Ukrainian Journal of Ecology

Ukrainian Journal of Ecology, 2022, 12(5), 67-69, doi: 10.15421/2022_376

RESEARCH ARTICLE

Evaluation of fatty acid composition in two varieties of cardoon (Algerian and French) and one variety of artichoke

W. Benhalima[1*], A. Dellal[2], O. Merah[3]

[1]*Faculty of Nature and Life Sciences-Ibn Khaldoun, Tiaret University, 14000, Algeria*

[2]*Laboratory of Agrobiotechnology and Nutrition in Semi-arid Zones, Ibn Khaldoun University, Tiaret 14000, Algeria*

[3]*Department of Biological Engineering, Paul Sabatier University, 32000 Auch; Laboratory of Agro-industrial Chemistry, LCA, University of Toulouse, INRA, 31030, Toulouse, France*

**Corresponding author E-mail: benhalimawahiba@gmail.com, dellal05_aek@yahoo.fr, othmane.merah@ensiacet.fr*

Received: *01 June, 2022; Manuscript No: UJE-22-65624;* ***Editor assigned:*** *03 June, 2022, PreQC No: P-65624;* ***Reviewed:*** *14 June, 2022, QC No: Q-65624;* ***Revised:*** *20 June, 2022, Manuscript No: R-65624;* ***Published:*** *25 June, 2022.*

This study aims to determine the seeds oil fatty acid content of two varieties of Algerian and French cardoon of the genus Cynara and a variety of artichoke. For the Algerian cardoon, we used the unarmed white variety and for the artichoke, we selected the violet of Provence. The extraction of the oils was carried out by the Soxhletmethod; on the other hand, the fatty acid content was determined by the technique of Gas Chromatography (GC).

The obtained results showed a high content of unsaturated fatty acids in the three varieties, cardoon (84.28%) and (85.72%), while the artichoke recorded (73.88%). The main acids were oleic, linoleic and palmitic. This composition is significantly different compared to other studies carried out previously, in particular Miceli 1996. These results seem encouraging and open up real prospects and possible new niches for the use of these vegetables in different fields such as medicine, against cardiovascular diseases, pharmaceuticals and cosmetics.

Keywords: Artichoke, Cardoon, Seeds, Fatty acid, GC.

Introduction

Artichoke and Cardoon aretwo similar plants which belong to the Asteraceae family and the descynarées tribe. They are well-known field vegetables, and they are well spread and cultivated even in amateurs' gardens. The *Cynara* L. genus is spontaneous plant in the Mediterranean basin where several species are found. The most widespread is *Cynaracardunculus* L., which is thought to be the origin of artichoke and cardoon (Jean-Noël, 2012). *Cynaracardunculus* L. is a complex species composed of globe artichoke [var.scolymus (L.) Fiori], cultivated cardoon (var.altilis DC.) and wild cardoon (var. sylvestris (lamk) Fiori.). The three types (wild cardoon, cultivated, and artichoke) are fully cross-compatible and cross- fertile and their F1 hybrids are fully fertile (Pandino, et al., 2012). Artichoke was used as food and medicine by the ancient Egyptians, Greeks and Romans (Petropoulos,, et al., 2019). It also has an antioxidant and health-protective effect due to its high content of phenolic compounds, which are also essential from a technological point of view (Bonasia, et al., 2010). Cardoon plant parts can also be considered a significant value productas they are rich in bioactive compounds. They can be used not only for the production of biofuels but also for human consumption for their nutritional value (Fernández, et al., 2006; Borgognone, et al., 2014).

Seeds constitute a small part of the total aboveground biomass. Several studies have reported and confirmed important bioactive properties, mainly due to their high efficiency in the elimination of free radicals (Cuvelier, et al., 2004).

Fatty acids are present in many products of animal and vegetable origin. Among saturated fatty acids, C12, C16 and C18 are the most frequent. Among monounsaturated fatty acids, C18:1 and to a lesser extent C16:1. Polyunsaturated, C18: 2 and C18: 3 are the most common (Curt, et al., 2002).

The objective of this study is the evaluation of the composition of fatty acids in two species of the genus Cynara (in this case, the artichoke and the cardoon) as well as their medical, industrial, pharmaceutical and cosmetic valorization.

Materials and Methods

Chemicals

The used products came from the National Polytechnic Institute of Toulouse INP-LCA. The tests were performed at the same laboratory.

Plant material

The used cardoon seeds came from an Algerian variety (blanc inerme) and a French variety. For the artichoke, the variety chosen was (violet de Provence). The local varieties were harvested at the Mina perimeter, in Relizane region (Algeria).

Oil extraction

The oils were extracted from the harvested seeds using the soxhlet apparatus. This method extract oil with an organic solvent (cyclohexane) on 20 g of solid matter (crushed seeds) for 6 h with a 1:10 w:v ratio. The solvent containing the oil was removed using a rotary evaporator at a temperature of 45°C. The extracted oil was collected in appropriate bottles and stored in the dark in a room at 4°C until analysis.

Determination of fatty acids

The fatty acid (FA) composition was determined, in triplicate, according to ISO 12966-3normative after conversion of fatty acids to fatty acid methyl esters (FAME). The seeds were crushedin an electric grinder. Five millilitres of tert-butyl methyl ether (TBME; ME0552. Scharlau) was mixed with 200 mg of ground sample. The mixture was filtered through a GHP filter with 0.45 µm pores. Then, 50 L of 0.2 M trimethylsulfonium hydroxide (TMSH) in methanol (Macherey-Nagel) was mixed with 100 L of the filtrate.

The FAME was analyzed by Gas Chromatography coupled with flame ionization detection (Varian 3900). The GC was equipped with a CP-select CB for the FAME column (50 m 0.32 mm inner diameter, 0.25 m film thickness), with helium as gas carrier (1.2 ml/min). The split injector (1:100) and the FID were maintained at 250°C. The initial temperature of the oven was maintained at 185°C for 40 min, increased to 250°C at a rate of 15 C/min, and then cooled there and remained for 10 min.

Results

The obtained results represent the mean of three tests carried out in parallel ± the standard deviation.

Table 1. Fatty acid composition of the two varieties of cardoon and the artichokevariety.

Saturatedfattyacids	**Cardonvariety**		**Artichoke variety**
	Algerian	**French**	
C14:0 (Myristicacid)	0.11 ± 0	0.10 ± 0	0.16 ± 0.01
C1 6:0 (Palmiticacid)	11.37 ± 0.01	10.91 ± 0.01	19.06 ± 0.02
C17:0 (Heptadecanoicacid)	0.59 ± 0	nd (undefined)	1.05 ± 0.05
C18:0 (StearicAcid)	3.25 ± 0.01	3.24 ± 0.01	3.95 ± 0.01
S/ Total 1	15.32	14.25	24.22
Monounsaturatedfattyacids			
C18:1n-9 (Oleicacid)	29.24 ± 0.03	24.33 ± 0.01	46.20 ± 0.07
C18:1n-7 (Vaccenicacid)	0.17 ± 0	0.67 ± 0.01	0.91 ± 0.01
S/Total 2	29.24	25	47.11
Polyunsaturatedfattyacids			
C18:2n-6 (Linoleicacid)	54.87 ± 0.06	60.72 ± 0.05	27.68 ± 0.03
Total	99.43	99.97	99.01

Discussion

The fatty acid composition for the different studied varieties is represented in Table 1.

There is a clear predominance of unsaturated fatty acids (AGI) for the Algerian and French varieties with respective proportions of 84.28% and 85.72% of total fatty acids. The predominant fatty acid composition for the Algerian variety are linoleic acid (54.87%), oleic acid (29.24%), (11.37%) stearic acid (3.25%) and some trace elements for myristic acid (0.11%), heptadecanoic acid (0.59%), arachidic acid (0.35%) and vaccenic acid (0.17%). For the French variety, the composition seems noticeably different. The main proportions of fatty acids are as follows: linoleic (60.72%), oleic (24.33%), palmitic acid (10.91%), and stearic (3.24%). The trace elements are 0.10% and 0.67% for myristic and vaccenic respectively.

Accordingly, the Cardoon seed oil is very rich in unsaturated fatty acids for the two studied varieties. The remaining saturated acids were 15.76% for the Algerian variety and 14.28% for the French variety. The results of the French variety were almost identical to the previous results (Petropoulos, et al., 2015; Raccuia, et al., 2007; Falleh, et al., 2008) and close to the results obtained by the Algerian variety.

For the artichoke, the results showed that the predominant fatty acids in the oil were the unsaturated fatty acids (AGI) with a proportion of (74.97%).

The main fatty acids of the seeds extracted from the artichoke were oleic (46.20%), linoleic (27.68%), palmitic (19.06%), stearic (4.91%) and some traces of heptadecanoic acid (1.05%), vaccenic (0.91%), myristic (0.16%). These results are different from those reported in other studies (Foti, et al., 1999; Durazzo, et al., 2013; Ayerza, et al., 2009) in particular the content of oleic acid which was the most superior (46.20%). However, in the previous results, the most dominant acid was linoleic more than 50%.

The differences could be due to genotypic and environmental factors as well as the methods used for the extraction and measurements of oils and fatty acids.

Conclusion

The present study shows a very rich content of mono and polyunsaturated fatty acids in the genus Cynara seeds oil. The main fatty acids are linoleic, oleic and palmitic acid. The fatty acid profile obtained by this study reveals the influence of genotypic and environmental factors on the composition of fatty acids.

Cynara oil contains bioactive molecules and a very nutrient profile necessary for human consumption and other uses including linoleic acids, which have shown their effectiveness in protecting the cardiovascular system. They also stimulate the immune defenses and protect the functioning of the nervous system. They may have other uses in industry such as pharmaceuticals and cosmetics.

References

Jean-Noël, P. (2012). Artichoke and cardoon what are these thistles that we eat. Histoire des Plantes, pp:42-45.

Pandino, G., Lombardo, S., Williamson, G., Mauromicale, G. (2012). Polyphenol profile and content in wild and cultivated *Cynara cardunculus* L. Italian Journal of Agronomy, 7:e35-e35.

Petropoulos, S., Fernandes, A., Pereira, C., Tzortzakis, N., Vaz, J., Soković, M., Ferreira, I.C. (2019). Bioactivities, chemical composition and nutritional value of *Cynara cardunculus* L. seeds. Food Chemistry, 289:404-412.

Bonasia, A., Conversa, G., Lazzizera, C., Gambacorta, G., Elia, A. (2010). Morphological and qualitative characterisation of globe artichoke head from new seed-propagated cultivars. Journal of the Science of Food and Agriculture, 90:2689-2693.

Fernández, J., Curt, M.D., Aguado, P.L. (2006). Industrial application of *Cynaracardunculus* L. for energy and other uses. Industrial crops and Products, 24:222-229.

Borgognone, D., Cardarelli, M., Rea, E., Lucini, L., Colla, G. (2014). Salinity source-induced changes in yield, mineral composition, phenolic acids and flavonoids in leaves of artichoke and cardoon grown in floating system. Journal of the Science of Food and Agriculture, 94:1231-1237.

Cuvelier, C., Cabaraux, J.F., Dufrasne, I., Hornick, J.L., Istasse, L. (2004). Fatty acids: Nomenclature and dietary sources.

Curt, M.D., Sánchez, G., Fernández, J. (2002). The potential of Cynaracardunculus L. for seed oil production in a perennial cultivation system. Biomass and Bioenergy, 23:33-46.

Petropoulos, S.A., Fernandes, Â., Barros, L., Ferreira, I.C.F.R., Ntatsi, G. (2015). Morphological, nutritional and chemical description of "Vatikiotiko", an onion local landrace from Greece. Food Chemistry, 182:156-163.

Raccuia, S.A., Melilli, M.G. (2007). Biomass and grain oil yields in Cynaracardunculus L. genotypes grown in a Mediterranean environment. Field Crops Research, 101:187-197.

Falleh, H., Ksouri, R., Chaieb, K., Karray-Bouraoui, N., Trabelsi, N., Boulaaba, M. (2008). Phenolic composition of *Cynaracardunculus* L. organs, and their biological activities. Comptes Rendus Biologies, 331:372–379.

Foti, S., Mauromicale, G., Raccuia, S.A., Fallico, B., Fanella, F., Maccarone, E. (1999). Possible alternative use of *Cynara* spp. I. Biomass, grain yield and chemical composition of grain. Industrial Crops and Products, 10:219-228.

Durazzo, A., Foddai, M., Temperini, A., Azzini, E., Venneria, E., Lucarini, M. (2013). Antioxidant properties of seeds from lines of artichoke, cultivated cardoon and wild cardoon. Antioxidants, 2:52-61.

Ayerza, R., Coates, W. (2009). Influence of environment on growing period and yield, protein, oil and linolenic content of three chia (*Salvia hispanica* L.) selections. Industrial Crops and Products, 30:321-324.

Citation:

Benhalima, W., Dellal, A., Merah, O. (2022). Evaluation of fatty acid composition in two varieties of cardoon (Algerian and French) and one variety of artichoke. *Ukrainian Journal of Ecology.* 12:67-69.