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Seasonal variation of the Nutrients and Anti- nutrients factors of Eremomastax polysperma

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Abstract: *Samples of Eremomastax polysperma leaves were obtained from three cultivated gardens of the plant within Akwa Ibom State. During dry and wet seasons of the year. The plant was analyzed for Nutritional and Anti- nutrient potentials of the leaves to establish their variation with season. The result of the analysis revealed a significant level of variable among all the chemicals. For the proximate, Ash, fat, crude protein crude fiber, were higher in the dry season while moisture, carbohydrate and energy were higher in the wet season. The trends of occurrence of the macro mineral were the same but with variations in concentration for both seasons. Trends of occurrence as well as concentration differ in the micro minerals. There were higher concentrations of tannins, phytates and oxalate during the dry season while the wet season experienced higher HCN. The abundance of the nutrient factors were high enough to justify the acclaimed health potential of this plant since the levels of the Ant-nutrients were low enough not to interfere with nutrient intake. However activities of the dry season need be monitored to avoid continuous increase of these Anti- nutrients available to the plants.*

Key word*: seasonal variation, Neutrients, Anti-nutrients, Eremomastax polysperma.*

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I. Introduction

Plants that show good health promotion properties are the bedrock for food and pharmaceutical industries. In addition, the increasing global shift to the use of natural products which are presumed to be safer and more affordable is a big boost to industrial reliance on these plants.

According to Iba: et al, (2015), the use of botanical for the management of health problem date back to the origin of man. According to Evans, (2002) such a practice has been described as herbalism or botanical medicine and this is almost universal among non industrialized societies (Ilesanmi *et al*., 2018). It is generally known in ethnomedicine that plants based natural constituent (ie the active components) can be derived from any parts of the plant the bark, leaves, flowers, root, sced, fruit or even the whole plant (Areghore and Hunter, 1999: Imaga, 2010). Furthermore, the bioactive elements (ingredients) that have the therapeutic activity in plants are mostly unidentified and traditional healers carry out holistic use of this plants (Iba *et al.*, 2015)

Eremomastax polysperma is a members of the *Acanthaceae* family is one of the under studied species of medicinal plant that form part of the natural herbal remedy base commonly used by local communities in some Africa countries (Uyoh *et al*., 2014). The leaves of the plant are broad with fairly rough edges. The top green and back pink. It is an erect or somewhat scrambling perennial herb, 1.3-2cm tall. It is a Glabrous to siliceous paberulent stem when young (Hutchison and Dalziel, 1968; Ilesanmi and Okon, 2017). In Nigeria the plant is commonly known as 'blood tonic' plant. The Efik and Ibibio of Cross river and Akwa Ibom state called the plant *Edemididuot*, meaning purple back, Yoruba call it *Oyun*, Hausa; *Esinyin* and Ibos; *Nkwukwo* (Latilo and Daramola, 1964). Presently there are a lot of scientific interest for the development of plant products as dietary supplement. However, there are some chemical compound in these plants that may mediate their effect on the human body (Tapsell *et al.*, 2016) and the health or medicinal potency of the plant depend on the concentration of such chemicals present in the plant, some of which include the nutrients and Anti-nutrient factors as will be revealed and documented in this research, with the consideration of the two major seasons of the year as observed in Nigeria.

II. Materials And Method

PLANT COLLECTION AND PREPARATION

Fresh leaves of *Eremomastax polysperma* were obtained from the herb farms in three local government areas; Ikot Ekpene, Uyo and Eket in Akwa Ibom state of Nigeria. Packed in polyethylene bag and taken to the chemistry laboratory of Akwa Ibom state polytechnic, Ikot Osurua. The leaves was washed with clean water, chopped into smaller sizes and air dried for about two weeks, then ground into fine powder using mortar and pestle, homogenized and stored in air tight container prio-analysis. This process was carried out in February 2018 dry season and was repeated in August 2018 wet season and all corresponding analysis were carried out respectively.

Analytical processes
Proximate analysis

Moisture, ash, crude fibre, crude fat and crude protein were determined as described by AOAC (2005). Soluble carbohydrate was obtained by subtracting the component (protein + fat + fiber + ash) in % from the total dry matter as 100%. While caloric value was estimated by multiplying the values of crude protein, fat and carbohydrate by 4, 9 and 4 respectively, then taking the average of the sum of the products

% Carbohydrate = 100 – (a+b+c+d)

$$\% \text{ Caloric value} = \frac{(a \times 4)+(b \times 9) + (c \times 4)}{3}$$

Mineral analysis

The mineral contents of the plant was analyzed by method of AOAC (2005). After digestion of samples using aqua regia reagent, sodium and potassium were determined using flame photometer, the rest of the minerals were determined by atomic absorption spectrophotometer (AAS). Whereas Phosphorus colorimetrically using vanadium. Molybelate (yellow) James (1984).

Anti-nutrients:

The oxalate content of the plant was determined by method of Oke (1969). Hydrogen Cyanide by the alkaline titration method of AOAC (2005), phytic acid by James (1984) and Tannins was determined by the method of Burn (1971).

III. Results

The results of the proximate mineral and -Anti-nutrients of *E. polysperma* during dry and wet seasons were presented in Table 1 – 3 Table 1: The proximate composition of *Eremomaxtax polysperma* leaves during dry and wet season.

Proximate component	Dry season	Wet season	WHO RDA
Moisture	43.41±0.22	56.5±2.12	3.71/day
Ash	27.34±0.88	23.05±1.41	6g/day
Crude fat	6.22±0.71	1.84±1.98	46 g/day
Crude protein	32.15±0.45	27.28±0.83	55 g/day
Crude fiber	9.24±0.21	3,40±1.41	24g/day
Carbohydrate	24.05±3.15	44.26±1.98	300 g/day
Caloric Energy value	280.18	302.72	2500kcal

Mean ± standard deviation of triplicate readings

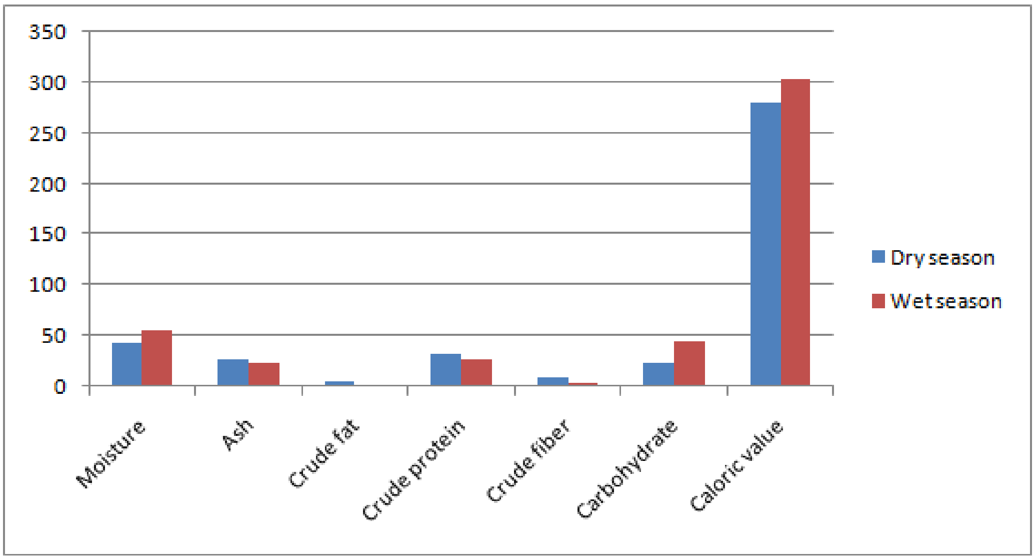

Figure 1: A bar chart of the % proximate composition of *E.polysperma*

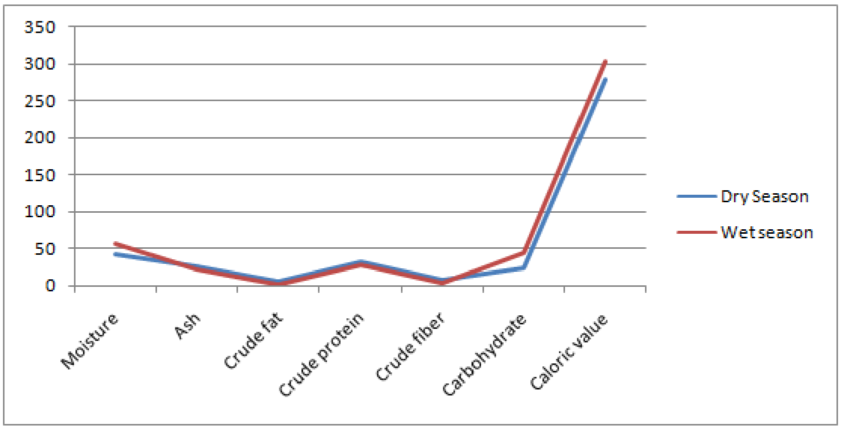

Figure 2: A graph of the % proximate composition of *E.polysperma*

Table 2: Mineral composition of E. polysperma leaves during dry and wet season.

Mineral content	Dry season mg/100g.	Wet season mg/100g.	WHO (RDA)mg/day
Iron (Fe)	0.985+ 0 .001	0.825+0.001	28
Manganese(Mn)	0.822+0.003	1.65+0.014	8-13mg/day
Copper (Cu)	0.087+0.001	48.375+0.012	1.5-3.0
Zinc (Zn)	0.434+0.002	0.67+0.028	12
Calcium (Ca)	34.11+0.14	54.30+0.005	500
Sodium(Na)	107.20+0.78	103.21+0.5	80
Potasium(K)	370.315+0.071	341.05+0.7	35
Phosphporus(P)	78.13+0.014	92.055+0.01	250
Magnesium(Mg)	136.81+0.071	148.375+0.02	95

Mean+ standard deviation

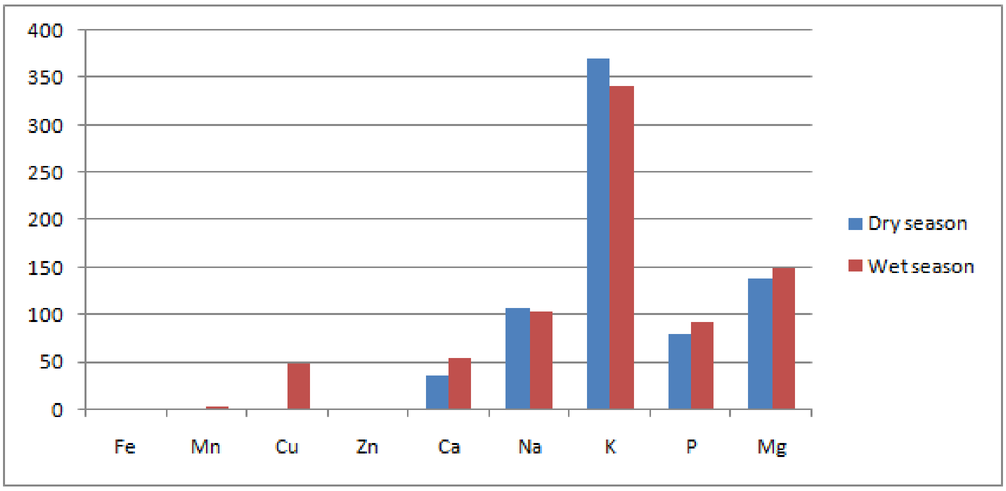

Figure 3: Bar chart of the concentrations of minerals in *E.polysperma* mg/100g

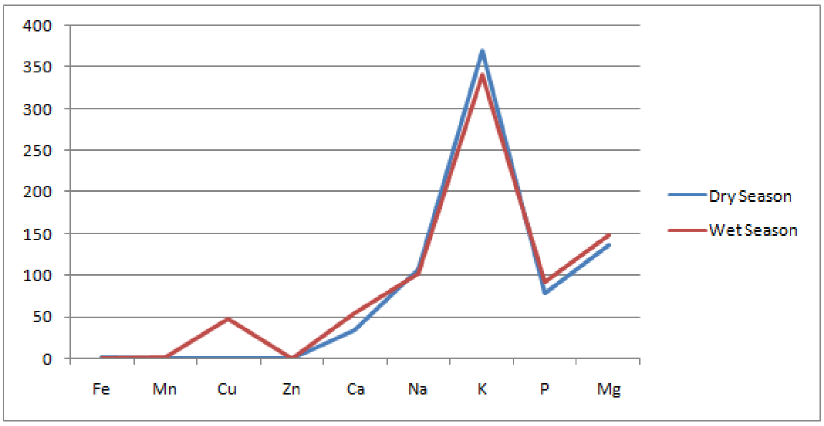

Figure 4: Graph of the concentrations of minerals in *E.polysperma* mg/100g

Table 3: Anti-nutrients composition of E.polyperma leaves during dry wet seasons.

Anti nutrients	Dry season	Wet season
Phytates	22.10±0.01	19.78±0.03
Hydrogen cyanide	8.54±0.28	9.35±0.11
Tannins	7.28±0.0.15	2.92±0.23
Oxalates.	1.72±0.17	0.13±0.01

Mean± standard deviation of triplicate values.

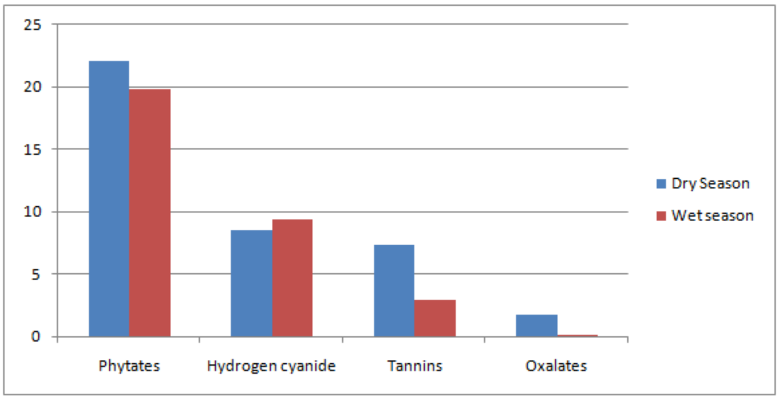

Figure 5: Bar chart of anti nutrients in *E.polysperma* mg/100g

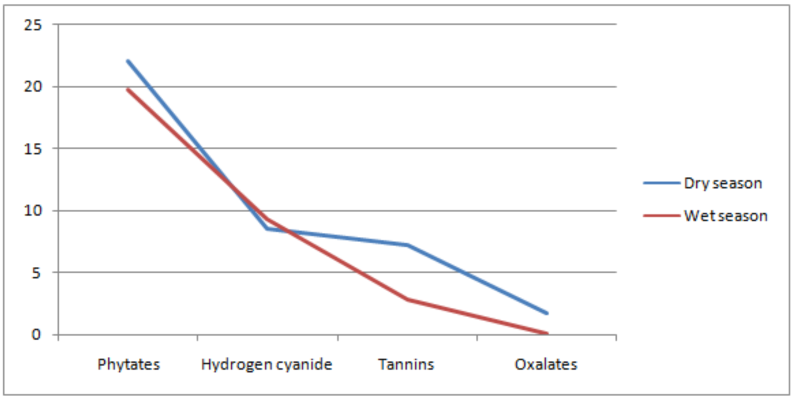

Figure 6: Graph of anti nutrients in *E. polysperma* mg/100g

IV. Discussion

The result of this analysis revealed the presence of all the analyzed nutrients and anti nutrients at various concentrations in the plant.

Proximate composition

The moisture content in *Ermoastax polysperma* showed that the wet season value 56.5±2.12% was higher than the dry season value 43.41±0.22%. Moisture is an index of its water activity and a measure of stability and susceptibility to microbial contamination (Mallikharjuna *et al.,*). These level obtained in the plant for both season were higher than 8.99±0.17 and 8.14±0.17 reported for *E. polysperma* and *E. speciosa* respectively (Uyoh *et al* 2014). But lower than 81.48 % moisture reported by llesanmi and Okon (2017) for the same plant. This level of moisture will not permit long-term storage of the plant and is disadvantaged to rural dwellers where there are no effective storage facilities.

The ash content reported here was higher (27.34±0.08) in the dry season than during the wet season (23.05±1.41)%. The values were similar to 24.93 and 23.42% recorded for *Eremomaxtax polysperma* and *E.speciosa* respective (Uyoh *et al* 2014), higher than 2.01% and 604% for E.polysperma and Aspilia Africana leaves respectively (Ilesanmi and Okon 2017). This is an indication of high mineral content for this leave at both seasons.

Crude fat content 6.22±0.71 and 1.84±1.98% for dry and wet seasons respectively were higher than reports for *Eremomaxtax polysperma* and E. speciosa (Uyoh et al, 2014), *Eremomaxtax polysperma* and A. Africana (0.62 and 3.59)% respectively (llesanmi and Okon 2017) but lower than report in Andrographis Paniculata leaves 9.71±0.00% (Abasiekong and Osabor 2017).

The plant showed a high level of protein for both seasons. Though higher (32.15±0.45)% during the dry season than wet season (27.28± 0.83)%. These values are higher than reports of Edak *et al.*, (2014), llesanmi and Okon, (2017) and that in *A. paniculata* which showed 5.88 stem and 14.88mg/100 leave (Abasiekong and Osaber, 2017), Cucurbita maxima (Pumpkin) peel (11.73%) (Olayemi and Sahihu,2014) Treculia Africana, 10.30± 0.01 and 20.80±0.03% for fermented and fried respectively (Okoh 2013). The level of protein in the plant is enough to prevent protein energy malnutrition in its users. Crude fibre in this study is higher, 9.24±02% during the dry season than 3.40±1.41% of the wet season these values are lower than 12.06±0.08 and 11.64±0.23 reported by Uyoh *et al*, (2014) while the dry season value is higher and the wet season value is lower than 6.22±0.01 recorded in *A.paniculata* (Abasiekong and Osabar 2017). Dietary fiber has some physiological effect in the gastro intestinal tract such as variation in faecal water, faecal bully transit time, and elimination of bile acids. It also affect nutritional sterols, which lower the body cholesterol pool, thereby reducing the incidence of coronary and breast cancer. (Effiong *et al* 2005).

Carbohydrate level in this plant were high. The wet season value 44.26±1.98% higher than the dry season value 24.o5±3.15%. these are similar to the range of values 33.19%-37.81 reported by Uyoh et al (2014). Carbohydrates is very important in living organism as they serve as food and energy storage in living organism. This plant can be described as a good source of carbohydrate during both wet and dry seasons. Finally, the caloric value was higher 302.72k cal during the wet season than 280.18k cal obtained during the dry season. From this experiment, the proximate composition of this plant varies widely with season, which may therefore be attributed to some environmental factors like temperature, humidity, sunlight and probably the cultural practices influenced by the seasons.

Mineral composition: The order plant contain both macro and micro mineral in appreciable concentration the increasing order of these mineral during the dry season were Cu (0.087) < Zn (0.434) <Mn (0.822) < Fe (0.982) <Ca (34.110) <P (78.13) <Na (107.20) <Mg(136.810) <K(370.315). and Zn (0.670) <Fe (0.825) <Mn (1.650)< Cu (48.375) <Ca(34.300)<P (92.055)< Na(103.210) Mg(148.375)< K (341.050) during the dry and wet season respectively. Though the trend varied for the micro mineral but it showed same trend for the macro mineral, Cu Zn, Mn were higher and Fe lower during the wet season than dry season in the micro. On the other hand, P and Mg were higher, Na and K were lower during the wet season than the dry season. Ca remained relatively constant. This plant is a good source of these minerals. This research result conformed with that of llesanmi and Okon (2017), who reported some of these mineral in the same plant but recorded highest concentration for Ca and not K as obtained here However the presence of these mineral can justify its high medicinal relevance as these minerals play very important roles in health maintenance. While excess or deficiency of some could be fatal. Seasonal anthropogenic activities which control the environmental pollution/contamination status could also be a factor

Anti-nutrient:

The presence of these anti-nutritional factors (ANT) in plants affect the absorption and availability of some mineral by humans and animal. Antinutrient reduce the nutrient utilization and or food intake of plant food (Bassir, 1969). The results obtained indicated that phytates, oxalates and tannins were higher during the dry season while hydrogen cyanide was lower during the dry seasons than at the wet season. Their increasing order of occurrence was Oxalate (1.72± 0.17) < Tannins (7.28± 0.51) < HCN (8.54±0.28) < Phytates (22.10±0.01) during the dry season and Oxalate (0.13±0.01)< Tannins(2.92±0.23) < HCN (9.35± 0.11) < phytate (19.78±0.03) Mg/100g in the wet season. These values are lower than the range of values of oxalate 2.50±0.037 to 10.40±0.026; Tannins 50.20±0.03 to 63.40±0.05. and phytates 485.70±3.78 to 743±1.73 but higher than HCN 0.17.00±0.02 to 0.43.00±0.17 reported in lasenthera africana (Editan), Heinsia and piper quineensis respectively (Abasiekong *et al.,* 2014)

V. Conclusion

In conclusion, season can be seen as an important factor that can control both anthropogenic and natural activities in a society, influencing the biodiversity and resource they contain; thus the percentages of crude fat, crude protein and ash were higher while moisture carbohydrate and caloric values were lowers, Fe, Na and K were higher while Mn, Cu Zn, Ca, P and Mg were lowers. Also phytates, Tannins and oxalate were higher while hydrogen cyanide was lower during dry season. Variations were observed for all the chemicals. However, the concentrations of the nutrients for both season were high enough to justify the role of the plant in traditional medicines but activities must be regulated to control the phytate, tannins and oxalates available to the plant in dry season and HCN in wet season

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