Preliminary study of the antioxidant activity of mangosteen peel from different acquisition as material gel peel-off mask

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Abstract. Indonesia is the fifth largest producer of mangosteen in the world. West Sumatra is the second largest mangosteen center in Indonesia after West Java. Natural antioxidants can be obtained from mangosteen peel. In this research we used mangosteen from West Sumatera (Padang) and West Java (Muncul, Aeon, Tanah Tinggi, and Sayur Box). The dried mangosteen peel extracted using alcohol. The extraction process using sonication method with a variation of time 30, 45 and 60 minutes, respectively, then evaporated until get the condensed extract. Antioxidant test result from the condensed extract shows that the value of IC50 for mangosteen from all area was 3.76-20.53 ppm. The longer sonication time from AEON has the highest IC50 value (20.27 ppm) than others (3.76-8.11 ppm). From identification using UVvis test, it shows that mangosteen peel contains of flavonoid, tannin, and saponin compound. The mangosteen peel extract from different regions has varying antioxidant activity.

Keywords: extract, IC50, sonication, West Java, West Sumatera

1. Introduction

Mangosteen recognize as “Queen fruit” for one of the tropical fruits in Southeast Asia, i.g. Indonesia, Malaysia, Sri Lanka, Philippines, Myanmar and Thailand (Suvarnakutaet al. 2011). In Indonesia, many orchards widespread cultivation this fuit such as in West Sumatra and Java (Syafrudin, 2009). The fruit is sweet and tangy, juicy, somewhat fibers, flesh, and reddish-purple colored peel when ripe (Karp, 2006).

Mangosteen consists of fruit flesh on the inside and fruit skin on the outside. Fruit flesh is the most consumed while the skin will become trash or waste. Mangosteen pulp contains 80.2–84.9% water, 60–63 calories, 0.5–0.6 g protein, 0.1–0.6 g fat, carbohydrates 14.3–15.6 g, fiber 5–5.1 g, calcium
0.01–8 mg, phosphorus 0.02–12 mg, iron 0.2–12 mg, vitamins B1, B2, and B3 by 0.03 mg, and vitamin C 4–2 mg (Dharmawansiy, 2014; Wulan, 2015). Mangosteen flesh has the ability to improve memory function in mice test animals (Wulan, 2015). Mangosteen flesh contains xanthon compounds that function as the immune system and mental health (Harrow, 2006). In addition, xanthon compounds are also found in mangosteen peel which has been used in making skin freshening lotions and ointments for skin diseases (Harrow, 2006).

The method commonly used to obtain extracts is maceration (Indriyati et al., 2009; Suhery & Anggraini, 2016). The method has also been carried out to obtain mangosteen rind extract (Indriyati et al., 2009). However, this method requires a long time of about 3 weeks so we need another method to get the extract in a shorter time. The method is ultrasonication (Altemimi et al., 2017). This study will compare the results of mangosteen rind extract with maceration and ultrasonication methods.

Mangosteen peel extract as raw material for making gel-peel off masks in previous studies came from one place (Indriyani et al., 2009) while in this study mangosteen rind to be extracted came from four cultivation centers in western Java and one cultivation center in West Sumatra. Plants that grow in different areas will have different compounds. Therefore the study of the content of the chemical compounds of mangosteen rind from various cultivation centers needs to be done.

2. Methodology

2.1 Mangosteen peel extract preparation
Mangosteen fruit is first separated between the flesh and peel of the fruit. Mangosteen peel washed with water three times. After that, the clean mangosteen peel boiled for 1 hour and then drained and weighed. Fruit peel is thinly sliced before drying using an oven. Mangosteen peel sliced put in the oven racks and carried out the drying process with a temperature of 70°C for five days. Mangosteen peels weighed and put in ziploc plastic and then mashed using a blender. The resulting powder is then sifted to produce > 2 mm.

Mangosteen rind extract obtained by maceration which refers to Priani et al. (2015). Mangosteen rind powder is placed in a Beaker tube of 100 mg added with 500 mL of 96% ethanol. Immersion is done repeatedly every 3 days by adding 96% ethanol until the solution becomes clear. The next step is filtration and evaporation using a rotary evaporator for about 1 hour at a temperature of 52°C.

2.2 Mangosteen Skin Extraction (Utami et al., 2009)
Mangosteen peel powder (100 g) is mixed with ethanol solvent and extracted by ultrasonication (room temperature; 42 kHz; 30, 45, 50 minutes). The optimum conditions obtained for the greatest antioxidant activity of the extract from the ultrasonication method were when the ethanol solvent volume was 500 mL with an extraction time of 30, 45, 50 minutes.

2.3 Mangosteen Skin Phytochemical Test (Ashri, 2016).
1. Flavanoid Test
A mangosteen peel extract of 0.5 g is put into a test tube, then dissolved with distilled water. Then add 2-3 drops of concentrated HCl. Mg powder was added to taste. Positive results are indicated by a dark red/orange discoloration.

2. Tanin Test
A mangosteen peel extract of 0.5 g is put into a test tube, then dissolved with distilled water. Then add 2-3 drops of 10% NaCl solution and 2-3 drops of FeCl3. Positive results are shown by the formation of green blue (tannin catechol) and black blue (tannin pyrogalol).

3. Saponin Test
Mangosteen peel extract is boiled with 20 mL of water in a water bath. The filtrate is shaken and allowed to stand for 15 minutes. The formation of a stable foam means that there are positive saponins.
2.4 Antioxidant Activity Test of Mangosteen Skin Extract (Miryanti et al., 2011).
The DPPH solution used was made by weighing 2 mg of DPPH then dissolved with methanol in a volumetric flask to 100 mL, then shaken until homogeneous to obtain a solution with a concentration of 0.002%. The DPPH solution is stored in a container lined with aluminum paper. A blank solution was made by adding 2 mL of methanol with 2 mL of 0.002% DPPH solution to the test tube, then divortexed until homogeneous and incubated at room temperature for 30 minutes in a dark room. The absorption of the solution is measured using a UV-Vis Perkin Elmer Lambda 25 spectrophotometer to obtain the maximum wavelength.

Mangosteen peel extract as much as 2 mL put into a test tube, then added to it 2 mL DPPH 0.002%. The mixture was then vortexed until homogeneous and incubated at room temperature for 30 minutes in a dark room. Absorption was measured at 517 nm wave length on the Perkin Elmer Lambda 25 UV-Vis spectrophotometer. Measurement was repeated 3 times. As a standard used ascorbic acid (concentrations of 0.5; 1; 2; and 4 ppm) with the same treatment as the test sample. Then the% inhibition is calculated and entered into the linear regression equation to obtain an IC50 value. The absorption value of DPPH solution before and after the addition of the sample is calculated as percent inhibition (% inhibition) with the following formula:

\[
\% \text{ Inhibition} = \left( \frac{\text{absorbent blanks}}{\text{absorbent blanks}} \right) \times 100\%
\]

The calculation results are entered into the regression equation with the concentration of extract (ppm) as abscissa (X axis) and the value of% inhibition (antioxidant) as its coordinates (Y axis). IC50 value from the calculation at the time of% inhibition of 50% \( y = ax + b \).

3. Result and Discussion
Mangosteen rind has the ability as an antioxidant. After being analyzed by the DPPH method and the different extraction processes, the results of antioxidant tests from each sample are shown in Figure 1.

![Figure 1. IC50 values with different extraction processes and locations](image)

IC50 values of mangosteen rind samples with different locations, namely 7.91-20.53 ppm. IC50 value with ultrasonic extraction process was 7.28-15.22 ppm while IC50 value with maceration process ranged from 7.73 to 20.53 ppm. The IC50 value in this study was categorized very strongly by Molyneux (2004) because its value is less than 50. These results support previous research (Tristantini, et al., 2016) that observed the antioxidant activity of the cape leaves. Tanjung leaf extract has an IC50 value of 10.6-23.27 ppm.
The mangosteen rind extraction process with ultrasonication produces IC50 values lower than the extraction process with maceration. These results indicate the antioxidant activity produced by the ultrasonication process is stronger than the results of extraction by the maceration process. In addition, a short time from the ultrasonication process can save time in procuring the extract of the sample under study and not using too much solvent.

Mangosteen peel extract from five locations contains tannin, saponin, and flavonoid compounds (Table 1). The content of flavonoid compounds is characterized by a change in color in the sample to red or orange. Tannin compounds are formed in samples which after mixing with 2-3 drops of NaCl 3% change color to blackish green or turquoise. The saponin content in each mangosteen rind extract is characterized by the appearance of foam on each filtrate after adding 20 mL of water to form foam.

Table 1. Phytochemical compound from varied locaton

| Sample collection | Flavonoid | Tannin | Saponin |
|-------------------|-----------|--------|---------|
| AEON              | V         | V      | V       |
| Super Box         | V         | V      | V       |
| Muncul            | V         | V      | V       |
| Tanah Tinggi      | V         | V      | V       |
| Sijnung           | V         | V      | V       |

Various studies have been carried out to reveal phytochemical compounds in plants, including Vitamins A, C, E, and phenolic components such as flavonoids, tannins, and lignin which have functions as antioxidants (Supredini et al., 2004; Altemimi et al., 2017). The results of this study support the results of previous studies on the phytochemical compounds of Aristolochiabaetica roots which also contain flavonoid compounds, tannins, and saponins (Bourhia et al., 2019). Other plants that contain tannin compounds are mangosteen peel (Pothitirat et al., 2009).

The content of flavonoids and tannins in mangosteen peel is also influenced by the level of fruit maturity. In this study using mangosteen that has matured from different acquisition locations so that flavonoid compounds and tannins are found in all extracts (Table 1). This is consistent with the results of previous studies (Suttirak & Manurakchinakorn, 2014). Mature mangosteen rind extract contains the highest total flavonoid compound (4.08 g / 100 g) compared to young fruit skin extract (2.91 g / 200 g) (Suttirak & Manurakchinakorn, 2014). The opposite occurs in the tannin content of young rind extract g / 100 g) which is higher than the extract of old rind extract (28.88 g / 100 g) (Suttirak & Manurakchinakorn, 2014). The low content of tannins in old mangosteen rind extract is caused by the reduction in yellow sap (Suttirak & Manurakchinakorn, 2014).

More or less the content of phytochemical compounds in plants can also be affected by the process. Mangosteen peel extract which was previously dried has fewer phytochemical compounds compared to mangosteen rind extract made fresh. This is due to the degradation of volatile compounds due to heating during the process (Suttirak & Manurakchinakorn, 2014).

Phytochemical content of mangosteen rind extract can also be influenced by the type of solvent used (Zarena and Sankar, 2009; Suttirak & Manurakchinakorn, 2014).

Mangosteen peel extracted with ethyl acetate and acetone 80% has higher tannin compounds compared to using 70% to 100% ethanol solvents (Suttirak & Manurakchinakorn, 2014) Because ethyl acetate and acetone solvents can cause skin irritation in humans, ethanol solvents are chosen to reduce their irritating effects.

4. Conclusion
Flavonoid, tannins, and saponins compounds were detected in all mangosteen rind extract samples. Mangosteen rind extract from various regions has a high antioxidant ability.
References

[1] Anindya, D. 2012. Efek Ekstrak Kulit Manggis (Garcinia Mangostana L.) Terhadap Pertumbuhan Bakteri Shigella dysentriae dan Escherichia coli. Ciputat: UIN Press.

[2] Ariani, L. & Wigati, D. 2016. Formulasi Masker Gel Peel-Off Ekstrak Etanol Kulit Buah Jeruk Manis (Citrus sinensis L.) sebagai Obat Jerawat. Media Farmasi Indonesia, 11(2).

[3] Ashri, N. H. 2016. Uji Aktivitas dan Identifikasi Senyawa Kimia Antibakteri Ekstrak Etanol Daun Bidara (ziziphus spina-christi l) terhadap Beberapa Bakteri Patogen. Makassar: UIN Alauddin Makassar.

[4] Burda, S. & Oleszek, W. 2001. J. Agric. Food. Chem. 49:2774-2779.

[5] Irawati, L. 2013. Pengaruh Komposisi Masker Kulit Buah Manggis (Garcinia Mangostana L) dan Pati Bengkung Terhadap Hasil Penyembuhan Jerawat Pada Kulit Wajah Berminyak. Jurnal Tata Rias, 2.

[6] Iswari K dan Sudaryono T. 2007. Empat Jenis Olahan Manggis, Si Ratu Buah Dunia dari Sumbar. Di dalam Tabloid Sinar Tani. BPTP Sumbar.

[7] Komansilan, J. G., Mintjelungan, C. N., & Waworuntu, O. 2015. Daya Hambat Ekstrak Kulit Manggis (Garcinia Mangostana L.) Terhadap Streptococcus Mutans. Jurnal e-Gigi, 3(2).

[8] Miryanti, Y. I. A., Sapei, L., Budiono, K., & Indra, S. 2011. Ekstraksi Antioksidan dari Kulit Buah Manggis (Garcinia mangostana L.). Bandung: UNPAR Press.

[9] Priani, S. E., Irawati, I., & Darma, G. C. (2015). Formulasi Masker Peel-Off Kulit Buah Manggis (Garcinia mangostana Linn.). 91-95.

[10] Qosim, Warid Ali. 2007. Kulit Buah Manggis sebagai Antioksidan. http://anekaplanta.wordpress.com/2007/12/26/kulit-buah-manggis-sebagaiantioksidan/ (diakses 26 Desember 2007).

[11] Richa, Y. 2009. Uji aktivitas penangkap radikal dari ekstrak petroleum ether, etilasetat dan etanol rhizomaban inahong (Anredera cordifolia (Tenore) Steen) dengan metod DPPH (2,2-difenil-1-piridhidrazil). Skripsi Fakultas Farmasi, Universitas Muhammadiyah Surakarta.

[12] Shahidi, F. 1997. Natural Antioxidants (Chemistry, Health Effects, and Applications). AOAC Press: Champaign, Illinois.

[13] Trifena, 2012. Analisis Uji In Vitro dan In Vivo Ekstrak Kombinasi Kulit manggis (Garcinia mangostana L.) dan Pegagan (centella asiatica L.) Sebagai Krim Antioksidan. Depok: UI Press.

[14] Utami, T. S., Arbianti, R., Hermansyah, H., & Reza, A. 2009. Perbandingan Aktivitas Antioksidan Ekstrak Etanol Daun Simpur (Dillenia indica) dari Berbagai Metode Ekstraksi dengan Uji ANOVA. Seminar Nasional Teknik Kimia Indonesia– SNTKI, 19–20.