Pharmacognostical Standardization of Fruits of *Elaeocarpus sphaericus* (Gaertn). K. Schum


**INTRODUCTION**

The World Health Organization estimates that 80% of the world’s population relies on herbal medicine. Meanwhile, the use of herbs in the United States is expanding rapidly, to the point where herbal products are readily found in most pharmacies and supermarkets. From 1990 to 1997, as the use of complementary and alternative medicine rose from 34 to 42%, herbal use quadrupled from 3 to 12%. It is worth remembering that these rapid changes have come not through the medical profession, but by popular demand. The public has discovered that natural medicines often provide a safe, effective, and economical alternative to pharmaceuticals, and research validates this finding. The majority of those who use herbal and high-dose vitamin products fail to tell their physicians. Either they assume that these products are harmless and not worth mentioning or they fear being ridiculed by doctors skeptical about their use. These same doctors, however, must begin to familiarize themselves with the subject. Aside from the advantages of the natural products, herb–drug interactions are a growing concern: almost one in five prescription drug users also using supplements.[1] India has a rich heritage of traditional medicines and the traditional health care systems have been flourishing for many centuries. It mainly consist of three major systems namely Ayurveda, Siddha and Unani systems of Medicine.[2] In almost all the traditional systems of medicine, the quality control aspect has been

**ABSTRACT:** *Elaeocarpus sphaericus* fruits have been used, as anticonvulsant and analgesic. It is also used in the treatment of epilepsy and hysteria. *Elaeocarpus sphaericus* fruits are used in treatment of head related troubles, epileptic fits, rheumatism, typhoid fever, dysentery and diarrhea. The present study will assist in standardization for quality, purity and sample identification. Various standardization parameters like morphological characters, microscopic evaluation, physicochemical evaluations (loss on drying, ash values, extractive values), preliminary phytochemical screening and TLC chromatographic profile of the extract were carried out and the qualitative parameters were reported. These studies provide referential information for correct identification and standardization of this plant material.

**Keywords:** *Elaeocarpus sphaericus*, standardization, microscopic evaluation, TLC.

**Editor:** Srisailam Kesetti, Phcog.Net

**Copyright:** © 2010 Phcog.net

**Author for Correspondence:** Email: gaganshah83@gmail.com

Downloaded from www.phcogj.com
considered from its inspection itself by the Rishis and later by the Vaidya and Hakims. However, in modern concept it requires necessary changes in their approach. Quality control and quality assurance is an integral part of traditional medicines, which ensures that it delivers the required quantity of quality medicament.\[3\]

Elaeocarpus sphaericus fruit belongs to the family Elaeocarpaceae, also called Rudraksha, used in Ayurveda for mental diseases, epilepsy, asthma, hypertension, arthrititis, and liver diseases. Rudraksha is very useful for the patients of high blood pressure. It does not let it go up or down. It keeps the blood pressure normal. It pacifies Vata (air), Pitta (bile) and cough automatically. It is also useful for women in pregnancy. Rudraksha are a good medicine for skin diseases and for leprosy. Hysteria, coma, leucorrhoea and female diseases related to genital organs can be cured by Rudraksha. Rudraksha increase memory also. Rudraksha beads are dielectric as they store electrical energy and they have permanent magnetic properties that change with the different mukhi beads, e.g., one mukhi bead boosts the concentration and will power of the wearer. According to Vedas it prevents diseases of head such as stroke, paralysis, etc. The complete list of all the properties found inherent in the Rudraksha beads includes electromagnetism, paramagnetism, diamagnetism and dynamic polarity or the ability to change polarity. Wearing of Rudraksha controls heart beat and has a positive effect on blood pressure, stress, anxiety, depression, palpitations and lack of concentration. It was also found that Rudraksha beads have antiaging properties based on their electromagnetism. Rudraksha beads users have repeatedly confirmed that they have experienced considerable relief from the debilitating effects of high blood pressure, stress, hypertension, depression and other mind related problems including neurotic conditions.\[8\] Moreover, Elaeocarpus sphaericus fruits are also useful in lowering the body temperature and act as an antipyretic agent during fever. Elaeocarpus sphaericus are effective in treatment of malaria.\[9\] According to Ayurveda, Elaeocarpus sphaericus fruits are used in treatment of typhoid fever, dysentery and diarrhea. The leaves are used in rheumatism. The bark is useful in vomiting of blood and in biliousness.\[9] Alkaloid are reported to be the major phytocconstituents of E. sphaericus. These include, elaeocarpidine, elaeocarpine\[9] and rudrakine.\[9] Flavonoids are also reported to be the phytocconstituents of E. sphaericus. It includes quercetin.\[9] Earlier pharmacological activities of Elaeocarpus sphaericus showed that the crude extract has antiamthic, antidepressant anti-inflammatory,\[10] antimicrobial,\[12] anticonvulsive, antiepileptic and anti-hypertensive properties.\[13\]

However, no scientific standards or pharmacognostic parameters are yet available to determine the quality of this crude drug. The present work therefore, attempts to report necessary pharmacognostic and standardization parameters for fruits of Elaeocarpus sphaericus.

**MATERIALS AND METHODS**

**Description of plant of Elaeocarpus sphaericus**

**Tree:** The tree is large evergreen broad-leaved tree.

**Leaves:** Leaves are 10–15 by 2.4–4.5 cm., oblong-lanceolate, acute or acuminate, obscurely and irregularly crenate-serrate or sub entire, decurrent into the petiole, glabrous; petioles 6–10 mm. long.

**Bark:** The bark is grayish white and rough in texture with small vertical lenticels and natural horizontal furrow.

**Trunk:** The main trunk of Rudraksh tree is cylindrical.

**Flowers:** Racemes 5–7.5 cm. long, from the old wood; buds ovoid-conical, pointed; pedicels 6 mm. long. Sepal 6 mm long, oblong, acuminate, pubescent outside. Petals 8 mm. long, oblong, laciniate about half way down and ciliolate. Stamens about 40, in groups opposite each petal; filaments very short; anthers linear, one valve tipped at the apex with a small tuft of glistering hairs.\[14\]

**Fruits:** Fruits 2.5 cm in diameter globose somewhat obovoid purple drupes stone tubercled longitudinally grooved generally five celled and five seeded. The ovary of Rudraksh is five celled. Thus, an ovary may produce 1, 2, 3, 4 or 5 seeds depending upon the abortion of ovules during development into seeds.\[15\]

**Collection and authentication**

Elaeocarpus sphaericus fruits were collected in the month of February 2007 from Hari Har Ashram Haridwar, India. The taxonomic identity of the plant was confirmed by Dr. P. Jayaraman, Head, Plant Anatomy Research Center (PARC), Pharmacognosy Institute, Chennai 60045. A voucher specimen (No. PARC 2007/8) has been deposited in the same herbarium.

**Preparation of fruit extract**

Fruits of Elaeocarpus sphaericus were separately dried in shade and powdered. One hundred grams of powdered fruits and seeds were subjected separately to successive Soxhlet extraction by solvents in increasing order of polarity viz., petroleum ether (60–80°C), chloroform and methanol. Before each extraction, the powdered material was dried in hot air-over below
Pharmacognostical Standardization of Fruits of *Elaeocarpus sphaericus* (Gaertn). K. Schum

50°C. Each extract was concentrated by distilling off the solvent and then evaporating to dryness on the water-bath. The three extracts were weighed and the percentage was calculated in terms of air-dried weight of the plant material.

**Phytochemical screening**

The various extracts of *Elaeocarpus sphaericus* of both fruits were subjected to qualitative chemical examination.[16,17]

**Thin layer chromatographic profile**

TLC glass plates (5 × 15 cm), 0.25 mm thick were prepared using silica gel G. The plates were activated at 110°C for 30 minutes. The TLC profiles of the extracts were studied using different solvent systems. TLC plates were developed in TLC chamber. Thin layer chromatograms were visualized under 254/366 nm UV light and in iodine chamber. Spraying reagent 5% methanolic-sulphuric acid is used.

**Organoleptic evaluation**

Organoleptic evaluation of fruits and seeds was done by observing fruits and seeds with naked eyes.

**Microscopic and histological technique of fruits**

**Study of transverse sections:** The fruits of *Elaeocarpus sphaericus* were boiled with water until soft. Free hand sections of both fruits and seeds were cut transferred on slides cleared by warming with chloral hydrate and mounted in glycerin. The lignified and cellulosic tissues were distinguished using differential staining techniques.[18]

**Photomicrography:** Microscopic evaluation of tissues was supplemented with micrographs. Photographs of different magnifications were taken with Nikon Labpot 2 microscopic unit. For normal observations bright field was used. For the study of crystals, starch grain and lignified cells, polarized light was employed. Since these structures have birefringent property, under polarized light they appear bright against dark background. Magnifications of the figures are indicated by the scale-bars.[19]

**Powder microscopy:** A few drops of chloral hydrate solution was added to a sample of powered plant material on a slide, covered with a glass slip and heated gently over a microbunsen. Vigorous boiling was avoided. The slide was examined under the microscope. When the clearing process is completed a drop of glycerol solution was added which will prevent crystallization of the mounting agent on cooling.

**Physicochemical analysis:** Physicochemical analysis i.e., alcohol (90% ethanol) and water soluble extractive values, total ash, acid-insoluble ash, and loss on drying of the powdered drug were determined.[20,21]

**RESULTS**

**Organoleptic features of fruit**

Colour - Blue  
Taste - Pungent  
Description - The fruit is spherical with smooth surface. It is a single seeded drupe with thick, soft epicarp and mesocarp and hard stony endocarp. The surface of the endocarp is nodulated with irregular tubercles (Figure 1). Inside the fruit occurs a single seed with endosperm surrounding the embryo.

**FIGURE 1:** Single fruit showing soft epicarp and hard stony endocarp.

**Microscopic features of the fruit**

In the cross sectional view, the epicarp is represented by a thin dark epidermal layer of small rectangular cells (Figure 2).

**FIGURE 2:** T.S. of fruit, outer portion enlarged (anatomy of fruit).
Inner to the epidermis is a wide fleshy mesocarp. The cells of mesocarp are parenchymatous, thin walled and compact (Figure 3).

**FIGURE 3:** T.S. of fruit, a sector enlarged.

Major portion of the mesocarp cells have dense tannin content, especially, four or five layers of mesocarp cells, inner to the epidermis have dense tannin content. There are also irregular masses of sclereids especially in the outer zone (Figure 2 and Figure 3). The sclereids are polyhedral with thick walls and narrow lumen. Scattered in mesocarp there are vascular strands comprising of few clusters of xylem elements (Figure 4).

**Powder microscopy**

The powder of the mesocarp, stony endocarp and seed were studied under the microscope. The following components are observed:

**FIGURE 4:** T.S. of fruit, vascular system and tanniniferous cells.

(a) The cells of mesocarp are parenchymatous. They are elongated, cylindrical or spherical in shape (Figures 5, 6). They have thin cellulose walls; the cells content in dense and darkly staining. The cylindrical cells are 150 µm long and 30

**FIGURE 5:** Dense parenchymatous mesocarp.

**FIGURE 6:** Elongated, cylindrical parenchymatous cells, enlarged.

**FIGURE 7:** Powder microscopy showing stony endocarp.
Pharmacognostical Standardization of Fruits of *Elaeocarpus sphaericus* (Gaertn). K. Schum

**FIGURE 7.1:** Parenchymatous mesocarp and stony sclereids of endocarp.

![Parenchymatous mesocarp and stony sclereids of endocarp.](image1)

[Pa-Parenchymatous mesocarp; Scl-Sclereid]

μm thick. The square shaped cells are 70 μm in diameter.

(b) Cells of stony endocarp (Figure 7 and Figure 8). The major component of the endocarp is the stone cells. This is diametric in shape. They have thick, lignified and smooth walls. The cell’s lumen is wider. The cell walls have abundant canal like thickenings (Figure 7.1). The sclereids are 70 μm long and 30–40 μm wide.

(c) Crystal bearing cells (Figure 9–10). Thick mass of cells of the powder, when viewed under the polarized light microscope, showed the presence of calcium oxalate crystals in the cells. They are large and diffuse in distribution. They are 20–40 μm in diameter.

**Physical parameters**

The physical parameters of powdered fruits of *Elaeocarpus sphaericus* were evaluated Table 1.

**FIGURE 8:** Stone cells enlarged.

![Stone cells enlarged.](image2)

[Cw-cell wall; Pa- Parenchymatous mesocarp; Spl-sieve plate; Scl-Sclereid]

**FIGURE 9:** Druses in the endocarp under polarized light microscope.

![Druses in the endocarp under polarized light microscope.](image3)

[Dr- Druses; En- Endocarp]

**FIGURE 10:** Druses and tanniferous cells under low magnification in polarized light microscope.

![Druses and tanniferous cells under low magnification in polarized light microscope.](image4)

[Dr- Druses]

**Thin layer chromatography**

TLC of the methanolic extract on silica gel G using n-butanol : acetic acid : water (4:1:5) under UV (366 nm) shows one fluorescent zone at Rf value of 0.91 (violet). On exposure to iodine vapour, three spots appeared at Rf values of 0.18, 0.29 and 0.50 (all yellow). On spraying with 5% methanolic–sulphuric acid reagent and heating the plate at 105°C for ten minutes a single spot appears at Rf 0.89 (grey).

**TABLE 1:** Physical parameters of powdered fruits of *Elaeocarpus sphaericus*.

<table>
<thead>
<tr>
<th>PHYSICAL PARAMETER</th>
<th>% W/W (AIR DRIED DRUG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethanol-soluble extractive</td>
<td>2.4</td>
</tr>
<tr>
<td>Water soluble extractive</td>
<td>3.2</td>
</tr>
<tr>
<td>Total ash</td>
<td>1.0</td>
</tr>
<tr>
<td>Acid insoluble ash</td>
<td>0.24</td>
</tr>
<tr>
<td>Loss on drying</td>
<td>8.2</td>
</tr>
</tbody>
</table>
TABLE 2: Results of phytochemical screening of *Elaeocarpus sphaericus* fruit extracts.

<table>
<thead>
<tr>
<th>PHYTOCHEMICALS</th>
<th>PETROLEUM ETHER</th>
<th>CHLOROFORM</th>
<th>METHANOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkaloids</td>
<td>−</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>−</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Proteins and aminoacids</td>
<td>−</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Phytosterols</td>
<td>−</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Phenolic compounds and tannins</td>
<td>−</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Saponins</td>
<td>−</td>
<td>−</td>
<td></td>
</tr>
<tr>
<td>Triterpenoids</td>
<td>−</td>
<td>−</td>
<td>−</td>
</tr>
<tr>
<td>Flavonoids</td>
<td>−</td>
<td>−</td>
<td></td>
</tr>
<tr>
<td>Fixed oils and fats</td>
<td>−</td>
<td>−</td>
<td>−</td>
</tr>
</tbody>
</table>

**Preliminary phytochemical screening**

The preliminary phytochemical investigation of the methanol, petroleum ether and chloroform extracts of *Elaeocarpus sphaericus* fruits shows the presence of alkaloids, carbohydrates, steroids, flavonoids, phenolic compounds and tannins (Table 2).

**DISCUSSION**

As a part of standardization, the macroscopical examination of fruits of *Elaeocarpus sphaericus* was studied. Macrosopical evaluation is a technique of qualitative evaluation based on the study of morphological and sensory profiles of drugs. The macroscopical characters of the fruits of plant can serve as diagnostic parameters. The microscopic evaluation of fruits of *Elaeocarpus sphaericus* and extractive values, ash values and loss on drying of the powdered drug and phytochemical screening of the extract have been carried out which would be of considerable use in the identification of this drug. Percentages of the extractive values, ash values and loss on drying were calculated with reference to the air-dried drug. The percent extractives in different solvents indicate the quantity and nature of constituents in the extracts. The extractive values are also helpful in estimation of specific constituents soluble in particular solvent. Thin layer chromatography (TLC) was examined in short UV (254 nm) and long UV (366 nm) which is particularly valuable for the preliminary separation and determination of plant constituents. This finding is useful to supplement the existing information with regard to identification and standardization of *Elaeocarpus sphaericus* even in the powdered form of the plant drug to distinguish it from drug and adulterant. These studies also suggest that the observed pharmacognostic and phytochemical parameters are of great value in the quality control and formulation development.

**CONCLUSION**

The present study may be useful to supplement the information with regard to its standardization and identification and in carrying out further research and its use in Ayurvedic system of medicine.

**ACKNOWLEDGEMENT**

The authors gratefully acknowledge the support of Department of Natural Products, Faculty of Pharmacy, Punjabi University, Patiala, for providing necessary facilities to carry out this research work.

**REFERENCES**


