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Nutritional Value and Chemical Constituents of some accessions of *Cenchrus ciliaris* L. from Ha'il, Saudi Arabia

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Abstract

The current study was conducted to assess the nutritional value and the mineral content of some local accessions of *Cenchrus ciliaris* of Ha'il region, Saudi Arabia. Six accessions of the *Cenchrus ciliaris* were collected and analyzed in spring 2016. The study showed that the protein content varied from 1.17±0.34-2.56±0.69 DW%, the sugar content varied from 0.8±0.96-1.7±0.54 DW %., the starch content varied from 0.3±0.08-1±0.78 DW %, (ADF) varied from 26±5.57-70±0.23 DW %, and finally (TDN) varied from 30±2.21-74±0.98 DW%. Such results suggest that *C. ciliaris* accessions have lower values of protein, sugar and starch compared to common forages such as alfalfa. In addition, the accessions' content of Calcium varied from 0.27-3 mg/kg, Sodium content varied from 0.15-7 mg/kg, Potassium content varied from 8-17 mg/kg, Iron varied from 0.31-1.99 mg/kg and finally, Zinc varied from 0.07-0.19 mg/kg. These findings suggest that at least *C. ciliaris* accessions' content of Calcium and Potassium is sufficient enough to meet ruminants' dietary requirements.

Keywords: *Cenchrus, Ruminants, Nutritional Content, Protein, Sugar, Starch, ADF, NDF, Minerals.*

Introduction

Buffelgrass *Cenchrus ciliaris* L. is an important perennial range grass species of Ha'il, Saudi Arabia. It belongs to the family Poaceae, and is a good choice to grazing animals. It ranges in height from 10-150 cm (averaging 70 cm). This grass is one of the most important wild forage species worldwide, known by high pastoral value and high diversity (Mseddi et al. 2002), (Visser et al. 2008) and (Kharrat Souissi et al. 2011). In addition, *C. ciliaris* is highly tolerable to certain unfavorable conditions due to its high resistance to drought, salinity, and its capacity to withstand heavy grazing (Marshall et al., 2012) (Heneidy and Halmy 2009). Moreover, the high productivity of this species allows cultivating it as a primary source for animal feed in several regions of the world, such as Australia, the United States and Pakistan, (Mseddi et al. 2004a; Mseddi et al. 2004b).

The potentiality of any feed to support animal production depends on the quality consumed by the animal and the extent to which the feed meets energy, protein, minerals and vitamin requirement (Minson, 1990 and Frost et al, 2012). Also, (Devendra, 1990) argued that the recognition of the potentiality of local grasses to produce considerable amounts of high protein biomass and energy especially in harsh and arid conditions has led to the development of animal farming systems that integrate the use of foliage with local bulky feed resources. Therefore, laboratory analyses are needed to determine the nutritive value of local fodder and forage.

Saudi Arabia lies in the arid-climate zone, and therefore it suffers from the scarcity and fluctuating quantity and quality of the year-round feed supply to grazing animals. Consequently, researchers and policy makers should provide adequate information to the public of how to provide good quality feed to livestock in order to raise and maintain their productivity.

Cenchrus ciliaris has considerable potential in supporting economical livestock production (Ashrafm et al. 2013). However, a little information regarding its nutritive value in Saudi Arabia is available, so this study was launched to envisage the nutritional value and the mineral content of some accession of *Cenchrus ciliaris* in Ha'il region, Saudi Arabia.

Materials and Methods

Study area: Ha'il region lies in the northern central part of Saudi Arabia between 25° 29′N and 38° 42′E and it covers an area of 118,322 sq km. Livestock production in Ha'il, particularly sheep and camels, is mostly dependent on rangeland. The animals are let to graze on the open ranges which are classified among the arid-zones with short scattered rainy season and prolonged dry period that lasts most of the year.

Samples collection: Six accessions of *C. ciliaris* (Aja, Aljameyyen, Alqaed, Alsenayyah, Alzaytoon, and Alworood) were collected from the margins of some public parks of Ha'il region, Saudi Arabia in late spring 2016. Those accessions were named after the names of the public parks that they were collected from. Irrigation of water in those parks is available all year-round and they can be considered as protected areas since grazing animals do not

reach them. Collecting samples were restricted on public parks because collecting them from Ha'il's open range is difficult task as it is normally very rare and preferable grass to be grazed by ruminants.

Fresh *C. ciliaris* specimens were uprooted by digging the soil and preserved in polyethylene bags. Then samples were transferred to the laboratory (Biology Department, Faculty of Science, University of Hail) for identification and further analysis. Samples were subjected to drying in an oven at the temperature of 105 C° for 24 h, and then 50g of dry weight (DW) of each sample were packed in paper sacks. On each sack collection the site name and dry weight were recorded.

Biochemical Analysis

Dried samples were grinded and homogenized, and then stored in polyethylene bottles until analysis (Trivedy, K. et al. 1988). For the estimation of protein, the protocol of (Lowry,H., and Rosebrough, L.1951) was applied. Also, Total soluble sugar and total starch estimated according to the methods of (Ashwell, 1957). Results were expressed as percentage of dry weight (DW%).

Acid Detergent Fiber (ADF) and Total digestable nutreint (TDN) were estimated based on the AOAC official method (1973). The minerals were analyzed using Atomic Absorption Spectroscopy (Instrument: Aanalyst 400).

Statistical Analysis

The results were obtained by making three independent measurements and therefore presented as means provided with standard errors.

Results and Discussion

The current study was carried out in order to assess the nutritional value and the mineral content of six local accessions of the *C. ciliaris* grass in Ha'il, Saudi Arabaia.

Nutritional Content Value

Figure (1) shows that the total protein content varied from 1.17±0.34-2.56±0.69 DW%, the sugar content as shown in (Figure 2) varied 0.8±0.96-1.7±0.54 DW %, the starch content varied from 0.3±0.08-1±0.78 DW % as shown in figure (3). Also, the acid detergent fiber (ADF %) which is represented in figure (4) varied from 26±5.57-70±0.23 DW %, and the total digestible nutrient (TDN %) values which were shown in figure (5) varied from 30±2.21-74±0.98 DW%. Such results show that all accessions of *C. ciliaris* have lower values of protein, sugar and starch compared to common forages such as alfalfa (Rinehart 2008).

Mineral Content Value

Figure (6) shows that the *C. ciliaris* accessions' content of Calcium varied from 0.27-3 mg/kg, Sodium content varied from 0.15-7 mg/kg as in figure (7), Potassium content varied from 8-17 mg/kg as shown in figure (8), Iron varied from 0.31-1.99 mg/kg as shown in figure (9). Finally, figure (10) shows that the grasses content of Zinc varied from 0.07-0.19 mg/kg. According to (Manzoor, et al 2013) at least the *C. ciliaris* accessions' content of Calcium, Potassium and Sodium are sufficient enough to meet livestock dietary requirements.

As addressed above there is a clear variation in the nutritional value and mineral content of the *C. ciliaris* accessions. This variation could be attributed to many factors including; climate, species, soil type, plant phenology and other abiotic conditions (Greene et al, 1987). In accordance with (Rinehart 2008) and (Manzoor et al, 2013), findings of the current study show that values of protein, ADF, TDN, Calcium and Potassium of *C. ciliaris* made it a good choice to meet ruminants' nutritional requirements.

According to (Soni, et al 2014) livestock owners should gain adequate knowledge of mineral content of local feeds and fodder in order to help them identify the deficiency of particular minerals and accordingly, provide nutritional intervention that can be made to enhance the productivity and general health of the animals. However, the investment of *C. ciliaris* as a diet for livestock should not be overestimated by cultivating or introducing it into a wider range of habitats. This is because of its ability to invade and eliminate other native species which might be a threat to the biodiversity of the region (D'antonio and Vitousek, 1992), (Marshall et al, 2012) and (Parwani and Mankad, 2013).

Conclusion

No important work has examined the nutritional value and mineral content of *C. ciliaris* grass of Ha'il. The current results showed lower nutritional and mineral contents values of *C. ciliaris* compared to common forage such as alfalfa. Consequently, it is livestock owners in dry climate regions like ha'il, should only depend on *C. ciliaris* as a complementary diet for their animals. Also, further research is hugely recommended to evaluate the nutritional value and mineral content of *C. ciliaris* taking in consideration analyzing further minerals. As well as investigating the effect of some important ecophysiological factors such as plant growth stages, plant seasonal changes, drought and salinity.

Acknowledgement

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References

Ashraf, M., Mahmood, K., Yusoff, I. and Qureshi, A. (2013): Chemical constituents of *Cenchrus ciliaris*. from the cholistan desert, pakistan. Arch. Biol. Sci., Belgrade, 65 (4), 1473-1478.

Ashwell, G., (1957). Colorimetric Analysis of Sugars; Methods in Enzymology; V, 3: 53-54.

Ball,M., Collins, M., Lacefield, D., Martin, P., Mertens A., Olson, E., Putnam, H., Undersander, J., and Wolf, W.(2001). Understanding Forage Quality. American Farm Bureau Federation Publication 1-01, Park Ridge, IL.

Heneidy, S. and Halmy, M. (2009): The nutritive value and role of Panicum turgidum Forssk. in the arid ecosystems of the Egyptian desert. Acta Bot. Croat. 68 (1), 127–146.

Manzoor, M, Sultan, J, Nisa M. and Bilal, M. (2013): Nutrietive evaulation and in-situ digestibility of irrigated grasses. The Journal of Animal & Plant Sciences, 23(5): 1223-1227.

Kharrat Souissi A., Baumel A., Mseddi K., Torre F. and Chaieb M. (2011) Polymorphism of Cenchrus ciliaris L. a perennial grass of arid zone. African Journal of Ecology, 49(2), 209-220.

Lowry, H. and Rosebrough, L. (1951): Protein measurement with the folin phenol reagent. African J. Biotechnol., 8: 231-249

Mseddi, K., Chaieb, M. and Neffati, M. (2004a): Fodder yield and response to grazing, simulated by cutting, of different accessions of Cenchrus ciliaris L. Cahiers Options Méditerranéennes (CIHEAM), 62, 349-352.

Mseddi, K., Mnif, L., Chaieb, M., Neffati, M. and Roux, M. (2004b): Aboveground phytomass productivity and morphological variability of Tunisian accessions of Cenchrus ciliaris L. - African Journal of Range and Forage Science 21: 49-55.

Minson, D.J. (1990): Forage in ruminant nutrition. Academic press, San Diego, California, USA.

Marshall, M., Lewis, M. and Ostendorf, B. (2012): Buffel grass (*Cenchrus ciliaris*) as an invader and threat to biodiversity in arid environments: A review. Journal of Arid Environments. (78): 1-12.

Parwani, K. and Mankad, H. (2013): Environmental Impact on Biomass and Allelopathic effect of *Cenchrus ciliaris*. L. European Academic Research 1, 275-285.

Trivedy, K., Goel, K. and Trisalm, L. (1988): Plant Analysis; Practical Methods in Ecology and Environmental Sciences, Environ. Media Publications, pp: 139-151.

Visser, M., Mseddi, K., Chaieb, M. and Neffati, M. (2008): Assessing yield and yield stability of remnant populations of Cenchrus ciliaris L. in arid Tunisia: developing a blueprint for initiating native seed production. - Grass and forage science 63: 301-313.

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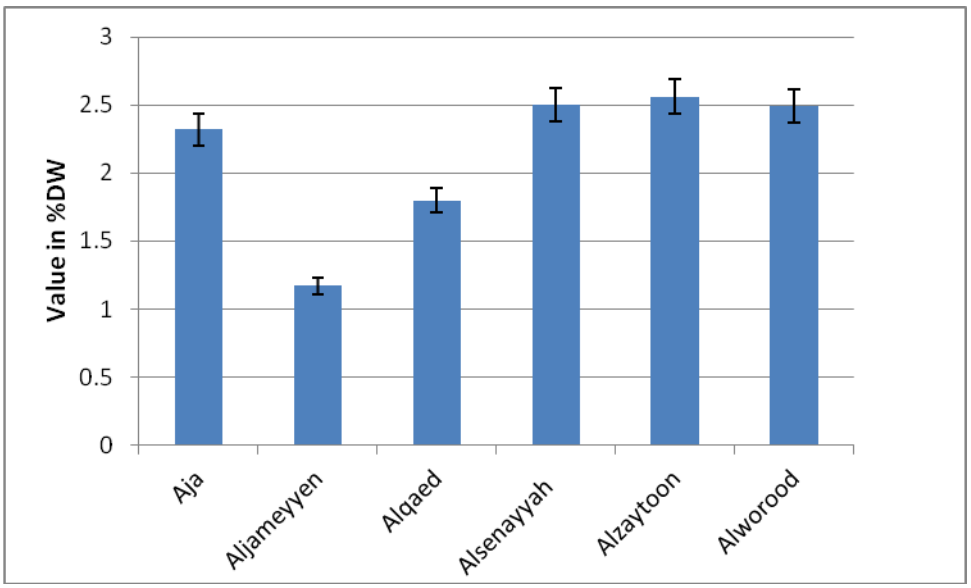


Figure (1) Total protein content in mg/kg.
(All data are expressed in MEAN±SD in DW%).

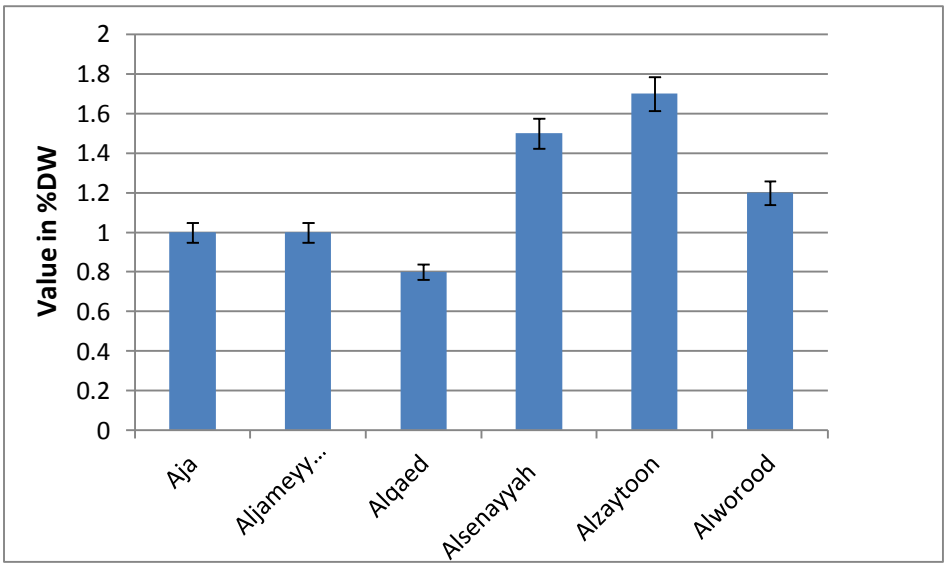


Figure (2) Total soluble sugar content in mg/kg.
(All data are expressed in MEAN±SD in DW%).

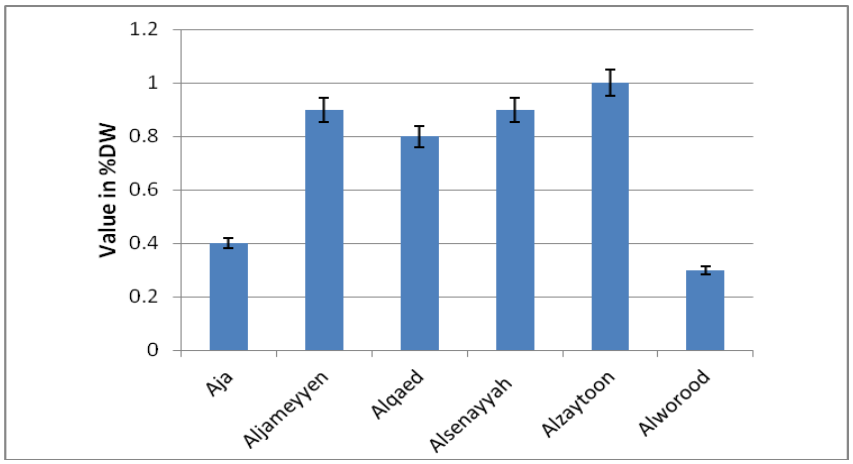


Figure (3) Total starch content in mg/kg.
(All data are expressed in MEAN±SD in DW%).

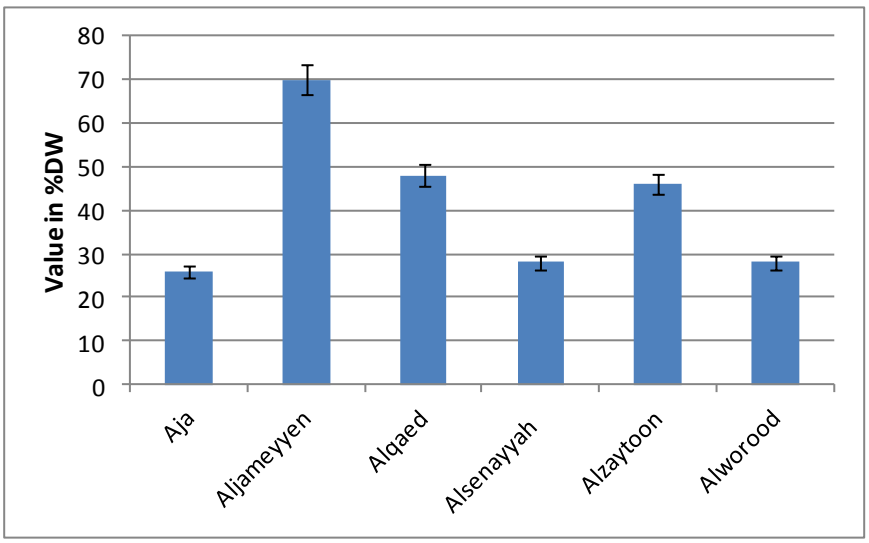


Figure 4. Acid Detergent Fiber (ADF)
(All data are expressed in MEAN±SD in DW %).

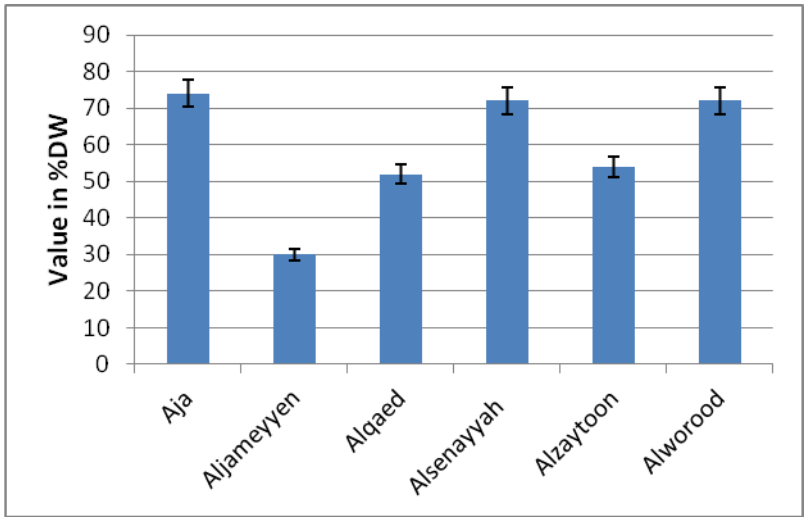


Figure 5. Total Digestible Nutrient (TDN)
(All data are expressed in MEAN±SD in DW%).

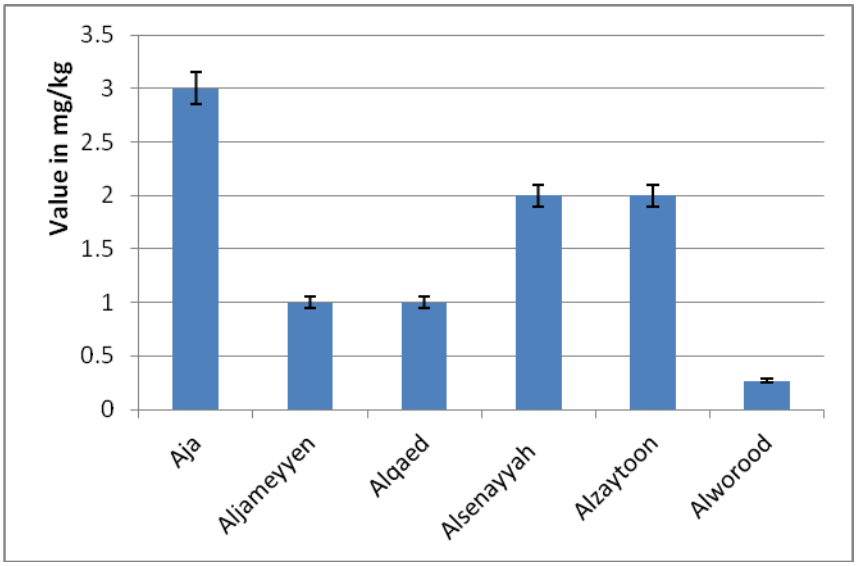


Figure 6. Calcium content in mg/kg.

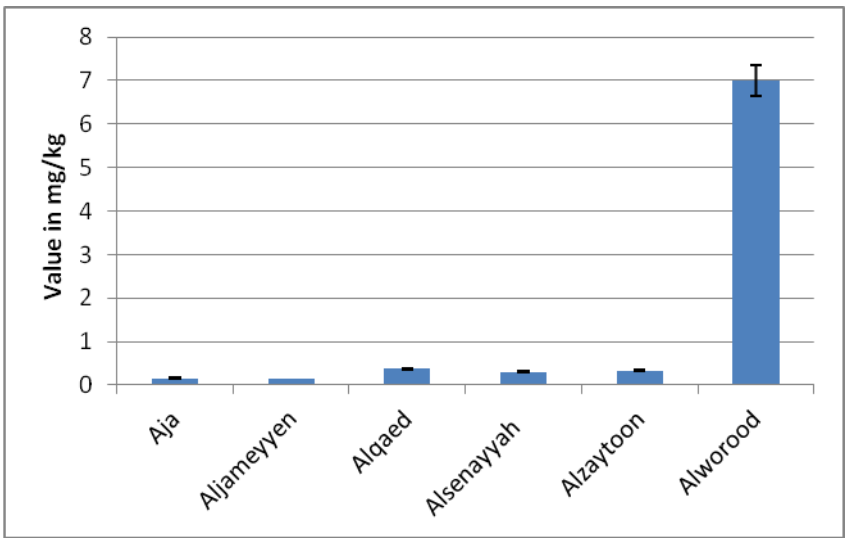
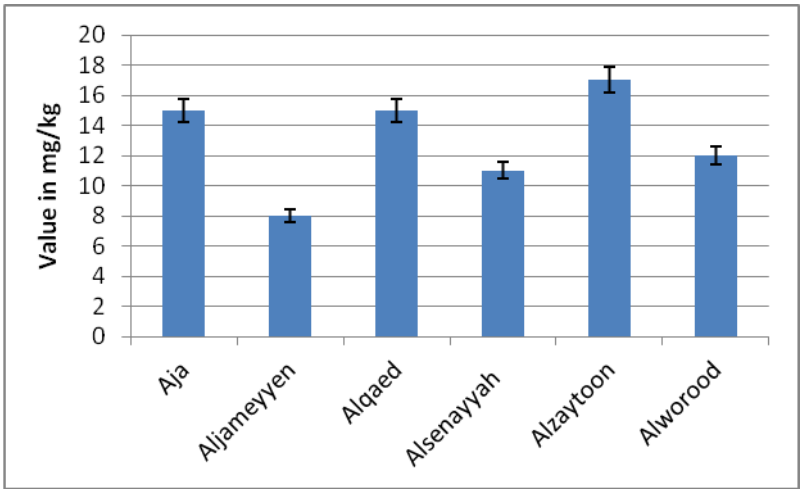


Figure 7. Sodium content in mg/kg.



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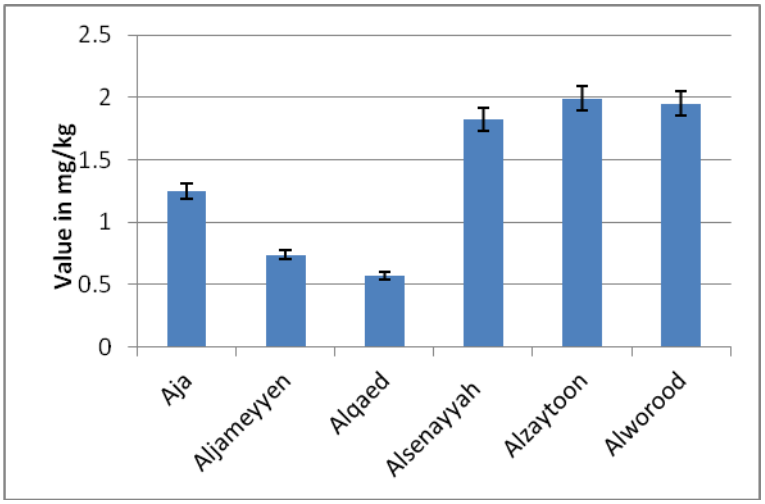

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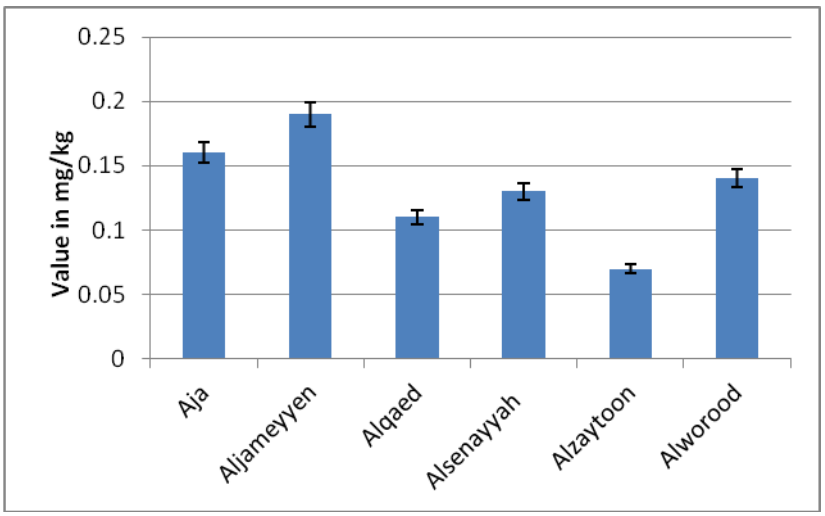

Figure 10. Zinc content in mg/kg.