Academic Scholars Publishing League (ASPL)
International Journal of Scholarly & Educational Research in Africa
ISSN: 2360-9981 | Volume 13, Issue 9 | March, 2024| pages 13 – 23
DOI: 7360-983-3-1392
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https://arcnjournals.org

Comparative Study on some Mineral Composition of the Seeds Extract of *Cassia occidentalis*, *Ocimum gratissimum* and *Senn tora* Obtained from Kafur Local Government Area of Katsina State, Nigeria

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Abstract: *Vegetables are essential resources that supplies food to nearly all terrestrial organism including Humans. Hence, there is the need to analyze its mineral composition, for the awareness of the benefit and nutritional values they contained. Ocimum gratissimum, Cassia Occidentalis and sennatora seeds extract collected from different locations in Kafur Local Government Area, Katsina State were analysed for minerals composition. After samples digestion, Atomic Absorption Spectroscopy (AAS) was used to study the mineral composition. The results obtained were compared with RDA & FAO permissible limits. The results of minerals composition in (mg/kg) were in the following ranges (19.05 ± 0.25 – 45.39 ± 0.235) for Ca, (0.789 ± 0.031 – 5.65 ± 0.132) for Fe, (68.68 ± 0.228 – 293.9 ± 0.53) for K, (18.01 ± 0.121 – 24.73 ± 0.10) for Mg, ((9.674 ± 0.197 – 16.67 ± 0.429) for Na and (0.472 ± 0.01 – 1.641 ± 0.002) for Zn. All the values were below the permissible limit of RDA/FAO. The result of statistical analysis indicated no significant differences as p – values were found to be less than 0.05 (p<0.05).*

Keywords: *Vegetable, Occimu gratissimum, Senna tora, Cassia occidentalis Seed, Mineral Composition.*

ntroduction

Plants are the cheapest and most available sources of important nutrients, supplying the body with minerals, vitamins and some hormone precursors, protein, energy and essential amino acids (Amaechi, 2009). Most tropical countries are blessed with a diversity of foodstuffs which play a basic role in nutrition and healthy body development. Unfortunately, an estimate of 789 million people in developing countries still suffers from malnutrition, especially infants and children of rural areas (WHF, 2005). Malnutrition can be tremendously reduced with an increased use of foods rich in energy, proteins, iron and vitamin A most especially those from the rural environment. The lack of nutritional information and any nation that requires development must search inward to identify areas where it has comparative advantage over other nations and seek to develop the identified areas. Apart from hydrocarbons, Nigeria has advantage in agricultural sector where varieties of products are produced due to the favorable climatic condition, good soil and the fact that over 70% of the entire land mass of the country is arable. Seed extracts is one of these major agricultural product and serve as main source for production of edible oil that are normally called vegetable oil (Chauhan, 2019).

Inadequate development of nutritionally improved products from local raw materials have direct bearing on nutrition. Recently in Africa, increased interest has been observed in the use of herbs to improve health; herbs could be regarded as one of the first real functional food, but has largely become forgotten food in the modern westernized diet. Culinary herbs are as important today as they were in ancient times for enhancing the flavor and taste of our foods as well as serving as a source of dietary medicine (Uhegbu *et al.,* 2011).

Materials and Methods

All the chemicals used were of analytical grade purity, distilled water was used for solution preparation. Analytical grade reagent and deionized water were used throughout the study. All the glass wares and plastic containers used were washed cleaned and dried in an oven at 105^{o}C. All weighing was carried out on analytical weighing balance.

Sampling and Sample Preparation

Fresh samples of *senna tora, occimum gratissimum,* and *cassia seeds*, were obtained from Kafur Local Government Area of Katsina State. The plant samples were identified at Department of Plant Science, Bayero University Kano. The samples were thoroughly washed with deionized water to remove some dust, dirt, or possibly parasites. The samples were air-dried at room temperature and then pulvarized with mortar and pestle and were packed in airtight containers. The names of the plant seeds used in the analysis were reported in table 1.

Table 1: Sample seeds Analyzed:

S/N	Botanical Name	Common Name	Family	Abbreviation
1	*Ocimum G seed*	Scent leaf	*Lamiaceae martinov*	OGS
2	*Senna tora* Seed	Sickle Senna	*Fabaceae*	STS
3	*Cassia Occidentalis*	Coffee Senna	*Fabaceae*	COS

Extraction of seeds Samples

Powdered samples was loaded in a weight extraction thimbles and introduced in a socxhlet apparatus connected to a solvent flask, containing a require quantity of solvent (n-hexane) with anti-bumping granules, and connected to a condenser. The soxthlet set-up was then placed on a condenser at 65^{o}C for 8 hours extraction. The thimble was then removed and the solvent with the extract was then transferred in to conical flask and place on water birth for solvent to evaporate and the flask was then cooled after oven dried at 105 ^{o}C for 1hour (Rahimullah, 2016).

Digestion of samples

2g of the seeds extract was weight in the crucibles and placed in the muffles furnace at room temperature, the temperature was then gradually increases to reached 550^{o}C for 3hour until the samples turn to ash. The ash was then dissolves in 10% hydrochloric acid, filtered and

diluted to a required volumes in a standard flasks with distilled water. The solution was then run for mineral analysis by Atomic Absorption Spectrophotometer. (AOAC)(2005).

Instrumentation

Mineral elements were determined using Atomic Absorption Spectrophotometer (AAS) equipped with background correction. The result of each sample represents an average of three replicate reading. A calibration curve of Absorbance Against concentrations of each element under investigation was plotted and finally the concentration of each element was determined from the calibration curve of its standard by interpolation.

RESULT

The results of minerals analyses of the three (3) plant seeds samples analyzed are presented in figures: 1-6.

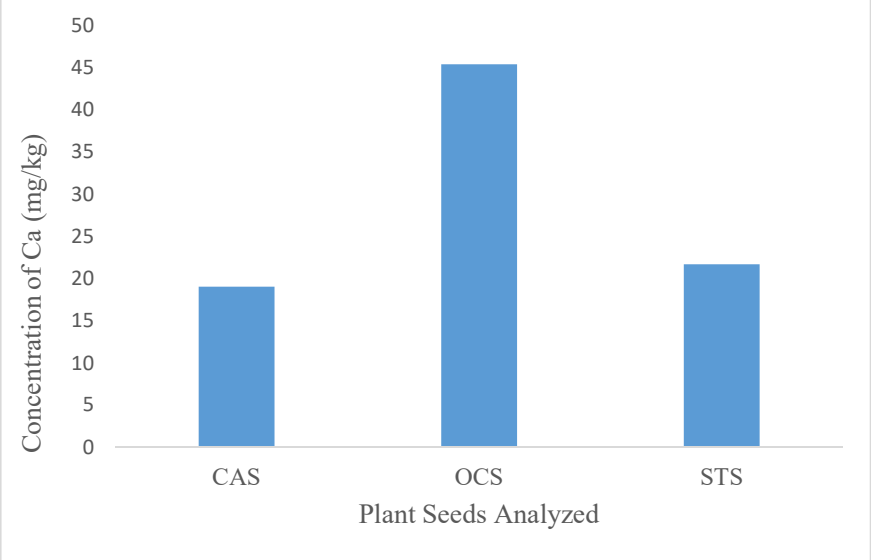

Figure 1: Concentration of calcium in the plants seeds analyzed (mg/kg)

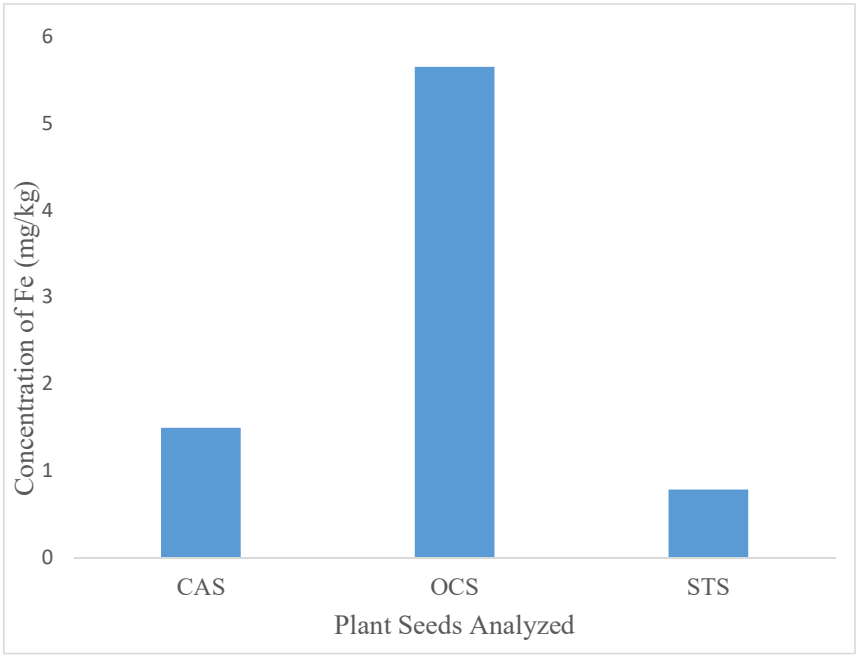

Fig 2: Concentration of Iron in the Plant Seeds Analyzed (mg/kg).

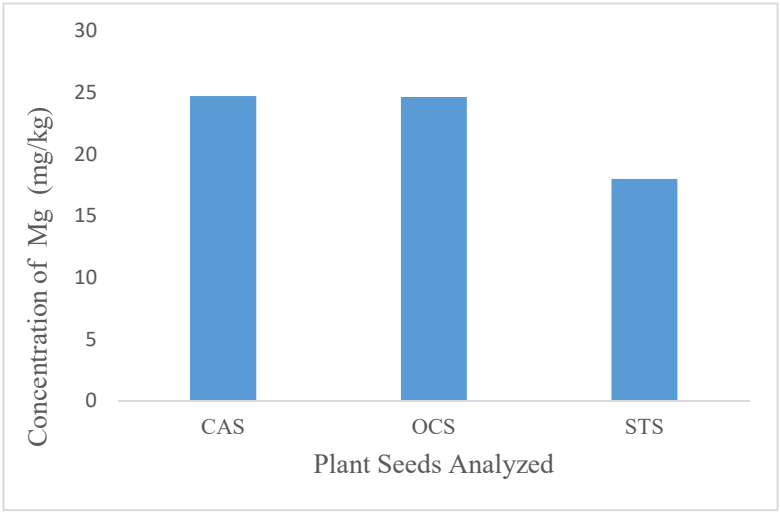

Fig 4: Concentration of Magnesium in the Plant Seeds Analyzed (mg/kg).

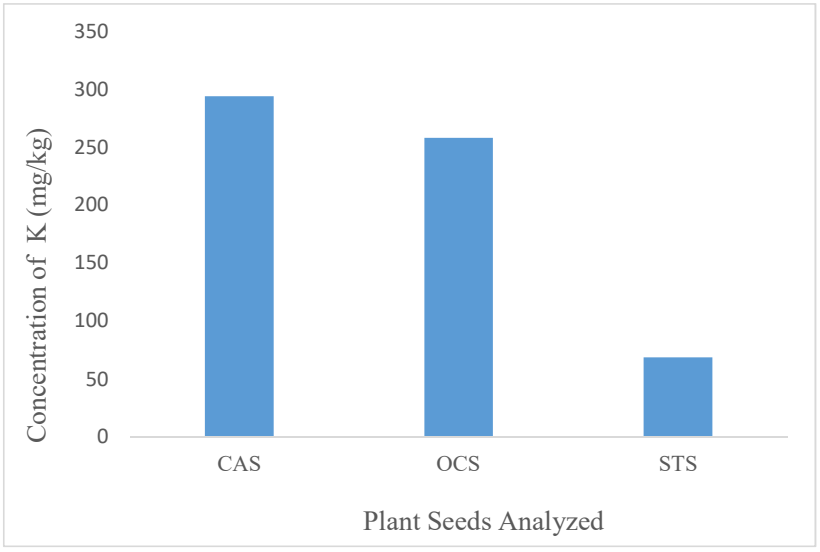

Fig 3: Concentration of Potassium in the Plant Seeds Analyzed (mg/kg).

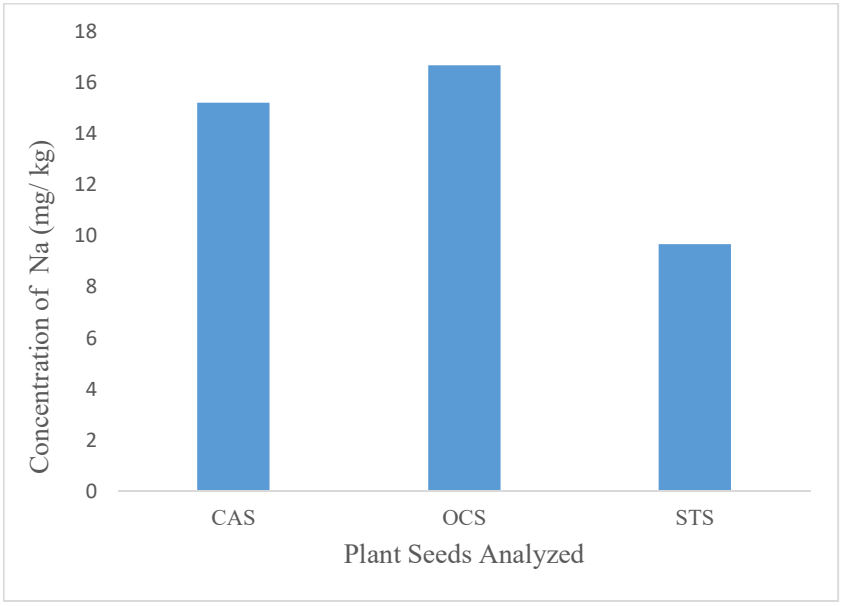

Fig 5: Concentration of Sodium in the Plant Seeds Analyzed (mg/kg).

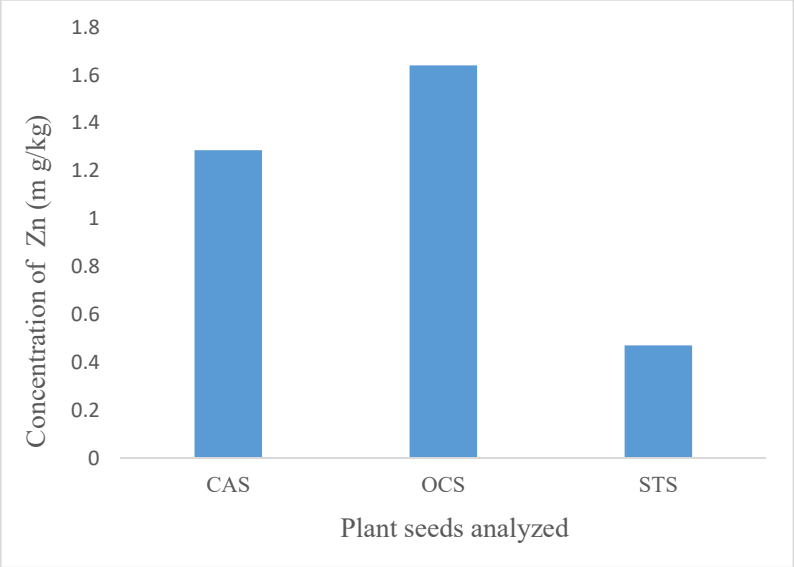

Fig 6: Concentration of Zinc in the Plant Seeds Analyzed (mg/kg).

Discussion

Mineral Composition of Selected Seeds Samples

Fig. 1. Calcium: Showed calcium concentration ranged from 19.05 ± 0.269 mg/kg for *cassia* seed to 45.39 ± 0.235 mg/kg for *Occimumgratissimum* seed. The concentration of calcium was found to be 21.72 mg/kg for *Senna tora* seed extract. The result obtained from the present work were observed to be below the permissible limit of 3000mg/100g by WHO and FAO (2006) for proper growth and development. Calcium is important for maintaining strong bones and teeth, supporting nerve transmission, promoting proper muscle function, involving in many enzymatic reaction within the body (Utta 2022). Intake of calcium, magnesium, phosphorus, and potassium with moderate level of sodium intake is associated with aterial hypertension, insulin resistance, demineralization of blood and overall cardiovascular risk (Davies 2012). A value of 63.96 ± 0.11 mg/100g for Calcium in *Telfairia occidentals* from Anambra, as reported by Oladejo *et al.,* (2019) was higher than the present work. Utta *et al* (2022) reported calcium level of 158.02 ± 0.28 mg/100g Ca, in *senna tora* leaves, the result was high than the present study. This could be as a result of continuous application of organic manure or fertilizer which led to accumulation of calcium in the soil. 39 mg/100g for Calcium in cabbage obtained by Kumar *et al* (2020) and 36.99 ± 3.19 mg/g reported by Odoh *et al* (2017). Olapade *et al* (2004) obtained 29.73± 0.90mg/kg calcium in *Cassia sieberiana* seed closely agreed with the findings of the present study. 13.65 – 23.00 mg/100g concentration of calcium in the leaves of *amaranthus* and *occimum* leaves were reported by Oluwole *et al,* (2019), the result were below that of the present study. This could be as a result of insufficient calcium in the soil.

Fig. 2. Iron: Revealed *Ocimum gratissimum* with the highest concentration of iron 5.650 ±0.0132mg/kg followed by *cassia* seed with 1.497±0.021mg/kg and least 0.789±0.03mg/kg found in *senna tora* seed extract respectively. The RDA value of iron is 8 mg/day. This plant

seeds are good source of iron. These results were below the permissible limit of 425.00 mg/100g by WHO and FAO (2006). The values obtained in this work were observed to be lower compared to other published works, such as 13.85 mg/100g obtained in *moringa* seed reported by Adukana *et al,* (2013). 40.81 mg/kg obtained in violet basil from Iran reported by Mirdehghan, (2009). 111.50 mg/100g in *citrullusvulgaris* from Adamawa as reported by Penuel *et al,* (2014). 6.44±0.4 mg/kg in *Trianthema portulacastrum L* was reported by Khan *et al,* (2013). This could be attributed to the high moisture contained in the soil which washes away iron thereby reducing its concentration in the soil. Iron is required for hemoglobin formation and its deficiency leads to anemia, may increase your risk of developing complication that affect the heart or lungs, such as an abdominally fast heartbeat (tachycardia) or heart failure. Iron helps to oxygenate the blood, convert blood sugar to energy, and boost the immune system, aids cognitive function, support healthy skin, hair and nails (Adukana *et al*., 2013).

Fig. 3. Potassium: Obtained potassium concentration of 293.9 ± 0.53 mg/kg for *Occimumgratissimum* seed, 258.1 ± 1.03 mg/kg for *cassia* seed and 68.68 ± 0.228 mg/kg for *Senna tora* seed. These results were below the permissible limit of 3500 mg/100g by WHO and FAO (2006). The RDA for potassium is 2500mg for adult. The sample contributes some percentage to RDA, meaning the seeds are good source that contribute to the diet of hypertensive patients (FAO). Potassium plays a critical role in human health. It involved in maintaining blood pressure and reducing risk of stroke, preserving calcium store in bone, and helping the kidney to work efficiently. Low potassium level can make muscles feel week, or even become paralyzed, and abnormal heart rhythms may develop. The results of the study closely agreed with the reports of Oyewole *et al,* (2022) who obtained 319.36 mg/kg for K in *cassia fistula* seed from Ado Ekiti and Olapade *et al.,* (2019) that obtained 252.32.33 ± 14.95 mg/kg for K in *cassia sieberiana seed*. 18.76 ± 0.1 mg/kg reported by Aluko *et al.,* (2012) in *Ocimumgratissimum* was quite lower than the values obtained in the present work. This might be as a result of the sandy nature of the soil which allow the movement of water pass through it, which led to decrease potassium in the soil. (Oluwole *et al.*, 2019).

Fig. 4. Magnesium: Showed concentration of magnesium in the analysed samples ranged between 24.73 ± 0.10 mg/kg to 18.01 ± 0.121 mg/kg with *Ocimum gratissimum* having the highest concentration, followed by *Cassia* seed with 24.62 ± 0.07 mg/kg and *Senna tora* seed with 18.01 ± 0.12 mg/kg. The results obtained in this work were below the permissible limit of 350 mg/100g by WHO & FAO (2006).Almost similar values were previously reported for leafy vegetables which include 18.70 mg/100g in *CurcubitaSpp* (Nwofia *et al*., 2012) and 28.3 ± 2.5 mg/100g for Mg in *mollugapentaphylla* (Arasaretnam *et al*., 2019). 61.61 ± 0.11 mg/100g for Mg in *Talinum triangulare* from Ado-Ekiti as reported by Oladejo *et al*., (2019) was higher than the values obtained in the present work. This high concentration might be as result of application of fertilizer which led to the accumulation of magnesium in the soil. Magnesium is important for reducing high blood pressure, combats asthma, protect your heart, protects against diabetes and improveds digestion and alleviates constipation symptoms (Adukana *et al*., 2013).

Fig. 5. Sodium: Revealed sodium concentration of sampled was 16.67 ± 0.429 mg/kg for *cassia* seed, 15.21 ± 0.207 mg/kg for *Occimumgratissimum* seed and 9.674 ± 0.197 mg/g for *Senna tora* seed. These results were below the permissible limit of 3400 mg/kg for sodium by WHO

& FAO (2006).The values were comparable lower than 1.85 mg/100g in *senna obtusfolia* (Aja *et al*; 2017).

Almost similar values were previously reported for sodium in some green leafy vegetables such 9.50±0.03 mg/kg reported for sodium in *Ocimumgratissimum* in South Western Nigeria (Aluko *et al*., 2012). 9.19 mg/kg for sodium in *cassia Fistula* from Ado-Ekiti (Oyewole *et al*., 2022) a slightly higher value of 21.85 ± 7.38 mg/kg was also reported for sodium in *Faba* been seed (Oluwale, 2019). This might be due to accumulation of sodium in the soil as a result of application of fertilizer or pesticide. Sodium is needed by a body in relatively small amount. Sodium is essential in humans for the regulation of body fluids and electrolytes, and for the proper functioning of nerves and muscles. (Aja *et al* 2017).

Fig. 6. Zinc: Obtained zinc concentration in selected seed samples, the result revealed *cassia* seed contained the highest concentration of 1.641 ±0.002 mg/kg followed by *Ocimumgratissimum* with 1.287 ± 0.011 mg/kg. *Senna* tora seed was found to have 0.472 ± 0.0051 mg/kg. These values were found to be below the permissible limit of 20 mg/kg by WHO & FAO (2006) Lower values than the present work were previously reported for zinc in leafy vegetables which include: Muhammad, (2011) reported 0.375 mg/kg for zinc in *cassia tora* from Kano, Igwe, (2016) reported 0.77 ± 0.04 mg/kg for zinc in *tetrapleuratetraptera* seed from Abia and Olapade *et al*., (2014) reported 0.99 ± 0.26 mg/kg for zinc in *cassia sieberiana* seed in some settlement around Oyo State. However, Ezello *et al*., (2020) reported 123.94 ± 0.01 mg/kg for zinc in bitter leaf from Ose market Anambra. This value was found to be extremely higher than the values obtained in the present study. This indicate a significant pollution. This high concentration might be due to accumulation of zinc in the soil where zinc rich fertilizer is applied. Zinc is an essential in human health and is an important to life, it is natural element found in all plants and animals and play a crucial part in the health of our skin, bones, hair, nails, muscles, nerves and brain function. Zinc is essential for growth, formation of DNA, and used to control enzymes that operate and renew the cells in the bodies. Deficiency of zinc may result in dwarfism. (Saleem *et al*; 2022).

The Disparities in the concentration of minerals in vegetables could be attributed to vegetable specie, age of vegetable, part of the vegetable used, composition of growth substrate and the environment (soil, water, temperature & humidity) (Trowbridge and Mortorel 2002).

Conclusion

The results of the study provide information on the mineral composition of the seeds samples.' The seeds samples were observed to have acceptable values of the minerals (Ca, Fe, K, Mg, Na, and Zn) were also present in appreciable amount. The samples contains sufficiently good amount of some essential nutrients even though may not provide all nutrient required by a man. They contain moderate amount of calcium, which essential for Calcium for maintaining strong bones and teeth, supporting nerve transmission, promoting proper muscle function, involving in many enzymatic reaction within the body for proper growth and development. It is also low in sodium which help in decreases blood pressure. Potassium *in cassia* and *ocimum* are in appreciable quantity. *Ocimum* seed among the others, possessed high mineral elements. According to WHO, RDA/FAO values, compared to the results obtained; consumption of the seeds extract analyzed, can contribute with some essential nutrient require by the body.

References

Adekunle, O. A., Adedamola, A. O. & Bayonle, O. M. (2018). Proximate, phytochemical and mineral compositions of roasted seed of coffee senna (Senna occidentalis Linn). *Annals: Food Science and Technology*, 19 (1).

Aja, P.M., Chijioke, O.M., Okohu, M.O., Ibere, J.B. & Ugwu O. (2017). Mineral & Proximate Composition of Senna occidentalis leaves. *Journal of Applied Sciences* 2(1): 59 – 74.

Aluko, B.T., Oloyede, O.I. & Afolayan, A.J. (2012). Photochemical and Nutrient composition of the leaves of *Occimumgratissimum*. *African Journal of Biotechnology* 11(63): 12697 – 12701.

Amaechi, N.C. (2009). Nutritive and anti – nutritive evaluation of wonderful Kola (Buccholzia Coricea) Seeds. *Pakistan Journal of Nutrition.* 8: 1120 – 1122.

AOAC, (2005). Official Method of Analysis. 15th Edition. Association of Official Analytical Chemist, Washington D.CPP, 328-334.

Arasaretnam, S., Kiruthika, A., Mahendran T. (2019). Nutritional and Mineral composition of selected green leafy vegetables. *Cylon Journal of Sciences* 47(1) 2018. 35 – 41.

Bamigboye, A.Y., Okafar, A.C. & Adepoju, O.T. (2010). Proximate and mineral composition of whole and Dehuled Niegrian sesame seed. *African Journal of Food Science and Technology* 1(13): 71 – 75.

Chauhan, N.S. (2019). Medicinal and aromatic plants of Himachal Pradesh. Indus Pub. Co. New Delhi. 151-52. Anonymous. The Wealth of India A dictionary of Indian raw materials & Industrial products, Publications & Information Directorate, C.S.I.R., 1(3), 368-70.

Daniyan, S.Y., Abalako, M.E., Aransiola, S.A. & Elenba, O.M. (2011). Phyto-chemical screening, proximate analysis and mineral composition of *cassia occidentalis* seed extract. *Asian Journal of Pharmaceutical Health sciences* 1 (3), 1 – 4.

Ezello, C.A., Okonkwo, S.I., Onuarah, C.C., Chibuezeh, A.L. & Ugwunnadi, N.E. (2020). Determination of heavy metals in some fruits and vegetables from selected markets in Anambra. *Acts Scientific Nutritional Healthy* 4(4). ISSN 2582 – 1423.

FAO, (2006). Human vitamin and mineral requirements. Report of a joint FAO/WHO expert consultation Bankok, Thailand 3(5), 151-25.

FAO/WHO, (2006), Food Composition Data 6th edition 101-103.

FNB (2005). Food and Nutrition Board. Dietary reference intake for water, potassium, sodium, chloride and sulphate. National Academic Press, 500 Fith Street, N. W. Washinton, DC 20001, USA, 77-185.

Igwe, O.U. & Akabuike, H.C. (2016). Free radical scavenging activity, phytochemical and antimicrobial properties of tetrapleuratetraptra seeds. *International Journal of Chemistry and Chemical Science* 3(2): 37 – 42.

Kdam, R.M.K. (2022). Proximate analysis and phytochemical screening of Golden Shower Tree (cassia fistula) leaves & Fruits and its antimicrobial activity. A thesis submitted to University of Gezira in fulfilment of the requirements for the award of PhD in Chemistry, pp 78-80.

Kumar, D., Kumar S. & Shekhar C. (2020). Nutritional components in green leafy vegetable: *Journal of Pharcognosy and Phytochemistry* 9(5): 2498 – 2502.

Mirdehghan, S.H. (2009). Determination of mineral nutrients in some leafy vegetables in Iran. Proceeding of the 6th international post – harvest symposium Antalya, Turkey April, 2 – 12 – 2009.

Muhammad K.J., Akanji, F.T., Jamil, S., Basar N. & Mahdi S. (2011). Phytochemical screening and proximate analysis of ethanolic extract of cassia Seed mineral. *Nigerian Journal of Sciences 8*(11):55-68.

Nwofia, G.E., Nwogu, V.N.K., Blessing, N. (2012). Nutritional variation in front and seeds of pumpkins (curcubiata Spp) accession from Nigeria. *Pakistan Journal of Nutrition* 11(10): 848 – 858.

Odoh, R., Gary, Y.G., Sundra, U.I. & Archibong, C.S. (2017). Nutritional Evaluation and Proximate Analysis of varities of some edible leafy vegetable in Northern Nigeria. *Journal of Bioscience and Biotechnology Discovery* 2(1): 30 – 45.

Oladejo, A.A., Apolowo, O.A., Mustapha, S., Aliyu, A.S., Ilesanmi, O.T., Fatoyinbo, A.A. (2019). Comparative study of mineral composition of some selected Nigerian Green leafy vegetables from two different regions. *Asian Journal of Advances in Agricultural research* 11(3):1 – 5.

Olapade, A.A., Ajayi O.A. & Ajayi I.A. (2016). Physical and chemical properties of cassia sieberiana seeds. *International Food Fesearch Journal* 21(2): 761 – 772.

Olumide, M.A., Ajayi, O.A. & Akinboye, O.E. (2019). Comparative study of proximate, mineral and phytochemical amygdaline and moringa oleifera. *Journal of Medicinal Plant Research*. 13(15): 351 – 356

Oluwole, S.O., Fajana O.O., Ogum, M.L., Ogbe, A.A. & Ademola, O.A. (2019). Proximate and mineral composition, Analysis of the leaves of Amarathus cruenties and occimumgratissimum in some selected areas in Lagos. *International Journal of Ecosystem* 9(1): 6 – 11.

Oyewale. T.A., Oyewole, O.N. & Falodun, A.E. (2022). Cassia Fistla seeds**,**Nutritional Profile and Therapeutic Potentials,*Insight in Chemistry and Biochemistry* 2(2) PP 1 – 7.

Rahimullah, S. & Syed. I.Z. (2016). Phytochemical proximate and nutrient analysis of cassia Toraseedc. *International Journal of Pharmaceutical Science Invention* 6(1) PP 4 – 6.

Saleem, M.H., Usman, K., Rizwan, M., Aljabri, H. & Alsafran, M. (2022). Function and strategies for Enhancing Zinc availability in plant for sustainable Agriculture. *Front plant Sci.* 13:10.33092 dol: 3389/Fpls/10330092.

Trowbridge, F. & Mortorell, R. (2002). Forging Effective Strategies to combat iron deficiency. Summary and Recommendation. *Journal of Nutrition*. 132(4): 875 – 879.

Utta, A.J., Maimalari, Z.B. & Usman M.M. (2021). Proximate composition mineral content and anti-nutrient factors of leaves of Senna Occidentalis. *African Journal of Pharmaceutical Research and Development* vol. 13(2): 127 – 132.