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PHARMACOGNOSTICAL AND PHYTOCHEMICAL STUDY ON CAESALPINIA BONDUC.L (LATAKARANJ)-AN OVERVIEW

[*]Singh P. K., [*]Dwivedi M., [*]Prakash S., [*]Dubey R. K., [*]Tiwari S., [*]Kumar A. and [*]Shukla L. K.

[*]Centre for National Facility for Tribal & Herbal Medicine (NFTHM), IMS, BHU.

[**]Deptt of Botany, Gulab Singh Degree Collage, Kanpur.

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***Correspondence for Author**
Dr. Dwivedi M.
Centre for National Facility for Tribal & Herbal Medicine (NFTHM), IMS, BHU.

ABSTRACT

Caesalpinia bonduc L. (Latakaranj) is a medicinal plant belonging to the family Caesalpiniaceae. It is a prickly shrub widely distributed all over the world especially in India, Sri Lanka and Andaman and Nicobar Islands, in India specially found in tropical regions. *Caesalpinia bonduc* L. have medicinal properties so it is a very valuable medicinal plant which is utilized in traditional system of medicine. The plant has been reported to possess anxiolytic, antinociceptive, antidiarrhoeal, antidiabetic, adaptogenic, anthelmintic, antiestrogenic, antiinflammatory, antimalarial, antimicrobial, antifungal, antispasmodic, antioxidant, antiproliferative, antipsoriatic, antitumor, larvacidal, muscle contractile, hepatoprotective, anticonvulsant and antifilarial activities. Presence of active constituents of Caesalpinia bonduc(L.) are alkaloids, flavonoids, glycosides, saponins, tannins and triterpenoids. This review attempts to encompass the available literature on Caesalpinia bonduc(L.) with respect to its pharmacognostic characters, chemical constituents, summary of its various pharmacological activities and traditional uses.

KEYWORDS: Latakaranj, Macroscopic, Microscopic, Active constituents.

INTRODUCTION

Relationships between human and medicinal plants have been emphasized by Ayurveda since the origin of mankind. Humans have depended on plants for their basic needs such as food-stuffs, shelters, clothing, fertilizers, flavors and fragrances and medicines. Ayurveda is one of the oldest medical systems in the world, providing innumerable leads to find active and

therapeutically useful compounds for drug development from plants. Currently, the use of herbal medicines is wide spread in developing as well as developed countries due to its natural source and limited adverse effects.

There are number of medicinal plants in Ayurveda that are recommended for the treatment of various disorders, one of them being *Caesalpinia bonduc* L. is an Ayurvedic multidimensional property containing plant belonging to family Caesalpiniaceae. In Ayurvedic text it commonly known as Latakaranj. It is an armed liana, up to 15 m in height, found up to an altitude of 1,000 m in Himalaya and wild throughout the plains of India and; it is also found in deltaic region of western, eastern and southern India. Found particularly along the seacoast throughout the hotter parts of India, Burma and Sri Lanka.

Synonym

Sanskrit: Kantakikaranja, Latakaranja

Hindi: Kanta karanja, Karnjuwa, Kanti Karanja, Kanja, Kalkaranj.

English: Fever Nut, Malacca Nut

Bengali: Nata, Kantakaranja

Gujrati: Kankacha, Gajya

Scientific classification

Kingdom: Plantae

Phylum: Magnoliophyta

Class: Angiospermae

Order: Fabales

Family: Caesalpiniaceae

Genus: Caesalpinia

Pharmacodynamics

Rasa: Katu, Tikta

Guna: Laghu, Ruksha, Tikshna

Virya: Ushna

Vipaka: Katu

MACROSCOPICAL CHARACTER

An extensive climber; branches finely grey-downy, armed with hooked and straight hard yellow prickles. Leaves are with large, leafy, branched, basal appendages; 30-60 cm. long; petioles prickly; stipules a pair of reduced pinnae at the base of the leaf each furnished with a long mucronate point; pinnae 6-8 pairs, 5-7.5 cm. long, with a pair of hook stipulary spines at the base. main leaf axis armed with stout, sharp, recurved spines, divided into 4-8 pairs of secondary branches. Leaflet: Leaflets 6-9 pairs, 2-3.8 by 1.3-2.2 cm., membranous, elliptic-oblong, obtuse, strongly mucronate, glabrous above, more or less puberulous beneath;

petioloules very short; stipels of short hooked spines. Flowers: Flowers in dense (usually) long-peduncled terminal and supraaxillary racemes dense at the top, laxdownward, 15-25 cm. long; pedicels very short in bud, elongating to 5 mm. in flower and 8 mm. in fruits, brown-downy; bracts squarrose, linear, acute, reaching1 cm. long, fulvous hair. Calyx 6-8 mm. long, fulvous hairy; lobes obovate-oblong, obtuse. Petals oblanceolate, yellow. Seeds 11, 12, 16, 17, 18: Seed coat is hard, glossy and greenish to ash grey in colour. And is traversed by circular and vertical faint markings of the cracks, forming uniform rectangular to squarish rectulations all over the surface Seeds 1-2, oblong, lead-colored, 1.3 cm. long. A raised hilum with remains of the stalk lies in the centre of the dark spot, at the narrow edge of the seed. Adjacent to the hilum, lies a faint coloured circular to oval elevated micropyle. In dry seed, kernel gets detached from the testa. Testa is about 1-1.25 mm in thickness and is composed of three distinct layers, the outermost - thin and brittle, the middle one - broad, fibrous and dark – brown and the innermost – white and papery. The seed is ex-albuminous. The kernel surface isfurrowed and ridged, hard, pale yellowish – white, circular to oval, flattened and about 1.23- 1.75 cm. in diameter. A scar of the micropyle lies at one end of the kernel, from where arises a prominent ridge demarking the two cotyledons of the embryo. Plumule – radical axis is thick, cylindrical and straight. Taste is very bitter and odour is nauseating and unpleasant.

Fig. 1: Caesulpinia Plant

Fig. 2: Caesalpinia Fruit

Fig. 3: Caesalpinia Seed

MICROSCOPIC CHARACTERISTIC

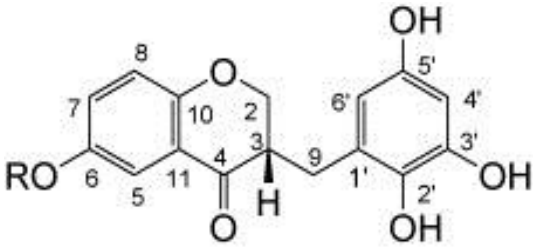
Seeds: Seeds show a palisade layers which are composed of vertical, columnar and laterally closed appressed cells. Thickenings are present on the walls of palisade cells which in tangential section appear as 6-10 denticulate projections into the lumen of cells. Then after that there is the layer of bearer cells and a thick zone of parenchymatous cells. The majority of bearer cells are T-shaped, thick walled and non lignified. Some of the major diagnostic microscopic characters of the powder are columnar palisade cells, bone shaped thick walled parenchymatous cells with brown contentand cells filled with starch grains.

AYURVEDIC LITERATURE

Latakaranj is well recognized drug in todays Scenario, there is much confusion regarding drug. This drug is not found in any ancient treatise viz Brhattrayi and Astang Sangraha. Through we found one reference of kuberaksa" in Harita Samhita is not original one. Dalhan has taken Cirbiva and kantaki karanja (Synonym of Latakaranj) from karanjadvaya". He opiend kantakikaranja for pitika at many places. Description of Latakaranja is given in different nighantu. Which is very much confusing as they use putika, putikaranj, cirbilva, Nakatmala, as synonym. Kaiyadeva has described Latakaranja separately. In bhavmishra has given description of three types of karanj. He has taken karanj, Nakatmala, cirbilvaka as synonyms of kantakikaranja. It seems that use of this drug was started from medieval period and become famous and replaced cirbilva from the karanjadvaya.[16-29]

ACTIVE CONSTITUENTS OF CONSTITUENTS OF PLANT

The seeds of the plant contain Bonducin, Proteins, Saponin, Starch, Sucrose, two Phytosterols namely Sitosterol and Heptocosane, a new Homoisoflavone- Bonducelline and Citrulline, Fatty acids such as Palmitic, Stearic, Lignoceric, Oleic, Linolenic acids. The seed kernels of the plant contain α-, β-, γ- and δ-Caesalpins, Caesalpin-F and Amino acids. From the methanolic extract of seed kernels of Caesalpinia crista from Myanmar, five new cassane-type diterpenes, caesalpinins MA-ME(1-5) and three new norcassane-type diterpenes, norcaesalpinin MA-MC (6-8), have been isolated, together with 12 known cassane-type diterpenes, 14(17)-dehydrocaesalmin F, caesaldekarin e, caesalmin B, caesalmin C, caesalmin E, 2-acetoxy-3-deacetoxycaesaldekarine, 2-acetoxycaesaldekarine, caesalpinin C, 7-acetoxybonducellpin C, caesalpinin E, norcaesalpinin B and 6-acetoxy-3-deacetoxycaesaldekarine.[1]



(1) R = H
(2) R = CH_3

Fig. 4: Structures of caesalpinianone (1) and 6-*O*-methylcaesalpinianone.

TRADITIONAL USE

Caesalpinia bonduc. is used in vast range of diseases. It is the best panacea for abdominal pain due to flatulence, as it effectively alleviates the vata dosha. The powder of its roasted seeds with ghee mitigates the condition and relieves the pain. During postpartum period, the abdominal pain is eliminated with the roasted seed powder, asafoetida, ghee and little amount of salt. The seeds powder, given with milk, controls the diarrhea. The skin of the seed being astringent is beneficial as a medicament for diarrhea, dysentery and colitis. In worm infestations, the juice of its leaves or powder of its roasted seeds is given along with palasa, amra and haridra. Latakaranja (combination of its roasted seeds powder and pippali (1:1) with honey) is the best medication for malarial fever. The combination of its roasted seeds powder, pippali (1:1) is given with honey, approximately 0.5 gm., three times a day for 3-4 days duration. Another combination recommended for malaria is the powders of marica and latakaranja (Sakra vati). The splenic enlargement due to malaria, responds well to latakarnja. The leaves fried in ghee, eliminate vata and relieve constipation, hence valuable in piles. The seeds are stimulant to the uterus, improve the menstrual discharge in oligomenorrhea and reduce the pain in lower abdominal region. The skin of the seed is extremely beneficial in the treatment of leucorrhea. The seeds also render contraceptive activity. Latakaranja is used as a bitter tonic. It is also a useful remedy for cough and asthma, as it alleviates the kapha dosha. For this purpose, the tender leaves (fresh juice) are given along with the honey to ward off the mucous secretions. The oil prepared from the leaves, is a valuable nervine tonic.

PHARMACOLOGICAL PROPERTIES

1. Anthelmintic activity

Jabbar et al. has first time reported anthelmintic activity in Caesalpinia bonducella by in vitro and in vivo; they justified their use in the traditional medicine system of Pakistan.[2] Anthelmintic activity of leaves of Caesalpinia bonducella was investigated for their anthelmintic activity against Phertima posthuma and Ascardia galli Variuos concentrations were used in bioassay. Both extracts showed significant anthelmintic activity.[3]

2. Antimalarial activity

Most of the plant from Caesalpinia species shows antimalarial activity. The isolated diterpenes such as 44 cassane- and norcassane type diterpenes. Most of the tested diterpenes showed antimalarial activity, norcaesalpinin E showed the most potent activity, more than the drug chloroquine.[4]

3. Antioxidant activity

Study showed the methanolic extract of Caesalpinia has potent antioxidant activity and ROS scavenging activity as well asiron chelating property. (2) Ethyl acetate extract showed a maximum of 49% free radical scavenging activity at the end of 1 hr.[5]

4. Antidiabetic/Hypoglycemic

Most of the plant from Caesalpinia species shows Antidiabetic and Hypoglycemic activity. The ethanolic extract (250mg/kg/day) lowered blood glucose level within 2 weeks in the alloxan diabetic albino rats confirming its hypoglycemic activity. β - sistosterol isolated from the stem bark was found to posses potent hypoglycemic activity when compared to other isolated compounds.(1) The seed kernel of Caesalpinia bonducella has significant antidiabetic and hypoglycemic effects. Activity may be partly due to a positive effect on glycogen synthesis in the liver, skeletal muscle and heart muscle due to an insulin-like action of its constituents and partly due to stimulatory action on insulin release. The ethanolic and aqueous extracts showed significant blood sugar lowering effect of C. bonducella. The aqueous extract of C. bonducella seed shell showed very significant blood sugar lowering in glucose loaded STZ and alloxan diabetic models.[6-7]

5. Antifilarial

The Caesalpinia bonducella seed kernel extract and fractions showed microfilaricidal, macrofilaricidal and female-sterilizing efficacy against L. sigmodontin and microfilaricidal and female-sterilizing efficacy against B. malayi in animal models, suggesting a potential for its use in new antifilarial drug development.[8]

6. Anxiolytic Activity

The seed extract of C. bonducella showed a significant and dose dependant anxiolytic activity.[9]

7. Antitumor/Antioxidant Activity

Study of methanol extract of Caesalpinia bonducella showed significant antitumor and antioxidant activity in Erllich ascites carcinoma (EAC)-bearing mice.[10]

8. Analgesic Activity

The flower extract of Caesalpinia bonducella showed significant antinociceptive effect in the inflammatory phase of formalin-induced pain and acetic- induced parietal pain.[11]

9. Analgesic/Antipyretic/Anti- Inflammatory

The seed oil of Caesalpinia bonducella could be a potential source of an anti inflammatory, antipyretic and analgesic agent.[12]

10. Immunomodulatory

The aqueous extract of Caesalpinia bonducella seeds on cell mediated and humoral components of the immune system in rats produced an increase in hemagglutinating antibody titer and a change in delayed-type hypersensitivity suggesting that the extract could be a promising immunostimulatory agent.[13]

11. Anti-Amyloidogenic/Alzheimer's disease

Caesalpinia leaf aqueous extract has anti-amyloidogenic potential. Study showed aqueous extract of Latakaranj could inhibit the Abeta aggregration from monomers and oligomers and able to disintegrate the preformed fibrils.[14]

12. Nootropic/Memory Enhancer

Dried seed kernels of Caesalpinia extract have a potential as a learning and memory enhancer. Results suggest that it can be beneficial in improving cognition in disorders like demential and other neurodegenerative disorders.[15]

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