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Antioxidant Activity and Body Scrub Formulation from Yellow Dragon Fruit Peel (Selenicereus megalanthus) Extract.

Fendi Yoga Wardana [a, 1*], Tufa Nur Islamiyah [a, 2], Irnandhea Putri Arifin [a, 3]

[a] Department of Pharmacy, Faculty of Science and Technology, Institut Teknologi Sains dan Kesehatan RS dr. Soepraoen Kesdam V/BRW, Malang, 65147, Indonesia

*fendiyoga@itsk-seopraoen.ac.id

Kata kunci:

Antioksidan;
DPPH;
Lulur;
Kulit buah naga kuning (*Selenicereus megalanthus*)

ABSTRAK

Antioksidan merupakan zat yang menekan respon oksidasi akibat radikal bebas yang dapat merusak asam lemak tak jenuh pada lapisan pembagi sel, sel pembuluh darah, dan jaringan lipid. Buah naga dilaporkan memiliki aktivitas antioksidan yang tinggi. Tujuan penelitian adalah mengetahui kandungan antioksidan pada ekstrak kulit buah naga kuning (*Selenicereus megalanthus*) dan memformulasikannya sebagai lulur. Penelitian ini merupakan eksperimen laboratorium, kulit buah naga kuning diekstraksi dengan cara maserasi menggunakan etanol 96%. Penentuan aktivitas antioksidan dilakukan dengan menggunakan reagen 2,2-difenil-1-pikrilhidrazil (DPPH). Formulasi sediaan lulur menggunakan variasi konsentrasi ekstrak 1% dan 3%. Evaluasi sediaan lulur meliputi homogenitas, organoleptik, pH dan daya sebar. Ekstrak kulit buah naga kuning menunjukkan aktivitas antioksidan dengan nilai IC_{50} sebesar 2,7 ppm (kategori antioksidan kuat). Hasil evaluasi kedua formula tidak memberikan perbedaan yang signifikan. Kedua sediaan lulur tersebut homogen, pemeriksaan organoleptik menunjukkan warna putih kekuningan dan tidak tengik, pH berkisar 7,7-7,8 dan daya sebar berkisar 4,3-4,4 cm. Ekstrak kulit buah naga kuning mempunyai aktivitas antioksidan yang sangat kuat dan dapat diformulasikan sebagai produk lulur.

Key word:

Antioxidant;
Body scrub;
DPPH;
Yellow dragon fruit peel (Selenicereus megalanthus)

ABSTRACT

Antioxidant agents are substances that repress oxidation responses due to free radicals which can cause harm to unsaturated greasy acids in cell divider films, blood vessel cells and lipid tissue. Dragon fruit has been reported to have high antioxidant activity. The aim of the research was to determine the antioxidants in yellow dragon fruit peel (Selenicereus megalanthus) extract and formulate them as body scrub. Research design of laboratory experiments, the yellow dragon fruit peel was extracted by maceration using 96% ethanol. Antioxidant activity testing was carried out using 2,2-diphenyl-1-picrylhydrazyl (DPPH). Preparation of the formula using extract concentration variations of 1% and 3%. The evaluation of body scrub preparation include homogeneity, organoleptic, pH and dispersive power. The yellow dragon fruit peel extract showed antioxidant activity with IC_{50} value of 2.7 ppm (strong antioxidant). The results of the evaluation of the two formulas did not provide a significant difference. Both body scrub preparations were homogeneous, organoleptic evaluation showed a yellowish-white color and does not become rancid, pH range of 7.7-7.8 and dispersive power range of 4.3-4.4 cm. The yellow dragon fruit peel extract has very strong antioxidant activity and can be formulated as a scrub product.

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Introduction

Free radicals are atoms or molecules with free electrons that can cause oxidative stress, which is the result of an imbalance of two opposing forces, namely Reactive Oxygen Species (ROS) and Antioxidants (Halliwell, 2020). The existence of various destructive actions of ROS causes the body to need important substances that can protect the body from free radical attacks and can reduce the negative effects caused by ROS, these substances are antioxidants (Di Meo & Venditti, 2020). Antioxidant agents are substances that repress oxidation responses due to free radicals which can cause harm to unsaturated greasy acids in cell divider films, blood vessel cells and lipid tissue, so that they can cause dangerous diseases (Xiao et al., 2020).

Dragon fruit is a perennial herbaceous climbing cactus distributed mainly in tropical and subtropical regions and has very good drought tolerance (Sosa et al., 2020). Dragon fruit has four species, namely dragon fruit with white flesh (*Hylocereus undatus*), dragon fruit with red flesh (*Hylocereus polyrhizus*), dragon fruit with super red flesh (*Hylocereus costaricencis*) and yellow dragon fruit with white flesh (Selenicerius megalanthus) (Arivalagan et al., 2021). The nutritional content of dragon fruit is water 90.20%, carbohydrates 11.50%, protein 0.53%, fat 0.40%, fruit fiber 0.71%, calcium 6-10 mg/100g, phosphorus 8.70%, vitamin C 9.40% (Farid Hossain et al., 2021). Dragon fruit contains phenolic compounds that have the potential to be used as antioxidants (Mahargyani, 2018). Dragon fruit peel also contains vitamin C, vitamin E, vitamin A, alkaloids, terpenoids, flavonoids, thiamine, niacin, pyridoxine, cobalamin, phenolic, carotene, and phytoalbumin, which also have antioxidant effects (Harni et al., 2023).

Cosmetics are materials or products used outside the human body to clean, remove body odor and protect the body (Halla et al., 2018). Examples of cosmetic products that are useful for cleaning the body are scrubs. Scrubs function to remove dead skin cells, open pores, and make the skin brighter and whiter (Musdalipah et al., 2016)(Taliana, 2020). Scrub products can be enriched with additional ingredients that contain functional compounds and have benefits like antioxidants (Lestari et al., 2020). The aim of the research was to determine the antioxidants in yellow dragon fruit peel (*Selenicereus megalanthus*) extract and formulate them as body scrub.

Methods

Materials

This research was using yellow dragon fruit from a plantation area in Malang and has been determined by a botanist at Material Medica Batu, East Java. All pharmaceutical grade ingredients in the form of triethanolamine (Sigma-Aldrich), stearic acid (Sigma-Aldrich), rice flour, methylparaben (Sigma-Aldrich), propylparaben (Sigma-Aldrich), cetyl alcohol (Smart-Lab), propylene glycol (Smart-Lab), sorbitan esters, dextrose (Smart-Lab), mineral oil (Smart-Lab), sodium lauryl sulfate (Sigma-Aldrich), ethanol 96% (Smart-Lab), methanol (Smart-Lab) and the standard substance 1,1 Diphenyl 2 Picrylhydrazyl (Sigma-Aldrich).

Instrumentations

Shimadzu Spectrophotometer UV-Visible 1780 type, pH meter (Benchtop), rotary evaporator (DLAB-RE100), droplet pipette, beaker glass (Pyrex), volumetric flask (Pyrex), glass funnel (Pyrex), filter paper (Whatman) no 41, mortar and stamper.

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Extract preparation

A total of 250 g of yellow dragon fruit peel simplicia was macerated with 96% ethanol at a ratio of 1:3 for three days. The macerate was filtered and evaporated using a rotary evaporator at 60 ^{0}C to obtain a thick extract.

Phytochemical tests for extracts

Phytochemical tests in this experiment were conducted to analyze the content of secondary metabolite compounds in yellow dragon fruit skin extract using standard methods (Nortjie et al., 2022). This phytochemical detection is for the identification of alkaloids, flavonoids, saponins, and tannins terpenoids, and steroids.

Determination of antioxidant activity with DPPH

Antioxidant activity test by DPPH test was carried out by weighing 10 mg of DPPH solution and then adding 100 ml of methanol in a volumetric flask, meaning the concentration was 10 ppm, the solution for comparison. Preparation of sample solutions by diluting 10 mg of yellow dragon fruit peel extract with methanol to obtain concentration variations of 10; 50; 100; 150; and 200 ppm. Take each concentration of 1 mL and add 2 mL of 0.1 mM DPPH, then incubate for 30 minutes. Furthermore, the absorbance of the sample was determined using UV-Vis Spectrophotometry at a wavelength of 520 nm. Calculation of the value of percentage inhibition is determined using the formula. Analysis of the value of antioxidant activity was determined using probit analysis with SPSS.

$$\%\text{inhibition} = \frac{(A0 - A1)\ x\ 100}{A0}$$

A0 = blank absorbance
A1 = sample absorbance

Formulation of body scrubs

The formulation of body scrub cream starts by considering the ingredients you will use, distinguishing the oil and liquid phases in the melting conditions (Tabel 1). The oil phase (stearic acid, mineral oil, cetyl alcohol, sorbitan ester, then mixed with Propylparaben) is melted in a porcelain container at a temperature of 70 ^{0}C in a water bath while being homogenized. The water phase (methylparaben dissolved in hot water and propylene glycol, triethanolamine, dextrose, and sodium lauryl sulfate added) is melted in a porcelain cup in a water bath at the same temperature while being homogenized. For body scrub, the oil and water phases are mixed with an electric mixer for 3 minutes, left for 20 seconds, then homogenized to form a cream, extract and rice flour (mesh 60/40) are added. (mesh 60/40) (Hilda et al., 2021).

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Table 1. Body scrub formula composition

Ingredients	Formula A	Formula B
Yellow dragon fruit peel extract	1%	3%
Rice flour	10%	10%
Stearic acid	14%	14%
Triethanolamine	3%	3%
Sorbitan esters	5%	5%
Propylene glycol	10%	10%
Methylparaben	0.02%	0.02%
Propylparaben	0.02%	0.02%
Dextrose	5%	5%
Mineral oil	10%	10%
Sodium lauryl sulfate	1%	1%
Cetyl alcohol	2%	2%
Aquadest	Ad 100 ml	Ad 100 ml

Furthermore, the formulation evaluation test was carried out for the body scrub. Evaluation of cream formulations included organoleptic, homogeneity, pH and dispersive power.

Results and Discussion

Phytochemical test results

The results of phytochemical tests show that yellow dragon fruit skin extract comprises alkaloids, flavonoids, tannins, terpenoids, and steroids. (Tabel 2). Based on previous research (Khoirunisa et al., 2018) showed that red dragon fruit skin contains flavonoids which have antioxidant properties. The oxidation-reduction activity of phenolic materials, such as flavonoids and phenolic acids, can neutralize or stabilize free radical compounds. Phenolic compounds are potential products for UV radiation prevention and physiological aging (Gordiienko et al., 2018).

Table 2. Phytochemical screening results

Phytochemical screening	Result
Alkaloids	+
Flavonoids	+
Saponins	-
Tannins	-
Terpenoids	+
Steroids	+

Antioxidant activity of yellow dragon fruit peel extract

Antioxidant activity testing was carried out using the DPPH reagent. The principle in the DPPH assay is that antioxidant compounds will react with DPPH radicals through a hydrogen atom donor mechanism. This causes a purple to yellow color change which is measured at a wavelength of 520 nm (Surya & Rahayu, 2020). The test was determined by measuring the absorbance of the sample concentrations of 10; 50; 100; 150 and 200 ppm (Tabel 3). The antioxidant activity results were validated through replicate treatments for each concentration tested, with a negative control consisting of a blank DPPH solution. According to the existing literature, dragon fruit exhibits antioxidant activity.

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Table 3. The result of the % inhibition of the yellow dragon fruit peel extract

Concentrations of sample (ppm)	% Inhibition			
	Replication 1	Replication 2	Replication 3	Average
Blanko (DPPH)	-	-	-	-
10	80.35	80.34	80.36	80.35 ± 0.01
50	96.42	96.40	96.42	96.42 ± 0.01
100	100	100.04	100.01	100 ± 0.02
150	116.06	116.08	116.07	116.07 ± 0.01
200	148.21	148.20	148.22	148.21 ± 0.01

The antioxidant activity of the yellow dragon fruit peel extract has an IC_{50} value of 2.7 ppm and belongs to a very strong antioxidant. This is following the results of research on antioxidant activity in red dragon fruit peel extract using DPPH which obtained antioxidant activity results with an IC_{50} value of 2.69 ppm (Astika Winahyu et al., 2019). It has also been reported that the antioxidant activity of the polar fraction of red dragon fruit skin extract with DPPH reagent has an IC_{50} value of 46.36 ppm (Yusriyani & Syarifuddin KA, 2020). The peel and pulp of dragon fruits are potential sources of phenolic compounds, particularly the peel, which contains phenolics with antioxidant and antiproliferative properties that may be exploited as raw materials in the food and pharmaceutical industries (Chen et al., 2021)(Selvaraj et al., 2021).

Results of body scrub characteristics

In this study, the amount of extract added to make body scrub cream from yellow dragon fruit peel extract was successfully changed. Organoleptic investigations revealed that the color of the scrub formula changed with each addition of various amounts of extract. The color will change from pale yellow to bright yellow depending on the concentration of the extract used in the cream mixture (Figure 1). The results of the test evaluation showed that the scrub cream product was homogeneous, easy to apply and comfortable on the skin based on the dispersive power test (Tabel 4). The yellow dragon fruit skin extract scrub cream has a value range of around pH 7.

Table 4. Evaluation of body scrub cream

Parameter	Formula A	Formula B
Color	Pale yellow	Bright yellow
Consistency	Creamy	Creamy
Odor	Odorless	Odorless
pH	7.8	7.7
Homogeneity	Homogeneous	Homogeneous
Dispersive power (cm)	4.4	4.3

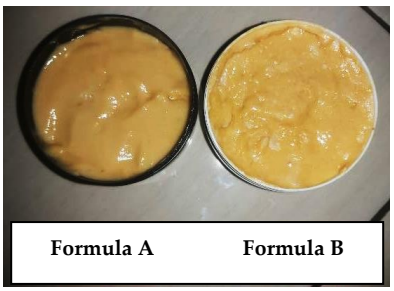

Figure 1. Yellow dragon fruit peel body scrub

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The spreadability of a cosmetic product improves with improved consistency and texture (Jadoon et al., 2015)(Yuniarsih et al., 2021). Because the water-emulsified oil with a hydrophilic exterior phase blends with water and skin secretions, it is easily absorbed from the skin, hydrophilic cream was chosen to contain yellow dragon fruit peel extract. These cream products can be used to treat human skin since topical administration has a stronger photoprotective effect than oral remedies (Pritasari et al., 2020). Hydrophilic cream with polyphenols and flavonoids ideal delivery method (Kulawik-Pióro et al., 2019).

Conclusions

Yellow dragon fruit skin extract shows properties as a very strong antioxidant with an IC_{50} value of 2.7 ppm. Based on the results of the evaluation of the tests on the two scrub formulas with variations in extract concentration, there was no significant difference.

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