

**A PHARMACOLOGICAL AND PHYTOCHEMICAL REVIEW OF *CERBERA ODOLLAM*  
A PLANT WITH SIGNIFICANT ETHNOMEDICINAL VALUE**

Md. Siddiqui Islam\* and Zebunnesa Ahmed

Department of Pharmacy, Southeast University, Dhaka-1213, Bangladesh.

\*Corresponding Author: Dr. Md. Siddiqui Islam

Department of Pharmacy, Southeast University, Dhaka-1213, Bangladesh.

Article Received on 06/09/2017

Article Revised on 17/10/2017

Article Accepted on 08/11/2017

**ABSTRACT**

Herbal and folklore medicines are achieving popularity throughout the world due to its safety. Herbal medicines also have nutritional value therefore; it is now the most popular choice for their pharmacological activities too. Climate and geographical factors of Bangladesh made it vast sources of herbal medicines. The availability and cost-effectiveness of traditional medicines has also played an important role to make it a popular drug of choice among developing countries like Bangladesh. In Bangladesh people are using plants to treat various diseases. In this current review, we have gone through an extensive literature search to find out botanical data, chemical constituent and pharmacological activities in scientific researches of *Cerbera odollam*. The featured plant of this review articles revealed various activities. We intend to do this literature review to find out the potential scientific value of this plant to justify its traditional uses. We hope, this study will help the researchers to find out potential drugs in the future according to their pharmacological studies.

**KEYWORDS:** Herbal medicine; *Cerbera odollam*; Pharmacological; Phytochemical.**1. INTRODUCTION**

Medicinal plants have enormous value that's why, it is impossible to measure the importance of medicinal plants in human livelihood due to their inseparable contribution to the human life. Bangladesh is a land rich with plant diversity because of its fertile land and humid climate. Majority of the people of Bangladesh are living in the rural area and these rural and tribal people are greatly dependent on traditional medicine make with plant sources.<sup>[1]</sup> Bangladesh has used the traditional treatment system for a long time to treat their ailments. Ayurvedic, Unani, and folk medicinal systems are the three main classes of traditional healers of Bangladesh among them a folk medicinal system uses mainly the plants and plants part in the treatment of diseases.<sup>[2]</sup> The procedure and process of treating patients with traditional medicine is usually not stored in a written rather it passes from one generation to another through verbal contact.<sup>[3-6]</sup>

The interest of research on the traditionally used plant has increased in greater extent due to its availability and future potentiality to contribute in medicinal sector, in recent years. This type of folklore and traditional medicine make itself as valuable sources to discover new drugs with less side effects and adverse effects.<sup>[7]</sup> Different researches on ethno-medicines have been performing nowadays based on their various therapeutic effects.<sup>[8]</sup> Plants have been used for a long time to heal various types of wound through traditional medicine

systems. Healthcare resources are draining a huge amount of economy for the treatment of chronic wound.<sup>[9,10]</sup>

The literature review done by researchers revealed that there is a significant gap exists between scientific validation of ethnomedicine and their uses. In this review article, we have tried to collect information about *Cerbera odollam* plant with uses in traditional medicine of Bangladesh and its respective pharmacological effects studied through various reputed scientific journals to find out the relation between traditional use and pharmacological effects.

**Description of *Cerbera odollam*****Taxonomic Hierarchy**

Domain: Eukaryota  
Kingdom: Plantae  
Subkingdom: Viridiaeplantae  
Phylum: Tracheophyta  
Subphylum: Euphyllophytina  
Infraphylum: Radiatopses  
Subclass: Asteridae  
Superorder: Gentiananae  
Order: Gentianales  
Family: Apocynaceae  
Subfamily: Rauvolfioideae  
Tribe: Plumerieae  
Genus: *Cerbera*  
Specific epithet: *odollam*.

Botanical name: *Cerbera odollam* Gaertn.

### General Botanical Data

**Growth Form:** This is a medium size tree with up to 12 m tall have a round and bushy crown with scars on the leaves.

**Leaves:** Leaves are entirely dark green fleshy oblanceolate apex base tapering, slightly coriaceous. Petiole is 2 to 5 cm long in size with lateral and reticulate vein growth in surfaces.

**Flowers:** Flowers of *Cerebra odollam* are similar for all Apocynaceae family which is large, regular, bisexual corolla funnel shaped with 5 lobed.

**Fruits:** Round shaped apple like fruits with single poisonous seed, surrounded by thick fibrous husk and a papery outer pulp. Ripen food converted from green to reddish purple to brownish black and dropping from tree. The thin pulp is eaten by birds. The fruits in green form sometimes look like a mango.

**Reproductive biology:** Pollination of this tree is usually occurs through insects.

**Ecology:** It is mangrove associated tree along with brackish waters. This tree grows where the salinity is typically low.

### Phytochemical Studies on *Cerbera odollam*

Three compounds i.e. one  $14\beta$  (H) steroid and two benzoic acid derivatives have been isolated from the carbon tetrachloride soluble fraction of a methanol extract of the stem bark of *Cerbera odollam* Gaertn (Family-Apocynaceae). The structure of  $14\beta$  (H) steroid which was detected to be triticosterol on the basis of spectroscopic data of this compound. This is the second example of a naturally occurring compound with a  $14\beta$  (H) steroid skeleton. The benzoic acid derivatives were tentatively characterized as 2, 6-dihydroxy-4-methoxy benzoic acid and 2-hydroxy-4-methoxy-6-methyl benzoic acid.<sup>[11]</sup> The vebioside, Deacetyl-tanghinin, neriifolin, tanghinin and monoacetylneriifolin were identified from the seed total extract of *Cerbera odollam* by N.G Bisset.<sup>[12]</sup>

In an another study a cardenolide glycoside, 3 beta-O-(2'-O-acetyl-1-thevetosyl)-15(14-->8) abeo-5 beta-(8R)-14-oxo-card-20(22)-enolide (2'-O-acetyl cereaside A), was isolated and identified from a methylene extract of the seeds of *Cerbera odollam*, together with four known compounds: cerleaside A, 17 alpha-neriifolin, 17 beta-neriifolin and cerberin.<sup>[13]</sup>

### Traditional uses of *Cerbera odollam*

*Cerbera* is named after Cerberus, the three headed dog of Greek mythology that guarded the gate to the Underworld, because all parts of the plant are toxic. Even using the wood for a fire can produce a poisonous

smoke. The tree has contained the harmful toxic chemical 'Cerberin', which can stop heart from functioning. The seed of this tree have shown poisonous effects in an epidemic way in Madagascar.

On one occasion over 6000 people died in a single ordeal.<sup>[14]</sup> However, it is believed that this practice may still occur in remote areas of the island. *Cerbera* seeds are still used in India as a poison since the taste can be converted with spices and the chemical is hard to detect in an autopsy. Though it is mainly used for poisoning purpose, its different parts are still used in other purposes.

The seed poisoning symptoms include various symptoms like, nausea and vomiting. The poisoning may also causes death by hyperkalemia. In the Philippine, the seeds were used as a fish poison in small stream (*Cerbera odollam*, RMBR). Investigations have also been made into the feasibility of converting the seeds into biodiesel.<sup>[15]</sup> The seeds contain non-selective oil, producing a shining flame with a pleasant nut-like odor. The Burmese use it for lighting, as cosmetic or mixed with other oils as an insecticide or insect repellent.<sup>[16]</sup> The fruits are used for manufacturing bio-insecticide and deodorants and also used as a cure for hydrophobia. Interestingly, the species available in coastal region of Bangladesh is not too much poisonous and even the local people use the fleshy portion of the fruit as food.

The wood produces a fine charcoal that was used for gun powder by the Thais (*Cerbera odollam*, RMBR). The wood is also used for non-durable or indoor applications. Medicinally, the wood is used in paralysis.<sup>[11]</sup> Latex of the tree is also used as a emetic and purgative agents.<sup>[17]</sup>

### Pharmacological Activities

To find out possible cytotoxic activities the leaf extracts of *Cerbera odollam* was studied against two kinds of breast cancer cell lines which are T47D and MCF7 with two ovarian cancer cells and a normal usual cell line. The crude fraction was further fractionated with butanol, water and ethyl acetate. And all the fractions were exhibited strong anticancer activity with lower inhibitory concentration value.<sup>[18]</sup>

In a study done by Rahman et al. have reported that crude methanolic extract of this plant showed antibacterial, antinociceptive and diuretic activity at different dose. This plant extract have also showed significant activity against various microorganism. Commonly skin bacteria were also used to investigate antimicrobial activity of *Cerbera odollam* in a study and the study results suggested that it may be used in skin preparations to treat various diseases.<sup>[19]</sup>

### CONCLUSION

Extensive literature study results revealed that our featured plant have potential pharmacological activities against various diseases and in various animal models.

Since this plant is significantly active against various disease conditions so chemical investigations are needed to find out the future lead compound to develop drugs. Plant sources are being used for a long time to explore our medicinal sector because of their less side effects and more effectiveness.

#### CONFLICT OF INTEREST

We have no conflict of interest.

#### ACKNOWLEDGEMENT

We would like to give thanks to the Department of Pharmacy, Southeast University for technical support.

#### REFERENCES

- Hossan S, Agarwala B, Sarwar S, Karim M, Jahan R, Rahmatullah M, Rahmatullah M. Traditional use of medicinal plants in Bangladesh to treat urinary tract infections and sexually transmitted diseases. *Ethnobot Res Appl*, 2010; 8(0): 061.
- Rahmatullah M, Kabir AABT, Rahman MM, Hossan MS, Khatun Z, Khatun MA, Jahan R. Ethnomedicinal practices among a minority group of Christians residing in Mirzapur village of Dinajpur district, Bangladesh. *Adv Nat Appl Sci.*, 2010; 4(1): 45–51.
- Nadembega P, Boussim JI, Nikiema JB, Poli F, Antognoni F. Medicinal plants in Baskoure, Kourittenga Province, Burkina Faso: An ethnobotanical study. *J Ethnopharmacol* 2011; 133(2): 378–95.
- Sofowora EA. Medicinal plants and Medicine in Africa 2nd eds. John Wiley and Sons; 1993.
- Asase A, Akwetey GA, Achel DG. Ethnopharmacological use of herbal remedies for the treatment of malaria in the Dangme West District of Ghana. *J Ethnopharmacol*, 2010; 129(3): 367–76.
- Asase A, Kokubun T, Grayer RJ, Kite G, Simmonds MSJ, Oteng-Yeboah AA, Odamtten GT. Chemical constituents and antimicrobial activity of medicinal plants from Ghana: *Cassia sieberiana*, *Haematostaphis barteri*, *Mitragyna inermis* and *Pseudocedrela kotschyi*. *Phyther Res.*, 2008; 22(8): 1013–6.
- Shil S, Choudhury MD. Indigenous Knowledge on Healthcare Practices by the Reang Tribe of Dhalai District of Tripura, North East India. *Ethnobot Leaflet*, 2009; 13: 775–90.
- Scartezzini P, Speroni E. Review on some plants of Indian traditional medicine with antioxidant activity. *Journal of Ethnopharmacology*. 2000; 23–43.
- Harding KG, Morris HL, Patel GK. Science, medicine and the future: healing chronic wounds. *BMJ* 2002; 324(7330): 160–3.
- Rafe, M.R., 2017. A review of five traditionally used anti-diabetic plants of Bangladesh and their pharmacological activities. *Asian Pacific Journal of Tropical Medicine*, 2017; 10(10): 933–939.
- Kuddus, M.R., Rumi, F., Masud, M.M. and Hasan, C.M., PHYTOCHEMICAL SCREENING AND ANTIOXIDANT ACTIVITY STUDIES OF CERBERA ODOLLAM GAERTN. *Int J Pharma Bioscience*, 2011; 2: 413-418.
- Bisset, N.G., The occurrence of alkaloids in the Apocynaceae. Part II. A review of recent developments. In *Annales Bogoriensis*, 1961; 4: 65-144.
- Laphookhieo, S., Cheenpracha, S., Karalai, C., Chantrapromma, S., Ponglimanont, C. and Chantrapromma, K., Cytotoxic cardenolide glycoside from the seeds of *Cerbera odollam*. *Phytochemistry*, 2004; 65(4): 507-510.
- Heiss, A., Maleissye, D., Tardieu, J., Viossat, V., Sahetchian, K.A. and Pitt, I.G., Reactions of primary and secondary butoxy radicals in oxygen at atmospheric pressure. *International Journal of Chemical Kinetics*, 1991; 23(7): 607-622.
- Kansedo, J., Lee, K.T. and Bhatia, S., *Cerbera odollam* (sea mango) oil as a promising non-edible feedstock for biodiesel production. *Fuel*, 2009; 88(6): 1148-1150.
- Folmer, F., Jaspars, M., Dicato, M. and Diederich, M., Photosynthetic marine organisms as a source of anticancer compounds. *Phytochemistry reviews*, 2010; 9(4): 557-579.
- Naskar, K.R. and Bakshi, D.G., Some of the Important Medicinal Plants of Apocynaceae from West Bengal. *Bull. bot. Soc. Bengal*, 1981; 35: 7-14.
- Syarifah, M.S., Nurhanan, M.Y., Haffiz, J.M., Ilham, A.M., Getha, K., Asiah, O., Norhayati, I., Sahira, H.L. and Suryani, S.A., Potential anticancer compound from *Cerbera odollam*. *Journal of Tropical Forest Science*, 2011; 89-96.
- Shankar, S. Gokul; K, Babu; S, Subashini; and Rai, Sadananda "Can *Cerbera odollam* Fruit Extract Serve as an Anti-microbial Ingredient in Deodorants?," *Ethnobotanical Leaflets*, 2009; 4(5).