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# Pistachio kernel and its role in nutrition and health

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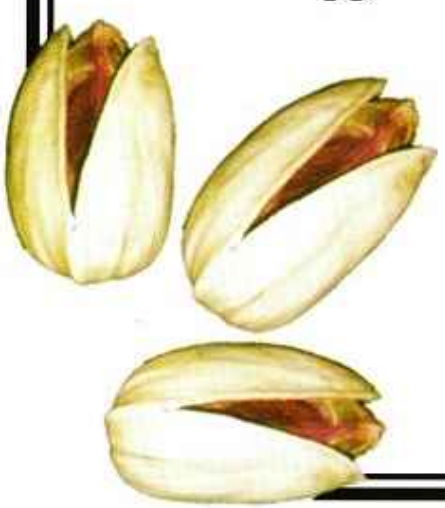

# Pistachio kernel and its role in nutrition and health

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## Introduction:

When you ask yourself which materials must be placed in a healthy and balanced nutrition basket, certainly nuts are among them. Studies have shown that nut daily consumption can provide vitamins, minerals, fibers. Nuts are a part of low fat and high fiber diet. Therefore they reduce coronary heart disease, cancers and birthday defects.

In all history and in the world, nuts have been nutrients for human and therefore they must be as a part of diet.

## Nut consumption history:

Nuts have been taken into consideration in all history and all parts of the world. They have been used in different shapes. This variation is visible from food recipes, light travel food, winter food and delicious imported food. Pistachio using goes back to Stone Age and 7000 years B.C. Romans, Iranians and Arabs used almond for concentration of food. In the tenth century, Harisa (prepared from almond) used in stews as a flavors. 400 years later, this kind of seasoning became customary in Europe. In $6^{th}$ century B.C, Solon (as a Greece emperor) had forbidden export of nuts from Greece. Meanwhile pistachio, walnut and hazelnut were dehiscent in Attica (Greece capital). The motivation for his behavior was people providing necessities. Harris was a travel food and for its preparing, it must be pounded nuts and dried fruits to a paste and then shaped and covered with sugar. Nuts as a delicious food were exported from Iran to china. Nuts were used for main food and high consumption in winter In Scandinavia. As they could be dried and preserved for long time in cold and dry winter (2).

Nowadays nuts have high consumption as snacks. Except for chestnut with moisture content of higher than 50 percent and oil content of 3 percent, other nuts have less than 7 percent

moisture and 50-70 percent oil. Most of the time nuts are roasted and then used. As for pistachio, first it is immersed in bane, then dried and roasted in 120 degree centigrade. Roasted pistachio is consumed directly (3).

**Study on the non scientific ideas in nuts:**

Whereas pistachio has been selected as a natural food by most people, why nowadays low dietary snack value, such as corn snack and chips, are consumed more than pistachio? Studies showed that some people had wrong and non scientific beliefs about pistachio nutrition value. Here some of these beliefs are pointed out:

**Non scientific beliefs 1: many people believe that pistachio nut has got cholesterol**

**Scientific truth**: pistachio as a vegetable food has not got cholesterol. In fact plants don't have any cholesterol. Cholesterol is a part of animal cell membrane whereas plant cell membrane has no cholesterol. Fibers contain Plant cell wall. Animal cells have not got septum. This is the main difference between animal and plant cells:

**All Plants have fiber and all animals have cholesterol.**

For general understanding, we need high nutritional training. According to the rules, it is necessary to use nutrition label "No cholesterol" on vegetable food packaging such as pistachio. In this case consumers don't make a mistake between vegetable food and removed cholesterol food. Nutrition experts know this subject clearly, but people have a wrong belief and it is necessary to educate people to be

informed. Some studies showed pistachio role in reducing of cholesterol (2, 11).

**Non scientific beliefs 2:**
**It is possible to consume high amount of pistachio in each meal and this is not balance nutrition diet**
**Scientific truth**:
Studies of Iran's nutrition research institute showed that nut consumption amount in each meal are small and is about 30 grams. This amount is in conformity with balance nutrition diet. World health organization (W.H.O) suggested consuming 400 gram vegetables and fruits in a day. One-ounce nuts can be considered as a part of diet. Usually a one ounce nut (28.3 grams) is less than one quarter of a cup or a small punch (10).

**Non scientific beliefs 3:**
**If we use pistachio nut, we can not reduce weight**
**Scientific fact:**
Clinical studies showed that consumption of nuts such as pistachio before lunch and dinner can reduce weight (2, 11). In other words if nuts used in nutrition diet on programmed basis, the weight not only doesn't increase but also decreases.

**Pistachio nut health benefit:**
**1- providing nutrients for body needs:**
A one-ounce serving of pistachio contains more than 10% of the daily value for dietary fiber, vitamin B-6, thiamin, magnesium, phosphorus and copper.
Comparison between pistachio and other food nutrients showed that:

 A one-ounce serving of pistachio is more useful than any other snack nuts.

You can get more dietary fiber from serving of pistachios than 1/2 cup of broccoli or spinach.

The amount of vitamin B-6 in one-ounce of pistachios is four times higher than peanut butter.

Pistachios have got as much thiamin as 1/2 cup of cooked rice.

Pistachio has got as much potassium as half of a large banana.

The amount of lutein found in a one-ounce serving of pistachios is equivalent to about 1/4 cup of fresh broccoli or cooked sweet corn. Lutein may play a major role in maintaining eye health.

A one ounce serving of pistachio contains 13g of total fat, of which just 1.5g is saturated fat. While pistachios contain fat, the fat is predominantly monounsaturated, similar to that found in olive oil (10).

**2- having omega-3 (linolenic acid)**

Pistachio nut has got 0.3% omega-3 fatty acid (table 2). Omega-3 fatty acid converted into hormone-like compounds, which play role in many body functions including vital organ function and intracellular activity. Therefore they are necessary for us. Researchers suggested that at least 0.5% of body energy must be obtained from omega-3 fatty acid. Fish, olive oil, canola oil and walnut are good sources of omega-3 fatty acid (9).

Omega-3 deficiencies are linked to:

* decreased memory and mental abilities,
* tingling sensation of the nerves,
* Poor vision,
* diminished immune function,
* increased tendency to form blood clots,

*increased triglycerides and bad cholesterol (LDL) levels,
*impaired membrane function,
*hypertension,
*irregular heart beat,
* learning disorders,
* menopausal discomfort,
* growth retardation in infants, children, and pregnant women (9).

**3- reducing bad cholesterol and preventing coronary heart disease:**

On the statistical basis of Iran's ministry of health and medical education, 700-800 people died daily due to illness and among them 317 due to coronary heart disease. Unfortunately in recent years coronary heart disease has increased and at present heart disease is the most prevalent reason for death. Symptoms of coronary heart disease are thorax pain and heart attack. Reason of heart disease is gradual formation of fat sedimentation in inner layer of artery wall. They result in limited blood circulation. This phenomenon called hardening of arteries. There is no obvious sign, but when increased arteries damage and decreased heart blood circulation, pains reveal. Complete heart arteries closure, will result in heart attack. Most people in many countries have got this problem and on the basis of predictions we will have critical situation in 2020. For this reason world health organization and world heart federation started many program via education and information for disease preventing (1).

**3-1- coherence of cholesterol and heart diseases:**

Cholesterol causes heart arteries to become thin. As a result blood pressure decreases and causes heart not to have enough oxygen. Cholesterol circulates in blood in the form of

lipoprotein package. Like oil and water, cholesterol and blood can not be mixed together. Therefore cholesterol has to make lipoprotein cover. It is emphasized to reduce high cholesterol food consumption for curing hyperlipidaemia. Because of natural cholesterol synthesis in body; daily cholesterol intake must be reduced less than 300 mg.

Suitable blood cholesterol levels are:

Total cholesterol: less than 200 mg/dl

Bad cholesterol: less than 130 mg/dl

Good cholesterol: more than 35 mg/dl

Triglycerides: less than 250 mg/dl (4).

Studies on 27 products in Virginia polytechnic institute and state university showed that pistachio nut contained more phytosterol than other nuts. Phytosterols reduced blood bad cholesterol. Also they reduced risk of cancers (5).

A number of studies have looked at the effect on blood lipids (fats) and lipoproteins including nuts in the diet. Different population groups including men and women have taken part in these research studies. The

Studies included participants with lipid levels in the normal range as

Well as those with hyperlipidaemia (high levels of blood fat). The

Participants aged ranged from 18 to 81 years. In spite of this diversity in

Subject characteristics and study

Design, reductions of between 9 and 31% in LDL cholesterol were observed. The quantities of nuts consumed in the studies varied from 30 to 100 g per day. Almonds, macadamias, pistachios, walnuts, pecans, and hazelnuts (tree nuts) have all been used in studies (11). In this regard, consumption of 4 g pistachio kernel reduced bad cholesterol level to 1% (6).

Studies on 31000 men and women showed that consumption of nuts for 5 times in a week reduces coronary heart disease death (2).
Initial evidence for the benefit of nut consumption came from population studies which looked at the diets of large numbers of people over long periods of time. In four US studies, the Adventist Health Study, the Iowa Women's Health Study, the Nurses' Health Study and the Physicians' Health Study, a total of over 160 000 men and women were sampled for between 6 and 14 years. These studies showed very consistent indications for the health benefits of nuts. When compared with never eating nuts, the effect of eating small quantities of nuts (30 g) four to five times per week or more caused reduction in CVD risk of between 18 and 51% (7).
Research results have shown that acid folic in nuts could reduce hemosystein (a sulfur contain materials) and as a result it prevents coronary heart disease. Hemosystein hurt cell wall and makes fat sediments. Increasing daily acid folic intake to 100 micro grams reduced coronary heart disease 7% in men and 5% in women (4).

**4- preventing bone hollowness:**
Nuts such as pistachio, walnut, almond and hazelnut have got high amount of calcium and phosphorus. These minerals have a positive role in strengthening bones and teeth.

**5- Preventing diabetes:**
Nowadays it is suggested that use mono unsaturated fatty acids in diabetic diets. Clinical researches showed that diets contained mono unsaturated fatty acid and low amount of carbohydrates, resulting in suitable situation of glucose and insulin in blood plasma. Nuts conform to diabetic diet completely. They are suitable snack due to low carbohydrate

and protein and high amount of unsaturated fatty acids. Using one- ounce pistachio nut or 4-5 table spoon pistachio butter by Women per week, reduced 20-30 % diabetic type 2 risks. Research finding show that women, who have diabetic type 2, should eat 4-5 table spoon pistachio butter. It reduces 16% of illness growth (6 and 10).

**6- Preventing Alzheimer and cancer:**

USDA studies on fruits, vegetable and nuts, show that pistachio is rich source of antioxidants which reduce Alzheimer and cancer. For examples Florida cancer council researchers concluded that nuts and olive oil could reduce 50% of sarcocela cancer (10).

**7- reducing Gallstones:**

Researchers from the Harvard Medical School say that nuts are rich in several compounds that may protect against gallstone disease. They found that women who consumed more than 5 ounces of nuts per week had 25 percent lower risk of cholecystectomy (removal of the gall bladder) than women who never ate nuts or who ate less than 1 ounce per month (10).

**8- Protecting eye health:**

According to a USDA study conducted to measure non – nutrient or phytochemical components of nuts, significant amounts of the antioxidant, lutein, have been found in pistachios. Lutein prevent breakdown of the central portion of the retina. The Amount of lutein in 1- ounce of pistachios is 0.36 mg (10).

**9-Improving immune system of body:**
Studies show that nuts such as pistachio, almond, walnut and hazel nut have high amount of vitamin E. And can improve immune system of body (11).

**10- Helping in blood clotting:**
According to Mackenzie report in 2003, nuts are a good source of vitamin k. amount of vitamin K in hazelnut, pistachio and walnut is 14.2, 13.2 and 2.4 μg respectively in 100 g kernel. Vitamin K is a main cofactor in converting glutamic acid to gamma carboxy glutamic acid. It is important in blood clotting (8).

**11-Adjusting blood pressure:**
There is argenin amino acid in nuts protein. Argenin is necessary for producing nitric oxide. Nitric oxide can adjust blood pressure and prevent blood obstruction (11).

**12- Helping in special compound production:**
Vitamin B6 in pistachio and other nuts can help in cell making proteins. Also Vitamin B6 helps in construction of insulin, hemoglobin and antibodies (10).

**Chemical composition of pistachio kernel and some nuts:**
Table 1 shows Chemical composition of pistachio kernel and some nuts. Data related to nut kernels. Nuts such as pistachio are rich food and prefer to be used as a main element of daily intake (13).

**1- moisture:**
Fresh nuts have high moisture. For example fresh pistachio has 38-40 percent of moisture. In dried pistachio moisture content is 6 percent. Low moisture content is very important in storage and processing. If moisture content is low, molding

will not happen and oils, proteins and carbohydrate are more stable. If relative humidity is 55 percent, nuts moisture content will be low (13).

## 2- Fats and oils:

Amount of oils in most nuts is high (more than 50 percent). High oil amount has an important role in curing, storage and processing of nuts. To keep optimum stability of fats, drying must be carried out without high temperature under air circulation condition. Nuts must be stored in low temperature, low storing cost, processed in short time and then cooled as soon as possible. Nuts have high calorie because of high amount of oils. Table 2 shows fatty acid composition in pistachio, almond, walnut and hazelnut. Nuts are rich in mono and poly unsaturated fatty acids. Pistachio and almond are rich in mono unsaturated fatty acid. Walnut and hazelnut are rich in poly unsaturated fatty acid. Mono unsaturated fatty acid in pistachio, almond, hazelnut and walnut is less than 6 percent (3, 12).

## 3- proteins:

Tree nuts have high protein in average. Amount of proteins increases after drying and oil extraction. Protein content of nuts is less than 5 percent and more than 30 percent. Pistachio, walnut and almond have 20 percent protein. If Nuts have high oil content, protein content will decrease (13).

## 4- carbohydrates:

Nuts have low amount of carbohydrates. During processing different type of carbohydrates such as sugar, syrup, starch and pectin added to them. Natural carbohydrates in pistachio and almond are 20 percent and in walnut and hazelnut are 15 percent (10). As whole carbohydrates in nuts are low but in

some nuts such as pistachio they create a sweet taste. Also starch is very low in nuts (13).

**5- minerals and ash:**

Most nuts are rich in phosphorous, potassium and magnesium. They have a little ferrous and sodium. Also they are poor in calcium. Cations are cofactor in enzyme reactions. For example magnesium is a cofactor for more than 300 enzymes. This is very important in nutrition point of view. Enzymes which use thiamin, riboflavin, vitamin B6, vitamin C and vitamin E, need magnesium. (2, 13). Amount of ash in nuts is less than 3 percent (13).

**6- vitamins:**

On the whole, vitamins are co – enzyme in many metabolic paths. For example B group vitamins have an important role in converting carbohydrates, proteins and oils to energy. Also vitamin E is the main preventing factor in immune system of body against cell oxidation hurt (2, 13). In nuts amount of vitamins is low. Pistachio has average amount of vitamin A. Other nuts have a little vitamin A. Hazel nut, walnut and almond are good sources of vitamin B1. Almonds have 1 percent riboflavin. Amount of riboflavin in other nuts such as pistachio is low. Also niacin in pistachio is less than 2 percent. Except pistachio that has 30 percent ascorbic acid, other nuts have low ascorbic acid. Vitamin B6 naturally is in 3 types (pyridoxine, pyrodoxal, pyrodoxamin) free or combined with phosphor etc. amount of Vitamin B6 is 1-6.5 mg/g. in hazelnut and walnut. Vitamin B6 has pyrodoxal form and in almond is pyridoxine form.

**Appreciation:**

Hereby I express my thanks and appreciations to Dr Hokmabbadi for his advice for some references.

## Appendix:

Table 1- composition of some nuts (100gr)

| composition | walnut | hazelnut | almond | pistachio |
|---|---|---|---|---|
| (%) Water | 3.5 | 5.8 | 4.7 | 5.3 |
| (gr) Protein | 14.8 | 12.6 | 18.6 | 19.3 |
| Total oil (gr) | 64 | 62.4 | 54.2 | 53.7 |
| Saturated oil (gr) | 4.4 | 2.7 | 3.6 | 5.8 |
| Mono un saturated oil (gr) | 12.1 | 48.6 | 36 | 26.6 |
| Poly un saturated oil (gr) | 49.4 | 7.1 | 13.1 | 18.5 |
| Carbohydrates (gr) | 15.8 | 16.7 | 19.5 | 19 |
| Fiber (gr) | 2.1 | 3 | 2.6 | 1.9 |
| Ash (gr) | 1.9 | 2.5 | 3 | 2.7 |
| Ca (mg) | 99 | 209 | 234 | 131 |
| P (mg) | 380 | 337 | 504 | 500 |
| Fe (mg) | 3.1 | 3.4 | 4.7 | 7.3 |
| Na (mg) | 3 | 3 | 5 | 7 |
| P (mg) | 450 | 704 | 773 | 972 |
| Mg (mg) | 131 | 184 | 270 | 158 |
| Zn (mg) | 2.5 | 2.2 | 3.6 | 2.3 |
| Mn (mg) | 3.41 | 6.16 | 2.53 | 1.20 |
| Vita B6 (mg) | 0.5 | 0.56 | 0.13 | 1.7 |
| Thiamin (mg) | 0.33 | 0.46 | 0.24 | 0.67 |
| Riboflavin (mg) | 0.2 | 0.1 | 1.1 | 0.3 |
| Niacin (mg) | 0.9 | 0.9 | 3.5 | 1.4 |
| Vita A (µg retinol) | 4 | 3 | 2 | 22 |
| Vita C (mg) | 2 | Trace | Trace | 30 |
| Vita k (mg) | 2.4 | 14.2 | - | 13.2 |
| Vita E (mg) | 2.9 | 15.2 | 26.2 | 4.6 |
| Folate (µg) | 66 | 72 | 49 | 67 |
| Argenin (mg) | 2.28 | 2.21 | 2.13 | 2.47 |
| Phytosterol (mg) | 72 | 96 | 120 | 214 |
| Energy (Cal) | 651 | 634 | 598 | 594 |

Source: 9, 12, 13

Table 2- fatty acid composition in nuts

| **Fatty acid** | **walnut** | **Hazel nut** | **almond** | **pistachio** |
|---|---|---|---|---|
| Miristic | 0.4 | 0.1 | 0.2 | 0.6 |
| Palmetic | 3.4 | 5.97 | 12.6 | 8.2 |
| Stearic | 1.8 | 1.72 | 4 | 1.6 |
| Oleic | 35.6 | 79.46 | 62.5 | 69 |
| Linoleic | 48.6 | 12.24 | 24.4 | 1.98 |
| Linolenic | 7.4 | 0.12 | – | – |
| Lignoceric | 0.04 | – | – | – |
| Omega 3 | 9 | 0.14 | 0.4 | 0.3 |

Source: 11, 13

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