

Major Health Benefits and Functional and Sensory Properties of Cookies Prepared from All Purpose Flour Supplemented with Fox Nut

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ORIGINAL
ARTICLE



Abstract: Many diet cookies are available these days in the market that are very healthy and have many nutritional benefits too. Fox nut chocolate cookies are energy filled and healthy sacks. The cookies are essential for our bodies due to their immense health benefits (Giram, Agrawal, & Shere, 2017). So I thought to make a certain type of cookie that is healthier and has many nutritional benefits due to fox nuts, which holds the top position among the nuts. The Fox nut chocolate cookies are made by grinding and mixing 50g of fox nut with a 60g of all-purpose flour (see fig. 1). 50g of butter and 50g of granulated sugar is then combined separately before adding a teaspoon of baking powder, 2 spoons of cocoa powder, and a quarter teaspoon of baking powder onto it. The new content is then mixed with the ground fox nut and all-purpose flour. The made dough is shaped before being pre-heated in the oven at a temperature of 180 degrees Celsius for 15 minutes. Apart from Fox nuts and hence it's processed flour being readily available it was found out that it has got few very rare health benefits that would not only improvise the daily lifestyle of an individual but also replace lots of additional food stuff as it's got so much of health regeneration potential. To mention a few, high amount of magnesium, high amount of protein fixing and regenerative abilities, high amount of potassium, anti-ageing properties and the low levels of glycemic index and GI levels. The cookies prepared from Fox nut and all-purpose flour were appreciable in terms of sensory analysis and had lower moisture and fat content. They were also soft and appealing in color.

Keywords: Cookies, Makhana, *Euryale ferox* Salisb, Ayurveda, Nutrition

I. Fox nut chocolate cookies are healthy

A majority of the people tend to think that cookies fall into the category of junk foods that are rich in sugar and butter. However, Fox nut chocolate cookies are designed with health benefits. They are made from natural ingredients including fox nuts and coco powder and thus possess high nutritional values (O'Neil & Nicklas, 2015). The snacks also contain flour and granulated sugar, which are instrumental in giving our bodies the much-needed energy.

Fox nut

Makhana (*Euryale ferox* Salisb) is an aquatic crop, belonging to the family of Nymphaeaceae. It is commonly known as Gorgon Nut or Fox Nut, and it is grown in stagnant perennial water bodies like ponds, land depressions, oxbow lakes, swamps and ditches. Makhana seeds are also called as Black Diamond. It is a food item for the religious fast of various people. Popped Makhana is used in preparation of a number of delicious and rich sweet dishes, pudding and milk based sweets. Apart from these, Makhana is used for medicinal purposes as well, both in India and China as documented in the ancient literatures. The seed is analgesic and aphrodisiac, hence used in the preparations of a number of Ayurvedic medicines.

Nutritional Values, Gluten-Free, and Non-GMO

Many of the cookies out there contain artificial sweeteners and food colors. However, Fox nut chocolate cookies are made from natural ingredients; therefore, they are favorable snacks for kids (Loewenstein, Price, & Volpp, 2016). They are also gluten-free, which means they do not have any harmful effect on people with allergies. The fact that the snack is also non-GMO makes it an excellent choice for better health.

Aim and Objective

The present work aimed to make a new food product that named fox nut chocolate cookies, cookies that are made by adding fox nut so that it can be eaten as a daily snack in the form of a cookie because of its major health benefits, which will help many people in combating various health problems.

Plant description

E. ferox Salisb is stem less, prickly, aquatic herb with rootstock short and thick. The leaves are submerged, oblong, orbicular corrugated about 6-100 cm in diameter; reddish green above, purple below and densely spinous. The flowers are solitary, submerged, and epigynous with four persistent, thorny sepals inserted on the torus above the level of the ovary, together with many seriate petals. Most flowers are cleistogamous, but chasmogamous flowers may also be produced. The inferior, multicarpellary ovary develops into a spongy berry like fruit which is densely prickly, the size of an orange, and contains 30-40 pea size seeds with hard black seed coat and a mucilaginous aril. The pulpy aril keeps the seeds floating for a few days after they dehisce, before they finally settle down to the bottom of the water

Makhana Scientific description

- Kingdom-Plantae
- Unranked-Angiosperms
- Order-Nymphaeales
- Family-Nymphaeaceae
- Genus- *Euryale*Salisb.
- Species- *E. ferox*

Table 1. Chemical Composition Makhana

Determination	whole starch	protein free starch
Yield (%) from seed meal	52.5	n.d
Moisture (%)	14.4	13.5
Ash (%)	15	0.15
N (%) by kjedahl method	1.36	Nil
Protein (%) by amino acid analysis	7.32	Trace
Total carbohydrate (%)	77.33	86.85
Amylose (%), potentiometrically	n.d	25.3
Amylopectin (%) with respect to amylose	n.d	74.7

Nutritive Value

Makhana (*Euryale ferox* Salisb.) having low fat content, high contents of carbohydrates, protein and minerals. The calorific value of raw seeds (362 k cal/100g) and puffed seeds (328 k cal/100g). The chemical constituents are 0.02 calcium 0.9 phosphorus and 0.0014 iron⁷. Nutritional studies shows that edible parts of the seeds contain 12.8% moisture, 9.7% protein, 0.1% fat, 76.9% carbohydrate, 0.5% mineral matters, and 1.45% iron besides a good proportion of sugar, ascorbic acid and phenol. Amino acid index is higher than in staple foods, which signifies its unique food quality.

Antidiabetic and Antihyperlipidemic of *E. Ferox*salisb.:

The extract of *E. Ferox*salisb. seeds extract protects β -cells against ROS-mediated destruction by improvising the levels of antioxidant enzymes and minimizing hyperglycemia which could be due to release of insulin from remnant and recovered β -cells in pancreas in STZ-induced diabetic rats as confirmed by the ultrastructural, histopathological studies. The research clearly indicates that ethanolic extract of *E. Ferox*salisb. may be utilized as important source of natural antioxidants with antidiabetic and antihyperlipidemic potential and can be used as plausible food additives or as a functional food in future.

Medicinal properties of Makhana

1. The seeds contain sufficient amount of vitamins so, used to treat beriberi, a disease caused by deficiency of Vitamin B110.

2. Feeding of *E. ferox*, stimulated humeral immunity and suggested its applications in mothers after delivery and invalids.

3. Makhana alleviates Vata and Pitta Dosha. It strengthens the heart and is very useful in anemia. Makhana increases quality and quantity of semen, prevents premature ejaculation, increases libido and helps in female infertility. It strengthens body and increases energy level. Because of its aphrodisiac properties it is grouped under Vrishyadi group. The herbs under this group are used in Vajikarana therapy. Makhana increases stickiness of secretions by increasing moisture level in body. Hence it increases quality and quantity of semen and useful in impotence. It helps to increase the fertility in women and reduces Vata and Pitta. It strengthens the body and reduces burning sensation and quenches thirst.

4. Makhana is used as a tonic and for the treatment of leucorrhoea and good immunostimulant.

5. Diabetes - Diabetes is a metabolic disorder, which is accompanied by high blood glucose levels. It is a result of improper functioning of the pancreas, which secretes the insulin hormone. Fox nut is a sweet and sour seed. These seeds contain starch and protein which is excellent for diabetes.

6. Anti-aging: Makhana is rich in antioxidants that works as age lock system, and makes us younger for much longer. Makhana is effective for individuals with high risk of premature ageing, premature white hairs, wrinkles and other signs of aging.

7. Chinese medicine: According to principles of traditional Chinese medicine, fox nut or Makhana is used to strengthen spleen and kidneys. It indicated in conditions like spermatorrhea, premature ejaculation, neuralgia, incontinence, chronic diarrhea etc. According to herbalists it is helpful in preventing early discharge of semen and restores sexual vigor in older men. Makhana helps in conditions like arthritis, erectile dysfunction and premature aging. This herb has antioxidant properties and helps in digestion, rejuvenates respiratory system and prevents frequent urination.

8. *Euryale ferox* seed is consumed medicinally or for food in China. The study on Makhana revealed it to contain significant antioxidant activity, which may be associated with its medical applications as a proteinuria inhibitor of diabetic nephropathy.

9. Makhana seeds benefit the spleen, kidney, and heart. The seed also has calming properties that alleviate restlessness, palpitations, and insomnia. It is also rich in calcium. It is a highly regarded herb for restoring sexual vigor and youthful energy in older men. It regulates blood pressure, relieves numbness and aching near waist and knees. It is Suitable for arthritis, helps fighting impotency and premature aging. Makhana is very useful for women during and post pregnancy period. It is also helps your respiratory system, veins and digestion. Popped Makhana contains almost 12% of protein (excellent especially for vegetarians) It reverses the aging process over a period of time.

Materials and methods

The Fox nut chocolate cookies are made by grinding and mixing 50g of fox nut with a 60g of all-purpose flour (see fig. 1). 50g of butter and 50g of granulated sugar is then combined separately before adding a teaspoon of baking powder, 2 spoons of cocoa powder, and a quarter teaspoon of baking powder onto it. The new content is then mixed with the ground fox nut and all-purpose flour. The made dough is shaped before being pre-heated in the oven at a temperature of 180 degrees Celsius for 15 minutes.

A baking Oven is needed to bake the cookies using Infrared Radiation. Infrared Radiation penetrates biscuit dough by approximately 4mm, (depending on wavelength and moisture content). It is the only heat transfer mode to truly bake the product from the centre. This is the key advantage of baking by infrared radiation. 50 g of Fox nut and 60 g of all-purpose flour, 50g of butter and 50g of granulated sugar, a teaspoon of baking powder, 2 spoons of cocoa powder, a quarter teaspoon of baking soda.

Physical analysis of cookies

Cookie Diameter

The total diameter was measured in centimeter with the help of a Vernier caliper. The cookies were rotated at an angle of 90° for duplicate readings. This process was repeated thrice to get an average value and result was reported in centimeter.

Cookie thickness

The thickness (T) of the cookies was determined by placing four cookies stacking on one another. The thickness was measured in centimeter with the help of a Vernier caliper.

This process was repeated thrice to get an average value and results were reported in centimeter.

Cookie spread ratio

Cookie spread was determined from the diameter and thickness, using the following formula:

$$\text{Spread} = D/T$$

Bulk volume

Bulk volume of cookies was determined with slight modifications to the method described by Mir et al. (2014b) Mir, N. A., Gul, K., & Riar, C. S. (2014b). Techno functional and nutritional characterization of gluten-free cakes prepared from water chestnut flours and hydrocolloids. *Journal of Food Processing & Preservation*. doi:10.1111/jfpp.12311).

Bulk density

Bulk density of cookies was determined by the help of bulk volume and weight of cookie, using the following formula:

$$\text{Bulk density} = \text{Weight of cookie} / \text{Bulk volume}$$

Breaking strength of cookies

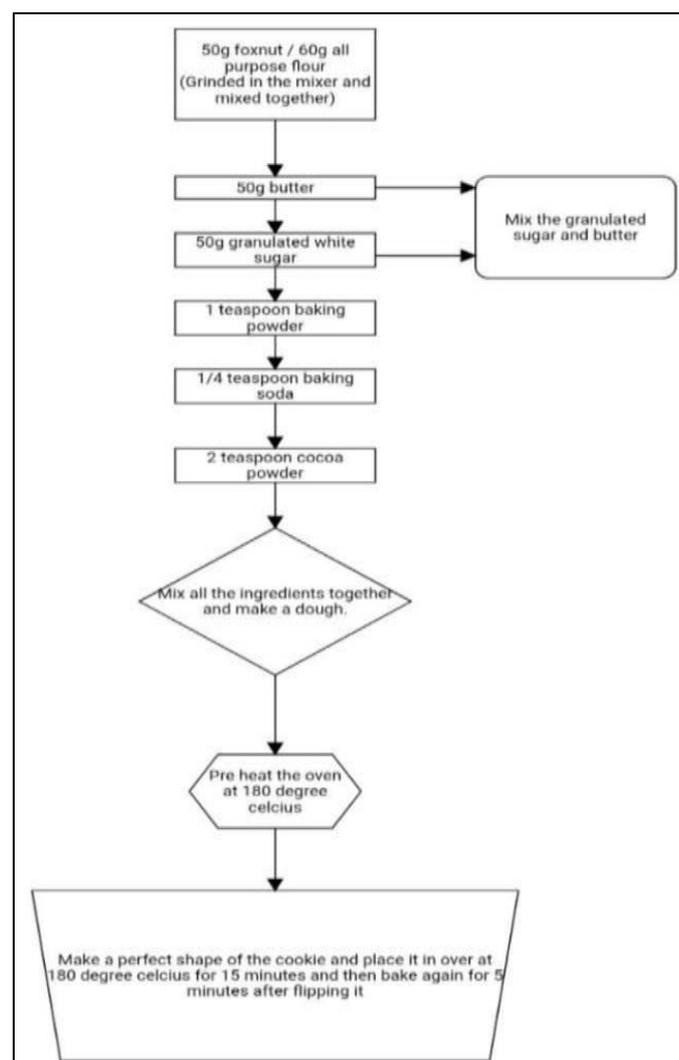
Breaking strength of cookie was measured using the HDP/BS blade. The individual samples of cookies were placed on the platform and the blade was attached to the crosshead of the instrument. The texture analyzer (TA) setting was kept at:

- **Probe:** Three-point bend ring
- **Mode:** Measure force in compression
- **Pre-test speed:** 2 mm/s
- **Test speed:** 3 mm/s
- **Post-test speed:** 10 mm/s.

Sensory evaluation

The sensory quality and overall acceptability of cookies were carried out on a 5-point scale. The sensory panel involved semi-trained panelists of Department of Food Engineering and Technology. The samples were rated on the basis of the criteria: 5 being highly acceptable and 0 being completely unacceptable with respect to different characteristics.

Figure 1. Fox nut chocolate cookies preparation process



II. RESULTS

Results recorded after the consumption of Fox nut chocolate cookies were very surprising. Middle-aged People who ate Fox nut chocolate cookies daily as their breakfast meal saw many changes in their body as Fox nut is an anti-aging agent. The enzymes that assist in fixing and preserving the impaired proteins are found in the lotus seed in high quantity. The enzymes that exist in these Lotus seeds are expected to obstruct the aging process, it helped the people combat protein deficiency in the body, and Lotus seed's excellent property is that it is low on GI, so it slowly and gradually releases the energy levels in the body so that you remain energetic throughout the day.

It will keep away stress and keep your mind hale and healthy. Fox nut cookies helped the people who have heart disease as it contains an abundant amount of magnesium, which is the highest channel blocker and significantly

improves the blood and oxygen. They also help in the flow of other important nutrients.

Low magnesium levels can put your body to the risk of heart attacks. Its consumption leads to a dramatic change in the heart condition as the content of folate and magnesium reduce the risk of diseases linked with coronary heart diseases. It helped the people who were obese as it has low glycemic index that leaves you feeling full and satisfied, eventually leading to weight loss. Fox nut cookie helped the people who have Insomnia, as it has the ability to regulate and handle the unnerving condition of insomnia as it has a naturally sedative consequence. It helped the people who are diabetic as it contains vital proteins and starch which is great for the health of a diabetic.

Fox nut cookie helped the people who were suffering from sexual problems as it helps in increasing the sperm quantity in men whereas in women, it greatly helps in increasing the fertility. Fox nut cookie helped the people who were suffering from hypertension, stress and blood pressure as Fox nut has high potassium which helps in decreasing the same.

Table 2. Sensory scores of prepared cookie

Sample	Physical appearance	Mouth feel	Color	Oiliness	Stickiness
1	4.8	4.7	4.9	4	2

Table 3. Breaking Strength of cookie

Formulation of cookie	Force
50g fox nut, 60g all-purpose flour	1.312

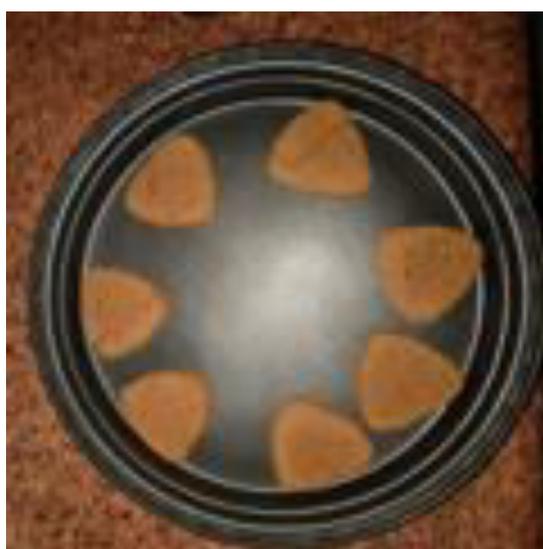
Table 4. Physical Characteristic of cookie

Formulation of cookie	Diameter (cm)	Thickness (cm)	Spread ratio	Bulk volume (ml)	Weight of cookie	Bulk density (gm/ml)	Breaking strength (Force)
50g fox nut, 60g all purpose flour	5.1	0.629	7.209	15.82	10.53	0.610	1.312

Figure 2. First stage of cookie preparation



Figure 3. Final stage of cookie preparation



III. DISCUSSION

Makhana is very useful drugs for medicinal purpose as well as food supplement. Makhana also named as Fox nut, PhoolMakhana, lotus seeds, Gorgon nut, Euryale Ferox. The plant fox nut belongs to the family Nymphaeaceae. It grows in water and is found in India, Korea, China, Japan and Russia. In India, it is popularly known as Makhana. They are the edible seeds of Lotus flower which can be roasted or fried. These are used in many dishes of India. They are also considered as very pious food and used in many rituals. Along with this, they are also highly beneficial in terms of nutritional values. Makhana is superior to dry fruits such as almonds, walnut, coconut and cashew nut in term of sugar, protein, ascorbic acid and phenol content. Makhana seeds are low in saturated fats, sodium and cholesterol and are high in magnesium potassium and phosphorus. It contains easily digestible protein, carbohydrate, moisture, fat, total minerals, phosphorus and iron. These chemical constituents are very useful for human body and they also provide rich source of nutrition. It is avoiding constipation due to having high fiber.

Makhana is helpful in diarrhea and improving appetite. Makhana contains flavonoids, which are antioxidants and reverse the adverse effects of free radicals in the body. They also prevent the inflammations in the body. These free radicals are the main cause of many degenerative diseases like diabetes mellitus, heart problems. Makhana is known as anti-aging foods because of powerful antioxidants. It acts as an aphrodisiac and increases quality and quantity of semen, prevents premature ejaculation, increases libido and helps in female infertility.

Fox nuts regulate the blood pressure as they are low in sodium and high in potassium, So a very beneficial food for the hypertensive people. Makhana contain iron, so it is also helpful in anemia. According to Ayurveda, Fox nut alleviates Vata and PittaDosh due to Madhura rasa, MadhuraVipak and SheetaVirya. Makhana is Raktapittahara, Garbhashtapana, Vrsya, Bayle properties and mainly indicated in Sukrameha and Daha. Makhana having good source of energy, carbohydrate, protein and mineral, so it will be use the management of Protein Energy Malnutrition (PEM).

According to the Chinese medicine, fox nut or Makhana is used to strengthen spleen and kidneys. According to

herbalists, it is helpful in preventing early discharge of semen and restores sexual vigor in older men. It is also recommended for the women during pregnancy and post-natal weaknesses. Makhana regulates blood pressure, relieves numbness and aching near waist and knees. It increases moisture level in body tissues. They also help to lower the blood sugar levels, so a healthy snack for diabetics.

IV. CONCLUSION

Crushed Fox nut, which is gluten-free and readily available, it is used to substitute all-purpose flour to prepare cookies. The cookies prepared from Fox nut and all-purpose flour were appreciable in terms of sensory analysis and had lower moisture and fat content. They were also soft and appealing in color. Further studies on the utilization of Fox nut can help combat various health problems at the same time to uplift the socioeconomic conditions of people associated with this trade. Based on the above mentioned research done, the new aspects of research could be the economic benefits of using the Fox nut flour considering the easy and high availability of the former. Not forgetting the study that can be done as a survey that would compare the health improvements in different aspects of human health when the consumption of products supplemented with Fox nut flour is done over a certain period of time.

V. DECLARATION

No funding is provided for the research work that I have done and there is no conflict of interest.

REFERENCE

- [1] Giram, S. J., Agrawal, R. S., & Shere, D. M. (2017). Organoleptic and nutritional evaluation of cookies supplemented with oat and finger millet. *International Journal of Pure & Applied Bioscience*, 5(5), 360-365.
- [2] Loewenstein, G., Price, J., & Volpp, K. (2016). Habit formation in children: Evidence from incentives for healthy eating. *Journal of Health Economics*, 45, 47-54.
- [3] O'Neil, C. E., & Nicklas, T. A. (2015). Tree nut consumption is associated with better nutrient adequacy and diet quality in adults: National Health and Nutrition Examination Survey 2005–2010. *Nutrients*, 7(1), 595-607.
- [4] Prem Kumar Sundaram, BikashSarkar and Surajit Mondal, Design and Performance Evaluation of Pedal Operated Makhana (Euryale ferox Salisb) Seed

- Grader, Research Journal of Agricultural Sciences 5(3): 428-431, May-June (2014)
- [5] Song CW, Wang SM, Zhou LL, Hou FF, Wang KJ, Han QB, Li N, Cheng YX. Isolation and identification of compounds responsible for antioxidant capacity of *Euryale ferox* seeds. *J Agric Food Chem.* 2011 Feb 23;59(4):1199-204. doi: 10.1021/jf1041933. Epub 2011 Jan 31
- [6] http://manjumakhana.com/benefits_Fox_nut.php. 13 September 2015
- [7] Dhanvantari Nighantu, P.V. Sharma, Guru Prasad Sharma Varanasi.
- [8] Puri A, Sahai R, Singh KL Immunostimulant activity of dry fruits and plants materials used in Indian traditional medical system for mothers after child birth and invalids. *Journal Ethnopharmacology*, 2000;71(1-2):89-92.
- [9] <http://www.ayurhelp.com/articles/medicinal-properties-foxnut-euryale-ferox-or-%E2%80%9Cmakhana%E2%80%9D#.VnZ5Cb-81C0>. 20 December 2015.
- [10] Danish Ahmed, Vikas Kumar, Amita Verma, Girija Shankar Shukla, and Manju Sharma, Antidiabetic, antioxidant, antihyperlipidemic effect of extract of *Euryale ferox* salisb. with enhanced histopathology of pancreas, liver and kidney in streptozotocin induced diabetic rats, *Springer plus.* 2015; 4: 315. Published online 2015 Jul 3. doi: 10.1186/s40064-015-1059-7 PMID: PMC4489967.
- [11] (2014b) Mir, N.A., Gul, K., & Riar, C.S. (2014b). Techno functional and nutritional characterization of gluten-free cakes prepared from water chestnut flours and hydrocolloids. *Journal of Food Processing & Preservation.* doi:10.1111/jfpp.12311).

SUPPLEMENTARY REFERENCE

Nutrition Facts Comparison: nuts, almonds vs seeds, lotus seeds, dried

Nutrition Facts		Nutrition Facts	
Serving Size: 100g or 3.5oz		Serving Size: 100g or 3.5oz	
Amount Per Serving		Amount Per Serving	
Calories	Calories from Fat 414	Calories	Calories from Fat 16
575		332	
% Daily Value*		% Daily Value*	
Total Fat	76%	Total Fat	3%
49g		2g	
Saturated Fat 4g	19%	Saturated Fat 0g	2%
Trans Fat 0g		Trans Fat 0g	
Cholesterol	0%	Cholesterol	0%
0mg		0mg	
Sodium	0%	Sodium	0%
1mg		5mg	
Total Carbohydrate	7%	Total Carbohydrate	21%
22g		64g	
Dietary Fiber 12g	49%	Dietary Fiber 0g	~
Sugars 4g		Sugars 0g	
Protein		Protein	
21g		15g	
Vitamin A 0% · Vitamin C 0%		Vitamin A 1% · Vitamin C 0%	
Calcium 26% · Iron 21%		Calcium 16% · Iron 20%	
*Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs.		*Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs.	

Calories Compared: Nuts, Almonds vs Seeds, lotus seeds, dried

Calories				Calories			
Serving Size: 100g or 3.5oz				Serving Size: 100g or 3.5oz			
	kcal*	kJoules*	RDI%		kcal*	kJoules*	RDI%
Total Calories	575 kcal	2406 kJ	29%	Total Calories	332 kcal	1389 kJ	17%
from Carbs	88.2 kcal	369.02 kJ		from Carbs	262.4 kcal	1097.85 kJ	
from Fat	413.6 kcal	1730.69 kJ		from Fat	16.5 kcal	68.99 kJ	
from Protein	73.6 kcal	308.08 kJ		from Protein	53.5 kcal	223.73 kJ	
from Alcohol	0 kcal	0 kJ		from Alcohol	0 kcal	0 kJ	
*The unit "kcal" or kilocalories are what most American's think of as 1 Calorie. Other countries use the unit kilojoule (kJ) to measure Food Energy. 1 kcal is equal to 4.184 kilojoules.				*The unit "kcal" or kilocalories are what most American's think of as 1 Calorie. Other countries use the unit kilojoule (kJ) to measure Food Energy. 1 kcal is equal to 4.184 kilojoules.			

Vitamin Comparison: Nuts, Almonds vs Seeds, lotus seeds, dried

Vitamin Content

Serving Size: 100g or 3.5oz

	Amount	RDI%
Vitamin A	1 IU	0%
Vitamin B6	0.143 mg	7%
Vitamin B12	0 mcg	0%
Vitamin B12, Added	0 mcg	0%
Vitamin C	0 mg	0%
Vitamin D	0 IU	0%
Vitamin D2	~	
Vitamin D3	~	
Vitamin D (D2 + D3)	0 mcg	0%
Vitamin E (Alpha-tocopherol)	26.22 mg	131%
Vitamin E, Added	0 mg	0%
Vitamin K	0 mcg	0%
Thiamin	0.211 mg	14%
Riboflavin	1.014 mg	60%
Niacin	3.385 mg	17%
Pantothenic Acid	0.469 mg	5%
Folate	50 mcg	12%
Folate, Food	50 mcg	12%
Folate, DFE	50 mcg DFE	12%
Choline	52.1 mg	~
Betaine	0.5 mg	~

*Daily Value not established for starred items.
~Data not available for tilde (~) items.

Vitamin Content

Serving Size: 100g or 3.5oz

	Amount	RDI%
Vitamin A	50 IU	1%
Vitamin B6	0.629 mg	31%
Vitamin B12	0 mcg	0%
Vitamin B12, Added	~	
Vitamin C	0 mg	0%
Vitamin D	0 IU	0%
Vitamin D2	~	
Vitamin D3	~	
Vitamin D (D2 + D3)	0 mcg	0%
Vitamin E (Alpha-tocopherol)	~	
Vitamin E, Added	~	
Vitamin K	~	
Thiamin	0.64 mg	43%
Riboflavin	0.15 mg	9%
Niacin	1.6 mg	8%
Pantothenic Acid	0.851 mg	9%
Folate	104 mcg	26%
Folate, Food	104 mcg	26%
Folate, DFE	104 mcg DFE	26%
Choline	~	
Betaine	~	

*Daily Value not established for starred items.
~Data not available for tilde (~) items.

Minerals Compared: Nuts, Almonds vs Seeds, lotus seeds, dried

Mineral Content

Serving Size: 100g or 3.5oz

	Amount	RDI%
Calcium	264 mg	26%
Iron	3.72 mg	21%
Magnesium	268 mg	67%
Phosphorus	484 mg	48%
Potassium	705 mg	15%
Sodium	1 mg	0%
Zinc	3.08 mg	21%
Copper	0.996 mg	50%
Manganese	2.285 mg	114%
Selenium	2.5 mcg	4%
Fluoride	~	

*Daily Value not established for starred items.

~Data not available for tilde (~) items.

Mineral Content

Serving Size: 100g or 3.5oz

	Amount	RDI%
Calcium	163 mg	16%
Iron	3.53 mg	20%
Magnesium	210 mg	52%
Phosphorus	626 mg	63%
Potassium	1368 mg	29%
Sodium	5 mg	0%
Zinc	1.05 mg	7%
Copper	0.35 mg	18%
Manganese	2.318 mg	116%
Selenium	~	
Fluoride	~	

*Daily Value not established for starred items.

~Data not available for tilde (~) items.

**Protein and Amino Acids Comparison:
Nuts, Almonds (Left) vs
Seeds, lotus seeds, dried (Right)**

Protein & Aminos

Serving Size: 100g or 3.5oz

	Amount	RDI%*
Protein	21.22g	42%
Essential Aminos		
Histidine	0.557 g	80%
Isoleucine	0.702 g	50%
Leucine	1.488 g	55%
Lysine	0.58 g	28%
Methionine	0.151 g	
Phenylalanine	1.12 g	
Threonine	0.598 g	57%
Tryptophan	0.214 g	76%
Valine	0.817 g	45%
Non-essential Aminos		
Arginine	2.446 g	
Alanine	1.027 g	
Aspartate	2.911 g	
Cystine	0.189 g	
Glutamate	6.81 g	
Glycine	1.469 g	
Hydroxyproline	~	
Proline	1.032 g	
Serine	0.948 g	
Tyrosine	0.452 g	
Methionine + Cystine†	0.34 g	32
Phenylalanine + Tyrosine†	1.572 g	150

* Amino acid RDI's are based on the World Health Organization's recommended daily intake for an adult human weighing 70 kg (154.3 pounds). "Protein and amino acid requirements in human nutrition". WHO Press, page 150.

† The World Health Organization provides a single recommended daily intake for the combinations of Methionine and Cysteine and the combination of Phenylalanine and Tyrosine.

‡ Arginine, Cystine and Tyrosine are required by infants and growing children and we have therefore included

Protein & Aminos

Serving Size: 100g or 3.5oz

	Amount	RDI%*
Protein	15.41g	31%
Essential Aminos		
Histidine	0.43 g	61%
Isoleucine	0.765 g	55%
Leucine	1.215 g	45%
Lysine	0.985 g	47%
Methionine	0.267 g	
Phenylalanine	0.767 g	
Threonine	0.747 g	71%
Tryptophan	0.221 g	79%
Valine	0.991 g	54%
Non-essential Aminos		
Arginine	1.262 g	
Alanine	0.892 g	
Aspartate	1.884 g	
Cystine	0.201 g	
Glutamate	3.57 g	
Glycine	0.826 g	
Hydroxyproline	~	
Proline	1.285 g	
Serine	0.939 g	
Tyrosine	0.375 g	
Methionine + Cystine†	0.468 g	45
Phenylalanine + Tyrosine†	1.142 g	109

* Amino acid RDI's are based on the World Health Organization's recommended daily intake for an adult human weighing 70 kg (154.3 pounds). "Protein and amino acid requirements in human nutrition". WHO Press, page 150.

† The World Health Organization provides a single recommended daily intake for the combinations of Methionine and Cysteine and the combination of Phenylalanine and Tyrosine.

‡ Arginine, Cystine and Tyrosine are required by infants and growing children and we have therefore included them in the list of essential amino acids. [Imura K, Okada A (1998). "Amino acid metabolism in pediatric patients"]

--Data not available for tilde (~) items.