 mg, dissolve with 70% ethanol to 100 ml in a measuring flask, then shake until homogeneous so that a solution with a concentration of 100 ppm is obtained and then stored in a dark place [12].
2. Determination of the maximum wavelength
   The maximum absorption wavelength of DPPH was obtained based on research, which is 517 nm [13].
3. Preparation of vitamin C 100 ppm solution
   10 mg of pure vitamin C powder, dissolved with distilled water up to 100 ml in a volumetric flask to obtain a concentration of 100 ppm as the mother liquor. Beat until homogeneous [12].
4. Determination of blanko and vitamin C
   Put 2 ml of DPPH and 2 ml of of 70% ethanol solution into a test tube, shake until homogeneous and store in a dark place for 30 minutes [12]. 2 ml of vitamin C solution was added with 2 ml of DPPH solution, shaken until homogeneous and then stored in a dark place for 30 minutes. After that, the absorption was measured by UV-Vis spectrophotometry at its maximum wavelength [12].
5. Preparation of sample solution
   Put 2 ml of each concentration of formulation face mist in a volumetric flask and made up to 10 ml with 70% ethanol. Take 2 ml of each concentration, then add 2 ml of DPPH solution (2.2-diphenyl-1-picrylhydrazyl). The solution was homogenized, then incubated in a dark room for 30 minutes. Each solution was measured of absorbance at the maximum wavelength [12].

4. Finding and Discussion

4.1. Finding

1) Organoleptic Test result
   Observation of organoleptic test findings showing that formula I was light yellow in color with a liquid form, had a distinct odor, and was clear on the 14th day, but particles formed. It has a lighter yellow hue in formula II, is liquid, has a distinct odor, and is clear, but particles appear on the 14th day. Formula III is pure white in color, liquid, odorless, and transparent.
2) Homogeneity Test Analysis
   Based on the results of the homogeneity test, it was found that formula I, formula II and formula III were homogeneous.
3) pH Test Analysis
   Based on the observation formula I had a pH value of 6.9 to 5.5, formula II 6.5 to 6.1 and formula III 6.8 to 6.3. It can be seen in the graph where the lowest pH is 5.5 and the highest pH is 6.9.
4) Viscosity Test
   Figure 1 shows the Viscosity Test Chart.

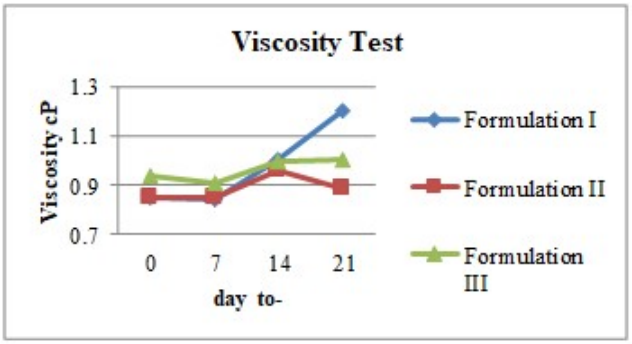

Figure 1. Viscosity Test Chart

5) Facial Moisture
   Based on the results of the skin moisture test, formula I, formula II and formula III have a % moisture value that increases in the first minute and then slowly decreases until the eight hour test time for formulas I and III, while in formula II % moisture again increased.
6) Spray Pattern Test
   Based on the results of the spray pattern test, it was found that formula I, formula II and formula III produced a good pattern.
7) Dry Time
   Based on the results of the dry time test, the average dry time value for formula I is 3.20 minutes, formula II is 02.23 minutes and formula III is 3.15 minutes.
8) Antioxidant Activity Test
   Based on the results of the antioxidant test, the % inhibition of the face mist preparation was 68.16% for formula I, 56.25% for formula II, and 41.21% for formula III, while the IC50 value was 2.38 ppm.

4.2. Discussion

The organoleptic tests showed that formula I had light yellow in color, formula II had lighter yellow in color, and formula III had clear white. Different concentrations of mangosteen peel extract are responsible for the color variations. Because the facial mist preparation in formula I has a higher proportion of mangosteen peel extract, the odor produced in formula I is stronger than formula II and formula III. While the ensuing facial mist preparations have a liquid and transparent form, their shape and clarity are both liquid and clear. The findings of the clarity evaluation on the 14th and 21st day stability tests revealed that small particles appeared during the test in formulas I and II. According to

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Khairunnissa [14] because of the usage of active compounds in the form of extracts, the clarity changes to the presence of particles or becomes hazier.

The results of the face mist preparation homogeneity test revealed that all formulations were homogeneous, with no coarse materials or agglomerated particles on the glass plate. This is in accordance with the requirements for homogenous preparations, which include the absence of coarse-particle materials [15]and the absence of visible particle clumping in the dispersion system.

pH values of 6.9, 6.5, and 6.8 were obtained from the pH test data in formulas I, II, and III, respectively. Face mist preparations must match the skin pH criterion, which is in the pH range of 4.5-6.5, according to. Skin irritation can occur if the pH is too acidic, and scaly skin can occur if the pH is too alkaline. Due to uncontrollable temperature conditions, the three formulas tended to decrease in stability testing. The ability of water to ionize and generate more hydrogen ions increases as the temperature rises, resulting in a reduction in pH and vice versa [16].

The results of the pH test were analyzed statistically with One Way Anova, it was found that the pH test data for face mist preparations were normally distributed with a significance value of 0.917 (> 0.05) and homogeneous with a significance value of 0.507 (> 0.05). One Way Anova, obtained a significance value of 0.485 (> 0.05). This shows that there is no significant difference from the pH test results in each formula.

An Ostwald viscometer was used to test the viscosity of the face mist preparation, with the goal of determining the time required for the face mist preparation to pass through two spots as a constant distance parameter. Newton's rules of fluid flow qualities are supposed to be followed by spray preparations. When Newton's fluid rules are followed, the best profile can be achieved, which is also easy to remove from the storage container. The viscosity test yielded 0.849 cP for formulation I, and 0.849 cP and 0.934 cP for formulations II and III, respectively, where the standard value of the viscosity of the solution is 0.8904 cP [17]. Varied extract concentrations result in different viscosity values. The viscosity or viscosity in which the viscosity will grow is affected by the concentration of the extract. Formula III has a good viscosity value which in the initial evaluation shows a viscosity value that meets the standard.

Based on the results of the stability test for 21 days, the preparation experienced a decrease and increase in the viscosity value due to one of the temperature factors, where the temperature of the room where the preparation was stored was not controlled. If the temperature decreases, the attractive force between similar molecules occurs which will cause the molecules to move freely and form a tighter bond structure [17], so that the viscosity will increase at low temperatures and vice versa if the temperature increases.

The results of the normality test showed that the viscosity data of face mist preparations were not normally distributed with a significance value of 0.022 (<0.05), so that an analysis was carried out using the Kruskal Wallis test on data that were not normally distributed and not homogeneous, the significance value was 0.408 (>0, 05) so it can be said that the data does not have a significant difference.

Facial moisture testing was carried out using the Skin Analyzer tool with time intervals of 1 minute, 30 minutes, 1 hour, 2 hours, 5 hours and 8 hours. Moisture parameters with the percentage of moisture on dehydrated or dry skin 0-29%, normal skin 30-50% and hydrated or moist skin 51-100% [18]. The results of the skin moisture test showed that all face mist formulations had a high moisturizing effect. The percentage of moisture as time goes on, the moisture level decreases, but the percentage of moisture still shows within the normal range of skin. Several factors that can affect skin moisture include genetic factors, gender, exposure to pollution and weather [19].

The results of the skin moisture test were analyzed statistically with One Way Anova. Analysis of the normality test, obtained a significance value of 1 minute to 8 hours in a row of 0.035, 0.001, 0.005, 0.000, 0.133, 0.001, this indicates that the data is homogeneous at 5 hours (<0.05). Then the One Way Anova test was carried out and obtained a significance value of 0.579 (> 0.05), which means that there is no significant difference in the percentage increase in skin moisture in the three formulations. Furthermore, Kruskal Wallis analysis was carried out on data that were not normally distributed and not homogeneous, the significance value was obtained at the 1st minute 0,900, 30th minute 0,585, 60th minute 0,633, 2nd hour 0,657 and 8th hour 0,519 (> 0.05) which means there is no significant difference.

The spray pattern test revealed that all three formulae sprayed out evenly and in the form of tiny particles. This is due to the preparation's low viscosity, which allows it to be easily taken from the storage container. Each formula has a viscosity value in the range of 0.8904 cP, which is near to the

standard [16]. Spraying patterns are affected by viscosity. Low viscosity seeks to make spraying easier [15].

The dry time test resulted in an average of 3.20 minutes from 30 respondents in formula I, 2.23 minutes in formula II, and 3.15 minutes in formula III. For spray formulations, a suitable dry time test is less than 5 minutes [9]. The longer the dry period, the greater the viscosity value. Because Formula II has the shortest dry time, it can be stated that it is the better dry time preparation.

The results of the dry time test were analyzed statistically with One Way Anova, it was found that the dry time test data for face mist preparations were normally distributed with a significance value of 0.192 (> 0.05) and homogeneous 0.814 (> 0.05), then One Way Anova analysis was obtained. a significance value of 0.011 (<0.05). This indicates that there is a significant difference in the results of the dry time test for each formula.

The DPPH method, which uses a chemical reaction with a maximum absorbance of 517 nm to measure antioxidant activity, was used to determine antioxidant activity. 'Umar, 2014' is a term used to describe a person who is the results of the antioxidant test for face mist preparations showed an IC50 value of 2.38 ppm. If the IC50 value of a substance is less than 50 ppm, it is considered a very potent antioxidant [20]. The higher the antioxidant activity, the lower the IC50 value. Antioxidant testing using the DPPH method revealed that a face mist containing pomegranate peel and mangosteen peel extract had a very strong antioxidant activity, with an IC50 value exceeding that of a single pomegranate peel extract preparation of 9.58 ppm [21] or the use of peel extract. single mangosteen fruit of 5.545 ppm. It can be demonstrated that using both antioxidant chemicals together can increase their action.

5. Conclusion

Based on the results of this research, it can be stated that formula I with a concentration of peel extract is the best formulation for creating a facial mist with pomegranate peel extract (*Punica granatum L.*) and mangosteen peel (*Garcinia mangostana L.*) as an antioxidant for 21 days. 15 mg of mangosteen peel and 10 mg of pomegranate. The results of the organoleptic, homogeneity, pH, and viscosity tests were in agreement with the standards and requirements of the physical stability of the three formulas. So that the research followed the stated hypothesis, which is to find the optimal formulation with physically stable preparations for a facial mist combining pomegranate peel extract (*Punica granatum L.*) and mangosteen peel (*Garcinia mangostana L.*).

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