PHYTOCHEMISTRY AND PHARMACOLOGICAL ACTIVITIES OF ARAGVADH (CASSIA FISTULA LINN): A REVIEW

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ABSTRACT

Aragvadh (Cassia Fistula Linn) also known as Purging Cassia or Indian Laburnum is an important medicinal plant used in Indian system of medicine. The Purging Cassia - also called Cassia fistula Linn. is a moderate to medium sized deciduous tree which is very common in Indian continent. The fruit pulp contains the anthraquinone and rhein(I) in the free state as well as in the form of glycoside, responsible for significant mild purgative action. The oldest record of its medicinal use can be traced as far as 3000 years when Charak and Sushruta used Aragvadh in the treatment of different kinds of skin diseases (Kushthas). The present article gives an account of updated information on this important plant which is highly beneficial for different ailments. The review reveals about different activities of plant like purgative, diuretic, laxative, anti-asthmatic, hepatoprotective, anti-allergic and various other important medicinal properties. This will also provide valuable information which will assist the scientists in getting more advanced knowledge about this plant species.

Key words: Aragvadh, Cassia Fistula Linn, Purging Cassia, Anthraquinone, Kushtha.

INTRODUCTION

Cassia fistula Linn. also known as Purging Cassia or Indian Laburnum is an important medicinal plant used in Indian system of medicine. The species is native to the Indian subcontinent and adjacent regions of Southeast Asia. It ranges from southern Pakistan eastward throughout India to Myanmar and Thailand and south to Sri Lanka. In literature, it is closely associated with the Mullai (forest) region of Sangam landscape. It is the national tree of Thailand, and its flower is Thailand's national flower. It is also the state flower of Kerala in India and of immense importance amongst the Malayali population. In Vedic Literature, the dried branches of Aragvadha are used for Ritual performances (Ap. Gr. 7/18/7). Cassia fistula Linn. is a moderate sized deciduous tree, distributed throughout India as wild or cultivated plant. It is 18-24m in height, with greenish grey smooth bark when young and rough, dark brown when mature. Leaflets are 8-12 pair; flowers are yellow, long drooping racemes; pods are cylindrical and pulpy; seeds are light brown, hard and shiny. Cassia fistula Linn. has shown various pharmacological activities like antimicrobial, antifungal, antipyretic, analgesic, larvicidal, anti-inflammatory, anti-oxidant, anti-tumour, hepatoprotective and hypoglycemic. Ayurvedic medicine recognizes its use in Vibandha, Udvartaka, Gulma, Shula, Udararoga, Hridroga and Prameha. Aragvadh is used in Ayurvedic remedies for curing flatulence, inflammation, abdominal distension, hepato biliary disorders, constipation, skin diseases, intermittent fever, especially for black water fever, worm infestation. Traditionally, Cassia fistula Linn. is taken in many forms as
Aragvadhadi kvathā, Aragvadhadi leha, Aragvadharihista, Mahamarichyadi taila7.

VERNACULAR NAMES

Aragvadha is commonly known as Rajavriksh, Shampaka, Chaturangula, Arevata, Vyadhigata, Kritmalah, Sunari, Svarnanga, and agricultural implements. The Rajvriksha

When included it in Aushadhi Varga5,6,28,29 and Raj nighantu in Prabhaderaadi varga30.

BOTANICAL DISCRIPITION

Cassia fistula Linn. is a moderate to medium sized deciduous tree 6-9 meters tall with a straight trunk and spreading branches. The stem bark is pale grey, smooth and slender when young; and dark brown, rough when old. Very showy in flowering stage, that’s why called as king of trees (Rajvriksha). Leaves young, flowers bright yellow, 5 cm across, in lax drooping clusters to 60 cm long. Petals 5, obovate veined. The three lowest stamens longer than others, curled and with large anthers. Pod long cylindrical to 60 cm, brown to glossy bark31.

Flowering – February to April, Fruiting – May to January32.

DISTRIBUTION

It is indigenous to India and naturalized in Tropical Africa, South America and West Indies, found throughout in India from Punjab to Kanyakumari in all deciduous forests and hilly tracts. It is sometimes cultivated for its beautiful yellow flowers, in the gardens and avenues. Common throughout in Dun and Saharanpur, also found in low valleys upto 4000 ft.33

The heartwood is yellowish or brick-red, tough, very hard and extremely durable excellent for posts carts, and agricultural implements. The dark-brown sweetish pulp of the ripe fruit is an ingredient of spiced native tobacco. The twigs are often lopped for cattle fodder. The gum exuded by the bark is astringent. The bark is used for tanning and dyeing34.

MACROSCOPIC FEATURES

- **Root**: The root bark is reddish brown and rough with numerous horizontal lenticels. The outermost tissue of the bark can be peeled off easily. The inner surface of a fresh bark is smooth and light pink in colour.

- **Stem**: The trunk is almost straight with spreading branches and branch lets. When young, outer surface of the stem is smooth and greenish to pale grey in colour but the older stems are dark brown to greyish white in colour with a rough surface.

- **Leaves**: Alternate, 20-25 cm, long, peripinnate, the leaflets are 4-8 pairs, when fresh are coriaceous and on drying they become papery. Petioles 6-9 mm long. Leaflets large, 5-12 by 3.5-9 cms midrib.
densely pubescents beneath. Young leaflets are tender, green, occasionally tinged with pink or of a rich copper colour; mature leaves bright green and glabrous above and paler, somewhat silvery beneath.\textsuperscript{35}

- **Fruits and seeds:** The pods are 40-70 cm long and 20-27 mm in diameter mostly straight, smooth. Internally, the pod is divided by thin, buff colored, transverse dissepiments at intervals of about 0.5 cm. Each compartment contains one seed and the fresh fruit is filled with a black pulp, which contracts on drying. 25-100 seeds of each pod are flat, oval and reddish brown in colour.\textsuperscript{36}

**How to Identify**

Outer surface of the root is reddish brown and rough with numerous horizontal dots. Stem bark is also rough due to the presence of lenticels. Leaflets are 4-8 pairs, coriaceous flowers are golden yellow in colour. Pods are long, straightly curved, sub-cylindrical, dark chocolate brown, seeds are embedded in the inner compartment of the fruit and are flat, reddish brown in colour with well marked rapnae.\textsuperscript{37}

**SUBSTITUTE**

Pods of *Cassia grandis* Linn. (Horse cassia) are sometimes used as a substitute. The pods are longer, thicker and heavier than those of *C. fistula* about 50-80 cm long and 4cm in diameter, laterally compressed, surface rough, one prominent ridge on the dorsal side and two on the ventral surface.\textsuperscript{36}

**CHEMICAL COMPOSITION**

*Amaltas* is rich in Tannin\textsuperscript{38}, anthraquinones, rhein I, emodin II, kaem ferol III, Proanthocynadins\textsuperscript{39}, steroids, gum (Glactomannans)\textsuperscript{40}, waxes, volatile oil and the alkaloid chaksine\textsuperscript{41}.

The root bark contains Tannins, phlobaphenes and anthraquinone derivatives. Ramiah and Abraham (1977) isolated and identify one proanthocynidine as fistucacidin\textsuperscript{42}.

The aqueous extract of the leaves of the cassia fistula was fractionated by precipitation with an acid. Two glycosides identified as Sennoside A and Sennoside B were isolated. Seasonal variation was found to occur in glycosidal content of the leaf\textsuperscript{43}.

Leaves are found to be contain free rhein, rhein glycoside, Sennoside A and Sennoside B. Cassia genus are generally rich in tannins. The fruit pulp contains the anthraquinone rhein (I) in the free state as well as in the form of glycoside\textsuperscript{44}. Kumar et al (1966) have isolated a glycoside fistuline, from the flower\textsuperscript{45}.

**PHARMACOLOGICAL ACTIVITIES**

- **Antitumor activity**

  The effects of methanolic extract (ME) of *Cassia fistula* seed on the growth of Ehrlich ascites carcinoma (EAC) and on the life span of tumour bearing mice were studied. ME treatment showed an increase of life span, and a decrease in the tumour volume and viable tumour cell count in the EAC tumour hosts. Cytological studies have revealed a reduction in the mitotic activity, and the appearance of membrane blebbing and intracytoplasmic vacuoles in the treated tumour cells. Improvement in the haematological parameters following ME treatment, like haemoglobin content, red blood cell count and bone marrow cell count of the tumour bearing mice have also been observed. The results of the present study suggest that ME of *C. fistula* seed has an antitumor activity.\textsuperscript{46,47}

- **Antimicrobial activity**

  Antifungal activity of leaf extract of *Cassia fistula* was reported\textsuperscript{48}. In-vitro Antibacterial activity observed in Leaf and Root Extract of *Cassia fistula*.\textsuperscript{49} The fruit pulp is active against *Mycobacterium tuberculosis*.\textsuperscript{50} The antibacterial activity of *Cassia fistula* has been reported by Patel and Patel\textsuperscript{51}. The leaves, stem bark and fruit pulp showed antibacterial activity. The fruit pulp was the most potent in this respect. The activity might be due to the presence of flavonoids. The solvent ether extract of the fruit pulp possess the maximum activity and when compared to chloramphenicol, the activity of 1 gm of this extract was found to be more than that seen with 100-g of chloramphenicol\textsuperscript{52}. Lilly Kutty and Santa kumari reported that stem bark and root bark possessed antifungal activity\textsuperscript{53}. The antifungal activity was further confirmed by studies on the flavinoidal glycosides isolated from the acetone extract of the root. It is reported (annual report CCRIMH, circuit no. 4, clinical report, 1970, Trivandrum) that cases of *Vipadika* and Gajacharma, which were cases of dermatophytic infections showed clearing of lesions with relief of pruritis with *Aragwadha moola twak* lepam\textsuperscript{54}.

- **Purgative activity**

  The aqueous extract of the fruit pulp had significant purgative action, the activity is due to the presence of anthraquinones present\textsuperscript{55}.  

Antioxidant activity

The investigation suggest that the antioxidant properties of 90% ethanol extracts of leaves, and 90% methanol extracts of stem bark, pulp and flowers from Cassia fistula. The antioxidant activity power was in the decreasing order of stem bark, leaves, flowers and pulp and was well correlated with the total polyphenolic content of the extracts. The reason for low antioxidant activity in the flower and pulp fractions could be the presence of some pro oxidants, such as chrysophanol and reducing sugars which dominate the antioxidant compounds present in the extracts. Thus, the stem bark had more antioxidant activity in terms of reducing power, inhibition of per oxidation, O2 and DPPH radical scavenging ability.

Anti-leishmaniac activity

The effectiveness of Cassia fistula in the treatment of leishmaniasis, the efficacy of concentrated boiled extract and hydroalcoholic extract of C. fistula on leishmaniasis was compared with intraleisional injection of Glucantime [meglumine antimonate] in this study. Results indicate that the C. fistula fruit gel increases the efficacy of intraleisional meglumine antimonate for the treatment of cutaneous leishmaniasis. Combination therapy with intraleisional meglumine antimonate and C. fistula fruit gel should be considered for the treatment of acute cutaneous leishmaniasis.

Anti ulcer activity

The ethanolic leaf extract (ELE) of Cassia fistula Linn. (Caesalpinaceae) was evaluated for anti ulcer activity against pylorus ligation - Induced gastric ulcer.

Wound healing activity

Cfistula treated rats showed better wound closure, improved tissue regeneration at the wound site, and supporting histological parameters pertaining to wound healing.

AYURVEDIC PROPERTIES AND PHARMACOLOGICAL EFFECT

According to Ayurveda Literature, Aragvadh is Madhura (sweet) in Rasa (taste); guru (heavy), Mridu and Snigdha in Guna (properties); Sheeta (cold) in Virya (potency) and Madhura in Vipaka (metabolism). Due to these properties, Aragvadh pacifies Vata and pitta. Pharmacological properties of Aragvadh are Rechaka, Jwaraghna, Hridhya, Raktapitta Shaamaka, Kushthaghna, Ruchikara, Yakrita Uttejaka, Anulomana, Shotha hara, Vedna sthapaka, Pitta saraka, Mutra ranjaka and Daha prashamaka.

MEDICINAL USES

- Chrarak has categorized the pulp of Aragvadh under soft purgative (C.S.Su. 25/40). According to Charak, the pulp of its fruit is useful in fever, Heart diseases, gout, flatulence and it can be given even to Infant, old, weak and emaciated person without any harmful effect (C.S. Ka. 8/4,5).
- Pulp of its fruit can be given with milk or with draksha swaras for fever (C.S.Chi. 3/232). Decoction of panchang of Amaltas should be used for bathing, washing and drinking in skin diseases (kustha) (C.S.Chi. 7/92).
- Pulp of fruit can be given with juice of sugar cane in jaundice (C.S.Chi. 16/58) (A.H.Chi. 16/41).
- The leaves of Aragvad, bark of Shleshmatak etc. should be used separately or jointly as a local paste added with little ghee for curing Erysipelas (C.S. Chi.21/89-92).
- The tender leaves of Sunisannaka, nimbi, arka, vetas and aragvadha should be used as vegetable cooked with water and oil and without salt for curing Urustambha. (C.S.Chi. 27/27).
- In Udara roga caused by Pitta, the patient should be purged with milk added with paste of Trivrit or processed with Eranda; or Satala and Tryamana or Aragvadh (C.S.Chi. 13/69-70).
- According to Sushruta, decoction of Amaltas leaf should be used to clean wind. (S.S.Chi.19/39).
- Decoction of Amaltas panchang should be used in Haridrameha (S.S.Chi.11/8). Medicated Ghrita prepared from root bark of Amaltas should be regularly taken orally to cure skin diseases (Kustha) (S.S.Chi. 9/7).
- Powder of Aragvadha, Haridra and Himsra mixed with honey and ghee is made into a wick which is applied in wounds for their purification (S.S.Chi. 8/30).
- Decoction of the leaves of Karavira, Jati, Aragvadha, Tarkari and Arka should be used for washing Veneral diseases (S.S. Chi. 19/39).
According to Vagbhatta, Ghee is cooked with root bark of Aragvadha and taken with decoction of Khadira which helps in destroying Leprosy (A.H.Chi. 19/13)²⁵.

For curing Amavata, Leaves of Aragvadha are fried with mustard oil and taken in evening followed by meal (B.P.Chi. 26/52)²⁶.

Root bark of Aragvadha pounded with rice water is used as snuff and paste in case of Gandamala (V.M.41/23)²⁷.

Application of leaf Kalka with Kanji in skin cures Dadru, Shidhma, Kitibha and other skin disease²⁸.

The local application of paste of root of Aragvadh separately pounded with water helps in curing the severe veneral disease. The paste of leaves of Aragvadh pounded with breast milk should be applied on wound and Stria gravidarum for healing²⁹.

In the Konkan, the juice of the young leaves is used to cure ringworm and to allay the irritation caused by the application of the marking nut juice³⁰.

**IMPORTANT FORMULATIONS**

* Aragvadhadi Lehya, Aragvadhadi Taila, Aragvadhadi kwath churna, Aragvadharishta³¹.

**CONCLUSION**

This substantial literary survey revealed that *Cassia fistula* Linn. is an important medicinal plant which can be used for curing different ailments. The plant shows the presence of many chemical constituents which are responsible for different pharmacological activities. The plant *Cassia fistula* Linn. can be taken as Amaltas. The Fruit pulp is sweet, Cold, heavy and act as a good purgative. It cures fever, haematemesis, Leucoderma, eczema and other skin diseases. The paste of the root taken with milk ceases arthritis and ringworm. It is fruit pulp is purgative due to presence of anthraquinones. Constipation is a major complication of high grade fever, so it has been advised to take its pulp regularly in fever. Virechan is best kind of treatment for skin diseases, being soft purgative it has been indicated in skin diseases by seers of Ayurveda. So this review clearly reveal the importance of this medicinal plant *Aragvadha - Cassia fistula* Linn. But it will be a boon to the Health system only when this traditional knowledge is integrated for demonstration of clinical and biochemical evidence of efficacy.

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