



RECENT ADVANCES ON THE PHYTOCHEMICAL AND PHARMACOLOGICAL PROFILE OF PLANT *HELICTERES ISORA* LINN.

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ABSTRACT

In India, use of different parts of several medicinal plants to cure specific ailments has been in vogue from ancient times and inherited traditionally. The fruits of *Helicteres isora* Linn (Sterculiaceae) have been used in the indigenous system of medicine in India for the treatment of griping bowels and diarrheal diseases. The roots and the bark are expectorant, demulcent, hypoglycemic and useful in colic, scabies, gastropathy, diabetes, diarrhoea and dysentery. The fruits are astringents, refrigerant, stomachic, vulnerary and useful in griping of bowels, flatulence of children and antispasmodic. The barks of *H. isora* showed prominent antimicrobial activity against *Staphylococcus aureus*, *Bacillus subtilis*, *Pseudomonas aeruginosa* and *Escherichia coli* and fruits against *Candida albicans*. The presence of flavones, triterpenoids, cucurbitacin, phytosterols, saponins, sugars and phlobatannins were demonstrated in roots and barks *H. isora* L. The use of medicinal plants in India contributes significantly in primary health care and it is interesting to determine whether actual pharmacological effects support the traditional uses or merely based on folklore. The review revealed that the fruits of *H. isora* L. were used in diarrhoeal infection and it is anti-candidal but so far no information on antibacterial activities of fruits of *H. isora* is available hence, attempt was made to find out phytochemical contents and antibacterial potentials of fruits of *H. isora* against diarrhoeal/enteric bacterial pathogens.

KEY WORDS: *Helicteris isora* Linn; Antimicrobial activity; Phytochemical creening; Pharmacology; Hypolipideamic.

INTRODUCTION

Botanical Name: *Helicteres isora* Linn

Family: Sterculiaceae

Nomenclature:

English - East Indian Screw Tree

Sanskrit- Avartani, Mriga-shinga

Hindi-Marophali, Jonkaphal, Bhendu

Marathi- Kewan, Murudsheng

Gujarati-Murudsheng

Bengali-Atmora¹

Habitat

The plant grows often gregariously, throughout India, from Jammu eastwards to Nepal, Bihar and Bengal and Southwards in Central, Western and Southern India and Andaman islands. It occurs as an undergrowth, especially as a secondly growth in forests. In some places as in the Siwalik tract in U.P, it forms dense, almost impenetrable thickets covering large areas practically to the exclusion of other growth. It is also distributed in Malaya, Phillipines, Australia and West Indies.

Description

It resembles the common hazel and is a sub-deciduous shrub or a small tree with stem 1-2 inches in diameter and reaching a height of 5-15 feet². Two varieties of the plant are distinguished, variety tomentosa, in which the underside of the leaves is glabrous (distributed mostly in northern and central India) and variety glabrescens, in which both sides of leaves are nearly glabrous (distributed in southern India)¹

Bark

The plant is covered with grey bark and young shoots are clothed with stellate hair³

Leaves

They are simple, alternate, bifarious, 7.5-12.5 by 5-10 cms, oblong, ovate or obliquely cordate and shortly acuminate, closely dotted on both surfaces with stellate hair, margin is serrate, scabrous above and pubescent below³. Petiole is 6-9mm long and stipule is subulate 6mm long.^{3,4}

Flowers

They are solitary or in sparse clusters of 2-6 which appear in the rainy season (August-December). They are red in colour and turn pale blue when old or leaden blue when attacked by insects⁵. They are 2.5-3.8cm long, distinctly bilabiate, pedicels are very short, stellately tomentose, bracts small, subulate, hairy, calyx tubular 2cm long, 2 lipped. Petals are closely hooked together. Staminal column is fused with the gynophores. 10 anthers are present in a ring round the ovary which is conical and placed on a curved gynophores. Style is as long as the ovary and deflexed.⁴

Fruits

Commonly called as Mrigashringa in Sanskrit where the name is derived from 'Mriga' meaning 'deer' and 'shringa' meaning horn, from the twisted form of the carpels². They are 5.0-6.3 cm long, greenish-brown, linear. They ripen in March. The fruits is anterior of 5 follicles twisted together like a corkscrew born at the tip of along gynophor. The pericarp shows a brown epicarp and stellate lignified trichomes along with lysigenous mucilage cavities. The mesocarp and endocarp consist of fibres. The testa sows rectangular thin-walled cells, followed by lignified palisade cells and a row of brown pigment cells. The endosperm and embryo are parenchymatous and show the presence of aleurone grains and oil^{4,6}.

Seeds

Each follicle contains 15-28 seeds placed in a row which are brown black in colour, rhomboid, highly polished². When the fruits ripen, they untwine and scatter the seeds contained in them.¹

PHYTOCHEMISTRY

Root

Chemical studies conducted on the roots by Qui Wenhao et.al.⁷ resulted in the isolation of six compounds. Four of them were identified as β -sitosterol, betulinic acid, oleanolic acid and daucosterol. The fifth is a novel triterpenoid identified as 3-oxo-27-acetoxy-olean-12-3n-28 oic methyl ester named as

isorin. The sixth is a new natural compound, 3 β ,27 diacetoxy-lup20(29)-en-28-oic methyl ester.

In another study, Mark F.Bean et al.⁸ reported the presence of two potent cytotoxic compounds, cucurbitacin and isocucurbitacin B in the dried roots. Their identification was done by physical and spectral data.

A preliminary chemical examination showed the presence of saponins and the absence of alkaloids and flavonoids⁹.

Stem Bark

Chemical investigations done by N.Saraswati Bai,¹⁰ led to the identification of chloplast, pigments, phytosterols, hydroxy carboxylic acid, orange-yellow colouring matter, saponins phlobotannis, sugar and lignins. According to a preliminary chemical examination conducted by Kapoor et.al.⁹ alkaloids and flavonoid were absent. Strong greenish-white fibre with a pearly luster is present in the inner bark of the plant and is polygonal in cross-section with a circular or oval lumen. These are arranged as zones of the soft tissue in the phloem region. The el wall is thick and lignified and chemical analysis showed the presence of ash, cellulose, lignin, fats and waxes and nitrogen.^{1,5}

Leaves

Singh S.H.et al.¹¹ isolated four crystalline compounds, from the hexane extract of the leaves. These were identified as tetratriacontany l-tetratriacontanoate, tetratriacontanoic acid, Tetratriacontanol and sitosterol, from the basis of their spectral data; physical tests and hydrolytic studies.

Another study by Ramesh et.al.¹² resulted in the isolation and characterisation of a new flavones methyl ether, 7,4¹ di-O-methyl isoscutellarein i.e.(5,8-dihydroxy-7,4¹dimethoxy flavones) along with Kaempferol-3-o-galactoside(trifolin) and herbacetin-8-o-glucoronide (hibifolin) from the leaves of *Helicteres isora*.

A preliminary screening undertaken by Kapor et.al.⁹ showed the absence of saponins, alkaloids and flavonoids.

Fruits (pods)

Analysis of the pods, long ago by Dymock led to the inability to determine any active principle. However on reanalysis by Department of Chemistry, Calcutta School of Tropical Medicine, demulcent substances and tannins were found to be present¹³.

A preliminary investigation conducted by Nair S. and Grampurohit,N.D.¹⁶ on the phytoconstituents of the pericarp of the fruits showed the presence of volatile oil 0.8% w/v, phenolic compounds and tannin, flavonoids, gums and mucilage and carbohydrates.

Seeds

A study by Barik et.al.¹⁷ resulted in the isolation of diosgenin, a steroidal drug intermediate in yield of 0.33%. This was confirmed by spectral methods and physical tests. Although this yield is not worthy of commercial exploitation, the major advantage is that diosgenin obtained in not admixed with other sterod sapogenins like in other sources.

A preliminary study of phytoconstituents of seeds by Nair S. And Grampurohit N.D.¹⁶, showed the presence of phytosterols, fixed oils and fats, phenolic compounds and tannins and amino acid and carbohydrates.

A study of the powdered whole plant by Zafar-ul-Ahmad¹⁸ afforded the presence of 4-quinoline alkaloids viz. malatyamine. The structure was confirmed by spectral methods. This is the first report from the plant source.

A preliminary study of phytoconstituents of fruits and bark by Gayathri Devi S.et.al., showed The fruit and bark are said to possess several medicinal values. Hence the present study was designed to screen and quantify selected phytochemicals

(polyphenols, tannins, total carotenoids, flavonoids) and proximate principles (carbohydrates, protein, fibre, minerals such as calcium, phosphorus and iron). Results indicate that the fruit contained more amounts of polyphenols (317.7 mg/100g), ascorbic acid (80.0 mg / 100g) and carotenoids (1.7 mg / 100g) than the bark. The bark contained more amounts of tannins (205.1mg / 100g), flavonoids (42.0 mg / 100 g), α -tocopherol (44.0 mg / 100g) and reduced glutathione (184.6 mg / 100g) when compared to the fruit.¹⁹

PHARMACOLOGICAL EFFECTS OF EXTRACTS OBTAINED FROM *HELICTERES ISORA* LINN.

Antidiabetic Activity:²⁰

Ranjan Chakrabarti et al evaluate Antidiabetic and hypolipidemic activity of *Helicteres isora* in animal models. Ethanolic extract of H. Isora root caused significant reduction in plasma glucose, triglyceride and insulin levels at 300 mg/kg dose after 9 days of administration to insulin resistant and diabetic C57BL/KsJdb/db mice.

M. Rajasekara Pandian et al have shows Hypoglycaemic effect of *Helicteres isora* bark extract in rats. The hypoglycaemic effect of the aqueous extract of the bark of *Helicteres isora* L. (Sterculiaceae) was investigated in normal, glucose load conditions and streptozotocin (STZ)-induced diabetic rats.

Hypolipidaemic activity:²¹

G. Kumar, and A.G. Murugesan estimated the the hypolipidaemic effect of an aqueous extract of the bark of *Helicteres isora* was investigated in streptozotocin (STZ)-induced diabetic rats. Administration of the bark extract of *Helicteres isora* (100 and 200 mg/kg b.w.) for 21 days resulted in significant reduction in serum and tissue cholesterol, phospholipids, free fatty acids and triglycerides in STZ diabetic rats.

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Anti-oxidant activity:²²⁻²³

P.K. Basniwal et al. Was envestigated the aqueous (hot) extract of H.isora Linn.(AEHI) exhibited strong antioxidant activity by inhibiting nitric oxide and scavenging superoxide anion and hydrogen peroxide radicals when compared with different standards such as L-ascorbic acid, quercetin and rutin.

S. Gayathri Devi et al, have shown a strong *in vitro* antioxidant activity of the methanolic extract of both fruit and bark of *Helicteres isora*. Therefore, it can prevent cells against oxidative damage and toxic effects of ROS and control several diseases. However, further studies are required to reveal *in vivo* antioxidant activity of *Helicteres isora* and its potential for therapeutic use.

Antinociceptive activity:²⁴

Sama Venkatesh et al *Helicteres isora* root extracts were studied for antinociceptive activity on acetic acid-induced writhing test in mice, at a dose of 250 mg/kg. Petroleum ether, chloroform and aqueous ethanol extracts have shown significant activity.

Hepatoprotective activity:

K. Gayathri et al a preliminary biochemical screening of *Helicteres isora* l. stem bark in carbon tetrachloride induced toxicity in rats. The potential efficacy for hepatocellular regeneration of the ethanolic extract of *Helicteres isora* L. at

doses of 150 and 250 mg/kg was investigated in CCl₄-induced hepatic damage in rats for 21 days.

Antibacterial activity:²⁴⁻²⁵

S.Venkatesh et al have shows Antimicrobial activity of *Helicteres isora* Root. Y.S.Banginwar et al evaluated that evaluation of phytochemical and antibacterial potential of *helicteres isora* l. fruits against enteric bacterial pathogens. The fruit aqueous extracts of *H. isora* showed prominent antibacterial activities against *E.coli*, *Staphylococcus epidermidis*, *Salmonella typhimurium* and *Proteus vulgaris*; moderate activity against *Enterobacter aerogenes*, *Staphylococcus aureus*, *Salmonella typhi* and least activity against *Pseudomonas aeruginosa*.

Cardiotonic activity:²⁶

Dama G.Y.et al studied that comparative cardiotonic activity of *Helicteres isora* with digoxin on isolated frog heart. It is

interesting to know that *Helicteres isora* has rapid onset of action compared to Digoxin.

These preliminary studies confirm the better cardiotonic activity of *Helicteres Isora* and it can stand as better option for digitalis. Further studies can confirm the reduced toxicity & this will be the advantage of *Helicteres Isora* over digitalis.

CONCLUSION

Various bioactivity studies of *Helicteres isora* Linn plant derivatives are at the preliminary level requiring further studies to delineate the mechanism of action. Only few studies shed light in the mechanism of action in details. This review provides outlook on various aspect that need to be done to carry forward the available information in developing suitable clinical therapeutics out of plant *Helicteres isora* Linn.

TABLE 1: PHYTOCHEMICAL SCREENING OF THE FRUIT AND BARK OF *HELICTERES ISORA*

SR.NO.	PHYTOCHEMICALS	OBSERVATION	INFERENCE
1.	Carbohydrate	Reddish violet ring at the junction of two liquids was obtained in Molisch's Test	+
2.	Proteins	Violet color obtained in biuret reaction and deep orange color developed in xanthoproteic reaction	+
3.	Polyphenols	Blue color developed with ferric chloride	+
4.	Tannins	White precipitate with lead acetate was obtained	+
5.	Flavonoids	Deep blue color	+
6.	Alkaloids	Yellow brown precipitate	+
7.	Saponins	A honey comb like froth formed	+
8.	Steroids	The upper layer red and the sulphuric layer showed an yellow color with a green fluorescence	+



FIGURE 1: FRUITS OF PLANT *HELICTERES ISORA* LINN

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