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RUDRAKSHA (*ELAEOCARPUS GANITRUS*) IN AYURVEDIC CLASSICS: A CRITICAL APPRAISAL WITH CONTEMPORARY SCIENTIFIC INSIGHTS

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ABSTRACT

Rudraksha (*Elaeocarpus ganitrus*) is an evergreen tree traditionally revered in Shaiva traditions and described in Ayurvedic Nighantus for its therapeutic properties. Although not elaborately mentioned in the Brihattrayi, classical lexicons attribute to it Vata-Kapha shamaka action and indications in conditions such as Daha, Jwara, Unmada, Shirashoola, and related psychosomatic disorders. The present narrative-cum-critical review aims to compile and analyze classical Ayurvedic references and correlate them with contemporary scientific findings. Literary sources from major Nighantus were examined, and electronic databases including PubMed, Scopus, Google Scholar, and AYUSH Research Portal were searched for relevant experimental and review studies. Phytochemical investigations reveal that *Elaeocarpus ganitrus* contains diverse bioactive compounds, including flavonoids (quercetin, kaempferol, catechin), phenolic acids (gallic acid, chlorogenic acid, ferulic acid), tannins, glycosides, alkaloids, and terpenoids. Experimental studies demonstrate antioxidant, anti-inflammatory, antihypertensive, antidiabetic, nephroprotective, immunomodulatory, antibacterial, anticancer, and anxiolytic activities, supporting several traditional claims. Acute toxicity studies indicate a relatively favorable safety profile in animal models.

Despite promising preclinical evidence, robust human clinical trials and standardization protocols remain limited. Further systematic research is necessary to validate its efficacy and ensure its rational integration into evidence-based integrative healthcare.

KEYWORDS: Rudraksha; Elaeocarpus ganitrus; Ayurveda; Phytochemistry; Antioxidant; Antihypertensive; Neuroprotective; Integrative medicine; Medicinal plants; Vata-Kapha shamaka.

INTRODUCTION

Rudraksha (*E. ganitrus*) is an evergreen tree native to the Himalayan region and Southeast Asia. Its dried seeds have long held spiritual and medicinal importance, particularly within Hinduism and Shaivism. Beyond their religious significance, classical Ayurvedic literature attributes cardiotonic, mind-calming, and tridosha-balancing properties to Rudraksha, recommending it for stress, hypertension, palpitations, and anxiety.

Modern scientific interest in integrative medicine has prompted investigation into the pharmacological basis of these traditional claims. Phytochemical studies reveal that *Elaeocarpus ganitrus* seeds contain alkaloids, flavonoids, tannins, and glycosides, which exhibit antioxidant, anti-inflammatory, and neuroprotective activities in preliminary research. Emerging evidence suggests potential modulation of autonomic nervous system balance, supporting its proposed role in stress reduction and cardiovascular regulation.

Despite extensive traditional use, systematic scientific evaluation remains limited. This review aims to synthesize classical references and contemporary findings to critically assess the phytochemistry, mechanisms of action, safety, and therapeutic potential of Rudraksha in holistic and integrative healthcare.

MATERIAL AND METHODS

This study was designed as a narrative-cum-critical review aimed at systematically compiling, analyzing, and appraising references to Elaeocarpus ganitrus (Rudraksha) in Ayurvedic classics and correlating them with contemporary scientific evidence. Primary references to Rudraksha were searched in major Ayurvedic compendia. Relevant Sanskrit terms such as *Rudraksha*, *Rudrakshaphala*, and regional synonyms were used to identify references. Descriptions regarding *Rasa*, *Guna*, *Virya*, *Vipaka*, *Karma*, therapeutic indications, formulations, and mode of administration were extracted. Electronic databases

including PubMed, Scopus, Google Scholar, and AYUSH Research Portal were searched for peer-reviewed articles up to the most recent available year. Search keywords included "Rudraksha," "Elaeocarpus ganitrus," "phytochemistry," "pharmacology," "antioxidant," "anti-inflammatory," "neuroprotective," "cardiovascular," and "autonomic nervous system." Experimental studies (in vitro and in vivo), clinical studies, phytochemical analyses, and review articles published in English were included. As this study was based exclusively on published literature and classical texts, ethical committee approval was not required.

Etymology[1]

रुद्रस्य अक्षि कारणत्वेनास्त्यस्येति।। (शब्दकल्प द्रुम)

Rudraksha is a sanskrit compound word consisting of "Rudra" (रुद्र) referring to Shiva and "akṣa"(अक्ष) meaning "eye" meaning "Eye of Rudra".

Vedic Literature

Rudraksha appears in later Vedic and post-Vedic literature, especially in Shaiva Upanishads and Puranas**. Rudraksha Jabala Upanishad** gives detailed descriptions of origin, types (mukhi), wearing rules, and spiritual benefits. States that Rudraksha originated from the tears of Lord Shiva.[2] **Shiva Purana** contains mythological narration of Rudraksha's origin and also about spiritual and therapeutic merits.[3] In **Padma Purana**, the sanctity and benefits of wearing Rudraksha is explained.[4] **Linga Purana** gives references of Rudraksha in Shaiva worship context.

Ayurvedic Literature

Rudraksha has not been described directly in Brihattrayi. But Nighantus like *Abhidhana Ratnamala, Shaligram Nighantu, Raj Nighantu, Priya Nighantu, Shadrasas Nighantu* and *Shaligram Nighantu* have explained the uses of *Rudraksha*.

Table No. 1: Synonyms of Rudraksha as per different Nighantu.

Synonyms	Nighantu
Paravat	Abhidhan Ratnamala
Airavat	Abhidhan Ratnamala
Shivaksha	Shaligram Nighantu, Raj Nighantu
Sarvaksha	Shaligram Nighantu, Raj Nighantu
Bhutnashana	Shaligram Nighantu, Raj Nighantu
Pavana	Shaligram Nighantu, Raj Nighantu
Neelakanthaksha	Shaligram Nighantu, Raj Nighantu
Haraksha	Shaligram Nighantu, Raj Nighantu

Shivpriya	Shaligram Nighantu, Raj Nighantu
Girishpriya	Priya Nihantu

Table No. 2: References of Rudraksha in various Nighantu.

Sr. No.	Nighantu	Reference
1.	Nighantu Shesha	Vruksha Kand
2.	Shadrasa Nighantu	Amlarasa skandha (2/20)
3.	Raj Nighantu	Amradi Varga (186-187 sloka)
4.	Bhavaprakash Nighantu	Anekarthanam varga
5.	Shaligram Nighantu	Vatadi Varga
6.	Nighantu Adarash	Rudraksha Varga
7.	Shankar Nighantu	Dwitiya Bhag (639 sloka)
8.	Priya Nighantu	Haritakyadi Varga (154-155 sloka)

Table No. 3: Ras Panchak of *Rudraksha* according to various Nighantu.

Acharya	Rasa	Guna	Virya	Vipaka	Prabhav	Doshaghnta
Priya Nighantu	Madhura	Guru, Snigdha	Sheeta	Madhura	Raktabhara Shamak	Vata-Pitta shamaka
Raj Nighantu	Amla	–	Ushna	–	–	Vata-Kapha shamaka
Nighantu Adarsha	Amla	–	–	–	–	Vata-Kapha shamaka
Shaligram Nighantu	Amla	–	Ushna	–	–	Vata-Kapha shamaka
Shankar Nighantu	Amla	–	Ushna	–	–	Vata-Kapha shamaka

Table No. 4: Karma according to different Nighantu.

Nighantu	Karma
Priya Nighantu	Useful in Daha, Jwar, Unmada, Visphota, Sheetla, Vran
Shankar Nigantu	To alleviate headache, Bhutabadha, Grahabadha
Shaligram Nighantu	Useful in Headache, Bhutgraha
Raj Nighantu	Useful in Headache, Bhutgraha

Morphology of *E. ganitrus*[5]

Rudraksha is a large, woody, perennial, pyramid-shaped, evergreen tree with a large spreading crown & height reaches up to 50-200 feet. **Leaves** are simple, large, glabrous, oblong-lanceolate, acute or acuminate, sub-entire or irregularly crenate, shining green on the sun-facing side and dull stringy on earth facing side with length 5-6 inches and breadth 2 inches. **Flowers** are sweet-smelling, pointed, elongate, about 1-2 cm indiameter densely racemes mainly from the axils of fallen leaves, white or yellow, linear anther, and fringed petals. Flowering started in the April to May month. **Trunk** is cylindrical with greyish-white and rough-textured bark. **Fruits** are small, fleshy, acidic, round or oval, violet or blue bearing

(blueberry bead) a centrally located seed containing a bead called Rudraksha. They start appearing in June and ripen near October. It starts giving fruit after 7 years from the day of sowing. The diameter of a standard fruit is about 1.3-2cm. **Endocarp** is hard, stony, strongly tubercular, globular, reddish-brown having 5 longitudinal ridges, sometimes 1 to 4 with a diameter 14-17mm.

Microscopic characters of *E. ganitrus*[6]

Seed coat is multilayered, oval to polygonal stone cells. Internally followed by 8-10 layers of tangentially elongated, oval shaped, thin walled, parenchytamous cells, filled with reddish brown contents, except middle 2 or 3 layers. **Endosperm** is oval to polygonal, thin walled, parenchymatous cells, has rosette crystals of calcium oxalate and oil globules. **Powder** is reddish brown, polygonal lignified with narrow lumened stone cells, thin walled, parenchymatous cells with reddish-brown contents, rosette crystals of calcium oxalate & oil gloules.

Important Formulations

Gorochanad Vati, Cukkumtippalyadi Gutika, Dhanwantra Gutika, Svarnmukladi Gutika, Mrtasanjivani Gutika.

Useful part and dose

As per Acharya P.V. Sharma, *Phalasthi* should be consumed in the dose of 3-5 grams, while API recommends its dose of 1-2 grams.

Cultivation & Method of propagation[7]

Propagation is primarily carried out through seeds, which should be soaked for 24–48 hours and sown 0.5–1 inch deep in a well-drained mixture of garden soil, coco peat, and perlite. Due to the plant's slow growth, germination may take several weeks. Vegetative methods such as air layering are effective, particularly in the pre-monsoon season, with indole-3-butyric acid (IBA, 500 mg/L) promoting root initiation. Rooted layers and healthy stem cuttings can be transplanted into a sand–soil–manure mixture in sunny locations. For cultivation, plants may be grown in 15–18 inches deep pots or in the field at approximately 30 × 30 ft spacing using organic-rich soil. Irrigation should be provided when the topsoil dries, avoiding winter fertilization. A balanced liquid fertilizer can be applied every 6–8 weeks until the plant reaches 5–6 feet in height, or well-decomposed cow dung may be used as an organic alternative. Regular pruning of dead branches enhances fruiting.

Phytochemistry of *E. ganitrus*

HPLC of 70% ethanolic extract of *E. ganitrus* showed presence of total of 93 compounds, including 46 flavonoids, 17 phenols, 14 polyphenols, 3 phenolic acid, 3 phenolic glycosides, 2 flavonoid glycosides, 2 glycosides, 2 phenylpropanoid glycoside, 1 hydroxycinnamic acid, 1 lignan, 1 tannin, and 1 terpene glycoside.[8]

LC-MS indicated presence of major eleven compounds, that include quercetin, gallic acid, ferulic acid, chlorogenic acid, pinocembrin, p-aminobenzoic acid, epicatechin, catechin, caffeic acid, syringaldehyde, and naringenin.

The ethanolic extract of *E. ganitrus* fruit is found to be rich in Flavonoid, Saponins, Phenol, Carbohydrates, Glycosides, Steroids & Terpenoids, Fixed Oils and fat and shows presence of phenols and flavonoids with the amount of 232.24 ±0.31 mg/gm and 91.42±0.44mg/gm respectively (Hardainiyan et al., 2015). The ethanolic extract of *E. ganitrus* (bark) shows the presence of carbohydrates, alkaloids, steroids, flavonoids, phenol, tannin, saponin, glycosides and terpenoids.[9] Ethanol extract of *E. ganitrus* beads contains quercetin derivative that has anxiolytic potential (Singh et al., 2013) and also has Rudrakine in the leaves. Kaempferol and Quercetin are dominantly present in seeds of *E. ganitrus*.[10]

Recent phytochemical analyses (including a preprint reporting HPLC/LC-MS of hydroethanolic leaf extract) have detected Epicatechin, Catechin, Hesperidin, Kaempferol, Gallic acid, Syringic acid, Quercetin, Ellagic acid, Chlorogenic acid, Myricetin 3-O-rhamnoside, Isorhamnetin, (-)-Epicatechin 4''-0-, Scopoletin, Coumarin, Anthocyanins, Paeoniflorin, Esculin, Caffeoyl glucose, Verbascoside, Cinnamtannin A2.

Table No. 5: Research activities & Pharmacological actions of *E. ganitrus*.

Plant Part	Dosage Employed	Experimental Subjects	Outcome
Seed	1000–1.500 µg AuNPs/mL	Pseudomonas desmolyticum and Staphylococcus aureus	Antibacterial[11]
Seed	100, 200, and 400 mg/kg body weight (ethanolic extract)	male Wistar rats	Immunomodulatory activity[12]
Seed	250, 500 and 1000 mg/kg of body weight (aqueous extract)	Adult male Wistar rats and Swiss albino mice	Antidiabetic[13]
Dried fruit	250, 500 and 1000mg/kg orally (Aqueous extract)	Male Wistar rats and Swiss albino mice	Anti-Hypertensive[14]
Fresh leaves	> 400 µg/mL; ethanolic EtOAc fraction	Zebrafish	Antimelanogenesis[15]
Dried	100, 200, and 400 mg/kg body	Male Wistar rats	Nephroprotective[16]

seeds	weight (ethanolic extract)		
Dried leaves	silver nanoparticles from aqueous and methanolic extracts (25 µg, 50 µg, 100 µg, 200 µg, and 400 µg)	standard MTT assay using the breast cancer cell line	Anticancer[17]
Dried fruit	Whatman filter paper no. 1 containing 100 mcg of the extracts	staph., entrococcus, Vibrio cholera etc	Antibacterial[18]

Toxicity Studies

LD50 of the extracts of *E. sphaericus* fruit(mg/kg) were petroleum ether (PE) 620.0; benzene (BE) 560.0; chloroform (CE) 670.0; acetone (AE) 575.0 and ethanol (EE) 780.0 respectively.[19]

In the acute oral toxicity study, EGA showed no mortality till the 5 g/kg dose in mice.[20]

RESULTS AND DISCUSSION

The review of classical and contemporary literature indicates that *Rudraksha* (Elaeocarpus ganitrus) holds a recognized position in later Ayurvedic Nighantus, where it is described predominantly as Vata-Kapha shamaka and indicated in conditions such as Daha, Jwara, Unmada, Shirashoola, and Bhutabadha. Although absent in the Brihattrayi, its repeated references in lexicons suggest established traditional usage. Phytochemical investigations demonstrate that the seeds, fruits, bark, and leaves contain diverse bioactive compounds including flavonoids (quercetin, kaempferol, catechin), phenolic acids (gallic acid, chlorogenic acid, ferulic acid), tannins, alkaloids, glycosides, and terpenoids. Experimental studies (in vitro and in vivo) report antioxidant, anti-inflammatory, antihypertensive, antidiabetic, nephroprotective, immunomodulatory, antibacterial, anticancer, and anxiolytic activities. These findings partially validate classical claims, particularly regarding stress reduction, cardiovascular regulation, and neuropsychiatric benefits. Toxicity studies indicate a relatively wide safety margin in animal models, with no mortality observed at high doses in acute studies. However, most available evidence remains preclinical, and variations in Rasapanchaka descriptions and phytochemical composition highlight the need for standardization and deeper mechanistic exploration.

CONCLUSION

In conclusion, Rudraksha (*E. ganitrus*) demonstrates significant therapeutic potential supported by traditional Ayurvedic references and emerging pharmacological evidence. Its

rich phytochemical composition and broad spectrum of biological activities suggest possible applications in stress-related, cardiovascular, inflammatory, and metabolic disorders. Nevertheless, well-designed clinical trials, standardized extract profiling, dose optimization, and long-term safety studies are essential to establish its efficacy and facilitate its rational integration into evidence-based integrative healthcare.

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