Revue Agrobiologia
www.agrobiologia.net
ISSN (Print): 2170-1652
e-ISSN (Online): 2507-7627

MINERAL CONTENT AND CHEMICAL COMPOSITION OF THE LIPID FRACTION OF ALGERIAN *ALLIUM TRIQUETRUM* BULBS

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Reçu le 02/12/2022, Révisé le 03/05/2023, Accepté le 05/06/2023

Abstract

Description of the subject: *Allium triquetrum* L. is an edible plant belonging to the genus *Allium*, very rarely studied.

Objective: In the present study, mineral content and lipid fraction composition of *A. triquetrum* bulbs have been undertaken.

Methods: Ash was obtained by incineration and the concentration of minerals and trace minerals were determined by using Ion Chromatography and Atomic Absorption Spectrometry. Gas Chromatography-Mass Spectrometry was used to analyze the lipid fraction extracted by the petroleum ether.

Results: The results showed that ash content is equal to 4.75 ± 0.05 %. In addition, mineral content determination revealed the presence of potassium (1249.75 mg/100g), calcium (155.65 mg/100g), magnesium (105.70 mg/100g), phosphate (1249.50 mg/100g), sulphate (470.15 mg/100g), chloride (197.65 mg/100g) and iron (144.55 mg/100g) with low amount of sodium (80.30 mg/100g). The bulbs contain also zinc, copper and manganese with small levels. Lipid extract analysis revealed the presence of fatty acids (saturated, monounsaturated and polyunsaturated fatty acids) which hexadecanoic acid was the most component, hydrocarbons (n-tetradecane, n-octadecane, n-tricosane, 1-hexadecene), sulfur compounds (trans-propenyl-methyl disulfide 1,3-dithiane Methyl-trans-propenyl-disulfide) and other substances (Phenol, 2,4-bis (1,1-dimethylethyl) 4-(3,4-dimethoxybenzylidene)-1-(4-nitrophenyl)-3-phenyl-2-pyrazolin-5-one,14-B-h-pregna, neophytadiene).

Conclusion: The results of this study showed that bulbs of the spontaneous *A. triquetrum* are very rich in minerals, trace elements and several other compounds that can be used in food and pharmaceutical applications.

Keywords: *Allium triquetrum* L., bulbs, macro-elements, trace-elements, lipid fraction.

TENEUR EN MINÉRAUX ET COMPOSITION CHIMIQUE DE LA FRACTION LIPIDIQUE DES BULBES *D'ALLIUM TRIQUETRUM* D'ALGÉRIE

Résumé

Description du sujet : *Allium triquetrum* L. est une plante comestible appartenant au genre *Allium*, très rarement étudiée.

Objectifs : Dans le présent travail, la teneur en minéraux et la composition de la fraction lipidique des bulbes d'*A. triquetrum* ont été étudiées.

Méthodes : Les cendres ont été obtenues par incinération et le dosage de minéraux et d'oligo-éléments a été effectué par la chromatographie ionique et la spectrométrie d'absorption atomique. La chromatographie en phase gazeuse couplée à la spectrométrie de masse a été utilisée pour analyser la fraction lipidique extraite par l'éther de pétrole.

Résultats : Les résultats ont montré que la teneur en cendres est égale à 4,75 ± 0,05 %. De plus, le dosage de minéraux a révélé la présence de potassium (1249,75 mg/100g), de calcium (155,65 mg/100g), de magnésium (105,70 mg/100g), de phosphate (1249,50 mg/100g), de sulfate (470,15 mg/100g), de chlorure (197,65 mg/100 g) et de fer (144,55 mg/100 g) avec une faible quantité de sodium (80,30 mg/100 g). Les bulbes contiennent également du zinc, du cuivre et du manganèse avec de faibles concentrations. L'analyse des extraits lipidiques a révélé la présence d'acides gras (acides gras saturés, monoinsaturés et polyinsaturés) dont l'acide hexadécanoïque est le composant majoritaire, d'hydrocarbures (n-tétradécane, n-octadécane, n-tricosane, 1-hexadécène), de composés soufrés (trans- propényl-méthyl disulfure 1,3-dithiane Méthyl-trans-propényl-disulfure) et d'autres substances (Phénol, 2,4-bis (1,1-diméthyléthyl) 4-(3,4-diméthoxybenzylidène)-1-(4- nitrophényl)-3-phényl-2-pyrazolin-5-one, 14-B-h-pregna, néophytadiène).

Conclusion : Les résultats de cette étude ont montré que les bulbes d'*A. triquetrum* spontanée sont très riches en minéraux, oligo-éléments et plusieurs autres composés qui peuvent être utilisés dans des applications alimentaires et pharmaceutiques.

Mots clés: *Allium triquetrum* L., bulbes, macro-éléments, oligo-éléments, fraction lipidique.

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INTRODUCTION

Allium is the most representative genus of the Liliaceae family which includes 700 species, each differing in taste, form and colour, but known to have close biochemical and phytochemical properties [1]. These species are distributed mainly in Europe, North America, Northern Africa and Asia [2]. Comprises perennial herbs with globose to piriform bulbs. The leaves are flat to cylindrical while stems are cylindrical, trigonus, or flat. The flowers are white, yellowish, pink, or purple; holding six petals that might be free or slightly connate at the base [3]. For many centuries, several of these species have been used both as food and for medicinal applications because they contain several phytonutrients and bioactive compounds including thiosulfinates and organosulfur derivatives. In fact, these common food plants are used in the treatment and prevention of cancer, coronary heart disease, obesity, hypercholesterolemia, diabetes and hypertension [4, 5]. In literature, several investigations about cultivar *Allium* species (Garlic, Onion), such as chemical composition, biological activities and data concerning the macro- and micro-elements content were shown, but few studies have been interested in spontaneous species as *Allium triquetrum* L. This plant is characterized by green striped, white, pendulous flowers looking like small lilies. It possesses several vernacular names (e.g., triangle onion, triangular-stalked garlic, three-cornered leek), which refer to different taxa [6]. The plant is used as the main ingredient in salads, cooked in soups or eaten raw because of its mild taste similar to onion [6, 7]. In traditional medicine, this plant is used for its anti-inflammatory, antiseptic and antiparasitic activities. Thus, the bulbs contain hypotensive and deworming properties [8, 9] and the whole plant and flowers are used for the prevention of kidneys and intestines and also exhibits soporofic effects [10]. In recent years, some scientific work has focused on the phytochemical and pharmacological study of this plant and has proven the presence of various active secondary metabolites which may be responsible for its anti-inflammatory [11], antimicrobial [12, 13, 14] and antioxidant activities [12, 15]. In the aim to continuing on this line of research and contributing to the enrichment of data on *A. triquetrum*, the objective of the present study was to determine, for the first time, the mineral content and the composition of the petroleum ether extract (lipid fraction) of bulbs of the Algerian *A. triquetrum* species and to infer their effect in health and human nutrition.

MATERIALS AND METHODS

1. Plant material

A. triquetrum was collected from our local field in Mitidja, Blida, Algeria. Bulbs were separated, washed, cut into small pieces and then dried and protected from light at room temperature (25-28 °C) to constant weight. After drying, bulbs cutting were ground into powder.

2. Chemical

All chemicals used in this study were of analytical grade (Sigma–Aldrich ® 90, St. Louis, Mo., USA).

3. Mineralization

Bulbs powder has been mineralized following the protocols described by Pinta (1968) [16], (1973) [17] and Martin *et al.* (1984) [18].

3.1. Incineration

2g of the sample were weighed in a porcelain dish and placed in the cold muffle furnace. Then, the temperature was increased uniformly to 500-550 °C for 4 hours. Obtained ash was cooled in the desiccator for 5 min. The test was realized in triplicate. Ash content was expressed in percentage (%) relative to the initial mass of vegetable powder. It has been calculated as follows: $\boldsymbol{T = \frac{Pce - Pc}{P \times 100}}$. T: ash content (%), P: weight of the sample, Pce: weight of capsule with ash; Pc: weight of the empty capsule. The average of ash content was calculated according to the following formula: $\boldsymbol{T\,(mean) = \frac{T_1 + T_2 + T_3}{3}}$

3.2. Preparation of ash solution

Ash was dissolved using 2 mL of concentrated nitric acid. The mixture was heated over a hot plate until the appearance of the first vapors. Few milliliters of ultrapure water were added and the solution was allowed to cool at room temperature and then filtered to remove undissolved particles. The filtrate was transferred into a volumetric flask (100 mL) and then adjusted with ultrapure water. To obtain the approximate concentration of the nitrate anion present in the bulbs, another solution was prepared by using hydrochloric acid to acidify the ash.

4. Extraction of the lipid fraction

The lipid fraction was extracted by maceration. 20 g of the bulbs powder were mixed with 250 mL of petroleum ether and the whole was stirred magnetically for 24 h.

The solution was filtered by Whatman paper N° 4 and then evaporated to dryness using a vacuum rotavapor (Laborota 4001-efficient Heidolph 2) at 40 °C. The petroleum ether extract of bulbs was conserved at 4 °C within one month, until further use.

5. Analytical Methods

5.1. Analysis of the mineral composition

Analysis of minerals is realized on the laboratory of analytical chemistry of the scientific police centre. The concentrations of the macro-elements were determined by using Ion Chromatography IC (Biomax instrument, ICS 3000), while the trace-elements were determined by using Atomic Absorption Spectrometry AAS (Perkin Elmer instrument, Analyst 800).

5.2. Analysis of the lipid extract

This part was done at the laboratory of analysis of the centre of biotechnology of Sfax (CBS-SFAX, Tunisia). The lipid concrete was dissolved with petroleum ether at the concentration of 1 mg/mL and then analyzed by gas chromatography coupled with mass spectrometry GC-MS. The petroleum ether extract was performed with GC 6890N and 5975B MS Agilent model, equipped with an Agilent Technologies capillary HP-5MS column (30 m × 0.25 mm i.d. × 0.25 µm film thickness) and an electron impact ionization (ionization voltage 70 eV; all Agilent, Santa Clara, CA). The carrier gas was helium used at 1.5 mL/min flow rate. Injected volume was 1 µl. The oven temperature program started from 38 °C (held for 3 min) and then was programmed to rise to 250 °C at a rate of 5 °C/min. The duration of the analysis was 49.40 min. The chromatograph was equipped with a split/splitless injector used in the splitless mode. Components of lipid fraction bulbs were identified by comparing their Kovats index and mass spectral fragmentation patterns with those of the standards stored on the Wiley Registry of Mass Spectral Data 7th edition (Agilent Technologies, Inc.) and National Institute of Standards and Technology 05 MS (NIST) library data.

RESULTS

1. Ash content

The results of ash content are shown in table 1. Table 1 showed that *A. triquetrum* bulbs contain 4.75 % of ash and 95.25 % of organic matter relative to the dry weight.

Table 1. Ash and organic matter contents of *A. triquetrum* bulbs (mean ± standard deviation)

	Bulbs
Weight of vegetable powder (g)	2.00 ± 0.06
weight of ash (g)	0.095 ± 0.001
Ash content (%)	4.75 ± 0.05 %
Organic matter content (%)	95.25 ± 0.05 %

2. Mineral composition

The results of ash analysis are resumed in table 2. Ash analysis revealed the presence of several macro and micro-elements with considerable amounts. Potassium is the most dominant cationic element (1249.75 mg/L). Thus, potassium is associated with lower levels of sodium (80.30 mg/100g); the Na/K ratio is 0.06. Also, bulbs contain calcium (155.65 mg/100g) and magnesium (105.70 mg/100g). Anionic ions analysis showed the presence of three elements which are: chloride, sulphate and phosphate with the absence of nitrate. The major element is phosphate (1249.50 mg/100g) followed by sulfate (470.15 mg/100g) then chloride (197.65 mg/100g). On the other hand, bulbs are rich in iron; its concentration is 144.55 mg/100g. Furthermore, the sample contains zinc (27.45 mg/100g), copper (12.35 mg/100g) and a small amount of manganese (3.55 mg/100g).

Table 2. Mineral content of *A. triquetrum* bulbs

Cationic element	Concentration (mg/100g)	Anionic element	Concentration (mg/100g)	Trace element	Concentration (mg/100g)
Sodium	80.30	Chloride	197.65	Iron	144.55
Potassium	1249.75	Sulfate	470.15	Manganese	3.55
Magnesium	105.70	Phosphate	1249.50	Zinc	27.45
Calcium	155.65	Nitrate	-	Copper	12.35

4. Lipid fraction composition

Table 3 shows the chemical constituents, the retention time and the relative percentage of the total chromatogram area according to the total compounds of the lipid fraction of *A. triquetrum* bulbs. GC-MS analysis of the petroleum ether extract of the three-cornered-leek bulbs identified fifty constituents representing 61.54 % of the total extract.

Table 3. Chemical composition of the lipid extract of *A. triquetrum* bulbs analyzed by GC-MS

N°	Rt time	Component	Area %
			1.00
	7.496 7.742	Methyl-trans-propenyl-disulfide	2.19
	10.303	Trans propenyl methyl disulfide 1,3-dithiane	0.03
	12.225	1,8-Cineole	0.16
	12.428	Methyl allylthioacetate diallyl disulphide	0.37
	12.594	Diallyl tetrasulphide	0.19
	12.865	Trisulfide, methyl 2-propenyl	0.16
	14.049	Trans-propenyl propyl disulfide	0.07
	15.239	Cyclopentasiloxane, decamethyl	0.45
	15.623	n-Dodecane	0.17
	17.439	Undecane, 2,6-dimethyl	1.03
	17.816	n-Tetradecane	0.29
	17.997	Cyclotridecane	0.89
	18.796	n-Tridecane	0.31
	19.662	Cyclohexasiloxane, dodecamethyl	0.20
	19.994	Tridecane, 2-methyl	0.32
	21.802	Dodecane, 2,6,10-trimethyl	0.09
	22.059	Cyclotetradecane	0.12
	22.292	Tetradecane, 4-methyl	0.36
	22.352	Tetratriacontane	0.08
	23.091	Tetradecane, 3-methyl	0.83
	23.136	Eicosane	0.45
	23.453	Cycloheptasiloxane, tetradecamethyl	1.44
	23.920	Phenol, 2,4-bis (1,1-dimethylethyl)	0.07
	24.274	Dodecane, 4,6-dimethyl	0.27
	24.447	Cyclopentadecane	0.05
	24.575	Pentadecane, 4-methyl	0.24
	24.741	Pentadecane, 2-methyl	0.17
	25.427	Pentadecane, 3-methyl	0.79
	26.843	1-Hexadecene	0.18
	27.039	Hexadecane, 2-methyl	0.66
	27.665	Cyclooctasiloxane, hexadecamethyl	1.27
	27.785	n-Heptadecane	0.45
	27.868	n-Docosane	0.51
	29.164	n-Heneicosane	0.14
	29.639	Heptadecane, 3-methyl	0.17
	29.782	15-Heptadecenal	1.83
	29.971	n-Octadecane	0.21
	30.589	Hexadecane, 2,6,10,14-tetramethyl	0.83
	30.875	Neophytadiene	0.10
	33.090	Tetradecanoic acid, trimethylsilyl ester	0.81
	33.755	Dibutyl phthalate	23.24
	36.059	Hexadecanoic acid (Palmitic acid)	0.33
	36.662	1-Mercapto-2-heptadecanone	6.93
	36.737	9,12-Octadecadienoic acid (Linoleic acid)	3.81
	37.046	9-Octadecenoic acid (Z) (Oleic acid)	1.98
	38.719	Octadecanoic acid (Stearic acid)	0.06
	39.081	1-Docosanethiol	1.48
	43.414	n-Tricosane	2.49
		4-(3,4-Dimethoxybenzylidene)-1-(4-nitrophenyl)-3-phenyl-2-pyrazolin-5-one	
	44.348	14-Beta.-H-pregna	0.97
Total		61.54 %	

These constituents belong to different classes of compounds including fatty acids FAs, hydrocarbons, organosulfur and other chemical groups. FAs were the most important chemical group of the lipid fraction; they constitute 36.06% of the total identified chromatogram. Hexadecanoic acid or palmitic acid (saturated FA) was the major FA, representing 23.24 % followed by 9,12-octadecadienoic acid or linoleic acid (6.93 %, polyunsaturated FA ω-6), 9-octadecenoic acid or oleic acid (3.81 %, monounsaturated FA ω-9) and octadecanoic acid or stearic acid (saturated FA, 1.98 %).

On the other hand, alkane compounds showed about 12% of the identified chromatographic peaks, the main ones being represented by octadecane (1.83%), tricosane (1.48%), heptadecane (1.27%), tetradecane (1.03%) and eicosane (0.83%). Sulfur compounds that characterize *Allium* species constitute 4.07% of all the molecules identified. 1,3-Dithiane trans-propenyl methyl disulfide was the main component of these group (2.19 %) followed by methyl-trans-propenyl-disulfide (1%), diallyl tetrasulfide (0.37%), trisulfide, methyl 2-propenyl (0.19%) methyl-allylthioacetate diallyl disulfide (0.16%) and trans-propenyl propyl disulfide (0.16%). In addition, analysis of the lipid fraction of the bulbs revealed the presence of other constitutes belonging to other chemical groups. Of these: 4-(3,4-dimethoxybenzylidene) -1- (4-nitrophenyl) -3-phenyl-2-pyrazolin-5-one (2.49%), phenol, 2,4-bis (1,1-dimethylethyl) (1.44 %), 14-beta-h-pregna (0.97 %), neophytadiene (0.83%), dibutyl phthalate (0.81%), cyclooctasiloxane, hexadecamethyl (0.66%), cycloheptasiloxane, tetradecamethyl (0.45%) and cyclohexasiloxane, dodecamethyl (0.31%).

DISCUSSION

The results of ash content and mineral composition of *A. triquetrum* bulbs in this study were proximate to that presented by works conducted on other species of the *Allium* genus. The study of Konate et *al.* [19] showed that the mineral matter contents of eleven varieties of *A. cepa* bulbs are different and ranging from 2.49 ± 0.47% to 6.64 ± 0.42%. Nwinuka et *al.* [20] reported that the ash level is equal to 8.48 ± 0.15% for onions and 4.45 ± 0.10% for garlic. According to Messiaen et *al.* [21], the dry matter of bulbs of the various species of the genus *Allium* contains from 1 to 3% of ash. Thus, Sa'adatu [22], showed that garlic bulbs collected from three regions contain many ions and trace elements on slightly different proportions. The plants are rich on potassium, magnesium and calcium. They also contain copper and manganese. Otherwise, the study of Edet et *al.* [23], revealed the presence of macro and micro-elements in *A. cepa* bulbs in the following order: Ca>Mg>Mn>K>P>Na>Fe.

Minerals are important as constituents of bones, teeth, soft tissues, hemoglobin, muscles, blood and nerve cells and are essential for overall mental and physical well-being [24]. The high potassium content of *A. triquetrum* is nutritionally significant. *Allium* spp have been shown to have abundant potassium with very low sodium content [25]. The Na/K ratio in the body is very important for the prevention of arterial hypertension; Na/K ratio less than 1 is recommended. A diet that is high in potassium and low in sodium is very beneficial for the prevention of high blood pressure [26]. On the other hand, a diet rich in potassium, magnesium and calcium can reduce coronary heart disease and stroke [27]. Calcium is necessary for the development and maintenance of bones and the regulation of nervous excitability and muscle contraction [22]. Phosphorus also has the potential to lower blood pressure [28]. Chlorine, sodium and potassium help maintain the osmotic pressure and therefore the equilibrium of the water compartments. Chlorine also enters the composition of gastric hydrochloric acid [29]. Sulfur is the essential element of *Allium* plants because it is included in the composition of the main secondary metabolites namely, organo-sulfur compounds, which give the characteristic odor to these species. The main therapeutic effects of these plants are largely due to these sulfur compounds [30]. Sulfuric amino acids such as methionine and cysteine are components of many essential molecules such as B vitamins, glutathione, collagen, keratin, glucosamine and coenzyme A [31].

Micronutrients are constituents of the healthy growth of plants and animals [22]. According to Andreini et *al.* [32], some transition metals such as iron, zinc, manganese and copper are very essential for life. They act as enzymatic cofactors. Zinc plays a vital role in the proper functioning of the reproductive system and the metabolism of acids. It is also beneficial as a stabilizer of cell membranes and a stimulator of the immune response. Manganese is an essential element for the synthesis of hemoglobin while copper is a component of many enzymatic systems [26].

Data of lipid composition obtained in our study are approximate to the results of Rabah et *al.* [14], which showed that fatty acids are the main components of the dichloromethane extract with the presence of alkanes, alcohols and small amounts of aldehydes, sterols, monoglycerides and aromatic compounds.

According to Bernhard [33], *A. triquetrum* contains a large proportion of dimethyl disulfide, moderate proportions of methyl-n-propyl and methyl ally1 disulfides and small amounts of some fourteen other volatiles. Otherwise, Muoio et *al.* [3], studied the sulfur compounds of *A. triquetrum* and revealed only the presence of diallyldisulfide. In addition, they have been showed that bulbs and flowers of triangular onion contain flavonoids and saponins [6]. The studies of Menacer et *al.* [11, 15], revealed that *A. triquetrum* bulbs contain flavonoids and polyphenols such us gallic acid, catechin, rutin, naringenin, ferulic acid, hydroxy-cinnamic acid and coumarin with the presence of terpenes, saponins and other molecules.

In addition, previous studies reported the lipid fraction profile of different organs of several *Allium* species.

In fact, the study of Zouari Chekki et *al*. [34] showed that lipid fraction of garlic bulbs is very rich in saturated and unsaturated fatty acids, especially in lauric acid, palmitic acid and linoleic acid while their essential oil contains a good content of diallyl disulfide and diallyl trisulfide. Another study focused on the chemical composition of the essential oil of *A. atroviolaceum* flowers showed the presence of sulfur compounds, the most important of which are cis-propenyl methyl disulfide, methyl-trans-propenyl-1,3-dithiane disulfide and dimethyl trisulfide, fatty acids (palmitic acid, linoleic acid) and alkanes (nonacosane, eicosane and tetracosane) [35]. In parallel, the study of the composition of essential oils of the bulbs, leaves, stems and flowers of *A. nigrum* has shown fatty acids in which palmitic acid was the major component, alkanes and sesquiterpenes with the absence of organo-sulfur compounds [36]. The essential oil of *A. rotundum* flowers is reported to contain mainly 14-Beta-H-pregna and other molecules such as cis and trans-propenyl propyl disulfide, trisulfide dipropyl, phenol, 2,4-bis(1,1-dimethylethyl), decane and dibutyl phtalat [37].

Palmitic acid is one of the most common saturated FA found in plants. It has been reported that saturated FAs increase the risk of developing cardiovascular diseases, oxidative DNA damage, DNA strand breakage, necrosis, and apoptosis in human cells *in vitro*. While, when consumed with polyunsaturated FAs like linoleic acid, saturated FAs are unlikely to have any significant impact on human health. [38]. Linoleic acid is an essential polyunsaturated FA (ω-6 group) because it cannot be synthesized by the body. Also, it is a metabolic precursor of ω-6 polyunsaturated fatty acids and has important roles in human growth and development, as well as in the prevention and treatment of coronary artery diseases, hypertension, diabetes, arthritis, other inflammatory and autoimmune disorders and cancer [38, 39]. Oleic acid (monounsaturated FA) is a major constituent of structural lipids; it possesses possibly hypocholesterolemic and anti-atherogenic properties [39].

In the literature, organo-sulfur compounds exhibit several biological activities [24, 30]. Indeed, diallyl sulfide inhibits the proliferation and growth of pancreatic tumor cells and promotes the apoptosis of breast cancer cells. Diallyl trisulfide exhibits strong cytotoxic activity on prostate cancer cells by inhibition of cell proliferation and induction of apoptosis. Thus, diallyl disulfide, trisulfide and tetrasulfide have been shown to have strong antibacterial activity. They also possess antifungal, antiparasitic, insecticidal, antioxidant, anti-inflammatory and hypocholestrolemiant properties [40].

Phenol, 2,4-bis (1,1-dimethylethyl) is one of the phenolic compounds which are bioactive substances widely distributed in natural products. They have been proved to have multiple biological properties, such as antioxidant, antimutagenic, antibacterial, antiviral and anti-inflammatory activities [41, 42]. Plants rich in polyphenols can retard the oxidative degradation of lipids and improve the quality and nutritional value of food [43]. According to Himed [12] and Menacer et *al*. [13, 15]extracts of *A. triquetrum* bulbs showed an interest antioxidant and anti-inflammatory effects. Furthermore, neophytadiene is a terpene compound already known for its antibacterial effect and thus contributes to the treatment of headaches, rheumatism and some dermatological diseases [44]. The antibacterial activity of triangle onion has already been demonstrated [12, 13, 14].

CONCLUSION

This report revealed that *Allium triquetrum* bulbs are well rich with minerals (sodium, potassium, calcium, magnesium, phosphate, sulphate) and trace minerals (iron, copper, manganese, zinc). In addition, GC-MS analysis showed richness and diversity on the composition of the lipid fraction; it contains several constitutes belonging to FAs which hexadecanoic acid was the main component, hydrocarbons, sulfur compounds and other molecules. Literature data showed that minerals and identified compounds of the lipid extract possess several biological activities such as antioxidant, antimicrobial and anti-inflammatory effects. From the results obtained it is possible to conclude that *A. triquetrum* bulbs combine the nutritive and the pharmaceutical aspects and can be used as a food additive and on the prevention and the treatment of many diseases. However, to prove their potential utilization in food and medicinal applications, other studies are recommended.

Acknowledgments

The authors are very grateful Pr. TOUNSI Slim Director of the biopesticides laboratory- CBS for his help and all staff of the laboratory of analysis of the centre of biotechnology of Sfax CBS – Tunisia, for their technical assistance. Also, we thank the staff of the analytical chemistry laboratory of scientific police centre.

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