

## MEDICINAL PROPERTIES OF ANTHOCEPHALUS INDICUS (KADAM): AN INDIGENOUS MEDICINAL PLANT

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### ABSTRACT

*Anthocephalus indicus* or *A. indicus* (family Rubiaceae; Hindi name KADAMBA or KADAM) is one of such ayurvedic remedy that has been mentioned in many Indian medicinal literatures. This article discusses about the medicinal principles of *Anthocephalus indicus*. In this communication, we reviewed the phytochemistry of *Anthocephalus cadamba* and its application in the cure of various ailments like diabetes mellitus, diarrhoea, fever, inflammation, haemoptysis, cough, vomiting, wounds, ulcers, debility and antimicrobial activity. The major constituents of the plant are triterpenes, triterpenoid glycosides, flavanoids, saponins, indole alkaloids; cadambine, cadamine, isocadambine, isodihydrocadambine. This review discusses the investigations made by various workers related to chemical constituents, pharmacological action and toxicological studies of this plant since years till date.

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### INTRODUCTION

**History of indigenous herbs in India:** During Vedic period Aryans compiled their work related to herbal remedy in holy Vedas when then came to north India. References about a number of herbal remedies have been mentioned in '*Rig-Veda*' (about 200 B.C.). In '*Atharva-Veda*' (about 200 B.C.) description of medicinal plants has been made under separate chapter '*Ayurveda*'. It was Charak (about 600 B.C.) who made the scientific classification of herbal drugs on remedial properties in his renowned treatise '*Charak Samhita*' (A compendium of general medicine). In this he described 50 classes of herbal remedies comprising 500 crude drugs (Jyotic Mitra, 1980). Sushruta (about 400 B.C.) classified 700 drugs in 37 classes. In this process Nagarjuna further editing '*Sushruta Samhita*' described the presence of active pharmacological materials of plants in bark, leaf, flower, fruit and root etc. Later on Srangadhar (about 1400 A.D.) mentioned the efficacy of herbal drugs and Dhanvantari (about 1500 A.D.) further classified the medicinal plants to avoid the confusion in identification. Bhav Mishra (about 1600 A.D.) also wrote his monumental work entitled '*Bhavprakash*' and provided descriptive names of medicinal plants. In recent past from the accumulated knowledge our ancient literature, useful remedies and herbal drugs against *Madhumeha* have been identified and compiled by.(1-4)

### Herbal Hypoglycemic Plants with anti-dyslipoproteinemic Activity :

India has a very important place in the history of medicine as recent researches have revealed the great heights to which surgery had reached (WHO, 1980). From time immemorial many medicinal plants are well known in this country use of herbal medicine can be traced to the remote past. One of the oldest treaties in the world in Rigveda (4500 BC-1000 BC) where healing properties of some herbs are mentioned in the form of sonnets, which were often recited in religious ritual. Ayurvedic literature contains intelligent observations on plague, malaria, tuberculosis, cancer and diabetic etc. Thousands of medicinal plants have been described and were known to be dispensing ointments, inhalations and sneezing powder etc. for curing various diseases. (5)

### Anthocephalus indicus (A. indicus, KADAMBA, KADAM) :

*Anthocephalus indicus* or *A. indicus* (family Rubiaceae; Hindi name KADAMBA or KADAM) is a favourite plant of "Lord Krishna" and one of the herbs mentioned in all ancient sanskrit scriptures. There is a mention of *Kadamba* in Sri Krishna *Crictra*. *Kalidasa*, the great ancient poet of India, in this romantic poetry '*Meghaduta*' has cited the ornamental use of *Kadamba* (*Nipa*) flowers by women of Alka Nagri (*Meghaduta*, Uttaramegha, S-2). In Ayurveda

texts, it has various synonyms like vrttapuspa, Kadambri, Sindhupuspa, madadhya, etc. The great sage Charaka has categorised it as vedanasthapana-analgesic, vamanopaga- adjunct to emesis and its fruit pulp as sukrasodhana- purifier of seminal fluids (Charaka Samhita, Sutra A-4). Susruta has cited it as visaghna-detoxifier and stambhana – antidiarrhoeal (Sushruta Samhita, Sutra A-38). (1, 6 - 8)

Kadamba grows throughout India. It is also distributed in Thailand and Indo-china and east-ward in Malaysian archipelago to Papua New Guinea, especially at low levels in wet places; it is a medium sized tree, growing 15-20 metres in height, evergreen, with rounded crown. The bark is dark gray in colour, frequently longitudinally fissured, exfoliating in thin scales. The leaves, resembling to those of madhuka, 30 cm long cm broad ovate, with prominent veins. (9 -16) The flowers are small, orange in colour, in globose head. The fruit round like small balls, hard, yellow when ripe, sweet and sour in taste. Kadamba is bitter, pungent and astringent in taste (*rasa*), pungent in the post digestive effect (*vipaka*) and has cold potency (*virya*). It alleviates all the three dosas predominantly kapha and pitta. It possesses light (*laghu*) and dry (*ruksha*) attributes. By its special potency (*prabhava*). It acts as (*vedanasthapana*) analgesic and (*visaghna*) detoxifier the toxins. (17-20)



*Tree of A. indicus*



*Flowers of A. indicus*



*Fruits of A. indicus*

In Raja Nighantu, three kinds of Kadamba are mentioned namely, dhara kadamba that is the kadamba described above, dhuli kadamba – which blooms in the spring and bhumi kadamba- which has small flowers. The roots, fruits, leaves, bark skins are used for medicinal purposes. Externally the wounds and ulcers are dressed with its leaves (slightly wormed) in alleviate the pain swelling and for cleansing and better healing of wounds. The decoction of the leaves is also used for this purpose. The juice of bark in combined with cumin seeds and sugar alleviates vomiting. The excessive thirst in fevers, quenched with its fruit juice. Kadamba is rewarding in skin diseases as it improves the complexion of the skin. In burning sensation of the body and fever, the bark skin is commonly used. The bark skin and the fruits are salubrious in general debility. (21-33)

### PHARMACOLOGICAL STUDIES

From literature survey it was found that the almost all parts of the plant *Anthocephalus cadamba* is used in the treatment of various diseases. Decoction of leaves is used as gargle in aphthae or stomatitis and in the treatment of ulcers, wounds, and metorrhoea. Bark of the plant is used in fever, inflammation, cough, vomiting, diarrhoea, diabetes, burning sensation, diuresis, wounds, ulcers and in the treatment of snake bite.

*A. indicus* is one such Ayurvedic remedy that was mentioned in many Indian medicinal literatures as antidiarrhoeal and detoxifier and analgesic and purifier of seminal fluids. In traditional system of medication warm aqueous extract of *A. indicus* leaves has been used to alleviate the pain, swelling and for better healing of wounds as well as for treatment of menorrhagia. The decoction of bark skin of this plant is effective in diarrhoea, dysentery and colitis. The fruit juice of the plant augments the quantity of breast milk of lactating mothers and also works as a lactodepurant. (34)

### PHYTOCHEMISTRY

*A. indicus* primarily consist of indole alkaloids, terpenoids, sapogenins, saponins, terpenes, steroids, fats and reducing sugars. The bark also consist of tannins and an astringent principle; which is due to the presence of an acid similar to cincho-tannic acid. A new pentacyclic triterpenic acid isolated from the stem bark *Anthocephalus adamba* named cadambagenic acid (18 $\alpha$ -olean-12ene-3 $\beta$ -hydroxy 27,28-dioic acid), along with this acid quinovic acid and  $\beta$  sitosterol have also been isolated. Dried stem bark of *A. indicus* has been investigated for its steroidal and alkaloidal constituents having good therapeutic values. Some chemical investigations on *A. indicus* have also been done. Heartwood and leaves

of this plant contain cadambine and isomers of dihydrocadambine and isodihydrocadambine. Stem bark contains cadambogic acid alongwith quinovic acid and sitosterol. 1,(35-40)

Complex polysaccharides from flower and seeds of *A. indicus* have been isolated. The compounds mentioned above may be responsible to exert beneficial effects of arial parts of *A. indicus*. Furthermore, root extract of this plant is salutary in urinary ailments like dysurea calculi and glycosuria. However, not much have so done to explore other biological activities and/or the isolation of active ingredients from the fruit and root. Since hyperglycemia following oxidative stress play important role in the initiation and progression of diabetic dyslipoproteinemia and glycosuria, therefore, the aim of the present study was to investigate antidiabetic, antidyslipoproteinemic and antioxidant activities of *A. indicus* fruits and roots *in vivo* and *in vitro*. (41-45)

#### TOXICOLOGICAL STUDIES

According to best of my knowledge no any scientifically validated toxicological relevant studies of *A. indicus* fruits and roots at dose 500 mg/kg body weight has been published till today. Toxicological studies The methanolic extract of *A. indicus* barks were studied for its toxicity in mouse models. The results suggested that acute toxicity was found in animal models at doses range higher than 3000 mg/kg and there was no mortality found at 3000 mg/kg dose in animal models. The sub-acute toxicity was carried out at dose 600 mg/kg. From the result it is suggested that *A. indicus* is non-toxic at doses of 600 mg/kg body weight. (46)

#### DISCUSSION

To date, many favorable experimental and clinical effects of *A. indicus* preparations have been reported. These biological responses have been largely attributed to reduction of risk factors for cardiovascular diseases and stimulation of immune functions, enhanced detoxification of foreign compound, hepatoprotective, antimicrobial effect and antioxidant effect. *A. indicus* is reported to prevent cardiovascular disease by multiple effects, one of which is the decrease total cholesterol and triglycerides, LDLc, VLDLc, while increase HDLc and suppression of the cholesterol biosynthesis. These paradoxical observations warrant a systemic study to resolve the controversy. It is a remarkable plant, which has multiple beneficial effects such as antimicrobial, antithrombotic, hypolipidemic antiarthritic, hypoglycemic and antitumor activity. Additionally, *A. indicus* has known hypoglycemic properties, which have been demonstrated in alloxan induced diabetic

rats. Its activity appears to be in part due to stimulation of insulin secretion from  $\beta$ -cell in the pancreas. (47- 49)

#### CONCLUSION

Research in medicinal plant has gained a rehabilitated focus freshly. The main reason is that the other system of medicine associated with number of adverse effects that often cause to sober problems. Although *A. indicus* has a variety of medicinal activities but it is time to discover its medicinal values at molecular level with the help of various biotechnological techniques. Few toxicological studies have been reported. The work could also be done in this direction to ensure free utility of the plant. It is concluded that *A. indicus* has the regulatory effect on the lipolytic activities of plasma and liver in hyperlipidemic conditions and they also possess the power of regulating the faecal excretion of bile acids. Treatment with these test compounds also caused reversal in the levels of total cholesterol, phospholipids, triglycerides and free fatty acids in dyslipoproteinemia. The outcomes of the pre-existing studies suggest that *A. indicus* can contribute their potential as antidyslipidemic and antioxidant drugs to the world of natural products in the field of dyslipoproteinemia. It should be pointed out here that plant derived natural compounds have been established a proven platform for developing new drug synthesis with fewer side effects.

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