

The Use of Binahong (*Anredera Cordifolia* (Ten.) Steenis) as A Source of Antioxidant Compounds

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Abstract

Binahong (*Anredera cordifolia* (Ten.) Steenis), is used in pharmaceutical industries and for treating various diseases in ethnomedicinal practices since a long time from generation to generation. It contains several alkaloids, flavonoids saponins, phenols, and large amount of other secondary metabolites that have 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. This study provides important and valuable information about the plant that has high utilization in the ethnomedicinal health care system of Indonesia.

Keywords: Antioxidant, Chemicals, Indonesia, Leaf, Rhizome

Introduction

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 have local origin but some of them have been naturalised by bringing them from other places. Likewise, binahong (*Anredera cordifolia* (Ten.) Steenis) synonyms *Boussingaultia Pseudobasseloides* Haum *Boussingaultia gracilis*, *Boussingaultia cordifolia* (Ten), family Basellaceae, [21] is one of the (medicinal) plants that grows widely in Indonesia has its centre of diversity in the South or latin America. Binahong plants grow largely in Indonesia, Australia, China, southern Brazil to Paraguay the United States and northern Argentina. It is a highly popular plant among these and has number of uses in local ethno medicinal systems to treat a number of diseases [14]. The plant species is invasive in nature and grows everywhere in the low and highlands. It can be popularly planted in pots to decorate rooms and houses as indoor or outdoor ornamental and medicinal plant. Generative (seed), but more often developed or cultivated vegetative organs like rhizome [13].

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 [11].

Kingdom : Plantae
 Subkingdom : Tracheobionta
 Superdivision : Spermatophyta
 Division : Magnoliophyta
 Class : Magnoliopsida
 Subclass : Hamamelidae
 Order : Caryophyllales
 Family : Basellaceae
 Genus : *Anredera*
 Species : *Anredera cordifolia* (Tenore) Steenis

[Source: 2]



[Source: 8]

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

It 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 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 stems, flowers, and roots have antioxidant properties [11]. Manoi [9], with number of other biochemical compounds in Binahong leaves to heal many diseases such as kidney damage, diabetes, heart swelling, stroke, hemorrhoids and gout. Tshikalange et al. [20], reports that the plant can be used for treatment of infectious and sexual diseases like syphilis. Besides this, binahong leaves, contain antioxidants that have a healing effect for these diseases. They are also extremely rich in oleanolic acid, which is from the triterpenoid group [12]. 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. [1] emphasize that the Binahong plant has large number of alkaloids, flavonoids, phenols, saponins, steroids, and triterpenoids, with high antioxidant activities. These alkaloids prevent formation of the radicals and also bind the free ones to highly reactive molecules, to prevent oxidation, and catalase and glutathione peroxidase activities. These extracts are also very rich in vitamins E, C, A and carotene, flavonoids, albumin, bilirubin, ceruloplasmin, etc [23]. These alleviate blood cholesterol and as anti-cancer agents due to the presence of terpenoids flavanoid and other biochemicals [9]. 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 prominent role in reducing blood cholesterol and anti-carcinogenic substances. Examples of some diseases that can be controlled by its use include kidney and cardiovascular failure, and stop various organ cancers, etc.

Morphology

It is 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 [2]. It also finds the opportunity to grow in the tropics and sub-tropics. Although Binahong plants are produced from seeds, they can also be propagated vegetatively by their roots or rhizomes [4]. While a part of this plant consists of leaves, stems, flowers, roots and rhizomes. Its leaves have a very short stem (submarine), with 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 [11]. Binahong plants have a special stem structure with rhizomes, branching, horizontal growth and shoots that appear above ground on tips [19].



a. rhizome



b. flowers



c. leaves



d. Stems

Source: [8]

Figure 2: parts of the binahong plant

Cultivation in Indonesia

Ecophysiology

Grows on a variety of soils, in areas with precipitation of 1,500-4,500 mm/year and requires little shading.

Cultivation

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

Handling

Maintenance by replanting, fertilizing and controlling pests and diseases using pesticides.

These days, the binahong plant is used extensively in raw form for use in phytopharmaceutical industries. Research Institution of Medicinal Plants and Spices in Indonesia, suggests about 20% of it as raw material from cultivated binahong. Rest of 80% is collected from the wild thickets [3]. Therefore, to meet the local and exotic needs as a pharmaceutical product, it is desirable to develop new agronomic and in vitro techniques of farming in a controlled conditions, to maintain quality of harvested binahong.

Antioxidant Contents

Flavonoids, saponins and alkaloids are the main phytochemicals harvested from binahong. They contain a total flavonoid contents of 0.6 mg/100g of dried root powder [15].

p-Coumaric acid structure is found in Binahong leaves. There are many types of plants beneficial for health [10].

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

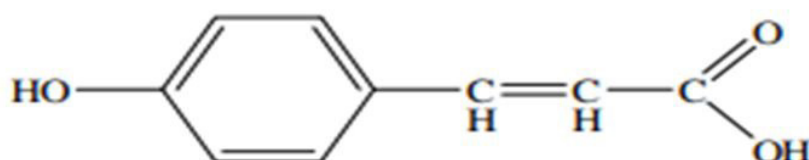


Figure 3: p-Coumaric acid structure

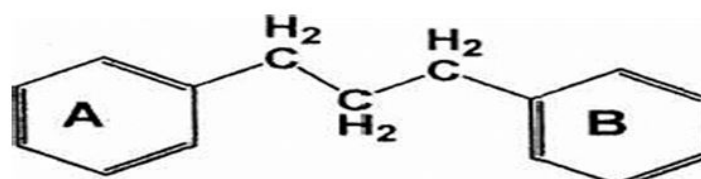


Figure 4: Flavonoid Structure

Binahong plant is highly rich in flavonoids, that increase antioxidant enzymes activities like superoxide dismutase and catalase. These activities inhibit and stop following sel-

enite-induced cataractogenesis [22], [16]. 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 [6].

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	+

Phytochemical analysis suggested that binahong leaves have many active components but only alkaloids with method by Mayer showed negative results

Its leaves have flavonoids amounting to 11.23 mg/kg and their fresh flavonoids of about 7.81 mg/kg. These flavonoids are obtained from the isolation and identification of fresh and dried powder of ethanol extract of leaves are vitexin and acid [5].

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	$C_{16}H_{32}O_2$	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 [5]

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, [5].

Binahong Effects

The previous studies have reported that binahong leaf extracts heal internal and external surgical wounds, burn wounds, regulate and blood circulation, [7]. Swellings, blood clots, restoring weak conditions Theyhave analgesic activity [24] preventing strokes [[17],[3]].and improve damaged kidney functions [18].

How to Process Binahong Leaf

Wound healing

The leaves are kneaded until soft and slimy in the paste on the wound (Personal Observations 2021).

Cough medicine

10 pieces of binahong leaves are washed and then boiled until it reduces to one cup. It is medicated to the patient thereafter for using it 1 time a day (Personal Observations 2021).

Acne medication

Some times 8 binahong leaves are boiled to make 1 or 2 cups of water. This drink is taken once a day (Personal Observations 2021).

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 (Personal Observations 2021).

Impotence Drugs

The plant is also used to treat impotency. The people with problem of impotency boil 3-10 leaves in 2 cups water to make it one cup. Drink it once a day to treat impotency (Personal Observations 2021).

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 (Personal Observations 2021).

Conclusions

The use of plants in classical ethnomedicinal systems is known to the Indonesian people since long time immemorial and is an empiric experience. It has high potential to use it as a natural herbal medicines through using it. It will be highly desired if the plant is investigated extensively for its chemical compounds for the greater benefit of human beings.

References

1. Astuti, Sri Murni, Mimi Sakinah A.M, Retno Andayani B.M, and Awalludin Risch. 2011. Determination of Saponin Compound from (*Anredera cordifolia* (Ten). Steenis.) Plant (Binahong) to Potential Treatment for Several Diseases. Journal of Agricultural Science. 3: 4.
2. Backer, C.A., and van de Brink, B. 1963. Flora of Java, N.V.P. Noordhoff, Groningen, The Netherlands. 1(3): 191-238.
3. Balai Penelitian Tanaman Rempah dan Obat (BALITTRO), 2006. Rencanadan strategis Balai Penelitian Tanaman Obat dan Aromatik 2006-2009. Balai Penelitian Tanaman Obat dan Aromatik (BALITTRO), Bogor, Indonesia (In Indonesian Language).
4. BPOM RI-Direktorat Obat Asli Indonesia 2008. *Anredera cordifolia* (Ten.) Steenis.
5. Feriyani F, Darmawi D, Balqis U, Lubis RR. The Analysis of Binahong Leaves Potential (*Anredera cordifolia*) as an Alternative Treatment of Anticataractogenesis. Open Access Maced J Med Sci. 2020 Aug 20 8 (B): 820-4.
6. Fidrianny I, Wirasutisna KR, Amanda P. Senyawa antioksidan dari ekstrak etil asetat daun binahong (*Anredera cordifolia* (Ten.) Steenis) dari babakan ciparay, Bandung Selatan, Indonesia. Acta Pharm Indones. 2013 38(1): 26-30
7. Hanafiah, OA, DS Hanafiah, ES Bayu, T Abidin, S Ilyas, M Nainggolan and E Syamsudin (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.
8. <http://herbsfromdistantlands.blogspot.com/2018/08/anredera-cordifolia-madeira-vine.html> Acces date: 25 October 2021.299.
9. Manoi F (2009) Binahong *Anredera cordifolia* (Ten) Steenis. Sebagai Obat. Jurnal Warta Penelitian Dan Pengembangan Tanaman Industri 15(1): 3-5.
10. M Goleniowski, M Bonfill, R Cusido, and J Palazón (2013) "Phenolic Acids," in Natural Products, Berlin, Heidelberg: Springer Berlin Heidelberg. 1951-73.
11. Mus (2008) Informasi Spesies Binahong *Anredera cordifolia* (Ten.) Steenis. www.plantamor.com. (10 April 2019).
12. Octavia DR (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.
13. PIER (Pasific Island Ecosystem at Risk). 2000. Invasive Plant Species: *Anredera cordifolia*.
14. 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): 128-33.
15. Ray-Yu Yang PhD, Shou Lin BSc and George Kuo PhD (2007) Content and Distribution of Flavonoids Among 91 Edible Plant Species. Asia Pac J Clin Nutrision 2008. 17 (SI): 275-9.
16. Rooban BN, Sasikala V, Devi VG, 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
17. Sukrama DM, DM Wihandani and AP Manuaba (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 9.
18. Takahashi MY, Asikin K, Takara and K Wada (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: 2317-20.
19. Tjitrosoepomo G (1999) Morfologi Tumbuhan. Gadjah Mada University Press. Yogyakarta. 218-51.
20. Tshikalange TE, JJM Meyer and AA Husein (2005) Antimicrobial activity, toxicity and the isolation of a bioactive compound from plants used to treat sexually transmitted diseases, Journal of Ethno pharmacology 96: 515-9.

21. Wagner WL, DR Herbst, SH. Sohmer (1999) Manual of the Flowering Plants of Hawai'i. 2 Vols. Bishop Museum Special Publication 83.
22. Wang T, Zhang P, Zhao C, Zhang Y, Liu H, Hu L, et al. (2011) Prevention effect in selenite-induced cataract in vivo and antioxidative effects in vitro of *Crataegus pinnatifida* leaves. Biol Trace Elem Res. 142(1): 106-16.
23. Winarsi H (2011) Antioksidan Alami dan Radikal Bebas, Penerbit Kanisius, Yogyakarta. 15-21: 79-82.
24. Yuziani, Y, U Harahap and K Karsono (2014) Evaluation of analgesic activities of ethanolic extract of *Anredera cordifolia* (Ten) steenis leaf. Int. J PharmTech Res. 6: 1608-10.

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