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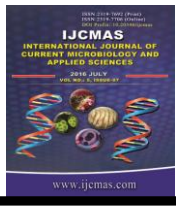

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Are Grasses in the Arid Conditions of Ha'il, Nutritive enough for Ruminants?

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A B S T R A C T

The current study was carried out to evaluate the nutritional value and the mineral content of some local grasses of Ha'il region, Saudi Arabia. Ten members of the Poaceae family were collected and analyzed in spring 2016. The study showed that the protein content varied from 0.24±0.53-2.49±0.87 DW%, the sugar content varied from0.6±0.4-2±0.01 DW %., the starch content varied from 0.3±0.08-2±0.09 DW %, (ADF) varied from 26±5.57-78±0.24 DW %, and (TDN) varied from 22±1.76-74±0.98 DW%. Such results suggest that the grasses have lower values of protein, sugar and starch compared to common forages such as alfalfa. In addition, the grasses content of Calcium varied from 0.1-0.9 mg/kg, Sodium content varied from 0.1-8 mg/kg and Potassium content varied from 7-16 mg/kg, Iron varied from 0.31-2.75 mg/kg and finally, Zinc varied from 0.08-0.25 mg/kg. These findings suggest that the grasses content of Calcium and Potassium is sufficient enough to meet ruminants' dietary requirements.

Introduction

Rural people in Saudi Arabia depend hugely on rangeland as a source of income as it provides forage and feed to their livestock particularly sheep, goats and camels. The way that they feed their livestock is open grazing specifically members of the Poaceae family. This family is the major constituent of rangelands worldwide and one of the largest and most valuable group of flowering plants (some 610 genera, and about 10.000 species) (Part *et al.*, 2011).In addition, grasses have been recorded to be able to tolerate certain unfavorable conditions such as drought and salinity which allow them to well-establish a wide range of habitats (Heneidy and Halmy, 2009).

Minson, 1990 and Frost *et al.*, 2012 have suggested that 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. Also, 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 (Devendra, 1990).Therefore, laboratory analyses are needed to determine the nutritive value of fodder and forage.

A typical forage analysis includes measurements of dry matter, protein, sugar, starch and fiber (acid detergent fiber and neutral detergent fiber). Sometimes ash is measured, and when heat-damaged protein is suspected, acid detergent insoluble protein should be measured. Many other results provided on laboratory reports (digestible energy or protein, net energy, total digestible nutrients, potential intake, etc.) are calculated or estimated from measured analyses (Ball *et al.*, 2001).

Saudi Arabia is one of the arid-zone countries that suffer from the scarcity and fluctuating quantity and quality of the year-round feed supply to livestock. Thus, scientists 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. For this purpose, the current study was carried out to evaluate the nutritional value and the mineral content of some local grasses 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

Ten plants species (*Bromus catharticus, Cenchrus ciliaris, Cenchrus setigerus, Horduim murinum, Hyparrhenia hirta, Pensitetuim setaceum, Poa annua, Polypogon monspeliensis, Schismus arabicus* and *Stipagro stisobtusa*) of the local natural pasture were collected from Ha'il region, Saudi Arabia in late spring 2016.

Fresh grass 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 the temperature of 105C° for 24h, and then50g of dry weight (DW) of each sample were packed in paper sacks. On each sack collection the site name, grass species name, and dry weight were recorded.

Biochemical Analysis

Dried samples were grinded and homogenized, and then stored in polyethylene bottles until analysis (Trivedy, R.K., *et al* 1988). For the estimation of protein, the protocol of (Lowry, O.H., and Rosebrough, 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 nutrient (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

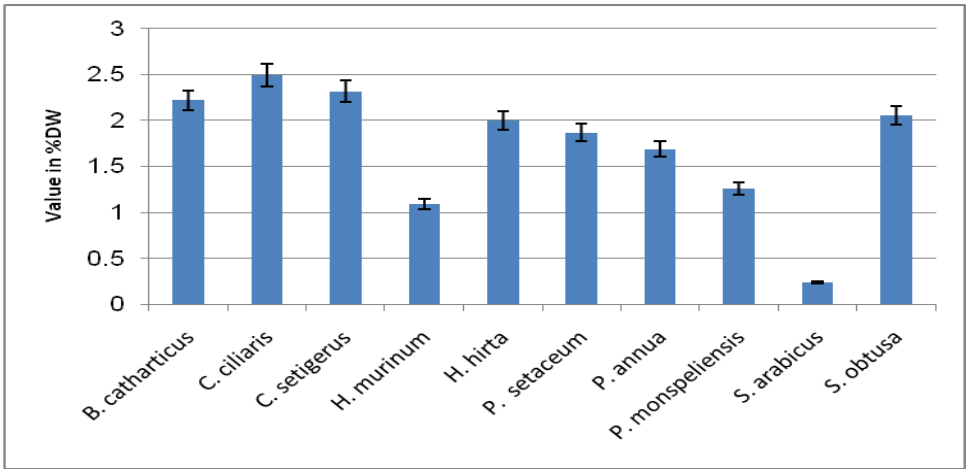
The current study was carried out in order to assess the nutritional value and the mineral content of ten local grasses of the Poaceae family (*Bromus catharticus, Cenchrus ciliaris, Cenchrus setigerus, Horduim murinum, Hyparrhenia hirta, Pensitetuimsetaceum, Poa annua, Polypogon monspeliensis, Schismus arabicus* and *Stipagro stisobtuse*) collected from Ha'il, Saudi Arabia.

Nutritional Content Value**:**Figure (1) shows that the total protein content varied from 0.24±0.53-2.49±0.87 DW%, the sugar content as shown in (Figure 2) varied 0.6±0.4-2±0.01 DW %, the starch content varied from 0.3±0.08-2±0.09 DW % as shown in figure (3). Also, the acid detergent fiber (ADF %) which is represented in figure (4) varied from 26±5.57-78±0.24 DW %, and the total digestible nutrient (TDN%) values which were shown in figure (5) varied from 22±1.76-74±0.98 DW%. Figure (6) shows that the grasses content of Calcium varied from 0.1-0.9 mg/kg, Sodium content varied from 0.1-8 mg/kg as in figure (7), Potassium content varied from 7-16 mg/k gas shown in figure (8), Iron varied from 0.31-2.75 mg/k gas shown in figure (9). Finally, figure (10) shows that the grasses content of Zinc varied from 0.08-0.25 mg/kg.

Previous results show that the grasses have lower values of protein sugar and starch compared to common forages such as alfalfa (Rinehart, 2008).

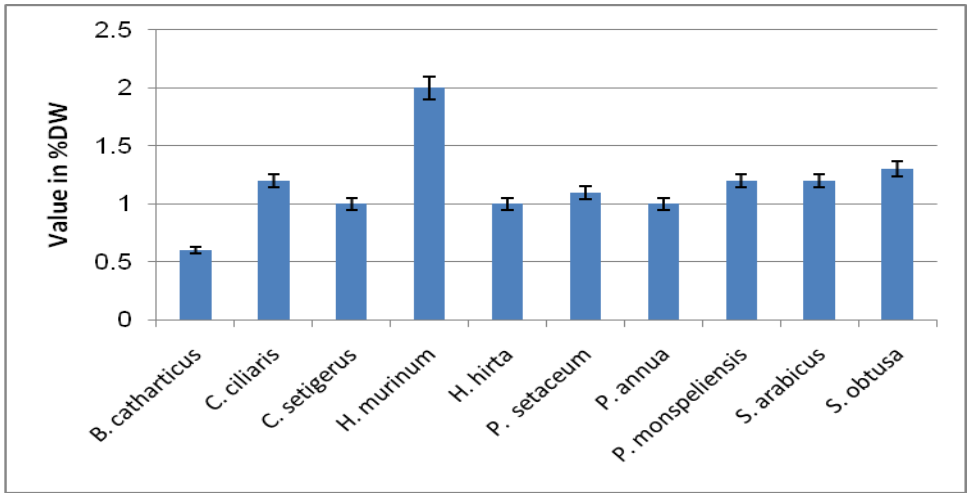
As addressed above there is a clear variation in the nutritional value and mineral content of the grass species. This variation could be attributed to many factors including; climate, species, soil type, plant phenology and other abiotic conditions (Greene *et al.*, 1987). Generally, findings show that values of protein, ADF, TDN, Calcium and Potassium of *C.ciliaris* and *C. setigerus* made them a better choice to meet ruminants' nutritional requirements compared to the other grasses and this is supported by (Rinehart 2008) and (Manzoor *et al.*, 2013).

Fig.1 Total protein content in mg/kg.



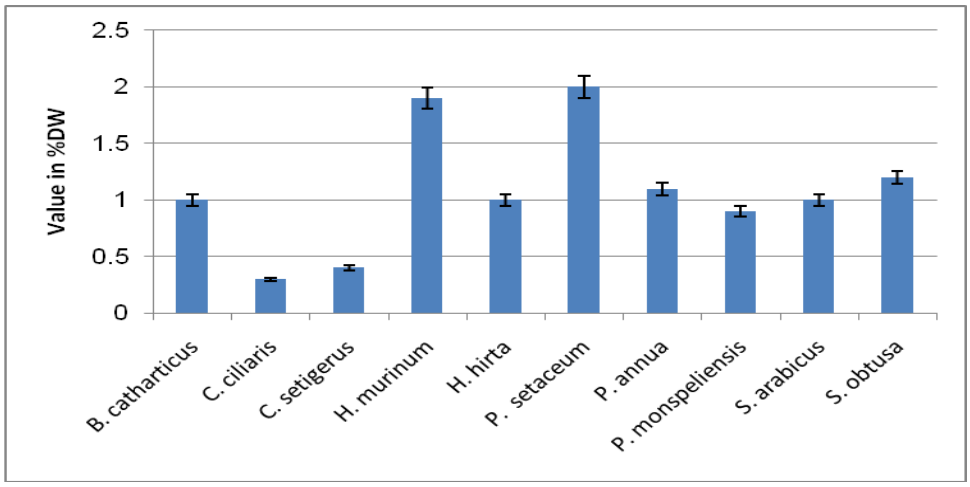
(All data are expressed in MEAN±SD in DW%).

Fig.2 Total soluble sugar content in mg/kg



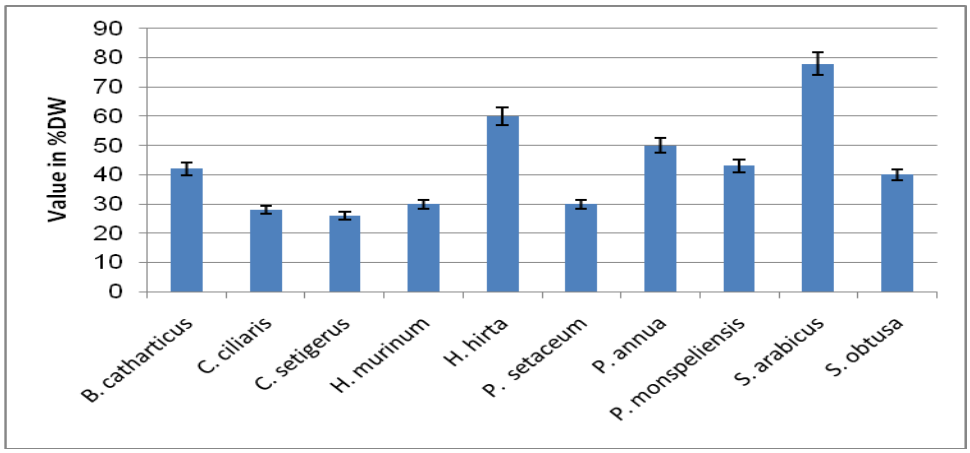
(All data are expressed in MEAN±SD in DW%).

Fig.3 Total starch content in mg/kg



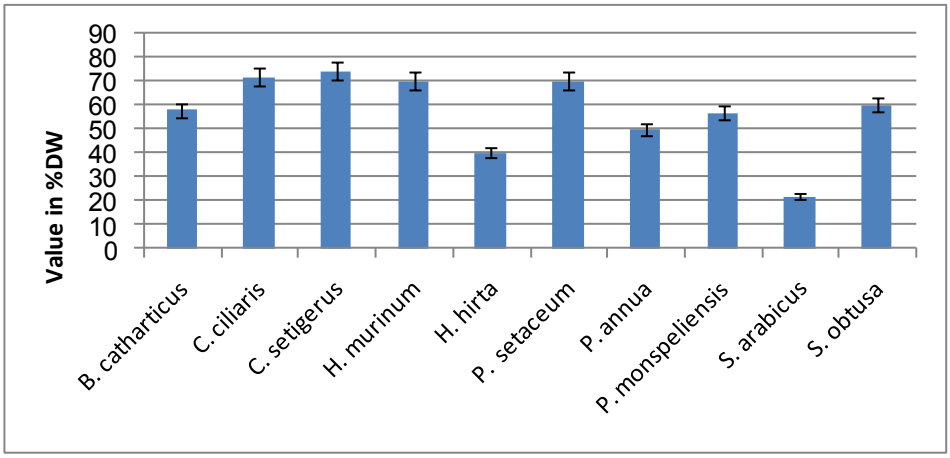
(All data are expressed in MEAN±SD in DW%).

Fig.4 Acid Detergent Fiber (ADF)



(All data are expressed in MEAN±SD in DW %).

Fig.5 Total Digestible Nutrient (TDN)



(All data are expressed in MEAN±SD in DW%).

Fig.6 Calcium content in mg/kg.

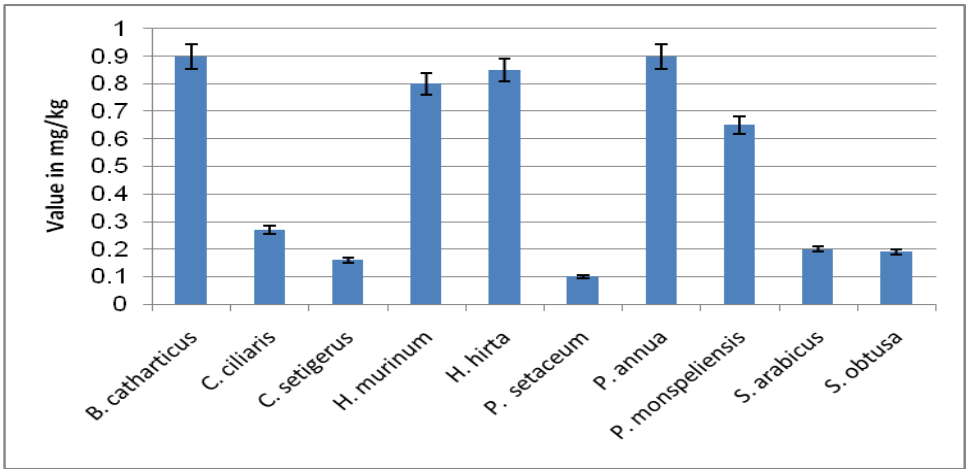


Fig.7 Sodium content in mg/kg.

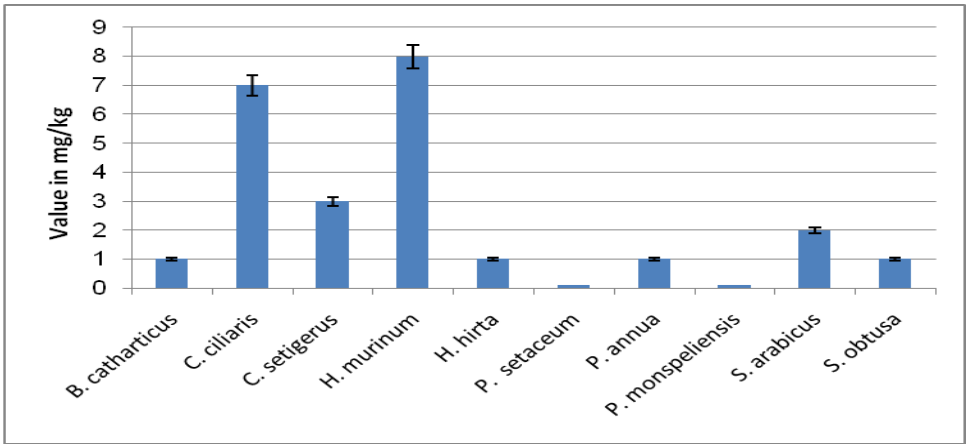


Fig.8 Potassium content in mg/kg.

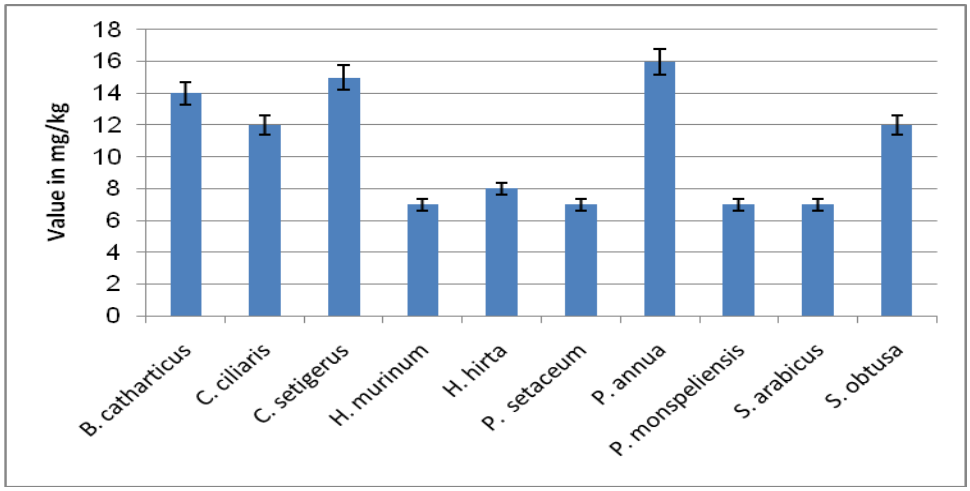


Fig.9 Iron content in mg/kg.

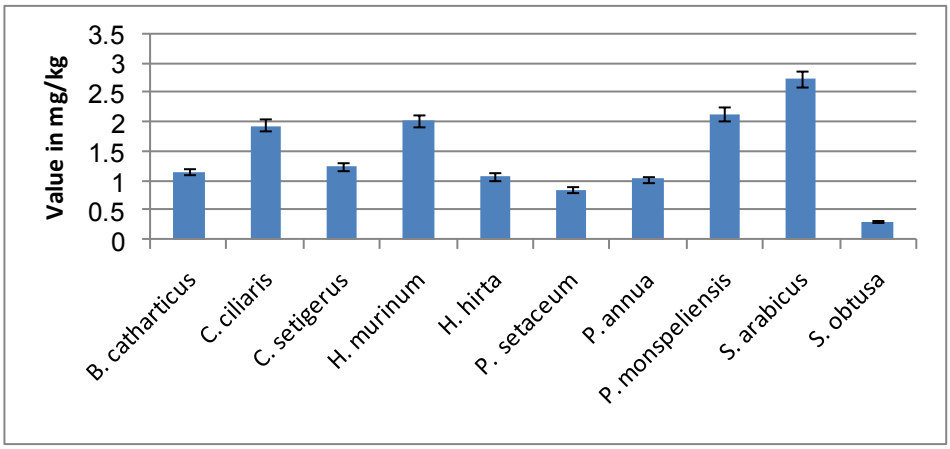
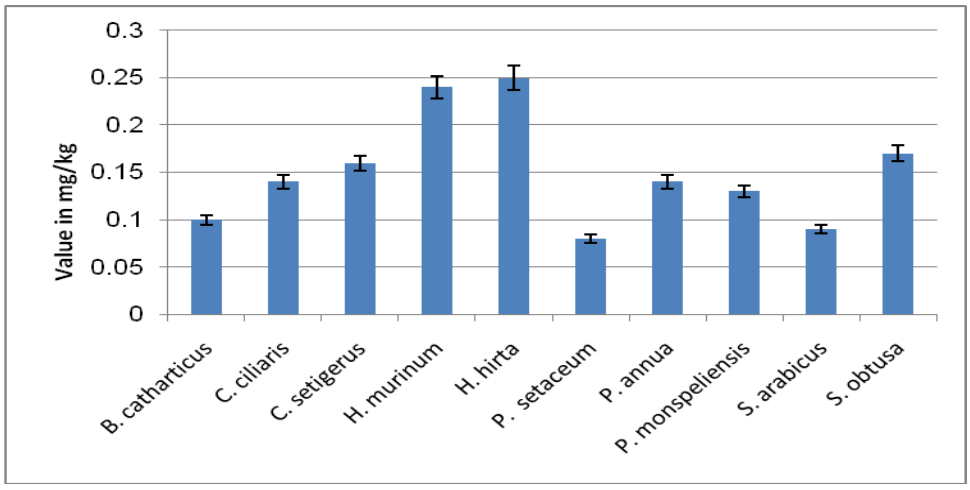


Fig.10 Zinc content in mg/kg.



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 local grasses as a diet for livestock should not be overestimated by cultivating or introducing them into a wider range of habitats. This is because of their ability to invade and eliminate other native species which might be a threat to the biodiversity of the region (D'antonio and Vitousek, 1992) and (Marshall *et al.*, 2012).According to (Manzoor *et al* 2013) grasses content of Calcium, Potassium and Sodium are sufficient enough to meet livestock dietary requirements.

In conclusion, to the best of my knowledge, no important work has examined the nutritional value and mineral content of local grasses of Ha'il. The current results showed low nutritional and mineral contents values of the grasses compared to common forage such as alfalfa. Consequently, it is recommended that those grasses should be paid attention as a secondary source of feeding for ruminants. In other words, livestock owners in dry climate regions like ha'il, should depend on grasses as a complementary diet for their animals. Also, further research is hugely needed to evaluate the nutritional value and mineral content of a wider spectrum of local grasses taking in consideration analyzing further minerals. As well as investigating the effect of some important eco physiological factors such as plant growth stages, plant seasonal changes, drought and salinity.

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