Fatty acids composition in Pistachio

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Abstract . Pistachio (*Pistacia vera* L.), is an important food source for human health. It has nutritional content rich in protein, fat, fatty acids, fiber, vitamins and minerals. Such as other nuts, pistachio oil is rich in unsaturated fatty acids. Pistachio is rich in omega fatty acids such as n-3, n-6, n-9, it is known to be beneficial in decreasing cholesterol by increasing HDL level in blood plasma. Oleic acid (C18: 1) and palmitoleic acid are the main component of unsaturated fatty acids in pistachio. It has fatty acids such as linoleic acid and alpha linoleic acid among polyunsaturated fatty acids and myristic acid, palmitic acid, stearic acid among saturated fatty acids. Gas chromatography-flame ionization detector (GC-FID) is generally used for the analysis of fatty acids in foods. The main component of unsaturated fatty acids contained in pistachio is oleic acid (C18: 1) and the variety varies between 51.6% and 81.17% according to the origin. Linoleic acid (C18:2) content, which is a polyunsaturated fatty acid, varies between 15% and 30%. Stearic acid content of saturated fatty acids varies between 0.8% and 3.5%. This review provides information about the properties and curent status of the fatty acids in pistachios.

1 Introduction

Pistachio (*Pistacia vera* L.), belonging to the *Pistacia* genus, is a hard-shelled fruit species with high economic value. This family also includes genus such as mango (0 D Q J L I H U D L.), cashew ($ Q D F D U G L X P R F F L G H Q W D O H L.), pepper tree (Schinus spp.) and sumac (Rhus spp.) [1]. Pistachio, which is known to consist of approximately 600 species, is known to have a dioecious flower structure and to be wind-pollinated, except for a few exceptional cases [2]. The genus Pistacia includes approximately more than 13 species, and only *Pistacia vera* L. has economic value. Other species are wild species and some of them are used as rootstocks in pistachios [3]. The first cultivation of cultivated forms of pistachio began in the ancient Persian Empire [1] and it was later determined that wild forms were cultivated in Anatolia, Syria and Afghanistan. Pistachio has two gene centers. The first of these; is the Near East gene center, which includes the high parts of Anatolia, the Caucasus, Iran and Turkmenistan, and the second gene center is the Central Asian.

Iran, the USA, Turkiye, China, and Syria are known as the major pistachio producers. According to the latest report by the Food and Agricultural Organization of the United Nations (FAO), 915,718 tons of pistachios were produced in the world in 2021. Although our country ranks second after America in world pistachio production, it is closely followed by Iran and China. According to the production amounts in the world, America (523,900 tons), Turkiye (119,355 tons), Iran (135,000 tons), China (78,817 tons) and Syria (43,104 tons) are among the most important pistachio-producing countries [4] (Table 1). Our country has an important place in pistachio cultivation because it has suitable ecological conditions [5]. ù D Q O Õ X U I D D Q G * D] L D the main producing provinces in Turkiye.

Table 1. Pistachio production amounts of countries

Country	Total Production (MTs)
USA	523,900
Turkiye	119,355
Iran	135,000
China	78,817
Syria	43,104

Depending on the production regions in Turkiye, there are many types of pistachios and the main types D U H 8] X Q 2 K D G L 6 L L U W + D O H E L D
W K H V H W \ S H V . H W H Q * \ P O H ÷ L 9 D K L
+ D F Õ ù H U L I L 6 X O W D Q L % H \ D] % H Q among the pistachio varieties grown in our country [6]. Pistachios are rich in nutritional content. Pistachios stand out especially with their total fat, saturated and unsaturated fatty acids, protein, carbohydrates, vitamins, mineral substances, dietary fiber and phytochemicals. It has been emphasized that pistachios, which have a high rate of unsaturated fat, regulate the

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body's fat profile, reduce bad cholesterol (LDL) and increase good cholesterol (HDL). It is reported that when pistachios are added to the normal diet, there is a 24% increase in HDL level, without any significant change in total cholesterol (TC), LDL and triglyceride levels, and the TC/HDL ratio decreases [7]. Pistachios are not only utilized in food and different industries such as nuts, desserts, chocolate, pastry industry, but also used as medicinal drugs since it has been scientifically proven that its gums have anti-viral, anti-insektisit, anti-microbial, antifungal, anti-cancer properties, especially in recent years.

1.1 Fatty acids

Significant health problems occur when food components are not consumed in sufficient quantities to meet daily needs. Studies have shown that there is a relationship between the way people eat and the diseases they suffer. Today, fats are one of the most frequently questioned issues when the relationship between certain diseases and diet is investigating [8]. For example, the low death rate from coronary heart disease among Greenland Eskimos has been attributed to their high consumption of fish, which contains polyunsaturated fatty acids known as omega-3 [9].

Fatty acids (FA) play multiple roles in humans and other organisms. Most importantly, FA are a substantial part of lipids, one of the three major components of biological matter (along with proteins and carbohydrates) [10]. Fatty acids are also important energy substrates, accounting for about 30% of total energy intake in humans. They can be stored in excess in adipose tissue, especially when an increased dietary intake of fat and energy occurs, leading to obesity, which leads to obesity [11].

In Research especially in the saturated or unsaturated structure of fats their presence, cholesterol and essential fatty acid content, oxidative stability has been emphasised [12]. Essential fatty acids are important for cardiovascular health because they are converted into compounds such as prostaglandins, which protect against oxidative stability, human ageing and life span [12]. Today, especially developed in countries, people who want to lead a healthy life Therefore, they pay attention to their nutrition [13]. However, consumption R I-linolenic acid in western countries It is also stated that it is insufficient [14].

One of the basic food components and human fats, which have an important role in nutrition, not only not a source of high energy, fat-soluble contain vitamins, combine with proteins lipoproteins and their effects on health therefore they are very important [15]. Food components although fats provide the most energy of all, experts believe that calories from saturated fats less than 10 per cent of the daily intake of fats and oils calories should not be more than 30-35%. [16, 17]

The total amount of fat and the type of fat determine the effect of its consumption on health [18, 19]. Fatty acids can be into several groups according to their structure, physiological role and biological effects. In the following paragraphs, fatty acids are saturated and unsaturated fatty acids

1.1.1 Saturated fatty acids

Saturated fatty acids do not have double bonds in their chains. Since all carbon bonds are saturated with hydrogen are quite stable structures. Apart from the carboxyl group in fatty acids since they do not contain functional groups are the least chemically reactive. Carbon number saturated fatty acids up to 10% at room temperature liquid and volatile [22]. Saturated fat in general The vast majority of fats consisting of acids solid at room temperature, containing unsaturated fatty acids fats are liquid. Some common fats found in foods saturated fatty acids are palmitic, stearic and myristic acids [21].

Although the calories taken in with saturated fatty acids are the same as the calories given by other fatty acids; they cause fat accumulation and weight gain in the body [22]. In the reduction of cardiovascular diseases, saturated fats consumption should be reduced and saturated fat intake amount is less than 7% of the total energy should be required [23]. Saturated fatty acids in the blood low density lipoprotein (LDL, bad cholesterol) preventing it from being cleaned. As a result, atherosclerosis can be caused by the formation of deposits in the blood vessels [15]. Saturated fatty acids in blood fat increases the proportion of saturated fats. Dietary saturated fat acids increase LDL cholesterol level and insulin is effective in the formation of resistance, therefore increases the tendency to diabetes [23].

1.1.2 Unsaturated fatty acids

Unsaturated fatty acids have one or more contains more double bonds. Fatty acids in chain structure They contain bonds of different length, number and structure. Of these, those with a double bond are monounsaturated fat acids, and those containing more than one double bond are multiple they are called unsaturated fatty acids [8]. In food commonly found monounsaturated fatty acid oleic acid and polyunsaturated fatty acid is linoleic acid [21]. Due to double bonds in their structure, unsaturated fat acids are chemically more complex than saturated fatty acids reactive. This activity is characterised by a double bond in the fatty acid chain. increases according to its number. Saturated fatty acids and monounsaturated unsaturated fatty acids in the human and animal body Although they can be synthesised polyunsaturated fat acids cannot be synthesised and are therefore essential [24]. Unsaturated fatty acids olive oil, hazelnut, canola, vegetable oils such as corn, soya, sunflower oil and especially-cold water species such as mackerel, tuna and salmon It is stated that it is found intensively in fish [23]. Oleic, palmitoleic, linoleic, linolenic, arachidic and gadoleic acid are known unsaturated fatty acids.

For the analysis of fatty acids in foods, they are generally detected using a flame ionization detector on the GC Agilent device.

1.2 Pistachios in terms of fatty acid content

In a study, the oil contents of 8 different varieties of unprocessed pistachios obtained from the Spanish Regional Research Center and the compositions and properties of the products obtained from them were investigated. The average oil content of 'Aeigina 'Avdat', 'Kastel', 'Kerman', 'Larnoka', 'Mateur', 'Napoletana' and 'Sirora' varieties is 40.7% in 'Avdat' variety and 54.7% in Kastel variety. It was found to be statistically significant with the Duncan test performed on these 8 varieties. Oleic acid contents vary between 55% and 74%, and the variety with the highest oleic acid content is Larnoka (73.6%), while the variety with the lowest oleic acid content is Kerman (55.5%). Linoleic acid content between 13% and 30% among varieties, and the highest value was found in the Kerman variety (29.7%). According to this study, it was determined that oleic acid content had the highest content.

[25], the aim of their study oil contents of Turkish and Iranian varieties were analyzed. While the average fat content in Turkish varieties was between 48.55% and 58.50%, it was found between 47.65% and 63.31% in Iranian varieties. It was determined that the highest fatty acid content was Oleic acid and it was observed that the Turkish variety Sultani had the highest oleic acid content with 72.63%.

2 Conclusion

Unsaturated fatty acids are beneficial for human health. It protects cardiovascular health, reduces triglyceride levels, increases HDL, known as good cholesterol, and helps reduce the risk of heart attack. Pistachios are rich in fatty acids. It is rich in oleic acid, known as unsaturated fatty acids. As a result, pistachio consumption is important for human health.

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