Vol 10 No. 1 (2025) 26-40 ISSN (Online) : 2502-0943

Jurnal Katalisator

ANTI-AGING ACTIVITY WITH TYROSINASE INHIBITORS AND ANTIOXIDANTS FROM BADUY OUTER TRIBE PLANTS AS COSMETICS: REVIEW

Yuri Pratiwi Utami [1,6*)], Anto Apriyanto [2,6)], Nurhayani [3,6)], Agus Firmansyah [4,6)], Firdaus [5,6)]

[1)]Bachelor of Medicine Study Program, Faculty of Medicine, Mega Buana University Palopo
[2)] Islamic Economics Study Program, Faculty of Economics and Business, Muhammadiyah Business Institute Bekasi
[3)] Bachelor of Medicine Study Program, Faculty of Medicine, Muhammadiyah University of Surakarta
[4)] Communication Science Study Program, Faculty of Communication Science, Esa Unggul University Jakarta
[5)] Islamic Religious Education Study Program, Faculty of Islamic Studies, Muhammadiyah University of Purwokerto
[6)] Inspiring Lecturer Paragon

* **Email** : utamiyuri88@gmail.com

Detail Artikel

Diterima : 1 April 2025
Direvisi : 4 April 2025
Diterbitkan : 11 April 2025

Kata Kunci

Antiaging
tyrosinase inhibitor
antioxidant
cosmetics
Baduy

Penulis Korespondensi

Name : Yuri Prtaiwi Utami
Affiliation : Mega Buana University Palopo
E-mail : utamiyuri88@gmail.com

ABSTRACT

Aging is an unavoidable physiological process. The process of premature aging is prevented using natural anti-aging cosmetics derived from plants. Cosmetics can be used as anti-aging products. Therefore, plants can be used as substitutes for anti-aging chemicals with fewer side effects. There are many herbal plants that are empirically used by the Baduy community and have potential as anti-aging agents with tyrosinase inhibitory and antioxidant activities. Evidence of anti-aging activity can be obtained by testing the effects of each herbal plant, which has been conducted by several researchers previously. The purpose of this article is to provide information on which plants have the potential as anti-aging agents for cosmetic raw materials thru a literature review of journals in electronic databases. The results obtained from several plants such as Carica papaya L., Kaempferia galanga, Psidium guajava, Zingiber officinale var. Rubrum, Piper bettle, Caesalpinia sappan L, and Etlingera elatior (Jack) R.M. Sm have tyrosinase inhibitory activity. Orthosiphon stamineus B., Coleus scutellarioides (L.)

http://doi.org/10.22216/jk.v5i2.5717
Published by LLDIKTI Wilayah X

Benth, and Imperata cylindrica (L) Beauv., the cogongrass plant, use an antioxidant approach as anti-aging. In conclusion, all herbal plants from the Baduy tribe have the potential as raw materials for anti-aging cosmetics

INTRODUCTION

The outermost part of the body that serves as the main protection from ultraviolet rays is the skin. Melasma is found in 40% of southeast Asians and 9% of Hispanics in America. Hyperpigmentation, in which too much melanin is produced, causes melasma (Mustopa, 2022). Aging is defined as a process of progressive decline in skin function and capacity (Yusharyahya, 2021). An increase in the number of free radicals, an increase in age, and excessive exposure to ultraviolet light can accelerate the aging process or cause premature aging (Ahmad & Damayanti, 2018).

Tyrosinase is an enzyme that plays a role in melanin biosynthesis, so it has a very important role in the pigmentation process. L-Tyrosinase plays an important role in two processes: hydroxylation of L-Tyrosine to L-DOPA and oxidation of L-DOPA to dopakuinone. Dopakuinones then polymerize to form dopachromes, which then produce the pigment melanin (Mustopa, 2022).

The beauty industry and the medical world urgently need tyrosinase inhibitors to prevent Reaction Oxygen Species (ROS) free radicals from forming. Hydroquinone, tropolone, azelic acid, mercury, and kojic acid are some of the active compounds that have been used in cosmetic products as tyrosinase inhibitors; however, the use of these compounds can harm the body and produce high concentrations of kojic acid (Owolabi dkk., 2020). Alternative tyrosinase inhibitors from natural materials are needed. Plants known to the Indonesian people are numerous and widespread, especially plants that contain flavonoids, such as quercetin, mirisetin, kaempferol, and isoflavones, flavonols, and stilbenoids (Mustopa dkk., 2024).

Some plants have been observed in the Baduy tribe. Through journal literature searches in electronic databases, antioxidants are found as raw materials for cosmetics. *Carica papaya* L, *Orthosiphon stamineus* B, *Coleus scutellarioides* (L.) Benth, *Imperata cylindrica* (L) Beauv., *Kaempferia galanga*, *Psidium guajava*, *Zingiber officinale* var. Rubrum, *Piper bettle*, *Caesalpinia sappan* L, and *Etlingera elatior* (Jack) R.M. Sm. are a few of the herbal plants found outside of Baduy. Flavonoids and phenolics are the two secondary metabolites found in plants that have the greatest impact on cosmetics (Utami, Apriyanto, dkk., 2024).

One of the tribes in Indonesia that utilizes natural resources in the form of plants is the Baduy tribe. Therefore, it is necessary to study the antiaging activity of plants that have been surveyed and studied to have tyrosinase inhibitor activity.

http://doi.org/10.22216/jk.v5i2.5717
Published by LLDIKTI Wilayah X

METHODS

The article review process was carried out by searching journal literature through electronic databases on the internet in the form of Google Scholar and Pubmed. The search was conducted using the keywords "antiaging", "tyrosinase", "antioxidant" and "cosmetics". The main data sources used included research journals published in national and international journals. Screening of the obtained journals was carried out with inclusion criteria in the form of research articles on the Antiaging Potential of Herbal Plants of the Outer Baduy Community Approach to Tyrosinase Inhibitor Activity and Antioxidants as Cosmetics published in the last five years and exclusion criteria in the form of herbal plants that were not found to have anti-aging activity as tyrosinase enzyme inhibitors and limited articles so that they were cited published in the last ten years.

RESULT AND DISCUSSION

Changes in the human self caused by age, psychological and social factors are known as aging. In general, aging is defined as the physical changes that occur in the human body. Free radicals from ultraviolet light are one of the causes of skin damage. Free radicals cause oxidative damage to skin cells, leading to aging. The source of free radicals can come from within our own body (endogenous), which consists of residual fat, protein, carbohydrate, and metabolic (Patimah et.al., 2025).

Aging processes such as photooxidation and photoisomeration are caused by free radicals derived from solar ultraviolet light. Reactive oxygen species (ROS) release hydrogen peroxide (H_2O_2), superperoxide anion (O_2), and hydroxyl radical (OH) when the chromophore absorbs ultraviolet light. This causes a photo-oxidation reaction. Therefore premature aging can be treated with antioxidants (Utami, Apriyanto, et.al., 2024).

To overcome premature aging, cosmetics are needed, namely skin whitening cosmetics are cosmetic products that contain active ingredients that whiten the skin by stopping the formation of new melanin or removing existing melanin. Most whitening cosmetics contain active whitening agents such as kojic acid, ascorbic acid, hydroquinone, mercury, and others. One of the benefits of using whitening cosmetics is that the skin becomes whiter and shinier. However, since many people do not know about whitening cosmetics, they do not know the adverse effects that may occur if the product is used too much (Owolabi et.al., 2020).

Melanin pigment is a pigment that can protect the skin from sun exposure. In the process of melanin formation (melanogenesis), the enzyme tyrosinase acts as a catalyst in two different reactions: hydroxylation of tyrosine to dihydroxy-phenylalanine (L-DOPA) and oxidation of L-DOPA to DOPA quinone. Tyrosinase in skin tissue is activated by solar UV radiation, accelerating the production of melanin. Thus, melanin production becomes excessive and causes brown skin hyperpigmentation. To prevent excessive melanin production, antioxidant compounds or tyrosinase inhibitors can be used. The combination of antioxidants and tyrosinase inhibitors can be found from natural or synthetic compounds (Reigada et.al., 2020).

As a country with immense biodiversity, Indonesia is endowed with rich natural resources, including traditional medicinal materials, which are national assets that need to be explored, researched, developed, and optimized for their utilization. Besides its forests, Indonesia has the second-largest biodiversity in the world, as evidenced by the high number of native medicinal plants (Utami, 2021).

Pepaya (*Carica papaya* L.)

Cosmetics use tyrosinase inhibitors to prevent hyperpigmentation. The aim was to test the tyrosinase enzyme inhibitory activity of the ethanol extract of papaya leaves (*Carica papaya* L.) in vitro. When compared to synthesis, choosing inhibitors derived from natural materials is safer. Because papaya leaves contain flavonoid compounds, it is suspected that the ethanol extract functions as a tyrosinase inhibitor. To produce a thick extract, papaya leaves were macerated with 70% ethanol. Tests were conducted with L-DOPA as substrate and ethanol extract of papaya leaves with concentrations of 20000, 10000, 5000, 2500, 1250, 625, and 312.5 g/ml. These concentrations were positively controlled with kojic acid, and then the absorbance was measured with a microplate reader with a wavelength of 490 nm. The results showed that the ethanol extract of papaya leaves (*Carica papaya* L.) has tyrosinase inhibitor activity with IC_{50} of 12158.8751 g/ml and relative potency of 6.879 x 10-3 times kojic acid (Patimah et.al., 2025) .

In a cream (o/w) preparation, papaya fruit extract was shown to have anti-aging properties, can slow down the symptoms of aging, and exhibit skin renewal properties. Papaya contains many anti-oxidants, including vitamin A, vitamin C, vitamin E, potassium, magnesium, and fiber. Therefore, the cream prepared from papaya fruit extract can be considered as an anti-aging medicine that can be used to slow down the symptoms of aging (Patimah et.al., 2025). The results showed that the IC_{50} value of papaya peel extract with a dose of 2 grams was 51.88 ppm and lemon peel extract with a dose of 5 grams was 39.87 ppm. For clay mask preparations, the brown preparation is considered homogeneous with a pH of 5.44, drying time of 15.25 minutes; formula II preparation is considered homogeneous with a pH of 5.66, drying time of 5.44 minutes; and formula III preparation is considered homogeneous with a pH of 5.50, drying time of 5.44 minutes (Patimah et.al., 2025).

Studies using methanol extract from the flesh of papaya fruit (*Carica papaya* L.) found similar results and showed that the antioxidant activity was strong. In the first study, the methanol extract had an IC_{50} value of 99.8599 g/mL, while in the second study, the IC_{50} value was 80.52 g/mL. Both studies showed that the antioxidant activity was in the strong category because this is due to the phenol content of papaya fruit (*Carica papaya* L.) which is very useful as an antioxidant that helps the body fight free radicals. (Utami, Apriyanto, et.al., 2024). The results of research conducted in several journals show that papaya (*Carica papaya* L.) plant parts have an IC_{50} value of 13.769 g/mL for their antioxidant parts, namely fruit skin, fruit flesh, and papaya leaves. In addition, the papaya (*Carica papaya* L.) part has the highest antioxidant activity of all parts, namely papaya fruit skin from ethanol extract. (Santi et.al., 2021).

http://doi.org/10.22216/jk.v5i2.5717
Published by LLDIKTI Wilayah X

Jambu Biji (*Psidium guajava*)

Tyrosinase inhibitor activity in ethanol extract of white-fleshed guava leaves (*Psidium guajava* L), was conducted to determine the percentage of tyrosinase inhibitor activity and to determine the IC_{50} value of tyrosinase inhibitor of ethanol extract of white fleshy guava leaves (*Psidium guajava* L). The sample used is part of the white-fleshed guava leaf (Psidium guajava L.). The results showed that guava leaf extract (*Psidium guajava* L) has activity as a tyrosinase inhibitor. White-fleshed guava leaf extract (*Psidium guajava* L) has the average percent inhibitor at concentrations (20 ppm, 40 ppm, 60 ppm, 80 ppm and 100 ppm) were 42.87%, 46.59%, 47.34%, 49.57% and 52.76% respectively. Leaf extract of *Psidium guajava* L has an IC_{50}value of 79.10 µg/mL. While the IC_{50} value of kojic acid as a positive control is 65.29 µg/mL. Thus it can be concluded that the ethanol extract of white-fleshed guava leaves has tyrosinase inhibitor activity with IC_{50} 79.10 µg/mL having strong activity. (Ramadani, 2024).

Senyawa-senyawa aktif pada daun jambu bji yang berperan sebagai antioksidan yang berasal dari gugus fenolik diantaranya, protocatechuic acid, ferulic acid, quercetin, guavin B, ascorbic acid, gallic acid, and caffeic acid. Selain itu pada gugus flavonoid terdapat, isoflavonoid, Flavonol, Katein dan Kalkon. Senyawa antioksidan dari polifenolik ini memiliki peran sebagai pereduksi, penangkap radical bebas, dan menghambat proses pembentukan ROS dengan mengikat ion logam diperlukan untuk katalisis generasi ROS (Ramadani, 2024).

Sirih Merah (*Piper crocatum*)

Red betel, also known as *Piper crocatum*, is a very common plant in Indonesia. The ethyl acetate fraction of red betel leaf contains columbin and schisandrin compounds, which function as HMG-CoA reductase inhibitors in silico. Betel leaf extracts and fractions can also inhibit MDA (malondialdehyde) formation reactions in vitro, and have acetylcholinesterase inhibitory activity in silico (Khalida, 2021).

Studies have been conducted in vitro by testing the ability of ethanol extract, ethyl acetate fraction, n-hexane fraction, and water fraction of red betel leaf to stop tyrosinase enzyme activity. Samples were derived from previous studies. Tyrosinase Activity Assay Kit (colorimetry) Ab252899 was used to use tyrosinase enzyme. In this study, the tyrosinase receptor with PDB code 5M8O was used, with tropolone serving as the natural ligand and kojic acid serving as the comparison ligand. The free energies (G) of the compounds catechin, N1-(5-methylisoxazol-3-yl)ethane diamide, and 1-Amino-3-(aminooxy)-2-propanyl N-(4,6-diamino-1,3,5-triazin-2-yl)glycinate dihydrochloride were lowest at -6.7 kcal/mol, -6.6 kcal/mol, and -6.3 kcal/mol, respectively. The affinity energies of tropolone and kojic acid were only -5.4 kcal/mol, respectively. In vitro test results showed that the aqueous fraction at a concentration of 10,000 ppm had the highest tyrosinase inhibitory activity of 84.84% (Mustopa, 2022) .

The ethanol extract contains elimisin, neoptadien, germacron and propionic acid compounds. Elimisin compounds are thought to have tyrosinase inhibitor activity because

http://doi.org/10.22216/jk.v5i2.5717
Published by LLDIKTI Wilayah X

these compounds have antioxidant and antiviral activities. Elimisin has a benzene ring and carbon chain (at C3-C6), so there is a structural similarity with tyrosinase substrates. The ethyl acetate fraction contains secondary metabolites including 3-(3,4 dimethylphenyl) propionic acid, schisandrin, and columbin. The compound suspected to have tyrosinase inhibitor activity is (3,4 dimethylphenyl) propionic acid. The compound (3,4 dimethylphenyl) propionic acid has antioxidant activity, hydroxyl group acceptor, and is able to chelate Zn metal ions contained in tyrosinase. The n-hexane fraction dissolves non-polar compounds from betel leaf. The compounds suspected as tyrosinase inhibitors are 4-methoxyindole, protocatechuic acid, N1-(5-methylisoxazol-3- yl) ethane diamide, L-(+)-arginine hydrochloride and 1-amino-3-(aminooxy)-2-propanyl N-(4, 6 diamino-1, 3, 5 triazin-2-yl) glycinate dihydrochloride. This is because these compounds belong to the phenolic group and have benzene rings that resemble tyrosinase substrates (Mustopa et.al., 2024).

Both extracts and fractions of red betel leaf inhibited tyrosinase. The n-hexane fraction and water fraction had high levels of tyrosinase inhibition in the in vitro assay at a concentration of 10000 ppm. In silico testing results support these findings. Nine compounds in the n-hexane fraction and catechins of the aqueous extract had lower ΔG values than the natural ligands, so in vitro testing proved that, compared to other extracts and fractions, the aqueous fraction and n-hexane fraction had high tyrosinase inhibitor activity. The test ligands or bioactive compounds used from red betel leaf have been shown to inhibit tyrosinase activity. Catechin is the best test ligand to inhibit tyrosinase in silico. Water and n-hexane fractions have high tyrosinase inhibition and have the same real value (Mustopa et.al., 2024).

Secang (*Caesalpinia sappan* L.)

Plants that impart flavors that can be added to food. Spices consist of plant parts that contain phyto-chemicals, which are products of plant metabolism. These parts include stems, roots, leaves rhizomes bulbs, seeds, bark, and flowers (Huda, 2022). Sappan wood (*Caesalpinia sappan* L.) from the Caesalpiniaceae family is one of the many medicinal spice plants found in Indonesia that contains many antioxidants. The woody part of the secang plant contains many antioxidants and also contains alkaloids, tannins, and saponins (Permadi et.al., 2022).

Secang wood (*Caesalpinia sappan* L.) is a common plant in Southeast Asia. There is a lot of secang wood in Indonesia. In Indonesia, secang wood is only used as a natural colorant or mixed ingredient in herbal drinks. This is where the compound brazilin dissolved in water is the source of this natural red dye. One of the main compounds in secang wood (*Caesalpinia sappan* L.) is brazilin (7,11b-dihydrobenz[b]indeno[1,2-d]pyran-3,6a,9,10(6H)-tetrol). It is known to have various functions, including antioxidant, antibacterial, anti-inflammatory, whitening agent and anti-aging (Hadi et.al., 2023).

The activity of Secang to inhibit tyrosinase, TYRP-1 and dopachrome indicates the ability of brazilin to inhibit melanogenesis. Tyrosinase is an enzyme that plays an important role in the process of melanin formation, and the inhibitory activity of tyrosinase enzyme was measured by calculating the inhibition of dopachrome, which is the result of oxidation of L-

http://doi.org/10.22216/jk.v5i2.5717
Published by LLDIKTI Wilayah X

DOPA by tyrosinase enzyme. Brazilin also inhibited tyrosinase in B16F10 cells. The test results showed that Brazilin in concentrations of 100 to 1000 ng/mL had the ability to significantly reduce the function of the tyrosinase enzyme. With 100 mg/m brazilin can also reduce melanin production by 37%. This was demonstrated by real-time RT-PCR testing, which showed a decrease in TYRP1/TYRP2/TYR/MITF mRNA levels and melanin production. In addition, tyrosinase inhibitory activity showed that brazilin can reduce melanin production in B16F10 cells (Puspitadewi & Sriwidodo, 2023).

The mechanism of brazilin as anti-aging is because it has antioxidant activity, suppresses ROS formation, increases GPX7 expression, inhibits MMP, blocks NF-kB activation, increases HaCaT cellular activity and the expression of claudin 3, claudin 6, and ZO-2 junction genes. In addition, secang wood extract can also suppress the formation of ROS in NHEK (Normal Human Epidermal Keratinocytes) irradiated by UVA. Another study was conducted by measuring GPX7 expression in NHEK irradiated with UVA and then given sappan wood extract. The results showed that UVA radiation decreased GPX7 expression, while the addition of sappan wood extract significantly increased GPX7 expression. These results provide evidence that induction of GPX7 expression can provide protection against UVA-induced photoaging and that sappan wood extract with brazilin can increase GPX7 expression (Puspitadewi & Sriwidodo, 2023).

The expression of MMP-1 and MMP-3 in UVB-irradiated human dermal fibroblasts (HDFs) was reduced by brazilin. In addition, brazilin is known to block UVB-induced ROS in HDFs. ROS is a trigger for UVB-mediated MMP induction. ROS levels are increased, which can be decreased by brazilin administration. In addition, there is another component responsible for the expression of MMP1 and MMP-3, namely NF-kB (Nuclear Factor KappaB). NF-kB is an important component in ultraviolet sunlight (UVB)-induced MMP-1 and MMP-3 expression. Brazilin is known to have the ability to stop ultraviolet sunlight-induced NF-kB activation, which makes it a compound that can be used as a skin anti-aging in cosmetic products (Puspitadewi & Sriwidodo, 2023)

Caesalpinia sappan L., also known as sappan, is a plant that contains brazilin. This brazilin has the ability to stop the enzyme tyrosinase from producing melanin in human skin. Tyrosinase enzyme inhibitor activity testing was done on the supernatant produced by the four isolates. This was done using a microplate reader to measure the absorbance of dopachrome. According to this study, the aqueous condensed extract, a secondary metabolite of the endophytic mold secang wood, has activity as a tyrosinase inhibitor with an IC_{50} value of 153.462 ppm and a relative potency of 0.372 times kojic acid. Meanwhile, the n-butanol extract had an IC_{50} value of 181.134 ppm and a relative potency of 0.315 times kojic acid. (Raharja, 2021).

This is also supported due to the antioxidant activity of the secang plant. The presence of orange-colored flavonoids and the IC50 value of secang wood ethanol extract of 56.32 g/mL indicate that it is a strong antioxidant (Nurullita & Irawati, 2022). The IC_{50} value of methanol extract was 1.75 ppm and the IC_{50} value of ethyl acetate fraction was 0.88 ppm when using DPPH method to show antioxidant activity. (Laksmiani et.al., 2020). The IC_{50}

Jurnal Katalisator Vol 10 No. 1 (2025) 26-40

value of secang wood extract was 55.018 ppm, indicating the presence of strong antioxidants (Prabawa et.al, 2019).

Jahe Merah (*Zingiber officinale* var. Rubrum), Kencur (*Kaempferia galanga*) and Kecombrang patikala (*Etlingera elatior* (Jack) R.M. Sm.)

Indonesians have long used the Zingiberaceae tribe to make java scrubs. Topically, Nepalese women also use ginger and turmeric to treat dark spots. In addition, the enzyme tyrosinase from zingiberaceae has been observed in several studies. Zingiberaceae, one of the plant families of the order Zingiberales, has 52 genera and 1300 species. Plants of the Zingiberaceae family are found in humid places, both in the tropics and subtropics. Therefore, they are commonly found in Indonesia, which also has a tropical climate. Plants of the Zingiberaceae family are found in the highlands (above 2000 meters above sea level). They are characterized by short stems that are later replaced by pseudo-stems formed from the arrangement of leaf midribs (Sari et.al., 2023).

In addition, plants from the Zingberaceae family are known for their unique aroma. This aroma comes from secondary metabolite compounds produced by Zingberaceae plants, namely essential oils, which are mainly found in the rhizome of the plant. These aromatic compounds are also widely used as medicine, especially for the Zingber genus (Andini et.al., 2020).

Hyperpigmentation is the result of prolonged, continuous UV exposure. Tyrosinase activity inhibition is one way to stop hyperpigmentation. Several Zingiberaceae plants, including galanga, bangle hantu, and turmeric, have the ability to suppress tyrosinase activity. The purpose of this study was to determine whether the rhizomes of several Zingiberaceae plants suppress tyrosinase activity. Furthermore, tests were conducted on the fractions of chosen plants. Techniques: 96% ethanol was utilized for extraction by maceration, while n-hexane and ethyl acetate were employed for fractionation. Alpha-arbutin was used as the positive control in the in vitro tyrosinase inhibition assay (Aprilliani et.al., 2018).

Results: Tyrosinase inhibitory activity was detected in 19 samples. The highest level of inhibition against tyrosinase activity was demonstrated by the ethanolic extracts of kecombrang, kunci pepet, bangle hitam, temu giring, and red ginger, with percentages of inhibition of 22.50 ± 1.46%, 20.75 ± 0.04%, 19.96 ± 0.03%, 18.85 ± 0.11%, and 18.63 ± 0.06%, respectively. Kecombrang extract's IC_{50} (761.75 ± 23.1 mg/L) was greater than that of water fraction (587.40 ± 2.6 mg/L), n-hexane (575.37 ± 4.1 mg/L), and ethyl acetate (542.39 ± 12.4 mg/L). In conclusion, the IC_{50} values of the three fractions were superior to those of the extract. Compared to the water and n-hexane fractions of kecombrang rhizome, the ethyl acetate fraction exhibited a noticeably greater degree of tyrosinase inhibition (Aprilliani et.al., 2018).

Approach to Antioxidant Activity as Anti Aging

Several plants that have been surveyed in the Baduy tribe were not found to have anti-aging activity using the tyrosinase enzyme inhibitor method. Thus, the approach of

http://doi.org/10.22216/jk.v5i2.5717
Published by LLDIKTI Wilayah X

antioxidant activity as anti-aging is studied. Antioxidants help prevent aging and degenerative diseases. All living things will experience the aging process, which can cause changes throughout the body, including the skin. Some people age in accordance with their age, but some people age faster or so-called premature aging. This can be caused by the accumulation of free radicals, such as sun exposure and air pollution. Aging is initiated by the accumulation of free radicals. Antioxidants that are known to control the reactivity of free radicals are assumed to be anti-aging (Reigada et.al., 2020).

Jahe Merah (*Zingiber officinale* var. Rubrum)

The results and discussion showed that red ginger rhizome extract (*Zingiber officinale* Rosc. var. rubrum) contains tannins, flavonoids, saponins, alkaloids, and terpenoids and has strong antioxidant activity with IC_{50} 10.35 g/mL. It is used as an alternative to vitamin C because vitamin C is more practical, safe, and soluble in water, and is a natural antioxidant compound that has strong antioxidant activity when compared to vitamin A and vitamin E. Based on the results of the study, the IC_{50} value for vitamin C is 1.785 µg/mL. (Munadi, 2020). With an IC_{50} value of 46.91 ppm and an AAI (Antioxidant Activity Index) value of 2.3, the ethanol extract of red ginger can be used as herbal medicine and as raw material for phytopharmaceutical drugs. The results of this study indicate that ethanol extract of red ginger has potential as a very strong natural antioxidant. (Dewi et.al., 2024).

Kencur (*Kaempferia galanga*)

The herbal plants kencur (*Kaempferia galanga* L.), galangal (*Alpinia galanga* L.), and temulawak (*Curcuma xanthorrhiza* Roxb.) are used extensively in traditional medicine due to their active components, flavonoids and phenols, which are known to have antioxidant properties. Using the DPPH, ABTS, and FRAP methodologies, this study seeks to ascertain the antioxidant activity of the kencur, galangal, and curcuma extract combination. Descriptive and experimental research methods were employed. Phytochemical screening for flavonoids and phenols, as well as the identification of flavonoid group components from the combination of extracts, were done using the descriptive approach. Antioxidant activity was examined experimentally using the DPPH, ABTS, and FRAP techniques (Mujayani, 2023).

Two factorials and a completely randomized design (CRD) were the research design employed. Combining extracts A (1:1:1), B (1:2:1), and C (2:1:2) was the first factor; concentration (10, 50, 100, 150, and 200 ppm) was the second. Two-way ANOVA was used to evaluate the data, and then Duncan's test was used. According to the results, extract B's antioxidant activity at a concentration of 200 ppm was able to diminish DPPH free radicals by 78.21%. ABTS free radicals were reduced by 91.11% by the antioxidant activity of extract A at a concentration of 200 ppm. When extract A was combined with a 200 ppm concentration, the antioxidant activity was able to diminish FRAP free radicals by 52.76%. Ascorbic acid is an antioxidant that can convert Fe^{3+} metal ions to Fe^{2+} ions, and a combination of kencur, galangal, and curcuma extracts may be a good source of antioxidants with scavenging properties (Mujayani, 2023).

Kecombrang (*Etlingera elatior* (Jack) R.M. Sm.)

Prior research on patikala leaf samples from Enrekang included standardizing simplisia and patikala leaf extracts. Ethanol extracts contain terpenoids/steroids, alkaloids, flavonoids, and tannins, whereas simplisia contains terpenoids/steroids, flavonoids, tannins, and saponins. The findings shown that the ethanol extract of patikala leaves (*Etlingera elatior* (Jack) R.M. Sm.) from Enrekang possesses excellent antioxidant ability, with an IC_{50} value of 37.9823µg/mL, to combat ABTS radicals (Utami et.al., 2023).

The antioxidant activity of the extract was assessed using the ferric reducing antioxidant power (FRAP) method and the 2,2-diphenyl-1-picrilhydrazyl (DPPH) and 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid (ABTS) radical scavenging tests. The DPPH radical scavenging activity's IC50 value was 42.45 ± 1.37 µg/mL, while vitamin C's (positive control) was 2.78 ± 0.01 µg/mL. The ABTS scavenging activity's IC_{50} value was 26.46 ± 0.09 µg/mL, while vitamin C's was 0.15 ± 0.02 µg/mL (Utami, Yulianty, et.al., 2024).

Kumis Kucing (*Orthosiphon stamineus* B.)

The herbal plant *Orthosiphon stamineus* is well-known for its variety of secondary metabolites, which include flavonoids, terpenoids, and phenolic compounds with medicinal potential, particularly as antioxidants. The purpose of this study is to find probable secondary metabolite profiles that inhibit prooxidant enzymes and to identify plant component samples and flower color phenotypes with the highest phytochemical content and antioxidant capability. Several antioxidant tests, metabolomic analysis with PCA and HCA, virtual screening, and molecular dynamics simulation are among the techniques employed.

The findings indicated that the purple flower phenotype had the highest antioxidant capacity and phytochemical content. In addition, the secondary metabolite profile revealed significant differences between plant part samples, with the highest concentration found in the flower and leaf parts for both flower color phenotypes. Based on virtual screening, it was determined that orthosyphonone C had an affinity energy value of -9.7 kcal.mol-1 to the enzyme 5-Lipoxygenase (5-LOX), while salvianolic acid B had an affinity energy of -11.3 kcal.mol-1 to the enzyme inducible Nitric Oxide Synthase (iNOS). Both of these enzymes demonstrated good conformational stability in molecular dynamics simulations for 20 seconds (Mahendra, 2024).

Plants create a large number of polyphenolic chemicals, including flavonoids, which are secondary metabolites. Because flavonoids can supply hydrogen atoms or bind with metal compounds to absorb oxygen, they may also have promise as antioxidants (Wang et.al., 2023). Flavonoids are found in cat's whiskers. *Orthosiphon stamineus* B leaf extract's antioxidant activity test findings showed that it was a strong antioxidant (concentration between 50 and 100 ppm), with an average IC_{50} value of 65.62513 ppm. Using quercetin as a reference solution for comparison, the result was 13.84515 ppm. Since the IC_{50} value was less than 50 ppm, quercetin is considered a very potent antioxidant (Salasa et.al., 2021).

Miana (*Coleus scutellarioides* (L.) Benth)

The ornamental plant *Coleus scutellarioides* (L.) Benth has a single leaf type and a purple color. The purple color of the miana plant indicates the presence of anthocyanin pigments, which have antioxidant activity. Because of this activity, the plant can be used to help treat cell disorders brought on by free radicals. Quantitative investigations reveal the possibility of substantial antioxidant activity, namely with an IC_{50} value of 54.39 µg/mL, whereas qualitative testing of ethanol extracts of miana leaves reveal antioxidant components marked by changes in color from purple to yellow (Purnama Aji et.al., 2022).

The results of the antioxidant activity test of the miana leaf fraction and vitamin C indicate that the n-hexane fraction has an IC_{50}value of 240.48 ppm, which is classified as moderate, the ethyl acetate fraction has an IC_{50} value of 111.55 ppm, which is classified as moderate, and the aquadestilate fraction has an IC_{50} value of 79.943 ppm, which is classified as strong. Vitamin C, as a positive control, has an IC_{50} value of 14.535 ppm, which is classified as very strong. The aquadestilata fraction has the highest antioxidant activity when compared to the ethyl acetate and n-hexane fractions, according to the results of the IC50 value acquisition. According to the IC_{50} values, the miana leaf aquadestilata fraction may have antioxidant properties (Muadifah et.al., 2024).

Ilalang (*Imperata cylindrica* (L) Beauv.)

Previous studies on phytochemical screening showed that methanol extracts of alang-alang *(Imperata cylindrica* Linn.) leaves contain flavonoids, phenolics, and steroids. Because their hydroxyl groups are bound to the carbon of aromatic rings, flavonoids can capture free radicals and stabilize them, preventing the chain reaction of free radicals (Saleh dkk., 2023) .

As a source of antioxidants, phenolic compounds and flavonoids found in thatch rhizomes can be used. Because they have a hydroxyl group attached to the carbon of the aromatic ring, flavonoids have the ability to function as antioxidants. They can capture free radicals by donating electrons, or reductants, which results in more stable products and stops the free radical chain reaction (Wiadnyani, 2019).

Because of their hydroxyl groups, which can donate hydrogen atoms to DPPH free radicals to create reduced DPPH molecules, flavonoid compounds exhibit antioxidant properties. This may have an impact on a sample's antioxidant activity. The antioxidant activity increases with the number of hydroxyl groups that can give hydrogen. The methanol extract of thatch leaves (Imperata cylindrica Linn.), n-Hexan fraction, and ethanol fraction had IC50 values of 14.786 µg/mL, 100.371 µg/mL, and 11.588 µg/mL, respectively, according to the study's findings (Munadi et.al., 2024).

CONCLUSION

Carica papaya L., Kaempferia galanga, Psidium guajava, Zingiber officinale var. Rubrum, Piper bettle, Caesalpinia sappan L. and Etlingera elatior (Jack) R.M. Sm have tyrosinase inhibitor activity. *Orthosiphon stamineus B.,, Coleus scutellarioides (L.) Benth* and *Imperata cylindrica (L) Beauv.* thatch plants use antioxidant approaches as antiaging. In

http://doi.org/10.22216/jk.v5i2.5717
Published by LLDIKTI Wilayah X

conclusion, all herbal plants of the baduy tribe have the potential as anti-aging cosmetic raw materials.

ACKNOWLEDGEMENT

Thank you to Bachelor of Medicine Study Program, Faculty of Medicine, Mega Buana University Palopo. Islamic Economics Study Program, Faculty of Economics and Business, Muhammadiyah Business Institute Bekasi. Bachelor of Medicine Study Program, Faculty of Medicine, Muhammadiyah University of Surakarta. Communication Science Study Program, Faculty of Communication Science, Esa Unggul University Jakarta. Islamic Religious Education Study Program, Faculty of Islamic Studies, Muhammadiyah University of Purwokerto , as the institution where we serve. A big thank you to Inspiring Lecturer Paragon who is the research funder.

REFERENCES

Andini, V., Rafdinal, R., & Turnip, M. (2020). Inventory of Zingiberaceae in the Tembawang Forest Area of Sumber Karya Village, Teriak District, Bengkayang Regency. *Jurnal Protobiont*, *9*(1). Https://Doi.Org/10.26418/Protobiont.V9i1.42165

Aprilliani, A., Suganda, A. G., & Prasetyo, R. T. (2018). Inhibition Test of Tyrosinase Enzyme Activity from Several Types of Plants in the Zingiberaceae Family. *Jurnal Ilmiah Farmasi Farmasyifa*, *4*(1). Https://Doi.Org/10.20885/Jif.Vol14.Iss1.Art05

Dewi, N. W. R. K., Yasa, G. T., & Santi, M. D. S. (2024). Potential of 96% Ethanol Extract of Red Ginger Rhizome (*Zingiber Officinale* Var. Rubrum) as an Antioxidant. *Jurnal Skala Husada : The Journal Of Health*, *21*(2), 57–62. Https://Doi.Org/10.33992/Jsh:Tjoh.V21i2.3855

Hadi, K., Setiami, C., Azizah, W., Hidayah, W., & Fatisa, Y. (2023). Study of Antioxidant Activity from Secang Wood (*Caesalpinia sappan* L.). *Jurnal Sains Dan Kesehatan, 13*(2).

Huda, N. (2022). Utilization of Selected Spices as Immunity Herbal Remedies in the New Normal Era. *Jurnal Surya Masyarakat*, *4*(2), 160. Https://Doi.Org/10.26714/Jsm.4.2.2022.160-168

Khalida, S. (2021). Analysis of the Potential of Active Compounds in Red Betel Leaves *(Piper Crocatum) a*s an Acetylcholinesterase Enzyme Inhibitor In Silico. Bogor: Institut Pertanian Bogor.

Laksmiani, N. P. L., Leliqia, N. P. E., Armita, P. M. N., Arijana, N. I. G. K., Saputra, A. A. B. Y., & Prananingtyas, K. I. (2020). In-Silico And In-Vitro Studies Of Antioxidant And Sun Protection Activities Of Sappan Wood (*Caesalpinia sappan* L.):

Doi.Org/10.26538/Tjnpr/V4i12.8. *Tropical Journal Of Natural Product Research (Tjnpr)*, *4*(12), Article 12. Https://Tjnpr.Org/Index.Php/Home/Article/View/860

Mahendra, F. R. (2024). *Exploration of Antioxidants in Cat's Whiskers Plant Through Metabolomic, In Vitro, and In Silico Approaches.* http://Repository.Ipb.Ac.Id/Handle/123456789/158397

Muadifah, A., Ima, E. A., & Putri, A. E. (2024). Quality Analysis of Antioxidant Activity of Miana Leaf Fraction (*Coleus atropurpureus* L. Benth) on the Shelf Life of Jelly Candy. *Majalah Farmaseutik*, *19*(4), Article 4. Https://Doi.Org/10.22146/Farmaseutik.V19i4.79364

Mujayani, N. R. (2023). Antioxidant Activity of a Combination of Kencur Extract (Kaempferia galanga L.), Galangal (Alpinia galanga L.), and Temulawak (Curcuma xanthorrhiza Roxb.) Based on DPPH, ABTS, and FRAP Methods. [Doctoral, Universitas Negeri Jakarta]. Http://Repository.Unj.Ac.Id/37648/

Munadi, R. (2020). Analysis of Chemical Components and Antioxidant Activity Test of Red Ginger Rhizome Extract (*Zingiber officinale* Rosc. Var Rubrum). *Cokroaminoto Journal Of Chemical Science*, *2*(1), Article 1. Https://Www.Science.E-Journal.My.Id/Cjcs/Article/View/31

Munadi, R., Jasmiadi, & Ruslan, E. R. (2024). Antioxidant Activity Test of Fractionated Methanol Extract of Cogon Grass Leaves (*Imperata cylindrica* Linn.) Using the DPPH Method. *Cokroaminoto Journal Of Chemical Science*, *6*(1), Article 1. Https://Www.Science.E-Journal.My.Id/Cjcs/Article/View/198

Mustopa, S. (2022). In Silico and In Vitro Study of Extracts and Fractions of Red Betel Leaf *(Piper crocatum)* as Tyrosinase Inhibitors. [Thesis, Ipb University]. Http://Repository.Ipb.Ac.Id/Handle/123456789/114128

Mustopa, S., Safithri, M., & Ambarsari, L. (2024). Potential Of Red Betel Leaves (*Piper crocatum*) As Tyrosinase Inhibitor In Silico and In Vitro. *Indonesian Journal Of Pharmaceutical Science And Technology*, *11*(1).

Nurullita, U., & Irawati, E. (2022). Comparison of Antioxidant Activity of Natural and Synthetic Materials (Study on Secang Wood and Vitamin C). *Jurnal Mipa*, *11*(2), Article 2. Https://Doi.Org/10.35799/Jm.V11i2.40089

Owolabi, J. O., Fabiyi, O. S., Adelakin, L. A., & Ekwerike, M. C. (2020). Effects Of Skin Lightening Cream Agents—Hydroquinone And Kojic Acid, On The Skin Of Adult Female Experimental Rats. *Clinical, Cosmetic And Investigational Dermatology*, *13*, 283–289. Https://Doi.Org/10.2147/Ccid.S233185

Patimah, K., Hidayati, N. K., & Santoso, J. (2025). Formulation and Activity Testing of Clay Mask Preparations from Papaya Peel Extract (*Carica papaya* Linn.) with a

Combination of Lemon Peel Extract (*Citrus limon* Burm F.) as an Anti-Aging Agent. *Jurnal Riset Kefarmasian Indonesia*, *7*(1). Https://Doi.Org/10.33759/Jrki.V7i1.588

Permadi, T., Mulyani, R. D., & Laurensia, V. (2022). Formulation of Antioxidant Syrup from a Combination of Sappan Wood (*Caesalpinia sappan*) and White Turmeric (*Curcuma mangga* Val). *Jurnal Ilmiah Farmako Bahari*, *13*(2), 176–183. Https://Doi.Org/10.52434/Jfb.V13i2.1453

Prabawa, I. D. G. P., Khairiah, N., & Ihsan, H. (2019). Study of Bioactivity and Secondary Metabolites from Sappan Wood Extract (*Caesalpinia sappan* L.) for Active Ingredient Preparation. Prosiding Seminar Nasional Ke-2 Tahun 2019 Balai Riset Dan Standardisasi Industri Samarinda.

Purnama Aji, N., Noviyanty, Y., & Rahmawati, R. (2022). U Antioxidant Activity Ethanol Extract of Miana Leaves (*Coleus scutellarioides* (L.)Benth) Using the DPPH Method (1,1-Diphenyl-2-Picrylhydrazyl). *Science, Technology And Agriculture Journal*, *3*(2). Https://Doi.Org/10.37638/Sinta.3.2.65-76

Puspitadewi, N., & Sriwidodo, S. (2023). Article Review: Activity and Utilization of Brazilin from Sappan Wood (*Caesalpinia sappan* L.) in Cosmetic Preparations. *Farmaka*, *21*(1).

Raharja, Q. A. (2021). The Potential of Secondary Metabolites from Endophytic Fungi of Sappanwood (*Caesalpinia sappan* L.) as Tyrosinase Enzyme Inhibitors. Program Studi Farmasi Fakultas Farmasi Dan Sains Universitas Muhammadiyah Prof. Dr. Hamka Jakarta.

Ramadani, S. A. (2024). Activity of Guava Leaf Extract (*Psidium Guajava* L) as an Antioxidant Using the DPPH Method. *Makassar Natural Product Journal (Mnpj)*, 96–106. Https://Journal.Farmasi.Umi.Ac.Id/Index.Php/Mnpj/Article/View/164

Reigada, I., Moliner, C., Valero, M. S., Weinkove, D., Langa, E., & Gómez Rincón, C. (2020). Antioxidant And Antiaging Effects Of Licorice On The Caenorhabditis Elegans Model. *Journal Of Medicinal Food*, *23*(1), 72–78. Https://Doi.Org/10.1089/Jmf.2019.0081

Salasa, A. M., Ratnah, S., & Abdullah, T. (2021). Total Flavonoid Content and Antioxidant Activity of Cat's Whiskers Leaf Extract (*Orthosiphon stamineus* B.). *Media Farmasi*, *17*(2), Article 2. Https://Doi.Org/10.32382/Mf.V17i2.2292

Saleh, C., Sestiani, M., & Erwin, E. (2023). Activity of Methanol Extract of Cogon Grass Leaves (*Imperata cylindrica* (L.) P. Beauv) as an Anti-inflammatory: Activity Of Alang-Alang (*Imperata cylindrica* (L.) P. Beauv) Leaves Methanol Extract As Anti-Inflammatory. *Jurnal Sains Dan Kesehatan*, *5*(3), Article 3. Https://Doi.Org/10.25026/Jsk.V5i3.1649

Santi, I., Abidin, Z., & Asnawi, N. (2021). Antioxidant Activity of Papaya Plants (*Carica papaya* L.). *Assyifa Jurnal Farmasi*. Https://Doi.Org/10.56711/Jifa.V13i2.777

Sari, A. P., Rahman, S. R., Sanawiah, S., & Nurdin, M. R. T. J. P. (2023). Identification and Characterization of Zingiberaceae Family Plants in Budong-Budong Village, Mamuju Tengah Regency. *Celebes Biodiversitas : Jurnal Sains Dan Pendidikan Biologi*, *6*(1), Article 1. Https://Doi.Org/10.51336/Cb.V6i1.395

Utami, Y. P. (2021). PPotential of Ethanol Extract of Red Andong Leaves (*Cordyline fruticosa* (L.) A. Cheval) as an Antioxidant Against DPPH Radicals. *Jurnal Farmasi Medica/Pharmacy Medical Journal (Pmj)*, *4*(1), Article 1. Https://Doi.Org/10.35799/Pmj.4.1.2021.34521

Utami, Y. P., Apriyanto, A., & Firmansyah, A. (2024). Plants Of Outer Baduy Community In Banten As Cosmetic Raw Materials. *9*(1). Https://Doi.Org///Doi.Org/10.22216/Jk.V5i2.5717

Utami, Y. P., Yulianty, R., Djabir, Y. Y., & Alam, G. (2023). Potential of Ethanol Extract of Red Andong Leaves (*Cordyline fruticosa* (L.) A. Cheval) as an Antioxidant Against DPPH Radicals *Jurnal Katalisator*, *8*(2), 291–300. Https://Doi.Org/10.22216/Katalisator.V8i2.2572

Utami, Y. P., Yulianty, R., Djabir, Y. Y., & Alam, G. (2024). Antioxidant Activity, Total Phenolic And Total Flavonoid Contents Of *Etlingera elatior* (Jack) R.M. Smith From North Luwu, Indonesia. *Tropical Journal Of Natural Product Research*, *8*(1). Https://Doi.Org/10.26538/Tjnpr/V8i1.34

Wang, J., Zhou ,Wei-Yu, Huang ,Xiao-Xiao, & And Song, S. (2023). Flavonoids With Antioxidant And Tyrosinase Inhibitory Activity From Corn Silk (*Stigma maydis*). *Natural Product Research*, *37*(5), 835–839. Https://Doi.Org/10.1080/14786419.2022.2089986

Wiadnyani, S. (2019). The Influence of Ethanol Concentration on the Antioxidant Activity of Cogongrass Rhizome Extract (*Imperata cylindrica* (L) Beauv.) in Extraction Using Ultrasonic Waves. *Jurnal Ilmu Dan Teknologi Pangan (Itepa)*, *4*(2).