

## QUANTITATIVE ANALYSIS OF THE SEED OIL FROM *PISTACIA ATLANTICA* VAR *MUTICA* IN BOYER AHMAD

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### ABSTRACT

*Pistacia atlantica* or Bene (from the family Anacardiaceae) is a native fruit in Iran that is used in traditional herbal medicine. The fruit is an oval shaped about 8 mm long and 6 mm wide and contains a single seed. Excellent edible oil is obtained from the seed. The study was carried out to discover the oil content and fatty acids composition of *P. atlantica* seed. The present study is the first report of the oil extracted from *P. atlantica* seeds in Boyer Ahmad. In order to discover the seeds oil percent and composition of fatty acids, the soxhlet method and gas chromatography (GC) were used. Amount of oil obtained from *P. atlantica* seed was 53 %. Based on the analysis of fatty acids by GC, major fatty acids in seed of *P. atlantica* were 10 compounds. Oleic acid (53/83 %) and linoleic acid (32/55 %) and palmitic acid (9/57 %) were recognized major fatty acids of oil. Other fatty acids identified were lauric acid (C12:0), myristic acid (C14:0), palmitoleic acid (C16:1), margaric acid (C17:0), stearic acid (C18:0), linolenic acid (C18:3) and eicosanoid acid (C20:1). Oleic acid rich diets in type 2 diabetes reduce insulin resistance, and restored endothelium-dependent vasodilatation. Hence *P. atlantica* seeds, represent a rich source of oleic acid.

**Keywords:** *Pistaciaatlantica*, Seed, Oil, Fatty acids

### INTRODUCTION

*Pistacia atlantica* belongs to the Anacardiaceae family. This plant is native to Iran and is used as a medicinal plant (Farhoosh *et al.*, 2009). Fruit is about 8 mm long and 6 mm wide and has a single grain (Huxley, 1992). An edible oil is derived from the seeds (Facciola, 1990).

*P. atlantica* oil recently is produced in the world as a stable compound with antioxidant properties. The content of turpentine oil are 5.6 percent non-soap materials, carotenes, tocopherols and alcohol. Tocopherols and Tocotrienols have similar antioxidant activity and act similar to vitamin E, which is beneficial to human health (Farhoosh *et al.*, 2011; Delazar *et al.*, 2015). Consumption of *P. atlantica* oil has a positive effect in reducing the symptoms of hyperthyroidism. *P. atlantica* oil in rats with hyperthyroidism caused the serum leptin concentration to reduce significantly during the experimental period (Nazifi *et al.*, 2011). Aker *et al.*, (2006) stated that unsaturated fat reduces serum leptin levels (Okere *et al.*, 2006). On a dry weight basis, the amount of oil of turpentine is 53.28 percent. Its major fatty acids include oleic acid, linoleic acid and palmitic acid (Acheheb *et al.*, 2012).

Oleic acid by reducing bad cholesterol (LDL) and maintaining or increasing blood cholesterol (HDL) is effective in the prevention of coronary artery disease and cardiovascular disease (Yukuia *et al.*, 2009). The beneficial effect of oleic acid on insulin sensitivity, endothelium dependent vasodilatation and glucose transport in adipocytes was reported (Ryan *et al.*, 2000). Accordingly, changing diet rich in polyunsaturated fatty acids, to a diet rich in mono-unsaturated fatty acids, in diabetes II, reduced insulin resistance and returned endothelium-dependent vasodilatation to normal state. The aim of this study was to evaluate the fatty acid composition of *P. atlantica* oil grown in Boyer-Ahmad city.

### MATERIALS AND METHODS

#### *Gathering and Preparing Seeds*

*P. atlantica* in October 2014 was gathered randomly from distribution centers located in the city of Yasouj, Boyer Ahmad internal market and was prepared by separation of the sell and the core and making seeds powder.

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**Extracting and Measuring the Amount of Oil**

In order to extract *P. atlantica* oil, soxhlet and hexane solvent method was used using 10 g of sample. The results were expressed as the percentage of fat in dry weight.

**Supplying Oil Methyl Ester**

From the oil samples obtained from 100 mg was weighed and mixed with 10 ml of methanol-acetyl chloride, after solving the oil in the solvent, the sample rested for 1 hour at 85 degrees Celsius.

Then about 4 ml of distilled water was added to methylated oil, using a mixer mixture was mixed for 5 minutes, then 2 ml of hexane solvent containing (01/0 TBHQ) were added to the mixture and after mixing with stirring, was centrifuged for 5 minutes at a speed of 4000 rpm at 25 degrees Celsius with UV2100PC.

Using a micropipette, centrifuge samples upper liquid carefully removed so as not dealing with the bottom, was poured in the container, and was refrigerated until use.

**Analysis of Fatty Acid Methyl Esters by Gas Chromatography (GC)**

In order to analyze the methyl esters of fatty acids, gas chromatography model (A3420SP- with silica column) -length of 30 m, thickness of 25 mm and a diameter of 25 mm- and 1075FID detector were used. Before injecting the sample into the column, air, hydrogen and nitrogen generator was switched on. Switching gas chromatography on, nitrogen gas flew into column and air and hydrogen gas flew into the detector and the flame lighted up (prior to sample injection ensure that flame is lighted).

Column, the injector and detector temperature was respectively 198, 250 and 300 degrees Celsius. In addition, standard sample was prepared in the same way and given the same amount was injected into the column.

When the temperature of every three sections reached the set temperature, 3 ml of sample was removed with Hamilton syringe and was injected into the column.

**Statistical Analysis**

For oil evaluation Peak-ABC chromatography work station Ver 2.24 was used. In addition, to determine the percentage of each fatty acids in the oil the calculation section of software was used.

**RESULTS AND DISCUSSION**

**Results**

Average seed oil was 53 percent (Table 1). Based on the results of fatty acid analysis by gas chromatography (GC), 10 major fatty acids were detected: Oleic acid, linoleic acid with 53.83 and 32.55 percent respectively were the highest unsaturated fatty acids and palmitic acid (57.9 percent), was the main saturated fatty acid known.

**Table 1: The results of tests conducted on the seed**

Parameter	Repetition 1	Repetition 2	Repetition 3
Oil (%)	53.14	53.05	53

**Table 2: The *P. atlantica* oil fatty acids**

Fatty acid	The fatty acid (Percent)
Lauric acid	0.4654
Myristic acid	0.2148
Palmitic acid	9.57
Palmitoleic acid	0.7103
Margaric acid	0.1269
Stearic acid	1.777
Oleic acid	53.83
Linoleic acid	32.55
Linolenic acid	0.5632
Eicosanoic acid	0.1884

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Other detected fatty acids include Lauric acid, Myristic acid, Palmitoleic acid, Margaric acid, stearic acid, linolenic acid and the acid Eicosanoic (Table 2). The results of fatty acid methyl esters latency showed that the predominant fatty acids, including Oleic acid, Linoleic acid, Palmitic acid, appeared in the detector in 55, 61 and 40 minutes respectively.

### Discussion

The average oil content was determined 53 %. Yousefi *et al.*, in 2002 reported that 45%. Acheheb *et al.*, in 2012 reported it 53.08%. Comparing seed oil of *P. atlantica* with conventional oil sources such as hemp seed oil (33.5 percent) indicated that *P. atlantica* compared with other oilseed crops had a high percentage of oil (Shahverdi, 2010). Oil percent varies due to the variety of plant, irrigation and area (Greve *et al.*, 1992). Results of Table 2 show that *P. atlantica* seed oil is rich in polyunsaturated fatty acids oleic and linoleic acid and total it contains 12.15 percent saturated fatty acids and 87.84 percent unsaturated fatty acids. The proportion of unsaturated fatty acids to saturated fatty acids in this study was 7/22. Saber *et al.*, reported it 5 in 2012.

After the comparison and evaluation of the results of this research with results from other researchers, it can be said that *P. atlantica* seed is a good source of useful fatty acids and combination of unsaturated fatty acids and polyunsaturated fatty acids value was about 87.84% seed, which was a high ratio among vegetable oils.

### Conclusion

Oleic acid-rich diet in type II diabetes, decreased insulin resistance and endothelium-dependent vasodilation returned to the normal state and *P. atlantica* seeds are rich in oleic acid.

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