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An Introduction to the Plant Binahong (Anredera cordifolia (TEN.) Steenis) as a Source Of Antıoxidant Compounds

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Antioxidant, Chemicals, Indonesia, Leaf, Rhizome

Abstract

Binahong (Anredera cordifolia (Ten.) Steenis), is a popular medicinal plant of Indonesia, which has long been used in the treatment of various diseases in the popular pharmaceutical industry, and ethnomedical applications. It contains various alkaloids, flavonoids, saponins, phenols, and a large amount of other secondary metabolites with characteristic antibacterial and antioxidant effects. These compounds are also used to treat many diseases like diabetes and vomiting etc. Therefore, it has a very important place and potential role in the life of the Indonesian people. The aim of this study provide important and valuable information about the plant which has high use in the ethno-medicinal care system of Indonesia.

Anahtar Kelimeler

Antioksidan, Kimyasallar, Endonezya, Yaprak, Rizom

Antioksidan Bileşikler Kaynağı Olarak Binahong Bitkisine (Anredera cordifolia (TEN.) Steenis) Giriş

Özet

Binahong (Anredera cordifolia (Ten.) Steenis), popüler tıbbi ilaç endüstrisinde ve etnomedikal uygulamalarda çeşitli hastalıkların tedavisinde uzun zamandan beri kullanılan Endonezya'nın popüler bir tıbbi bitkisidir. Çeşitli alkaloidler, flavonoidler, saponinler, fenoller ve karakteristik antibakteriyel ve antioksidan etkilere sahip çok miktarda diğer ikincil metabolitleri içermektedir. Bu bileşikler aynı zamanda diyabet ve kusma gibi birçok hastalığın tedavisinde de kullanılmaktadır. Bu nedenle Endonezya halkının yaşamında çok önemli bir yeri ve potansiyel rolü vardır. Bu çalışmanın amacı, Endonezya'nın etnomedikal sağlık sisteminde kullanımı yüksek olan bitki hakkında önemli ve değerli bilgiler sunmaktır.

1. GİRİŞ

A large number of medicinal plants grow in Indonesia, and many of them are used as ethno-medicinal plants by the local people. Most of these plants are of local origin but some of them have been brought from abroad and naturalized. Binahong (Anredera cordifolia (Ten.) Steenis), whose center of diversity is South or Latin America, is one of the widely grown (medicinal) plants in Indonesia. Boussingaultia pseudobasselloides Haum, B. gracilis and B. cordifolia are synonyms of the binahong plant from the family Basellaceae (Yuziani et al., 2014). Binahong plants grow largely in Indonesia, Australia, China, southern Brazil to Parguay Argentina, the United States, and the North America. The binahong plant, which is very popular among these countries, has number of uses in local ethno medicinal systems to treat a number of diseases (PROSEA, 2003). The plant species are invasive in nature and grows everywhere in the lowlands and highlands. It can be popularly planted in pots to decorate rooms and homes as indoor or outdoor ornamental and medicinal plants. Generative (seed), but more often developed or cultivated vegetative organs like rhizome (PIER, 2000) are also used for its propagation.

2. General information about binahong (A. cordifolia (Ten.) Steenis) and plant taxonomy

The plant is called Binahong in Indonesia, Malaysia, Singapore, North and South Korea. It is called dheng shan chi in China and heartleaf madeira vine in England (Miladiyah and Prabowo, 2012).

Kingdom: Plantae
Subkingdom: Tracheobionta
Superdivision: Spermatophyta
Division: Magnoliophyta
Class: Magnoliopsida
Subclass: Hamamelidae
Order: Caryophyllales
Family: Basellaceae
Genus: Anredera
Species: Anredera cordifolia (Tenore) Steenis
(Source: Backer and van de Brink, 1963).

(https://www.cabidigitallibrary.org/doi/10.1079/cabicompendium.112290)

Figure 1. Binahong (A. cordifolia (Ten.) Steenis) plant

Binahong grows from vines growing on compact rhizomes and is invasive or weedy in growing habit. It grows from 30 to 40 cm in length, it twines around the trees, constrict them and lead to their death. Therefore the plant is restricted in Newzealand and Australia. There is no restriction in the multiplication of the plant in Indonesia. The plants grow on rhizomes with heart shaped and soft fleshy heart-shaped leaves. They have herbaceous soft and cylindrical stems with alternate leaves growing and emerging on nodes with 5-10 cm or more plant height and about 3-7 cm wide trunks. The leaves, stem, flowers, and roots have antioxidant properties (Miladiyah and Prabowo, 2012). Manoi, (2009) has mentioned that many other biochemical compounds in Binahong leaves heal many diseases such as kidney damage, diabetes, heart swelling, stroke, hemorrhoids, and gout. Tshikalange et al., 2005 reports that the plant can be used for treatment of infectious and sexual diseases like syphilis. In addition, binahong leaves, contain antioxidants that have a healing effect on these diseases. They are also extremely rich in terms of oleanolic acid, which is from the triterpenoid group (Octavia, 2009). According to the same researcher, these chemicals from the triterpenoid group are organically synthesized isometric hydrocarbon compounds that help to rebuild or repair damaged body cells.

Astuti et al., 2019 emphasize that the Binahong plant has a large number of alkaloids, flavonoids, phenols, saponins, steroids, and triterpenoids, with high antioxidant activities. These alkaloids prevent the formation of the radicals and also prevent oxidation, catalase, and glutathione peroxidase activities by binding free ones to highly reactive molecules. These extracts are also very rich in vitamins E, C, A and carotene, flavonoids, albumin, bilirubin, ceruloplasmin, etc (Winarsi, 2011). These alleviate cholesterol in the blood and are used as anti-cancer agents due to the presence of terpenoids, flavanoids, and other biochemicals (Manoi, 2009). As drug activity, flavonoids are anti-inflammatory, antioxidant, and hypoglycemic; while terpenoids assist in the recovery (repair) process of body cells. They have also been found to play a significant role in reducing blood cholesterol and anti-carcinogenic substances (Dardouk et al., 2019). Examples of some diseases that can be controlled with its use are kidney and cardiovascular failure, stopping various organ cancers, etc.

2.1. Morphology

Binahong is an annual and spreading, can grow up to 5 m. Binahong can be grown easily in the plains and mountains as well as in pots as an ornamental and/or medicinal plant (Backer and van de Brink, 1963). It also finds the opportunity to grow in the tropical and sub-tropical region. Although Binahong plants are produced from seeds, they can also be propagated vegetatively by their roots or rhizomes (BPOM, 2008). Part of this plant consists of leaves, stems, flowers, roots, and rhizomes. Its leaves have a very short stem, alternately arranged leaves ~ 5 to 10 cm long and ~ 3

to 7 cm wide, green in color, and heart-shaped. It has textured, cylindrical, and red-handled smooth surfaces (Miladiyah ve Prabowo, 2012). Binahong plants have a special stem structure with rhizomes, branching, horizontal growth, and shoots that appear above ground on tips (Tjitrosoepomo, 1999).

a. rhizome

b. flowers

c. leaves

c. Steams

Source:(https://www.cabidigitallibrary.org/doi/10.1079/cabicompendium.112290 and https://alchetron.com/Anredera-cordifolia)

Figure 2. parts of the binahong plant

2.2. Cultivation In Indonesia

2.2.1. Ecophysiology

It grows in various soils, in region with 1,500-4,500 mm/year precipitation and requires a little shading.

2.2.2. Cultivation

After tillage, the rhizomes are planted directly in the garden using a soil depth of 3-5cm at a distance of 25-60 cm.

2.2.3. Handling and Maintenance

Nowadays, the binahong plant is widely used in raw form for use in phytopharmaceutical industry. Research Institution of Medicinal Plants and Spices in Indonesia, suggests about 20% it as raw material from cultivated binahong. The rest of 80% is collected from the wild thickets (BALITTRO, 2006). Therefore, to meet the local and exotic needs as a pharmaceutical product, it is desirable to develop new agronomic and in vitro farming techniques under controlled conditions to maintain quality of harvested binahong.

3. Antioxidant Contents

Flavonoids, saponins and alkaloids are the main phytochemical harvested from binahong. They contain a total flavonoid contents of 0.6 mg/100 grams of dried root powder (Yang et al., 2008).

Table 1. Chemical contents on the parts of the binahong plant

Parts of Plant	Chemical Contents
Leaves	Saponin and flavonoid
Steam	Polyphenol, saponin and flavonoid
Rhizome	Saponin and flavonoid
Root	Alkaloid, saponin, polyphenol

p-Coumaric acid structure is found in Binahong leaves. There are many types of plants beneficial for health (Goleniowski, 2013).

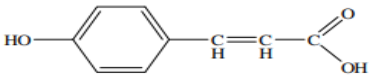

Figure 3. p-Coumaric acid structure

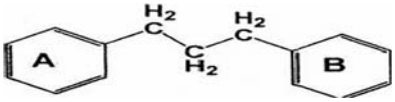

Figure 4. Flavonoid Structure

Table 2. Phytochemical analysis results of binahong (A. cordifolia) leaves

No.	Compounds	Comment
1	Flavonoids	+
2	Saponin	+
3	Terpenoid	+
4	Tannins/phenolics	+
5	Steroid	+
6	Alkaloid	
	Mayer	-
	Wagner	+
	Dragendroff's	+

Binahong plant is very rich in flavonoids, that increase antioxidant enzymes activities like superoxide dismutase and catalase. These activities inhibit, and then stop selenite-induced

cataractogenesis (Wang et al., 2011, Rooban, 2012). Binahong leaves also contain antioxidants that reach 40.27% or 4.25 mmol/100 g in fresh and 3.68 mmol/100 g dry weight (Fidrianny et al., 2013).

Phytochemical analysis suggested that binahong leaves have many active components, but only alkaloids with Mayer's method showed negative results.

Its leaves contain 11.23 mg/kg flavonoids and about 7.81 mg/kg fresh flavonoids; which are extracted from of ethanol extract of fresh and dried leaf powder (Feriyani et al., 2020).

Binahong leaves contain antioxidant compounds such as tocopherol, carotenoids, ascorbic acid, flavonoids, caffeine and pyruvate. These compounds play an important role in aldose reductase inhibitors. They are quercetin, ellagic acid, procyanidin, epicatechin, peonidin-3-O-β-glucoside, cyanidin-3-O-β-glucoside, and others, and act as antigenic like phenolic acids, polyunsaturated fatty acids polyphenols, terpenes, flavonoids, and carotenoids, (Feriyani et al., 2020).

Table 3. Compound content of binahong (A. cordifolia) leaves

No.	Compounds	Chemical Formula	RT	Contents (%)
1	Phytol	$C_{20}H_{40}O$	28,934	35,68
2	Cis-cis,cis-7,10,13-hexadecatrienal	$C_{16}H_{26}O$	31,685	9.94
3	2,3-dihydroxypropyl palmitat	$C_{19}H_{38}O_4$	30,844	6,27
4	2-Ethylbutyric acid, monododecyl ester	$C_6H_{12}O_2$	30,927	5,86
5	Hexadecanoic acid	$C_{16}H_{32}O_2$	30,410	5,12
6	Squalene	$C_{30}H_{50}$	32,168	4,23
7	Hexadecanoic acid	$C_{16}H_{32}O_2$	30,596	4,07
8	Hexadecanoic acid	$C_{16}H_{32}O_2$	30,168	3.79
9	Hexadecanoic acid	$C_{16}H_{32}O_2$	30,444	3.68
10	Linoleic acid, methyl ester	$C_{19}H_{34}O_2$	28,762	3,35
11	Hexadecanoic acid	$C_{16}H_{32}O_2$	30,237	2,42
12	Hexadecanoic acid, methyl ester	$C_{17}H_{34}O_2$	27.493	2,40
13	3 (2H)-selenophene, 2-(dihydro-4,4 dimethyl-3-oxo selenophene-2(3H)-ylidene 0-dihydro-4,4-dimethyl	$C_6H_{10}O_2$	40,704	2,34
14	Hexadecanoic acid	$C_{16}H_{32}O_2$	29,996	2,20
15	Neophytadiene	$C_{20}H_{38}$	26,514	2,16
16	Hexadecanoic acid	$C_{16}H_{32}O_2$	30,044	1,61
17	9-octadecanoid acid	$C_{18}H_{34}O_2$	29,837	1,31

*Source: PubChem Feriyani et al., 2020

3.1 Binahong Effects

Previous studies have reported that binahong leaf extracts heal internal and external surgical wounds, burn wounds, regulate and blood circulation, (Hanafiah et al., 2017). It has swellings, blood clots, restoring weak conditions,analgesic activity (Yuziani et al., 2014) preventing strokes (Sukrama et al., 2016, BALITTRO, 2006) and improve damaged kidney functions (Takahashi, 2012).

3.2 How To Process Binahong Leaf

- Wound healing, the leaves are kneaded until they become soft and slimy and then in the paste on the wound.
- Cough medicine, 10 pieces of binahong leaves are washed and then boiled until it reduces to one cup. It is then given to the patient to use once a day.
- Acne medication, sometimes 8 binahong leaves are boiled to make 1 or 2 cups of water. This drink is taken once a day.
- Drugs for lack of appetite, take 5 pieces of binahong leaves and boil them to make 1 or 2 cups of water. Drink this once a day.
- Impotence Drugs, the plant is also used to treat impotency. The people with problem of impotency boil 3-10 leaves in 2 cups of water to make it one 1 cup. Drink it once a day to treat impotency.
- Shortness of breath medicine, 7 pieces of binahong leaves are boiled in 2 cups of water until it becomes 1 cup. This drink is taken once a day.

4. CONCLUSION

The use of plants in classical ethnomedicinal systems has been known to the Indonesian people since time immemorial and is an empiric experience. It has a high potential for use in a natural herbal medicine through using it. It would be highly desirable to investigate the plant extensively in terms of its chemical compounds for the further benefit of human.

REFERENCES

Astuti, S. M., Mimi Sakinah A.M., Retno Andayani B.M., & Awalludin R. (2011). Determination of saponin compound from (Anredera cordifolia (Ten). Steenis.) Plant (Binahong) to Potential Treatment for Several Diseases. J. Agric. Sci. 3(4) 224-232.

Backer, C.A., & van de Brink, B. (1963). Flora of Java, N.V.P. Noordhoff, Groningen, The Netherlands, 1(3):191-238.

Balai Penelitian Tanaman Rempah dan Obat (BALITTRO), (2006). Rencana dan strategis Balai Penelitian Tanaman Obat dan Aromatik 2006-2009. Bogor, Indonesia (In Indonesian Language).

BPOM RI-Direktorat Obat Asli Indonesia (2008). Anredera cordifolia (Ten.) Steenis. http://perpustakaan.pom.go.id/ebook/Taksonomi%20Koleksi%20Tanaman%20Obat%20Kebun%20Tanaman%20Obat%20Citeureup/Anredera%20cordifolia%C2%A0%C2%A0(Ten.)%20Steenis.pdf (Accession date: 21 03. 2023).

Feriyani, F., Darmawi, D., Balqis, U., Lubis, R.R. (2020). The Analysis of Binahong Leaves Potential (Anredera cordifolia) as an Alternative Treatment of Anticataractogenesis. Open Access Maced J Med Sci. 20 (8): 8 (B):820-824. https://doi.org/10.3889/oamjms.2020.4849

Fidrianny, I., Wirasutisna, K.R., & Amanda, P. (2013) Senyawa antioksidan dari ekstrak etil asetat daun binahong (Anredera cordifolia (Ten.) Steenis) dari babakan ciparay, Bandung Selatan, Indonesia. Acta Pharm. Indonesia. 2013;38(1):26-30. https://doi.org/10.32382/mf.v15i2.1127

Goleniowski, M., Bonfill, M., Cusido, R., Palazón, J. (2013). Phenolic Acids. In: Ramawat, K., Mérillon, JM. (eds) Natural Products. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-22144-6_64

Hanafiah, O.A., Hanafiah, D.S., Bayu, E.S., Abidin, T., Ilyas S., Nainggolan M. & Syamsudin, E. (2017). Quantity differences of secondary metabolites (saponins, tannins and flavonoids) from Binahong plant extract (Anredera cordifolia (Ten.) Steenis) treated and untreated with Colchicines that play a role in wound healing. World J. Dent., 8: 296-

Manoi, F. (2009). Binahong Anredera cordifolia (Ten) Steenis. Sebagai Obat. J. Warta Penelit. Pengemb. Tan. Industri. 15(1):3-5. (In Indonesia Language).

Miladiyah, I., & Prabowo, B. R. (2012). Ethanolic extract of Anredera cordifolia (Ten.) Steenis leaves improved wound healing in guinea pigs. Universa Medicina, 31(1): 4-11.

Octavia, D.R. (2009), Uji Aktivitas Penangkap Radikal Ekstrak Petroleum Eter, Etil Asetat, dan Etanol Daun Binahong Anredera cordifolia (Tenore) Steenis. dengan Metode DPPH (2,2-difenil-1-pikrilhidrazil), skripsi sarjana, Fakultas Farmasi Universitas Muhammadiyah Surakarta, Surakarta, 3-21. (In Indonesia Language).

PIER. (Pasific Island Ecosystem at Risk). (2000). Insasive Plant Species: Anradera cordifolia. Available: http://www.hear.org/pier/ancor.htm (Acceses date: October 21, 2021).

PROSEA.(2003). Plant Resources of South-East Asia : Medicinal and Poisonous Plant 3. In de Padua, L.S., Bunyapraphatsara and Lemmens, R.H.M.J (Eds.). PROSEA Indonesia. Bogor. 2 (15):128-133.

Rooban, B.N., Sasikala, V., Devi, V.G., Sahasranamam, V., Abraham, A., (2012) Prevention of selenite induced oxidative stress and cataractogenesis by luteolin isolated from Vitex negundo. Chem. Biol. Interact. 196 (1-2):30-8.

Sukrama, D.M, Wihandani D.M. & Manuaba, A.P. (2016). Topical Binahong (Anredera cordifolia) leaf extract increases interleukin-6 and VEGF during burn wound healing in Wistar rats infected with Pseudomonas aeruginosa. Biol. Med., Vol. 9.

Takahashi, M., Asikin Y., Takara K. & Wada, K. (2012). Screening of medicinal and edible plants in Okinawa, Japan, for enhanced proliferative and collagen synthesis activities in NB1RGB human skin fibroblast cells. Biosci. Biotechnol. Biochem., 76: 2317-2320.

Tjitrosoepomo, G. (1999). Morfologi Tumbuhan. Gadjah Mada University Press. Yogyakarta. pp 218-251 (In Indonesia Language).

Tshikalange, T.E., Meyer J.J.M., & Husein, A.A. (2005). Antimicrobial activity, toxicity and the isolation of a bioactive compound from plants used to treat sexually transmitted diseases. J. Ethno pharmacol. 96:515-519.

Wagner, W.L., Herbst, D.R., & Sohmer, S.H. (1999). Manual of the Flowering Plants of Hawai'i. 2 Vols. Bishop Museum Special Publication 83.

Wang, T., Zhang, P., Zhao, C., Zhang, Y., Liu, H., Hu, L., Gao, X, Zhang, D. (2011). Prevention effect in selenite-induced cataract in vivo and antioxidative effects in vitro of Crataegus pinnatifida leaves. Biol. Trace. Elem. Res. 2011;142(1):106-16.

Winarsi, H., (2011). Antioksidan Alami dan Radikal Bebas, Penerbit Kanisius, Yogyakarta, 15(21): 79-82. (In Indonesia Language).

Yang, R., Y, Lin, S., Kuo, G. Content and distribution of flavonoids among 91 edible plant species. Asia Pac J Clin Nutr. 2008;17 Suppl 1:275-9. PMID: 18296355.

Yuziani, Y., Harahap U. & Karsono, K. (2014). Evaluation of analgesic activities of ethanolic extract of Anredera cordifolia (Ten) steenis leaf. Int. J. Pharm. Tech. Res., 6: 1608-1610.