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## ***Elaeocarpus sphaericus*: A Tree with Curative Powers: an Overview**

<sup>1</sup>Manu Pant, <sup>1</sup>Ankita Lal, <sup>2</sup>Prabha Bisht and <sup>1</sup>Anju Rani

<sup>1</sup>Department of Biotechnology, Graphic Era University, Dehradun, India

<sup>2</sup>Tissue Culture Discipline, Botany Division, Forest Research Institute, Dehradun, India

*Corresponding Author: Manu Pant, Department of Biotechnology, Graphic Era University, Dehradun, India  
Tel: +91 9917292899*

### **ABSTRACT**

*Elaeocarpus sphaericus*, commonly known as Rudraksha, is an evergreen tree occupying several regions of central and north-east India. The tree is known for its varied medicinal and therapeutic properties. The dried fruit, known as the Bead, possesses electrical and electromagnetic properties accounting for their innumerable healing powers. The leaves, fruits and seeds also serve several medicinal and therapeutic purposes. While delayed fruiting and poor seed viability resist mass propagation via seeds, other vegetative propagation methods are also not very successful. This study briefly reviews the botany, pharmacology, biochemistry and concerns in propagation and conservation of this species. This is an attempt to compile and document information on different aspects of *E. sphaericus* and highlight the need for research and development to promote this plant.

**Key words:** *Elaeocarpus sphaericus*, beads, therapeutic value, medicinal properties, propagation

### **INTRODUCTION**

*Elaeocarpus* is a genus of tropical and subtropical evergreen trees and shrubs. Belonging to family Elaeocarpaceae, the genus includes approximately 350 species distributed from Madagascar in the west to New Zealand in the East; covering the regions of Southeast Asia, Southern China, Japan, Malaysia, Australia, New Guinea, Fiji and Hawaii (Coode, 2007). Most species are evergreen forest trees but some montane species are nearly shrubs. The Indian subcontinent marks the western limit of *Elaeocarpus* distribution in Asia (including India, Bangladesh, Bhutan, Nepal, Pakistan and Srilanka) (Zmarzty, 2001). Besides, about 30-45 species of *Elaeocarpus* are indigenous to the subcontinent of which *Elaeocarpus sphaericus* is one of the medicinally and commercially valuable species.

*Elaeocarpus sphaericus* Gaertn. K. Schum. (Syn. *Elaeocarpus ganitrus* Roxb.) (Chromosome number  $2n = 50$ ) is commonly known as Rudraksha (in Hindi) or Bead tree (in English). The trees occupy the areas starting from Manila, Philippines and fleeting through Myanmar to whole North-East India, Bangladesh, Nepal and Bhutan (Asolkar *et al.*, 1992; Bhuyan *et al.*, 2002). In India, the trees occupy the regions ranging from the Gangetic Plain to the foothills of the great Himalaya, Arunachal Pradesh, Bihar, Madhya Pradesh and the Konkan Ghats (Fig. 1) where the tree is known by an array of vernacular names viz. Rudraksha, Bhootanasana, Neelakandaksha, Sivaksha Sivapriya (Sanskrit), Rosery nut; Rudraksham (Malyalam); Ludrai (Sylhet), Dubichi (Chakma), Ludrak (Garo).



Fig. 1: Distribution of *E. sphaericus* in India (dotted regions)



Fig. 2(a-c): (a) *Eleaocarpus sphaericus* (rudraksha) (a) Tree (b) Leaves and (c) Dried fruit (bead)

Rudraksha is a large, evergreen, drought-tolerant, perennial broad-leaved tree with a large spreading crown. The tree attains a height of about 50-200 feet (Singh *et al.*, 2003; Kumar *et al.*, 2008). The stem is cylindrical with a dirty white and coarse textured bark. Leaves are 10-15 cm long, simple, alternate, oblong-lanceolate, acute or acuminate, obscurely and irregularly crenate-serrate or sub entire. They are shining green on the upper side with and dull-fibrous on dorsal side (Fig. 2a-b). As the tree matures, the leafy crown obtains a pyramidal shape in nature

and the roots rise up narrowly near the trunk and radiate out along the ground-surface. Flowering occurs in the month of April-May. The flowers are small, white with fringed petals (about 8 mm long), half way down and ciliate. Fruiting is delayed; taking about 7-8 years to fruit. The fruits are borne in the month of June and gradually ripen over a period of time extending from August to October (Khan *et al.*, 2005). A standard fruit is about 1.3-2 cm in diameter, globose or obovoid and purplish-blue in colour (thus the name Blueberry bead). It has a hard, stony endocarp (sclerotesta) with lignified isodiametric sclereids. The fruit includes five or six carpels, each carpel having a single large seed. The seed is elliptical consisting of a membranous seed coat. It encloses a dense cellular endosperm comprising of calcium oxalate druses and tubercles (Singh *et al.*, 2010). The stony endocarp (with seed inside) on drying forms the much-valuable "Bead" (Fig. 2c). The type of bead formed varies with the environment and location of the trees; for instance, the Himalayan beads are larger, heavier and therapeutically more powerful due to the environment they grow in.

### **THERAPEUTIC PROPERTIES OF BEADS AND THEIR MECHANISM OF ACTION**

*E. sphaericus* beads (The Blueberry beads) are formed of different combinations of Carbon, Hydrogen, Oxygen, Nitrogen and different trace elements. The Ayurvedic system of medicine highlights the therapeutic powers of these beads which are known to have a positive effect on heart and nerves. The bead is attributed with ability to reduce body temperature and having a calming effect. People suffering from anxiety are advised to keep a five-mukhi (five-faced) *E. sphaericus* bead to regain confidence; hence acting as a stabilizing anchor. Besides, beads have electromagnetic and electrical properties giving them several healing powers (Fig. 3). Owing to these properties, the beads enjoy a good market and have an excellent commercial value.

### **FOLKLORE AND TRADITIONAL USES**

*Elaeocarpus sphaericus* tree holds immense importance in the Hindu religion. According to Hindu mythology, the term "Rudraksha" means "Tears of Lord Shiva" (Rudra-Lord Shiva in his most fierce forms+ Aksha: Eye). The tree, therefore enjoys much revered status and is worshipped as being generated from the tear drops from eyes of Lord Shiva (after His 1000 years of meditation) and helps provide concentration (aksha = axis= concentration). The remedial powers of Rudraksha and its usage have been mentioned in several religious texts viz., Padma Purana, Mantra Maharnava, Rudraksha Jabala Upanishad, Siva Purana (Vidyasvara Samhita), Srimad Devi Bhagavatam.

In ancient times, the fruits were employed to ward-off evil spirits and omens (Acharya, 1976) which could have been some form of microbial infection. In folk medicine, the parts of Rudraksha tree have been extensively used in the treatment of stress, anxiety, depression, palpitation, nerve pain, epilepsy, migraine, asthma, hypertension, arthritis and liver diseases (Khare, 2004; Dasgupta *et al.*, 1984). The Rudraksha berry is used in a variety of treatment including indigestion, vomiting, injuries, epilepsy etc. Besides, the fruits also constitute the diet of the fruit bats or flying foxes in the Himalayan region.

### **CHEMICAL CONSTITUENTS AND MEDICINAL USES**

*Elaeocarpus* species are known to contain several chemicals such as triterpenes, tannins (e.g., geranin and 3, 4, 5-trimethoxy geranin), indolizine alkaloids (e.g. grandisines), flavonoids.

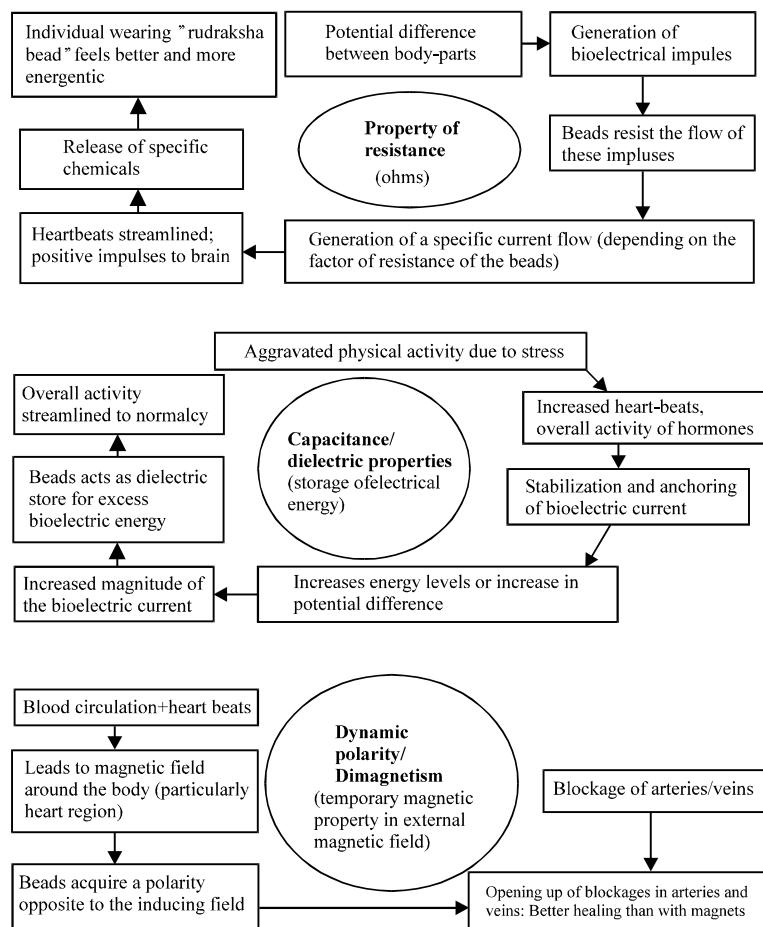


Fig. 3: Therapeutic potential of rudraksha beads

*E. sphaericus*, in particular, has been reported to possess alkaloids, glycosides, steroids, flavonoid (quercetin), tannins (gallic and ellagic acids), fatty acids (palmitic and linoleic acids), carbohydrates, proteins and ash (Lal, 1975; Rastogi and Mehrotra, 1991; Sakat *et al.*, 2009; Singh *et al.*, 2010; Shah *et al.*, 2011). Several isomeric alkaloids of molecular formula  $C_{16}H_{21}NO_2$  have been isolated from the leaves of Rudraksha tree (Johns *et al.*, 1969, 1970). These include elaeocarpidine, elaeocarpine, isoelaocarpine, epiisoelaocarpiline, epialloelaocarpiline, alloelaocarpiline, pseudoepiisoelaocarpiline. Besides, the species also contains an important non-aromatic indolizidine alkaloid-rudrakine (Ray *et al.*, 1979) (Fig. 4).

These important chemical constituents of the leaves, fruits and seeds of *E. sphaericus* account for several medicinal properties of Rudraksha. The extracts of leaves and fruit, in particular, exhibit analgesic, antiepileptic, anticonvulsive, antihypertensive, hypnotic, tranquillizing, thermogenic, sedative, smooth muscle relaxant and hydrocholeretic properties (Lal, 1975; Bhattacharya *et al.*, 1975; Dasgupta *et al.*, 1984; Panday and Bhattacharya, 1985; Almeida *et al.*, 2001; Sakat *et al.*, 2009; Nain *et al.*, 2012). Rudraksha fruits are also useful in cough, bronchitis, neuralgia,

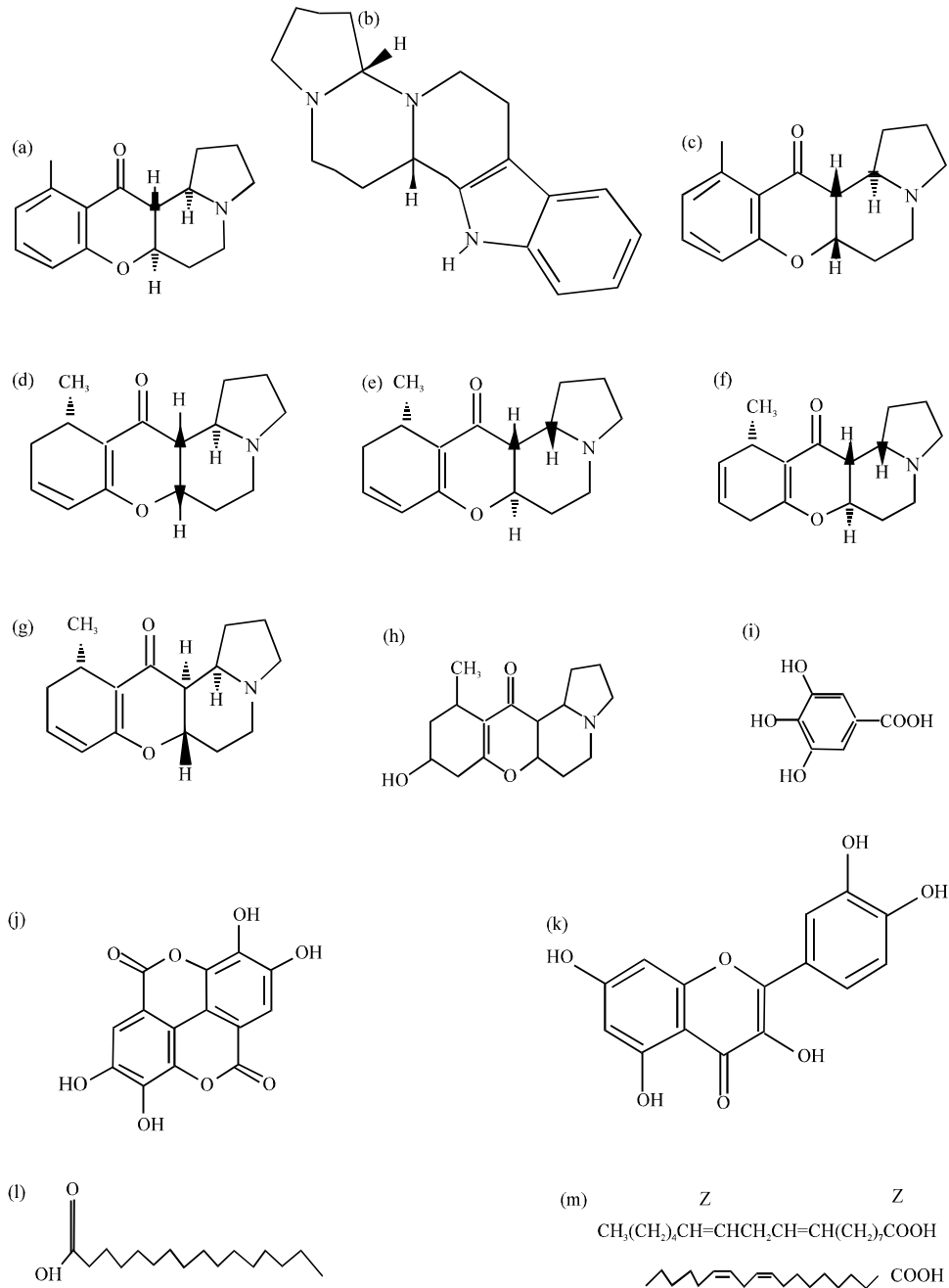


Fig. 4(a-m): Chemical constituents of *Elaeocarpus sphaericus* (a) Elaeocarpidine, (b) (+)-Elaeocarpine, (c) (+)-Epielaecarpiline, (d) (+)-Isoelaecarpine, (e) (-)-alloelaecarpiline, (f) (+)-Pseudoepiisoeleocarpiline, (g) (+)-Epialloelaecarpiline, (h) Rudrakine, (i) Gallic acid, (j) Ellagic acid, (k) Quercetin, (l) Palmitic acid and (m) Linoleic acid

cephalalgia, anorexia, migraine, manic conditions and other brain disorders (Singh *et al.*, 2000a, b). The flesh or pulp of drupe has been reported to cure epilepsy and mental illness (Satyavati *et al.*, 1976) (Table 1).

Table 1: Medicinal properties of *Elaeocarpus sphaericus*

Extract used	Properties exhibited	References
Petroleum ether/benzene/ chloroform/acetone/ethanol	Antiasthmatic	Singh <i>et al.</i> (2000b)
Petroleum ether/methanol/chloroform/water	Analgesic	Nain <i>et al.</i> (2012)
Petroleum ether/benzene/chloroform/acetone/ethanol	Anticonvulsant	Dasgupta <i>et al.</i> (1984) and Asolkar <i>et al.</i> (1992)
Petroleum ether/ethanol	Antidepressant	Singh <i>et al.</i> (2000a)
Water	Antidiabetic	Hule <i>et al.</i> (2011)
Chloroform/ethanol/water	Antifungal	Singh <i>et al.</i> (2010)
Petroleum ether/benzene/chloroform/acetone/ethanol	Anti inflammatory	Singh and Pandey (1999) and Singh <i>et al.</i> (2000b)
Water/ethyl acetate	Antihypertensive	Sarkar <i>et al.</i> (1972a, b, 1973), Asolkar <i>et al.</i> (1992), Sakat <i>et al.</i> (2009) and Lakshmi <i>et al.</i> (2011)
Petroleum ether/benzene/, chloroform/acetone/ethanol	Antimicrobial	Singh and Nath (1999)
Ethanol	Antioxidant	Kumar <i>et al.</i> (2008)
Petroleum ether/benzene/chloroform/acetone/ethanol	Antiulcerogenic	Singh <i>et al.</i> (2000a)
Methanol	Anxiolytic	Shah <i>et al.</i> (2011)
Water	Cardiac stimulant	Asolkar <i>et al.</i> (1992)
Water	Bronchodilatory	Asolkar <i>et al.</i> (1992)
Methanol	Immunomodulatory	Hule and Juvekar (2009, 2010)

Besides the medicinal properties, Rudraksha tree is also valued for its timber. The white wood from the tree has a unique strength to weight ratio making it a preferred source for a variety of purposes such as manufacture of aeroplane-propellers.

## PROPAGATION METHODS

*E. sphaericus* is conventionally propagated through seeds since cuttings/grafting methods have not been very successful. The seeds are collected in the month of December-January. The treatment involves a 15 min pre-washing of cleaned stones with concentrated sulphuric acid followed by washing in tap water and subsequent soaking in lukewarm water (40°C) for about 48 h. Alternatively, a method of mechanical scarification by hammer may be employed; taking due care to minimize any damage to the seeds. Sowing is done in shaded mother beds at a depth of 1.0 to 1.5 cm (Singh *et al.*, 2003). The seeds prefer a clayey or loamy, slightly acidic (6.0-6.3) to neutral (6.3-7.3) and well drained soil. Shade conditions are necessary to provide an ambient micro-environment optimal for seed germination since the gestation period may vary a minimum of 45 days to over an year. A dense canopy cover has been reported to be preferable for *E. sphaericus* seedlings growth (Khan *et al.*, 2004). Germinated seedlings at 2 or 3 leaves stage and become ready for field plantation after about 8 months (Singh *et al.*, 2003). The plant requires a temperature range of 10-30°C, humid to warm climate with preferable partial shade for suitable growth.

## CONCERNS

Despite all attempts, there are no proven records of successful establishment of seedling-raised plants of *E. sphaericus* in nurseries or forests. This may be due to the fact that if cuttings are taken from mature trees the success achieved in rooting is not encouraging until and unless the tissue has been rejuvenated following hedging. Besides, conventional vegetative propagation methods using branch cuttings may result in plagiotropic growth (Joshi *et al.*, 2003a).

Delayed fruiting, poor seed viability (less than 3 months) and erratic seed-germination rates impede mass propagation via seeds (Bhuyan *et al.*, 2002). This, aided by increasing human-activities has led to an alarming danger to the existing populations of Rudraksha.

Unscientific practices of bead collection have caused a drastic decline of the seed reservoir in the soil, hence hampering natural species regeneration (Bhuyan *et al.*, 2002; Khan *et al.*, 2004). The natural and planted forest stands of the species are therefore becoming increasingly threatened.

## CONCLUSION

Most of the studies on *E. sphaericus* have been limited to pharmacological and pharmacognostic investigations. A strong need is felt to screen the different chemo-types of Rudraksha growing at different phytogeographical locations. Similarly, biodiversity studies at morphological, biochemical and genetic levels will enable the research community to realize the extent of variability within the existing germplasm of the species. Want of suitable and established agro-techniques to promote propagation of *E. sphaericus* opens a wide scope for exploring varied aspects of the species. Resistances in regeneration via conventional methods of cuttings, graftings and through seed germination have resulted in constant decline in natural stands of Rudraksha. Moreover, regeneration via seeds do not ensure true-to parent type populations. Thus, there are no established varieties or lines of this medicinally valuable tree species. Clonal forestry becomes important to bridge the gap between the growing demand and inadequate supply of wood (Joshi *et al.*, 2003b). In this scenario, plant tissue culture technique offers a potential instrument for mass multiplication, clonal propagation and germplasm conservation of this medicinally and economically valuable tree species. Several workers have reported the efficiency of tissue culture technology in mass propagation, with a high multiplication rate, of commercially important species (Bisht *et al.*, 1999, 2010a-b). However, there are no published reports on *in vitro* propagation of this species calling for concerted efforts in this direction.

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