

***Padma-beeja* (Seeds of *Nelumbo nucifera Gaertn.*): A Potent Nutritional Supplement During Pregnancy**

Mridul Ranjan¹, Awantika Jaiswal^{2*}

¹Department of Panchkarma, Faculty of Ayurveda, Institute of Medical Sciences, Banaras Hindu University, Varanasi-221005, Uttar Pradesh, India

²Urban Primary Health Centre, Rajghat, Varanasi, Uttar Pradesh, India

*Corresponding Author

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Abstract:

Aim of the study: The present study aims to reveal the benefits of *Padma-beeja* for women's health, especially during pregnancy, with an emphasis on the literature review, pharmacological and biochemical scientific evidences available in the domain to substantiate these claims.

Materials and method: A systematic and comprehensive literature search was conducted in Ayurvedic classics to explore the rationale behind the traditional uses of *Padma-beeja*. The Ayurvedic Pharmacopoeia and other relevant scientific works were consulted to enhance clarity and scientific understanding of the subject matter. To provide scientific evidence of its uses, international and national journals, along with other published materials, were reviewed, aiming to engage scholars interested in Ayurvedic medicinal plants.

Discussion: The present review article highlights the ancient therapeutic applications of *Padma-beeja* of ancient Indian traditions to the present day. Traditionally, *Padma-beeja* is used as a food product during antenatal period. Scientific evidence corroborates the rationale described in the available Ayurvedic classics of various periods of India.

Conclusion: This study delves into the initial references of *Padma beeja*, along with its significant synonyms, properties, and actions, as documented in the original Ayurvedic texts. Subsequent works have further expanded upon this knowledge, emphasizing its continued traditional uses even in modern times.

Key words: *Padma-beeja*, *Garbha-sansthapaka*, nutritional supplement, antenatal period

Introduction:

Maternal malnutrition remains a major public health concern in various regions of the world, including India.[1] The health and nutritional status of women before, during, and after pregnancy play a crucial role in determining the early growth and development of their children. Maternal undernutrition has been associated with increased risks of maternal mortality, fetal growth retardation, and neonatal death. In India, it is estimated that one-fifth of childhood stunting cases can be attributed to maternal undernutrition.[2] Additionally, inadequate maternal nutrition negatively affects the sensory, language, and cognitive brain functions in offspring.

This article highlights nutritional value of *Padmabeeja* (seeds of *Nelumbo nucifera Gaertn.*) as a dietary supplement for improving maternal nutrition.

In Ayurveda, Ahara (food) is regarded as *Mahabhaishajya* (supreme form of medicine) [3] and *Padmabeeja* is considered one such natural food that is easily available and offers dual benefits: it helps manage uterine discharge (*Garbha-srava*) during pregnancy and provides essential nutrition to both the mother and the fetus. The term, *Padma* (*Nelumbo nucifera Gaertn.*) symbolizes *Shobha* (beauty of mind and body) and *Samvridhi* (nutritional potency).[4] More than seventy synonyms of *Padma* mentioned in Ayurvedic Samhita indicate its medicinal importance.[5]

In various Ayurvedic texts, Padma-beeja is classified as *Garbha-sansthapak param* (i.e. it nourishes the uterus and promotes implantation). It is described as having *Madhura, Kashaya, Tikta rasa* (sweet, astringent, and bitter tastes); *Sheeta veerya* (cool potency); *Madhura vipaka* (sweet post-digestive effect); *Guru guna* (heavy in digestion); *Balya* (strength-promoting), *Vrishya* (aphrodisiac), *Pitta-rakta-daha shamaka* (alleviating burning sensations due to vitiated *Pitta* and *Rakta*).[6]

The nutritional composition of Padma-beeja per 100 g is as follows:

- Energy: 348.45 kcal
- Protein: 10.6–15.9%
- Crude fat: 1.93–2.8%
- Crude fiber: 2.7%
- Ash: 3.9–4.5%
- Carbohydrates: 70–72.17%
- Moisture: 10.5%

Mineral content:

- Iron: 0.199%
- Manganese: 0.356%
- Zinc: 0.084%
- Copper: 0.0463%
- Magnesium: 9.2%
- Calcium: 22.1%
- Potassium: 28.5%
- Chromium: 0.0042%
- Sodium: 1%. [7]



Figure.1- *Nelumbo nucifera* Gaertn. Flower, seeds

MATERIALS AND METHODS

The information for this study was obtained from the following sources:

- Ayurvedic literature such as Charaka Samhita, Sushruta Samhita, Ashtanga Hridaya etc,
- Various Nighantus (Ayurvedic lexicons)
- Government reports, dissertations, books and research articles
- Databases related to the seeds of *Nelumbo nucifera* Gaertn.

A thorough examination of original Ayurvedic scriptures and standard texts from different historical periods was undertaken. This comprehensive analysis aimed to provide meaningful insights into the traditional and scientific understanding of Padma-beeja.

BOTANICAL DESCRIPTION

Botanical name- *Nelumbo nucifera* Gaertn.

Family-*Nelumbonaceae*

Synonyms- *Kamalbeej*, *Kamalalkshya*, *Padmakshya*, *Kalodyam*, *Padma-karkati*, *Bheda*,

Krochadan [8,9]

Vernacular name-*Kamalgatta* (lotus seed)

Morphological characters:

Nelumbo nucifera is a large aquatic herb with slender, elongated, branched, and creeping stems that produce roots at the nodes. The leaves are membranous, 0.3–0.6 meters or more in diameter, orbicular, concave or cupped, erect, exactly peltate, entire, radiately nerved, glaucous, and glabrous. Petioles are very long, rough with small, distant prickles, and otherwise smooth. Flowers are solitary, 10–25 cm in diameter, white or rosy, borne on peduncles arising from the nodes of the stem, sheathing at the base. Sepals are small; petals range from 5–12.5 cm in length, elliptic, obtuse, finely veined, concave, and initially erect, later spreading. Anthers possess a clavate appendage. The torus is about 18 mm high, spongy, and flat-topped, enlarging during fruiting to 5–10 cm in breadth. Ripe carpels are ovoid, glabrous, and approximately 12 mm long. A lotus seed consists of a plumule (core), cotyledon (main part), membrane, and pericarp.[10]

PADMA BEEJA IN SAMHITAS

1. Padma beeja in Charak Samhita

In Charak Samhita Padma beeja is mentioned under the name Pushakara beeja.[11] Acharya Charaka has kept Padma beeja under *Madhura* (sweet) and *Kashaya* (astringent) Skandhas. Its use in combination with Madhu (honey) is contraindicated due to *Viruddha-ahara* (dietetic incompatibility).[12,13,14] During 4th to 8th month of pregnancy, if intrauterine bleeding occurs, Pushakara beeja (padma beeja) is recommended either singly or in combination with *Sringataka* (*Trapa bispinosa* Roxb.) and *Kasheruka* (*Scirpus kysoor* Roxb.).[15] Acharya Charaka further describes the properties of Padma-beeja as *Madhura Rasa*; *Madhura Vipaka*, and its efficacy in pacifying *Raktapitta* (bleeding disorders).[15]

2. Padma-beeja in Sushruta Samhita

Acharya Sushruta has described properties of Padma-beeja similar to those in Charaka Samhita.[16]

According to him, Padma possesses *Tikta* (bitter), *Madhura* (sweet) *Rasa*; *Sheeta Veerya* (cold potency) and it pacifies *Pitta* and *Kapha Doshas*. [17]

3. Padma-beeja in Ashtanga Hridaya

Acharya Vagbhata, in the Ashtanga Hridaya, also mentions similar properties of Padma-beeja as described by Acharya Charaka.[18,19]

4. Padma-beeja in Ashtanga Sangraha

In the Ashtanga Sangraha, the same properties of Padma-beeja are mentioned as those described in the Charaka Samhita.[20,21]

PADMA-BEEJA IN NIGHANTUS

1. Madanadi Nighantu

In Madanadi nighantu, Padma beeja is said to be *Kashaya*, *Madhura Rasa*, *Sheeta Veerya* and properties that pacify *Kapha* and *Rakta*. It is also said to improve complexion.[22]

2. Dhanvantari Nighantu

Dhanvantari nighantu elaborates the properties of Padma beeja as having *Madhura*, *Tikta rasa*; *Garbha-sthapana uttam* (highly beneficial for conception), *Rakta-pitta prashamana* (relieves bleeding diathesis) and aggravates *Vata* slightly.[9] In *Karveeradi varga*, it has been told that it is mentioned as highly useful in *Rakta-pitta vikara* (bleeding disorders).

3. Nighantu Shesha

In Nighnatu Shesha, only synonyms of Padma-beeja are mentioned - Padmakshya and Padma-karkati.[23]

4. Raja Nighantu

The Raja Nighantu describes Padma-beeja as having *Madhura* and *Katu rasa* (sweet and pungent taste). It is effective in *Pittaja chardi* (vomiting due to pitta vitiation), pacifies *Daha* (burning sensation) and *Rakta doṣha*, aids *Pachana* (digestion), and enhances appetite.[24]

5. Kaiyadeva Nighantu

In Kaiyadeva nighantu, Padma beeja is described as having *Tikta*, *Kashaya*, *Madhura rasa*; *Guru guna*; *Balya* properties. It pacifies *Pitta-rakta-daha* and is regarded as the best for *Garbha-sansthapana Dravya* (i.e. provides nutrition to uterus and promotes implantation).[25]

6. Bhavaprakash Nighantu[6]

The Bhavaprakasha described properties of Padma-beeja similar to those in the Kaiyadeva Nighantu. It also mentions that *Makkhana* (*Euryale ferox* Salisb.) shares comparable properties with Padma beeja.

7. Priya Nighantu

According to Acharya Priyavrata Sharma, Padma-beeja possesses properties similar to Padma pushpa (lotus flower) like-*Madhura*, *Kashaya*, *Sheeta Veerya*, pacifies *Kapha-pitta*. It alleviates *Trishna* (thirst), *Daha* (burning sensation), *Rakta-pitta* (bleeding disorder), *Visha* (toxin), *Visarpa nashan* (erysipelas), *Visheshad Garbhadam* (promotes conception and fetal nutrition), *Balya* and *Vrishya* (aphrodisiac).[26]

8. Sidha bhesajya Manimala

This Chikitsa Grantha mentions the use of Padma-beeja in *Peya* (medicated gruel) form for treatment of *Chardi* (emesis), *Hikka* (hiccough) and *Pradara* (uterine bleeding).[27]

9. Other texts

The seeds possess a sweet, cooling, astringent, and slightly bitter taste. They are considered aphrodisiacs, sedative to the gravid uterus, and tonics to the female reproductive system. They are beneficial in conditions such as Menorrhagia and Leucorrhoea.[28]

LOTUS SEED (TRADITIONAL AND AUSPICIOUS ASPECT)

All parts of lotus possess nutritional value, however, the seed (*Padma-beeja*) is considered especially *Visheh-pushtikarak* (potent nutritive).[29] During *Navaratri* (devi-poojan), oblation (*aahuti*) of Padma-beeja is offered in *Yagya*. This practice signifies its nutritive and *Medhya* (intellect-enhancing) properties, indicating its traditional role in supporting maternal brain and mental development.

Chemical Constituents of the Seed

Lotus seed (*Padma Beeja*) contains several bioactive alkaloids, including lieninine, neferine, and isoliensinine. The seed also contains 2-3% oil, composed primarily of palmitic, myristic, oleic and linoleic acid. Among these, Linoleic acid serves as a rich source of omega-3 fatty acids.[30] Adequate intake of omega-3 fatty acids during pregnancy is essential, as they serve as critical structural components for the development of the fetal brain and retina. Additionally, omega-3 fatty acids have been shown to influence gestational duration and may help reduce the risk of perinatal depression. [31,32]

Table 1: Nutritional value of *Padma-beeja* [33]

Constituents	Amount (per100 g)
Carbohydrates	61-62%
Total protein	16-21%

Crude fat	2.40-3%
Moisture content	5-9%
Energy	348.45 cal/100gm
Vitamin C	20-24 mg/100gm
Iron	13–18 mg
Calcium	30–31 mg
Sodium	1 mg
Potassium	16–20 mg
Zinc	0.084mg
Manganese	0.356mg
Magnesium	9.2mg
Chromium	0.0042mg
Copper	0.0463mg
Folic acid	0.20mg/gm

Nutritional and Functional Significance

Padma-beeja is rich in protein, with albumin constituting major protein fraction (41.6%). The protein quality of lotus seeds is comparable to that of soybean protein.[31] Adequate protein intake is vital during pregnancy for fetal tissue growth, as protein deficiency may lead to intrauterine growth retardation (IUGR).

The seed also contains carbohydrates in the form of starch, oligosaccharides, and other polysaccharides, which act as prebiotics by promoting the growth of beneficial gut microflora. These components can aid in relieving constipation, making Padma Beeja a beneficial dietary supplement during the antenatal period.[30]

Moreover, carbohydrates provide glucose, the primary energy substrate supporting both maternal and fetal brain functions. They also serve as a crucial source of folate, a B-group vitamin essential for the neural and overall developmental processes of the fetus, particularly during early stages of pregnancy.[34]

Misconception about *Padma-beeja*

A common misconception exists among the general public that Padma-beeja (lotus seed) and Makhana (fox nut) are the same. However, they are derived from different botanical sources and belong to distinct genera, though both are members of the family Nymphaeaceae. Padma-beeja is obtained from *Nelumbo nucifera* Gaertn., commonly known as the sacred lotus, whereas Makhana is derived from *Euryale ferox* Salisb., commonly referred to as the gorgon nut or fox nut.

PHARMACOLOGICAL ACTIVITY

Lotus seeds (*Padma-beeja*) have been reported to exhibit a wide range of pharmacological properties, supported by modern research and traditional Ayurvedic references. The most notable pharmacological activities are summarized below:

- 1. Anti-inflammatory effect-** Lotus seeds contain bioactive compounds such as triterpenoids, which exhibit significant anti-inflammatory effects. These constituents may help reduce inflammation and provide therapeutic benefits in conditions such as atopic dermatitis, rheumatoid arthritis, and other chronic inflammatory disorders. Experimental studies have demonstrated that lotus seed extract, administered at a dose of 10 mg/kg, inhibited the activation of the pro-inflammatory cytokine tumor necrosis factor-alpha (TNF- α), indicating a potent anti-inflammatory potential.[35]
- 2. Hepatoprotective activity-** Research suggests that the seeds of *Nelumbo nucifera* possess hepatoprotective effects, potentially preventing liver injury induced by toxins or chemical agents. In experimental models of aflatoxin B₁ and carbon tetrachloride (CCl₄)-induced hepatotoxicity, the ethanolic extract of *Nelumbo nucifera* seeds (10–500 mg/mL) exhibited dose-dependent inhibition of CCl₄-induced cell death. This finding supports the extract's potential in mitigating hepatic damage and oxidative stress associated with toxin exposure.[36]

3. **Antioxidant activity**- Methanolic extracts of lotus seeds have demonstrated significant antioxidant activity, particularly in the ONOO⁻ (peroxynitrite) system, though with limited effects in the DPPH and total ROS assays. The antioxidant potential is attributed to the presence of flavonoids, phenolic compounds, and vitamin C, which help protect cellular components from oxidative stress, thereby reducing the risk of chronic degenerative diseases.[37]
4. **Neuroprotective activity**- The seeds of *Nelumbo nucifera* exhibit neuroprotective properties, potentially safeguarding neuronal cells against oxidative stress-induced damage. Such effects may contribute to the prevention or attenuation of neurodegenerative disorders including Alzheimer's disease and Parkinson's disease. The bioactive constituents of the seed may exert their effects through antioxidative and anti-apoptotic mechanisms.[38]
5. **Immunomodulatory activity**- Studies indicate that lotus seeds enhance total leukocyte count and stimulate lymphocyte proliferation, suggesting a role in modulating immune responses. These findings highlight the immunostimulant potential of lotus seeds, positioning them as a natural source for enhancing host defense mechanisms and maintaining immune homeostasis.[39]
6. **Anti-cancer activity**- Extracts of lotus seeds have shown potential anticancer effects by inhibiting cellular proliferation and metastasis while promoting apoptosis and autophagy in malignant cells. Several plant-derived secondary metabolites present in *Nelumbo nucifera* contribute to these effects through distinct biochemical pathways, underlining the plant's promise as a source of natural anticancer agents.[40]
7. **Anti-diabetic activity**- The seeds of *Nelumbo nucifera* possess hypoglycemic and antidiabetic potential, particularly relevant in the management of gestational diabetes. Inhibition of the enzyme aldose reductase, a key component of the polyol pathway implicated in diabetic complications, has been observed in methanolic extracts of lotus seeds. This suggests that lotus seed constituents may modulate glucose metabolism and prevent hyperglycemia-induced cellular damage.[41]

Overall, the diverse pharmacological properties of lotus seeds—encompassing anti-inflammatory, hepatoprotective, antioxidant, neuroprotective, immunomodulatory, anticancer, and antidiabetic effects—highlight their potential as a nutraceutical and therapeutic supplement for promoting maternal and general health.

Different Dietary Preparations of Lotus Seed

Lotus seeds (*Padma Beeja*, *Nelumbo nucifera* Gaertn.) are consumed in various traditional and modern forms across different cultures. In Asian countries, they are often soaked and boiled to prepare soups, porridges, and sweet stews. The seeds can also be ground into a paste and used in confectionery items such as pastries and mooncakes, or cooked with ghee and sugar to prepare the traditional Indian sweet *Padma Beeja Halwa* (lotus seed pudding). In addition, powdered lotus seeds are incorporated into bakery products, health drinks, and infant foods due to their high protein and fiber content. Globally, lotus seeds are emerging as a versatile, gluten-free, protein-rich functional food ingredient suitable for both traditional diets and modern nutraceutical formulations

DISCUSSION

Antenatal care is a crucial phase during which a woman's health and lifestyle have a profound influence on the well-being of her developing baby. Among various factors, diet plays a pivotal role in supporting both fetal development and maternal health. Adequate nutrition and appropriate dietary practices are essential for ensuring the healthy growth and development of the mother as well as the fetus during pregnancy.

Padma-beeja (Seeds of *Nelumbo nucifera* Gaertn.) may be particularly beneficial in addressing macro and micronutrients deficiency during pregnancy. Acharya Charaka has recommended the use of *Padma-beeja* (referred to as *Pushkara-beeja*) between 4th to 8th months of pregnancy. In cases of intrauterine bleeding, Charaka advises consuming *Pushkara-beeja* alone or in combination with *Sringataka* (*Trapa bispinosa* Roxb.) and *Kasheruka* (*Scirpus kysoor* Roxb.), indicating its potential hemostatic property.[15]

Padma-beeja is a rich natural source of calcium and magnesium, minerals that play vital roles in maintaining normal blood pressure and cardiovascular function. Their adequate intake helps reduce the risk of pregnancy-induced

hypertension. Therefore, incorporating *Padma-beeja* into the diet can be beneficial in mitigating the likelihood of developing hypertension during pregnancy.⁴³ Additionally, lotus seeds are abundant in calcium, iron, zinc, and folic acid, which collectively improve pregnancy outcomes, reduce the risk of congenital defects, and provide comprehensive nutritional support during the antenatal period.^[42]

The seeds contain resistant starch type 3 (RS3), which acts as a prebiotic, helping alleviate pregnancy-induced constipation. It is also good source of folate, serving as an optimal fuel for both maternal and fetal brain function.^[30,43] *Padma-beeja* exhibits diverse pharmacological properties, including anti-inflammatory, hepatoprotective, antioxidant, immunomodulatory, anticancer, antidiabetic and neuroprotective effects.^[35,36,37,38,39,40,41] These attributes collectively contribute to protecting both mother and fetus from various ailments during pregnancy.

From an Ayurvedic perspective, during antenatal period (*Kalala-avastha*), there is dominance of *Jala Mahabhuta*, which nourishes the fetus. Similarly, *Padma-beeja*, being aquatic in nature, supports *Jivaneeya karma* (enhancement of vitality and immunity) and provides substantial nutritional support to both mother and the developing baby. *Padma-beeja* is natural, affordable, and efficacious, and therefore can serve as a potential alternative to synthetic vitamins and micronutrients supplements during pregnancy. Traditionally, in Varanasi district of Uttar Pradesh, India, lotus seeds are consumed during pregnancy in the form of *Halwa* (pudding). The preparation involves soaking the seeds overnight, grinding them into a paste, and cooking with ghee and sugar to make *halwa*. *Padma-beeja* is beneficial in preventing uterine secretions during ANC, *Garbhasaya balaya* (uterine tonic), *Garbha poshaka* (nourishes the fetus), *Trishadaha-prashman* (alleviates excessive thirst and burning sensation) and due to *Pitta-kapha-shamak* properties, it helps balancing elevated blood pressure during pregnancy.

Considering its multifaceted nutritional and therapeutic benefits, incorporating *Padma-beeja*-based dietary supplements into national maternal nutrition programs could play a significant role in preventing various physical and psychological disorders during the antenatal period.

CONCLUSION

Padma (lotus) holds great significance in Hindu tradition, as its flowers and seeds are considered sacred to Goddess Lakshmi, the deity of wealth and prosperity. Symbolically, the lotus absorbs energy from the rising sun, unfolding its petals as it blooms. Similarly, the regular consumption of *Padma-beeja* (lotus seeds) is believed to impart this conserved solar energy, providing nourishment and vitality to the mind and brain of both the mother and the developing fetus. Thus, *Padma-beeja* represents not only a sacred and symbolic plant but also a valuable nutritional source supporting maternal and fetal well-being during pregnancy.

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