Phytochemical and Pharmacognostic study on Haritaki
(Terminalia chebula Retz.)

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ABSTRACT The medicinal plants are an important resource for all major systems of health care, nutraceuticals and cosmetics. The medicinal plants base drug have the added advantage of being simple, effective and offering a broad spectrum of activity with a emphasis on the preventive action of drug. In this study botanical description, chemical Constituents, Ayurvedic Properties of Haritaki (Terminalia chebula Retz.)are discussed. Medicinal properties, formulation, dose, and pharmacological activity of Haritaki(Terminalia chebula Retz.) are also described.The present work deals with the pharmacognostical and preliminary phytochemical studies on Fruit ofHaritaki. Macroscopical and Microscopical Characters, physico-chemical constants, quantitative microscopy parameters, extractive values, TLC and HPTLC were studied. Preliminary phytochemical screening on Fruit of Haritaki were studied. The determination of these parameter will very useful for future researchers in their Phytochemical as well as Pharmacological evaluation of this plant.

Keywords: Terminalia chebula Retz., pharmacognostical study, Macroscopical and Microscopical Characters

Introduction -
Botanical classification: According to Benthem& Hooker (1862-1883)
Taxonomical position: Terminalia chebula Retz.
Kingdom : Plantae
Division : Magnoliophyta
Class : Magnoliopsida
Order : Myrtales
Family : Combretaceae
Genus : Terminalia
Species : chebula Retz.

Vernacular Names:
Assami : Hilikha
Bengali : Haritaki
Burma : Pangah
English : Black myrobalan, chebulic myrobalan
Gujarati : Hirdo, Harade.
Hindi : Har, Harara, Harra.
Konkani : Ordo
Malayalam : Divya, Katukka, Kayastha, Putanam
Punjabi : Halela, Har, Harrar, Hurh
Tamil: Amagola, Arabi, Aridadi, Attan, Kadu, Kadukkay, Kagodagasingi, Nechi, Pattiyam, Piradamai, Seya, Sidegi, Singi, Sirottam, Sittillai, Siva, Sivandi, Taduvairi, Tuvarchigai, Urogini, Vayadaram
Telugu : Haritaki, Karaka, Karakkaya, Nallakaraka, Resaki, Sringitiga
Tulu : Anile
Urdu : Haejarad
Uriya : Horida, Horitoki, Jonghihorida, Karedha.

Botanical Description:
Habitat: It is found throughout the greater parts of India, from Ravi eastwards to West Bengal and Assam, ascending to an altitude of 1500 m in the Himalayas, also in Bihar, Orissa, Madhya Pradesh, Maharashtra, Deccan and South India.
Habit: A moderate sized or large deciduous tree, attaining 15-24 meters in height.
Leaves: Ovate or elliptic with a pair of large glands at the top of the petiole.
Flowers: Flowers all hermaphrodite, 4mm. Across sessile, dull-white or yellow, with an offensives small. Spikes-sometimes simple, usually in short panicles, terminal and in the axils of the uppermost leaves.
Fruit: Drupes ellipsoidal, obovoid or ovoid, yellow to orange brown, and hard when ripe, 3–5 cm long, 5 ribbed on drying.

Seeds: Hard, pale yellow.

Flowering and fruiting time: Rains to summer season\(^1\).

Chemical Constituents

Major
Tannins, which on hydrolysis give chebulic acid and a D–galloyl glucose.

Others
Chebuagic acid, chebulinic acid, ellagic and gallic acid; a tannin terchebin, an ellagitannin terchebulin, syringic acid, gallic acid\(^2\).

Ayurvedic properties of Haritaki\(^3,4\)

Rasa - Kashaya, Amla, Madhura, Tikta, Katu.

Guna - Laghu, Ruksa.

Virya - Ushna.

Vipaka - Madhura.

Doshakarma - Tridoshahara.

Rogaghnata -
- Agnimandya-ajirna-shula-Anaha-ahdmana-vibandha-chardi
- Udararoga-gulmaudvartasaravshula, krimiArsha,
- Hriddourbalya-vatarkata-amavata-raktavikara, yakrita-plihavikara, pandu, kamala, kasa, shvasa,
- pratishayya, mutrakricchra-mutraghata, ashmari, prameha, kushtha,
- visarpa, jvara-vishamajvara-jirnajvara, shvatapradara.

Karma
Shothahara, Vedanasthapana, Vranashodhana, Vranaropana, Dipana, Pachana, Anulomana, Mridurecana, Krimighna, Grahi, Shonitasthapana, Hridaya, Kaphaghna, Srotoshodhana, Vrishya, Prajasthapana, Rasayana\(^5,6,7,8\).

Prayojyanga: Phala
Dose: 3–6 gm\(^9\)

Pharmacological activities
Antimicrobial, antifungal, antibacterial, anti-stress, antispasmodic, hypotensive, endurance promoting activity, anti-hepatitis B virus activity, hypolipidemic, inhibitory activity, against HIV-1 protease, anthelmintic, purgative.

Formulations (yoga)

Propagation and cultivation
It grows on variety of soils but thrives best in clay and sandy soils. The fruits ripen from November to March depending upon the locality. Mostly fallen fruits are collected in first half of January, they are dried and the seeds can be stored for one year. The germinative capacity of the seeds is low because of hard cover and seed requires presowing treatment. Best germination is obtained when the seeds are chipped at their broad end without damaging the embryo and then soaked in water for 36 hours, before they are sown in nursery beds. germination starts after 15 days and continues for 3 to 4 weeks. The tree can be successfully raised by direct sowing the seed or by transplanting the seedlings or by stem cuttings. It is observed that transplanting of one year seedling grows better than cutting or direct seed sown plants. The young plant requires watering during 1st hot weather. Shelter is desirable in early stages in nursery and also after transplanting. The general growth of the plant is slow.

Material and Methods

Plant material – Haritaki (\textit{Terminalia chebula} Retz.) has been identified by Prof. V.K. Joshi, Department of Dravyaguna, B.H.U. Useful part of drugs were collected from their natural habitat. The fruit of Haritaki was taken. The mature fruit of Haritaki was collected from the Ayurvedic Dravyaguna garden, B.H.U. Sample of collected drug were kept in the museum of the department of Dravyaguna faculty of Ayurveda IMS, BHU Varanasi as with Voucher specimen no-DG/17/136.

1. Preliminary Pharmacognostic Characteristics

Macroscopic and Microscopic description of as described in Haritaki (Fruit) API
Macroscopic study

Fruits are broken by crushing and seeds removed; pericarp occurs in pieces of various size; taste, astringent and bitter (Ayurvedic Pharmacopoeia of India, Part I, Volume VIII, First edition 2011).

Microscopic study

TS of pericarp shows epicarp consisting of one layer of epidermal cells, inner tangential and upper portions of radial wall thick; mesocarp, 2 to 3 layers of collenchyma, following by a broad zone of parenchyma in which are scattered group of fibers and sclereids and vascular bundles; fibres present with peg like outgrowth and simple pitted walls; sclereids of various shapes and sizes but mostly elongated; tannins, raphides and rosette crystals of calcium oxalate occur in parenchyma; endocarp consists of thick -walled sclereids of various shapes and size, mostly elongated; surface view of epidermis reveal polygonal, beaded cells; several of them divided into two by a thin septa; starch grains simple and compound with 2 to 8 components rounded or oval shape, measuring 2 to 7 μ in diameter, found in plenty in almost all cell of mesocarp (Ayurvedic Pharmacopoeia of India, Part I, Volume VIII, First edition 2011).

Powder microscopy of fruit powder of Haritaki

Coarse powder of greenish yellow to brown in colour. In microscopic powder study it shows lignified tissues of pink to purple colour. Aleurone grains of green colour, and oil globules of orangish yellow stain.

Observation

[I] Haritaki

<p>| Table 1: Certificate of Analysis of Haritaki |</p>
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Parameters</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Physical tests</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nature</td>
<td>Coarse powder</td>
</tr>
<tr>
<td></td>
<td>Colour</td>
<td>Greenish yellow</td>
</tr>
<tr>
<td></td>
<td>Odour</td>
<td>Characteristic</td>
</tr>
<tr>
<td></td>
<td>Taste</td>
<td>Astringent</td>
</tr>
<tr>
<td>II</td>
<td>Foreign matter</td>
<td>Nil</td>
</tr>
<tr>
<td>III</td>
<td>Moisture content (w/w%)</td>
<td>8.59</td>
</tr>
<tr>
<td>IV</td>
<td>Ash value (% w/w)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total ash</td>
<td>4.4</td>
</tr>
<tr>
<td></td>
<td>Acid insoluble ash</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td>Water soluble ash</td>
<td>0.934</td>
</tr>
</tbody>
</table>

<p>| Table 2 : Percentage yield of Extracts of Haritaki |</p>
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Extracts</th>
<th>Nature of Extract</th>
<th>Weight (gm)</th>
<th>% Yield w/w</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Hydro-alcohol</td>
<td>Viscous</td>
<td>48.2</td>
<td>48.2</td>
</tr>
</tbody>
</table>

[I] Genuine sample of Haritakigave the presence of following Phytochemicals

<table>
<thead>
<tr>
<th>Phytoconstituents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkaloids</td>
</tr>
<tr>
<td>Glycosides</td>
</tr>
<tr>
<td>Flavonoids</td>
</tr>
<tr>
<td>Steroid</td>
</tr>
<tr>
<td>Phenolic &amp; tannins</td>
</tr>
<tr>
<td>Saponins</td>
</tr>
<tr>
<td>Terpenoid</td>
</tr>
<tr>
<td>Sterol</td>
</tr>
<tr>
<td>Carbohydrates</td>
</tr>
<tr>
<td>Proteins</td>
</tr>
<tr>
<td>Amino Acids</td>
</tr>
</tbody>
</table>

(+ ) indicate present, (-) indicate absent
Thin Layer Chromatography (TLC) of Extracts

Thin layer chromatography is a technique in which a solute undergoes distribution between two phases, a stationary phase acting through adsorption and a mobile phase in the form of a liquid\(^\text{10}\).

**RESULTS :**

1) TLC of Hydroalcoholic extract of Haritaki

**Mobile phase:** A mixture of 6 ml of Toluene, 6 ml of Ethyl acetate, 1.8 formic acid, 0.25 methanol.

**Heat:** Heat at 110°C for 10 minutes and examines the plate under day light.

![TLC Image]

**Solvent system** [Toluene: Ethyl acetate:formic acid: methanol(6:6:1.8:0.25)]

**For Spot 1**

\[
\text{Rf Value} = \frac{1.3}{6.8} = 0.19
\]

**For Spot 2**

\[
\text{Rf Value} = \frac{3.7}{6.8} = 0.544
\]

**For Spot 3**

\[
\text{Rf Value} = \frac{4.7}{6.8} = 0.691
\]

**HPTLC (High Performance Thin Layer Chromatography)**

**Methodology:**

- 0.3g of extract was dissolved with 1 ml of water and 1 ml of ethylealcohol and 3, 6 and 9µl of the above extract was applied on a pre-coated silica gel F254 on aluminum plates to a band width of 7 mm using Linomat 5 TLC applicator.
- The plate was developed in Toluene: Ethyl-acetate: formic acid: methanol (6:6:1.8:0.25). The developed plates were visualized in UV 254 and 366 and scanned under UV 254 and 366 nm. R\(_6\) of the spots and densitometric scan were recorded.
HPTLC of Hydroalcoholic extract of Haritaki

Discussion and Conclusion

Pharmacognosy may be defined as a branch of bioscience which treats in detail medicinal and related product of crude or primary type obtained from plant, animal and mineral origins. In short it is an objective study of crude drugs from natural sources treated scientifically and it encompasses the knowledge of the history, distribution, cultivation, collection, processing for market and preservation, the study of sensory, physical, chemical, and structural characters and the uses of crude drugs. Pharmacognosy is a rapidly developing science, which deals with the complete and systematic knowledge of crude drugs of herbal, animal or mineral origin.

The macroscopic and microscopic identifying characters of fruit of Haritaki (Terminalia chebula Retz.) was included from the Ayurvedic Pharmacopoeia of India monograph considering the legal document of the Government of India. Powder microscopy of Fruit showed the presence of lignified tissues, Aleurone grains.
and oil globules. On physiochemical analysis, the moisture content was found in Haritaki 8.59%. The Total ash was found 4.4%; Acid insoluble ash was 0.20%, and; water soluble ash was 0.934% in fruit of Haritaki. The phytochemical investigations show the presence of alkaloid, Glycosides, Flavonoids, sterol, phenolic and tannins, Saponins, protein, and amino acids in fruit of Haritaki. The TLC and HPTLC was performed and the developed plates were visualized in UV 254nm, 366nm, which are presented in previous picture as TLC finger print as well as HPTLC chromatogram of hydro-alcoholic extract of Haritaki. This study will useful both physicians and researchers in their respective fields, either for the treatment of diseases or in the field of research.

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