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Review Article

HOLARRHENA PUBESCENS WALL EX.DON: A REVIEW ON ETHNOBOTANICAL, PHYTOCHEMICAL AND PHARMACOLOGICAL PROFILE

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ABSTRACT

Holarrhena pubescens Wall ex.Don shrub of the family-Apocyanaceae. This is found in open sandy places, and arid regions widely distributed in Indian sub-continent. The plant is used for various conditions such Kutaja herb is very useful for the treatment of dysentery caused due to amoeba. Leaves are applied over glandular swellings and are used traditionally as analgesic, anti-inflammatory and anti-diarrheal activity also in sores and piles. Its roots have contraceptive activity. Following various folk claims for the ailment of various diseases,efforts have been made by the researchers to verify the efficacy of this weed through scientific and biological screening.This article features chemical constituents, pharmacological activities and the traditional uses of H.pubescens. This compilation would pave further research on H.pubescens as an important medicinal plant.

KEYWORDS: H. pubescens, traditional uses and pharmacological properties.

INTRODUCTION

Kurchi is the dried stem bark of *H. pubescens (synonym:H.antidysenterica)* belonging to the family **Apocyanaceae**. Kurchi is also known as *Holarrhena*. **Flowering and Fruiting Time:**February-June. The Kurchi bark is collected from 8-10 years old plant. The bark of Kurchi is freed from attached wood and is peeled into small pieces.Kurchi is indigenous to India and is found at higher altitudes of 1000 metres. It is found in Himalayan region and also in the states of Orissa, Assam, Uttar Pradesh and Maharashtra [1].

HABITALS: Geographically where it grows: Asian countries up to an altitude of 1300 m and also found throughout India. It is in abundance in sub-Himalayan tract in deciduous forests and open wastelands. It is common in tropical parts of India and in sub-Himalayan tract. Grows in the tropical Himalayas at an altitude of 1,100 meters and found in Travancore, Assam and Uttar Pradesh parts of India [2].

Plant biography:

Synonym: *Holarrhena antidysenterica, Holarrhena pubescens* Will ex.Don

Family: **Apocyanaceae**

Common name:

- **Sanskri**t: Kutaja, Girimallikaa, Kaalinga, Kalingaka, Indravriksha, Shakra, Vatsa, Vatsaka,
- **English Name** - Kurchi, Conessi tree, conessi bark
- **Hindi Name –** Kuda, Kudaiya
- **Punjabi Name** - Kenara

- **Common name** - Country mallow, Heart-leaf
- **Telugu Name** - Kodisepala, Kodaga
- **Tamil Name** - Veppalai
- **Bengali Name** - Karachi, Kurachi
- **Marathi Name** - Kuda
- **Gujarati Name** - Kudo
- **Kannada Name** - Korachi
- **Malayalam Name** - Kodagapala
- **Oriya Name** - Kurei, Keruan
- **Urdu Name** - Tukhm-e-Kurchi, IndarjaoTalkh

Taxonomical classification:

Kingdom	Plantae
Subkingdom	Tracheobionta
Division	Magnoliophyta
Class	Magnoliopsida
Subclass	Asteridae

Order	Gentianales
Family	Apocynaceae
Genus	*Holarrhena*
Species	*Pubescens*

Macroscopical characters:

Size and shape Small re-curved pieces of varying sizes and thickness.**Outer surface** Buff to brownish, rough, wood sometimes attached to inner bark.**Fracture** Short and granular **Taste** Bitter **Odour** None **Smoothed Transverse Surface** Shows outer cork, wide Phelloderm containing stone cells and wide phloem with medullary ray and tangentially arranged stone cells.

Microscopical characters:

Periderm:Cork They are 5-9 layers, thin walled rectangular cells, some with yellowish matter.**Phellogen** Two layers of colourless rectangular cells.**Phelloderm** They are 5-10 layers, thin walled somewhat rectangular cells,

at times arranged in radial rows. The parenchymatous cells contain rhomboidal crystals and a few starch grains.**Cortex** They are wide, interspersed with groups of lignified, pitted, stone cells of large lumen and of various shapes (rectangular to elongate) and sizes.The cortical parenchyma surrounding the stone cells and as well the stone cells themselves contain rhomboidal crystals.Starch grains are present in cortical parenchyma.One or two groups of non-lignified pericyclic fibres are seen in the cortex.**Secondary phloem** It consists of phloem parenchyma, medullary rays and groups of stone cells arranged in tangential rows separated by medullary rays.The stone cells in the secondary phloem are encircled by a sheath of parenchyma containing rhomboidal crystals of calcium oxalate. **Medullary rays** They are 1-3 seriate, wide towards the outside and consist of thin walled radially elongated parenchymatous cells.Phloem parenchyma and medullary ray cells contain starch grains.

Phloem fibres are absent [3].

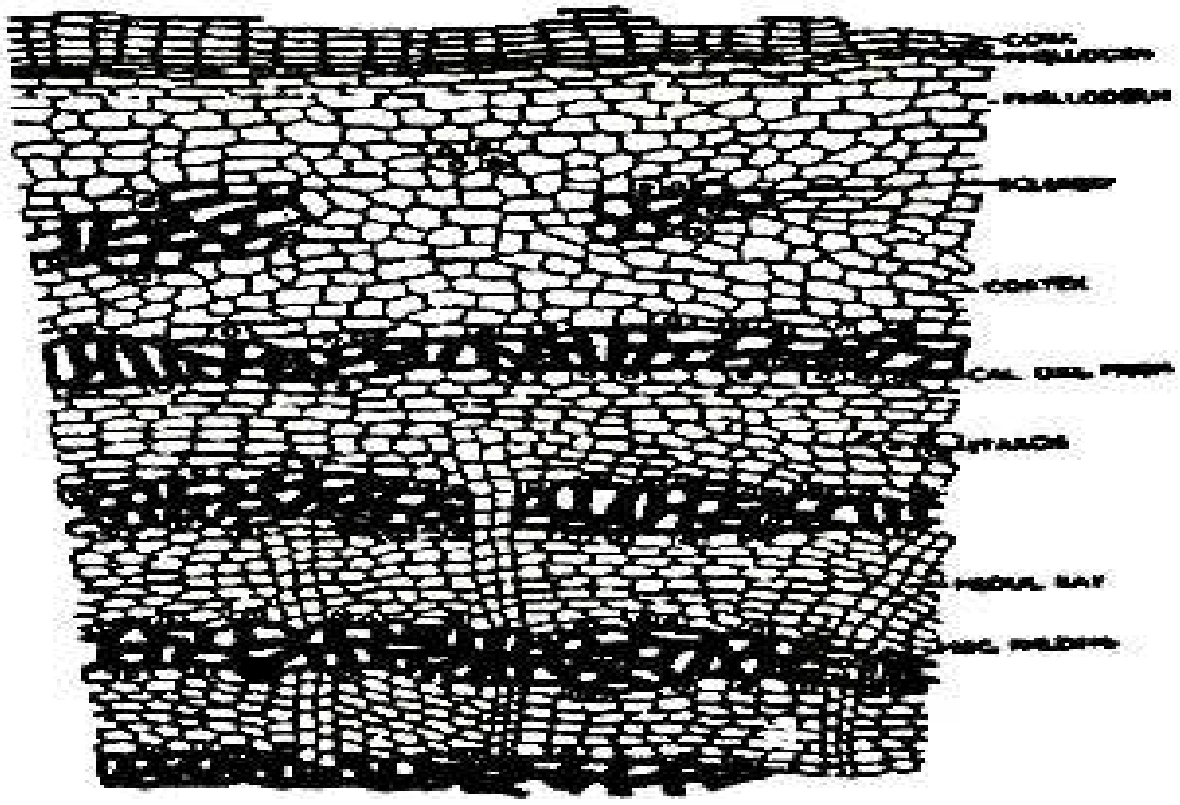


Figure: T.S of kurchi bark

Traditional use:

The H.pubescens traditionally useful in anaemia, colic pain, diarrhoea.

Seeds : Decoction beneficial in chronic dysentery and in bleeding piles. Powdered seeds mixed with honey given in chronic chest affection, asthma and colic pain.

Tridoshaghna – balances all the three Doshas
Samgrahi – absorbs moisture
Katu – pungent taste
Sheetala – coolant
Jvara – useful in fever
Atisara – useful in diarrhoea
Vatarsha – useful in Vata type of Arshas – associated with pain
Vamihara – useful in vomiting
Visarpakushtanut – useful in skin diseases including herpes

Leaves : Used in chronic bronchitis,liver disorders[4].

Bark : Useful in colitis, stomachic and tonic balances Kapha and Pitta
Raktahara –helps to detoxify blood

Samgraahika – absorbs moisture, useful in diarrhoea
Upashoshana – dries up, solidifies faeces
Raktapittahara – useful in bleeding disorders like bleeding hemorrhoids,
Hrudrogahara – useful in heart diseases
Jvara – effective in fever
Vatasruk – useful in gout,
Visarpa – useful in treating herpes
Deepana – improves digestion strength
Trut hara – quenches thirst
Pachana – relieves ama, indigestion
Kushtahara – useful in skin disease
Jantujit – useful in relieving intestinal worm infestation
Arsha – useful in bleeding disorders
Atisaraha – useful in diarrhea[5]

MORPHOLOGY

Habit : A deciduous medium-sized tree

Leaves : Opposite, ovate, oblong, thin, obtuse, pointed, subsessile

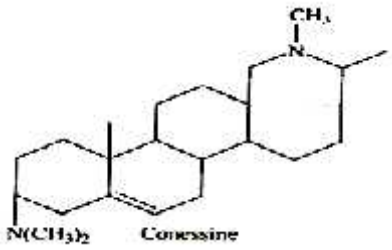
Inflorescence : Corymbose cymes

Flowers : White, scentless, bracteates, bracts small. Calyx-lobes 5, acute ciliate. Corolla salver-shaped, tube as long as lobes, hairy outside, lobes oblong, rounded, mouth without a hairy ring. Stamens 5, included. Carpels 2, free, style filiform, stigma thick

Fruit : A pair of follicles about 1.5 inches long, seeds many, comose[6]

Phytochemistry:

Around 30 alkaloids have been isolated from the plant, mostly from the bark. These include conessine, kurchine, kurchicine, holarrhimine, conarrhimine, conaine, conessimine, iso-conessimine, conimine, holacetin and conkurchin [7]. The bark contains the alkaloids, regholarrhenine-A, -B, -C, -D, -E and -F; pubescine, norholadiene, pubescimine, kurchinin, kurchinine ,kurchinidine, holarrifine, holadiene, kurchilidine, kurchamide, kurcholessine, kurchessine, conessine and isoconessimine, and the steroidal compounds kurchinicin and holadyson. The alkaloid conessine is used as a therapeutic drug for the treatment of dysentery and helminthic disorders. Conessine and conimine inhibited the growth of Shigella sonnei, S. flexneri and Salmonella enteritidis strains in vitro. In chronic amoebiasis, Bi-iodide compound of total alkaloids, given orally, compare favourably with emetine Bi-iodide. The plant possesses potent immunostimulant property [8]. Steroidal alkaloid from the seeds of *H. antidysenterica.* A new steroidal alkaloid, named antidysentericine, has been isolated from the seeds of *H. antidysenterica* and characterized as 3 beta-dimethylaminocon-5-enin-18-ones [9].



Conessine

Figure: Conessine (3 beta-dimethylaminocon-5-enin-18-ones)

Pharmacological activity:

1. Anti-bacterial Activity [10]: the investigation leaves and bark extracts (methanol and acetone) of *H. antidysenterica* were evaluated for antibacterial activity**.**

2. Anti-diarrhoeal Activity [11]: The study concluded that ethanolic extract of *H.antidysenterica* seeds effectively controlled diarrhea and decreased the severity of clinical signs of castor oil and E. coli induced diarrhea in Wistar rats

3. Protection of DNA From Radiation [12]: The indicate that under in vitro, ex vivo and in vivo conditions of radiation exposure, the extract HAE protects cellular DNA from deleterious effects of radiation and hence it may be useful to prevent genomic insults from radiation.

4. Antioxidant Activity [13]: The methanolic and water extract showed strong antioxidant activity with inhibition of more than 90% DPPH free radicals at the concentration of 100µg/mL**.**

5. Anthelmintic Activity [14]: It was concluded that seeds of *H.antidysenterica* showed potential anthelmintic activity. Further research work is needed to isolate phytoconstituent responsible for anthelmintic activity.

6. Anti-Amoebiasis Activity [15]: A daily intake of the bark powder for 15 days completelycured patients suffering from amoebiasis. Another clinicaltrial investigated the therapeutic efficacy of "Amoebin cap", amedicine for amoebiasis containing *H.antidysenterica* as one ofits constituents.

7. Anti-Inflammatory Activity [16]: Methanolic bark extract of *H.antidysenterica* demonstrated decreased nitric oxide and malondialdehyde levels and increased levels of superoxide dismutase and glutathionelevels in 2,4-Dinitrobenzene sulfonic acid induced colitis in male albino wistar rats. The rats also resisted rupture of goblet cells, inflammation in mucosal layers and inflammatory cellular infiltration.

8. Anti-Urolithic Property [17]: Crude aqueous methanolic seed extracts of *H.antidysenterica* significantly decrease the size of calcium oxalate crystals and convert them from calcium oxalate monohydrates (COM) to calcium oxalate dehydrate (COD) in vitro. The extract suppresses cell toxicity (induced by COM) and production of lactate dehydrogenase. The extract was tested in vivo in male wistar rats, which showed substantial decrease in polyurea, water intake, Ca^{++} excretion and crystal formation.

9. CNS Depressant Activities [18]: The cytotoxic CNS depressant activities of various fractions of *H.antidysenterica* leaves and seeds, found in this study, might embarkon some of the traditional medicinal uses of this plant. This evidence could be of particular interest in respect to uncover the unexplored efficacy in addition to being a potential source of chemically interesting and biologically important drug candidates.

10. Inhibition of acetylcholinesterase [19]: alkaloidal extract of the bark of *H. pubescens* showed several inhibition zones of acetylcholinesterase (AChE) inhibitor, using a bioautographic assay. Activity-guided fractionation afforded three new steroidal alkaloids, mokluangins A–C (1–3), together with three known compounds, antidysentericine (4), holaphyllamine (5), methylholaphyllamine (6). All structures were elucidated by analysis of NMR and MS spectroscopic data. Compound 2 showed moderate antibacterial activity against Bacillus subtilis and Escherichia coli with the MIC value of 16 µg/mL, while compound 3 exhibited moderate selective activity against E. coli with the MIC value of 16 µg/mL. In addition, compounds 1–4 also showed strong AChE inhibiting activity with IC_{50} values ranging from 1.44 to 23.22 µM. Molecular docking calculations were also performed and the results demonstrated that all compounds can bind at the aromatic gorge of AChE with estimated binding free energies correlated well with the in vitro inhibitory profiles. Hydrophobic and hydrogen bonding interactions contribute mainly to the binding of the alkaloids where the substituents at C-3 serving as key functional groups for the AChE inhibition. Our results will allow the development of new AChE-inhibitors based on steroidal alkaloid skeleton bearing the cyclic amide moiety.

11.Analgesic Activity [20]: the ethanolic extract of *H.antidysenterica* exhibits maximum analgesic activity at 20min at the given dose 250 mg/kg (i.p.), ($p<0.01$) and it was significant when compared with control and standard group. The chloroform extract showed a considerable activity whereas the pet ether extract activity was seen to be insignificant as compared to the standard.

12.Anti-Malarial Activity [21]: The present investigation demonstrates that the compound conessine exhibited substantial anti-malarial property. The isolated compound could be chemically modified to obtain a more potent chemical entity with improved characteristics against malaria.

13.Diuretic Activity [22]: Aqueous seed extract of *H.antidysenterica* showed a significant increase in urine output of wistar rats at dosage range of 30–100 mg/kg. A substantial increase was also observed in the amount of Na^+ and K^+ ions excreted through urine of treated rats.

14.Anti-diabetic Activity [23]: The ethanolic extract of *H.antidysenterica* seed has antihyperglycemic activity as it lo wers serum glucose level in diabetic albino rats and significantly increases glucose tolerance. It prevents weight loss in diabetic rats and corrects altered biochemical para meters e.g. serum cholesterol, triglyceride,aspartate transaminase, alanine transaminase, alkaline transferase, total protein, urea,creatinine and uric acid to near normal physiological range.This is an indication of its better metabolic control and potent antidiabetic property.Hence,further studies are required to know the exract mechanism of action and compound responsible for antidiabetic effect.

CONCLUSION

This review had shown that *H.pubescens* is a very important plant for its large number of medicinal properties as well as medicinally important chemicals like conessine (3 beta-dimethylaminocon-5-enin-18-ones) conessine, kurchine, kurchicine, holarrhimine, conarrhimine, conaine, conessimine, iso-conessimine, conimine, holacetin and conkurchin etc. The plant have many traditional uses in anaemia, colic pain, diarrhoea, haematuria, menorrhagia, obstetric conditions, spermatorrhoea, splenomegaly, Decoction beneficial in chronic dysentery and in bleeding piles. Powdered seeds mixed with honey given in chronic chest affection, asthma and colic pain, chronic bronchitis, liver disorders, colitis, stomachic and tonic etc. However very less work has been on this plant & there is further more scope of scientific investigation.

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