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EVALUATION OF SOME MINERALS COMPOSITION OF *MORINGA OLEIFERA* LEAVES PART CULTIVATED IN COLLEGE FARM, JERE, NIGERIA

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Abstract

Agricultural practicing is becoming cumbersome due to environmental pollutions. Natural or manmade, climatic change patterns have been causing various impacts on human and animals throughout the word. This research study was conducted on evaluation of some mineral compositions of Moringa oleifera Leaf part cultivated in College Farm, Jere, Nigeria. All materials used were of analytical grade and conducted under cleaned and hygienic environment. Standard operation procedures thoroughly followed. The method applied were as the methods described by Gwana et al., (2016) and AOAC, (1990). The results obtained in triplicate, revealed the mean concentration values of the seven elements (minerals ions) being determined and evaluated. These minerals ion were; Ca^{++} (101.92), Fe^{++} (0.60), K^{+} (8.73), Mg^{++} (65.88), Mn^{-} (0.38), PO_4^{-} (5.18) and finally Zn^{++} (0.33) all in g / l. The finding reveals that there are some mineral substances in the plant sampled such as Ca, Mg, K and PO_4 were found in abundance while Mn^{-}, Fe and Zn were found in moderate concentration values level compare to most values that were reported for medicinal and vegetables plant in literature. These elements are very important to body system to functions well and healthy. There are the needs to carry out intensive research on the all parts of the Moringa oleifera plant including the roots, leaves, stems, stem barks, flowers and seeds in order to evaluate the nutritive and non-nutritive compositions of the plant.

Keywords: Climate change, Environmental pollution, Food and health, Mineral ions, Minerals composition, Moringa oleifera,

Introduction

Nowadays, agricultural practicing is becoming cumbersome due to environmental pollutions. Natural or manmade, climatic change patterns have been causing various impacts on human and animals throughout the word, especially, in food productions and its food security and biosecurity management. Theses have to be address through collaborations collateral by intergovernmental, Non-governmental organisations (NGO); various international, national and local organisations and the financial institutes. This is because, when these greatest and serious challenges is been addressed, the future depends on the capacity of the agricultural sector.

In recent decades, changes in climate have caused impacts on natural and human system on all continents and across the oceans. Agriculture must be tailored to current and future climate change patterns to ensure tomorrow's food production. The future depends on the capacity of the agriculture sector to address this momentous challenge. Climate change is already a reality for many smallholders and testimony has been collected on the impacts family farming. The AfricaAdapt network aims to share knowledge on climate change adaptation in Africa, such as, longer dry periods, shrinking water supplies, increased flooding, desertification, and unpredictable and changing seasonal weather patterns, causing lower crop yields and thus farm production, are a few of the impacts pointed out (Anne, 2014).

Quality and large scale food production and health management are paramount issues to be born in mind and should be highly emphasised for the wellbeing of human and animal needs (Gwana *et al*., 2021; Idris *et al*., 2020; Gwana *et al*., 2016; Kosolo *et a*l., 2010). Food security and biosecurity management have to be a source of concerned when considering food production and its management. Previous studies have been reported that some plants are edible to both human and some animals; plant such as drumstick or horse red or miracle tree *(Moringa species)* that their various parts (root, stem back, leaf, flower, seed and pods) possess rich nutrient and medicinal properties (Gwana *et al.*, 2021; Idris *et al*., 2020). It is highly demand for its nutritional and medicinal, which is the most widely in the Monringaceae family and cultivated for its nutrients and medicinal purposes, all parts of the *Moringa* tree are edible and have long been consumed by human-being and animals, for example, the leaves of *M. oleifera* are eaten in African countries; such Nigeria, Ghana, Ethiopia, East Africa and Malawi, etc. (Gwana *et al*., 2016; Choudhury and Sinha, 2015; Okafor *et al*., 2014; Olson, 1999). *Moringa* plant commonly called 'Miracle plant or Horseradish' belong to a Monogerie family of shrubs and trees, and considered to have originated from North – west of India. The plant, scientific name is *M. oleifera,* is commonly called in Nigeria as drumstick or horse red or miracle tree or wonderful tree in English, while locally called *Zogale* in Hausa and *Allam* in Kanuri, Galagangi in Fulani, Kabe or Tsahausa in Margi, Eweigbale in Yoruba, Hallum in Babur - Bura and Okweoyibo in Igbo languages, few to be mentioned (Gwana et al., 2021; Gwana *et al*., 2016).

The Miracle plant belong to the; Kingdom: Plantae, they are unranked: Angiosperm and are Eudicots, Order: *Brassicales*, Family: *Moringaceae*, Genus: *Moringa*, and Specie: *oleifera*. Thus the terms; *M. oleifera* (Farooq and Bhanger, 2003). It is the only genus of the family of *Moringaceae* related to Brassicaceae, comprises of 13 to 14 species of which eight are endemic to the horn of Africa. Among the eight, three of genus *Moringa species* are; *M. oleifera* which is closely related to *M. concanensis* (found mostly in India) and *M. peregrine* (Asuk *et al*., 2015; Okafor *et al*., 2014; Kosolo *et al*., 2010; Farombi, 2003). These three species share a slender tree habit and the zygomorphic flowers (Okafor *et al*., 2014; Anhwange *et al*., 2004; Olson, 1999; Juniar *et al*., 2008).

The chemical analysis of *M. oleifera* on dry matter basis, revealed that it contained 27.2 % protein, 5.9 % moisture, 17.1 % fat, and 38.6 % carbohydrates (Azuonwu *et al*., 2016). Anwar and Rashid (2007), noticed that on a dry matter basis, the essential amino acid contents of the leaves and sulfur containing amino acids were higher than the amino acid pattern of the FAO reference protein. Gwana *et al*., (2016) stated that the plant *M. oleifera* contained much higher minerals / elements such as calcium, cadmium, chromium, potassium, manganese, zinc, and lead in lower amount of concentration. In addition to its compelling water purifying powers and high nutritional value which also contain high content of highly digestible protein, carotenoids, minerals and vitamin especially vitamin C. Hence it can be used as an ideal nutritional supplement which have been used to combat malnutrition, especially among infants and nursing mothers. *M. oleifera* is very important for its medicinal value as well (Okiki, *et al*., 2015; Oluduro and Aderiye, 2009; Farooq *et al*., 2006; Fletcher, 1998).

The *M. oleifera* plant share a slender tree habit and the zygomorphic flowers, growth and development; germination rate for fresh seeds are around 80 % going down to about 50 % after 12 months of storage, but do not survive after 2 years of storage. Initially, the tree grows at a remarkable rate of 3 – 4 m a year. Young trees raised from seed start flowering after 2 years. Trees grown from cutting the first fruit may be expected from 6 – 12 months after planting, flowering often proceed but coincides with the formation of new leaves formation. In Nigeria, flowering occurs throughout the year (Kosolo *et al*., 2010; Jabeen *et al*., 2008; FAO / UNO, 2006; Farooq and Bhanger, 2003). The plant *M. oleifera* is a deciduous to semi – evergreen shrub or small tree with a length from 1 – 10 m tall, and the trunk is up to 25 cm in diameter. The bark of the tree is whitish grey or pale bluff, smooth, corky and the young shoots are purplish or greenish white. The leaves of *M. oleifera* are alternate; 6.0 – 6.5 cm long, leaflets are elliptical to obviate, 0.5 – 3 cm x 0.3- 1.3 cm^2, rounded to cone at base, apex rounded and flowered panicle of 8 – 30 cm long. The flowers of plant are bisexual, zygomorphic, 5 numerous sepals free, 7 – 14 mm long, often unequal petals free, oblong – spatulate, 1 – 2 cm long, unequal, the largest erect, velvety pubescent, white or cream; stamen are 5, filaments are 7 – 8 cm long, anthers are waxy yellow in colour, fruits are 10 – 50 cm long with 9 ribbed, brown when ripe, many seeded. Seed globes are 1.0 – 1.5 cm in diameter with 3 thin wings of 0.5 – 2.5

cm long respectively (Abbas and Ahmed, 2012; Kosolo *et al*., 2010; Farooq and Bhanger, 2003; Farombi, 2003).

The plant *Moringa specie* is a plant that is highly demand for its nutritional and medicinal values. It has many species or variety, up to fourteen, among the specie is *Moringa oleifera*, which is the most widely cultivated in the Monringaceae family (Fahey, 2005; Kosolo *et a*l., 2010; Vinoth *et al*., 2012; Asuk *et al*., 2015). The plant drumstick or horse red or miracle tree is a tropical multipurpose tree that said to be originated and naturally grows well in India, Sub – Saharan Africa and South America and other part of the world. All parts of the plant are use as source of vegetable plant for food and medicinal or therapeutic purposes for both human and animal, especially the leaves part (Gwana *et al*., 2016; Vinoth *et al*., 2012; Aning, 2006; Olson, 1999). Dahot, 1998

The tree is grown best in dry sandy soil and tolerate poor soil including coastal areas, which is grown in countries like; Nigeria, Ghana, Niger, etc. and use as vegetable in cooking soup or for salad locally (Azuonwu *et al*., 2016; Yameogo *et al*., 2011; Oluduro and Aderiye, 2009; Fahey, 2005). It is used in the preparation of cosmetics, mechanical lubricant, and biofuel production. It has many potential uses both in agricultural and industrial (Siddhuraju and Becker, 2003; Rajangam *et al*., 2001; Oluduro and Aderiye, 2009; Dahot, 1998).

The leaves are completely safe for consumption and have no known negative side effects or toxic element (Thilza *et al*., 2010; Siddhuraju and Becker, 2003; Bhauger and Anwar, 2003). The leaves are eaten as salad, and cooked in soups and sauces. In the Mascarene Islands, it is known as a 'brede mourongue' or 'brede medaille'. The flowers and young fruits are sometimes eaten as vegetable, added to sauces or used to make tea. In Sudan, the flowers are made into a paste by crushing and frying. Older fruits are added to sauces. In West Africa, some health projects fight malnutrition quite successful by promoting a number of measures including the use of *Moringa oleifera* leaf powder in the diet of children and pregnant women (Azuonwu *et al*., 2016; Anwar and Rashid, 2007; John *et al*., 1986).

The cost of balance source of nutrients, that is rich in balance mineral composition has becoming scarce and worrisome nowadays and not affordable by the most communities. As such *M. oleifera* leaves has being established that contains some minerals that maintain the body metabolism and regulate osmoregulation in both man and animal wellbeing. All the plant parts are consuming for mineral as part of nutrient, as food and its very available at all seasons and this may solved the problems concerned. The aims and objectives of this study to evaluate some of the mineral (both macro and micro elements) content in *M. oleifera* leaves part of the plant that are cultivated in College Farm. This will reveal some of the mineral content of the leaves parts' of *M. oleifera* cultivated in College Farm, Jere, Borno State of Nigeria.

METHODOLOGY

Study Area

Jere Bowl is situated below 305 m above sea level, north of Maiduguri (Nyanganji, 2002). It is located between latitude 110° 48' – 110° 58' N and longitude 130° 06' – 130° 20' E in the Sudan – savannah transition zone. Jere Bowl covers an area of about 22,000 ha,

out of which a gross area of 15,850 ha was identified as suitable for irrigated agriculture (Gwana *et al*., 2021; Jibirin, 2010). Jere bowl fall within Jere LGA and it shares boundaries with some local government areas; to the northeast shares border with Nganzai and Mafa, while to the north-west and south-east shares border with Maiduguri and Konduga. The study area was selected based on its proximity, accessibility, relevance of the study and familiarity with the environment. Intensive irrigation activities take place all year round at the banks of the river (Musa *et al*., 2019; Gwana *et al*., 2013).

Materials

All materials used in this research study were of highly grade and hygienically cleaned. The following standard apparatus were required and used in cause of this scientific research study. Apparatus such as protective wears, plastic tray, plastic bucket, plastic knifes, plastic spatula, clean and sterile white cloth, sterile absorbable cotton wool, plastic sieves, crucible dish, reagent bottles (various types), measuring cylinder (25 ml, 50 ml, 100 ml, 250 ml, 500mland 1000 ml), volumetric flask (25 ml, 50 ml, 100 ml, 250 ml, 500ml and 1000 ml), watch glass, largemouth brown bottles, sample polythene bags, Whatman filter paper (No.1), hot air oven, muffle furnace, weighing balance, analytical balance and Atomic Absorption Spectrophotometer (AAS: Buck Model – 210 VGP). Reagents used in this research study were of analytical grade in terms of quality, and standard operation procedures (SOP) were absolutely being observed in cause of this scientific research study.

Methods

All reagents and apparatus used in the course carrying out the research study are of analytical grade and conducted under cleaned and hygienic environment. Standard operation procedures thoroughly followed. The method used in this research study were as the methods described by Gwana *et al*., (2016) and AOAC, (1990).

Sampling and Sample Collection

Procedures: - At about 6.30 AM, in the early morning hours, the sample of leaves part of the plant of *Moringa specie* was collected and obtained by purchasing from the farmers directly, by plugging the stalk of leaves compound on the main plant, from the *Moringa* plantation of the College Farm, Mohamet Lawan College of Agriculture, Maiduguri. The fresh-green leaves part sample of *Moringa specie* that was collected packed in polythene bags and was transported Laboratory Unit, Department of Animal Health and Production Technology, Mohamet Lawan College of Agriculture. Maiduguri, Nigeria. The sample was unpacked and placed on a plastic mat on top of examination table. A little out of the whole sampled were collected into a polythene bag and was taken to the Department of Forestry Technology, of the same Institute for the identification and authentication of the plant part sample.

Authentication and Identification of the Leaves Part of *Moringa specie*

The age of the plant was said to be 7 years old. The leaves part of plant was identified and authenticated as the leaves part of *Moringa oleifera* by Shettima, U. K. of department of Forestry Technology, MOLCA, Maiduguri. The leaves part of the *M. oleifera (M. oleifera)* were given authentication and identification with reference to the herbarium sheets (Voucher Number: *MOL-0027-20*). It was then kept, Stored and placed at Herbarium of the Department of Forestry Technology, Mohamet Lawan College of Agriculture, Maiduguri. The name of the plant, plant part, time, date and the year in which it was plugged written on the container as or for feature reference.

Natural Dehydration of the Leaves Part Sample

Procedures: - In laboratory, the sample was placed on to the table, and the leaves were destalked from the compound part. It was collected and transferred in to large plastic bowl, washed with tap water several times in order to remove any dust and insects waste (if any). Then rinsed with distilled water and later with deionised water, drained and dried in order to remove any traces of water. This was done in order to avoid the contamination of the leaves sample with any element if present. The drained and dried leaves sample was weighed on digital weighing machine for three times, the mean weight was taken and recorded. It was then spread on the polythene mat, air dried under average room temperature (22 ^{0}C – 32 ^{0}C) to a constant weight and to remove its moisture for 14 days, as described in the methods applied by Idris *et al.*, (2020); Gwan *et al*., (2016); Bamishaiye *el al*., (2011). The dried plant material (leaves part of *M. oleifera*) was collected and packed into plastic container and was ready for next processing.

Pulverization of Leaves parts of *M. oleifera*

Procedures: - The dried leaves sample (dried plant part sample) was placed in to mortar and blended in to fine powder with pestle for 15 minutes, in order to have a powder of leaves plant part of *M. oleifera*. The *M. oleifera* leaves powder obtained was transferred in to large mouth plastic containers, screwed cap to cover. The containers containing the *M. oleifera* leaves powder were labelled with following information; name and type of plant, plant part material, nature, date with time, and person who prepared it were recorded. It was stored in cool and dry environment, away from light, and placed on the shelve for further usage as described in the methods applied by Idris *et al.*, (2020). The fine powder was then used in the analysis.

Ashing of the Sample

Procedures: - The treated, air dried plants' part material sampled were pulverized in to powder. It was transferred crucible dish and put on to muffle furnace and heated at 500 ^{0}C for 3 hours. Then it was removed and put in to a desiccator and allowed to cooled and dried, as described by the methods of Gwana *et al*., (2016) and AOAC (1990)

Digestion *M. oleifera* Leaves Sample Extraction

Procedure: - About 0.5 g of the ashed sample was transferred in to 250 ml beaker. Then 10 ml of 6M Hydrochloric acid (HCl) was added, and covered the beaker with watch glass and heated for 15 minutes, removed and cooled. 1 ml of concentrated Nitric acid (H_2NO_3) was added and heated to evaporate to dryness and dehydrated the silica. 1 ml of 6M of HCl was added again. 10 ml of distilled water was added and heated to dissolved, cooled and filtered with filter paper What No.1 in to 100 ml volumetric flask up to the marked leveled. It was then transferred in to polythene bottle for the elements (minerals) analysis as described by Gwana *et al*., (2016) and AOAC, (1990).

Evaluation of *M. oleifera* Leaves Extract for Elemental ions

***Procedures*: -**The method applied in the evaluations of some minerals composition of the sample plant parts' material were by using the Atomic Absorption Spectrophotometric techniques as described by AOAC (1990).

Data Analysis

Data obtained from this research study was subjected to statistical tools of analysis using graphical presentation, mean for the measurement of central tendency, standard deviation for measurement of dispersion and or discrepancy within the variables being obtained and its' significance, as in method described by Stroud and Booth (2001).

Results

Table 1 showed the results obtained from the analysis (in triplicate) of the concentration mean values of minerals evaluated in the leaves of *M. oleifera* cultivated in the College Farm, Jere, Borno State of Nigeria. The results that were obtained in gram per litre revealed the mean values of the seven elements (minerals ions) being determined and evaluated. These minerals ion and their values were in triplicate; Calcium (Ca^{++}) ranged from 102.0 to 101.91 g / l, Iron (Fe^{++}) ranged from 0.62 to 0.59 g / l, Potassium (K^{+}) ranged from 8.51 to 9.05 g / l, Magnesium (Mg^{++}) ranged from 66.38 to 65.69 g / l, Manganese (Mn^{-}) ranged from 0.35 to 0.40 g / l, Phosphate (PO_4^{-}) ranged from 5.6 to 6.00 g / l and Zinc (Zn^{++}) ranged from 0.32 to 0.35 g / l respectively. Their concentrations mean values were as follows: Ca^{++} (101.92), Fe^{++} (0.60), K^{+} (8.73), Mg^{++} (65.88), Mn^{-} (0.38), PO_4^{-} (5.18) and finally Zn^{++} (0.33) all in g / l.

Table 1: Minerals Evaluated in leaves of *M. oleifera* Cultivated in Jere, Borno

Mineral Ions Evaluated	Number of Tests	Readings in g / l			Mean ± SD	* Standard Values
		1st	2nd	3rd		
Calcium (Ca^{++})	x 3	102.0	101.86	101.91	101.92 ± 0.08	75.0 g / l
Iron (Fe^{++})	x 3	0.62	0.59	0.60	0.60 ± 0.02	-
Potassium (K^{+})	x 3	8.51	9.05	8.65	8.73 ± 0.28	10.0 g / l
Magnesium (Mg^{++})	x 3	65.58	66.38	65.69	65.88 ± 0.43	-

Manganese (Mn^{-})	x 3	0.35	0.40	0.38	0.38 ± 0.03	-
Phosphate (PO_4^{-})	x 3	5.6	6.00	5.83	5.18 ± 0.20	-
Zinc (Zn^{++})	x 3	0.32,	0.35,	0.32	0.33 ± 0.02	5.0 g / l

Keys: - g / l = gram per litre, Sd = Standard Deviation, - = Not known as at the time of this research study by the researcher.
***Source: -** WHO / AOAC, safe limit, revision 2, section 973 – 42B (B).

Chart for Moringa oleifera cultivated in Jere Borno, Nigeria

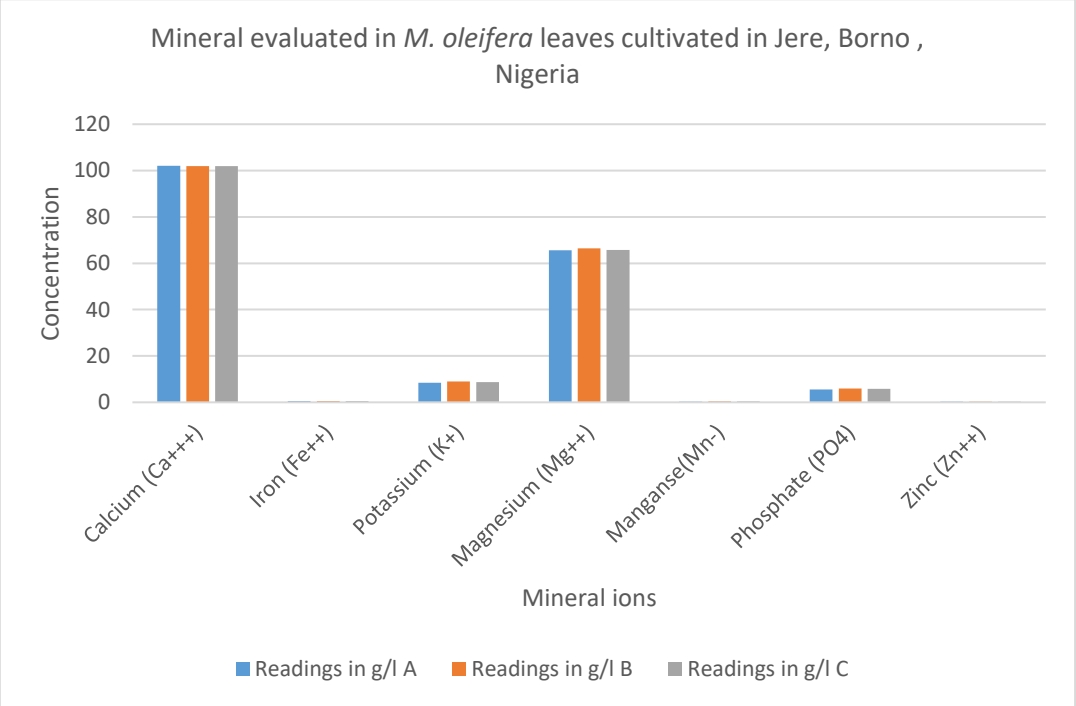

Figure 1: Mineral Ions evaluated in *M. oleifera* leaves cultivated in Jere, Borno, Nigeria

Discussion

Food security measures and biosecurity management have to be a source of concerned in food production and its health management. According to Idris *et al*., 2020; Gwana *et al*., (2016); and Kosolo *et a*l., (2010) who stated that quality and large scale food production and health management are paramount issues to be born in mind and should be highly emphasised for the wellbeing of human and animal needs. Previous research studies have been reported that some plants are edible to both human and some animals, because of their possession of rich minerals, vitamins, nutrient and medicinal properties. Okiki *et al*., (2015) and Fahey, (2005) also stated that in the last few years, such plant, as well as *M. oleifera* has been in the limelight of research and many researchers have reported that it is a potential source of minerals (both micro and micro), outstanding non-nutrients (phytochemicals) and highly digestible nutrients, and vitamins, especially vitamin C and carotenoids suitable for exploitation in many of the developing countries globally, where undernourishment is a major concern; basically for its nutritional,

prophylactic, and therapeutic potentials which has been reported in various experimental studies in humans and animals although in limited number.

In this research study, the results obtained from the analysed sample of *M. oleifera* leaf revealed that it contained more ash value which is an indicative for good and highly source of inorganic minerals content. According to Okiki *et al*., (2015); Valdez-Solana *et al*., (2015); Sodamade *et al*., (2013); Akpabio *et al*., (2012); stated that high ash content in food is a measure of high deposit of minerals content.

From the analysis, it revealed that the leaf sampled of *M. oleifera* that were cultivated at college of Agriculture farm had the highest concentration value of Ca^{++} of 102 g / l approximately. This value that was obtained, it exceeded the standard recommended value in medicinal plant or vegetable plant (75.0 g / l), when compared with. Then it followed by the Mg^{++} of which had the concentration value of 66 g / l approximately. Followed by K^{+} which had the concentration value of 9 g / l approximately which was less than the standard value of 10.0 g / l recommended safe limit by WHO / AOAC. It then followed by PO_4^{-} ions which had value of concentration of 5.2 g / l, and then followed by Fe^{++} ions which had a concentration value of 0.60 g / l, followed by Mn^{-} had 0.38 g / l, and the least among the elemental ions evaluated was Zn^{++} ions 0.33 g / l which was found less than that of standard recommended safe limit value of 5.0 g / l by WHO / AOAC. In sequentially, when these elemental ions are arranged in order of their magnitude, hence, we will have; $Ca^{++} > Mg^{++} > K^{+} > PO_4^{-} > Fe^{++} > Mn^{-} > Zn^{++}$ respectively.

In another finding, the results revealed that the sample of *M. oleifera* leaf powder possess minerals constituents quantitatively. These mineral substances such as Ca, Mg, K and PO_4 were found in abundance while Mn^{-}, Fe and Zn were found in moderate concentration values in this research study. These elements are very important to body system to functions well and healthy. According to Asuk *et al*., (2015) who stated that Ca along with K is required for the formation and the maintenance of bones and teeth. It is also required for blood clothing and muscles contraction. Also reiterated that, Mg is required in over 300 enzymes that use adenosine triphosphate. It contributes to DNA and RNA synthesis during cell proliferation. It is also important for nerves and heart function as well as release of insulin and ultimate insulin action on cells. It decreases blood pressure by dilating arteries and preventing abnormal heart rhythm.

Okiki *et al*., (2015) and Akpabio *et al*., (2013) who both stated that potassium (K) is very important in regulation of water and electrolytes balance and acid – base balance in the body system, as well as responsible for nerve action and function of the muscles. Deficiency of K lead to muscle paralysis. Also Asuk *et al*., (2015) stated that to prevent anaemia and other blood related diseases in infants, pregnant and nursing women as well as elderly people, diet rich in Iron (Fe) should be taken regularly. Added to this, Fe also plays a pivotal role in immune function, cognitive development, temperature regulation and energy metabolism. Fe is essential for the synthesis of haemoglobin and myoglobin, its deficiency results to and could cause anaemia. Offor *et al*., (2014) stated that Zinc (Zn) content of *M. oleifera* is indication that it can play an important role in the management of diabetics, which results from deficiency in insulin secretion, insulin action or both. Zinc is important for the synthesis of DNA, RNA, insulin and function of several enzymes, zinc is also required for cell reproduction and growth especially the sperm cells.

Summarily, the deficiencies of these essential macro and micro elemental ions in animals lead to paralysis, less sperm count, ecclaemsia, convulsion, irritability, anaemia, calcaemia, nervous malfunction, and may even lead to death. The finding this research study reveals that there are mineral substances such as Ca, Mg, K and PO_4 were found in

abundance while Mn^{-}, Fe and Zn were found in moderate concentration values level compare to most values that were reported for medicinal and vegetables plant in literature.

Conclusion

According Gwana *et al*., (2021) Food security and biosecurity management have to be a source of concerned when considering food production and its management. Previous studies have been reported that some plants are edible to both human and some animals; plant such as drumstick or horse red or miracle tree *(Moringa species)* that their various parts (root, stem back, leaf, flower, seed and pods) possess rich nutrient and medicinal properties, quality and large scale food production and health management are paramount issues to be born in mind and should be highly emphasised for the wellbeing of human and animal needs. Plants such as well as *Moringa oleifera* has been in the limelight of research and many researchers have reported that it is a potential source of minerals, outstanding non-nutrients, highly digestible nutrients, and some vitamins, especially vitamin C and carotenoids suitable for exploitation in many of the developing countries globally, where undernourishment is a major concern; basically for its nutritional, prophylactic, and therapeutic potentials.

Plants that their various plants' parts possess rich nutrient and medicinal properties especially, the leaf part of *M. oleifera* leaves possessed some minerals (macro and micro) which are potentials useful to the body system of man and animals. Among some plant's minerals substances such as Ca, Mg, K and PO_4 were found in abundance while Mn^{-}, Fe and Zn were found in moderate concentration values in this research study. These elements are very important to body system to functions well and healthy.

Recommendations

Based on the findings of this research study, we recommend the following; that there are the needs to carry out intensive research on the evaluation of minerals analysis of all parts of the plant *Moringa oleifera*, including the roots, leaves, stems, stem barks, flowers and seeds in order to evaluate the nutritive and non-nutritive (plant chemical) compositions of the plant. That peoples should always consume the leaves part of *M. oleifera* in form of soup or it salads. As such *M. oleifera* leaves has being established that contains some minerals (both macro and micro elements) that maintain the body metabolism and regulate osmoregulation in both man and animal wellbeing. Also has a low fat content, high carbohydrate and plant protein content and suggest that are proteins of good quality and are suitable for animal feeds and human diet and can effectively contribute to the daily protein needed, that it could be a good source of meal supplement, source of energy and structural materials as well as add to the bulk of the diets, they play a pivotal role as they provide energy to cells such as brain, muscles and blood, and they contribute to fat metabolism and laxative for human beings. The leaves part of *M. oleifera* should be added to human and animal feeds as meal supplement level, this is because, it possessed much plant nutrients and non-nutritive properties.

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