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Review Article

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-candidial 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
Sanskirt- Avartani,Mriga-shinga
Hindi-Marophali, Jonkaphal,Bhendu
Marathi- Kewan,Murudsheng
Gujarati-Murudsheng
Bengali-Atmora[1]

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 islans. 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 feet[2]. Two varieties of the pant 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 glabous (distributed in southern India)[1]

Bark
The plant is covered with grey bark and young shoots are clothed with stellate hair[3]

Leaves
They are simple, alternate, bifarious, 7.5-12.5 by 5-10 cms, oblong, ovate or obliquely cordate and shortly accuminate, closely dotted on both surfaces with stellate hair, margin is serrate, scabrous above and pubescent below[3]. Petiole is 6-9mm long andstipule 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 insects[5]. They are 2.5-3.8cm long, distinctly bilabitate, 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 carpels[2]. 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 tipofalong gynophor. The pericarp shows a brown epicarp and stellate lignified trichomes alongwith 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[456].

Seeds
Each follicle contains 15-28 seeds placed in a row which are brown black in colour, rhomboid, highly polished[2]. 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, betulic acid, oleanolic acid and daucosterol. The fifth is a noel triterpenoid identified as 3-oxo-27-acetoxy-olean-12-3n-28 oic methyl ester named as

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

In another study, Mark F.Bean et a.*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 flavonoids[9].

Stem Bark

Chemical investigations done by N.Saraswati Bai,[10] led to the identification of choloplast, 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, 7,4[1] di-O-methyl isoscutellarein i.e.(5,8-dihydroxy-7,4[1]dimethoxy 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, demulscent substances and tannins were found to be present[13].

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 o.33%.This was confirmed by spectral methods and physical tests. Although this yield is not worthy of commercial exploitation, the majour 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-Ahmad[18] afforded the presence of 4-quinoline alkaloids viz. malatyamine. The structure was confirmed by spectral methods. This is the first repport 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 *Helicteries 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

REFERENCES

1. The Wealth of India. Raw Materials; CSIR publication 1969;5: 25.
2. Khory R.N.an Katrak N.N, Materia Medica of India and their therapeutics,Neeraj Publlishing House,1981:104.
3. Vaidyaratnam P.S. andWarrier P.K, Indian Medicinal Plants-a compendium of 500 species, Orient Longman1995;3:132.
4. Kirtikar K.R. and Basu B.D., Indian Medicinal Plants, published by Lalit Mohan Basu;2nd edn,1975;1:371.
5. Talbot W.A., Forest Flora of the Bombay Presidency and Sind,Published by M.S.Bishen Sigh,Mahendra Pal Sigh,19091:146.
6. Deshmukh V.K.and Pandit U.Study of Helicteres isora Linn,Indian Journal of Pharmacy,1968;30(12):283.
7. Qui Wenhao,Li, Jingrong and Wang Mungshi; Chemical studies on H.isora Linn,Zhangguo Yaoke,Daxue xuebao,1991;22(4):203-206.through CA 1992;116:12485.
8. Bean M.F, Antoun M., Abramson D., Ching-Jer-Chang, Mc.Laughin J. And cassdy J.M.;Cucurbitacin B and Isocucurbitacin B: Cytotoxic Compounds of H.ispra, Journal of Nature Products,1985;48:500.
9. Kapoor et-al. Survey of Indian plants for saponins,alkaloids and flavonoids- II,Lloydia,34,p94 through Satyavati G.V., Medicinal plants of India,ICMR,2; 7.
10. N.Saraswatiibhai; Chemical investigations of the stem bark of H.isora; Bulletin of Central Research Institute,Univ. Travancore, Trivandrum, Sec A-3,1954:89-103 through CA, 1995;49:91051.
11. Singh S.B., Singh A.H. and Thakur R., Chemical constituents of the leaves of H.isora; Indian Journal of Pharmaceutical Sciences,1984;46(4):148-149 through MAPA,1984;6(6):8406-2920.
12. Ramesh P. And Yuvarajan C.R., A new flavones methyl ether from H.isora,Journal of Natural Proucts 1995;58(8):1242-1243.through CA,1995;123:251397.
13. Chopra R.N., Chopra I.C.,Honda K.L.,and Kapur L.D.,Indigenous drugs of India, Academic Publishers,2nd ed;1958:340.
14. Al-Yahya M.A., Phytochemical studies of the plant used in traditional medicine of Saudi Arabia,Fitotherepia,1986;105:149776.
15. Dan S. and Dan S.S., Chemical investigations in the family sterculiaceae, Fitotherepia,1988;59(4):348-349 through CA,1989;111:4258y.
16. Nair S. And Grampurohit N.D., Studies on an ayurvedic drug; Helicteres isora Linn, M.Pharm.Thesis submitted to S.N.D.T. Womens university,1996.
17. Barik B.R., Dey A.K. and Das P.C.H.isora Linn-a new source of diosgenin Indian Journal of Chemistry,1982;4(1):8204-0237.
18. Zafar-ul-Ahmad, Malatyamine from H.isora,Indian Drugs,1986;24(8):404 through MAPA,1987;9(5):8705-2869.
19. Gayathri P ., Gayathri Devi S ., Sivagami Srinivasan., Saroja S. Screening and Quantitation of Phytochemicals and Nutritional Components of the Fruit and Bark of *Helicteres Isora.* HYGEIA. J .D.MED**.** Vol.2, No.1 March-Aug, 2010: 57-62.
20. Chakrabarti.R, Reeba K, Vikramadithyan.R.M.,Sharma V.M, Jagadheshan. N, Rao Y.N, Sairam P, Rajagopalan R, Antidiabetic and hypolipidemic activity of Helicteres isora in animal models,Journal of Ethnopharmacology 81;2002:343-349.

21. Kumar G, Murugesan A.G, Hypolipidemic activity of Helicteres isora L.bark extracts in stretozocin induced diabetic rats,Kournal of Pharmacology 116(2008) :161-166
22. P.K.Basniwal,M.Suthar,G.S. Rathore, R.Gupta, V.Kumar,A.Pareek and D.Jain.Invitro antioxidant activity of hot aqueous extract of Helicteres isora Linn.Fruits,Natural Product Radiance,Vol.8(5),2009,483-87.
23. S.Gayathri Devi., S. Srinivasan., and S.Saroja., Plant Archives Vol.10 No.2; 2010:733-735.
24. S. Venkatesh., K.Sailaxmi., B.Madhara Reddy, M.Ramesh,Antinoceceptive activity of Helicteres isora , fitoterapia 78;2007:146-148.
25. D.H.Tambekar., B.S.Khante., B.K.Panzade., S.B.Dahikar and Y.S. Bangiwar,Evaluation of phytochemical and antibacterial potential of Helicteres isora Linn. Fruits against enteric bacterial Pathogens,Afr.J.Trad.CAM,2008;5(3):290-293.
26. Dama G.Y., Tare H.L., Gore M.S., Shende V.S., Deore S.R., Khandagale S.T., Kandekar A.E., Camparative Cardiotonic Activity of Helicteres Isora with Digoxin on isolated frog Heart, International Journal of Preclinical Research Vol-2,issue-2,Jul-Dec;2011:81-86.