MEDIRES
Symbol of Quality Research

Journal of Clinical and Medical Reviews
info@mediresonline.org

ISSN: 2836-2330 RESEARCH ARTICLE

Anthocleista Djalonensis: A Review of Its Ethnobotanical, Phytochemical and Pharmacological Potentials

Adebayo A. Ogunboye[1*], Olamide O. Crown[2]

[1]*Phytomedicine, Biochemical and Molecular Pharmacology and Toxicology Laboratories Department of Biochemistry, School of Life Sciences, Federal University of Technology, P. M. B. 704, Akure, Nigeria.*
[2]*Department of Chemistry, Physics and Atmospheric Sciences. Jackson States University, Jackson, Mississippi, USA.*

***Corresponding Author**: Adebayo A. Ogunboye, Phytomedicine, Biochemical and Molecular Pharmacology and Toxicology Laboratories, Department of Biochemistry, School of Life Sciences, Federal University of Technology, P. M. B. 704, Akure, Nigeria.

Received: 15 July 2022; **Accepted:** 25 July 2022; **Published:** 03 August 2022.

Citation: Adebayo A.O, Olamide O.C, (2022). Anthocleista Djalonensis: A Review of Its Ethnobotanical, Phytochemical and Pharmacological Potentials. Journal of Clinical and Medical Reviews. 1(1). DOI: 10.58489/2836-2330/002.

Abstract

Anthocleista djalonensis is widely used in African folk medicine to treat conditions. This review aims to provide for the first time ethnopharmacological information while critically evaluating the traditional medicinal uses, chemical constituents and pharmacological activities so as to unveil opportunities for future research. Ethno-medical uses of the, leaf, root and stem bark extracts include treatment of wound, constipation, diarrhoea, dysentery, abdominal pain, hepatitis, jaundice, cirrhosis, fungal skin infection, filarial worm infections, acute inflammation and boils on skin, anti-diabetes, antimalarial, anti-pyretic, anthelmintic, antimycobacterial, and anti-bacterial properties. Some of the compounds isolated are phthalide and xanthones sweroside, djalonenoside, lichex-anthone, stigmasterol, 3-oxo-Δ4′5-sitosterone, sitosterol, ursolicacid, djalonensin and D-(þ)-bornesitol. The pharmacological activities of the leaf, stem bark and root has been scientifically proven by in vitro and in vivo studies. The cytotoxic activity of the crude methanol extracts obtained from the stem, roots and leaves and three natural plant constituents (djalonenol, sweroside and djalonensone respectively) isolated from the extract had been evaluated in vitro. This review has been able to show the therapeutic potentials of Anthocleista djalonensis through its ethnobotanical and pharmacological uses.

Keywords: *Pharmacy, Genetics, Pharmacogenetics, Drugs, Medicine.*

Introduction

Anthocleista djalonensis A. Chev belongs to the family Gentianaceae and the Yoruba people of South west Nigeria refers to it as “Ewe Shapo” (Onocha and Okorie, 2003). The tree grows up to 15 m tall; bole up to 40 cm in diameter; twigs sometimes with 2 erect spines or small cushions above the leaf axils (Jensen and Schripsema, 2002). The Genus Anthocleista comprises 14 species (Neuwinger, 2000). The West Africa species have the same vernacular names (Cabbage tree) and are used by local practitioners for the same medicinal purpose. Several members of the genus are used for similar medicinal purposes. It is very difficult to differentiate between the dried bark of the different species (De Ruijter, 2007).

Ethnobotanical uses

Some of the ethno-medical uses of the extract of Anthocleista djalonensis leaves, roots and stem

bark include treatment of wound, constipation, diarrhoea, dysentery, abdominal pain (Okoli Iroegbu 2004), hepatitis, jaundice, cirrhosis, fungal skin infection, filarial worm infections, acute inflammation and boils on skin (Aiyeloja and Bellow, 2006). It has also been used to treat sexually transmitted infections (STI) and has been reported to have several functions including anti-diabetes, antimalarial, anti-pyretic, anthelmintic, antimycobacterial, anti-bacterial and wound healing properties (Okoli and Iroegbu, 2004; Chah et al., 2006; Nweze and Ngongeh, 2007; Esimone et al., 2009). It is widely used throughout its

distribution area as a strong purgative and diuretic (Neuwinger, 2000). A root decoction is commonly taken to treat constipation, to regulate menstruation and as an abortifacient. It is used as a wash, bath or as a vapour bath to treat leprosy, venereal diseases, oedema and scrotal elephantiasis. A root infusion is taken to treat intestinal problems, acute inflammations, and boils on the skin (Akubue et al., 1983; Okoli and Iroegbu, 2004). The plant is known to possess anti-inflammatory (Okunrobo et al., 2009) and free radical scavenging activities (Awah et al., 2010). The plant is a source of secondary metabolites which are cytotoxic (Okorie, 1976; Onocha et al., 2003) and antifungal (Bierer et al., 1995).

Chemical constituents

Some of the compounds that have been isolated from Anthocleista djalonensis are phthalide and xanthones (Okorie, 1976), The root bark of the plant is reported to contain irlbacholine (Bierer et al., 1995). Other compounds isolated from the plant include triterpenes, a monoterpene-diol djalonenol, a dibenzo-pyrone djalonensone, an iridoid glycoside sweroside (djalonenoside) (Onocha et al., 1995) as well as amplexine and axanthone lichexanthone (Okorie, 1976). The stem bark is also reported to contain the phthalide djalonensin (Okorie, 1976). Ogunwande et al. (2013) pioneering work on the volatile oil contents of Anthocleista djalonensis revealed sesquiterpene compounds (82.5%) are the dominant class of the 49 compounds in Anthocleista djalonensis and the main compounds are α-humulene, β- caryophyllene, humulene epoxide II and caryophyllene oxide. A monoterpenediol, djalonenol have been isolated from Anthocleista djalonensis and the isolation of dibenzo-α-pyrone, djalonensone from a plant source and its structurally elucidation as tetrahydro-3-hydroxyhydroxymethylene-4-(3-hydroxymethylene prop-1-ene)-2H-pyran-2-one was reported for the first time (Onocha et al., 1995). The isolation of sweroside, djalonenoside, lichex-anthone, stigmasterol, 3-oxo-Δ4′5-sitosterone, sitosterol, ursolicacid, djalonensin and D-(þ)-bornesitol from Anthocleista djalonensis have also been reported (Okorie, 1976; Onocha et al., 1995).

Pharmacological activities

In African traditional medicine, the leaves, stems and roots of Anthocleista djalonensis, is prepared as a decoction or macerated in water or alcohol, and the solution is given orally as a treatment for diabetes in Guinea, Nigeria, Togo, Ghana and Cameroun (Ampofo, 1977; Abuh et al., 1990; Madubunyi et al., 1994; Olowokudejo et al., 2008; Jiofack et al., 2010; Diallo et al., 2012; Soladoye et al., 2012; Tchacondo et al., 2012). The hypoglycemic effect of the leaves, stem bark and roots of Anthocleista djalonensis has been scientifically proven by in vitro and in vivo studies (Abuh et al., 1990; Olagunju et al., 1998; Mbouangouere et al., 2007; Okokon et al., 2012; Olubomehin et al., 2013; Osadebe et al., 2014a, 2014b; Sunday et al., 2014). The leaves, stem barks and roots of Anthocleista djalonensis revealed α-amylase inhibitory activity at 1mL of 250mg/mL concentration of their aqueous methanol extracts (Olubomehin et al., 2013). A. djalonensis had a better activity than other Anthocleista species which indicated that it might contain more of the active principles necessary for the management of diabetes. The different plant parts of Anthocleista djalonensis, at doses ranging from 50–3000mg/kg have all revealed in vivo antiplasmodial activities against Plasmodium falciparum or Plasmodium berghei in a dose dependent manner (Bassey et al., 2009; Alaribe et al., 2012; Odeghe et al., 2012a; Okon et al., 2014; Gboeloh et al., 2014; Ogbuehi et al., 2014). Irlbacholine, isolated from Anthocleista djalonensis revealed potent in vitro activity against three pathogenic fungi: C. albicans, C. neoformans, and A. fumigatus, with minimum inhibitory concentrations (MIC) of 1.25, 0.04 and 0.08 pg/mL respectively (Bierer et al. 1995). Similarly, Irlbacholine showed potent activity (MIC¼0.04 pg/mL) against the dermatophyte Trichophyton rubrum. In Nigeria and Togo, the leaf, bark and root of Anthocleista djalonensis and Anthocleista vogelii are used to treat hypertension. The root of Anthocleista djalonensis is also macerated in combination with three other plants (Crematogaster pilosa, Securida calondepedunculata and Nauclea latifolia) and one teaspoon is taken three times daily to treat hypertension in Nigeria (Olorunnisola et al., 2015). Anti-inflammatory agents/drugs make up about half of analgesics, because they remedy pain by reducing inflammation or swelling. Traditionally, a cold infusion of the stem bark of Anthocleista djalonensis with 8 other plants is prepared and two tablespoons is taken daily for the treatment of Asthma in Nigeria (Sonibare and Gbile, 2008; Borokini et al., 2013). For swellings, rheumatism and wounds, the area affected is poultice to relieve the soreness and inflammation, and to cleanse the wound (Musa et al., 2010). The action of A. djalonensis at central and peripheral sites to inhibit neurogenic and inflammatory pains has been proposed by Kagbo and Simon (2015), after investigation of the analgesic properties on the methanol root extract of Anthocleista djalonensis in albino rats using chemical, mechanical and thermal

models of pain. The methanol extracts of A. djalonensis leaves showed a very potent DPPH and O2_ anion radical scavenging activities (IC50¼8.6970.95 µg/mL and 5.3271.05 µg/mL respectively). Also, the extract displayed significantly higher OH radical and non-enzymatic lipid peroxidation inhibitory potentials than that of standard antioxidants (IC50¼33.0675.65 µg/mL and 59.1474.64 µg/mL respectively), likewise, it inhibited the accumulation of nitrite in vitro (Awah et al., 2010). The in vitro antihelmintic activity of the ethanol extract of Anthocleista djalonensis was studied against larvae of Heligmosomoides polygyrus (roundworm) at 25, 50, 100 and 200mg/mL concentrations (Nweze and Ngongeh, 2007). The extract had a concentration-dependent lethal action on H. polygyrus larvae. At a concentration of 100mg/mL, the extract recorded 98.45% mortality which was equivalent to that of levamisole (the positive control) at 10mg/mL. This is indicative of the validity of its use traditionally against worms and other internal parasites in the body, and thus, the mode of action of the species on the worms needs to be investigated. Traditionally, A. djalonensis is used in South West Nigeria to boost libido, induce erection, increase sperm count and consequently male fertility (Olowokudejo et al., 2008). Reactive oxygen species are important mediators of sperm dysfunction (Wang et al., 1997; Bansal and Bilaspuri, 2011). Production of MDA, an end product of lipid peroxidation, has been reported in spermatozoa. Anthocleista djalonensis possess the ability to improve sperm function thereby increasing male fertility, and hereby it gives support to its traditional use in the treatment of male fertility problems. Traditionally, Anthocleista djalonensis is used as purgative by locals/natives in Nigeria, Cameroun and other African regions (Dalziel, 1955, Okorie, 1976; Adjanohoun et al., 1986; Igoli et al., 2005; Olowokudejo et al., 2008; Lawal et al., 2010; Ariwaodo et al., 2012). The leaf, bark or roots are usually boiled with water and drank to obtain its purgative/laxative effect.

Toxicity studies

The cytotoxic activity of the crude methanol extracts obtained from the stem, roots and leaves of Anthocleista djalonensis and three natural plant constituents (djalonenol, sweroside and djalonensone respectively) isolated from the extract were evaluated in vitro against ST-57brain tumor transformed fibroblasts (Onocha et al., 2003). Comparatively, the three crude extracts as well as djalonenol and sweroside exhibited low cytotoxicity (ED5040– 70 µg/mL) while djalonensone was not significantly cytotoxic against the brain tumor transformed fibroblasts (Onocha et al., 2003).

Conclusion

This review has been able to show the therapeutic potentials of Anthocleista djalonensis through its ethnobotanical and pharmacological uses. These potentials might have been as a result of the array of phytochemicals found in it. However, there is need for substantial advanced research on the chemistry and pharmacological properties (both in vivo and in vitro), the determination of the mode of action of the active principles for new and already known pharmacological activities.

References

1. Abuh, F. Y., Wambebe, C., Rai, P. P., & Sokomba, E. N. (1990). Hypoglycaemic activity of Anthocleista vogelii (Planch) aqueous extract in rodents. Phytotherapy research, 4(1), 20-24.
2. Adjanohoun, J.E., Aboubakar, N., Dramane, K., Ebot, M.E., Ekpere, J.A., Enow-Orock, E.G., Focho, D., Gbile, Z.O., Kamanyi, A., KamsuKom, J., Keita, A., Mbenkum, T., Mbi, C.N., Mbiele, A.L., Mbome, I.L., Mubiru, N.K., Nancy, W.L., Nkongmeneck, B., Satabie, B., Sofowora, A., Tamze, V., Wirmum, C.K. (1986), Contribution to ethnobotanical and floristic studies in Cameroon. OAU/STRC 1986: P. 273.
3. Aiyeloja, A. A., & Bello, O. A. (2006). Ethnobotanical potentials of common herbs in Nigeria: A case study of Enugu state. Educational Research and Reviews, 1(1), 16.
4. Akubue, P. I., Mittal, G. C., & Aguwa, C. N. (1983). Preliminary pharmacological study of some Nigerian medicinal plants. 1. Journal of Ethnopharmacology, 8(1), 53-63.
5. Ampofo, D., (1977). Socio-cultural and medical perspectives of infertility in Ghana. In: Family welfare and development in Africa. International Planned Parenthood Federation, London.
6. Ariwaodo, J. O., Chukwuma, E. C., & Adeniji, K. A. (2012). Some medicinal plant species of Asamagbe stream bank vegetation, Forestry Research Institute of Nigeria, Ibadan. Ethnobotany Research and Applications, 10, 541-549.
7. Awah FM, Tufon E, Uzoegwu PN. (2010), Free radical scavenging activity and phenolic contents of Anthocleista djalonesis (Loganiaceae) leaf extract. International Journal of Biological and Chemical Sciences, 4: 2314-2323.
8. Bansal, A.K., Bilaspuri, G.S., (2011). Impacts of

oxidative stress and antioxidants on semen functions. Vet. Med. Int. 2011: 1–7.

9. Bassey, A. S., Okokon, J. E., Etim, E. I., Umoh, F. U., & Bassey, E. (2009). Evaluation of the in vivo antimalarial activity of ethanolic leaf and stembark extracts of Anthocleista djalonensis. Indian journal of pharmacology, 41(6), 258.
10. Bierer, D. E., Gerber, R. E., Jolad, S. D., Ubillas, R. P., Randle, J., Nauka, E., ... & Fort, D. M. (1995). Isolation, structure elucidation, and synthesis of irlbacholine, 1, 22-Bis [[[2-(trimethylammonium) ethoxy] phosphinyl] oxy] docosane: A novel antifungal plant metabolite from Irlbachia alata and Anthocleista djalonensis. The Journal of Organic Chemistry, 60(21), 7022-7026.
11. Borokini, T. I., Ighere, D. A., Clement, M., Ajiboye, T., & Alowonle, A. (2013). Ethnobiological survey of traditional medicine practices in Oyo State. Journal of Medicinal Plants, 1(5), 1-16.
12. Dalziel, J.M., (1955). The Useful Plants of West Tropical Africa. Crown Agents for the Colonies, London, UK.
13. De Ruijter A. (2007). Anthocleista djalonensis. A. Chev. Record from Protobase. Schmelzer G H. & Gurib-Fakin A. PROTA (Plant Resourses of Tropical Africa).
14. Diallo, A., Traore, M. S., Keita, S. M., Balde, M. A., Keita, A., Camara, M., ... & Balde, A. M. (2012). Management of diabetes in Guinean traditional medicine: an ethnobotanical investigation in the coastal lowlands. Journal of Ethnopharmacology, 144(2), 353-361.
15. Gboeloh, L. B., Okon, O. E., & Udoh, S. E. (2014). Antiplasmodial effect of anthocleista vogelii on albino mice experimentally infected with Plasmodium berghei berghei (NK 65). Journal of Parasitology Research, 2014.
16. Igoli, J. O., Ogaji, O. G., Tor-Ayiin, T. A., & Igoli, N. P. (2005). Traditional medicine practice amongst the Igede people of Nigeria. Part II. African Journal of Traditional, Complementary and Alternative Medicines, 2(2), 134-152.
17. Jensen, S. R., & Schripsema, J. (2002). Chemotaxonomy and pharmacology of Gentianaceae. Gentianaceae: systematics and natural history. Cambridge University Press, Cambridge, 573-631.
18. Jiofack, T., Fokunang, C., Guedje, N., Kemeuze, V., Fongnzossie, E., Nkongmeneck, B. A., ... & Tsabang, N. (2010). Ethnobotanical uses of medicinal plants of two ethnoecological regions of Cameroon. International Journal of Medicine and Medical Sciences, 2(3), 60-79.
19. Kagbo, H. D., & Simon, S. E. (2015). Evaluation of the analgesic properties of the methanol root extract of Anthocleista djalonensis A. Chev. World J Pharm Pharm Sci, 4, 1095-1104.
20. Lawal, I. O., Uzokwe, N. E., Igboanugo, A. B. I., Adio, A. F., Awosan, E. A., Nwogwugwu, J. O., ... & Adesoga, A. A. (2010). Ethno medicinal information on collation and identification of some medicinal plants in Research Institutes of South-west Nigeria. African Journal of Pharmacy and Pharmacology, 4(1), 001-007.
21. Madubunyi, I. I., Adam, K. P., & Becker, H. (1994). Anthocleistol, a new secoiridoid from Anthocleista nobilis. Zeitschrift für Naturforschung C, 49(3-4), 271-272.
22. Mbouangouere, R.N., Tane, P., Ngamga, D., Khan, S.N., Choudhary, M.I., Ngadjui, B.T., (2007). A New Steroid and α-glucosidase Inhibitors from Anthocleista schweinfurthii. Res. J. Med. Plant, 1.
23. Musa, A. D., Yusuf, G. O., Ojogbane, E. B., & Nwodo, O. F. C. (2010). Screening of eight plants used in folkloric medicine for the treatment of typhoid fever. Journal of Chemical and Pharmaceutical Research, 2(4), 7-15.
24. Neuwinger HD. (2000). African traditional medicine: a dictionary of plant use and applications. Medpharm Scientific, Stuttgart, Germany, 1-589.
25. Nweze, N. E., & Ngongeh, L. A. (2007). In vitro anthelmintic activity of Anthocleista djalonensis. Nigerian Veterinary Journal, 28(1), 9-13.
26. Odeghe, O.B., Uwakwe, A.A., Monago, C.C., (2012a). Antiplasmodial activity of methanolic stem bark extract of Anthocleista grandiflora in Mice. Int. J. Appl. 2: 142–148.
27. Ogbuehi, I. H., Ebong, O. O., Asuquo, E. O., & Nwauche, C. A. (2014). Evaluation of the antiplasmodial activity of the methanolic root extracts of Anthocleista nobilis G. Don, Nauclea latifolia Smith and Napoleona imperialis P. Beauv. British J Pharmacol Toxicol, 5(2), 75-82.
28. Ogunwande, I.A., Avoseh, N.O., Flamini, G., Hassan, A.S., Ogunmoye, A.O., Ogunsanwo, A.O., Yusuf, K.O., Kelechi, A.O., Tiamiyu, Z.A., Tabowei, G.O., (2013). Essential oils from the leaves of six medicinal plants of Nigeria. Nat. Prod. Commun. 8: 243–248.

29. Okokon, J. E., Antia, B. S., & Udobang, J. A. (2012). Antidiabetic activities of ethanolic extract and fraction of Anthocleista djalonensis. Asian Pacific Journal of Tropical Biomedicine, 2(6), 461-464.
30. Okoli, A. S., & Iroegbu, C. U. (2004). Evaluation of extracts of Anthocleista djalonensis, Nauclea latifolia and Uvaria afzalii for activity against bacterial isolates from cases of non-gonococcal urethritis. Journal of ethnopharmacology, 92(1), 135-144.
31. Okon, O. E., Gboeloh, L. B., & Udoh, S. E. (2014). Antimalarial effect of combined extracts of the leaf of Ficus exasperata and stem bark of Anthocleista vogelii on mice experimentally infected with Plasmodium berghei Berghei (Nk 65). Research Journal of Medicinal Plant, 8(3), 99-111.
32. Okorie D.A. (1976). A new phthalide and xanthones from Anthocleista djalonensis and Anthocleista vogelii. Phytochem. 15: 1799–1800.
33. Okunrobo L, Usifoh C, Ching P, Bariweni M. (2009), Anti-inflammatory evaluation of methanol extract and aqueous fraction of the leaves of Anthocleista djalonensis A. Chev (Gentianaceae). The Internet Journal of Pharmacology, 7: 23-34.
34. Olagunju, J.A., Loremikan, E.A., Gbile, Z.O., Moody, J.O., Ajaiyeoba, E.A., Adeboye, J.O., Ogundipe, O.O., (1998). Hypoglycemic and lipolytic activities of isosaline extract of the leaves of Anthocleista djalonensis A. Chev in alloxanized diabeticrats. In: Standardization and Utilization of Herbal Medicines: Challenges of the 21st Century. Proceedings of 1st International Workshop on Herbal Medicinal Products, Ibadan, Nigeria, 22–24 November, 1998. University of Ibadan, Department of Pharmacognosy, pp. 157–163.
35. Olorunnisola, O. S., Adetutu, A., & Afolayan, A. J. (2015). An inventory of plants commonly used in the treatment of some disease conditions in Ogbomoso, South West, Nigeria. Journal of Ethnopharmacology, 161, 60-68.
36. Olowokudejo, J. D., Kadiri, A. B., & Travih, V. A. (2008). An ethnobotanical survey of herbal markets and medicinal plants in Lagos State of Nigeria. Ethnobotanical leaflets, 2008(1), 116.
37. Olubomehin, O. O., Abo, K. A., & Ajaiyeoba, E. O. (2013). Alpha-amylase inhibitory activity of two Anthocleista species and in vivo rat model anti-diabetic activities of Anthocleista djalonensis extracts and fractions. Journal of Ethnopharmacology, 146(3), 811-814.
38. Onocha, P. A., Okorie, D. A., Connolly, J. D., Krebs, H. C., Meier, B., & Habermehl, G. G. (2003). Cytotoxic activity of the constituents of Anthocleista djalonensis and their derivatives. Nigerian Journal of Natural Products and Medicine, 7, 58-60.
39. Onocha, P. A., Okorie, D. A., Connolly, J. D., & Roycroft, D. S. (1995). Monoterpene diol, iridoid glucoside and dibenzo-α-pyrone from Anthocleista djalonensis. Phytochemistry, 40(4), 1183-1189.
40. Osadebe, P.O., Odoh, E.U., Uzor, P.F., (2014a). The search for new hypoglycemic agents from plant. Afr. J. Pharm. Pharmacol. 8: 292–303.
41. Osadebe, P. O., Uzor, P. F., Omeje, E. O., Agbo, M. O., & Obonga, W. O. (2014). Hypoglycemic activity of the extract and fractions of Anthocleista vogelii (Planch) stem bark. Tropical Journal of Pharmaceutical Research, 13(9), 1437-1443.
42. Soladoye, M. O., Chukwuma, E. C., & Owa, F. P. (2012). An 'Avalanche'of plant species for the traditional cure of diabetes mellitus in South-Western Nigeria. J Nat Prod Plant Resour, 2(1), 60-72.
43. Sonibare, M. A., & Gbile, Z. O. (2008). Ethnobotanical survey of anti-asthmatic plants in South Western Nigeria. African Journal of Traditional, Complementary and Alternative Medicines, 5(4), 340-345.
44. Struwe L. and Albert V. (Editors). Gentianaceae - Systematics and Natural History. Cambridge University Press, United Kingdom. 573–631.
45. Sunday, R., Ilesanmi, O., Obuotor, E., (2014). Antidiabetic effect of Anthocleista vogelii ethanolic root extract and fractions in wistar rats. Basic Clin. Pharmacol. Toxicol. 115: 1–374.
46. Tchacondo, T., Karou, S. D., Agban, A., Bako, M., Batawila, K., Bawa, M. L., ... & de Souza, C. (2012). Medicinal plants use in central Togo (Africa) with an emphasis on the timing. Pharmacognosy research, 4(2), 92.
47. Wang, A., Fanning, L., Anderson, D. J., & Loughlin, K. R. (1997). Generation of reactive oxygen species by leukocytes and sperm following exposure to urogenital tract infection. Archives of andrology, 39(1), 11-17.