

Determination of Some Important Inorganic Elements and Fatty Acids of Medlar's Fruit from Mazandaran's Forest

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Abstract: The objective of the present study was determined on the concentration of seven important elements and chemical composition of the organic compound from Medlar's fruit (Iran) using ICP-AES and GC-MS techniques. The mineral content of samples was determined by standard addition method and RSDs lower than 3.75. The detection limits of the method for the 7 elements were 0.04-4 $\mu\text{g l}^{-1}$. In Medlar fruit, the concentration of Calcium with compare to K, Mg, Na, Fe, Zn and Cr was more. Fourteen organic compounds of the Medlar's fruit were characterized. The results have shown that the main fatty acid is linolelaic acid with percentages of 24.01. The percentages of oleic acid and palmitic acid in this fruit were 11.45 and 6.97, respectively.

Key words: Medlar • Fatty Acids • GC/MS • Soxhlet Extraction • ICP-AES

INTRODUCTION

Medlar of the plant family Rosaceae consists of two species which is widespread in the Asia, southeastern part of Europe and north of America. But in Iran, only one species is identified [1, 2]. *Mespilus germanica* L. is the most important species of Medlar [3]. This species is native to Turkey and Iran and is locally known as "Azgil". It grows up to 6 m height. This species is cultivated in several areas of Iran.

Its fruits are a significant original of essential elements [4]. Medlar is rich of some useful mineral elements such as K, Na, Ca, Fe, Cr, Zn and Mg. These materials can be determined by various spectroscopic methods. The content of these mineral elements are dependent on their region and environmental conditions [5]. In Turkey, some mineral content of wild Medlar was determined and the results reveal that the potassium is a major element in this fruit with respect to other mineral elements. A study [3] described that the concentration of fatty acids composition during ripening were changed. The results indicated that the amounts of both saturated and unsaturated fatty acids composition changed markedly throughout fruit ripening. In this study, a numbers of elements such as Na, K, Ca, Mg, Fe, Zn and Cr were determined in Medlar fruits from north of Iran (Savadkoo) by Induction coupling plasma (ICP).

MATERIALS AND METHODS

Experimental: Medlar's fruits (*Mespilus germanica* L.) were collected from Iran's forest; Jo'areme Savadkoo (Province of Mazandaran, 400 m above the sea level) in November 2008. In first step all fruits were cleaned and then washed with freshwater and double-distilled water.

Mineral Content Analysis: About 100 g of sample were dried for 24 h in oven with 100°C. Two grams of dried sample heated in 700°C for 12 h. Then, the sample converted to ash. The remaining sample (ash) was solved in 5 ml HCl of six molar and then the solution was diluted to 50 ml with water. Samples were prepared with standard addition method and determination was done with an ICP-AES (vista series, Varian International AG, Australia). The Working condition of the ICP-AES is n Table 1 and the measured minerals content of medlar's fruit are listed in Table 2.

Identification of the Organic Compounds: Fatty acids and volatiles of 5 g Medlar's fruits were extracted in Soxhlet exelo 50/42. About 250 ml n-Hexan used as an extracting agent. After removal of solvent by rotary, the sample was mixed with 2 ml methanolic potassium hydroxide reagent, placed in a water bath at 70°C for 15 min. Then fatty acids methyl esters were extracted by hexane.

Table 1: Working condition of the ICP-AES

Rf power	1.2 kW
Plasma gas flow rate (Ar)	15 mL/min
Auxiliary gas flow rate (Ar)	1.5 mL/min
Viewing height	8 mm
Copy and reading time	1 s
Stability time	15 s
Nebulizer pressure	200 kPa
Pump rate	1.5 mL/min
Sampling time	15 s

Table 2: Mineral content of Medlar's fruit

Minerals	Values (mg/kg)
Na	649±0.54
K	7751.63±1.87
Ca	25359.00±0.10
Mg	787.69±0.86
Fe	164.53±1.04
Zn	41.13±0.00
Cr	1.82±0.14

The compounds of oil were identified by comparison of their mass spectra with those of a computer library or with authentic and confirmed by comparison of their retention indices, either with those of authentic compounds or with data published in the literature [5].

RESULTS AND DISCUSSION

Mineral Content of Medlar: The mineral content of wild Medlar fruits is given in Table 2. The result of the analyses was established to give nutrient values per 100 g of used portion of dried weight. The highest concentration of element belongs to calcium which was 25359.05 mg/kg. But, the other elements such as K, Mg, Na, Fe, Zn and Cr were 7751.62, 787.69, 649, 164.53, 41.13 and 1.82 mg/kg, respectively. The importance of these elements cannot be negligible due to many enzymes required as cofactors. This study attempts to contribute to knowledge of the nutritional properties of these wild fruit. In addition, the knowledge of the mineral contents of this fruit is important since it is of great interest locally.

Fatty Acids of Medlar: The extracted fatty acids, methyl esters and the derivatives of fatty acids compositions were determined using gas chromatography. The identification of components with their retention indices on a non-polar column are given in Table 3 and Figure 1.

Table 3: Fatty acids identified by GC-MS from Medlar's fruits

Num.	Retention Time	Component Name	Percentage
1	21.766	Lauric acid	0.37
2	26.329	Myristic acid	0.38
3	29.990	Palmitoleic acid	0.49
4	30.462	Palmitic acid	6.97
5	32.384	Margaric acid	0.21
6	33.672	linolelaidic acid	24.01
7	33.768	Oleic acid	11.45
8	34.230	Stearic acid	1.78
9	36.764	Linoleic acid	0.22
10	37.687	Arachidic acid	2.99
11	40.639	Phthalic acid	0.13
12	40.768	Behenic acid	2.45
13	43.301	Lignoceric acid	2.47
14	45.835	Cerotic acid	0.26

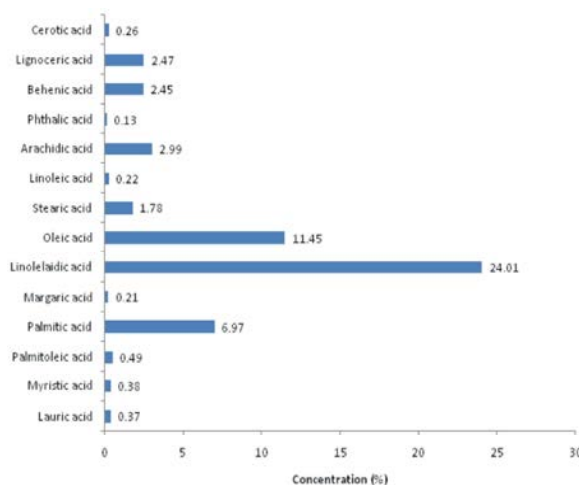


Fig. 1: The percentages of fatty acids for Merdlar's fruits

The samples are consisted of some unsaturated fatty acids including: linolelaidic acid, Palmitoleic, linoleic acids, oleic acid and phthalic acid. The numbers of saturated fatty acids were identified listed as Behenic, Lignoceric, Myristic, Lauric, Palmitic, Margaric, Arachidic and stearic acids. The quantities of unsaturated fatty acids in Medlar fruits are high.

CONCLUSION

In conclusion, our experimental results proved that wild Medlar' fruits is rich in essential oils which are useful for human's health. The contents of investigated oils are found linolelaidic acid in the highest concentration, followed by oleic acid and palmitic acid, respectively.

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