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Research Article

PHARMACOGNOSTICAL EVALUATION OF FRUITS OF *HELICTERES ISORA* LINN (*STERCULIACEAE*)

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Abstract

All information about the herbal drug including all its organoleptic characters, phytoconstituents, pharmacological actions and its standardization in respect to various parameters is required before developing an herbal drug formulation. *Helicteres isora* Linn, Syn. East Indian Screw Tree belonging to family Sterculiaceae was used during the 16th century for its astringent and blood-purifying properties in diarrhoea and worm infection. We are doing this work because it was thought worthwhile to explore this most functional plant on the basis of this standardization parameter. Objective of the work is to study pharmacognostic and physicochemical characteristics of fruits of *Helicteres isora* Linn. Fresh and dried fruits, fruit powder were studied for its morphology, microscopy, physicochemical & phytochemical characteristics, fluorescence analysis and other WHO recommended methods for standardization. The fruit was greenish brown in color, beaked; consist of 5 follicles twisted spirally with numerous angular and wrinkled seeds. Microscopy revealed the presence of pericarp showing an epicarp, covering trichomes and mucilaginous cells. The testa showed rectangular thin walled lignified cells. Preliminary phytochemical screening revealed the presence of carbohydrates, proteins, flavonoids, steroids, alkaloids, saponins and phenolic compounds. It can be concluded that the pharmacognostic profile of *Helicteres isora* Linn fruit is useful in standardization for quality, purity and sample identification.

Keywords: *Helicteres isora* Linn, Pharmacognostic evaluation, Phytochemical characteristics, Standardization.

INTRODUCTION

Herbal remedies are the futuristic therapeutic hope for all over world. The field of the herbal drugs and formulations is very vast and there is still lot to explore on the subject of standardization of these. So, while developing an herbal drug formulation it is must to have all the related knowledge of that particular drug including all its organoleptic characters to phytoconstituents to pharmacological action to its standardization in respect to various parameters with various techniques. *Helicteres isora* Linn, Syn. East Indian Screw Tree belonging to family Sterculiaceae was used during the 16th century for its astringent and blood-purifying properties in diarrhoea and worm infection.¹ It is often gregarious and common in dry forests throughout the India. It is a sub-deciduous shrub or small tree, attaining height of 1.5 to 5m. Bark is grey, covered with stellate hairs in young parts. Leaves are simple, alternate, bifarious, obovate, obliquely cordate, serrate, scabrous above and pubescent beneath. Flowers are red fading to lead color, present in axillary clusters of 2-6 together, stamina column fused with the gynophore. Fruits are 2.5-6 cm long, greenish brown in color, beaked, cylindrical, 5 follicles twisted spirally.²⁻⁶ Flowers appears in the month of September to December, fruits in the month of January to March.

Literature review revealed that the plant contains carbohydrate, proteins, flavonoids, steroids (diosgenin), mucilage, tannins, phenolic compound, saponins, beta

sitosterol, betulinic acid, oleanolic acid, daucosterol, six neolignans like the helicterins A-F & cytotoxic constituent like cucurbitacin B, iso-cucurbitacin B.⁷⁻¹¹ Studies have shown that the plant possess antimicrobial, antiparasitic, antioxidant, anti-inflammatory, antipyretic, antispasmodic, and antidiabetic activities.⁹⁻¹⁶ Though the more information about pharmacological effects and phytoconstituents is available, it was thought worthwhile to explore this most functional plant on the basis of this standardization parameter. In this work we deal with pharmacognostical, physicochemical and phytochemical characteristics of *Helicteres isora* Linn fruit. The objective of this study is to provide information for further identification and preparation of plant monograph and will assist in standardization for quality, purity.

MATERIALS AND METHODS

The dried fruits and powder of *Helicteres isora* Linn were received from S. G. Phytopharma, Kolhapur.

Macromorphology

The entire fruit of *Helicteres isora* Linn and the powder was evaluated for their sensory profile by observing their color, odor and taste along with some extra macroscopical characters as per standard WHO guidelines.¹⁷⁻¹⁹

Microscopy

The transverse sections of the fruit were taken, cleared with clearing agent and mounted in glycerine water. Microscopy of dried fruit powder was done for evaluating various parts present in the given dried fruit powder. The detail microscopical characters were observed under digital microscope (MOTIC-B1) and organ detection was reported according to the prescribed method.²⁰⁻²¹

Microchemical Testing

For detection of cell wall composition and cell contents, the transverse section of fruit and powder were treated with different but specific staining reagent and observed under digital microscope (MOTIC-B1). The cell wall composition, cell contents and tissue detection was reported separately.²⁰⁻²¹

Physicochemical Evaluation

Evaluation of crude drug ensures the identity of a drug and determines the quality and purity of drugs. The main reason behind the need for the evaluation of crude drugs is biochemical variation in the drug, effect of treatment and storage of drugs and adulteration and substitutions.²² Phytopharmacopoeial specification for the plant materials should be developed to enable the quality control person to verify and approve the materials. The various physicochemical parameters were viz. ash values, extractive values and loss on drying, fluorescence analysis. Determinations of these physicochemical parameters were done as per the procedures mentioned in accordance with the WHO guidelines.²³

Preliminary Phytochemical Screening

The chemical evaluation includes qualitative chemical tests which are used for identification of various phytoconstituents present in the powdered crude drug. Tests are carried out as per the procedure mention in the official protocol.²³

Fluorescence Analysis

Dried fruits powder observed under visible light, short ultra violet light, long ultra violet light after treatment with different reagents like Petroleum ether (60-80), Chloroform, Ethyl acetate, Methanol, 50% Sulphuric acid, 50% Nitric acid, 50% Hydrochloric acid, 10% Sodium hydroxide, etc.²⁴

RESULTS

Macromorphological Description

Helicteres isora Linn is a sub-deciduous shrub or small tree, attaining height of 1.5 to 5 m. Fruits were beaked, cylindrical, 5 follicles twisted spirally. The morphological details of the fruit are observed in Figure 1. The organoleptic evaluation of dried fruit revealed that the fruit were 2.5-6 cm long, greenish brown in color. The powder was greenish in color, with characteristic odor and slightly bitter in taste. The results of morphological characters are mentioned in Table 1.

Microscopy

Microscopical study showed the presence of pericarp consisting of an epicarp, mesocarp, and endocarp & lignified covering trichomes. Mesocarp consists of compactly arranged polygonal cells, number of lignified fibrovascular bundles & mucilage cavities. Testa is single layered, endosperm showed hexagonal thin walled lignified cells which encircles the cotyledon.

Microchemical Testing

Characterization of cell wall components and cell contents were done with the help of microchemical testing which revealed the presence of various types of cells along with their characterization. The details of these microchemical testing is reported in Table 2.

Physicochemical Evaluation

The moisture content of a drug should be determined and controlled because it will be responsible for decomposition of crude drug either by producing chemical changes or by promoting the microbial growth. The result of moisture content signifies whether the drug was properly dried and stored or not. The determination of ash value is useful for detecting low grade products, exhausted drugs and excess of sandy or earthy matter. The determination of extractive values is useful while selecting the solvent for extraction and also gives idea about the nature of major phytoconstituents present in the drug. Table 3 narrates the results of the physicochemical constants of dried fruit powder which lie within the limit; this signifies that the quality and purity of raw material was good enough.

Preliminary Phytochemical Screening

The powder was found to contain carbohydrates, proteins, flavonoids, steroids, alkaloids, saponins and phenolic compounds. The results of the preliminary phytochemical screening are expressed in Table 4.

Fluorescence Analysis

Fluorescence analysis of the powder treated with different solvents and reagents is exhibited in Table 5.

DISCUSSION

Today sophisticated modern research tools are available for evaluation of the plant drug but microscopic method is still one of the simplest and cheapest methods to start for establishing the correct identity of the source material.²⁵ Macroscopic and microscopic description of a medicinal plant is the first step towards establishing the identity and purity of drug. The macromorphology study gives the important sensory characteristics of the drug which are useful for initial identification. Microscopical evaluation is important in the identification of drug as well as small fragments of crude or powdered drug by characteristic tissue features. Every plant possesses characteristic tissue structure which is observed when properly mounted in stains and reagents.

Determination of moisture content is important because high moisture content may cause the decomposition of plant drug. Presence or absence of inorganic matter such as metallic salts and/ or silica can be determined by performing the total ash. This includes both 'physiological-ash' which is derived from the plant tissue itself, and 'non-physiological ash' which is the residue of extraneous matter adhering to the plant surface. Water-soluble ash is the water soluble portion of total ash. Acid-insoluble ash indicates the non-physiological ash due to adherence of inorganic dust, dirt to the crude drug. The ash values of the crude drug signify the presence or absence of adulteration.²⁶

The extractive values in different solvents indicate the nature of phytoconstituents from the crude drug and their solubility in a given solvent. Normally alcohol and water are used as

solvents to determine extractive value as per pharmacopoeias.²⁶

Many phytoconstituents exhibits the fluorescence phenomenon which can be seen with specific reagents or solvents. The fluorescence color is specific for each compound.

The plant material was subjected to preliminary phytochemical screening by different chemical tests for qualitative determination of phytoconstituents present in plant drug and this data was useful for selection of solvents for extraction purpose.²⁶

REFERENCES

- Khare CP. Encyclopedia of Indian medicinal plants. Springer publication, 2004. p. 244-245.
- Anonymous. The Wealth of India, Raw Materials. Vol-V (H-K), CSIR: New Delhi, 1996. p. 27-29.
- Kirtikar KR., Basu BD. Indian Medicinal Plants. International book distributors, India 1995. p. 132-133.
- Chatterjee A, Pakrashi S. The Treatise On Indian Medicinal Plants. 2010; (3). p. 14-16.
- Nadkarni KM, Nadkarni AK. Indian Materia Medica. Popular Prakashan, Bombay, India, 1976, (1). p. 615-616.
- Chkurian J. Plant That Heals. Oriental Watchman Publishing House, Pune, 2007, (2). p. 70.
- Gayathri P, Gayathri Devi S, Sivagami S, Saroja S. Screening and Quantitation of Phytochemicals and Nutritional Components of the Fruit and Bark of *Helicteres isora*. Hygeia journal for drugs and medicines. 2010; 2 (1); 57-62.
- Sabale PM, et al. Recent advances on the phytochemical and pharmacological profile of plant *Helicteres isora* Linn. International research journal of pharmacy. 2012; 3 (4); 14-17.
- Tiwari V, Tiwari A, Madhavan V. Preliminary phytochemical analysis, HPTLC studies and antipyretic activity of alcohol and aqueous extract of *Helicteres isora* L. root. International Journal of Pharmacy and Pharmaceutical Sciences. 2010; 2 (2); 74-79.
- Varghese E, Pappachen KL, S Sathia Narayanan. Isolation and evaluation of antimicrobial properties of isolated phytoconstituents of fruits of *Helicteres isora* Linn. Research journal of pharmaceutical, biological and chemical sciences. 2012; 3 (3); 959-964.
- Basniwal P K, et al. In-vitro antioxidant activity of hot aqueous extract of *Helicteres isora* Linn. fruits. Natural product radiance. 2009; 8 (5); 483-487.
- Shriram V, et al. Antibacterial & Antiplasmodic activities of *Helicteres isora* L. Indian J Med Res. July 2010; 94-99.
- Pohocha N, Grampurohit ND. Antispasmodic Activity of the Fruits of *Helicteres isora* Linn. Phytotherapy research. 2001; 15 (Issue 1); 49-52. [http://dx.doi.org/10.1002/1099-1573\(200102\)15:1<49::AID-PTR729>3.0.CO;2-E](http://dx.doi.org/10.1002/1099-1573(200102)15:1<49::AID-PTR729>3.0.CO;2-E)
- Badgujar VB, et al. Antiinflammatory activity of *Helicteres isora* Linn. stem bark extracts in rats. Asian Journal of Pharmaceutical and Clinical Research. 2009; 2 (4); 63-65.
- Chakrabarti R, et al. Antidiabetic and hypolipidemic activity of *Helicteres isora* in animal models. Journal of Ethnopharmacology. 2002; 81(3); 343-349. [http://dx.doi.org/10.1016/S0378-8741\(02\)00120-4](http://dx.doi.org/10.1016/S0378-8741(02)00120-4)
- Badgujar VB, Jain PS, Badgujar SV. Antifungal activity of stem bark of *Helicteres isora* Linn. Drug Invention Today. 2009; 1(2); 135-136.
- Kokate CK, Purohit AP, Gokhale SB. Pharmacognosy. 22nd ed., Nirali Prakashan, Pune, 2003. p. 109-257.
- Wallis TE. Text Book of Pharmacognosy. 5th ed., CBS Publishers and Distributors, Delhi, 2005. p. 104-158.
- World Health Organization. Quality control methods for medicinal plant materials. WHO/PHARM/92.559, 1998. p. 4-46.
- Kokate CK. Practical Pharmacognosy. 4th ed., Vallabh prakashan, New Delhi, India, 1997. p. 107-111.
- Khandelwal KR. Pawar AP, Gokhale SB. Practical pharmacognosy. 22nd ed., Nirali prakashan. 2012. p. 20.1-20.5.
- Jarald EE, Jarald SE. Textbook of Pharmacognosy and Phytochemistry. 1st ed., CBS publication; New Delhi, India, 2007. p. 96-101.
- Khandelwal KR. Pawar AP, Gokhale SB. Practical pharmacognosy. 22nd ed., Nirali prakashan. 2012. p. 23.1-25.9, 25.1-25.9.
- Pimple BP, Patel AN, Kadam PV, Patil MJ. Microscopic evaluation and physiochemical analysis of *Origanum majorana* Linn leaves. Asian Pacific Journal of Tropical Disease. 2012; 1-6.
- Kumar S, Kumar V, Om Prakash. Microscopic evaluation and physiochemical analysis of *Dillenia indica* leaf. Asian Pacific Journal of Tropical Biomedicine. 2011; 337-340.
- Mukherjee PK. Quality Control of Herbal Drugs. 1st ed., Business horizon publications. 2010. p. 186.

Table 1: Macromorphological Description

Sr. no	Characters	Observation
Organoleptic characters		
1	Color	Greenish brown
2	Odour	Characteristic
3	Taste	Slightly bitter
Quantitative macromorphology		
4	Size	1.5-6 cm
5	Diameter	1-2 mm
Extra features		
6	Shape	Cylindrical, 5 follicles twisted spirally.

Table 2: Microchemical Testing

Staining Reagents	Observations	Characteristics
Phloroglucinol + conc. HCL (1 : 1)	Pink	Lignified cells
Ruthenium red	Red	Mucilage cells
Iodine solution	Blue	Starch

Table 3: Physicochemical Evaluation

Sr. No.	Test	Result (% w/w)
1	Moisture content	5.07 ± 0.0176
2	Ash Values	
	Total ash	5.06 ± 0.0529
	Water soluble ash	6.06 ± 0.0416
	Acid insoluble ash	5.03 ± 0.0394
	Sulphated ash	4.08 ± 0.0230
3	Extractive value	
	Water soluble	15 ± 0.02309
	Alcohol soluble	25.43 ± 0.04807

(Results are expressed in ± SEM)

Table 4: Preliminary Phytochemical Screening

Phytoconstituent	Observations
Carbohydrate	+
Protein	+
Phenolic compounds	+
Tannins	+
Flavonoids	+
Alkaloids	+
Saponins	+
Steroids	+

Table 5: Fluorescence Analysis

Reagent	Visible	Short Ultra Violet	Long Ultra Violet
Water	Light Brown	Light Green	Green
Pet. Ether (bp: 60-80 ⁰ c)	White	White	No color
Ethyl acetate	Greenish Yellow	Greenish Yellow	White
Methanol	Greenish Yellow	Light Green	White
Chloroform	Greenish Yellow	Greenish Yellow	Yellow
Acetone	Off White	Off White	Off White
50 % Sulphuric acid	Pale Yellow	Light Green	Greenish Yellow
50 % Nitric acid	Yellowish Green	Green	Black
50 % Hydrochloric acid	Greenish Yellow	Green	Light Brown
Picric Acid	Light Yellow	Light Green	Brownish Black
10 % Sodium Hydroxide	Blackish Brown	Green	Dark Green
10 % Ferric Chloride	Yellowish Brown	Green	Black
Dil. Ammonia	Brown	Green	Yellowish Black

Figure 1: Fruits of *Helicteres isora* Linn Figure 2: T.S of *Helicteres isora* Linn fruit (under 10 X) Figure 3: T.S of *Helicteres isora* Linn fruit showing the lignified cells Figure 4: T.S of *Helicteres isora* Linn seed (under 100 X)

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