



E-ISSN: 2709-9385  
 P-ISSN: 2709-9377  
 JCRFS 2025; 6(1): 106-109  
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[www.foodresearchjournal.com](http://www.foodresearchjournal.com)  
 Received: 15-10-2024  
 Accepted: 21-11-2024

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## An overview of the impact of lotus seeds on weight management and brain health

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**DOI:** <https://dx.doi.org/10.22271/foodsci.2025.v6.i1b.189>

### Abstract

Lotus Seeds are commonly referred to as makhana or fox nuts and today many people are aware of the enormous health benefits of lotus seeds ranging from the slimming effect to boosting brain activity. These seeds are enriched with protein, fibre and have low-calorie content making them ideal for any diet, especially for those who are aimed to weight loss. Different studies have shown that this high-fibre food causes fullness feeling and having them as a healthy snack comprises less intake of calories in general. Also, they are low in glycaemic index which makes them to balance the blood sugar level to prevent the feeling of hunger while eating. Many research papers suggested that for boosting brain health, lotus seeds contain essential antioxidant compounds such as Kaempferol and flavonoids which facilitate the protection of the brain from oxidative stress. They also have thiamine, which is important in the functioning of the brain and the assisting of the transmission of signals through the brain that helps in enhancing memory and concentration. Lotus seeds are useful in lowering inflammation in the brain and body and therefore decrease the risk of neurodegenerative diseases such as Alzheimer's. These seeds can actually be taken to enhance sleep especially due to stress hence indirectly enhancing mental health.

**Keywords:** Lotus seed, health impact, brain health, weight management, antioxidant, calorie, protein

### Introduction

In ancient Pharaonic Egypt and India use Lotus flower for worshipping of their sacred god. (Sridhar et. al, 2007) [38]. Lotus (*Nelumbo nucifera G.*) is also known as water lily, sacred lotus, or Padma, Kamala is an aquatic perennial flower. While the *Nelumbo* genus *Nucifera* is a cultivated species, there is a wild variety called *N. lutea*. (Lin et al., 2019) [19]. There are 4 types of cultivated types of *N. nucifera*: Sacred lotus, Hindu lotus, Magnolia lotus, and Roseum Plenum (Singthong et al., 1992) [37]. The cultivated genus is native to sub-tropical countries of Asia like India, China, Pakistan Bangladesh etc, and is also found in Egypt, Persia, Northern Australia, and parts of North America. (Arooj et al., 2021) [2]. The cultivation for *N. nucifera* is an emerging trend because of its nutritious value and presently their use as Functional food and snack. (Maria et al., 2020) [22] 7000 years ago, ancient Indian Ayurvedic text and tradition mentioned the use of Lotus flower and plant parts (rhizome, seed, roots and buds) for their nutritious value (Ming et al., 2013) [24].

Lotus seeds commonly called Makhana or Fox nuts are beneficial for our Heart, Kidney with obesity or weight management and for brain health (Dandin et al., 2023) [7]. It provides various health benefits as they are rich in alkaloids, flavonoids, antioxidants, anti-steroids, antipyretics, anticancer substances, antiviral substances and substances that have weight management or anti-obesity properties (Sridhar et al., 2007) [38]. The seed contains 61%-62% of carbohydrates, 16%-21% of total protein, and 2.40%-3% of fat with 5%-9% of moisture content (Ali et al., 2012) [1]. Seeds have high fiber and high concentration vitamin C (20-24 mg/100g) with some other vitamin (S P Bangar et al., 2022) [4] and also good source of mineral salt like potassium, iron, sodium, magnesium, manganese, etc. (Kaur et. al, 2019) [14] with alkaloids, phenolic compounds and anti-oxidants (Mukherjee et. al; 2009) [26]. Makhana are these are characterized by low calorie, low fat; high fibre food which taken as raw, roasted or as soups, curries and snacks (Sarkar et al., 2015) [31].

**Discussion: Nutritional composition:** Many researchers considered that Lotus seeds have high nutritious value which contains balanced amount of carbohydrate, protein,

fat and minerals. Makhana are good source of antioxidants, phenolic compounds, also rich in vitamin, zinc, iron, calcium, phosphorus (Shad *et al.*, 2013) [33]. The components may vary between different varieties and cultivation environment but overall compositions are same (Shazad *et al.*, 2021) [34]. The general composition of nutrients is given below according to per 100g of dry weight in table 1.

**Table 1:** Nutritional composition of Lotus seed (Indrayan *et al.*, 2005) [9]

Nutritional Content	Amount/100g
Calories	348.45 kcal
Protein	16- 28%
Carbohydrates	60.3- 70%
Fibre	2.7%
Fats	0.22- 3.68%
Ca	60 mg
Fe	8.4 mg
Mg	210 mg
P	350 mg
K	500 mg
Na	1 mg
Cu	4 mg
Vitamin C	22- 24 mg
Vitamin B1	0.64 mg
Vitamin B2	0.009 mg
Vitamin B3	1.6 mg
Vitamin E	0.046 mg

Makhana are also rich in various antioxidants, phenolic compounds, alkaloids to benefit our health by their pharmacological properties like anti- inflammatory properties, anti- cancer properties, gastrointestinal regulation and immuno- protective properties (Meena *et al.*, 2009) [23] which help in weight management and brain health.

#### Some of them are given bellow

**Alkaloids:** According to Shoji *et al.*; 1967 Makhana contains alkaloids in very little number of alkaloids which help in prevent diarrhoea, help to keep calm, antispasmodic, and improve heart health. It contains alkaloids like dauricine, lotusine, nuciferine, pronuciferine, liensinine, isoliensinine, roemerine, nelumbine, neferine isoquinoline. (Furukawa *et al.*, 1965) [41].

**Flavonoids:** Lotus seed contains various types of flavonoids protect from free radicals, chronic disease, CVD, improve brain health and cognitive movement (Lee *et al.*, 2020) [18].

**Kaempferol:** Lotus seed contain antioxidants called kaempferol which helps in various way like reduces inflammation, supports heart health and preventing neurodegenerative diseases by protecting brain cells from oxidative stress (Kim *et al.*, 2012) [15].

**Epicatechin:** Epicatechin is an antioxidant found in Lotus seed also in tea and coffee (Chandra *et al.*, 2024) [42]. Epicatechin improve heart health by enhancing blood flow, reducing blood pressure, and lowering cholesterol levels. It also helps in reducing inflammation in the brain, potentially preventing cognitive decline (Sridhar *et al.*, 2007) [38].

**Polyphenols:** Lotus seed contain phenolic compounds like polyphenols (Ma *et al.*; 2019) [21] which help reduce

oxidative stress and inflammation, also linked with better brain health and the prevention of age-related neurodegenerative diseases (Limwachiranon *et al.*, 2018) [20].

#### Impact on Weight Management:

##### Positive Impact of Lotus Seed on Weight Management:

According to Indrayan *et al.* 2005 [9] Lotus seeds are High fiber, Low calorie, and low fat contain foods that can be included in the diet for managing weight. Lotus seeds help in lowering glucose levels in the blood, building muscle masses, improving digestion, and many more by which can help weight management (Jeyamurugan *et al.*, 2007) [7].

**High Fiber content:** Lotus seeds contain almost 3% dietary fiber which slows digestion so we feel full and reduce the overall calorie intake which helps in preventing overeating and promotes proper diet (Zhang *et al.*, 2015) [40].

**Low in Calories:** It contains a smaller number of calories which incorporated with diet helps in weight management (Sridhar *et al.*, 2007) [38].

**Low in Fats:** Lotus seeds are naturally low in fat also low in gluten which prevents weight gain and helps to maintain the ideal weight (Saeed *et al.*) [32].

**High in Protein:** Lotus contains 15%- 28% of protein, they are generally high in protein which helps in boost digestion and muscle repair and promotes fat burning which is effective for maintaining the ideal weight (Chouaibi *et al.*, 2012) [6].

**Low Glycaemic Index:** Makhana helps to maintain normal blood sugar levels in blood, and reduce cravings for foods which helps to maintain weight (Islam *et al.*, 2023) [10].

**Boost metabolism:** Lotus seed being high protein and low-fat helps boost metabolism and help burn calories ideally (Hasan *et al.*, 2021) [8].

##### Negative Impact of Lotus Seed on Weight Management:

As Lotus seed has many healthy impacts on weight management but also has many negative impacts on our body due to dependency and over-consumption of Makhana (Mishra; 2020) [27].

**Overconsumption:** Overconsumption of Lotus seed leads to high calorie intake which can cause obesity (Vermaak *et al.*, 2011) [39].

**Processed Makhana:** Processed makhana with oil, and added sugar may lead to weight gain and even lead to diabetes (Rai *et al.*, 2024) [30].

**Nutrient Imbalance:** Overdependency on Lotus seed can be missed on essential nutrients it can create health problems and potential weight gain (Sharma *et al.*; 2023) [43].

**Allergic reaction:** Some people can feel allergies that lead to digestive discomfort which can affect weight management (Hu *et al.*, 2023) [44].

**Impact Blood sugar:** Lotus seeds contain high fiber which can impact blood sugar levels and disrupt weight management (Jana *et al.*, 2019) <sup>[12]</sup>.

### Impact on Brain Health

#### Positive Impact of Lotus Seed on Brain Health

Lotus seeds are rich in flavonoids, alkaloids, antioxidants and their anti-inflammatory properties, prevent oxidative stress, neuroprotective properties and sedative properties which helps to improving the cognitive movement and sleep quality which lead to improving brain health (Bencheikh *et al.*, 2023) <sup>[5]</sup>.

**Rich in Antioxidants:** Lotus seed are rich in antioxidant like kaempferol, polyphenols, which are linked brain health. These help to protect brain cells from oxidative stress which linked with Parkinson's & Alzheimer's disease (Hasan *et al.*, 2021) <sup>[8]</sup>. Makhana helps to protect from free radicals which help to prevent cognitive development (Jha *et al.*, 2018) <sup>[13]</sup>.

**Anti-Inflammatory properties:** Lotus seeds rich in antioxidants which help prevent chronic inflammation of the brain can cause diseases like Dementia. Polyphenols and epicatechin prevent inflammation and maintain cognitive function (Mitra *et al.*, 2022) <sup>[28]</sup>.

**Neuroprotective Effect:** Lotus seed contained antioxidant like polyphenols and other bioactive compounds help to protect from brain damage from aging, stress and environmental toxins (Mitra *et al.*, 2022) <sup>[28]</sup>.

**Good source of Thiamine:** Makhana contains Vitamin- B1 or Thiamine helps in glucose metabolism and neurotransmitter activity. It helps to improve the cognitive function of the brain (Rastogi, 2010) <sup>[29]</sup>.

**Improved Sleep Quality:** Lotus seeds have mild sedative properties which help in promoting sleep quality and calming the sleep quality (Motti *et al.*, 2021) <sup>[25]</sup>.

**Regulates Mood and Stress:** Lotus seed contains alkaloids called isoquinoline which regulates mood by calming the mind and reducing anxiety; indirectly managing brain health (Shefard *et al.*, 2005) <sup>[35]</sup>.

#### Negative Impact of Lotus Seed on Brain Health:

Lotus seeds also have some negative impact on Brain health due to overdependency which leads to nutrient imbalance, and allergic reactions that cause mental discomfort and cognitive decline (Rastogi; 2010) <sup>[29]</sup>. The negative impacts are as follows;

**Nutrient Imbalance:** Overdependency on lotus seeds can cause nutrient imbalance (Sharma *et al.*, 2023) <sup>[43]</sup>. Due to lack of brain nutrients like omega-3 fatty acids, it declines cognitive functions and mental clarity (Assisi *et al.*, 2006) <sup>[3]</sup>.

**Overconsumption:** Overconsumption of makhana causes digestive problems, which create problems in sleep quality and indirectly affect brain functions (Kapoor *et al.*, 2005) <sup>[16]</sup>.

**Processed foods:** Blood sugar spikes due to processed makhana can cause long-term problems in brain functions (Kumari *et al.*, 2024) <sup>[17]</sup>.

**Allergic reaction:** Overdependency of Makhana can cause allergy leading to inflammation and impaired immune system that could cause cognitive decline and overall wellbeing (Hu *et al.*, 2023) <sup>[44]</sup>.

### Conclusion

For centuries Makhana has been used as various types of food source; it's also mentioned in ancient Ayurvedic text. Makhana used as Functional food is an emerging trend nowadays. Lotus Seeds have various positive health impacts on the human body due to their Antioxidant properties; high nutritious value, Low calorie- Low-fat food source. It is also a good source of plant-based protein and fiber. Due to their antioxidant properties, they help to maintain proper body function by protecting from free radicals, inflammation, and chronic and cardiovascular disease. It also functioned as a neuroprotective supporter by lowering cognitive damage, and age-related issues. But overconsumption or over-dependency on makhana can lead to various negative impacts on health.

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