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Characteristics of mangosteen rind peel off gel mask masker (Garcinia mangostana L.) with various concentrations

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ABSTRACT

Mangosteen (Garcinia mangostana L.) is a plant that has purplish-red fruit consisting of fruit flesh and fruit skin. The fruit's skin contains antioxidant compounds needed in facial skin rejuvenation in cosmetic products such as peel-off gel masks. This study aims to determine the best concentration of mangosteen rind extract for peel-off gel masks. The research consisted of two stages: the manufacture of mangosteen rind extract and peel-off gel mask. Mangosteen rind in powder form was soaked in 96% ethanol solution in a ratio of 1:5 for 24 hours and then filtered. The solution was extracted by the maceration method and then evaporated using a rotary evaporator. Antioxidant activity was carried out using the DPPH method. The peel-off gel mask consists of PVA (polyvinyl alcohol), HPMC (hydroxypropyl methylcellulose), methylparaben, propylene paraben, and propylene glycol with the addition of mangosteen rind extract of 10g (F1), 20g (F2), and 40g (F3). The results showed that the IC50 value obtained was 7.33 ppm. All treatments had a pH between 5.98-6.41 which was following the 1996 SNI for facial skin. The viscosity of the peel-off gel mask in all treatments ranged from 11606-23012.5 cps and was following SNI 1996. The drying time of the mask took between 29-38 minutes. The best peel-off gel mask was the F3 treatment compared to the F1 and F2 treatments for a long time. The addition of mangosteen rind extract to the peel-off gel mask preparation has a powerful antioxidant ability and is following SNI 1996 on pH and viscosity.

ABSTRAK

Manggis (Garcinia mangostana L.) merupakan tanaman yang memiliki buah berwarna merah keunguan yang terdiri atas daging buah dan kulit buah. Kulit buah mengandung senyawa antioksidan yang diperlukan dalam peremajaan kulit wajah pada produk kosmetik seperti masker gel peel-off. Penelitian ini bertujuan untuk mengetahui konsentrasi terbaik ekstrak kulit buah manggis untuk masker gel peel-off. Penelitian terdiri dari dua tahap, yaitu pembuatan ekstrak kulit buah manggis dan masker gel peel off. Kulit buah manggis yang berbentuk serbuk direndam dalam larutan etanol 96% dengan perbandingan 1:5 selama 24 jam kemudian disaring. Larutan diekstraksi dengan metode maserasi kemudian diuapkan menggunakan rotary evaporator. Aktivitas antioksidan yang dilakukan menggunakan metode DPPH. Masker gel peel-off terdiri atas bahan PVA (polivinil alkohol), HPMC (hydroxypropyl methylcellulose), methylparaben, propylene paraben, dan propylene glycol dengan penambahan ekstrak kulit buah manggis sebesar 10g (F1), 20g (F2), dan 40g (F3). Hasil penelitian menunjukkan bahwa nilai IC50 yang didapat sebesar 7,33 ppm. Semua pengobatan memiliki pH antara 5,98-6,41 yang sesuai dengan SNI tahun 1996 untuk kulit wajah. Viskositas masker gel peel off pada semua perlakuan berkisar antara 11606-23012,5 cps dan sesuai dengan SNI tahun 1996. Waktu pengeringan masker memerlukan waktu antara 29-38 menit. Masker gel peel-off terbaik adalah perlakuan F3 dibandingkan dengan perlakuan F1 dan F2 dalam waktu lama. Penambahan ekstrak kulit buah manggis pada sediaan masker gel peel-off memiliki kemampuan antioksidan yang sangat kuat dan sesuai SNI tahun 1996 pada pH dan viskositas.

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1. Introduction

Mangosteen (Garcinia mangostana L.) is the queen of fruit that grows in Southeast Asia [1], especially in Indonesia [2]. Mangosteen fruit has a reddish-purple color when ripe and sweet fruit. Mangosteen flesh can be consumed fresh or processed into a drink in the form of syrup [3]. Mangosteen rind, which is considered a waste product, can be used for a specific purpose. Based on previous research, mangosteen rind has many compounds, such as antioxidants, polyphenols, anthocyanins, and tannins [4-6], to be used for anti-inflammatory, anti-diarrheal, and anti-cancer [7].

Antioxidants are compounds that can eliminate, clean, and resist the formation of reactive oxygen [8] so that they can protect the body from free radical attacks, such as smoke, dust, and pollution. The habit of consuming fast food that is not balanced between carbohydrates, protein, and fat can also be reduced by antioxidants [9-10]. Antioxidants are divided into artificial and natural antioxidants. Artificial antioxidants come from the synthesis of chemicals whose use for a long time will cause health problems, while natural antioxidants are made from plant materials that are more friendly to the wearer's body [9]. Mangosteen rind is a source of natural antioxidants. The mangosteen rind's antioxidant activity is utilized to protect the skin from the sun and as an antiaging agent in the form of a peel-off gel mask [6, 9-10]. Peel-off gel masks are used for facial skin care because they can increase skin moisture and increase the effect of the main compound (active compound) on the epithelium due to the occlusivity of the polymer layer formed [6]. In addition, the peel-off gel mask, after drying, will form an occlusive film that is easily peeled off from the facial skin [11-12].

The utilization of mangosteen rind from mangosteen orchards as an ingredient for making face masks has been carried out. Mangosteen rind from orchards in Pariaman, West Sumatra [27] and Wanayasa, West Java [6] has been used in skincare products. In this study, the mangosteen rind used came from the Muncul area, one of the commercial areas in the Tangerang Selatan Banten area with varying concentrations of extracts used in the manufacture of peel-off gel masks. Mangosteen fruit located in this commercial area has traveled far from the mangosteen garden in the Bogor area so that it will experience mechanical damage, which will affect the content of chemical compounds in the skin of the fruit. This study aims to determine the antioxidant activity, pH, homogeneity, drying time, and viscosity. This study also aims to determine the best formulation of mangosteen peel extract for peel-off gel masks.

2. Research Methodology

2.1. Making Mangosteen Peel Powder

The ripe, reddish-purple mangosteen fruit comes from a fruit stall in the commercial area of Muncul, Jl. Raya Serpong, South Tangerang City, Banten Province. The fruit is separated from the flesh and skin and cleaned with water, drained and boiled for up to 15 minutes, then cooled and thinly sliced. The mangosteen rind slices were dried in an oven at 70°C for three days and then ground with a grinder to make a powder with a diameter of > 2 mm.

2.2. Extraction

Extraction of mangosteen rind powder was carried out at the Central Chemical Research Laboratory of the Integrated Laboratory of UIN Syarif Hidayatullah Jakarta. The ratio of macerated mangosteen rind powder with 96% ethanol is 1: 5. The new solvent was replaced after 24 hours of immersion until it became clear. The filtrate was evaporated with a rotary evaporator until thickened and then allowed to stand for several days until the solvent was not in the filtrate.

2.3. Antioxidant Activity

Antioxidant activity was carried out using 2.2-diphenyl-1-picrylhydrazyl (DPPH, Merck). This method refers to [13], which is based on the ability of the sample to reduce free radicals. The percentage of inhibition of free radical activity was obtained from the absorbance value of the sample.

2.4. Preparation of Peel-Off Gel Mask Preparation

The preparation of the peel-off gel mask begins with the manufacture of a base consisting of polyvinyl acetate (PVA), hydroxypropyl methylcellulose (HPMC), methylparaben, propylene paraben, and propylene glycol. 12g PVA with distilled water at 90°C as much as 48 mL is termed mass 1. A total of 1,26 g of HPMC was produced with distilled water at 90°C to 22 mL. A total of 1.26 g of HPMC was produced with distilled water at a temperature of 90°C. As much as 22 mL of this solution is referred to as mass 2. Methylparaben, propylene paraben and propylene glycol ingredients with each weight of 0.2g, 0.1g, and 15g combined with 5 mL 96 percent ethanol termed mass 3. Masses 1, 2, and 3 were added with 100 mL of distilled water and stirred until homogeneous, and then the skin extract was added. The mangosteen fruit used in this study were 10 grams (F1), 20 grams (F2), and 40 grams (F3).

2.5. Measurement of the Degree of Acidity (pH)

The measurement of the degree of acidity (pH) begins with calibrating the pH measuring device first. The pH measurement was carried out by dipping the electrode into each treatment as much as 1 g.

2.6. Homogeneity Test

The homogeneity test was carried out by observing directly with the bare eye. The preparation is placed on a slide and covered with another slide, then pressed and observed. This homogeneity test refers to research [14].

2.7. Peel-Off Gel Mask Drying Time

A total of 1 g of peel-off gel mask is applied to skin that measures 7 cm in length and 7 cm in breadth. The time required for the peel-off gel mask to dry was determined using a timer to create a film layer [14].

2.8. Viscosity Test

The viscosity test was carried out at the Chemical Laboratory of Universitas Sultan Ageng Tirtayasa. The peel-off gel mask is inserted into the container until the shaft is completely submerged. The tool used is a Brookfield viscometer which has been adjusted to the speed (rpm). How to use the tool is to press the enter button then the measurement results will appear on the tool [14].

3. Results and Discussion

3.1. Antioxidant Activity of Mangosteen Rind Extract

The mangosteen rind in this study had an antioxidant capacity (IC50) of 7.33 ppm. The IC50 value obtained from the mangosteen rind extract in this study was 19,240 ppm, smaller than the research results [6]. The calculation is due to the location of growth and environmental factors where the mangosteen plant grows, such as altitude, rainfall, temperature, humidity, mineral nutrient content [15-17], and growth hormone [18]. The environmental factors of the mangosteen plant can affect the chemical compounds it contains [19-20]. The mangosteen rind extract in this study has the excellent antioxidant ability because its value is less than 50 ppm [21-22].

3.2. The Degree of Acidity (Ph) of Mangosteen Peel-Off Gel Mask

The peel-off gel mask derived from mangosteen rind extract has a pH range of around 5.98-6.41 (Figure 1), with the lowest and highest pH values occurring in the second week for F3 and F1. In this study, the peel-off gel mask had a higher pH (5.98-6.41) than the study [6], which was around 5.4-5.9. The addition of mangosteen rind extract to the peel-off gel mask preparation, as shown in Figure 1, is caused by the Xhanton antioxidant compounds in the mangosteen rind extract, which are polyphenolic compounds that are slightly acidic [8, 23]. This study is similar to [6] in the use of solvents but differs in the source of the raw material for peel-off gel masks originating from the mangosteen orchard in Wanayasa Purwakarta. The pH range of the peel-off gel mask preparation in this study supports the study [24]. The pH value in this study was still tolerable for facial skin, which ranged from 4.5 to 6.5 [25]. The balanced pH of the peel-off gel mask preparation was between 4.5-8, and the pH of the peel-off gel mask in this study met the 1996 SNI.

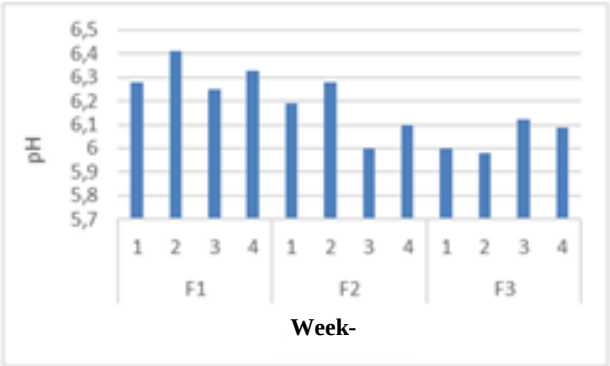

Figure 1. The pH value of the peel-off gel mask every week

3.3. The Homogeneity of the Peel-Off Gel Mask

The basic ingredients of peel-off gel masks added at various concentrations of mangosteen rind extract have varying homogeneity. Homogeneity occurs when the active substance mixes well on the peel-off gel mask preparation base so that no lumps occur when applied to the slide (Figure 2). Treatment F2 had higher homogeneity (+++) than treatment F1 (+) and F3 (++) (Figure 2). The F2 treatment was thicker than the other treatments, there was an even color match, and no particles of different color and thickness were found as in the F1 and F2 treatments. This study supports several previous studies [6, 24] that a good peel-off gel mask should be homogeneous.

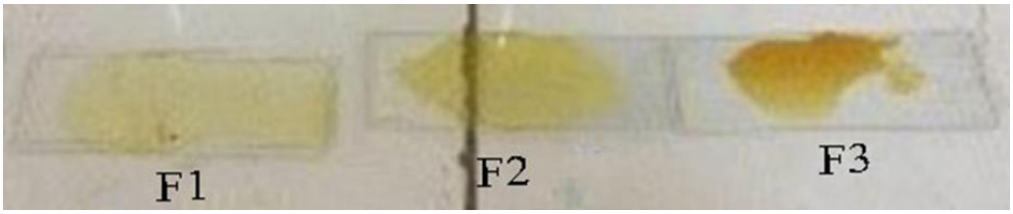

Figure 2. Variation of homogeneity of peel-off gel mask in each treatment

3.4. Peel-Off Gel Mask Drying Time

The peel-off gel mask preparation of mangosteen rind extract can dry between 29-38 minutes (Figure 3). The fastest drying time of 29 minutes was found in the F3 treatment in the second week compared to other treatments F1 and F2. The average drying time of F3 treatment was faster (30.75 minutes) than F1 (32.75 minutes) and F2 (36 minutes) treatments. The results of this study have a longer drying time [6, 24], whose peel-off gel mask preparation can dry in less than 30 minutes.

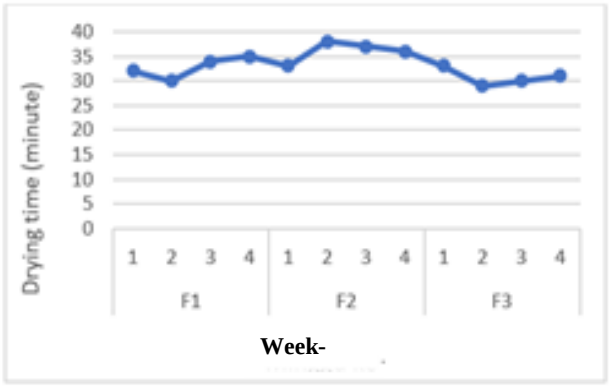

Figure 3. Drying time of the peel-off gel mask every week

The best drying time for the peel-off gel mask is 15 minutes after being applied to facial skin [26]. The addition of PVA (polyvinyl alcohol) in the formulation of the peel-off gel mask preparation affects the length of the drying time because PVA is adhesive in the formation of a film that is easily peeled off when dry [26]. In addition, the addition of aqua dest solvent to the peel-off gel mask preparation can slow down the drying time of the peel-off gel mask [26].

3.5. Viscosity of Peel-Off Gel Mask

The peel-off gel mask of mangosteen rind extract with various treatments had an average viscosity value between 11606-2312.5 cps (Figure 4). The best viscosity value was found in the F1 treatment (2312.5 cps) compared to the F2 (17705 cps) and F3 (12310 cps) treatments. The findings of this study are confirmed by research [7], which found that the viscosity of peel-off gel masks ranged between 22000 and 32000 cps when the same components and solvents were used. The peel-off gel mask in this study has met the requirements for the optimum viscosity value according to SNI 16-4380-1996S between 3000-50000 cps.

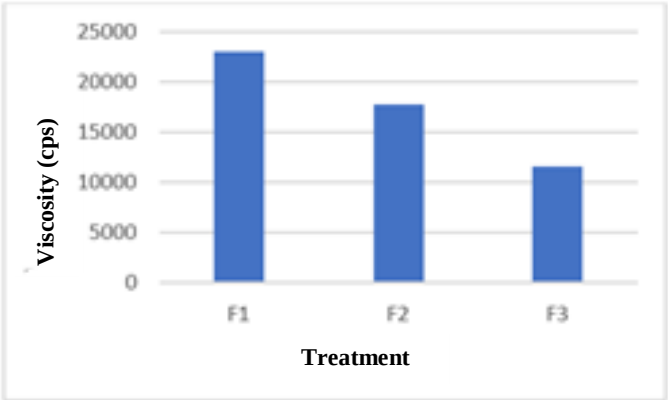

Figure 4. Viscosity of peel-off gel mask in various treatments

4. Conclusions

The IC50 value produced from mangosteen rind extract is less than 50 ppm, which is classified as very strong. The best homogeneity was found in the F2 treatment. The peel-off gel mask in this study complied with the 1996 SNI on pH and viscosity. The best treatment for peel-off gel mask was F3 treatment with a preparation given 40g of extract and had the fastest average drying time compared to other treatments.

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REFERENCES

[1] Pedraza-Chaverri, J., Cárdenas-Rodríguez, N., Orozco-Ibarra, M., & Pérez-Rojas, J. M. (2008). Medicinal properties of mangosteen (Garcinia mangostana). *Food and chemical toxicology*, vol. 46, no. 10, pp. 3227-3239.

[2] Sulasih, Sabir, & Santosa, E. (2013). Phylogenetic analysis of mangosteen (Garcinia mangostana L.) and its relatives based on morphological and inter simple sequence repeat (ISSR) markers. *SABRAO Journal of Breeding and Genetics*, vol. 45, no. 3, pp. 478-490.

[3] Gutierrez-Orozco, F., & Failla, M. L. (2013). Biological activities and bioavailability of mangosteen xanthones: A critical review of the current evidence. *Nutrients*, vol. 5, no. 8, pp. 3163–3183.

[4] Zhou, H. C., Lin, Y. M., Wei, S. D., & Tam, N. F. Y. (2011). Structural diversity and antioxidant activity of condensed tannins fractionated from mangosteen pericarp. *Food Chemistry*, vol. 129, no. 4, pp. 1710-1720.

[5] Chaovanalikit, A., Mingmuang, A., Kitbunluewit, T., Choldumrongkool, N., Sondee, J., & Chupratum, S. (2012). Anthocyanin and total phenolics content of mangosteen and effect of processing on the quality of mangosteen products. *International Food Research Journal*, vol. 19, no. 3, pp. 1047-1053.

[6] Priani, S. E., Irawati, I., & Darma, G. C. (2015). Formulasi Masker Gel Peel-Off Kulit Buah Manggis (Garcinia mangostana Linn.). *Indonesian Journal of Pharmaceutical Science and Technology*, vol. 2, no. 3, pp. 90-95.

[7] Madury, S. A., Fakhrunnisa, F., & Amin, A. (2013). Pemanfaatan kulit manggis (Garcinia mangostana L) sebagai formulasi tablet anti kanker yang praktis dan ekonomis. *Khazanah: Jurnal Mahasiswa*, vol. 5, no. 2, pp. 1-11.

[8] Dungir, S. G., Katja, D. G., & Kamu, V. S. (2012). Aktivitas antioksidan ekstrak fenolik dari kulit buah manggis (Garcinia mangostana L.). *Jurnal MIPA*, vol. 1, no. 1, pp. 11-15.

[9] Winarsih, H. (2007). *Antioksidan alami dan radikal bebas*, *Cetakan Kelima*. Yogyakarta: Kanisius.

[10] Rahmi, H. (2017). Aktivitas Antioksidan dari Berbagai Sumber Buah-buahan di Indonesia. *Jurnal Agrotek Indonesia (Indonesian Journal of Agrotech)*, vol. 2, no. 1, pp. 34-38.

[11] Barel, A. O., Paye, M., & Maibach, H. I. (2009). *Handbook of Cosmetics Skin Care*, 3*rd Edition*. New York: Informa Healthcare USA, Inc.

[12] Shai, A., Baran, R., & Maibach, H. I. (2009). *Handbook of cosmetic skin care*. New York: Informa Healthcare USA, Inc.

[13] Molyneux, P. (2004). The use of the stable free radical diphenylpicrylhydrazyl (DPPH) for estimating antioxidant activity. *Songklanakarin J. Sci. Technol.*, vol. 26, no. 2, pp. 211-219.

[14] Priani, S. E., Irawati, I., & Darma, G. C. E. (2015). Formulation of Peel-Off Facial Mask from Mangosteen Pericarp (Garcinia mangostana Linn.). *Indones. J. Pharm. Sci. Technol.*, vol. 2, no. 3, pp. 90-95.

[15] Khalid, K. A. (2006). Influence of water stress on growth, essential oil, and chemical composition of herbs [Ocimum sp.]. *International Agrophysics*, vol. 20, no. 4, pp. 289-296.

[16] Pothitirat, W., Chomnawang, M. T., Supabphol, R., & Gritsanapan, W. (2009). Comparison of bioactive compounds content, free radical scavenging and anti-acne inducing bacteria activities of extracts from the mangosteen fruit rind at two stages of maturity. *Fitoterapia*, vol. 80, no. 7, pp. 442-447.

[17] Kurniadinata, O. F., Poerwanto, R., & Susila, A. D. (2018). Studi Respon Tanaman Manggis terhadap Pemupukan Kalium (K) pada Hasil Relatif Buah Manggis Berdasarkan Status Kalium dalam Jaringan Daun Terminal. *Jurnal Hexagro*, vol. 2, no. 2, pp. 44-49.

[18] Nuraniputri, U., Daryanto, H. K. S., & Kuntjoro, K. (2016). Produksi manggis pada beberapa kelompok umur tanaman dan faktor-faktor yang mempengaruhi produksi manggis di kabupaten Sukabumi, Jawa Barat. *Jurnal Agribisnis Indonesia (Journal of Indonesian Agribusiness)*, vol. 4, no. 1, pp. 67-78.

[19] Sholekah, F. F. (2017). Perbedaan ketinggian tempat terhadap kandungan flavonoid dan beta karoten buah karika (Carica pubescens) daerah Dieng Wonosobo. *Prosiding Seminar Nasional Pendidikan Biologi dan Biologi. Fakultas MIPA, Universitas Negeri Yogyakarta*, pp. B75-B82.

[20] Astuti, E., Sunarminingsih, R., Jenie, U. A., Mubarika, S., & Sismindari, S. (2014). Pengaruh lokasi tumbuh, umur tanaman dan variasi jenis destilasi terhadap komposisi senyawa minyak atsiri rimpang curcuma mangga produksi beberapa sentra di Yogyakarta (Impact of growing sites, plant ages and variance of distillation types to Curcuma). *Jurnal Manusia dan Lingkungan*, vol. 21, no. 3, pp. 323-330.

[21] Abdullah, W., Runtuwene, M. R. J., & Kamu, V. S. (2014). Uji Fitokimia dan Penentuan Inhibition Concentration 50% pada Beberapa Tumbuhan Obat di Pulau Tidore. *Jurnal Ilmiah Sains*, vol. 14, no. 2, pp. 95-99.

[22] Tristantini, D., Ismawati, A., Pradana, B. T., & Jonathan, J. G. (2016). Pengujian aktivitas antioksidan menggunakan metode DPPH pada daun tanjung (Mimusops elengi L). *Prosiding Seminar Nasional Teknik Kimia Kejuangan*, G1, pp. 1-6.

[23] Sidiq, H. B. H. F., & Apriliyanti, I. P. (2018). Evaluasi sifat fisik dan uji iritasi gel ekstrak kulit buah pisang (Musa acuminata Colla). *JCPS (Journal of Current Pharmaceutical Sciences)*, vol. 2, no. 1, pp. 131-135.

[24] Cahyani, I. M., & Putri, I. D. C. (2018). Formulation of peel-off gel from extract of Curcuma heyneana val & zijp using carbopol 940. *Journal of Pharmaceutical and Medicinal Sciences*, vol. 2, no. 2, pp. 48-51.

[25] Tranggono, R. I., & Latifah, F. (2014). *Buku Pegangan Ilmu Pengetahuan Kosmetik*. Jakarta: PT Gramedia Pustaka Utama.

[26] Ariani, L. W., & Wigati, D. (2016). Formulasi masker gel peel-off ekstrak etanol kulit buah jeruk manis (Citrus sinensis (L.) osbeck) sebagai obat jerawat. *Media Farmasi Indonesia*, vol. 11, no. 2, pp. 1084-1092.

[27] Narulita, H. (2014). Studi praformulasi etanol 50% kulit buah manggis (Garcinia mangostana L.). *Undergraduate Theses*. Jakarta: UIN Syarif Hidayatullah Jakarta.