AMJ
ISSN: 0005-2523

ISSN: 0005-2523
Volume 62, Issue 10, December, 2022

SCOOPING REVIEW OF THE POTENTIAL DAYAK ONIONS (*Eleutherine bulbosa*) ON REPRODUCTION HEALTH

Ika Yulianti[1*], Aquartuti Tri Darmayanti[2,3], Rahmi Padlillah[1]

Universitas Borneo Tarakan, Amal Lama Road, No.1, Pantai Amal, Tarakan City, North Kalimantan[1]
School of Health Sciences Mambaul Ulum, North Ringroad Road, Mojosongo, Jebres, Surakarta City, Central Java 57127[2]
Universitas Sebelas Maret, Ir. Sutami Rioad, No.36, Kentingan, Jebres, Surakarta City, Central Java 57126[3]

Coresponding author: 1*

Keywords:
eleutherine bulbosa, dayak onion, reproductive health

ABSTRACT

Dayak onion or eleutherine bulbosa that grows in Kalimantan, Indonesia has promising potential for reproductive health. Contains several compounds such as naphthalene, anthraquinone, and naphtoquinone which have high antibacterial and antifungal effects, chloroform fraction which has strong anticancer activity, the ability of tuber extract to control fat and cholesterol levels, and has the potential to improve reproductive health in women. health and beauty. Dayak onions can be consumed directly as an ingredient in cooking mixtures, processed into yogurt or extracts of its chemical compounds as additional ingredients in the processed food industry. Further research on the effects and use of Dayak onions is still very much needed because Dayak onions have not been reported to have any adverse side effects.

1. Introduction

A number of studies have shown that natural-based products are the main source of chemical diversity [1]. Natural products with therapeutic properties are an important source of new biologically active compounds and have been used in many parts of the world and have attracted the interest of many researchers [2]. Selection of natural plants, one of which is Dayak onion (*Eleutherine bulbosa* [Mill.] Urb) is a perennial flowering herbaceous plant from the family Iridaceae, which widely cultivated in South America, Africa, and Indonesia and has become one of the traditional medicinal plants in Central Kalimantan [3], [4].

This plant grows at an altitude of 600-2000 meters above sea level on the island of Borneo [5]. This tuber is well known among the local tribes of Kalimantan, the Dayak, where it is traditionally used to treat diabetes, breast cancer, hypertension, stroke, sexual disorders, and to increase milk production [3], [5].

Eleutherine has several scientific names that are used interchangeably according to the region, such as *Eleutherine americana*, *Eleutherine palmifolia*, and *Eleutherine platifolia*. Nonetheless, *Eleutherine*

bulbosa was proposed as the official scientific name [1], [3]. Naphthalene, anthraquinone, and naphtoquinone compounds are the main constituents of E. bulbosa which exhibit various pharmacological properties such as anti-microbial, anti-inflammatory, antihypertensive, anti-cancer, anti-diabetic, and anti-melanogenesis [4], [6]. However, scientific evidence regarding the activity and biological potential of using E. bulbosa bulbs on women's reproductive health is still difficult and rarely to find. The purpose of this review is to provide scientific evidence about the potential use of Dayak onions for women's health problems.

2. Material and Method

All identified studies were independently assessed by all authors for relevance by title and abstract. Then, the full text version of all relevant possibilities, disagreements among the authors were decided through a discussion forum. The filtered data is presented in a flow table according to the PRISMA Extension for Scoping Reviews (PRISMA-ScR) item [7].

2.1 Search strategy

Articles searched through the database from January – July 2022. Through the PUBMED database, Science direct, and Google Scholar. No attempt was made by the author to search specifically for unpublished articles. The keywords used are "Dayak Onion AND Women health" AND " *eleutherine bulbosa* AND health" "*eleutherine bulbosa* AND reproductive health" AND "Dayak Onion AND Women health"

2.2 Inclusion criteria

Inclusion criteria: Articles in English or Indonesian. all types of primary research articles conducted on a laboratory basis or other primary research such as clinical trial design, experimental (with or without randomization) cross-sectional, observational, review, systematic review and letter to editor. Exclusion Criteria if published articles are in Chinese, Japanese, Spanish, and Arabic.

3. Results

3.1 Binds to estrogen receptors for reproductive health

The tubers of the Dayak onion (*Eleutherine bulbosa* (Mill.) Urb.), containing eleutherinol, a compound present in silico studies have been shown to bind to estrogen receptors [8], [9]. Estrogen is a female sex hormone that is naturally secreted by the ovaries, and functions in the development of female secondary sex characteristics during puberty [10]. In addition, estrogen also affects the stimulation of bone formation, lipid profile and vascular endothelium, liver and cardiovascular system [10]. However, during menopause, estrogen levels decrease drastically, causing symptoms associated with the menopausal transition in 85% of women. These symptoms include vasomotor, vaginal dryness, dyspareunia, hot flushes, night sweats and urogenital atrophy of varying severity [11].

The most effective treatment for relieving menopausal symptoms is the administration of estrogen with or without a progestogen. Most estrogenic responses in tissues are mediated by the Estrogen Receptor (ER), ER or ER. However, postmenopausal hormone replacement issues become increasingly complex, so many studies are developing non-estrogen alternatives to treat menopausal symptoms, avoid unwanted side effects, and improve overall health [12].

3.2 Female disorders

Eleutherine bulbosa is used in Columbia to treat menstrual discomfort, namely abdominal cramps and in Haiti as an antifertility agent [13]. In the Malay Peninsula, Bolivia and Peru to treat the problem of vaginal

ISSN: 0005-2523
Volume 62, Issue 10, December, 2022

discharge and anemia. *Eleutherine bulbosa* extract showed antifertility and wound healing activity (cicatrizant) without causing toxic effects [9].

3.3 Effects on reproductive organs

The effect of Dayak Onion Tuber Extract on ovariectomized rats experienced an increase in all plasma lipid serum except HDL, even onion bulb extract had better results compared to tamoxifen treatment, especially at DOE 3 doses [14]. Treatment of rats that had been ovariectomized by onion Dayak extract for 3 weeks could reduce the weight gain of rats, especially at DOE dose 2 and DOE dose 3, in addition, the effect of ovariectomy on uterine size and uterine weight was then evaluated. The results showed that ovariectomy reduced uterine size and administration of tamoxifen and three doses of Dayak onion extract could not restore uterine size after ovariectomy [10].

Dayak onions have also been reported to be able to prevent and treat bacteria that cause pelvic inflammatory disease, namely Escherichia coli [15]. Research on post-ovariectomized rats also reported that Dayak onion tuber extract significantly increased calcium levels, bone weight, and decreased fat levels in the bone marrow, making it very potential in the management of osteoporosis in post-menopausal women.

3.4 Potential in controlling blood pressure and heart health, potential in hypertension in pregnancy

Dayak onion bulbs are an alternative natural treatment for postmenopausal symptoms with lipid profile and blood pressure parameters [16]. Dayak onion bulb extract can reduce levels of Low-density lipoprotein (LDL) which is known as bad cholesterol to normal levels, previous studies reported that administration of Dayak onion bulb extract can reduce lipid profiles. This is because the eleutherinol extract contained in Dayak onion bulbs can bind to estrogen receptors which can increase LDL receptor activity in the liver and increase lipolysis [10], [14].

A study that extracted dried Dayak onion bulbs by maceration method using ethanol then concentrated with a rotary evaporator until the level was found to be 3.77% giving the result that *Eleutherine bulbosa* extract can reduce systolic blood pressure levels to 28.06% lower and diastolic to 30.47% lower [16]. Lipid profile of Dose 3 also showed recovery of Triglycerides, LDL, and total Cholesterol. Furthermore, the eleutherinol compound contained in the Dayak onion bulb extract which is an estrogen agonist can also prevent atherosclerosis [17].

3.5 Antimicrobial and antifungal effects on female problems

The ether fraction of the methanol extract of E. bulbosa (dayak onion) has strong activity against Staphylococcus aureus bacteria which is a bacteria that causes skin infections and Escherichia coli bacteria which can cause urinary tract disease, prostate, pelvic inflammation and diarrhea [15]. So it makes sense that Dayak onions are traditionally used as medicine to treat diarrhea, dysentery, jaundice, and colitis, by making juice, mixing food ingredients, or eating raw [3]. Three of the six compounds of Dayak onion extract that have anti-bacterial function are *naphthalene*, *anthraquinone*, and *naphthoquinone* [18].

Research conducted by (Harlita et al. 2018) showed that n-hexane, ethyl acetate, and 96% ethanol extract from Dayak onion bulb extract could inhibit methicillin-resistant Staphylococcus aureus (MRSA), Bacillus cereus, Shigella sp., and Pseudomonas aeruginosa [19]. The ethyl acetate extract showed the highest inhibition (10 mg/mL) on the growth of P. aeruginosa and S. aureus compared to cefadroxil (30 mg/mL). Microbial inhibition is caused by interference between alkaloid compounds and the formation of peptidoglycan components that can damage microbial cell walls [20]. Meanwhile, butanol extract from Dayak onion showed a good zone of inhibition against S. aureus and Shigella boydii compared to

gentamicin and ciprofloxacin.

The n-hexane compound extract also showed strong inhibitory activity against Candida albicans, one of the fungi that cause vaginal discharge, which is often found at a concentration of 200 mg/mL. Microbial inhibition displayed a clear diameter zone of 19.48 mm, causing changes in membrane permeability to pathogens, causing death. cells and lipophilic components that can damage the cell membrane of pathogens [21].

3.6 Antivirus to inhibit cancer cells and HIV

Tests carried out on blood cancer cells (Leukemia L1210), chemical compounds identified in the chloroform fraction of *Eleutherine bulbosa* which have strong anticancer activity are hexadecanoic acid, 9,12-octadecadienoic acid, linolenic acid, octadecanoic acid, androstan-17-one., and 1-(2,3,5,6-tetramethylphenyl)-ethanone. The chloroform fraction was the selected active fraction which had an antioxidant value of 19.649 ppm (very strong category) and anticancer activity against L 1210 leukemia cells 9.56 ppm (very strong category) [22].

Research on breast cancer cells (T47D) has reported several compounds that have the potential to inhibit cancer cells including: n-hexane extract cytotoxic IC50 value 265.023 ug/ml, ethyl acetate extract 147.24 ug/ml, and ethanol extract 3782.29 ug/ml. ml. Where in the concentration of each extract was able to inhibit 50% of the growth of T47D cells [23], [24]. From the results of these tests and calculations, there is great hope for the treatment of ER-positive breast cancer.

The potential of isoeleutherine and isoeleutherol extracts of Dayak onions in inhibiting human papilloma virus (HIV) cells has been reported by [10], [14], these extracts show potential anti-viral agents against HIV replication with IC values of 8.5 g/mL and 100 g /mL.

3.7 Potential in women's skin health

Dayak onion is one of the traditional medicines used to treat acne vulgaris. because Dayak onions have extracts that can inhibit the growth of Propionibacterium acnes. The modified onion formula showed antibacterial activity test against P. acnes showing an inhibition zone diameter between 14.85 and 17.10 mm, which can be concluded that the modified cream formula with the active ingredient of Dayak onion extract showed an increase in the inhibition zone against P. acnes and an increase in properties. organoleptic [2].

4. DISCUSSION

Eleutherine bulbosa is a bulbous plant, producing clumps of grass-like leaves. leaf length ranges from 30-50 cm, width 30-35 mm. Plants begin to grow tillers about 6 weeks after planting, with each tiller (bulb) consisting of layers, oval in shape, with a striking dark brown color, 40-50 mm long, 20-30 mm in diameter, and 2.0- 2.5g weight. Plants have short roots, easily detached from the tuber after harvesting. E. bulbosa flowers are rhipidium-shaped, with stems 25-50 mm long. This stalk has 3-4 secondary axes, with each consisting of 10-12 buds that open alternately each day [25], [26].

n the chemical study of E. bulbous, which dominated the analysis were bulb-shaped bulbs, in this section the presence of secondary metabolites was shown, proving the presence of naphthoquinones and anthraquinones [27], [1]. Phytochemical screening revealed the presence of alkaloids, steroid-free, hydroxybenzoate, quinones, anthraquinones, fixed coumarins, flavonoids and chalcones auronas in E. bulbous [1]. Phytochemical examination with hydroalcohol showed the presence of alkaloids, catechins,

ISSN: 0005-2523
Volume 62, Issue 10, December, 2022

flavanones and coumarins in the leaves and stems; Fixed acids, flavonoids, steroids and condensed tannins in leaves and triterpenoids [28].

Naphthoquinones (eleuterinona) isolated from dichloromethane extract of E. bulbous bulbs have strong activity against fungi [29]. In the rhizomes or tubers, compounds with antimicrobial properties and the ability to widen the tip of the valve are detected which are useful in treating heart disease [30]. Research has shown that eleuterol and eleuterina isoeleuterina isolated from rhizome extract of the species have antifungal activity and increase blood flow, including coronary arteries. Eleutherine, isoeleuterina, elecanacina and tuber isoeleuterol twisted from spherical Eleutherine exhibited inhibition of HIV replication [31].

Antibacterial properties of E. bulbous in Streptococcus pyogen. Previous research showed that the ethanolic species extract of the tuber exhibited a mild anti-bacterial effect and significant antioxidant activity. In vitro assays were carried out with Eleutherine leaves, round giardisidal extract which showed activity against Giardia lamblia and an ambicide against Entamoeba histolytica / Entamoeba dispar [32].

3. IMPLICTION INTO PRACTICE

Research shows that E. bulbosa bulbs or Dayak onions have been widely used in the food and beverage industry, such as the encapsulation of oligosaccharide extracts in Dayak onions facilitates the survival of the probiotic, Lactobacillus plantarum in yogurt [33].

Yogurt prepared with lactic acid exerts a 4-week effect in increasing anti-microbial activity against enteropathogenic bacteria such as: Clostridium perfringens, S. aureus, E. coli, and Salmonella typhimurium. Thus, the addition of oligosaccharides from Dayak onion extract in food shows great potential as an encapsulating agent [34].

The addition of Dayak onion bulb extract which can also increase the antioxidant activity of fermented soybeans and made a mixture of processed "tempe nuggets") a mixture of 15% tuber extract and fermented soybeans increases the antioxidant content and increases free radical scavenging capacity (Sajidah et al. 2018). Dayak onion tuber extract can also be used as a salad dressing mixture, even showing anti-staphylococcal activity, stabilizing heat and pH, and reducing lipid oxidation in salad dressing [35].

In addition, Dayak onion bulbs are also potential to make Indonesian snacks, such as preparations that use a mixture of rice flour and Dayak onion bulbs as a flavor enhancer. In a study a 1:2 combination (50 g tubers in 100 g rice flour) can be used as a measure in food processing and produces a savory taste and crunchy texture.

ACKNOWLEDGEMENT

This research was funded by Research Center and Community Services (Lembaga Penelitian dan Pengabdian Masyarakat/ LPPM) Universitas Borneo Tarakan

5. REFERENCES

[1] Couto CLL, Moraes DFC, Cartágenes SS, Flavia MM, Guerra RN. Eleutherine bulbous (Mill .) Urb .: A review study. 2016;10(21):286–97.

[2] Ardhany SD, Putra CD, Novaryatiin S. Modification of Anti-acne Bawang Dayak (Eleutherine bulbosa (Mill .) Urb .) Cream to Propionibacterium acnes. 2021;94–8.

[3] Kamarudin AA, Sayuti NH, Saad N, Asma N, Razak A. Eleutherine bulbosa (Mill .) Urb . Bulb : Review of the Pharmacological Activities and Its Prospects for Application. 2021;

[4] Insanu M, Kusmardiyani S, Hartati R. Recent Studies on Phytochemicals and Pharmacological Effects of Eleutherine Americana Merr. Procedia Chem. 2014;13:221–8.

[5] Ieyama T, Gunawan-Puteri MDPT, Kawabata J. α-Glucosidase inhibitors from the bulb of Eleutherine americana. Food Chem. 2011;128(2):308–11.

[6] Howes MJR, Quave CL, Collemare J, Tatsis EC, Twilley D, Lulekal E, et al. Molecules from nature: Reconciling biodiversity conservation and global healthcare imperatives for sustainable use of medicinal plants and fungi. Vol. 2, Plants People Planet. 2020. p. 463–81.

[7] Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation. Ann Intern Med. 2018;169(7):467–73.

[8] Amelia T, Pratiwi D, Romsiah, H. Tjahjono D. In Silico Study of The Component of Eleutherine americana MERR. on Human Estrogen Reseptor Alpha as Potential Anti-Breast Cancer. In: Proceedings of the 3rd International Conference on Computation for Science and Technology. 2015.

[9] Lans C, Purnamasari A, Bahtiar A. Effect of dayak onion (Eleutherine bulbosa (mill.) urb) on uterine wall and lipid profiles of ovariectomized rat. J Ethnobiol Ethnomed. 2007;3(1):1–6.

[10] Purnamasari A, Bahtiar A. Effect of dayak onion (Eleutherine bulbosa (mill.) urb) on uterine wall and lipid profiles of ovariectomized rat. Online J Biol Sci. 2018;18(1):1–6.

[11] O'Neill S, Eden J. The pathophysiology and therapy of menopausal symptoms. Vol. 30, Obstetrics, Gynaecology and Reproductive Medicine. 2020. p. 175–83.

[12] De Oliveira APS, De Sousa JF, Da Silva MA, Hilário F, Resende FA, De Camargo MS, et al. Estrogenic and chemopreventive activities of xanthones and flavones of Syngonanthus (Eriocaulaceae). Steroids. 2013;78(11):1053–63.

[13] Halberstein RA. Medicinal plants: Historical and cross-cultural usage patterns. Ann Epidemiol. 2005;15(9):686–99.

[14] Kitson AP, Marks KA, Aristizabal Henao JJ, Tupling AR, Stark KD. Prevention of hyperphagia prevents ovariectomy-induced triacylglycerol accumulation in liver, but not plasma. Nutr Res. 2015;35(12):1085–94.

[15] Jiang H, Man W, Hou A, Yang L, Xing X, Yan M. The chemical constituents from the active fractions of Eleutherine bulbosa with their antimicrobial activity. Nat Prod Res [Internet]. Taylor & Francis; 2018;0(0):1–7. Available from: https://doi.org/10.1080/14786419.2018.1530229

[16] Bahtiar A, Chumala DY. Dayak onions (Eleutherine bulbosa (Mill.) Urb.) bulbs extracts reduces blood pressure of hypoestrogen model rats by controlling lipids profile. Int J Morphol. 2018;36(3):1016–21.

ISSN: 0005-2523
Volume 62, Issue 10, December, 2022

[17] Palacio-Velarde G, Mieszczanska HZ. Preface. Management of Cardiovascular Disease in Women. 2014. p. vii–xi.

[18] Fauci AS, Morens DM. The Perpetual Challenge of Infectious Diseases. N Engl J Med. 2012;366(5):454–61.

[19] Harlita TD, Oedjijono, Asnani A. The antibacterial activity of dayak onion (Eleutherine palmifolia (L.) merr) towards pathogenic bacteria. Trop Life Sci Res. 2018;29(2):39–52.

[20]. González-Lamothe R, Mitchell G, Gattuso M, Diarra MS, Malouin F, Bouarab K. Plant antimicrobial agents and their effects on plant and human pathogens. Vol. 10, International Journal of Molecular Sciences. 2009. p. 3400–19.

[21] Banfi E, Scialino G, Zampieri D, Mamolo MG, Vio L, Ferrone M, et al. Antifungal and antimycobacterial activity of new imidazole and triazole derivatives. A combined experimental and computational approach. J Antimicrob Chemother. 2006;58(1):76–84.

[22] Lestari D, Kartika R, Marliana E. Antioxidant and anticancer activity of Eleutherine bulbosa (Mill.) Urb on leukemia cells L1210. J Phys Conf Ser. 2019;1277(1).

[23] Fitri Y, Suwarso E. (1392-1396)S-2014. Int J PharmTech Res CODEN IJPRIF ISSN. 2014;6(4):1392–6.

[24] Machana S, Weerapreeyakul N, Barusrux S, Nonpunya A, Sripanidkulchai B, Thitimetharoch T. Cytotoxic and apoptotic effects of six herbal plants against the human hepatocarcinoma (HepG2) cell line. Chin Med. 2011;6.

[25] Wiendi NMA, Maulida N, Krisantini K. Biology and bulb production of Eleutherine bulbosa (Iridaceae), a native species from Borneo, Indonesia. Ornam Hortic. 2021;27(2):232–7.

[26] Khokhar KM. Mineral nutrient management for onion bulb crops–a review. Vol. 94, Journal of Horticultural Science and Biotechnology. 2019. p. 703–17.

[27] Yuliandra Y, Oktarini R, Armenia A. Effect of Eleutherine americana Merr. bulb extract on blood pressure and heart rate in anesthetized hypertensive rats. J Sains Farm Klin. 2018;5(2):119.

[28] Paramapojn S, Ganzera M, Gritsanapan W, Stuppner H. Analysis of naphthoquinone derivatives in the Asian medicinal plant Eleutherine americana by RP-HPLC and LC-MS. J Pharm Biomed Anal. 2008;47(4–5):990–3.

[29] Xu J, Qiu F, Duan W, Qu G, Wang N, Yao X. New bioactive constituents from eleutherine americana. Front Chem China. 2006;1(3):320–3.

[30] Sirirak T, Voravuthikunchai SP. Eleutherine americana: A Candidate for the control of Campylobacter species. Poult Sci. 2011;90(4):791–6.

[31] Khatri S, Kumar M, Phougat N, Chaudhary R, Kumar Chhillar A. Perspectives on Phytochemicals

as Antibacterial Agents: An Outstanding Contribution to Modern Therapeutics. Mini-Reviews Med Chem. 2016;16(4):290–308.

[32] Nascimento MS, Vieira JMS, Malheiros LCS, JÚNIOR JOCS, Rodrigues LCS, Barbosa WLR. Characterisation of Isoeleutherine in Aqueous Extract of Eleutherine Plicata Herb, Iridaceae, Active Against Entamoeba Hystolitica/ Entamoeba Dispar in-Vitro. Int J Pharm Sci Res. 2012;3(4):1096–100.

[33] Phoem AN, Chanthachum S, Voravuthikunchai SP. Preparation of eleutherine americana-alginate complex microcapsules and application in bifidobacterium longum. Nutrients. 2015;7(2):831–48.

[34] Phoem AN, Chanthachum S, Voravuthikunchai SP. Applications of microencapsulated Bifidobacterium longum with Eleutherine americana in fresh milk tofu and pineapple juice. Nutrients. 2015;7(4):2469–84.

[35] Olawumiifesan B, Siripongvutikorn S, Yang Piyawan Voravuthikunchai SA. Application of eleutherine americana crude extract in homemade salad dressing. J Food Prot. 2009;72(3):650–5.