

ETHNO-MEDICINAL, PHYTOCHEMICAL AND PHARMACOLOGICAL INVESTIGATION ON *RA'I IBL* (*HELICTERES ISORA* LINN.) -A PERSUASIVE UNANI MEDICINAL PLANT

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Abstract:

Herbal Medicines are being used since time immemorial in organized and unorganized form such as tribal, native & folk forms. *Ra'i Ibl* (*Helicteres isora*) is a medical plant used in Unani System of Medicine, which grows in Central and Western India, Peninsula and Ceylon as far as west Jammu, eastward to Nepal, Bihar and Bengal. It is commonly known as Altwallatu/ Kisht ba'r Kisht/ Deer's Horn. It is also known as Marorphali due to screw like appearance of its fruit. Fruits are useful in intestinal disturbances such as colic, griping of bowels, flatulence and diarrhea in children.

H. isora is a rich source of antioxidants, carbohydrates, protein, fiber, calcium, phosphorus and iron. Active phyto-constituents include gallic acid, caffeic acid, vanillin and p-coumaric acid. It has *Mulattif* (Demulcent), *Qabiz* (Astringent), *Muhallil* (Resolvent), *Mushil-i Balgham* (Phlegmagogue), *Mufatteh-i Sudad* (Deobstruent), *Jali* (Detergent) and *Daf-i Sumoom* (Antidote) properties and used in *Ziabetus* (Diabetes), *Zaheer* (Dysentery), *Falij* (Paralysis) *Waja-ul Meda* (Gastralgia), *Deedaan-i Ama'a* (Helminthiasis) and *Suql-i Meda* (Heaviness and fullness of stomach) in Unani Medicine. The medicinal plant has been evaluated for antioxidant, antibacterial and anti-plasmodic, anti-diarrheal, anticancer, antinociceptive, hypolipidemic, hepatoprotective and wormicidal activities etc.

Keywords: *Ra'i Ibl*, *Marorphali*, *Helicteres isora* L., *Unani Medicine*, *Anti-diarrheal*

Introduction:

Ra'i Ibl (Helicteres isora), sometimes called the Indian screw tree, is a small tree or large shrub found in Southern Asia usually assigned to the family Malvaceae. This is a tall shrub or small tree with a stem 1-5 inches in diameter, reaching a height of 5-15 ft. Bark grey, in young parts covered with stellate hairs. The flowers are bright red. The fruit consists of five slender angular carpals, twisted like a corkscrew, and together forming a cone about 1½ to 2 inches long. The root bark is of dark brown colour and is very thickly studded with small round warts. Leaves bifarious, oblong, palmately nerved, obovate or obliquely cordate with serrated margin. Dried pods are yellowish brown to blackish brown in colour, screw-like in shape, peduncle and 3.0 to 5.5 cm long and 0.5 to 1.2 cm broad in dimension [1-4]. This medicinal plant has been used in several diseases. The root juice is claimed to be useful in cough, asthma, stomach affections, intestinal infections, diabetes and a cure for scabies when applied topically. The fruits are demulcent, mildly astringent and useful in griping and flatulence [2,5]. The presence of cucurbitacin B and iso cucurbitacin B were reported in the root[7]. Many pharmacological studies have been carried out to establish the claim of this Unani drug.



Fig.1:- (Helicteres isora Linn Plant)



Fig.2:- (Helicteres isora Linn Fruit)



Fig.3:- (Helicteres isora Linn Root)

Scientific classification of *Helicteres isora* Linn.[7]

Kingdom	Plantae
Class	Angiosperm
Subclass	Endicots
Order	Malvales
Family	Malvaceae
Sub Family	Helicteroidaea
Genus	Helicteres
Species	H. isora

Vernacular Names:**Arabic-** Altwaallatu [2,4]**Bengali-** Atmora[1,2,4,8]; Gubadarra [8]**English-** Deer's Horn [3]; East Indian Screw-Tree [3-4,8]**Gujrati-** Mriga Shringa [8]; Murdasing [1]**Hindi-** Marophali, Marori [8]; Marorphali, Jonkaphal, Bhendu [1-2,4]**Kannad-** Yedamuri, Kavargi [1,4]**Malayalam-** Valumbari [2,4,8]; Ishvaramuri [2,4]**Marathi-** Maedasingi, Muradasinge [2, 8]; Kevani [1-2,4,8]; Kewan, Varkati [1,4]**North-Western Province-** Bhendu, Marorphal [2]**Oriya-** Kaval, Modimodi, Murimuri, Orola [1-2,4]**Persian-** Ra'i Ibl [9-10]; Kisht ba'r Kisht [2-4,8,11-12]; Gisht ba'r Gisht [13-15]**Sanskrit-** Avartani, Avatarini, Mriga Shringa [1-3,8]

Sind- Vurkatee [2,8]

Tamil- Valumbirikai [4,8]; Valampiri, Valambiri, Kaiva [1-2,4]

Telgu- Valumbari [8]; Kaivum, Nalitada [4]

Urdu- Maror phali [2,4]

Habitat:

It grows in Central and Western India, central and western Peninsula and Ceylon as far west as Jammu, eastward to Nepal, Bihar and Bengal [3,6,8].

History and Botanical Description:

It is a tall shrub or small tree with a stem 1-5 inches in diameter, reaching a height of 5-15 ft. Bark grey, in young parts covered with stellate hairs [1-4], much resembling the common hazel. The flowers are bright red and showy, appearing in the rains. The peculiar twisted form of the carpals has probably led to its use as a medicine according to the ancient doctrine of signatures. The fruit consists of five slender angular carpals, twisted like a corkscrew, and together forming a cone about 1½ to 2 inches long. The carpals are pubescent and of a greenish brown colour. They contain a single row of dark brown angular seeds. The internal surface is of a light greenish hue and highly polished, taste mucilaginous. The root bark is of a dark brown colour and is very thickly studded with small round warts so as to present almost the appearance of Shagreen [3-4].

Leaves bifarious, oblong, palmately nerved, obovate or obliquely cordate with serrated margin, scabrous above and pubescent beneath. Petioles 6-9 mm long, stipules subulate and 6 mm long. Flowers solitary or in sparse clusters, 2.5-3.8 cm long. Pedicels very short, stellate tomentose, bracts, small, subulate and hairy. Calyx tubular, 2 cm long, stellate pubescent. Petals red at first, fading to lead colour, closely reflexed on the calyx. Staminal column fused with the gynophores, anthers 10 present in a ring round ovary. Ovary conical, follicles 5 in number, beaked, stellate tomentose. Seeds are numerous, angular in shape and testa is loose and wrinkled. [1-2,4].

Macroscopic:

Dried pods are yellowish brown to blackish brown in colour, screw-like in shape, peduncled and 3.0 to 5.5 cm long and 0.5 to 1.2 cm broad in dimension. The pods are

actually carpel and there are five carpels, which are twisted spirally. The seeds are small, reddish black and tubercled [4].

Microscopic:

The sectional view of fruit showed a single layered epicarp which consists of squarish to rectangular parenchymatous cells of which the wall of the outer side is slightly thickened. This epicarp also bears a number of stellate lignified trichomes. Outer part of the mesocarp usually consists of several layers of parenchymatous cells, which are thin walled, oval to polygonal loosely arranged and a number of lysogenic mucilage cavities are reported in this region. There are 6-8 layers of stone cells found in the middle part of mesocarp. These stone cells are hexagonal to polygonal having narrow lumen which is followed by 5-6 layers of fibres running tangentially. The sectional view of testa showed an outermost layer of epidermis, which has rectangular and thin walled parenchymatous cells. Beneath, which 3-4 layers of compact and slightly thick walled parenchymatous cells and that is followed by another layer of lignified palisade cells and row of brown pigment cells, i.e. endosperm which are large, thin walled parenchymatous cells. The embryo mostly consisted of thick walled, small rectangular to hexagonal parenchymatous cells possessing small and numerous aleurone grains. The radical also reveals parenchymatous tissues having small aleurone grains and epidermis is reported to have 3-4 celled trichomes. The transverse section of the stalk showed the single layer of cork and 4-5 layers of cork cambium followed by several layers of secondary cortex. The cells of the secondary cortex are thin walled, oval to round and loosely arranged parenchymatous; larger in the outer portion and smaller in the inner side. Five vascular supplies and phloem fibers in small groups but sometimes singly around vascular supply in the secondary cortex are also studied. Medullary rays are reported to be uniseriate [4].

Powder Analysis:

Fruit powder analysis showed the presence of fragments of mesocarpic parenchymatous cells, stone cells, fibre cells and palisades. Parenchyma contains aleurone grains, vascular tissues and trichomes. Fibres are quite large, highly lignified with rounded ends. Tracheids are shorter, lignified, ends rounded with reticulate thickenings. Vessels are studied to have variation in thickenings-spiral or reticulate or

scalar form. Stone cells are also studied which are hexagonal to oval, highly lignified with narrow lumen [4].

Maceration:

Maceration of the crude drug reveals the presence of a group of parenchymatous cells, palisade, stone cells, trichome and fibres in abundance.

Measurement of cells in micron:

A. Fruit

- | | |
|--------------------------|-------------------------|
| 1. Epicarp | T=9.0-16.0 x 7.0-14.0 |
| 2. Mesocarpic parenchyma | T=18.0-72.0 x 16.0-45.0 |
| 3. Stone cells | T=18.0-36.0 x 9.0-18.0 |

B. Seed

a. Seed coat

- | | |
|---------------|-------------------------|
| 1. Epidermis | T=13.5-18.0 x 11.0-13.5 |
| 2. Parenchyma | T=22.5-27.0 x 11.0-18.0 |
| 3. Palisade | T=73.0-77.0 x 6.0-7.0 |
| 4. Endosperm | T=18.0-31.5 x 9.0-13.5 |

b. Cotyledon

- | | |
|-------------------|------------------------|
| 1. Epidermis | T=10.0-14.0 x 9.0-13.5 |
| 2. Parenchyma | T=9.0-18.0 x 7.0-16.0 |
| 3. Aleurone grain | TD=1.5-2.5 |

c. Radicle

- | | |
|---------------|------------------------|
| 1. Epidermis | T=16.0-18.0 x 7.0-9.0 |
| 2. Parenchyma | T=13.5-49.5 x 9.0-45.0 |
| 3. Trichome | T=34.0-38.0 x 7.0-9.0 |

C. Stalk

- | | |
|--------------|-----------------------|
| 1. Cork cell | T=9.0-13.5 x 7.0-12.0 |
|--------------|-----------------------|

2. Cork cambium	T=18.0-76.5 x 13.5-45.0
3. Cortical cell	T=18.0-58.5 x 9.0-45.0
4. Phloem fibre	T=9.0-18.0 x 4.5-13.5
5. Medullary rays	T=7.0-9.0 x 4.0-5.0

T= Measurement in transverse section

TD= Measurement in diameter in transverse section

Fluorescent analysis:

S. No.	Reagent	Colour in daylight	Observation under U.V. Light		
			Modifying colour	Quality of light	Degree of Radiance
1	Mounted in Nitrocellulose solution	Yellowish brown	Brown	Light	Dull
2	In Sodium hydroxide and Methanol	Brownish yellow	Pale green	Dark	Bright
3	Treated with 1N NaOH in methanol and mounted in Nitro-cellulose solution	Coffee brown	Green	Light	Bright
4	1N Hydrochloric acid	Light brown	Brown	Light	Dull
5	Treated with 1N HCL and mounted in Nitro-cellulose solution	Light brown	Brown	Light	Dull
6	1N Sodium hydroxide in water	Coffee brown	Greenish yellow	Dark	Bright
7	Treated with 1N NaOH in water and mounted in Nitro-cellulose solution	Brown	Pale green	Light	Dull
8	Dilute Nitric acid (1:1)	Orange	Oily yellow	Dark	Bright
9	Dilute sulphuric acid (1:1)	Brown	Brown	Dark	Dull
10	Powder as such	Brown	Chocolate brown	Light	Bright

Acid/Chemical reagent reaction with powder:

S. No.	Acid/Chemical reagent	Observation
1	Conc. Sulphuric acid	Reddish black
2	Conc. Hydrochloric acid	Brownish yellow
3	Conc. Nitric acid	Orange
4	Glacial acetic acid	No change
5	Picric acid	No change
6	Ferric chloride (Aqueous)	Greenish blue
7	Iodine solution	Bluish black
8	Sodium hydroxide solution (5%)	Coca cola brown with fumes
9	Potassium hydroxide solution	Coca cola brown with fumes
10	Powder as such	Brown

Identity, purity and strength:

Foreign organic matter: not known

Total ash : 6.0%

Acid insoluble ash : 3.33%

pH of aq. Solution:

1% solution : 5.61%

10% solution : 5.55%

Extractability:

Alcohol : 4.24%

Water : 14.0%

Thin Layer Chromatography (T.L.C.) behaviors of petroleum ether extract (1.63%):

<i>Solvent system</i>	<i>Spray reagent</i>	<i>No. of spots</i>	<i>Rf values</i>
Benzene-Ethyl acetate (9:1)	I ₂ vapours	5	0.14, 0.50, 0.73, 0.85, 0.91 [4].

Ethnomedicinal uses of *Ra'i Ibl* (*Helicteres isora* Linn.)

- Fruits are useful in intestinal disturbances such as colic, griping of bowels, flatulence and diarrhea in children [1-3,5,8,16].
- The decoction of root, bark and its juice are individually demulcent, mild astringent, expectorant and stomachic. Bark is used in dysentery, diarrhea and scabies [1-3,5,8,17]; root juice used in empyema, diabetes, stomach affections and snake bite. Whereas individually root is used in scabies applied locally and acts as anti-galactagogue [1-2,5,8].
- Seeds powdered mixed with pure castor oil forms an excellent application in otorrhoea, ulcers in the ear etc. leaves decoction is used for clysters in Jamaica [2,8].

Phytochemistry and chemical Constituents:

H. isora is a rich source of antioxidants, carbohydrates, protein, fibre, calcium, phosphorus and iron [18]. Active phytoconstituents include gallic acid, caffeic acid, vanillin and p- coumaric acid [19-20]. Cucurbitacin b and iso cucurbitacin b have been isolated from the roots [6]. Additionally, Satake *et al* (1999) isolated rosmarinic acid and their derivatives; iso cutellarein and their derivatives; D-glucopyranosyl isorinic acid with rosmarinic acid; helisterculins A and B; and helisorin [21]. Its pods have demulcent substance quality and Tannins [8].

It contains chloroplast pigments, Phytosterol, a hydroxy-carboxylic acid (m.p.178-79^o), an orange-yellow crystalline colouring matter (m.p.189-90^o), saponins, sugars, phlobatannins and lignin (22.4%). [1,17], Diosgenin [4,16] and a new ester isolated from leaves and characterized as tetratriacotanyl iso cucurbitacin identified in roots [4].

Pharmacological Studies:

As far as pharmacological studies are concerned, numerous studies to find out new entity/ies have been carried out on this plant through documented approaches on scientific parameters to find out its biological activities are as;

- ✓ *Antifungal Activity* [22]
- ✓ *Anti Bacterial/ Microbial Activity* [23-24]
- ✓ *Antioxidant activity* [25]
- ✓ *Hypolipidemic activity* [26-27]
- ✓ *Antibacterial and antiplasmod activities* [28]
- ✓ *Cardiac antioxidant and antiperoxidative potency* [29]
- ✓ *Brain antioxidation potency* [30]
- ✓ *Anti cancer activity* [31]
- ✓ *Anti nociceptive activity* [32]
- ✓ *Hepatoprotective activity* [33]
- ✓ *Anti diarrheal Activity* [34]
- ✓ *Wormicidal activity* [35]

Part Used:

- Root [2-3,8,15,36]
- Bark [2-3,8,15]
- Fruits [2-3,8]
- Capsules (Pods), juice and Seeds also used [8]

Temperament (*Mijaz*):

- ✚ Hot [11]
- ✚ Hot 3° Dry 3° [3,10]
- ✚ Hot and Dry [4,14-15]
- ✚ Hot 1° Dry 1° [12-13]

Dose (*Miqdaar-i Khuraaq*):

- 2 to 5 gm [4]
- 5 to 7 gm [13]
- 3 gm [14]
- 0.75 to 7 gm [15]

Toxicity or Adverse effect (*Muzir Asraat*):

- *Qat'-i Bah* (Anaphrodisiac) [12-14]

Corrective (*Musleh*):

- *Habb-i Sanobar* [14]

Substitutes (*Badal*):

- *Sibr* (*Aloe barbadensis* Mill.) [13-14]

Compound Formulation:

- *Majoon Jograj Gogal* [4,13,38]

Taste of Drug:

- Sweet and agreeable [4]

Pharmacological Action:

- *Mulattif* (Demulcent) [1,3,5,10,13-14]
- *Qabiz* (Astringent) [1,3,5]
- *Muhallil* (Resolvent) [4,13-14]
- *Jali* (Detergent) [4,12-13]
- *Musakkin* (Analgesic) [4,13]
- *Mushil-i Balgham* (Phlegmagogue) [4,11,13-15]
- *Daf-i Sumoom* (Antidote)[10-12,15]
- *Mushil-i Saфра* (Cholagogue) [11,15]
- *Kasir-i Riyah* (Anti-Flatulent) [15]
- *Mofatteh Sudad* (Deobstruent)[12]

Therapeutic Uses:

- ❖ Root Bark is used in Diabetes [3]
- ❖ Used as Infusion or Decoction in *Waja' al-Meda* (Gastralgia), *Deedaan-i Ama'a* (Helminthiasis), *Suql-i Medah* (Heaviness and fullness of stomach) [11,15], *Zaheer* (dysentery)[1,4,13,15], *Falij* (Paralysis), *Amraaz-e A'ma* (Intestinal Diseases), *Sual* (Cough) [4,13]and *Sailaan-ul Uzn* (Otorrhoea) [15]
- ❖ Applied on *Awram-i Barida* (Chronic Inflammation) in the form of paste, *Amraaz-i Jild* (Skin Diseases). Paste prepared with its root and *Khall* (vinegar) is applied on *Qubaa* (Ringworm) [11-13,15]
- ❖ Oral administration is useful in *Lasa't al-Hasharaat* (Insect bite) [10-12] and *Ishaal-i Barida* (Diarrhoea due to cold) [11]

Discussion and conclusion:

At the first instant, it is apparent through the review of *Ra'i Ibl/Marorphali* (*Helicteres isora* Linn) that its restorative and medicinal potentials from the traditional Unani assortment of results are remarkable. *Ra'i Ibl/Marorphali* (*Helicteres isora* Linn) possesses multiple actions and can play a significant role in combating chronic inflammation, dysentery and other gastric and intestinal diseases without producing any side effects. The fruits are demulcent, mildly astringent and useful in griping and flatulence. The root juice is claimed to be useful in cough, asthma, stomach affections, intestinal ailments, diabetes and a cure for scabies when applied topically.

It is an influential medicinal herb in the Unani system of medicines with its safety and cost effective approach. Worthwhile, it is used in the prophylaxis of diverse disorders. It is clear in this review that this drug contains various phytochemicals, which are responsible for the therapeutic estimation of this plant. These claims of Unani medicine on the pharmacological actions of *Ra'i Ibl* have also been proved by scientific studies to some extent. There is a need to conduct more clinical studies on the efficacy of the drug in other diseases that are mentioned in Unani literature for its therapeutic uses. The Central Council for Research in Unani medicine has carried out its standardization on various parameters and efforts should be made to standardize a technique for utilization of all the parts which will lead to its wider commercial applicability. Further, there are many analyses of chemical constituents, and the pharmacological activity has

also been reported for this plant. The mechanism of pharmacological action and the metabolites responsible for these activities should be studied in more detail [37].

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CONFLICTS OF INTEREST

The authors have no conflicting financial or other interests.

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