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HELICTERES ISORA L. (ĀVARTANĪ): A COMPREHENSIVE REVIEW OF BOTANICAL IDENTITY, PHARMACOGNOSY, MICROSCOPY, AYURVEDIC ATTRIBUTES AND PHARMACOLOGICAL EVIDENCE

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ABSTRACT

Helicteres isora L., commonly known as Indian screw tree and referred to as Āvartanī in some Ayurvedic materia medica, is a shrub or small tree of the family Malvaceae (historically Sterculiaceae). Its most distinctive diagnostic feature is the spirally twisted fruit, which supports macroscopic recognition of the crude drug. This review expands an earlier narrative overview by bringing together botanical identification, classical Ayurvedic interpretation, pharmacognostic characters, microscopic diagnostic features, phytochemical findings and preclinical pharmacological evidence. Literature describing fruit microscopy reports three principal fruit-wall regions—epicarp, mesocarp and endocarp—and powdered fruit characters including stellate trichomes, prismatic crystals and endosperm cells. Leaf literature describes stellate hairs and stomatal features, while root and bark studies provide additional diagnostic and chemical information. Traditional uses include bowel-related complaints and other conditions documented in regional medical practice; experimental studies report antioxidant, antidiarrhoeal, hypoglycaemic and other activities. However, evidence varies by plant part, extract, model and study quality, and should not be presented as proof of clinical efficacy. Ayurvedic descriptions of rasa, guṇa, vīrya and vipāka are not entirely uniform across secondary sources, so textual claims require confirmation against the specific edition of the primary nighaṇṭu. This review therefore separates classical

interpretation from pharmacological hypotheses and identifies authentication, standardisation, safety and clinical research as priorities.

KEYWORDS: Helicteres isora; Āvartanī; Indian screw tree; pharmacognosy; powder microscopy; fruit anatomy; Dravyaguna; phytochemistry.

1. INTRODUCTION

Medicinal-plant identification is the first step in the safe and reproducible use of a crude herbal drug. A vernacular or Sanskrit name alone may not be sufficient because names can vary between regions, historical texts and commercial supply chains. For Āvartanī, the botanical identity most commonly associated in modern literature is Helicteres isora L. The plant is recognised by its rough, hairy foliage and unusual helically twisted fruit. This morphology is useful in field identification and in checking the identity of dried fruit sold as a medicinal raw material.

The available literature includes classical materia-medica discussions, ethnobotanical records, pharmacognostic studies and experimental pharmacology. These evidence types answer different questions. Classical sources document traditional classification and use; microscopy helps authenticate the raw material; chemical analyses characterise constituents; and pharmacological experiments explore possible biological activity. None of these evidence streams alone establishes efficacy in humans. A responsible review should keep these distinctions visible.

2. Botanical identity and nomenclature

1 Taxonomic position

Accepted botanical name: Helicteres isora L. Family: Malvaceae; older literature may place the species in Sterculiaceae. Genus: Helicteres. Common English names include Indian screw tree and East Indian screw tree. Regional names recorded in literature include Marodphali/Marorphali, Murudsheng and related forms; names vary geographically and should be accompanied by the scientific name in research and procurement records [1,2].

2 Habit, habitat and distribution

H. isora is described as a sub-deciduous shrub or small tree, often approximately 1.5–3 m in pharmacognostic accounts, although size varies with habitat and source. It occurs in parts of the Indian subcontinent and tropical Asia, including dry and deciduous forest habitats. Young branches may be rough and bear stellate hairs. Leaves are simple, alternate, ovate to oblong or obovate, with a cordate or oblique base and serrate/crenate margins. The lower leaf surface

is commonly more pubescent than the upper surface. Flowers occur singly or in small axillary groups; reports describe colour changes as flowers age. The fruit is the most conspicuous identification feature: elongated follicles/carpels form a twisted, screw-like unit, usually brown when mature and dried [1,2].

3 Diagnostic value of the fruit

The spiral fruit gives rise to the common name ‘screw tree’ and is a useful preliminary marker when intact fruits are available. The fruit should nevertheless be checked alongside size, surface hairs, colour, odour, taste and microscopic characters. Commercial material may be fragmented, immature, bleached, dyed or mixed with unrelated plant parts. Therefore, fruit shape is a strong macroscopic clue but not a substitute for complete pharmacognostic authentication.

3. Botanical photographs and visual documentation

For field or publication use, the preferred photographs are: (i) whole shrub with a scale reference; (ii) close-up of leaves showing both surfaces; (iii) flowers at different stages; (iv) attached immature and mature twisted fruits; and (v) dried drug material. A public image collection is available through Wikimedia Commons: https://commons.wikimedia.org/wiki/Category:Helicteres_isora. Select individual files only after checking the photographer, licence and attribution requirements. The 2014 review by Jain et al. also presents a multi-part botanical plate showing the plant, twig, bark, leaf and fruits [1]



Figure 1. Botanical visual reference of Helicteres Isora features.

4. Pharmacognostic evaluation

1 Macroscopic and organoleptic characters

Macroscopic examination records the observable features of the crude drug before destructive tests. For dried fruit, record the intact shape and degree of torsion, approximate length and width, surface texture, colour, apex, fracture, odour and taste. Literature describes mature fruit as brownish, hard and distinctly twisted; size and colour may differ with maturity, drying and storage. The characteristic astringent taste is consistent with tannin-containing material, but taste is subjective and should not be used as the sole identity test. The sample should be inspected for insects, mould, extraneous matter and unusual odour.

2 Microscopy of the fruit

A pharmacognostic study of H. isora fruit reported three recognisable regions in transverse section: epicarp, mesocarp and endocarp. The fruit wall contains supporting tissues associated with the rigidity of the mature fruit. Published descriptions of transverse sections and powdered fruit also report stellate trichomes, prismatic crystals and endosperm cells [3,4]. These are literature-reported characters; their abundance and visibility can vary with the maturity of the fruit, section orientation, sample preparation and microscope settings.

A practical laboratory workflow is to select representative fruits, soften them if required, prepare thin transverse sections with a sharp blade, clear or stain using an appropriate validated protocol, mount the section and examine under low and high magnification. Photograph each diagnostic feature with a scale bar and record the magnification. For powder microscopy, powder the authenticated fruit, mount small quantities in suitable media, and systematically scan several fields rather than selecting only striking structures. Reference slides and a voucher specimen should be retained.

3 Powder microscopy: reported diagnostic elements

Stellate trichomes are star-shaped epidermal hairs and are a useful supportive feature in this species. Prismatic crystals may appear as angular, refractile structures; crystal identity should be confirmed by appropriate microscopic tests rather than appearance alone. Endosperm-cell fragments may be encountered in powdered fruit. Depending on the plant part and preparation, thick-walled fibres, sclerenchymatous elements, stone cells and tannin-containing fragments have also been described in pharmacognostic literature [3,4]. Not every listed element must be present in every field or sample. A diagnostic report should distinguish clearly between structures directly observed in the current specimen and characters reported by previous authors.

4 Leaf microscopy

Leaves have been described as rough above and stellately hairy, particularly on the lower surface. Published reports discuss stellate trichomes and stomatal characters, including anomocytic stomata in some accounts [4,5]. For a reproducible leaf study, examine both adaxial and abaxial epidermal surfaces, document trichome type and distribution, stomatal type and density where feasible, and prepare transverse sections through the midrib and lamina. Record whether the mesophyll is dorsiventral, the arrangement of vascular tissues, and any mucilage-containing or crystal-bearing cells actually seen. Anatomical terminology should follow standard pharmacognosy references, and contradictory reports should be checked against the original study.

5 Bark and root microscopy

Bark and root are used in some traditional and experimental contexts, but they must not be assumed to share the same microscopic profile as fruit. Root studies have employed free-hand transverse sections, staining and powder examination; reports describe tissues such as cork, parenchyma, fibres and vascular elements, with variation according to organ age and section level [6]. For bark or root drug authentication, collect the organ-specific reference material, document diagnostic tissues and compare with authenticated voucher material. A fruit powder profile cannot authenticate a root or bark sample.

6 Limits of microscopic interpretation

Microscopy is most reliable when combined with botanical authentication, organoleptic examination and physicochemical or chromatographic tests. A single feature such as a stellate hair is not unique to one species across all plants. The sample source, collection date, plant part, processing and voucher number should be documented. The present article is a literature review and does not report original microscopy performed by the authors; the features described here should not be represented as new experimental observations.

5. Ayurvedic identity and interpretation

1 Name and textual context

The term Āvartanī is commonly explained in relation to the turning or spiral form of the fruit. Secondary reviews associate H. isora with names such as Āvartanī and Āvartaphala, but botanical equivalence and synonymy should be checked against the specific Sanskrit lexicon and edition used [1]. Some historical sources discuss possible confusion with Murvā (Marsdenia tenacissima) or similarities between the leaves and other plants. This history makes explicit botanical identification particularly important.

2 Rasa-pañcaka and textual variation

The submitted draft describes Āvartanī using kaṣāya and tikta rasa, laghu and rukṣa guṇa, uṣṇa vīrya and kaṭu vipāka. However, a widely cited 2014 review reports a profile of laghu and rukṣa guṇa, kaṣāya rasa, kaṭu vipāka and śīta vīrya [1]. This is a material discrepancy. It should not be silently resolved by selecting one version: verify the exact entry in the primary nighaṇṭu and its commentary, cite the edition and page, and explain if different texts record different attributes. Until that verification is completed, the vīrya should be described as textually inconsistent in the secondary literature.

3 Traditional actions and uses

Traditional and regional literature associates the fruit or other plant parts with bowel complaints, including diarrhoea and dysentery; other reports mention colic, intestinal worms and metabolic conditions [1,2]. In Dravyaguna discussion, these uses may be considered alongside the reported astringent taste and traditional grahi/stambhana interpretation. Such conceptual correlation is a traditional explanatory framework, not a demonstrated mechanism by itself. Classical indications should be tied to a named primary text, verse and edition whenever possible. Claims such as ‘best remedy’, ‘proven cure’ or definitive dosha action should be avoided unless supported by a reliable primary source.

6. Phytochemistry

Studies of H. isora have reported several classes of constituents, including phenolic compounds, flavonoids, tannins, sterols, triterpenoids and lignans, with profiles differing by organ and solvent. Fruit research has reported rosmarinic-acid-related compounds; leaf studies have isolated flavonoid derivatives; root investigations have reported cucurbitacin-related compounds [1,2]. Other reports describe phytosterols and phenolic constituents in bark and seeds. These findings should not be collapsed into a single universal chemical profile: plant part, geography, harvest stage, extraction solvent and analytical method all influence what is detected.

For quality control, a useful future protocol would pair macro- and microscopy with moisture content, total ash, acid-insoluble ash, water- and alcohol-soluble extractives, and a chromatographic fingerprint such as TLC/HPTLC. Marker selection must be based on confirmed identity, reproducible analytical performance and relevance to the intended material. Gallic acid, ellagic acid, rosmarinic-acid-related compounds or selected flavonoids may be candidates for investigation, but should not be declared official markers without validated evidence.

Pharmacological evidence

1 Antidiarrhoeal activity

Experimental studies have investigated fruit or bark extracts for effects on diarrhoea and intestinal motility. Astringent tannins provide a plausible explanation for some traditional bowel-related uses, while preclinical work has reported reduced stool frequency or intestinal transit in animal models [1,2]. These findings remain dependent on the extract, dose, experimental model and study quality. They do not establish that the crude drug is effective or safe for all causes of diarrhoea, particularly dysentery with blood, dehydration, fever or infection requiring specific treatment.

2 Antioxidant activity

Fruit extracts have shown antioxidant activity in laboratory assays, and phenolic constituents may contribute to radical-scavenging results [1,2]. In-vitro antioxidant activity is a screening endpoint; it does not necessarily translate into a clinically meaningful antioxidant effect after oral administration. Bioavailability, metabolism, dose and tissue exposure require separate study.

3 Antidiabetic and lipid-related activity

Animal studies have explored hypoglycaemic and hypolipidaemic effects of selected H. isora extracts. These observations are hypothesis-generating and may justify further mechanistic research, but they are not a basis for replacing established diabetes care or reducing prescribed medicines. Well-designed human trials, standardised products, pharmacokinetic data and interaction studies are needed before therapeutic recommendations can be made.

4 Other reported activities

Reviews describe investigations of antimicrobial, anti-inflammatory, antinociceptive, hepatoprotective, wound-related and cytotoxic activities in different experimental systems [1,2]. The evidence is heterogeneous and often preclinical. A positive result in a cell line or animal model is not proof of benefit in patients, and cytotoxicity against cancer cells in vitro should not be described as anticancer treatment.

Safety, quality and clinical considerations

The safety of a medicinal plant depends on identity, plant part, dose, preparation, duration, patient characteristics and concurrent medicines. Tannin-rich preparations may affect gastrointestinal tolerance and potentially alter the absorption of some nutrients or medicines; the clinical significance for H. isora requires better study. There is insufficient basis in the reviewed material to provide a universally applicable dose for self-treatment. Commercial

products should be sourced from reputable suppliers and checked for substitution, contamination, pesticides, heavy metals and microbial load.

Diarrhoea may lead to serious dehydration, and blood in stool, persistent fever, severe abdominal pain, reduced urine output, lethargy or symptoms in infants and older adults warrant prompt medical assessment. H. isora should not be recommended as a substitute for oral rehydration, diagnostic assessment or evidence-based treatment. Pregnant or breastfeeding people, children and patients taking long-term medicines should seek qualified professional advice before using concentrated preparations.

Research gaps and recommendations

First, the Ayurvedic identity and rasa-pañcaka should be checked against primary textual editions, with the exact Sanskrit entry, commentary, publication details and page numbers. Second, botanical specimens should be authenticated by a qualified taxonomist and deposited as voucher specimens. Third, organ-specific microscopy should be documented with labelled photomicrographs, scale bars, magnification and preparation methods. Fourth, physicochemical parameters and chromatographic fingerprints should be established across multiple authenticated batches. Fifth, pharmacological experiments should use standardised extracts, appropriate controls, transparent statistical methods and reproducible endpoints. Finally, clinical research should be considered only after adequate preclinical safety and product standardisation, with registered protocols and ethically approved methods.

Suggested standard operating procedure for a microscopy study

A reproducible study should begin with collection of mature and immature fruits, leaves and, where ethically and legally appropriate, bark or root from a botanically verified plant. Record the location at a non-sensitive locality level, collection date, habitat, plant part, maturity, drying conditions and collector. A qualified botanist should authenticate the material and a herbarium voucher should be deposited in an accessible institution. Prepare at least three independent samples or batches where possible so that observed features are not based on one unusual specimen.

For fruit transverse sections, rehydrate dried material when needed, cut sections as thinly as possible, and examine unstained and appropriately stained preparations. Use a calibrated ocular micrometer or digital scale bar. For powder microscopy, prepare separate slides from each batch and record the frequency of diagnostic fragments across multiple fields. Include representative and atypical fields in the image archive. The methods section should state

microscope model, objective magnification, mounting medium, stain and any clearing reagent. Avoid reporting a feature as absent unless adequate fields and replicate samples have been examined.

Quantitative pharmacognosy can complement descriptive microscopy. Candidate measurements include fruit dimensions, proportion of broken material, moisture, total ash, acid-insoluble ash and extractive values. These parameters should be measured with validated procedures and reported as observed results, not copied from unrelated studies. Acceptance ranges should be developed from authenticated batches and should account for seasonal and geographical variation. Chromatographic fingerprints can then be used to assess batch-to-batch consistency and detect adulteration, although chemical similarity alone cannot replace botanical identity.

A useful microscopy results table should separate organ, preparation, observed character, diagnostic value and literature source. For example: fruit transverse section—epicarp, mesocarp and endocarp—supports recognition of fruit-wall organisation; powdered fruit—stellate trichomes, prismatic crystals and endosperm fragments—supports powdered-drug assessment; leaf epidermis—trichomes and reported stomatal pattern—supports leaf identification. The final paper should replace these literature-derived descriptions with actual observations if laboratory work is performed, including photomicrographs, scale bars and sample identifiers.

CONCLUSION

Helicteres isora L. is a distinctive medicinal shrub whose spirally twisted fruit is an important macroscopic authentication feature. Pharmacognostic literature describes fruit-wall layers and powder characters including stellate trichomes, prismatic crystals and endosperm-cell fragments, while leaf and root studies provide additional organ-specific clues. Phytochemical and pharmacological reports suggest several areas for further investigation, particularly bowel-related effects and antioxidant or metabolic activity. Yet the strength of evidence differs substantially across uses, and preclinical findings should not be equated with clinical efficacy. For a scientifically robust article on Āvartanī, the central priorities are verified textual attribution, authenticated plant material, transparent microscopy, validated quality-control methods and cautious interpretation of experimental evidence.

REFERENCES

1. Jain V, Mishra N, Rani S, Shrivastava S. Plant profile, phytochemistry and pharmacology of Avartani (Helicteres isora Linn.): a review. Asian Pac J Trop Biomed. 2014;4(Suppl 1):S22–S26. doi:10.12980/APJTB.4.2014C872.
2. Mankar SS, Younas M, Pimpale A, Awari D. Pharmacognostic and pharmacological study of Helicteres isora Linn.—a review. J Pharm Res Int. 2021;33(49A):208–214. doi:10.9734/jpri/2021/v33i49A33322.
3. Andalil R, Mattummal R, Gopi DK, Sundaramoorthy B, Bobbili E, Narayana SKK. Pharmacognostic evaluation of key ingredient of Valampuritailam: Helicteres isora L. fruit. J Ayurveda Med Sci. 2018;3(4). doi:10.5530/jams.2018.3.27.
4. Chaudhari SR, Tare HL, Chumbhale DS, Dama GY, Deore SR. Microscopy of Helicteres fruits. J Plant Sci Res. 2021;37(1):33–40. doi:10.32381/JPSR.2021.37.01.5.
5. García S. Pharmacognostic review and phytochemical profiling of Helicteres isora: emerging herbal applications. J Pharmacogn Phytochem. 2024;13(6):429–433. doi:10.22271/phyto.2024.v13.i6e.15565.
6. Pharmacognostic study of Helicteres isora L. ResearchGate record and associated article text. Use the original full-text publication to confirm organ-specific methods and findings before citing in a submitted manuscript.
7. Royal Botanic Gardens, Kew. Medicinal Plant Names Services: Helicteres isora L. Available from: https://mpns.science.kew.org/mpns-portal/plantDetail?dbs=wcsCmp&plantId=2843218 (accessed 23 October 2026).
8. Wikimedia Commons. Category: Helicteres isora. Available from: https://commons.wikimedia.org/wiki/Category:Helicteres_isora (accessed 23 October 2026). Check each image's individual licence and attribution.