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A CONCEPTUAL STUDY ON LATAKARANJA: A CRITICAL DRUG REVIEW

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ABSTRACT

Many herbal medicines have been in use in various medical systems for the treatment and management of different diseases. The plant Caesalpinia bonducella (syn: Caesalpinia Crista Linn.) has been used in different system of conventional medication for the treatment of diseases and ailments of human beings. It is reported to contain various Alkaloids, Glycosides and Terpenoids. It has been reported as anti-asthmatic, anti- diabetic, anti-inflammatory, anti-oxidant, anti-bacterial, anti-filarial, anti-tumor, anxiolytic, immunomodulatory, hypoglycemic, activity. This evaluation attempts to include the available literature on Caesalpinia bonducella with respect to its pharmacognostic characters, chemical constituents, summary of its various pharmacological activities and traditional uses. It is a very important plant drug for hydrocele or other surgical diseases.

KEYWORDS: Latakaranja Pharmacology, historical Uses, etc.

INTRODUCTION

Plants have played an important role in maintaining human physical condition and improving the quality of human living for thousands of years and have served humans well as precious components of medicines, seasonings, beverages, cosmetics and dyes.

Traditional drugs are based on the principle that plants hold natural substances that can promote health and assuage illness.

In modern times, focus on plant research has increased all over the world and a large body of evidence has collected to show massive potential of medicinal plants used in various traditional systems.

Today, a great deal of public interest in the use of herbal drugs. Furthermore, many allopathic drugs had their origin in plant extract. There are many herbs, which are predominantly used to treat CVS problems, Hepatobiliary disorders, CNS system, digestive and metabolic disorders.

Raw drugs or medicinal plants, their extracts and their isolated compounds have verified spectrum of biological activities.

In Ayurveda, the ancient medicinal system of India. Latakaranja belonging to Family: Caesalpiniaceous. Found all over India and tropical countries of the World 1, 11. The plant was much confused with Caesalpinia bonducella (Syn. C. Bondoc).

"Bonducella" the name of the species is derived from the Arabic word "Bonduce" meaning a "little ball" which indicated the globular shape of the seed 11.

HISTORICAL REVIEW

Vedic kala

In Rigveda & Atharvaveda, the Latakaranja has been described as, "a plant creating obstacle to the pedestrians on the path while travelling."

Samhita kala

In Charak Samhita,[1] Chikitsashana, 15th chapter, he has mentioned it to be used to increase the bala of Grahani. Kshara prepared with duralabha, latakaranja, karanja, saptaparna, kutaja, dhataki, vacha, murva, patha, aaragvadha & gomutra increased the bala of Grahani.

In Sushrut Samhita,[2] Sushrut has mentioned Latakaranja while explaining pratisarniya & paneeya ksharas.In Chikitsasthana, Vatavyadhi chikitsa chapter, it is described in patra lavana & kalyanaka lavana.

Ashtang Hridaya[3]:-In Ashtanga Hridaya, Chikitsashana,

it is described in vataj hridroga chikitsa.

Habitat[11]
It is an armed liana, up to 15 meter in height, found up to an altitude of 1000 meter in Himalaya & wild through the plains of India & it is also found in deltaic region of western, eastern & southern India. It is found particularly along the seacoast through the hotter parts of India, Burma& Shree Lanka. It is also cultivated as fencing for the fields.

Nighantu Kala
Table 1: Classification of Latakaranja.

NIGHANTU	VARGA
1.Bhavaprakasha Nighantu[4]	Guduchyadi Varga
2.Dhanvantari Nighantu [5]	Aamradi Pancha Varga
3.Kaideo Nighantu [6]	Aushadhi Varga
4.Madanpal Nighantu [7]	Vatadi Varga
5.Priya Nighantu [8]	Guduchyadi Varga
6.Raj Nighantu [9]	Shalmalyadi, Paribhadradi Varga
7.Shodhala Nighantu [10]	Aamradi Varga

Growth & cultivation[12]
Growth of C. bonduc is fairly rapid at all stages. Seedlings reach 26 cm in 40 days after sowing. Older plants grow a meter or more per year. The typical habitat for this species is the coast. *Caesalpinia bonduc* grows in full sun and is intolerant of shade, but can withstand areas with partial shade It tolerates salt spray, saline soils, occasional flooding with seawater, and grows in a wide range of soil pH, from mildly acidic to alkaline soils. *Caesalpinia bonduc* is commonly found in beach vegetation, on coastal dunes, and at better-drained edges of mangrove forest, but also grows inland in disturbed areas. It competes well against grass and herbs, and scrambles onto the crowns of low trees and shrubs.

Propagation[11]
The plant is wild and propagated by seeds. Dormancy of the seeds can be overcome by acid scarification, light and temperature treatment with concentrated sulphuric acid for 30-90 minutes. If these acid treated seeds are exposed to blue spectrum of light for 72 hours, at 30^0 C, exhibit 100% maturation.

Distribution
C.Bonduc (L.) Roxb has pantropical distribiution.It is found throughout India, up to 1000 meters in the Himalaya, in the planes on waste lands & coastal areas.

Sanskrit names: Latakaranja [13]
This plant is considered as creeper type of karanja, since its fruits are similar to karanja.

Botanical Name:
Caesalpinia bonduc (L.) Roxb

Caesalpinia:[14] Describes family & the world is derived from an Italian botanist Andrea Caesalpino (1519-1603) who was physician to Pope Clement VIII.

Bonduc[15] This word is derived from the Arabic word Bonduce meaning a little ball which **indicate** the globular shape of the seed.

Classification
Kingdom:-Plantae – (plants)
Subkingdom:-Tracheobionata (vascular plants)
Superdivision:- Spermatophyta(seed plants)
Division: -Magnoliophyta –Angiosperms-(Flowering plants)
Class:-Magnoliopsida(Eucotyledonae-dicotyledony)
Subclass: -Rosidae
Order: -Fabales
Family:-Fabaceae(Leguminoceae-Pea family)
Subfamily:-Caesalpiniaceae
Tribe:-Caesalpinieae
Genus:-Caesalpinia
Species:- Bonduc

FamilyFeatures[16]:- Introduction
Leguminosae (A..L.de Jussieu) family is also known as Fabaceae (Lindley) =bean or pea family. It includes 630 genera & 1800 species. It is the 3 rd largest family after Asteraceae& Orchidaceae among the flowering plants.

This large family has traditionally been divided into three subfamilies viz. Papilionoidea (Faboideae), Caesalpinoideae & Mimosoideae. These have been recognized as independent familias Fabaceae (Papilionaceae), Ceasalpiniaceae & Mimosaceae in several recent systems of classification. A trend that tends to be reserving in last decade or so. Common features of the family include:-

Leaves-compound with pulvinate base, odd sepal anterior,

Flowers –polygynous
Carpel –one, with marginal placentation & Fruit-commonly a pod or lomentum.

Subfamily faboideae
It includes 440 genera & 12800 species. It is cosmopolitan in distribution, primarily in warm & temperate regions.

Salient features
Leaves:- Leaves pinnate,compound with pulvinate base
Flowers:- Zygomorphic.
Corolla:- Papillionaceous

Sepals:- United,odd sepal anterior. Stamens: - 10, usually diadelphous (1+ (9)
Carpel:- 1 Ovary:- superior Fruit:- a pod Eg.-Desmodium (400 species)

Trephorsia (400 species)

Subfamily Caesalpiniaceae
It includes 150 genera, 2700species. It is mainly distributed in tropics& subtropics. A few species found in temperate region.

Salient features:- Trees, shrubs or herbs.
Leaves:- usually pinnate compound with pulvinate base
Flowers:- zygomorphic
Corolla:- not papilionaceous, posterior petal innermost.
Sepals:- free, odd sepal anterior.
Stamen:- 10, usually free, in two whorls. Ovary: - superior
Carpel:- 1 Fruit:- a pod.
E.g.:- Bauhinia (250 species; Caesalpiniaceae-(120 species)

Subfamily Mimosoideae
It includes 40 genera, 2,500 species. It is distributed mainly in tropical& subtropical regions.

Salient features
Trees, shrubs or sub shrubs.

Leaves:- pinnate compound with pollinate base Flower:- Actinomorphic,
Corolla:- Not papilionaceous Petals:- Valvate
Sepals:- United, odd sepal anterior Stamens:- 4 to many, free or connate Ovary:- superior
Carpel:- 1
Fruit:- A pod or a lomentum Eg.-Acacia-(1000 SPECIES)
Mimosa-(500 species)

Subfamily Caesalpiniaceae:- Introduction:-
It includes 150 genera and 2700 species.

Distribution
It is distributed mainly distributed in tropics& subtropics. a few species found in temperate region.

Salient features
Trees, shrubs or herbs.

Leaves:- Pinnate compound with pulvinate base
Flowers:- Zygomorphic
Corolla:- Not papilionaceous,posterior petal innermost
Sepals:- Free, odd sepal anterior.
Stamen:- 10, usually free, in two whorls. Ovary: - Superior
Carpel:- 1 Fruit:- A pod Major genera:-
Bauhinia (250 species
Senna (250species)
Caesalpinia (120 species)
Cassia(30 species)

Description
Trees (Delonix), shrubs (Cassia occidentalis) or herbs (Cassia obtusa),rarely woody climbers(Bauhinia).
Leaves: – Alternate, pinately or palmetly compound, sometimes simple (Bauhinia) Leaf base:-(sometimes also leaf base)-pulvinate
Stipules:-present

Inflorescence:- Racemose, in racems or spikes
Flowers:- Bractate, (bracts usually caducous), bisexual, zygomorphic, perigynous.

Calyx:- With 5 sepals,rarely 4(Amherstia),free or rarely connate (Bauhinia),odd sepal anterior.
Corolla: With 5 petals,rarely 3(Amherstia),1(Pahuda) or even absent (Tamrindus), free, not Papilionceous, posterior petal innermost.
Androecium:- With 10 stamens,sometimes lesser (3 in Tamrindous), rarely more, free, sometimes unequal in size(Cassia).
Anthers: - Bithecous, dehiscence longitudinal or by apical pores. Gynoecium:- With a single carpel, unilocularwith many ovules, Placentation :- marginal
Ovary:- superior Style:- Single, curved
Fruit: - A legume or pod, rarely a lomentum

Seed: - 1 to many, seed coat hard, endosperm minute or absent, food reserved in Cotyledons.

Floral Formula

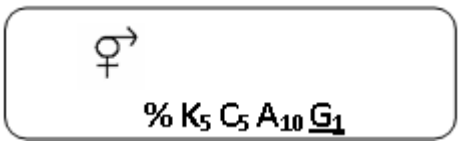


Fig.1: Floral Formula.

Vernacular names[17]
Table 2: Vernacular names of Latakaranja.

Language	Name
Bengali	Nata karanj,dehra
Malayalam	Aavil.kalanji,kalimaarakam,kolanchikuru
Konkani	Gajago
Tamil	Aavil,gajji,kachukkai,kalal,kalargodi,kalichikaai,mulal,suriyindu
Telugu	Gachha,gachhakaaya,gutsakai sukajambuka,thellagachha
Tulu	Gajige kaayi,kadenjikya
Guajarati	Kakcha,gajega kachhi
Marathi	Sagargota gajaga kanchaki
English	Fever nut, physic nut ,nicker nut

Arabic	Bonduc nut,akitmakit
Kannada	Gajagekaye,gajaga
Persian	Khayahe-I-Iblis(Devils nut
Hindi	Kathkaranj,kanthekaranja

Types

Table 3: Types of Latakaranja.

NIGHANTU							
Bhava prakasha	**3**	**Karanja**	**Ghrit karanja**	**Karanji**	**-**	**-**	**-**
Charaka	**2**	**Karanja**	**Puti karanja**	**-**	**-**	**-**	**-**
Bhava Mishra	**3**	**Karanji**	**Ghrit karanja**	**Kantaki Karanja**	**-**	**-**	**-**
Dhanvantari	**6**	**Karanja**	**Ghrit karanja**	**Udakeerya**	**Aangar vallika**	**Ritha karanja**	**Guchha karanja**
Raja	**3**	**Karanja**	**Ghrit karanja**	**Udakeerya**	**Aangar vallika**	**-**	**-**
Shodhala	**3**	**Karanja**	**Chira bilva**	**Valli Karanja**	**-**	**-**	**-**

Among these types nighantukaras described common synonyms so it leads to confusion. According to Bhava Prakasha Chirabilva& kantakikaranja are synonym while accorting to others, Chirabilva is different type of karanja.As Already described in the context of Karanja,Latakaranja is one among the three varieties of Karanja described by Bhavamishra.[18]

Morphology

- **Plant:-** An extensive climber; branches finely grey-downy; armed with hooked & straight hard yellow prickles.
- **Leaves:-** 30-60 cm long ; petioles prickly;stipules-a pair of reduced pinnae at the base of the leaf,each furnished with a long mucronate paint;globrous above;more/less puberulus beneath ;petioles -varius, very short ; stipules of short hooked spines.
- **Flowers:-** Yellow or red, In dense (usually spicate)long peduncle & supra- axillary racemes, dense at the top; lax downwards ;15-25 cm long, pedicles very short in bud;elongating to 5 mm in flower & 8 mm in fruit ; brown – downy bracts squarrose, linear, acute, reaching 1 cm long, fulvous –hairy calyx 6-8 mm long; lobes abdovate-oblong, obtuse, petals oblanceolate, yellow, filaments declinate, flattened at the base, clothed with long white silky hairs.
- **Pods:-** shortly stalked, oblong, 5-7.5 by 4.5 cm; densly armed, on the faces with wiry spicklets.
- **Seeds:-** 1-2 oblong, lead coloured,1.3 cm long.

Karma according to different texts

- ✧ Charaka samhita- Virechaka,shothaghna
- ✧ Sushruta samhita- Aadhmana hara,arshoghna
- ✧ Ashtanga hridaya- Gulma hara,medo hara
- ✧ Ashtanga sangraha- Arshoghna
- ✧ Bhavaprakasha nighant-Arshoghna, krimighna, kushthaghna
- ✧ Dhanvantari nighantu-Krimighna, kushthaghna. vrinaropaka
- ✧ Kaideo nighantu- Shothaghna,arshoghna,shula shamaka
- ✧ Madanpalanighantu-Udavartahara,yonidoshaghna,pramehahara
- ✧ Nighantu aadarsha-Shothaghna, yakrita-pleeha rogaghna
- ✧ Priya nighantu-Jwarghna,shothaghna
- ✧ Raja nighantu-Shulaghna,gulmahara, vrinaropak
- ✧ Shodhala nighantu-Shothaghna,yakrita-pleeharogaghna

Properties

Table 4: Showing Properties of Latakaranja.

NIGHANTU	**RASA**	**GUNA**	**VEERYA**	**VIPAKA**
Dhanvantari	Katu,Tikta	Teekshna	Ushna	Katu
Raj Nighantu	Katu	Teekshna	Ushna	Katu
Kaideo Nighantu	Katu,Tikta	Teekshna	Ushna	Katu
Priya Nighantu	Tikta	Laghu	Ushna	Katu
Shodhal Nighantu	Katu	Laghu	Ushna	Katu
Bhava Prakasha	Katu	Laghu	Ushna	Katu
NighantuAadarsha	Katu,Tikta	Laghu	Ushna	Katu

Matra: (Dose)
Seed Powder – 3 to 6 grams Leaf Juice – 12 to 24 ml
Vishesa yoga: Kuberakshi Vati, Ayush 64

Therapeutic Uses

B. bonduc is called as Latakaranja in Ayurveda, which is having great medicinal value.

Seeds

1. The seeds kernels have a bitter taste and are valued in indigenous medicine as a tonic.
2. They are ingredient of 'Ayush – 64" in ayurvedic compound preparation used as an anti-malarial drugs. They are also made into an ointment for treating hydrocele.[19]
3. As an infusion they are used for curing cerebral haemorrhage.[11]
4. They have also been found useful in some cases of asthma.
5. In Madras an ointment is made from the powdered seeds with castor oil &applied externally in hydrocele and orchitis.
6. The oil from the seed is used in convulsions and paralysis. The powdered seed with equal part of pepper powder is useful in malaria.[20]
7. In Mauritius, crushed seeds are given as an anthelmentic mixed with honey or castor oil. In West India, the roasted seeds are made into a kind of coffee for diabetics.[1]
8. The kerneal powder with sugar and goat milk gives good results in liver disorder.
9. The seeds are used as an antidote to opium, aconite, arsenic and copper poisoning.
10. It is recommended as a single drug for the treatment of amoebasis.
11. In some parts of Kerala, powder of the baked kernels with honey Is used in the treatment of hernia and swelling.
12. In Tamilnadu, use of the powder with castor oil orally to remove swelling from different parts of the body like stomach, legs, hands, heart etc. is well-known indicating good diuretic activity of the kernel.
13. The seeds of C. bonduc form a common household remedy for treatment of diabetes in Nicobar Island of India. The kernel mixed with leaves and flowers of butea frondosa and with flowering tops of Artemisia maritima are given for intestinal warms.
14. The fixed oil is emollient and used as a embrocation and to remove freckles from the ear.

Leaves

1. The leaves are considered very efficacious in the disorders of the liver.
2. In China, they are reckoned as a deobstruent and emmenagogue and an oil expressed from them is given in convulsions palsy and similar complaints.
3. Finely powdered leaves are prescribed as a uterine tonic after child birth.
4. In Malaya, the young leaves are used in intermittent fevers and for expelling intestinal worms.
5. In Ceylon, they are applied for toothache and they are also given for worms in children.
6. The juice of the leaves as anthelmintic; good in elephantiasis and smallpox; destroys the bad odour due to perspiration.[13]
7. Leaves after roasting with castor oil are applied externally to inflammatory swelling especially to inflamed piles, hydrocele and orchitis with benefit.
8. Tender leaves boiled with castor oil or ghee, if thickly applied on painful and swollen testicles are found to be very efficacious.[20] The boiled leaves are used as a gargle for sore throat.

Fixed Oil

1. The oil is emollient and used as a cosmetic preparation and also for stopping discharge from ears. It is anti-rheumatic and compared favorably with pherylbutazone.[13]
2. The oil is said to soften the skin and remove pimples. It is useful in cases of rheumatism, convulsions, paralysis and similar complaints. It is prescribed in cases of leucoderma, boils and other skin infections.

Classical uses[21]

1) Jwara-

Karanja majja+ativisha+maricham in chanaka pramana gutika shoud be administered in jwara, atisara & anala-mardava. Karanja majja +Kana can also be given in jwara.

2) Pravahika-

Ykshalochana majja with kanjika in sashleshma atisara & koshtha shula should be given.

3) Agnimandya-

Decoction of tender bark of Yakshasya can be given in agnimandya with aja dugdha & kana.

4) Shula[22]

Only latakaranja is enough to get rid of pain or colic & haritaki,saindhava,hingu show synergistic action with it in the respective activity.

Chemical composition

Roots:- A new rearranged Cassane furanoditerpine, Caesalpinin isolated from the roots of C.bonduc. Two new cassane diterpins, named caesaldekarins were isolated & identified from roots of C.bonduc. Bonducelpins A, B, C, & D was also reported.

Diosgenin (Seroidal saponin) also occurs in the roots.

Bark:- Homoisoflavonoids Caesalpinianone Hematoxylol, 6'-o acetylloganic acid 4'- o-acetylloganic acid, Stereochenol A

Leaves: - Pinitol (4.1%) Glucose Minerals like- calcium (2%); phosphrous(0.3%) Brazilline, Bonducin.

Seed kernel

Each & every part of the plant is claimed to poses some therapeutic properties, but seed kernel alone has been

systematically studied so far.

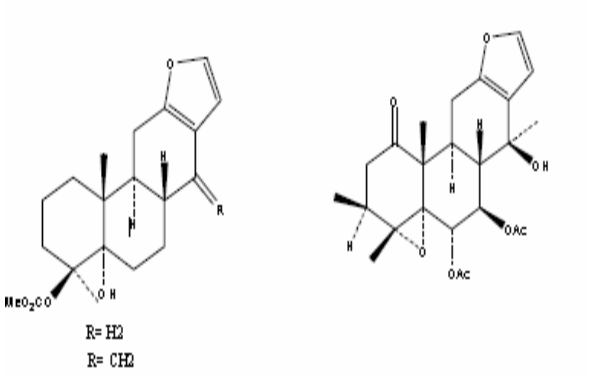
Glycosides

1st non -alkaloidal bitter principle isolated from the seed was bonducin (bonducellin).It was detected as a glycoside & was said to be sulphur containing compound. But later on the compound (C20H28O8-m.p=119.200 0C) was found to devoid of sulphur .The structural formula of bonducin (a homoisoflvone) has been well established. Saponin was reported in seed.

Number of enzymes like protease, uearse, amylase, proxidase, catalase & oxidase has been reported in the seed.

Terpenoids

Caesalpin[(C24H32O8)(1-Ketone6,7- diacycasa;mol.wt-44.512],[β caesalpin (C20H28O6) (1-ketone5,6,7,14 tetrahydroxy voucapanone;mol wt-364.438]& α caesalpin[(C34 H56O7) (o-tetradecanoyl voucapane diterpanoid;mol wt-576.812] were the 1st three bitter cassane /voucappane diterpinoids isolated from the seeds of C.bonduc.determination of the functional group,other chemical aspects,structure elucidation etc. were exhaustively studied by no of workers.δcaesalpin [(C20H30O6)(1α,5 α ,6 α ,7 α ,7β,14β-cassane)mol wt -366.453]is hydrolysed product of γ ceasalpin & a reduced product of α-caesalpin& βcaesalpin. α-caesalpin on hydrolysis yields acetic acid ,myristic acid & a crystalline bitter compound (C20H30O6). The structural relationship of α,β & γ - caesalpins with vinaticole, vouncapenic & cassaic acid have been astablished.three more caesalpins-E caesalpin,Fceasalpiin& Y caesalpin have also been isolated from C.bonduc.Y caesalpin ,a minor constituent is closely related to δ- caesalpin & F caesalpin is closely related to E- caesalpin.



Molecular structure of new compounds -Caesalpins

Reserved food material in the kernels

The kernels contains fatty oil(20-24 %); starch, sucrose, two phytosterols,one of them is identified as sitosterol,& a hydrocarbon having melting point 58-59 ^{0} C identified as heptocosane. Ghatak's investigated the presence of non-crystalline bitter glycoside bonducin,[11,23,24] a neutral saponin , starch, sucrose a enzyme & a yellow oil from seed kernels. A white amorphous bitter substance (0.03%) has been reported oil.

which is thick & pale yellow with characteristics: Saponification value:-197.9	**a disagreeable smell has the following Specific gravity:-0.926**
Acetyl value:-35.	Iodine value:-111.0
Acid value:-8.5	Unsaponified matter:-1.1%

The constituents of fatty acids are stearic ,palmitic,oleic.linoceric linoleic& a mixture of unsaturated acids of low molecular weights.

Seed kernels of C.bonduc contains proteins which varies from 7.4 to18.4%.amino acids composition was also studied by number of workers.

These are as follows:

Aspartic acid-9.5%	Glutamic acid-3.6%
Lysine-7.9%	Threonin-3.6%
Glycine-6.9%	Arginin3.4%
Leucine -6.3%	Proline3.3-%
Histidine -5.1%	L-alanine-2.5%
Isoleucine - 5.1%	Methionine-2.1%
Serine -3.8%	Phenyl alanin-1.4%
r-amino butyric acid-3.7%	Cystine-1.2%
Tyrosine -3.7%	Valine-1.2%
Citrulline -3.6%	Tryptophan-0.8%

Some of the common carbohydrates reported in the seeds are pentoan(16.8%), starch(6.1%), & water soluble mucilage (4.4%).4-o methyl muoinositol hydrate was isolated from C.bonduc grown in China.

Economic Importance

1. It helps to protect soil, furnishes cover for wild life. The seeds have been used as jewelry, prayer beeds, good luck charm They were anciently used as standards of weight in India(Vijayanagar coins 2002).
2. The species is sometimes planted as a hedge to prevent undesired entry to wild animals. Also it is used as in Indian medicine for variety of ailment.

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