

Rudraksha as a potential herbal drug insights into its anti-diabetic's anti-inflammatory , anti-oxidant and neuroprotective properties

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Abstract:

Rudraksha, derived from the Sanskrit terms "Rudra" (Lord Shiva) and "Aksha" (tear), is a genus of the Elaeocarpaceae family, specifically *Elaeocarpus ganitrus*. The plant produces attractive, rocky endocarps known as Rudraksha beads, which have been utilized for centuries to treat various ailments, including stress, anxiety, migraine, epilepsy, asthma, depression, and hypertension. The *Elaeocarpus* species, native to tropical and subtropical regions, is characterized by its olive-like fruits, as reflected in its Greek etymology. Rudraksha is regarded as a natural sedative, exhibiting magnetic properties that regulate blood pressure and heart rate. With its rich history and therapeutic applications, Rudraksha has emerged as a valuable resource in traditional medicine, offering a holistic approach to healthcare and wellness. This introduction provides a foundation for exploring the multifaceted benefits and properties of Rudraksha, highlighting its potential as a natural remedy for modern health concerns.

Introduction

The Sanskrit terms "Rudra" (meaning Lord Shiva) and "Aksha" (meaning tear) are the source of the name Rudraksha [1]. The *Elaeocarpus* species known locally as Rudraksha in India is a member of the Elaeocarpaceae family. It contains nuts or beads, which are rocky endocarps that are robust and quite attractive. [2] The genus *Elaeocarpus* is a member of the Elaeocarpaceae. Tropical and subtropical environments are home to numerous species. Elaeo, which means olive, and carpus, which means fruit, are the Greek roots of the word *Elaeocarpus*. These show that *Elaeocarpus* yields fruits that resemble olives. Rudraksha beads come from *E. ganitrus*. Rudraksha is regarded as a natural sedative. It features magnetic appropriate ties that control blood pressure and heart rate. Since ancient times, rudraks beads have been used to cure a variety of conditions, including stress, anxiety, migraine, neuralgia and epilepsy, asthma, depression, and hypertension. Additionally, this plant has a number of bioactivities, including antidiabetic, anti-inflammatory, antibacterial, and antioxidant properties. The *Elaeocarpus* group produces artistic fruits with a finely patterned stony endocarp that is quite durable. India is home to 25 of the approximately 120 *Elaeocarpus* species known to exist in Asia. With the exception of Tawang, Upper Subansiri, and certain high-elevation In addition, it has been shown that the fruit's exocarp, which is mostly high in proteins (4.3% dry mass, or 0.12g per fruit) and carbs (21.0% dry mass, or 0.58g per fruit), but low in lipids, offers consumers a nutritious incentive [4]. After seven years, these trees begin to bear fruit. Gas chromatography is used to determine the percentage symphony of gaseous elements C, H, and N found in *Elaeocarpus sphaericus*. These percentages are 17.897% H, 0.95% N, and 50.031% C [5]. As a mediator, Rudraksha is better and more advantageous than other plant materials because it is non-biodegradable and can tolerate repeated extractions..figure no 1



Plant Profile *Elaeocarpus ganitrus* wild

- Taxonomy- *Elaeocarpus ganitrus* falls under the classification of scientific as follows: Scientific Classification
- Botanical Name- *Elaeocarpus Ganitrus* (Roxb.)
- Kingdom- Plantae
- Division- Magnoliophyta
- Class- Magnoliopsida Order-
- Oxalidales Family- Elaeocarpaceae
- Genus- *Elaeocarpus*
- Species- *E. Ganitrus*
- Common Name- Rudraksha Type- *E. Serratus* Linn, *E. Ganitrus* Roxb, etc.
- Habit- Tree.[6]

Types of rudraksha

figRudraksha beads are categorized based on the number of clefts and furrows on their surface, referred to as mukhis. Typically, rudrakshas with 1-14 mukhis are recognized; however, scriptures mention up to 38 mukhis. A single mukhi rudraksha is rare. The most common type is the five-faceted or punchmukhi rudraksha. The effects of each bead vary according to the number of mukhis the number of mukhis figure 1 [7]



Botanical Description

It is a large evergreen tree with large leaves. Its height ranges from 50–200 feet. Leaves are large and shining green on the sun facing side and dull stringy on earth facing side. Flowers become visible in the month of April May and are white or yellow in colour Fruits start appearing in June and ripen near October. Ripe fruit is fleshy and has a seed with blue shell. Inner part or bead lying in the seed is called Rudraksha [8]

Geographical Distribution:

The native habitat of the Rudraksha tree encompasses a broad region across Southeast Asia, predominantly in countries such as India, Nepal, Indonesia, and Malaysia. The tree thrives in a tropical climate, requiring specific conditions like well-drained soil and ample sunlight for optimal growth. Within India, Rudraksha trees are found in various states, including Assam, Karnataka, Uttarakhand, and Arunachal Pradesh. The distribution is not limited to lowland areas; Rudraksha trees can also be found at elevations ranging from sea level up to around 3000 feet.[9]

Environmental Factors:

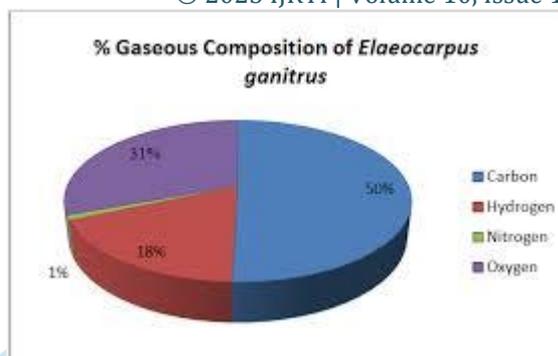
Several environmental factors influence the growth and health of Rudraksha trees. The tree's sensitivity to climate makes it particularly responsive to changes in temperature and rainfall. Well-drained soil with good aeration is essential for root development. Altitude is another significant factor affecting Rudraksha growth. The tree is often found in hilly regions, adapting to different elevations. Altitude can impact the size and shape of the Rudraksha seeds, adding complexity to the variations observed in the mukhis. Understanding the botanical characteristics and distribution of Rudraksha trees is fundamental to assessing the potential variations in chemical [10]

Bioactive Compounds in Elaeocarpus

The Elaeocarpus ganitrus fruit have many phytoconstituents such as alkaloids, flavonoids, tannins, steroids, triterpenoids, carbohydrates and cardiac glycosides. Singh¹⁰ says that a significant amount of phytocomponents such as isoelaecarpicine, elaeocarpine, isoelaecarpine and quercetin, gallic, ellagic acids and rudrakine. Three new ellagic acid derivatives of eleocarpaceae, 4-O-methylellagic acid 3-O- α -rhamnoside, 4-O-methylellagic acid 3-O-(300-O-acetyl)- α -rhamnoside and 4-O-methylellagic acid 3-O-(400-O-acetyl)- α -rhamnoside in addition to the known ellagic acid derivative, 4-O-methylellagic acid 3-O-(200,300-di-O-acetyl)- α -rhamnoside are used in multi besieged therapy of cancer and a significant antioxidant ability due to its wealthy content of tannins and flavonoids³⁴. Prosopis species has been widely used to cure basic ailments in the usual system of medicine³⁵. Elaeocarpus ganitrus have gallic, quercetin, and ellagic acids, (-) elaeocarpine, (-) isoelaecarpine and rudrakine [11]

Gaseous Composition of Rudraksha

Rudraksha beads are containing carbon, nitrogen, hydrogen, oxygen and trace elements in combined form. Percentage composition of gaseous elements in Rudraksha beads are show in figure 2 [12]



Medical properties

- **Antidiabetic effects –**

The aqueous seed extract of *Elaeocarpus ganitrus* (EAG) shown potential antidiabetic effects in experimental animals. The hypoglycemic effect of *E.ganitrus* may be attributed to alkaloids, viz. rudrakine, (-)-*elaecarpine* and (-)-*iso-elaecarpine*, flavonoids and glycosides. The study shows that EGA seeds have an antihyperglycemic activity in STZ-induced diabetic rats. However, further studies should be undertaken to identify the active hypoglycemic compounds and investigate the mechanism of action of the hypoglycemic activity of *E.ganitrus*. [13]

Preliminary findings indicate that Rudraksha may help in glucose metabolism and enhance sensitivity to insulin (Tripathy et al.,2025). It can therefore regulate blood glucose, making it a possible natural treatment for diabetes complications and other related conditions [14]

- **Antioxidant:**

The presence of bioactive compounds, including flavonoids, suggests antioxidant potential in Rudraksha seeds. Research into developing antioxidant formulations derived from Rudraksha could contribute to products aimed at combating oxidative stress, which is implicated in various diseases. Rudraksha beads, derived from the seeds of the Rudraksha tree (*Elaeocarpus ganitrus*), have been traditionally used in various cultural and spiritual practices in certain regions. While they are primarily known for their significance in meditation and prayer, there is limited scientific evidence regarding their role in antioxidant formulations.

Antioxidants are compounds that help protect the body from oxidative stress by neutralizing free radicals. Free radicals are molecules with unpaired electrons that can cause cellular damage. Many natural substances, such as vitamins C and E, beta-carotene, and various plant extracts, are known for their antioxidant properties.

Rudraksha beads contain various bioactive compounds, including alkaloids, flavonoids, tannins, and other phytochemicals. Some studies suggest that these compounds may possess antioxidant and antiinflammatory properties. However, research on the specific antioxidant potential of Rudraksha beads in the context of formulations is limited [15]

The ethanolic extract of the leaves of the Rudraksha plant was examined for their antioxidant, reducing power, metal chelating and hydroxyl radical scavenging activities. It was found that the phenolic and flavonoids constituents present in the leaves possess significant antioxidant activity. Also, the ethanolic extract showed only moderate hydroxyl radical scavenging activity while the extract at the dosage of 500 µg/ml showed maximum iron chelating activity. Moreover, a positive correlation between total phenolic content and antioxidant activity was reported [16]

- **Anti-inflammatory activity**

It is thought that rudraksha seeds have anti-inflammatory qualities. Rudraksha extracts may be investigated for their capacity to block inflammatory pathways. The creation of natural anti-inflammatory pharmaceuticals could offer substitutes for manufactured ones and possibly lessen adverse effects. Rudraksha beads' possible anti-inflammatory qualities have drawn attention from both conventional medicine and complementary therapies. The anti-inflammatory properties of Rudraksha beads are supported by some anecdotal and traditional evidence, however it's important to remember that there may not be much scientific research on this particular subject. (17)

The benzene, chloroform, acetone, petroleum ether, and ethanol, fruits extracts of *Elaeocarpus sphaericus* at a dose level of 200 mg/kg body weight was examined in rat paw edema employing different inflammogens. The ethanolic and petroleum ether fruit extracts are efficient against carrageenan, bradykinin and PGE. The chloroform fruit extract of *Elaeocarpus sphaericus* showed action against histamine. Chloroform extract, was largely efficient in 5-HT caused inflammation⁵⁰ and ethanolic extract also suppress histamine. In other investigation petroleum ether, benzene, acetone, chloroform, and ethanol fruit extracts exhibited strong antiinflammatory effect against both acute and subacute models [18]

- **Neuroprotective activity :**

Some traditional beliefs relate Rudraksha with greater mental clarity. Exploring the neuroprotective qualities of Rudraksha may lead to the development of medications that protect against neurodegenerative illnesses or increase cognitive function. *Elaeocarpus* belongs to DOR-targeting medicines that are important to treat many CNS or DOR-related illnesses. *Elaeocarpus*' alkaloids are strong options for treating DOR-related disorders. Extracts of *Elaeocarpus* are also helpful for treating a convulsive condition, anxiety, asthma, stress, depression, nerve pain, epilepsy, and migraine. They are connected with the delta-opioid receptor (DOR) in the brain. Therefore, they are considered DOR-related disorders. Opioid receptors are connected with many physiological functions. Their dysfunction can induce CNS disorders, such as cardiovascular disease, epileptic seizures, Parkinson's disease, depression, hypertension, malignancies, diabetic cutaneous sores, and immunological disease.

Opioids and their derivatives have often been useful as analgesics or antipain action for a long time. Their anti-pain activity is connected with δ -opioid receptor (DOR), μ -opioid receptor (MOR), and κ -opioid receptor (KOR). Opioid receptors also involve in the regulation of food and obesity, stress, and hibernation. The neuronal and myocardial tolerance to hypoxic and ischemic stress is connected to the upregulation and activation of DOR. Therefore, medicines that enhance the neuroprotective activity [15]

Conclusion:

In conclusion, the study of Rudraksha, a genus of the *Elaeocarpaceae* family, has unveiled the vast potential of this ancient plant in promoting healthcare and wellness. The therapeutic properties of Rudraksha, including its natural sedative and magnetic properties, have been shown to effectively regulate blood pressure, heart rate, and alleviate symptoms of various ailments such as stress, anxiety, migraine, epilepsy, asthma, depression, and hypertension. The rich history and cultural significance of Rudraksha, derived from the Sanskrit terms "Rudra" (Lord Shiva) and "Aksha" (tear), underscore its importance in traditional medicine. With its attractive, rocky endocarps and olive-like fruits, Rudraksha offers a holistic approach to healthcare, providing a natural and alternative solution to conventional medicine. The findings of this study highlight the potential of Rudraksha as a valuable resource in the development of new treatments and therapies, warranting further research and exploration. Ultimately, the multifaceted benefits and properties of Rudraksha make it an invaluable asset in the pursuit of overall wellness and health, offering a promising future for the application of this ancient plant in modern medicine. Recommendations for future studies include:

1. Clinical trials to further investigate the efficacy of Rudraksha in treating various ailments.
2. Phytochemical analysis to identify and isolate the active compounds responsible for its therapeutic properties.
3. Standardization of Rudraksha extracts to ensure consistency and quality in its medicinal applications.

By pursuing these avenues of research, we can unlock the full potential of Rudraksha and harness its benefits to improve human health and wellbeing.

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