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## *Cassia auriculata*: A healing herb for all remedy

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**Abstract**

Till date almost 3000 different medicinal plants in Indian sub continent has found to great potential in the emerging field of herbal medicines. More specific information about plant source as medicine had been mentioned in our old golden heritagious Ayurvedic literatures and also other alternate system of medicine. Various parts of plants such as Leafs, fruits, seeds etc. provide health and nutrition promoting compounds in human diet. The *Cassia auriculata* Linn. also known as *Avartaki* which has enormous traditional uses against various diseases. The present review aims to compile medicinal values of *Cassia auriculata* Linn. generated through the research activity using modern scientific approaches and innovative scientific tools.

**Keywords:** *Cassia auriculata*, *Avartaki*, ayurveda, ethanomedicine

**Introduction**

Herbal medicine is still the mainstay of about 75–80% of the world population, mainly in the developing countries, for primary health care because of better cultural acceptability, better compatibility with the human body and lesser side effects. However, the last few years have seen a major increase in their use in the developed world [1]. Plants are good sources for new safe, biodegradable and renewable drugs. The use of plants as therapeutic agents in addition to being used as food is age long. Though the therapeutic uses of plants by the primitive people lack scientific explanations [2], there is a great awareness in the use and significance of these medicinal floras by the World Health Organization in several resource- poor nations [3]. This has led to intensified efforts on the documentation of medicinal plants [4].

*Cassia auriculata* Linn. commonly known as ‘Tanner’s Cassia’ (Caesalpinaceae) or *Avartaki* in Ayurveda is an annual or biennial shrub found throughout India in open forests. The leaves are bitter, astringent, acrid, thermogenic, haematinic, constipating and expectorant; seeds are also bitter, astringent, acrid, cooling, ophthalmic, diuretic, alexeteric and vulnerary. The powdered dried flower bud is used as a substitute for tea in the case of diabetic patients and it is also supposed to improve the complexion in women and also considered to be one of the important dye yielding plants in India. It is found in dry zones of southern, western and central India extending up to Rajasthan in North; also cultivated in some parts of Punjab, Haryana, Uttar Pradesh and West Bengal, and often planted in gardens for ornament and as hedges [5]. We have put an effort to compile available literature on research work done for this plant mainly on its therapeutic utility till recent, from the early beginning. This review gives a bird view of the main biological activities, pharmacological actions and medicinal applications of *Cassia auriculata* (*Avartaki*).

**Phytoconstituents of *Cassia auriculata***

Secondary metabolites or Phytoconstituents are the compounds which are responsible for a particular therapeutic activity. There are several such compounds isolated from the different morphological parts of the plant which shows several pharmacological activities.

**Root:** The phytochemical examination of the root of the plant resulted in the isolation of a new flavone glycoside which has been identified as 7, 4-dihydroxy flavone-5-O-beta-D-galactopyranoside; on the basis of chemical studies and spectral UV, IR, PMR and mass data [6].

**Seed:** The seeds of the plant contain 4.8% of light yellow oil. It is low in unsaponifiable content and is non drying oil. Major components of fatty acids are palmitic, oleic and linoleic acids. Oil has about 75% of unsaturated fatty acid content [7]. GC-MS analysis of ethanolic seed extract revealed the presence of benzoic acid, 2- hydroxyl methyl ester (0.07%), glycine,

N-(trifluoroacetyl), 1- methylbutyl ester(0.10%), 2,3 dihydro-3,5 dihydroxy- 6 methyl-4H-pyran-4-one(0.12%), Capric acid ethyl ester (0.16%), Resorcinol (0.21%)<sup>[8]</sup>. Water soluble galactomannan from the seed of the plant furnished beta-D-mannopyranosyl-(1to4)-O-beta-D-mannopyranosyl (1to4)-O-beta-D-mannopyranose by partial hydrolysis<sup>[9]</sup>.

**Flower:** The CAFMET showed the significant amount of flavonoids and phenols, followed by tannin, terpenoids, alkaloids, carbohydrates and steroids<sup>[10]</sup>.

**Leaves:** Twenty-nine compounds were identified in the leaves of *C. auriculata*. The main constituents are 3-O-Methyl-dglucose (48.50%),  $\alpha$ - Tocopherol- $\beta$ -D-mannoside (14.22%), Resorcinol (11.80%), n-Hexadecanoic acid (3.21%), 13-Octadecenal, (Z) - (2.18%) and 1, 2, 3, 4-Tetrahydroisoquinolin-6-ol-1-carboxylic acid (1.98%)<sup>[11]</sup>.

**Stem bark:** The chemical investigation of the stem bark of the plant yielded two new triterpenoid glycosides<sup>[12]</sup>.

**Heart Wood:** The isolation of structural elucidation of new anthraquinone glycoside, 3hydroxy, 6,8,-dimethoxy-2-methyl anthraquinone 1-0-beta-D-galactonide from the heart wood of the plant was also reported<sup>[13]</sup>.

#### Ethano - Medicinal use

It is widely used in traditional medicine for rheumatism, conjunctivitis and diabetes<sup>[14]</sup>. Tribes of Eastern Ghats, make pills from ground leaves and fruits, for the treatment of leucorrhoea<sup>[15]</sup>. The tribals of the north east region are using the plants for treating skin disease and as purgative<sup>[16]</sup>. Southern Indian tribals prepare paste from leaves in vinegar, which applied on skin for various skin diseases<sup>[17]</sup>, dandruff<sup>[18]</sup>, bone fracture<sup>[19]</sup> and also some of them dropped the juice of fresh macerated leaves into ears in case of scorpion bite<sup>[20]</sup>. It was also found that tenders of leaves mixed with lime and is given once a day for treatment of stomachache<sup>[21]</sup>. Flowers are used for spermatorrhea. The whole plant is powdered with the leaves and stem of *Tinospora cordifolia* and mixed with cow's milk and taken internally to treat diarrhea. Flowers are crushed and mixed with goat's milk and taken orally to treat venereal diseases<sup>[22]</sup>. The Meena community of Rajasthan use the leaf extract of the plant for treating tuberculosis<sup>[23]</sup>. According to Ayurveda, roots are useful in urinary discharge and cures tumors, skin disease and asthma. Powder of bark is used for fixing teeth and decoction for chronic dysentery. Decorticated seeds in fine powder and paste are valued local applications to purulent ophthalmia and conjunctivitis<sup>[24]</sup>. *Cassia auriculata* is also one of the major components of beverage called kalpa herbal tea which has been widely consumed by people suffering from diabetes mellitus, constipation and urinary tract diseases<sup>[25]</sup>. An alternative preparation for diabetes medication is a mixture called Avarai panchaga choornam which is prepared from dried and powdered plant parts (equal amount of leaves, roots, flowers, bark and unripe fruits<sup>[26]</sup>).

#### Pharmacological action

##### Antiarthritic Property

Ethyl acetate fraction of *Cassia auriculata* leaves (EACA) has a good therapeutic action on symptoms of arthritis in Freund's complete adjuvants (FCA) induced arthritic rats. The anti-arthritic potential of EACA is mediated through multiple mechanisms viz., immune-suppressant, anti-inflammatory and

analgesic activity along with improvement in structural and functional integrity of joints. The quercetin and gallic acid present in f ethyl acetate fraction of EACA possess promising anti-arthritic activity by modulating bone erosion which may be attributed to its activity<sup>[27]</sup>.

##### Anticancer Property

*Cassia auriculata* leaf extract (CALE) inhibits the proliferation of MCF-7 and Hep-2 cells through induction of apoptosis, making CALE a candidate as new anti-cancer drug. CALE preferentially inhibited the growth of both the cell lines in a dose-dependent manner with IC50 values of 400 and 500 mg for MCF-7 and Hep-2 cells, respectively. Flavanoids and procyanidins, 3-O-beta-D-xylopyranosides, a class of triterpene glycosides, present in *Cassia auriculata* CALE would have been responsible for the anti-cancer activity against MCF-7 and Hep-2 cells<sup>[28]</sup>.

##### Antidiabetic Property

Extract of *C. auriculata* leaves produced significant hypoglycemic effect at 200 mg/kg dose, both in normal and alloxan-induced diabetic animals<sup>[29]</sup>. Aqueous extract of *cassia auriculata* in the dose 400mg/kg showed significant reduction in FBG and glycosylated haemoglobin (GHb) in streptozotacin induced rats having better antihyperglycemic effect than glibenclamide<sup>[30]</sup> whereas methanol extract showed the strongest alpha glucosidase inhibitory (AGH) activity<sup>[31]</sup> and n butanol fraction of flowers are having antihyperglycemic action<sup>[32]</sup>. The possible mechanism by which *Cassia auriculata* flower extract (CFEt) brings about its antihyperglycemic action may be by potentiation of pancreatic secretion of insulin from  $\beta$ -cell of islets or due to enhanced transport of blood glucose to peripheral tissue. This is clearly evident by the increased level of insulin in diabetic rats treated with (CFEt)<sup>[33]</sup>. Moreover CFEt increase total Erythrocyte receptor membrane insulin binding sites with a concomitant increase in plasma insulin<sup>[34]</sup>.

##### Anti-inflammatory Property

Methanolic extract of *Cassia auriculata* flowers (MECA)<sup>[35]</sup> and leaves exhibited profound anti-inflammatory activity in both acute and chronic animal models<sup>[36]</sup>. It was also seen that 50% acetone extract of the flower of *C. auriculata* showed marked anti-inflammatory activity in carrageenin induced oedema in rats<sup>[37]</sup>. The effect was due to the presence of the flavonol glycoside 5-O-methylquercetin 7-O-glucoside and tannin and steroid present in the flowers and the leaves.

##### Antimicrobial Property

Methanol extract of *cassia auriculata* leaves showed antibacterial activity against *Vibrio cholerae* and *Staphylococcus aureus* C<sup>[38]</sup>, potential inhibitory action against fungal strains (*Candida albicans*, *Candida tropicalis* and *Aspergillus niger*) and bacterial strain (*Staphylococcus aureus*, *Bacillus subtilis*, *Pseudomonas aeruginosa*<sup>[39]</sup>). Methanol extract of the fresh flowers of the plant exhibited inhibition zone against *Proteus mirabilis* and *Staphylococcus aureus*<sup>[40]</sup>. The leaves and flowers extract also showed the antibacterial activity against Extended Spectrum Beta Lactamase (ESBL) producing *E. coli*<sup>[41]</sup> and antiviral properties<sup>[42]</sup>.

##### Antioxidant property Property

The ethanol and methanol extracts of *C. auriculata* flowers showed antioxidant activity based on scavenging of 2,2'-

azinobis-(3- ethylbenzothiazoline-6-sulfonic acid) (ABTS) and 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical [43].

#### Antipyretic Property

The hexane, chloroform, ethyl acetate, acetone and methanol extracts of the leaf and flower of *C. auriculata* are known to have good activity against the fourth-instar larvae of the malaria vector *Anopheles stephensi* and the filariasis vector *C. quinquefasciatus* [44]. The leaf extract also showed promising activity against chloroquine resistant strain of *Plasmodium falciparum* [45] and methanol extract of flower showed antiplasmodial activity [46].

#### Antihelminthic Property

It is also responsible for Antiparasitic against blood-sucking parasites *Rhipicephalus (Boophilus) microplus*, *H. bispinosa*, *Hippobosca maculata*, *Damalinea caprae* and *P. cervi* [47].

#### Anti ulcer Property

The methanolic leaf extract of *Cassia auriculata* at dose of 300 mg/kg p.o. markedly decrease the incidence of ulcers in pyloric ligated rats [48].

#### Hepatoprotective Property

Supplementation with *Cassia auriculata* leaf extract can offer protection against free radical mediated oxidative stress in experimental hepatotoxicity. In addition, histopathological studies of the liver confirmed the beneficial role of *Cassia auriculata* leaf extract [49]. Root extract possess potent hepatoprotective activity against ethanol and antitubercular drug-induced hepatotoxicity in rats, which could be due to an inhibition of hepatic metabolizing enzymes and antioxidant activity [50].

#### Hyperlipidemia Property

Ethanol extract of *C. auriculata* exhibited hypocholesterolemic and hypotriglyceridemic effects, while increased the levels of HDL rats. However, it was found to be more effective in reducing the levels of TG and LDL as compared to its effect on TC and HDL.<sup>30</sup> The antihyperlipidemic effect could be attributed to direct lipase inhibitory effect of the plant constituents kaempferol-3-O-rutinoside, rutin, kaempferol, quercetin and luteolin [51]. Aqueous extract of *C. auriculata* produces high NADP+ which results in down regulation of lipogenesis and lowers the oxidative stress. Reduction of lipid peroxidation was associated with anti atherogenesis and naturally occurring dietary antioxidants have antiatherogenic effect, scavenge free radicals and superoxide anions thereby inhibiting lipid peroxidation and showing antihyperlipidemic effects [52].

#### Immunomodulator Property

Polyphenols derived from flowers *Cassia auriculata* boost T cell immunity by increasing the number of T cells and its sensitivity towards stimulants and decreasing ROS production by neutrophils that could potentially harm multiple biological systems in aged individuals [53].

#### Nephroprotective Property

The ethanol extract of the roots of *Cassia auriculata* reduced elevated blood urea and serum creatinine and normalized the histopathological changes in cisplatin- and gentamicin-induced renal injury in male albino rats [54].

#### Conclusion

Collectively, the studies cited in this review suggest that this plant and its extracts may be of therapeutic value with regard to several pathologies. More details of the mechanisms underlying the pharmacological activities with newer approaches utilizing collaborative research and modern technology in combination with established traditional health principles will yield rich dividends in the near future in improving health, especially among people who do not have access to the use of costlier western systems of medicine.

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