IJICM International Journal of Islamic and Complementary Medicine

Yugi Hari, *Identification of bioactive compounds in butter avocado*
e-ISSN: 2828-4569,Volume 6, No 2, 2025
https://doi.org/10.55116/IJICM.V6I2.114
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IDENTIFICATION OF BIOACTIVE COMPOUNDS IN BUTTER AVOCADO PEEL EXTRACT (*Persea americana*) AS A POTENTIAL MEDICINAL RAW MATERIAL

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ABSTRAK

Indonesia merupakan negara yang kaya akan keanekaragaman hayati, termasuk berbagai spesies tanaman yang berpotensi sebagai obat. Salah satu tanaman tersebut adalah alpukat (*Persea americana*), di mana bagian kulit buahnya yang sering dianggap limbah ternyata mengandung senyawa bioaktif dengan manfaat farmakologis. Penelitian ini bertujuan untuk mengidentifikasi senyawa metabolit sekunder yang terdapat dalam ekstrak etanol kulit buah alpukat varietas mentega asal Jember, Indonesia, melalui uji fitokimia secara kualitatif. Proses penelitian meliputi pembuatan simplisia, ekstraksi menggunakan etanol 96% dengan metode maserasi, serta uji fitokimia terhadap empat golongan senyawa, yaitu alkaloid, flavonoid, tanin, dan saponin. Hasil menunjukkan reaksi positif terhadap keempat senyawa tersebut. Alkaloid terdeteksi melalui pembentukan endapan dengan reagen Dragendorff, flavonoid melalui perubahan warna setelah penambahan HCl dan serbuk magnesium, tanin melalui perubahan warna setelah ditambahkan $FeCl_3$, dan saponin melalui pembentukan busa stabil setelah dikocok dengan air panas. Hasil penelitian ini menunjukkan bahwa kulit buah alpukat mengandung senyawa alami yang berpotensi sebagai sebagai bahan baku alternatif dalam pengembangan obat tradisional dan fitofarmaka.

Kata kunci: Fitokimia; Kulit buah alpukat; Obat tradisitional; Fitofarmaka

ABSTRACT

Indonesia is rich in biodiversity, including various plant species with potential medicinal properties. One such plant is the avocado (*Persea americana*), whose peel—often discarded as waste—contains bioactive compounds of pharmacological interest. This study aimed to identify the secondary metabolites present in the ethanol extract of Butter Avocado peel from Jember, Indonesia, through qualitative phytochemical screening. The research involved the preparation of simplicia, extraction using 96% ethanol via maceration, and phytochemical testing for four major compound groups: alkaloids, flavonoids, tannins, and saponins. The results showed positive reactions for all tested compounds, indicating the presence of these metabolites. Alkaloids were detected through precipitate formation with Dragendorff's reagent, flavonoids through color change with HCl and magnesium powder, tannins via a color reaction with $FeCl_3$, and saponins through persistent foam formation after shaking in hot water. The results of this study indicated that avocado skin contained natural compounds that had the potential to serve as alternative raw materials in the development of traditional medicines and phytopharmaceuticals.

Keywords: Phytochemicals; Avocado peel; Traditional medicine; Phytopharmaceutics

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e-ISSN: 2828-4569,Volume 6, No 2, 2025
https://doi.org/10.55116/IJICM.V6I2.114
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1. INTRODUCTION

Indonesia possesses abundant natural wealth and biological resources. Several regions across the country are renowned for their agricultural and plantation-based potential. One of the plant species recognized for its diverse pharmacological benefits in both traditional and modern medicine is the avocado (*Persea americana*).[1] This plant belongs to the Lauraceae family and originates from Mexico and America. However, it has now spread widely and is extensively cultivated in various tropical and subtropical regions, including Indonesia.[2] Its high adaptability to tropical environments allows this plant to thrive in various regions across Indonesia, making it a potential biological resource for the development of phytopharmaceuticals and natural medicinal raw materials.[3] The research and development based on this plant are essential, as its natural resources are abundantly available in various regions of Indonesia.[4]

Several varieties of avocado are cultivated in Indonesia, one of which is the Butter Avocado variety. The fruit's peel ranges in color from bright green to dark green, depending on the ripeness, with a smooth, thin, and slightly glossy texture. The shape of the fruit is generally pear-like, and it is relatively large compared to other varieties. The flesh is light green in color, has a soft texture, and is rich in oil, giving it a savory and rich taste.[5] The part of the avocado commonly consumed is the flesh, while the peel and seeds are often discarded as waste. However, avocado peel contains various active compounds that have the potential to offer health benefits.[6] Avocado peel has a high content of flavonoids and quercetin, which contribute to its antioxidant properties.[7] The peel of the Butter Avocado variety contains compounds similar to those found in other avocado varieties; however, the chemical composition of the plant is influenced by its species, geographical conditions, and climate.[8] Therefore, it is necessary to conduct a qualitative phytochemical test on the extract of Butter Avocado peel from Jember, Indonesia.

2. METHOD

The plants to be studied were first subjected to a taxonomic determination test. The identification of the butter avocado (*Persea americana*) plant was conducted at the Plant Laboratory of the Jember State Polytechnic. The preparation of simplisia and the extraction process were carried out at the Pharmaceutical Laboratory of University of dr. Soebandi, Jember.

2.1 INSTRUMENT AND MATERIALS

The instrument used in this study was an analytical scales (*Ohaus, Switzerland*), digital scales (CHQ*, China*), blender (*Philips, Netherland*), pharmaceutical sieve (CBN, *Indonesia*),

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https://doi.org/10.55116/IJICM.V6I2.114
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Rotavapor (*Heidolph, Germany*), Waterbath (*Faithful, China*), measuring cup 1000ml (*Pyrex, Indonesia*), beaker glass (*Pyrex, Indonesia*), Volumetric flask 10, 25, 50 ml (*Pyrex, Indonesia*), glass stirring rod, spatula, pipet volume 1 ml and 5 ml (*Iwaki*, *Indonesia*), micropipet (*Eppendorf, Germany*), spectrofotometer UV-Vis (*Shimadzu* UV-1900i, *Japan*).

The main materials used in this study included ripe butter var. avocado (*Persea americana*) peels with a brownish-green skin color obtained from Jember, Indonesia. Additional materials consisted of 96% ethanol, aluminum chloride ($AlCl_3$), sodium acetate, distilled water (aquadest), aluminum foil, hydrochloric acid (HCl) combined with magnesium powder, and several reagents for phytochemical screening such as Dragendorff's reagents, 2N HCl, ferric chloride ($FeCl_3$), chloroform, sulfuric acid, and acetic anhydride.

2.2 PREPARATION OF SIMPLISIA

The process of preparing simplisia from butter avocado var. (*Persea americana*) peel began with the selection and washing of the peel under running water. The peel was then separated from the remaining fruit flesh and cut into small pieces to facilitate uniform and efficient drying. The drying process was carried out in a shaded, open area, avoiding direct sunlight to prevent degradation of active compounds, and lasted for approximately seven days. Once dried, the peel was ground using a blender until it formed a fine powder, which was then sieved to obtain a uniform particle size.

2.3 EXTRACTION OF AVOCADO PEEL

The extraction process begins by weighing 500 grams of butter avocado peel simplicia powder (*Persea americana*) which has been dried and evenly crushed. The powder is then macerated using 2000 mL of 96% ethanol solvent for 3×24 hours (total 72 hours) at room temperature, with occasional stirring to maximize the diffusion of active compounds into the solvent. To ensure the reliability of the phytochemical screening results, each qualitative test was conducted in triplicate. After the maceration process complete, the mixture was filtered to separate the filtrate from the dregs of the simplicia. The resulting filtrate was concentrated using a vacuum rotary evaporator at 50–55°C for approximately 2 hours to effectively remove residual ethanol, following established protocols for phytochemical extraction.[9] This process was carried out until a thick extract (concentrated extract) containing a concentrate of active compounds was obtained. The thick extract was then stored in a clean, airtight container at low temperatures until the dilution stage or further testing was conducted.

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2.4 PHYTOCHEMICAL SCREENING

The fruit peel sample used for phytochemical screening was the ethanol extract of avocado peel. Alkaloid test was carried out with Dragendorff's reagent, flavonoid test was carried out with HCl + Mg powder reagent, tannin test by adding FeCl3 solution, saponin test by adding hot water then shaking vigorously and adding 2N HCL.[7]

3. DISCUSSION

Wet avocado peel samples were initially subjected to a drying process to reduce their moisture content. This step is essential to inhibit enzymatic activity that may otherwise degrade or transform the bioactive compounds present in the material. Drying also minimizes the risk of microbial growth, including mold and fungi, thereby enhancing the shelf life of the samples.[10] For the extraction process, 96% ethanol was employed as the solvent. According to Pujiastuti & Zeba (2021), ethanol is considered a universal and selective solvent capable of efficiently dissolving target phytochemicals. Additionally, it facilitates the breakdown of non-polar cell wall components, thereby enhancing the yield of extracted polyphenols.[11]

In this study, it was confirmed that the plant used was indeed the Butter Avocado variety, which was tested at the Plant Laboratory of the Jember State Polytechnic. Phytochemical tests were then conducted on four groups of compounds: alkaloids, flavonoids, tannins, and saponins, known for their biological benefits, such as antioxidant, anti-inflammatory, antimicrobial, and other activities.[12] Each compound group was tested using specific chemical reactions that resulted in color changes or precipitate formation, serving as indicators of the presence of these compounds. The chemical compound identification results from the ethanol extract of avocado peel are shown in Table 1 below:

Table 1. Results of Identification of Chemical Compounds of Ethanol Extract of Avocado Peel

No	Chemical Compounds	Reagents	Results
1	Flavonoids	HCl+ Mg powder	+
2	Alkaloids	Dragendorff	+
3	Saponins	Hot water + HCl 2N	+
4	Tannins	FeCl3	+

Source: Primary data, 2025

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Phytochemical screening of butter avocado peel (*Persea americana*) extract revealed the presence of several bioactive compounds, including flavonoids, alkaloids, tannins, and saponins. Qualitative detection of alkaloids was confirmed by the formation of a yellow-brown precipitate upon the addition of Dragendorff's reagent (Fig.1a). Flavonoids were identified by an orange color change following the addition of HCl and magnesium powder (Fig.1b). Tannins were confirmed through a reaction with $FeCl_3$, producing either a blue-black (hydrolyzable tannins) or greenish-black (condensed tannins) coloration (Fig.1c). Saponins were evidenced by the formation of a stable foam after agitation (Fig.1d), attributed to the presence of surface-active glycoside compounds capable of forming persistent froth in aqueous solution.[13]

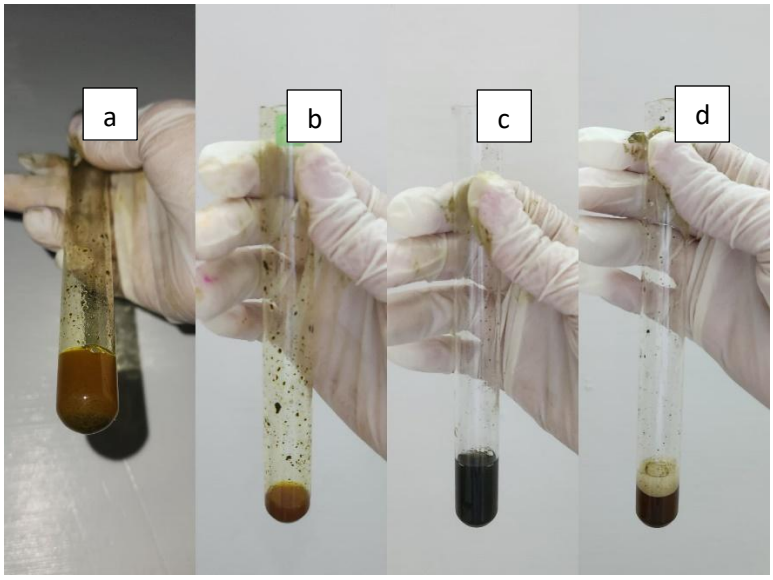

Fig 1. Image of qualitative examination results (a) alkaloids, (b) flavonoids, (c) tannins and (d) saponins.

Phytochemical test results revealed that the peel of the butter avocado (*Persea americana*) contains various bioactive compounds with potential health benefits, including alkaloids, flavonoids, tannins, and saponins. Alkaloids are known to possess pharmacological activities such as antimicrobial and anti-inflammatory effects.[14] Flavonoids act as powerful antioxidants that protect cells from oxidative damage caused by free radicals and also exhibit anti-inflammatory properties.[15] Tannins are recognized for their astringent characteristics and their natural antimicrobial activity.[12] Meanwhile, saponins demonstrate immunostimulant and antimicrobial activities, in addition to their ability to lower cholesterol levels.[16] The presence of these compounds indicates that avocado peel is not merely agricultural waste but also holds potential as an alternative raw material for the development of phytopharmaceuticals. Study conducted by Kempe et al. (2023) also supported these findings, stating that avocado peel contains secondary

e-ISSN: 2828-4569,Volume 6, No 2, 2025
https://doi.org/10.55116/IJICM.V6I2.114
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metabolite compounds with significant biological activity, making it a promising candidate for further pharmaceutical development. in another studies have stated that avocado peel extracted using methanol solvent gave positive results in the phenolic, flavonoid, alkaloid, tannins, and saponins test.[13] Thus, avocado fruit peel is identified as a source of phytochemicals that contribute to antioxidants.

4. CONCLUSION

Based on the results of qualitative phytochemical screening, butter avocado (*Persea americana*) peel extract was proven to contain several groups of secondary metabolite compounds, namely alkaloids, flavonoids, tannins, and saponins. The presence of these compounds indicates that avocado peel has the potential as a source of natural raw materials with medicinal properties. This finding supports the utilization of avocado peel waste which has so far been underutilized, as an alternative in the development of traditional medicine raw materials or phytopharmaceuticals.

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