American Journal of Food Science and Nutrition Research
2019; 6(1): 6-9
http://www.openscienceonline.com/journal/fsnr
ISSN: 2381-621X (Print); ISSN: 2381-6228 (Online)

Open Science

Minerals Composition of *Chrozophora Oblongifolia* Seeds in Kordofan, Region, Sudan

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To cite this article

Suleiman Ibrahim Abaker Abdalgader, Adam Ismail Ahmed. Minerals Composition of *Chrozophora Oblongifolia* Seeds in Kordofan, Region, Sudan. *American Journal of Food Science and Nutrition Research*. Vol. 6, No. 1, 2019, pp. 6-9.

Received: February 17, 2019; **Accepted**: March 27, 2019; **Published**: May 9, 2019

Abstract

The present research was conducted to study the minerals content of *Chrozophora Oblongifolia* seeds. The fresh seeds samples were procured from North and West kordofan, regions, Sudan. The minerals content of samples were measured according to the standard methods, using the Shimadzu ICPE-9820 multi-type ICP atomic emission spectrometer. The results found that the concentrations for P, Ca, Na, Fe, Al, Zn, Cu, Pb and Cd from North Kordofan seeds were 5.95, 2.5, 1.42, 1.93, 1.64, 0.766, 0.26, 0.012 and 0.002mg/100g, and that of West Kordofan seeds were 6.01, 2.37, 3.13, 0.71, 0.15, 0.06, 0.04, 0.009 and 0.001 mg/100g, respectively. Statistical analysis showed that the concentrations of P, Ca, Pb and Cd were significantly ($p \leq 0.05$) differences found between North and West Kordofan seeds, while Na, Fe, Al, Zn and Cu there were no significant ($p \leq 0.05$) differences found between samples of the two different locations. The concentrations of Ca, Fe, Al, Zn, Cu, Pb and Cd from North Kordofan seeds were higher than that of West Kordofan seeds, while sodium and phosphorus were higher in West Kordofan than that of North Kordofan. Phosphorus was the predominant macro element in the seeds followed by calcium and sodium. These results were showed a noticeable sensibly great amount content of phosphorus and calcium, and there were a vital part in building stronger, denser bones early in life and keeping bones and teeth solid and healthy later in our life. The study showed low concentration of trace elements i.e. Cu, Al and Zn. Also the results showed existence of trace amount for toxic elements such as lead and cadmium in *Chrozophora Oblongifolia* seeds. Regarding the stated limits of lead and cadmium for oilseeds were 0.1mg/kg (0.01 mg/100g), therefore the *Chrozophora Oblongifolia* seeds analyzed in present investigation can be considered as safe food for human's consumption.

Keywords

Chrozophora Oblongifolia, Kordofan, Minerals, Oilseeds, Toxic Element

1. Introduction

The *Chrozophora Oblongifolia* is a plant of the family Euphorbiaceae it is distributed in Egypt, Saudi Arabia, Yemen, Oman and Sudan -Red Sea coast [1]. The plant is known as *Argassi* in Sudan, where in eastern states the boiled seeds were used for food and extracted check oil from the seeds by traditional mills [2]. *Chrozophora Oblongifolia* is used in coloring foods, textiles, cosmetics and pharmaceutical preparations [3]. In 2014 study was conducted to analysis the seeds chemical composition of *Chrozophora brocchiana*, results were showed 4.87% for moisture, 18.05% protein, 42.9% oil, 21.7% fiber and 1.05% ash contents [4]. Galal and Adam stated that the trace metals contents were within the normal limit and its refining and bleaching behaving similar to that of the others normal vegetable oils the minerals and trace elements in foodstuffs is an important part of nutritional and toxicological analyses [5]. Copper, chromium, iron and zinc were essential micronutrients for human health. In addition, these elements play an important role in human metabolism, and interest in these elements is increasing together with reports of relationships between trace element status and oxidative diseases [6, 7]. Chromium is involved in carbohydrate and lipid metabolism, this nutrient has also been associated with

diabetes and cardiovascular disease [8]. Iron is an essential element; although it is metabolism occurs in a 'close circuit', their existence physiological losses need to be compensated [9]. Zinc enzymes participate in a wide variety of metabolic processes including carbohydrate, lipid and protein synthesis or degradation [8]. It is not known if Al is one of the trace elements essential for the human body because studies on its physiology and toxicity are made difficult by its ubiquity and because of contamination risks associated with this element [10]. Environmental pollution is the main cause of heavy metal contamination in the food chain, lead and cadmium are two potentially harmful metals even it have aroused considerable concern [11]. This has led to increased interest in determining lead levels in foodstuffs [12]. Cadmium is a toxic element present in low concentrations in nature; high levels are often associated with human activity and are found in urban and industrial waste disposal areas [12, 13]. Chrozophora seeds have been valued for their oils as much as a food and were an important source of nutrients, so the objective of the present study was conducted to study the minerals content of *Chrozophora Oblongifolia* seeds collected from different locations of Kordofan region.

2. Materials and Methods

2.1. Plant Materials

The fresh seeds of *Chrozophora Oblongifolia* were collected from two different locations i.e. West and North kordofan States, Sudan. The plant materials were air-dried in the laboratory and then ground into powder form using a mortar, sieving, then stored in air tight bottles pending the analyses.

2.2. Determination of Minerals Content

2.2.1. Preparation of Sample

After weighing out 0.4 g of sample into a digestion vessel, 4.5 ml nitric acid 1N and 0.5mL of 1N hydrochloric acid were added, and the sample was set aside for about one hour for pre-reaction processing. The decomposition vessel was then sealed, and digestion was conducted using a microwave sample preparation system. After cooling, the digest solution volume was adjusted to 20 ml using distilled water, and that was used as the sample solution.

2.2.2. Sample Analysis

The mineral content of sample solution was measured according to the standard methods of the Codex [14], using the Shimadzu ICPE-9820 multi-type ICP atomic emission spectrometer.

2.3. Statistical Analysis

All experiments were carried out in triplicate. Results are expressed as means ± SD. Statistical analysis was carried out using a one-way ANOVA with a significance level of ($p \leq 0.05$). The software used for the statistical analysis was the Statistical Packages for Social Science (SPSS 10).

3. Results and Discussion

3.1. Macro Elements

The results indicated that minerals content of the *Chrozophora oblongiflia* seeds from North Kordofan were 1.42, 2.5, 5.95 and 1.93mg/100g for Na, Ca, P and Fe, and that of West Kordofan seeds were 3.13, 2.37, 6.01 and 0.71 mg/100g, respectively (table 1). The statistical analysis showed that there were significant ($p \leq 0.05$) differences found between samples of the two different locations in sodium and phosphorus, while calcium and iron no significant differences ($p \leq 0.05$) were found between the two production regions. The results showed that the concentrations of Ca and Fe from North Kordofan seeds were higher than that of West Kordofan seeds, while sodium and phosphorus were higher in west kordofan than that of North Kordofan. Phosphorus was the predominant element found in the *Chrozophora Oblongifolia* seeds followed by calcium and sodium. On the other hands these values were higher than the other genus of Euphorbiaceae family such as jatropha P 0.51 and Ca 0.18mg/100g and lower than values of some oilseeds, sesame Ca 1463.45mg/100g and Fe 11.86mg/100g [15 and 16]. The *Chrozophora oblongiflia* seeds were a poor source of iron because it was contained trace amounts. Although these values were higher than the range obtained for *Chrozophora brocchiana* seeds studied was found 0.55mg/100g for iron [4]. These results were showed a noticeable sensibly great amount content of P and Ca, and there were a vital part in building stronger, denser bones early in life and keeping bones solid and healthy later in life [17]. Sodium is always included in the form of table salt in cooked foods as a flavoring agent, involved in maintaining water balance and it is essential for muscle and nerve activity [18].

Table 1. *Macro elements of North and West Kordofan Chrozophora oplongifolia seeds.*

Mineral mg/100g	North Kordofan	West Kordofan
Sodium (Na)	(1.42)b±0.09	(3.13)a±0.23
Calcium (Ca)	(2.5)a±0.52	(2.37)a±0.14
Phosphorus (P)	(5.95)a±0.12	(6.01)a±0.21
Iron (Fe)	(1.93)a±0.06	(0.71)b±0.004

*Values are mean ± standard deviations (SD).
*All Determinations were carried out in triplicate.
*Means not sharing superscript letters in a column were significant different.

3.2. Trace Elements

The results found that the seeds of *Chrozophora oplongifolia* have trace elements contents as follows: Cu, Al and Zn 0.26, 1.64 and 0.766 mg/100g, respectively, from North Kordofan seeds and that of West Kordofan seeds were 0.04, 0.15 and 0.06 mg/100g, respectively. The statistical analysis showed that there were significant ($p \leq 0.05$) differences found between samples of the two different locations. The study showed that the concentration of Zn from North and West Kordofan were lower when compared with the results of oilseeds ranges between 2.9-7.8mg/100g

for Zn [19], The reasons may attributed to the absorption rate of oilseeds and grains for the zinc salts is weak [20]. The concentration of Cu from North Kordofan was higher than the value 0.15mg/100g reported by Ahmed, and while the West Kordofan result was below these findings of the above mentioned author. Although as these values were low amount, but it can help human to be form red blood cells and kept the immune system, blood vessels, nerves, teeth and bones in healthy conditions and status [4 and 20].

Table 2. *Trace elements of North and West Kordofan Chrozophora oplongifolia seeds.*

Mineral mg/100g	North Kordofan	West Kordofan
Copper (Cu)	$(0.26)^a \pm 0.03$	$(0.04)^b \pm 0.009$
Aluminum (AL)	$(1.64)^a \pm 0.19$	$(0.15)^b \pm 0.001$
Zinc (Zn)	$(0.766)^a \pm 0.04$	$(0.06)^b \pm 0.001$

*Values are mean ± standard deviations (SD).
*All Determinations were carried out in triplicate.
*Means not sharing superscript letters in a column were significant different.

3.3. Toxic Elements

The analysis showed existence of trace amount of toxic elements in *Chrozophora Oblongifolia* seeds, from North Kordofan were 0.012 lead and 0.002mg/100g cadmium, and that of West Kordofan were 0.009mg/100g lead and 0.001mg/100g cadmium (table 3). The statistical analysis showed that there were no significant ($p \leq 0.05$) differences found between samples of the two different locations. These values obtained for lead it differently from a value of 0.003mg/100g for lead content reported by Ahmed, while Cd concentration in both samples were compatible with *Chrozophora brocchiana* value (0.001mg/100) [4]. Since potentially toxic metals (e.g., Pb and Cd) may enter the food chain as a result of their uptake by roots, it is necessary to assess the levels of toxic metal and to report possible contamination that would represent a health hazard [21]. Regarding the stated limits of Pb and Cd for oilseeds were 0.1mg/kg (0.01 mg/100g) according to the FAO/WHO standards, therefore the *Chrozophora Oblongifolia* seeds analyzed can be considered as safe food for human nutrition [22].

Table 3. *Toxic elements content of North and West Kordofan Chrozophora oplongifolia seeds.*

Mineral mg/100g	North Kordofan	West Kordofan
Lead (Pb)	$(0.012)^a \pm 0.002$	$(0.009)^a \pm 0.001$
Cadmium (Cd)	$(0.002)^a \pm 0.0009$	$(0.001)^a \pm 0.0009$

*Values are mean ± standard deviations (SD).
*All Determinations were carried out in triplicate
*Means not sharing superscript letters in a column were significant different

4. Conclusion

The study concluded that all the elements concentrations found from North Kordofan seeds were higher than that of West Kordofan seeds, except sodium and phosphorus. Phosphorus was the predominant element in the seeds followed by calcium and sodium. The analysis showed existence of trace amount of lead and cadmium in *Chrozophora Oblongifolia* seeds that within the permissible limit recommended by FAO/WHO [22]. These results are showed a noticeable sensibly great amount content of P and Ca, and there a vital part in building stronger, denser bones early in life and keeping bones and teeth solid and healthy later in life, deep analysis of seeds toxic elements need to be reinvestigated to confirm these findings, also vitamins and others nutritional compositions of the seeds need to be investigated in future work as recommended point of view.

Acknowledgements

Authors gratefully acknowledged the role of the staff of Central laboratory for Sudan of Ministry of Electricity during minerals analysis.

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