

Bioprospecting and Chemical Potential of Bioactive Compounds of Medicinal Plants of the Baduy Tribe of Banten Province

Asep Saefurohman^{a*}, Angger Arfi^b, Ais^c, Fahrizal^d

^a Department of Chemistry Faculty of Science, UIN Sultan Maulana Hasanuddin Banten, Serang, 42171, Indonesia

^b Faculty of Science, UIN Sultan Maulana Hasanuddin Banten, Serang, 42171, Indonesia

^c Faculty of Science, UIN Sultan Maulana Hasanuddin Banten, Serang, 42171, Indonesia

^d Faculty of Science, UIN Sultan Maulana Hasanuddin Banten, Serang, 42171, Indonesia

ARTICLE INFO

Received 26 July 2025

Accepted 31 October 2025

Key word:

Molecular docking

Molecular dynamics

Geranylgeraniol

Androgenetic alopecia

Myristica fragrans

ABSTRACT

Bioprospecting is the exploration, collection, research, and utilization of genetic and biological resources to obtain chemical compounds, genes, organisms, and other natural products. Bioprospection of medicinal plants is an exploration activity to have added value from both a scientific and an economic perspective. White Ginger (*Curcuma zedoria* Rosc) is included in the family of medicinal plants in the family Zingiberaceae. This plant is widely found in Baduy tribe and this is the first-time study of *Curcuma zedoria* Rosc from the Baduy Tiribe. The objective of the research was to find bioactive compounds from plants in Baduy tribe and the chemical potential of bioactive compounds as drugs. The method used in this research is descriptive qualitative, by describing the quality of bioactive compounds contained in traditional medicinal plants in the Baduy tribe. The research results showed that the yields obtained from the extraction using 70% ethanol solvent, water, and steeping water of white rhizome powder were 24.51%, 9.65%, and 12.22%, respectively. 70% ethanol medicinal plant extract and hot water at a concentration of 300 ppm did not have an inhibitory power on the activity of the enzyme tyrosine kinase, while the crude extract of 300 ppm aquadest had an inhibitory power of 7.23%. At a higher extract concentration, which is 700 ppm, 70% ethanol extract has the highest inhibitory power of 27.77%. The inhibition power of 700 ppm aqueous extract is 26.13% and 700 ppm hot water extract is 24.50%.

*e-mail:

asep.saefurohman@uinbanten.ac.id

*Telp:081380775639

Introduction

Indonesia is a tropical forest country that has very high biodiversity. Contains biological natural resources of various flora that can be used as herbal plants. The potential of this natural resource is utilized by the community around the forest. Inland tribal communities around the forest use herbal plants as raw materials for medicines derived from knowledge, customs, and habits from ancestors [1].

The exploration of natural products derived from medicinal plants that provide an abundance of bioactive compounds has long been a cornerstone of scientific discovery,

revolutionizing fields such as medicine, agriculture, and biotechnology. The exploration of medicinal plants is currently starting to be intensively carried out because of the content of bioactive compounds in them. Knowledge of phytochemicals in the plant body needs to be done to ensure the importance of *ethnomedicinal use*. Medicinal plants are from natural pharmaceuticals, believed to be safer and proven in treating various diseases [2].

Bioprospecting is the activity of exploration, collection, research, and utilization of genetic and biological resources to obtain chemical compounds, genes, organisms, and other natural products. Bioprospecting is the

exploration of biodiversity for genetic and biochemical resources that have commercial value [3].

The Baduy tribe is one of the traditional or ethnic communities with local knowledge in the use of medicinal plants. The Baduy people have long known traditional medicine by utilizing various types of herbal plants that have been passed down from generation to generation only orally. The Baduy tribe prefers to use herbal medicine and is reluctant to use manufactured medicines sold in stalls and health centers because it is considered to violate customary rules, but health problems can occur if the use of traditional medicine is not appropriate [4].

This research was carried out to find out the traditional medicinal plants in the Baduy tribe, maintain local wisdom in the health sector, especially traditional medicine practices in the Baduy tribe. The uses of this research are expected to help biodiversity conservation efforts and provide information for relevant agencies and make important contributions to science ethnopharmacology by identifying the bioactive compounds contained in the plant. These compounds can then be further studied to determine their effectiveness as active ingredients in the manufacture of modern medicines. One of the medicinal plants found at the Baduy tribe was White Ginger (*Curcuma zedoria* Rosc.).

Among the compounds found in white ginger (*Curcuma zedoria* Rosc) are flavonoids, saponins, and tannins are effective in inhibiting bacterial growth [5]. Therefore, this research focus on *Curcuma zedoria* Rosc and research on white ginger (*Curcuma zedoria* Rosc.) from The Baduy tribe has never been done before.

Materials and Methods

Tool

Oven, analytical scale, blender, 22 mesh sieves, glass containers (maceration vessels), Stirrer, black cloth/black plastic, UV-VIS spectrum, Beaker glass, Funnel, Split funnel, test tube, pipette, Erlenmeyer, micropipette, micro channel pipette, rotary evaporator, measuring cup, buffer, acid cabinet, autoclave, Laminar Air Flow (LAF), vortex, chamber reservoir, petri dish, ruler, test tube rack, incubator, 96 well plate, deep well, latex and

ELISA Reader Spectrophotometry, FTIR and HPLC.

Material

filter paper, *Nutrient Agar*, medicinal plant samples, HCl, KI, Ethanol 96%, aquades, butanol, alcohol 70%, tissue, SDS solution, DPPH Solution (2,2 diphenyl-1-picrylhydrazyl), MTT Solution (Micro tetrazolium or [3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide]), RPMI 1640 Media, methanol, Mayer reagent, boucharde reagent, dragendorff reagent, NaCl, FeCl₃, Glacial acetic acid, Concentrated sulfuric acid, Vitamin C, *Staphylococcus aureus* strain, n-hexane, paper disc and ethyl acetate.

Working Procedure

Pre-Research Process

The first step taken was a survey conducted in the Baduy Tribe, Banten Province, to find information. In addition, interviews were also conducted with local residents as important informants who supported the research. Interview questions include what ethnic medicinal plants are often used by locals.

Research Process

Drying and Refining

Drying of plant samples is carried out at room temperature (about 25°C) or in the oven at a temperature of no more than 30°C. Avoid drying the sample in sunlight because ultraviolet light can damage the compounds contained in the plant sample. Once completely dry, the dried samples of the plant can be stored for a long time [6].

Once the sample is dry, the sample is then mashed by crushing it by hand, or it can be used in a blender. After the sample is smooth, the sample is sifted using a sieve with a size of 22 mesh, then the result can be called simplisia.

Extraction

The extraction method used is the maceration method, or cold extraction without heating. This process begins by weighing 100 g of fine simplisia powder using an analytical scale. Hence, a glass container or maceration vessel is prepared, and then the simplisia is put into the vessel. Solvent in the form of 96%

alcohol was added to the vessel with a ratio of simplisia to solvent of 1:10 (gram: ml). Stir well, then the macerate is soaked for 3x24 hours and the macerate is stirred every 6 hours. The vessel is tightly closed and covered with a black cloth to protect it from light, air, and moisture, and is stored in a dark place [7].

After 3 days of soaking, the macerate is filtered with a canvas and then filtered again using filter paper. After filtering, the macerated pulp is filled with solvent again with the same solvent, namely 96% alcohol, and then left again for 3x24 hours; this activity is repeated 3 times. After the liquid extract is obtained, the mafiber is put into a *rotary evaporator* for evaporation so that the extract can be more thickens.

Fractionation

The extraction results using 96% ethanol solvent in the form of semi-thick extract were weighed as much as 10 g, then dissolved using 40 mL of aquadest and then fractionated with a mixture of 100 mL of n-hexane in a separation funnel. The n-hexane fraction in the above part will be poured into the *rotary evaporator* to be evaporated, and the water fraction obtained is then refractionated using a 100 mL ethyl acetate solvent in the same way [8].

Screening Phytochemistry

The phytochemical screening process is carried out with several processes, namely Alkaloids, Flavonoids, Saponins, Tannins, Steroids, and Triterpenoids, Phenols.

Result and Discussion

One of the results of tracing and observation were taken from the Baduy tribe medicinal plants, of the white ginger (*Curcuma zedoria* *Rosc*) plant as the focus of the research. White ginger plant is often used as a stimulant, dewormer, carminative, diuretic, anti-diarrheal, anti-pyretic, and cancer drug by boiling or brewing, even in the form of a mixture of dry powder or simplicia [9].

The chemical compounds contained in white ginger include monoterpenes, sesquiterpenes, zedoarone, picurcuminol, uminol kurk, and curcumin. The components of epicurcuminol and zedoarone are efficacious as anti-tumors. The monoterpene compounds contained in essential oils are efficacious as antineoplastics (anticancer) and have been

shown to inactivate the growth of breast cancer cells. Curcumin is efficacious as an anti-inflammatory and antioxidant that can prevent gene damage [10].

Water Content in White Ginger Rhizome

The water content in a material affects the resistance of the material to microbial attack. The greater the water content in a material, the lower its resistance to microbial attack [11]. The moisture content of fresh white ginger rhizomes was obtained at 82.81% according to Table 1.

Table 1. Moisture Content of White Rhizome

White Encounter Rhizome	Up to Air (%)
Fresh Samples	82,81
Dry Samples	10,42

Table 1 explains that the water contained in fresh white Ginger rhizomes is still very large. Meanwhile, the moisture content of white Ginger rhizomes dried with an oven temperature of 40°C for 4 days was obtained at 10.42%. The drying process causes the water content in the sample to decrease quite significantly. This is done to prevent unwanted chemical changes in the sample.

White Ginger Extraction

The entire white ginger rhizome powder to be used is extracted first using hexane. This is done to remove fat components that may interfere with the subsequent extraction handling process. The remaining pulp is then extracted using 70% ethanol solvent and aquadest, respectively. 70% ethanol extract is concentrated using a rotary evaporator flask at 40 °C to prevent possible damage to the components contained in the extract.

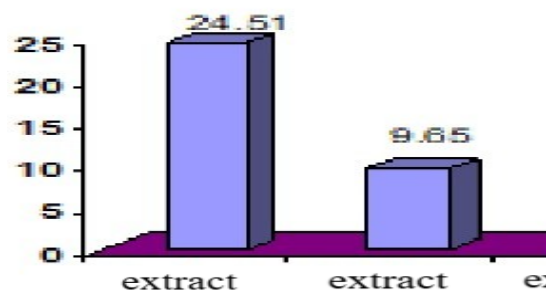


Figure 1. Yield Value (%) of White Ginger Extract

Figure 1 showed that the 70% ethanol extract (EtOH) produced is oily brown with a yield of 24.51%. The yield from aqueduct extract (dH₂O) was obtained at 9.65% and the yield from hot water extract was 12.22%.

Phytochemical Content

The results of the extraction of fresh white Ginger and dried white Ginger rhizomes were tested for phytochemistry. The secondary metabolite compounds examined were alkaloids, flavonoids, terpenoids and steroids, saponins, tannins, as well as quinones. The results of phytochemical filtration of each rhizome and white Ginger extract are in Table 2 [12].

Table 2. Phytochemical Filtration Results

Compound Groups	Sample				
	SS	CS	EE	EAdm	Eap
Alkaloid	+++	+++	+++	+++	+++
Flavonoid	+++	+++	+++	+++	+++
Aglikon					
Flavonoid	-	-	-	-	-
Glikosida					
Terpenoid	+++	+++	+	-	-
Steroid	-	-	-	-	-
Saponin	++	++	-	-	-
Tanin	-	-	-	-	-
Kuino's	-	-	-	-	-

Information:

SS : Fresh sample (+): Positive test result

SK : Dry sample (-): Negative test result

EE : Extract ethanol 70%

EAdm : Aquagus Extract

EAp : Hot water extract

Table 2 showed that fresh and dried white Ginger rhizomes contain secondary metabolite compounds, including alkaloids, flavonoids in the form of aglycons, terpenoids, and saponins. The drying process of rhizomes at 40 °C does not seem to damage the content of their secondary metabolite compounds. However, extraction with n-hexane can remove most of the terpenoid content in the pulp, so that negative terpenoid tests in aqua extracts and hot water extracts, and much lower in ethanol extracts, 70% of the content is reduced [13].

On the other hand, Table 2 showed that flavonoids and alkaloids are practically extracted entirely in the three solvents used.

This showed that the flavonoids and alkaloids contained in the rhizomes have different levels of polarity; moreover, they can be extracted in each solvent used. The flavonoids contained in fresh white Ginger rhizomes, dried rhizomes, and all extracts are a type of aglycon flavonoids, which are free flavonoids that are not bound to glycosides.

The concentration used in the in vitro testing of the tyrosine kinase enzyme is below the LC₅₀ value of each extract used ELISSA test. This is done to determine the inhibition of enzyme activity in a state that is practically non-toxic so that the level of strength of the extract used in the safest conditions for the body can be known. The concentrations used in the test were 300 ppm and 700 ppm for each extract.

Testing was conducted with negative control (without the addition of extracts) and positive control (containing genistein at concentrations of 300 ppm and 700 ppm). The results obtained were in the form of absorbance values from the activity of the enzyme tyrosine kinase. The value of the absorbance produced is inversely proportional to its inhibition power. The smaller the absorbance value produced, the greater the inhibition power to the activity of the tyrosine kinase enzyme because the product produced by the enzyme is less due to its inhibited activity. This can be seen from the intensity of the product's colour which is fading.

The test results showed that 70% ethanol coarse extract and white ginger hot water coarse extract at a concentration of 300 ppm did not inhibit the activity of the tyrosine kinase enzyme. This can be seen from the inhibition power that has negative or under negative control (EGFR). Meanwhile, aqua coarse extract at a concentration of 300 ppm has an inhibition power of 7.23%. This value is greater than the value of the positive control inhibition power of genistein in the concentration of 300 ppm is 6.71%. The inhibition power values for ethanol white coarse extract of 70%, aqua and hot water at a concentration of 700 ppm were 27.77%, 26.13% and 24.50% respectively. The inhibition of tyrosine kinase enzyme activity for the three extracts exceeded the inhibition value of the positive control of genistein at a concentration of 700 ppm, which was 12.89% and the inhibition power of the three extracts at a

concentration of 300 ppm. Hence, it can be stated that 70% ethanol white coarse extract at a concentration of 700 ppm and aqua coarse white coarse extract have good inhibition to the activity of tyrosine kinase enzyme. However, from the inhibition power value of the three extracts that are not much different, it can be stated that the coarse extract of white ginger aqua and hot water also has the potential to be a cancer drug.

The presence of several secondary metabolite compounds in the crude extracts tested, is thought to have its own role in inhibiting the activity of the enzyme tyrosine kinase. Alkaloids derived from medicinal plants are known to have a toxicity effect on cancer cells, can induce apoptosis in human cancer cells and have been shown to be effective and potent in treating metastatic breast cancer patients. Flavonoids themselves have the ability to inhibit EGFR (epidermal growth factor receptor) from the enzyme tyrosine kinase [14]. Therefore, the alkaloids and flavonoids contained in the coarse extracts of the plant are thought to have a certain role in inhibiting the activity of the enzyme tyrosine kinase.

The presence of terpenoid compounds in 70% ethanol crude extract is thought to play a role in enhancing the inhibitory power of the extract against the activity of the enzyme tyrosine kinase. Triterpenoid secondary metabolite compounds in ethanol extracts have been shown to inhibit the growth of human ovarian cancer line cells [15].

Medicinal plants as alternative therapeutic options have long history of use in the treatment of different types of cancers and it was well reported that herbs are good source of potential chemotherapeutic compounds. All extracts tested showed fairly good inhibitory properties against the activity of the enzyme tyrosine kinase at a concentration of 700 ppm. It even has greater inhibition than the positive control of genistein. This is very useful as scientific evidence in the study of the potential of several plants that have the potential as anticancer [16].

Acknowledgments

The authors thank to Lembaga Penelitian dan Pengabdian Masyarakat (LP2M)

Universitas Islam Negeri Sultan Maulana Hasanuddin Banten and Faculty of Science for funding this research.

Conclusion

One of the species of medicinal plants that has undergone bioprospection in the Baduy tribal community is White Ginger (*Curcuma zedoaria*). White rhizomes have the potential to inhibit the activity of the enzyme tyrosine kinase at certain concentrations. Raw extract of 70% white ethanol and hot water at a concentration of 300 ppm had no inhibition to the activity of the enzyme tyrosine kinase, while aqueductal crude extract of 300 ppm had an inhibition power of 7.23%. At a higher concentration of extract, which is 700 ppm, 70% ethanol extract has the highest inhibition of 27.77%. The inhibition power of 700 ppm aqueduct extract was 26.13% and 700 ppm hot water extract was 24.50%. The inhibition of the activity of the enzyme tyrosine kinase is affected by concentration.

Bibliography

- [1].A. Setiawan, "Keanekaragaman Hayati Indonesia: Masalah dan Upaya Konservasinya," 2022.
- [2] M. J. Rodrigues, "Bioprospecting of Natural Products from Medicinal Plants," *Plants*, vol. 13, no. 24, p. 3556, Dec. 2024, doi: 10.3390/plants13243556.
- [3] Y. Suryatinah, M. B. S., N. R. Wijaya, and D. H. Tjandrarini, "Eksplorasi dan Inventarisasi Tumbuhan Obat Lokal Berpotensi sebagai Antiinflamasi di Tiga Suku Dayak, Kalimantan Selatan," *Bul. Plasma Nutrafah*, vol. 26, no. 1, p. 63, July 2020, doi: 10.21082/blpn.v26n1.2020.p63-76.
- [4] R. C. E. Permana, "Masyarakat Baduy dan pengobatan tradisional berbasis tanaman," *Wacana J. Humanit. Indones.*, vol. 11, no. 1, p. 81, Apr. 2009, doi: 10.17510/wjhi.v11i1.145.
- [5] E. Gultom and I. Waruwu, "Pembuatan Dan Karakterisasi Carbon Dots Dari Tanaman Kunyit Putih Dengan Metode Hidrotermal".
- [6] S. Sulasiyah, P. R. Sarjono, and A. L. N. Aminin, "Antioxidant from Turmeric Fermentation Products (*Curcuma longa*) by *Aspergillus Oryzae*," *J. Kim. Sains Dan Apl.*, vol. 21, no. 1, pp. 13–18, Jan. 2018, doi:

10.14710/jksa.21.1.13-18.

[7] M. Simorangkir, B. Nainggolan, and S. Silaban, "Antioxidant activity of vacuum column chromatography fractions of ethanol extract of sarang banua (*Clerodendrum fragrans* vent willd) leaves," *J. Phys. Conf. Ser.*, vol. 1374, no. 1, p. 012016, Nov. 2019, doi: 10.1088/1742-6596/1374/1/012016.

[8] S. Yuliana, C. Wijayanti, N. R. L. Qodriyah, H. Sanjaya, R. A. Wahab, and E. Susanti, "Isolation and Identification of Indigenous Polypropylene- Degrading Bacteria Isolated From Bestari Landfill of Probolinggo".

[9] T. Firmansyah and E. O. Jawa La, "Skrining Fitokimia Ekstrak Etanol Rimpang Kunyit Putih Curcuma Zedoaria (Christm.) Roscoe," *Acta Holistica Pharm.*, vol. 4, no. 1, pp. 20–24, Apr. 2022, doi: 10.62857/ahp.v4i1.49.

[10] Y. Rahmawati, A. W. Ningsih, Y. Rahmawati, and F. Agustin, "2,8Departemen Biologi Farmasi, Universitas Anwar Medika, Sidoarjo 1,3,4,5,6,7Mahasiswa S1 Farmasi, Program Studi S1 Farmasi, Fakultas Ilmu Kesehatan, Universitas Anwar Medika, Sidoarjo".

[11] A. Intan Saridewi, N. W. Bogoriani, and P. Suarya, "AKTIVITAS EKSTRAK METANOL RIMPANG KUNYIT PUTIH (Curcuma zedoaria Rosc.) SEBAGAI HIPOLIPIDEMIA PADA TIKUS WISTAR PUTIH OBESITAS DENGAN DIET TINGGI KOLESTEROL," *J. Kim.*, p. 140, July 2018, doi: 10.24843/JCHEM.2018.v12.i02.p08.

[12] W. Leviana and V. Paramita, "Pengaruh Suhu Terhadap Kadar Air Dan Aktivitas Air Dalam Bahan Pada Kunyit (Curcuma Longa) Dengan Alat Pengering Electrical Oven," *METANA*, vol. 13, no. 2, p. 37, Dec. 2017, doi: 10.14710/metana.v13i2.18012.

[13] R. Wulandari and P. Puspitasari, "Pengaruh Infusa Rimpang Temu Putih (Curcuma zedoaria (Berg.) Roscoe) Terhadap Jumlah Leukosit Dan Differential Counting (Diffcount) Pada Kesembuhan Luka Laparatomi Pasca Bedah," *Medicra J. Med. Lab. Sci.*, vol. 2, no. 1, pp. 22–27, July 2019, doi: 10.21070/medicra.v2i1.1689.

[14] Azizuddin, A. M. Khan, and M. I. Choudhary, "Tyrosinase inhibitory potential of natural products isolated from various medicinal plants," *Nat. Prod. Res.*, vol. 25, no. 7, pp. 750–753, Apr. 2011, doi:

10.1080/14786419.2010.513684.

[15] Muhammad Andira Ibnu Shina, Tatiana Siska Wardani, and Kusumaningtyas Siwi Artini, "Uji Aktivitas Antibakteri Ekstrak, Fraksi Air, Fraksi Etil Asetat, Fraksi n-Heksan Daun Petai Cina (*Leucaena leucocephala*) Terhadap Bakteri *Staphylococcus aureus* ATCC 25923," *OBAT J. Ris. Ilmu Farm. Dan Kesehat.*, vol. 2, no. 6, pp. 1–37, Sept. 2024, doi: 10.61132/obat.v2i6.785.

[16] Sabila sultana, "Molecular targets for the management of cancer using Curcuma longa Linn. phytoconstituents: A Review", doi: <https://doi.org/10.1016/j.biopha.2020.111078>.



2025 by the authors. Licensee Fullerene Journal Of Chem. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).