

## CONTRIBUTION OF PISTACHIO (*Pistacia vera* L.) TOWARDS HUMAN HEALTH AND NUTRITION

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### Abstract

Pistachio, which is generally consumed as a nut in Turkey, has significant benefits for human nutrition and health, besides being the raw material of baklava and dessert industries. It is rich in healthy unsaturated fatty acids (oleic-linoleic acids) and proteins. Pistachios are also rich in minerals such as potassium, phosphorus, calcium and iron that have a role in improvement of anemia, bone development and regulation of blood pressure, as well as in Vitamin E, Vitamin A and Vitamin B complexes that cannot be synthesized in the human body. It is included in diets as it provides a feeling of fullness, due to its high fiber content. It was reported that pistachio consumed daily, at an amount of 20-30 grams, does not result in weight gain. Therefore, it can be a healthy snack. It was observed that pistachio partially reduces blood glucose level, that it could be used in a certain amount in diabetes and could be effective in cardiovascular diseases by modulating the LDL/HDL ratio in favor of HDL. It contains a significant amount of antioxidants. It was reported that pistachio can contribute to fighting cancer cells.

**Keywords:** Pistachio, human health, nutrient status, cholesterol, diabetes mellitus, antioxidant

### 1.Introduction

Traces of pistachio was discovered in the remains from the early bronze age between 3000-2100 BC in Oylum Mound excavations in Kilis (Ergeç, 2014). In the first century BC, Flavio Pompeo brought the pistachio from the Persian Empire (Iran) to North Africa and Spain (Tekin et al., 2001; Ak, 2014; Ergeç 2014; Özşabuncuoğlu, 2014).

Pistachio can grow in any soil (stony, rocky areas and steep slopes) when groundwater level is not high, and is resistant to aridity. It loves a long and hot summer, and a slightly cold, partially warm winter. Its temperature requirement is 3500-4000 growing degree days, and chilling requirement under 7.2<sup>0</sup>C is 750-850 hours/year (Tekin et al.,1993; Tekin et al., 2001). This data indicates that pistachio is climate-selective and cannot grow under all ecological conditions, and that one of the centers of origin of pistachio is the Southeastern Anatolia Region. This region, which is the initial cultivation area of pistachio, led the way in successfully cultivating this species (Ayfer, 1964). Hot and long summers as well as low humidity rate that stem from the ecology of this region can prevent the spreading of some toxins (aflatoxin) produced by some mushrooms present in nature at the

producer level (Anonymous, 2016a; Anonymous, 2016b). It is possible to say that Turkey is advantageous for farmers, in terms of contamination.

Pistachio, which is an important raw material of baklava, a dessert specific to Turkey, and dessert industry, is the top-quality nut throughout the world. Moreover, recent studies have shown that pistachios significantly contribute to human nutrition and human health.

## 2. Contributions to Human Nutrition

The protein content of pistachio ranges between 19% and 31%, and it is known as a source of protein (Okay, 2002; Harmankaya et al., 2014). Consuming 100 g of pistachios daily can meet 33% of the body's daily protein need (Yaman et al., 1990; Tekin et al., 2001). However, pistachio contains allergenic proteins that may lead to anaphylactic reactions. This can be dangerous for some consumers. Pis v1, 2S albumin; Pis v2, 11S globulin subunit, Pis v3, vicilin, Pis v4, manganese superoxide dismutase and Pis v5, 11S globulin subunit are the main allergens in pistachio (Ahn et al., 2009; Willison et al., 2008).

**Table 1.** Nutritional facts for 100 g of pistachios

	<b>Daily Intake Requirement</b>	<b>100 g of pistachio</b>	<b>Daily Intake Requirement Met (%)</b>
Calories (cal)	2900	597	20
Protein (g)	63	22	33
Fat (g)	60	51	73
Mg (g)	550	158	28
K (mg)	2000	1020	51
Ca (mg)	800	136	17
P (mg)	800	500	62
Vitamin E (mg)	10	5.2	52
Vitamin B1 (mg)	1.2	0.6	51
Vitamin A (IU)	875	230	26

Pistachio contain high amounts of unsaturated fatty acids. The total fat content of pistachio ranges between 50-60%. Monounsaturated fats make up 88% of this fat content. 81.17% of this is constituted by oleic acid (Ghrab et al., 2010; Okay, 2002; Seferoglu et al., 2006; Satil et al., 2003; Sena Moreno et al., 2015). Consuming 100 g of pistachios daily can meet 73% of the daily fat need (Yaman et al., 1990; Tekin et al., 2001). Pistachio are rich in monounsaturated fatty acid-oleic acids and polyunsaturated fatty acid-linoleic acids (omega 6) (Doğruer Kalkancı et al., 2005; Tokuşoğlu 2006). Pistachio are also rich in minerals such as potassium, phosphorus, and iron, as well as in Vitamin E and Vitamin B complexes (Yaman et al., 1990; Tekin et al., 2001).

As seen in Table 1, 88% of pistachio's fat content (50-60%) is constituted by healthy unsaturated fats. Consuming 100 g of pistachio daily can meet 73% of the daily fat need. It is an important source of protein (19.3%), and it meets 33% of daily protein needs. It is rich in Vitamin E, which has important antioxidative and cell-rejuvenating properties, and meets 52% of daily needs (100g daily consumption). Similarly, it is rich in Vitamin B complex and 100 g of pistachios meets 51%

of the daily Vitamin B need. Pistachio can significantly contribute to human nutrition due to its high nutritional value. However, overconsumption should be avoided. The calories (597) in pistachio can lead to weight gain.

**Table 2** Comparison of the nutrition facts of pistachio with other foods

<b>In 100 g</b>	<b>Pistachio</b>	<b>Hazelnut</b>	<b>Walnut</b>	<b>Almond</b>	<b>Beef</b>
<b>Protein(%)</b>	19.3	12.6	14.8	19.0	13.6
<b>Fat(%)</b>	53.7	62.4	64.0	54.0	41.0
<b>Carbohydrates(%)</b>	19.0	16.7	15.8	20.0	-
<b>Ca(mg)</b>	131.0	209.0	99.0	234.0	8.0
<b>P(mg)</b>	500.0	337.0	380.0	500.0	124.0
<b>Fe(mg)</b>	7.30	3.40	3.10	5.0	2.0
<b>K(mg)</b>	972.0	704.0	450.0	770.0	355.0
<b>Vitamin A(IU)</b>	230.0	-	30.0	-	80.0
<b>Vitamin B1(mg)</b>	0.67	0.46	0.23	0.24	0.06
<b>Vitamin B6 (mg)</b>	1.40	0.90	0.90	0.92	3.30
<b>Calories</b>	597.0	634.0	651.0	598.0	428.0

In terms of nutritional value, pistachios are richer in proteins and phosphorus, iron, potassium, Vitamin E, and Vitamin B complexes in particular, compared to hazelnuts, walnuts, almonds and beef. In terms of protein quality, beef, which is rich in protein, has a digestibility of 91-100% in the human body, whereas pistachio has a digestibility of 69-90% (Faraçlar, 1998; Güler, 2014; Baysal, 2015). Pistachios have high calcium, magnesium and potassium content, which is reported to play an important role in healthy bone formation and regulation of blood pressure (Şahan and Tekin, 2013; Güler, 2014).

When reviewing Table 2, it is apparent that pistachio has higher phosphorus, potassium, iron, Vitamin A, Vitamin B1 and Vitamin B6 content as compared to hazelnuts, almonds, walnuts and beef.

### **3. Contributions to Human Health**

In a study by Baltacı and Bağcı (2009) conducted in the Physiology Department of Gaziantep University Medical Faculty, 20-30 pistachio kernels were fed to 32 male subjects daily for 4 weeks. The subjects were started on a controlled diet for 4 weeks before starting the study, and those who satisfied the conditions were given pistachios. Blood glucose, triglyceride and total cholesterol levels dropped by 8.5%, 33% and 10%, respectively in comparison to the controlled diet. Good (HDL) cholesterol increased by 12%, while bad (LDL) cholesterol oxidation was reduced. These results show that pistachio contribute to the prevention of cardiovascular diseases. Furthermore, pistachio lower blood pressure. The same researchers indicated that this stems from the high potassium content of pistachio.

Pistachios are rich in phenolic substances and are among the top 50 foods that have the highest antioxidant potential. Of the most important antioxidants, they contain anthocyanins, phenolic acid, flavanones and stilbenes (Halvorsen et al., 2006). They also contains tocopherol, carotenoid,

chlorophyll, proanthocyanidin, anacardic acid and cardanol (Saitta et al., 2011). Antioxidants in pistachio such as resveratrol (0.04mg/100g), phytosterol (0.4mg/100g), tocopherol (0.6mg/100g) and stilbene (0.1mg/100g) reduce oxidation of bad cholesterol as well as the risk of cancer (Tokuşoğlu, 2016; Gilbert et al., 2005). However, it was reported that antioxidant activity of the fats in pistachio was reduced by nearly 60% after roasting (Gentile et al., 2007). Storage under low temperature and N<sub>2</sub> atmosphere can improve the preservation of phenolic compounds, flavonoids in and antioxidant capacity of raw pistachio nuts (Tsantili et al., 2011). Moreover, pistachio nuts were reported to be valuable in soap, cream and shampoo making in the cosmetic industry, since they positively affect the skin and hair due to their chemical content (Couceiro et al., 2013; Avanzato et al., 2008; Zhang et al., 2010).

It is recommended for dieting as it absorbs the gastric juice, and provides a feeling of fullness. It is stated that pistachio nuts can be included in the diet of diabetic patients as a food with a lower glycemic index than grains (Kepekçi et al., 1991).

Baer et al. (2012) conducted a study titled “Measured energy value of pistachio in the human diet” in the USA. In this crossover feeding study, sixteen subjects consumed pistachios for 3 weeks as part of a controlled diet. The study was evaluated according to dose-response and the following doses were used in feeding: (1-control) 0g/day, (2) 42g/day and (3) 89g/day. According to the results of this study, adding pistachios to the diet and reducing the consumed amount of other main constituents of the diet resulted in increased intake of fat and dietary fiber in addition to reduced carbohydrate intake. Moreover, the total digestive nutrient value of dietary fiber increased. This increase of 3 ounces/day (89 g/day) as compared to control 1 (0 g/day) was significant. It was found that the measured energy value of pistachios was 22.6 kJ/g, which was 5% lower than the value calculated using Atwater general factors, i.e. 23.7 kJ/g. It was stated that bad cholesterol (LDL) concentration was reduced by 6% after a controlled diet in groups 2 (42g/day) and 3 (89g/day).

#### 4. Conclusion

Considering the results of the study, it is apparent that pistachio, which is consumed as a nut and a raw material in the dessert industry, has significant health benefits in addition to its contributions to human nutrition. It is possible to say that pistachio is good for cardiovascular diseases due to the high potassium content, have antibacterial and anticarcinogenic properties due to the high antioxidant content, but there is a need for more detailed studies on these subjects.

Pistachio have been the raw material of the dessert and food industry due to the above-mentioned health benefits and nutritive properties. Considering all these properties of pistachio, it can be defined as a human-friendly “**concentrated food pill**”. Moreover, “**it adds quality to a product**” when it is added or used as raw material, thereby increasing the market share of these products and providing added value.

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