**International Journal of Advanced Scientific Research**
**www.allscientificjournal.com**
**ISSN: 2456-0421**
**Received: 01-03-2022; Accepted: 16-03-2022; Published: 30-03-2022**
**Volume 7, Issue 1, 2022, Page No. 13-17**

# Minerals content of marhabaib (*Cymbopogon*) leaves and spikes

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**Abstract**
Marhabaib or Maharaib, as normally known in "Sudan" is an annual grass which grows wildly in many parts of the country. It is used for medicinal and flavoring purposes. This study was conducted to determine minerals availability in Marhabaib leaves and spikes. The samples were collected from, Gedaref and Northern Darfur states. Inductively coupled plasma analysis was used. The results showed considerable availability of the main essential minerals.
Leaves showed minerals content as, S (2.88mg/100g), P (1.025mg/100g), I (0.83mg/100g), Fe (0.54mg/100g), Si (0.23mg/100g), Ca (0.21mg/100g), Mg (0.16mg/100g), Al (0.16mg/100g), Na (0.043mg/100g), and K (0.031mg/100g), whereas spikes content was P (2.5mg/100g), Fe (0.63 mg/100g), S(5.mg/100g), I (1.9 mg/100g), Al (0.69mg/100g), Si (0.425mg/100g), Mg (0.18mg/100g), Ca (0.16mg/100g), Na (0.095mg/100g), and K(0.078mg/100g). The toxic minerals in general either showed very low concentrations or not detected. As a conclusion cymbopogon leaves and spikes may be safe for medicinal and nutritional purposes.

**Keywords:** *Cymbopogon* schoenanthus, Marhabaib, ICP, Citratus, Lemongrass

## Introduction
The name *Cymbopogon* was derived from the Greek words "kymbe" (boat) and "pogon" (beard). It refers to the flower spike arrangement, which means boat- beard (Watson and Dallwitz; 2015, Shah *et al*; 2011). *Cymbopogon* genus is a number of herbs of the family (gramineae/poaceae), which are known worldwide by their high essential oils content.
They are distributed in many regions of the world and used for various purposes. The commercial and medicinal uses of the various *Cymbopogon* species are well documented and the chemo-types from this genus have been used as biomarkers for identification or classification (Avoseh *et al*; 2015). The genus of this family has about 144 species (Pavlovic *et al*; 2017, Khanuja *et al*; 2005) [21, 24]. The most known, common and well-studied species are Cymbopogon *schoenanthus*, *Cymbopogon citratus* and *Cymbopogon nervatus.* The species Cymbopogon *schoenanthus* is widely growing in many areas in Sudan. The species *Cymbopogon citratus* and *Cymbopogon flexuosus* are cultivated in west and east of India. Ther are several other species of this genus including *Cymbopogon bombycinus*, *Cymbopogon ambiguus*, *Cymbopogon obtectus*, *Cymbopogon refractus* and *Cymbopogon nardus* (Nambiar and Matela; 2012) [17]. The commercial value for most of *Cymbopogon* species is enhanced by their ability to grow in moderate and extremely harsh climatic conditions (Paladia etal; 2011). The most famous common name for all species of the genus *Cymbopogon* is Lemongrass, which is derived from the typical lemony odour of the essential oil (Al-snafi; 2016, Deshmukh *et al*; 2010, Joy; 2003). Lemongrass contains various phyto-constituents such as, flavonoids, phenolic compounds, terpenoids and essential oils, which may be responsible from the several biological activities of the grass (Shah *et al*; 2011). The plant may be promising as potent anti-tumor and chemo preventive drugs, in addition to the infusion of leaves, which is used against stomach trouble and as anti – spasmodic (Avoseh *et al*; 2015, ElGahazali *et al*; 1997) [3]. In some parts of Sudan and South Africa, these plants have a good application as roof thatches and grass broom (Shackleton *et al*; 2007) [23].

## Description
***Cymbopogon citratus*** is a herb with short roots and simple leaves which are, characterize by alternate, linear, with length ranging from (5.0 – 7.0 cm) and width ranging from (0.5 – 1.5 cm). The height of this herb may reach about 80cm (Eltahir and Aboalereash; 2010), Fig. 1.

***Cymbopogon schoenanthus*** is a herb with erect stems in tufted shape with a height reach about 90 cm to one meter. The leaves of this herb are simple, erect, alternate, sheathed, with length of (5.0 – 7.0 cm) and width of about 1cm (El Ghazali *et al*; 1997), Fig. 2.

**Fig 1:** *Cymbopogon citratus* with narrow and long leaves (www.theida.com/Lemongrass *Cymbopogon citratus*/Lemongrass-3).

**Fig 2:** *Cymbopogon schoenanthus* of Sudan (Northern Darfur state)

**Geoghrapic distribuation**

The plants of genus *Cymbopogon*, belonging to the grass family (*poaceae*) are distributed throughout, the warm regions of the world and Oceania (Bertea and Maffei; 2010). The species of this genus are indigenous in tropical and semi tropical areas of Asia and cultivated in Central America and Africa (Kumar *et al*; 2000). Wild *Cymbopogon citratus* in Asia is native in India and other tropical or subtropical countries (Oladeji *et al*; 2019, Figueirinha *et al*; 2008). According to Al- sanfi (2016), *Cymbopogon schoenanthus* is native in some tropical areas of Asia and Africa including Iraq, Oman, Saudi Arabia , Yemen, Sudan, Senegal, Somalia, Morocco, Mali, Mauritania, Niger, Nigeria, Algeria, Benin, Burkina Faso, Kenya, Chad, Djibouti, Ethiopia, Egypt, Libya and Togo.

**Medicinal uses**

*Cymbopogon* is widely used in traditional medicine to treat many health-related ailments as a part of the increasing interest in medicinal plants and their active ingredients (Mossa *et al*; 1987). *Cymbopogon schoenanthu* is used for treatments of gout, prostate inflammation, kidney diseases, stomach pains, fever, and rheumatism. It is also used as digestive for treating intestinal spasm and for treating anorexia (El tahir and Abu Elreish, 2010, Khadri *et al*; 2008, Ben Othman *et al*., 2013, Kpoviessi *et al*., 2014).

**Minerals content**

Fagbohun *et al*; (2010) reported minerals content of *Cymbopogon citratus* as Ca (39.5 mg/100g), Mg (70 mg/100g), Na (54.8 mg/100g), K (59.5 mg/100g), Mn (0.952 mg/100g), Fe (0.024 mg/100g), Zn (121 mg/100g) and P (89.3 mg/100g). Joy ( 2003) showed minerals contents of Lemongrass as Na (0.74%), K (2.12%), Ca (0.36%), Mg (0.15%), P ( 0.07%), S (0.19%), Fe (126.73 ppm), Mn (155.82 ppm), Zn (35.51 ppm) and Cu (56.64 ppm). for *Cymbopogon schonenanthus* cultivated in Iraq at maturity satage, Alsanfi (2016) reported minerals content on dry matter base to be, K (0.48%), Ca (0.49%), Mg (0.022%), Mn (2.7%), P (0.032%), Cu (23.0 ppm), Zn (3.5 ppm), and Co (0.023ppm).

**Materials and methods**

*Cymbopogon schoenanthus* spikes were obtained from Northern Darfur State and *Cymbopogon citratus* leaves from Gedaref State. 2.0 Grams of each sample was ignited to white ash. The ash was then dissolved in conc. nitric acid and completed to 25ml with distilled water. Full minerals content analysis was carried by (ICP) spectroscopy.

**Results and discussion**

Table.1 shows some minerals availability in Marhabaib leaves and spikes samples. Leaves analysis showed relatively high content of some minerals, including, S (2.88mg/100g), P (1.025mg/100g), I (0.83mg/100g), Fe (0.54mg/100g), Si (0.23mg/100g), Ca (0.21mg/100g), Mg (0.16mg/100g), Al (0.16mg/100g), Na (0.043mg/100g), K (0.031mg/100g), Zn (0.0049mg/100g), Cr (0.0034mg/100g), Mn (0.019m/100g), and Cu (0.025mg/100g). Fagbohun (2010), reported minerals content of lemongrass leaves as, P (54.8mg/100g), Ca (39.5mg/100g), Mg (70 mg/100g), Na (54.8 mg/100g) and K (59.5 mg/100g) and Zn (121mg/100g). On the other hand, Marhabaib spikes showed minerals content as, P (2.5mg/100g), Fe (0.63 mg/100g), S(5.4mg/100g), I (1.9 mg/100g), Al (0.69mg/100g), Si (0.425mg/100g), Mg (0.18mg/100g), Ca (0.16mg/100g), Na (0.095mg/100g), K(0.078mg/100g), Cu (0.034mg/100g), Mn (0.021mg/100mg), Zn (0.009mg/100g), and Cr (0.005mg/100g). Al- sanfi, (2016), who studied *Cymbopogon* spikes from Iraq showed, minerals content as, Ca (490 mg/100g), K (480 mg/100g), Mn (270 mg/100g), S (32mg/100g), Cu (3.2 mg/100g) and Zn (0.35mg/100g). Accordingly the leaves and spikes of Sudan (*Cymbopogon)* may be suggested as good sources of so many macro and micro nutrients.

**Table 1:** Minerals content of Marhabaib leaves and spikes (mg/100g)

| Mineral | In leaves | In spikes |
|---|---|---|
| S | 2.88 | 5.40 |
| p | 1.03 | 2.50 |
| I | 0.83 | 1.90 |
| Si | 0.23 | 0.43 |
| Ca | 0.21 | 0.16 |
| Mg | 0. 16 | 0.18 |
| Na | 0.043 | 0.095 |
| K | 0.031 | 0.078 |
| Fe | 0.54 | 0.63 |
| Zn | 0.0049 | 0.009 |
| Cu | 0.025 | 0.034 |
| Cr | 0.0750 | 0.005 |
| Mn | 0.0375 | 0.021 |
| Ni | Nd | Nd |
| Co | Nd | Nd |

The findings of this study were almost similar to that, reported by Anayo Joseph Uraku, *et al*., (2015) for *Cymbopogon citratus* leaves from Nigeria as Mn (2.57mg/100g), Ca (2.14mg/100g), K (0.64mg/100g), Na (0.41mg/100g), Cu (0.39mg/100g), Co (0.39mg/100g), Fe (0.11mg/100g) and Zn (0.03mg/100g). Nitsuh Birhanu *et al*., (2021) reported minerals content in *Cymbopogon* citratus samples from Ethiopia to range as, K (743.8–1020 mg/kg), Ca (123.1–129.3mg/kg), Mg (23.9–36.3mg/kg), Fe (10.35–22.3mg/kg), Mn (10.0–12.7mg/kg), Cu (1.48 –2.57mg/kg), Zn (0.59–1.077mg/kg), Pb (0.13–0.207mg/kg). Nitsuh Birhanu *et al*., (2021) stated that, the significant differences in minerals content could be, attributed to the differences in soil characteristics, use of fertilizers, pesticides, and industrial activities. The variations may also be due to the type of species, climatic conditions, and time of harvesting. In addition to that, *Cymbopogon Citratus* and *schoenanthus* species of the Sudan are wild grasses.

**Table 2:** Toxic minerals content (mg/100g)

| Mineral | In leaves | In spikes |
|---|---|---|
| Pb | ND | ND |
| As | ND | 0.08125 |
| Cd | 0.0015 | 00.0015 |
| Be | ND | ND |
| Ba | 0.0018 | 0.0015 |
| Sr | 0.001375 | 0.00056 |
| Sn | ND | ND |

The toxic minerals, Pb, As, Cd, Be, Ba, Sr and Sn were either present in very low levels or not detected in both leaves and spikes (Table.2). These results may strongly agree with that reported by Fagbohun (2010) and Al-

Sanfi (2016), therefore it can be concluded that, leaves and spikes of Sudan lemongrass are safe materials for human consumption and more scientific efforts may be needed for proper cultivation, propagation and harvesting of the plant throughout the country for economic and medicinal purposes.

**Conclusion**

From traditional uses sight of view, *Cymbopogon* species of Sudan may be fairly suitable and safe as food additives, hot drink or medicinal herb.

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