An Overview: Holarrhena antidysenterica

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Abstract
Background- Roots of the Ayurvedic system are plants. Plants have been used for thousands of years to treat various illnesses. There are several phytoconstituents in plant components. Secondary metabolites with pharmacological characteristics are produced by plants. portions of trees, shrubs, flowers, fruits, and bark that are used to make medicines. Since plant-based medicines are highly potent, easy to consume, and have fewer adverse effects, the majority of people utilized them in the past. One significant herb in that is Holarrhena antidysenterica. It is typically used to treat dysentery. It exhibits a wide range of pharmacological traits. Every component has unique pharmacological characteristics. It has tannin, saponin, alkaloids, and flavonoids, etc.

Keywords: Holarrhena anti-dysenterica, Alkaloids, Secondary product, phenolic compound.

1. Introduction

Plants and plant-derived products has been utilized as medicines since the dawn of human civilization. The "Rigveda," which was composed between 4500 and 1600 B.C., contains the first recorded mention of plants being used as medicine in Hindu culture. Worldwide, medicinal plants have significant economic worth. A significant portion of the populace in underdeveloped nations continues to utilize traditional folk medicine made from plant materials. The mixtures of secondary products found in plants provide plant materials their positive therapeutic effects. The majority of these substances found in plants are secondary metabolites that have specific physiological effects on the body, including alkaloids, tannins, phenolic compounds, flavonoids, resins, fatty acids, and gums etc (1).

In historical Ayurvedic formulations such as Kutajarishta, Kutajavleha, Kutajghan vati, Mahamanjishtadi Kashayam, Stanyashodhana Kashaya, and Patoladi Choornam, the plant *Holarrhena antidysenterica* is employed. Bhunimbadi Churna is a group of nine drugs mentioned in the Brihat Bhaishajya Ratnakar for their use in treating fever, jaundice, anemia, and diabetes.

Holarrhena antidysenterica is traditionally known for curing Pravahika (amebiasis), Atisara (diarrhea), Jwaratisara (secondary diarrhea), Asra (blood or blood-related disorders), Kustha (skin disorders), and Trsna (thirst) (2).

Taxonomical Classification of *Holarrhena Antidysenterica*(3)

Kingdom	**Plantae**
Subkingdom	Tracheobionta
Division	Magnoliophyta
Class	Magnoliophyta
Subclass	Asteridae
Order	Gentianales
Family	Apocynaceae
Subfamily	Apocynoideae
Genius	Holarrhena
Species	Antidysenterica

Botanical Name and Varieties (3)

Sr. No.	**Varieties**
1	*Holarrhena antidysenterica* (Linn.) Wall. exA. DC.
2	*Wrightia antidysenterica* (Linn.) R.Br.,
3	*H. pubescens* (Buch. -Ham.) Wall. ex-DC *Wrightia tinctoria* R. Br
4	*Wrightia tomentosa* Roem. & Scult.

Regional Names (4)

Languages	**Names**
Hindi	Kutaja, Kurchi
Guajarati	Kadavo Indrajav
Punjabi	Kewer, Keor
Telugu	Girimallika,
English	Tellicherry Bark
Sanskrit	Indrayava, Kutaja

2. Varieties

H. antidysentrica is a tiny deciduous tree that grows throughout India's dry woods. It has cream-white blooms. The indigenous medical system makes use of all the plant's parts. It is utilized to treat helminthic, astringent, diarrheal, and hemostatic illnesses.

W. tomentosa is a rare medicinal tree with numerous medical applications that is listed in category I of Red Data. In traditional medicine, W. tomentosa is frequently used to treat snake bites, arthritis, fever, stomachaches, and toothaches.

The deciduous *Wrightia tinctoria* R. Br. tree is a small to medium-sized tree that grows throughout India. It has historically been referred to as the "Jaundice Curative Tree" in South India. The plant is commonly known as Paalai, or "Sweet Indrajao." According to Deventhiran *et. al.,* (2016), the herb is useful in treating stomachic disorders, treating abdominal pain, and preventing diarrhea and hemorrhagic episodes.

The primary isolated chemicals from this plant's seeds, leaves, and bark are wrigatiadione, cycloartenone, cycloeucalenol, indigotin, indirubin, tryptanthrin, isatin, rutin, β-sitosterol, and β-amyrin. reviewed W. tinctoria's phytochemical, pharmacological, and pharmacognostical profile and highlighted its anti-diabetic, anti-HIV, and anti-cancer effects (5).

2. Economic Importance

With USD 1644 in exports, the United States is the biggest importer of Kutaja. From 2014 to 2016, USD 961 and USD 360 worth of Kutaja were imported by Canada and Singapore, respectively. During this time, India exported Kutaja for USD 3382 (2).

3. Qualitative Phytochemical Analysis (6)

Several chemical tests were conducted on the aqueous extracts of *Holarrhena antidysenterica* to identify phytoconstituents such as carbohydrates, alkaloids, proteins, amino acids, tannins, phenolics, saponins, and steroids (Table 1).

Table 1: Qualitative Phytochemical Analysis

Phytoconstituents	Chemical Test
Tests for Carbohydrates	Carbohydrates were tested using Benedict's test, Fehling's test, the Molisch test, and Barfoed's test.
Tests for Alkaloids	Alkaloids were tested using Dragendorff's test, Wagner's test, Mayer's test, and Hager's test.
Tests for Proteins and Amino acids	Tests such as the Biuret test, Xanthoprotein test, Lead Acetate test, and Ninhydrin test were used to analyse proteins and amino acids.
Tests for Tannins and Phenolics	To test for tannins and phenolics, 2-3 drops of ferric chloride were added to 1 ml of extract. The formation of a dark blue or greenish-black colour indicated the presence of tannins.
Tests for Steroids	The steroids were tested by using Liberman Burchard test, Salkowski test and Liebermann's reaction.

4. Leaves

4.1 Botanical Description

The size of the leaves is 15-30 cm x 4-12 cm. Its base is often rounded or sharp and is obtuse. Ten to fourteen pairs of opposing, sessile nerves make up leaves. Its cymes measure between 3 and 6 cm in diameter and its petioles measure 1.5 cm (Figure 1) (7).

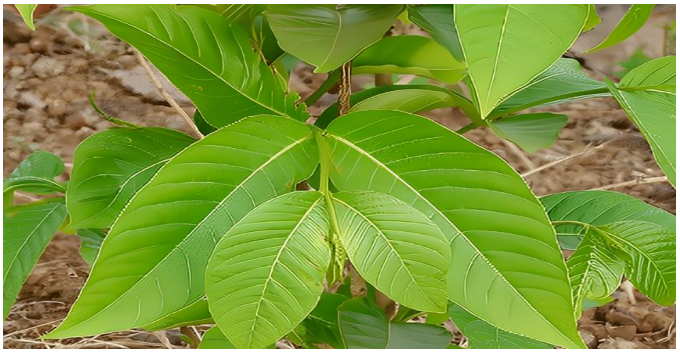

Figure 1: Leaves of *Holarrhena antidysenterica*

4.2 Alkaloids Present in Leaves (3)

Holantosine-A (C28H47NO6), Holantosine-B (C28H45NO5), Holanto sine-C (C28H47NO6), Holantosine-D (C28H45NO5), Holantosine-E (C28H47NO6), Holantosine-F (C28H45NO5), Holarosine A (C30H47 NO6), Holarosine B (C30H47NO6), Holarricine (C21H32N2O3),3 Kurchiphyllamine, Kurchaline,11Kurchiphylline (C23H47NO2).

4.3 Extract Preparation

The powdered leaves were subjected to a 48-hour Soxhlet extraction process using petroleum ether (60–80°C), ethanol, and chloroform in sequential order. The concentrated extract was then stored in an airtight bottle after recovering the solvent with a rotary vacuum evaporator (9).

4.4 Pharmacology of Leaf

1) The leaves of *Holarrhena antidysenterica* have analgesic properties (9)

2) Alpha glucosidase activity is inhibited by H. antidysenterica leaf extract, which reduces intestinal system 12's absorption of carbohydrates (10)

3) The in vitro cytotoxic activity of the ethanolic, hydroalcoholic, and aqueous extract of the leaves of *Holarrhena antidysenterica* against 14 human cancer cell lines, namely A549, COLO-205, DU-145, HeLa, HEP-2, IMR-32, KB, MCF-7, NCI-H23, OVACAR-5, SiHa, Sk-N-MC SW-620, and ZR-75-1, is also used for liver infections and chronic bronchitis. from cells found in nine distinct tissues: neural, ovarian, cervical, colon, lung, liver, and central nervous system (1)

5. Bark

5.1 Botanical Description

The plant has smooth or rough stem bark that ranges in colour from pale brown to greyish brown. It peels off in random areas and has a bitter taste. The colour of the root bark is reddish-brown (Figure 2) (7).

Figure 2: Bark of *Holarrhena Anti-dysenterica*

5.2 Alkaloids Present in Bark (3)

Holarrifine (C24H38N2O2), Kurchamide, Kurcholessine,7 Trimethylconkurchine (C24H38N2),-N-Methylholarrhimine (C22H38N2O), N-Methylholarrhimine (C22H38N2O), NNN’N0-Tetramethylholarrhimine (C25H44N2O), Conessidine (C21H32N2),

Holarrhidine (C21H36N2O), Kurchenine (C21H32N2O2), Holarrhessimine (C22H36N2O), Holarrhine (C20H38N2O3), Conkurchi nine (C25H36N2), Kurchamine (C22H36N2), 7a-Hydroxyconessine (C24H40N2O),Kurchilidine (C22H31NO), Neoconessine (isomer of conessine) (C24H40N2), Holadysenterine (C23H38N2O3), Kurchessine (C25H44N2), Lettocine (C17H25NO2), Kurchimine (C22H36N2), Holarrhenine, Holarrhimine/Kurchicine (C21H36N2O), Holacine (C26H44N2O2),Holafrine (C29H46N2O2), Holadysone (C21H28O4), Holacetine (C21H32N2O3), 3a-Aminoconan- 5-ene (C22H36N2), Dihydroisoconessimine (C23H40N2), Conamine (C22H36N2), Conkurchine (C20H32N2), Pubadysone (C21H26O3), Puboestrene (C20H24O3), Pubamide (C21H27NO3),Holadiene (C22H31NO), Kurchinidine (C21H29NO2), Kurchinine (C19H24O3), Pubescine (C22H26N2O4), Norholadiene (C21H29NO), Pubescimine (C24H40N2O), Holonamine, Regholarrhenine A (C22H31NO2), Regholarrhenine B (C21H29NO2), Regholarrhenine C (C22H34N2),4 Regholarrhenine D (C23H38N2O), Regholarrhenine E, Regholarrhenine F.

Table 2: Extractive Values of *H. antidysenterica* Stem Bark (11)

Sr. No.	Solvent	Values in Percentage
1	Petroleum ether (b.p. 60-80°)	1.60
2	Benzene	1.20
3	Chloroform	0.60
4	Acetone	4.49
5	Ethanol	5.26
6	Distilled water	13.72

5.3 Pharmacology OF Bark

1) Extracts from *Holarrhena antidysenterica's* stem bark Pathogens (Staphlococcus aureus, Salmonella typhi, and Escherichia coli) were inhibited by wall, albeit the efficiency of these inhibitors varied depending on the solvent. Among other antibacterial extracts, the ethanol extract had the highest level of efficacy against Staphylococcus aureus (12).

2) In Ayurvedic medicine, the bark is commonly used to treat spleen ailments, biliousness, leprosy, piles, and diarrhea. It is also used for headaches, piles, and excessive menstrual flow. In Unani medicine, the bark is used to treat dyspepsia, diarrhea, dysentery, asthma, bronchopneumonia, malaria, and chest infections (10).

3) A steroidal alkaloid called conessine, which was extracted from the bark of *H. antidysenterica*, had strong anti-malarial activity while posing little cytotoxicity (10)

4) Its bark aids in blood detoxification (10)

6. Seeds

6.1 Botanical Description

The seeds are linear to oblong, 1-2 cm long, light brown to brownish in hue, and exhibit epigeal germination. They can also be long, coma-shaped, or boat-shaped. The apex of the seeds has short-lived hairs (Figure 3) (7).

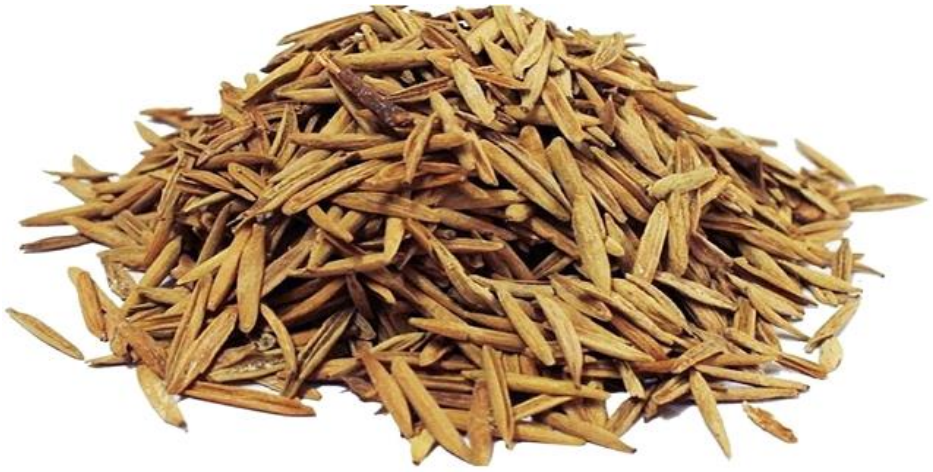

Figure 3: Seeds of *Holarrhena antidysenterica's*

6.2 Alkaloids Present in Seeds (3)

Seeds: Conimine (C22H36N2), Antidysentericine (C23H36N2O)

From both stem bark and seeds: 20-Aminoconananines, 3-Aminoconananines, 3,20-Diaminopregnanes, 3-Aminopregnans, Conanines, Conarrhimine [C21H34N2], Conessimine/Isoconessimine [C23H38N2], Conessine [C24H40N2], Isoconessine [C24H40N2] and their derivatives. A new steroidal alkaloid was also extracted, characterized and named as holadysenterine

6.3 Pharmacology of Seeds

1) *H. antidysenterica* seed ethanolic extract works well against both infected and non-infectious diarrhea (13).

2) The hydro-methanolic extract derived from seeds has antihyperglycemic properties by delaying the absorption of carbohydrates from the intestine by inhibiting α-glucosidase activity. Consequently, it prevents postprandial hyperglycemia (14).

3) H. antidysenterica crude aqueous methanolic seed extracts dramatically reduce the size of calcium oxalate crystals (15).

4) In Ayurvedic medicine, the seeds are used as an astringent and anthelmintic to treat bleeding piles, fatigue, leprosy, biliousness, and dysentery (10).

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