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Article

Nutrient composition of lotus (*Nelumbo nucifera*) fruits

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Abstract: The *Nelumbo nucifera* known as sacred lotus is an ornamental plant having medicinal possessions. Lotus seeds, which are currently the oldest known plant seeds, contain many functional constituents. The seeds have been widely used as both medicine and food. In the present studies, the nutrient composition of collected from two separate beels at Tarakanda, Mymensingh were determined. The nutrient composition was determined as moisture 17.727 (± 0.053), ash 9.49 (± 0.059), crude protein 16.563 (± 0.076), crude lipids 4.146 (± 0.038), crude fiber 7.755 (± 0.045), carbohydrate 44.042 (± 0.011). The results showed that lotus seeds contained a high content of moisture, crude protein, crude lipids, crude fiber, ash and carbohydrate. From this research, it found that lotus seeds were rich in crude protein and carbohydrate. The study may conclude that seeds could be incorporated in feed formulation as a source of nutrients. The present experiment may provide a guideline for the use of lotus seeds as human food.

Keywords: ornamental plant; lotus seeds; nutrient composition

1. Introduction

What we eat is the important quote in health and nutrition sciences. Healthy food when consumed confirms a healthy population. The insufficient source of animal proteins, has forced the nutrition lists, researchers and government organizations to search for the substitute sources of economically favorable and high quality proteins. The seeds of conventional plants have been proved an affluent source of proteins. These seed proteins are playing a great role in the management of malnutrition problems all over the world particularly in developing countries (Adebowale and Lawal, 2004; Famurewa and Raji, 2005). It has a very wide native distribution, ranging from central and northern India, through northern Indochina and East Asia.

The *Nelumbo nucifera* known as lotus is an aquatic plant belonging to family *Nelumbonaceae*. The plant grows up to a height of about 1.5m and a horizontal spread of up to 3m. Lotus seeds and their processing by-products are widely consumed in Asia, Americas, and Oceania for high content of physiologically active substances (Mukherjee *et al.*, 2009). Seeds are typically oval or spherical, with sizes varying according to varieties. Seeds are used in the diet; medical applications include treatment of inflammation, arrhythmia, cancer, but they can also be used as antidote and hepatic-protective ingredients. The seeds are also used in indigenous (e.g., Ayurveda, Chinese) and folk medicines to treat tissue inflammation, cancer, diuretics and skin diseases (Chopra, 1956).

In recent years, nutritional characteristics of lotus seeds have been gradually revealed, showing their potential application value in foods, pharmaceuticals and cosmetics. The purpose of this study was to enhancement existing knowledge on lotus seeds as the suitability of food source. There is no previous reported study on lotus seeds in Mymensingh region, so this attempt has been made to study this plant.

2. Materials and Methods

2.1. Study area and period

The experiment was conducted in two separate beels in Tarakanda upazila of Mymensingh district. The research was done from April to October 2019. Nutrient composition was determined in the fish nutrition laboratory of the Department of Aquaculture, Bangladesh Agricultural University, Mymensingh, Bangladesh.

2.2. Sample collection and preparation

The samples were collected from two separate beels at Tarakanda in Mymensingh District. At first lotus seeds were selected randomly and collected from beels. Total weight of the sample then measured by using a balance and the samples were dried in the sun for the determination of nutrient composition. Samples were sun dried for five days and transported to the fish nutrition laboratory of the department of Aquaculture, Bangladesh Agricultural University, Mymensingh.

2.3. Bio-chemical analysis

Nutrient composition analysis of moisture, crude protein, crude lipids, crude fiber and ash were carried out with certain modification according to the method of Association of Official Analytical Chemists, AOAC (2000).

2.3.1. Determination of moisture content

Moisture content (%) = (Weight of wet sample – Weight of dry sample) / Weight of sample × 100

2.3.2. Determination of crude protein content

% of Nitrogen = Miliequivalent of N_2 × Strength of HCl × Titrant used (ml) / Weight of sample g × 100
% of crude protein = % of Nitrogen × 5.85

2.3.3. Determination of ash content

Ash content % = (Dry sample + crucible) - empty crucible / weight of sample × 100

2.3.4. Determination of crude lipids content

Lipid content % = (weight of crude lipid –empty beaker weight) / weight of sample × 100

2.3.5. Determination of crude fiber content

Percent (%) of crude fiber = $(W_1\text{-}W_2)/W_o \times 100$
Where, W_o =Weight of the sample, W_1=weight before ashing, W_2= Weight after ashing

2.3.6. Determination of nitrogen free extract (NFE) content

Nitrogen free extract (carbohydrate) was estimated by using the following formula:
100 – (% protein + % lipid + % ash + % moisture + % crude fiber)

2.4. Data analysis

After data collection, data were statistically summarized and analyzed according to the objectives of the study. All statistical analysis was carried out by MS EXCEL 2010.

3. Results

3.1. Moisture content of lotus seeds

Moisture content (%) of lotus seeds collected from two separate beels at Tarakanda in Mymensingh district were 17.78 and 17.675, respectively. There was little variation might be due to environmental factors. Average moisture content (%) of lotus seeds collected from two separate beels was 17.727 (± 0.074). The results are shown in Figure 1.

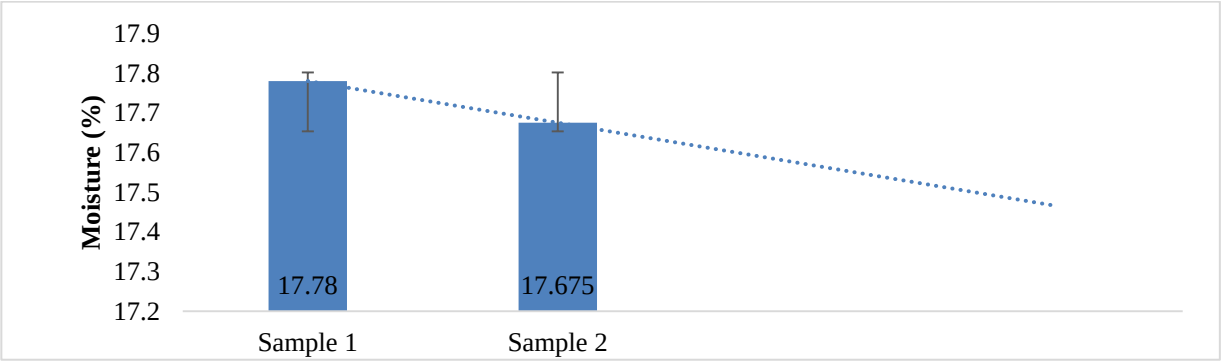

Figure 1. Moisture content (%) of lotus seeds collected from two separate beels at Tarakanda in Mymensingh district.

3.2. Protein content of lotus seeds

Protein content (%) of lotus seeds collected from two separate beels at Tarakanda in Mymensingh district were 16.643 and 16.703, respectively. There was little variation might be due to environmental factors. Average protein content (%) of lotus seeds collected from two separate beels was 16.673 (± 0.042). The results are shown in Figure 2.

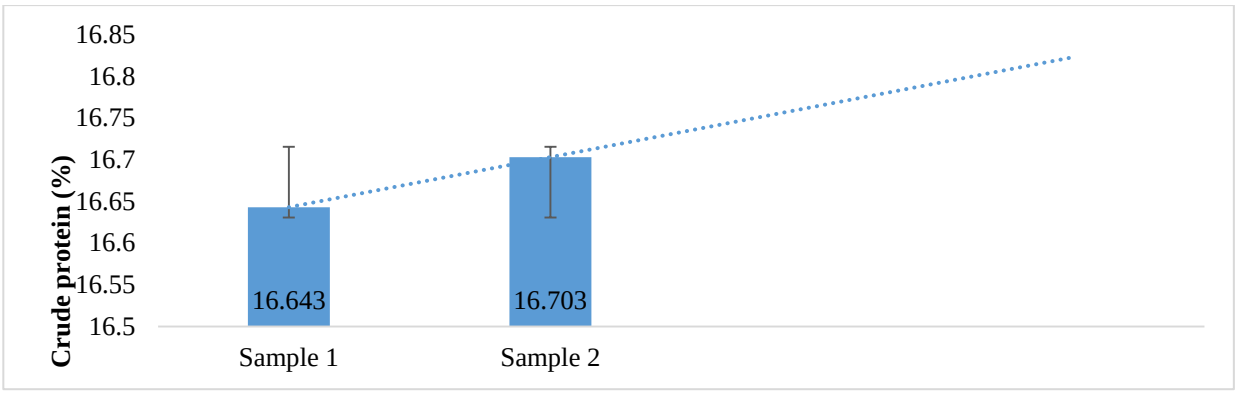

Figure 2. Crude protein content (%) of lotus seeds collected from two separate beels at Tarakanda in Mymensingh district.

3.3. Ash content of lotus seeds

Ash content (%) of lotus seeds collected from two separate beels at Tarakanda in Mymensingh district were 9.61 and 9.503, respectively. Average ash content (%) of lotus seeds collected from two separate beels was 9.556 (± 0.061). The results are shown in Figure 3.

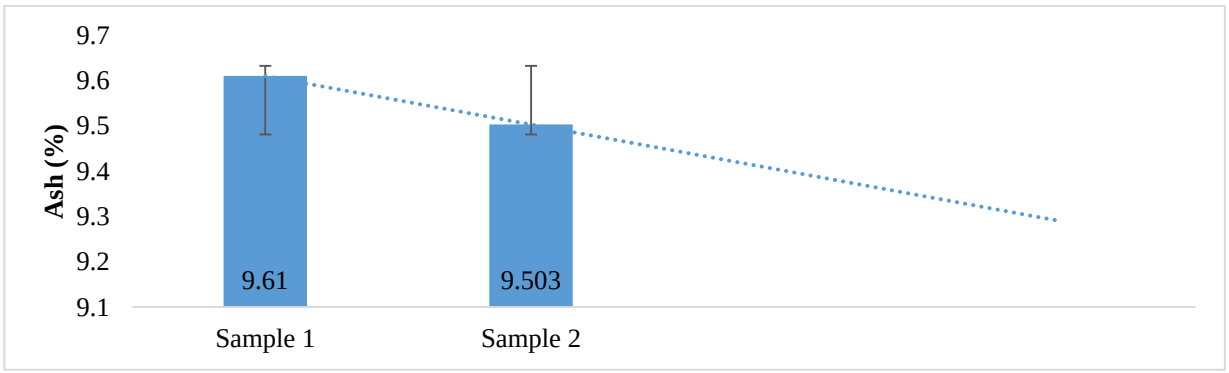

Figure 3. Ash content (%) of lotus seeds collected from two separate beels at Tarakanda in Mymensingh district.

3.4. Lipid content of lotus seeds

Lipid content (%) of lotus seeds collected from two separate beels at Tarakanda in Mymensingh district were 4.184 and 4.159, respectively. Average lipid content (%) of lotus seeds collected from two separate beels was 4.172 (± 0.012). The results are shown in Figure 4.

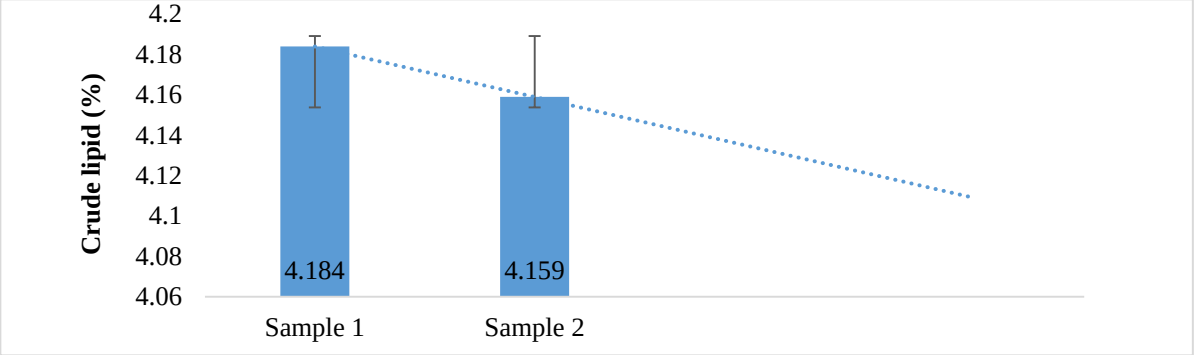

Figure 4. Crude lipid content (%) of lotus seeds collected from two separate beels at Tarakanda in Mymensingh district.

3.5. Crude fiber content of lotus seeds

Crude fiber content (%) of lotus seeds collected from two separate beels at Tarakanda in Mymensingh district were 7.739 and 7.829, respectively. Average crude fiber content (%) of lotus seeds collected from two separate beels was 7.779 (± 0.050). The results are shown in Figure 5.

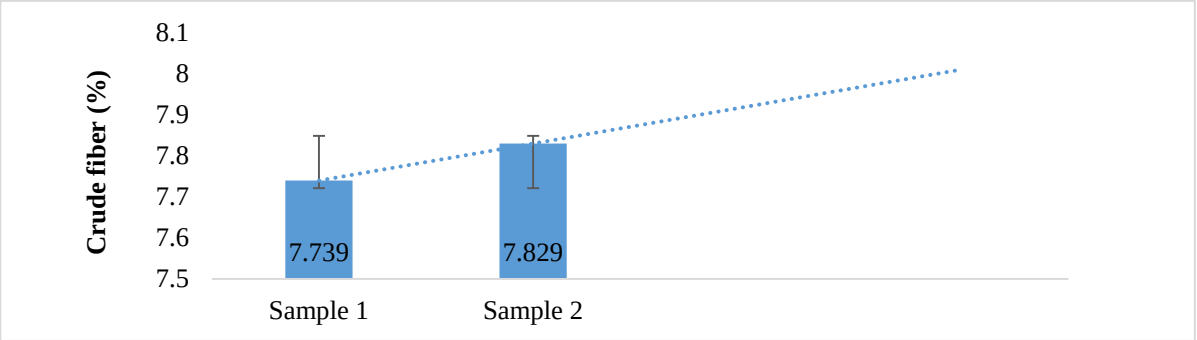

Figure 5. Crude fiber content (%) of lotus seeds collected from two separate beels at Tarakanda in Mymensingh district.

3.6. Nitrogen free extract content of lotus seeds

Nitrogen free extract (carbohydrates) content (%) of lotus seeds collected from two separate beels at Tarakanda in Mymensingh district were 44.047 and 44.036, respectively. Average carbohydrates content (%) of lotus seeds collected from two separate beels was 44.042 (±0.007). The results are shown in Figure 6.

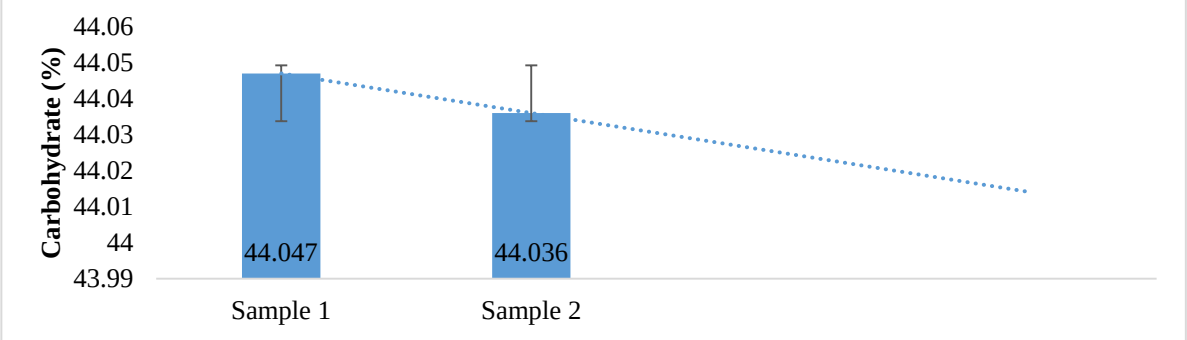

Figure 6. Carbohydrates content (%) of lotus seeds collected from two separate beels at Tarakanda in Mymensingh district.

The average protein content (%) of two samples of lotus seeds was about 16.673 (± 0.042), moisture content (%) of lotus seeds was about 17.727 (± 0.074), ash content (%) of lotus seeds was about 9.556 (± 0.061), lipid content (%) of lotus seeds was about 4.172 (± 0.012), crude fiber content (%) of lotus seeds was about 7.779 (± 0.050) and carbohydrates content (%) of lotus seeds was about 44.042 (±0.007). The nutrient composition of lotus seeds found in the present study are presented in Figure 7.

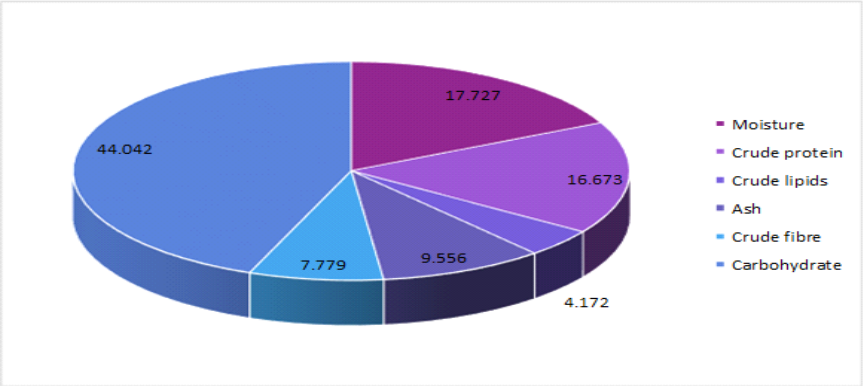

Figure 7. Average nutrient composition of two samples (sample 1 and sample 2) collected from two separate beels at Tarakanda in Mymensingh district.

4. Discussion

Aquatic plants grow abundantly in watercourses all over the world and considered as floating submerged and emergent aquatic vegetation. In recent past, numerous workers all over the world have tried to explore the possibilities of using these plants as a source of human feed and animal feed. Among them, lotus is an aquatic plant, which considered as a non-conventional aquatic vegetable. This experiment carried out to know the nutritional value of lotus seeds.

The average moisture content (%) of dried lotus seeds found in this research was 17.727%. Average moisture content (%) of dried lotus seeds was found 14.0% by Pan *et al.* (1993) which supported the present result of research. Some little variation might be due to dried of lotus seeds. Pan *et al.* (1993) lotus seeds dried seven days where in this research lotus seeds dried only five days. The variation might also be due to dried of lotus seeds, lotus habitat, species, season, storage condition, water quality and nutrient availability *etc*.

The average protein content (%) of dried lotus seeds found in this research was 16.563%. Average protein content (%) of dried lotus seeds was found 16.2% by Pan *et al.* (1993) which supported the present result of research. Some little variation might be due to habitat, species, water quality and nutrient availability *etc*. Wanyo *et al.* (2009) reported that wheat flour and rice flour content 11.0% and 6.83% protein respectively, where lotus seeds content 16.563% protein which is higher than Wanyo *et al.* (2009) experiment. This result indicated that lotus seeds content more protein percent than rice flour and wheat flour, so lotus seeds might be a good substitute of rice flour and wheat flour. The flour of lotus seeds is a good source of dietary proteins.

The average lipid content (%) of dried lotus seeds found in this research was 4.146%. Average lipid content (%) of dried lotus seeds was found 2.05% by Pan *et al.* (1993) which supported the result of present research. Therefore, lotus seeds might be a good source of lipid.

The average ash content (%) of dried lotus seeds found in this research was 9.491%. Average ash content (%) of dried lotus seeds was found 4.05% by Pan *et al.* (1993). The ash content of dried lotus seeds was higher than the Pan *et al.* experiment. Sridhar and Bhat (2007) was observed that dry lotus seeds content 3.9-4.5% ash, which is lower than this research. The variation might be due to dried of lotus seeds, lotus habitat, season, water quality *etc*. Average ash content (%) of dried Paniphal fruits was found 8.50% by Alfasane *et al.* (2011) which is similar to lotus seeds.

The average crude fiber content (%) of dried lotus seeds found in this research was 7.755%. Average crude fiber content (%) of dried lotus seeds was found 8.13% by Pan *et. al.* (1993) which supported the result of present research. The variation might be due to habitat, season, water quality *etc*.

The average nitrogen free extract (carbohydrates) content (%) of dried lotus seeds found in this research was 44.042%. Average carbohydrates content (%) of dried lotus seeds was found 55.77 by Pan *et. al.* (1993) which supported the result of present research. The variation might be due to dried of lotus seeds, lotus habitat,

season, water quality *etc*. The experiment may conclude that lotus seeds could be a good source of nutrients and showed its nutritional value that could be explored to provide affordable medicines to peoples.

5. Conclusions

Different parts of lotus are used as food and traditional medicinal purpose. Seeds of lotus are edible and used in cookery since ages. From the nutritional composition data analysis, it was found that seed can be successfully utilized as an important source of protein and carbohydrates for humans, livestock and also contains appreciable concentrations of phytochemicals which may provide a scientific rationale for the use of lotus seeds in the traditional medicine for the treatment of metabolic disorders. Therefore, future studies can be done on lotus seeds to evaluate its nutritional and pharmacological significance. Importance should be given on the cultivation of lotus in large scale, processing and proper storage of seeds so that general mass of people can consume lotus seeds as a low cost nutritious food and use it as a low cost medicine for the treatment of diseases. All these suggest that lotus seeds can actually serve as a non-conventional food supplement to help combat the problem of malnutrition of humans. People living around areas where this seeds are found, may look for processing methods to help integrate this into their food for humans. In addition, there is also a need to conserve this plant which is a treasure because of the habitat of the lotus plant is being polluted and threatened. So the lotus is of great significance to mankind.

Acknowledgments

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Conflict of interest

None to declare.

References

Adebowale KO and OS Lawal, 2004. Comparative study of the functional properties of bambarra groundnut (*Voandzeia subterranean*), jack bean (*Canavalia ensiformis*) and mucuna bean (*Mucuna pruriens*) flours. Food Res. Int., 37: 355–365.

Alfasane MA, M Khondker and MM Rahman, 2011. Biochemical composition of the fruits of water chestnut (*Trapa bispinosa*). Dhaka University Journal of Biological Sciences, 20: 95-98.

Chopra RN, SL Nayar, IC Chopra, LV Asolkar and KK Kakkar, 1956. Glossary of Indian Medicinal Plants. Council of Science and Indian Research, pp. 174.

Famurewa JAV and AO Raji, 2005. Parameters affecting milling qualities of undefatted soybeans (*Glycine max* (L.) merill) (1), selected thermal treatment. Int. J. Food Eng., 1**:** 1-9.

Mukherjee PK, D Mukherjee, AK Maji, S Rai and M Heinrich, 2009. The sacred lotus (*Nelumbo nucifera*) phytochemical and therapeutic profile. Journal of Pharmacology, 61: 407-422.

Pan L, H Liang and G Guo, 1993. Nutritional value and processing technology of lotus seed. Science Technology Food Industry, 1: 29–32.

Sridhar KR and R Bhat, 2007. Lotus – a potential nutraceutical source. Journal of Agricultural Technology, 3: 143-155.

Wanyo P, C Chomnawang and S Siriamornpun, 2009. Substitution of wheat flour with rice flour and rice bran in flake products: effects on chemical, physical and antioxidant properties. World Appl. Sci. J., 7**:** 49-56.