International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 10 October 2023
DOI: 10.47191/ijcsrr/V6-i10-34, Impact Factor: 6.789
IJCSRR @ 2023

A Comparative Analysis of the Nutritional and Chemical composition of six West African Medicinal Fruits

N. E. Ahajumobi[1*], E. T. Oparaocha T.[2]
[1] Dept. of Public Health, College of Health Science, Walden University, Minneapolis, USA.
[2] Dept. of Public Health, Federal University of Technology, Owerri, Nigeria.

ABSTRACT:
Background: Many nations can no longer afford the ever rising cost of healthcare, governments across the world are in search of alternative and affordable ways of disease control. Clinical studies are revealing hope from herbs.
Objectives: A comparative analysis of the nutritional and chemical composition of six fruits used for treating many diseases in West Africa; to examine the composition, concentration and education for easy choice of suitable fruits based on peculiar situations as well as to provide easy access of consensus evidence to busy healthcare practitioners. Also, clinical evidence of plant medicine is not as much as modern medicine and education is necessary.
Methods: A systematic review investigation. Theory is a Community approach to intervention services. Search engines were Google scholar, Firefox and Google.
Results: Macro and micronutrients were present in the plants. Moisture was high in all but, *Tetrapleura tetraptera*. *Anacardium occidentale*, 86.00g/100 g/dry weight showed highest carbohydrates concentration, *Annona muricata* was lowest, 14.63%. Crude protein was generally low in all the plants, *Chrysophyllum albidum* scored highest, 7.00%, *Annona muricata scored lowest*, 1.00%. Fat was generally low in all, highest fat, 4.00% occurred in *Tetrapleura tetraptera* and least, 0.88% in Annona muricata. Fibre concentration ranges from low to high. The highest fibre occurred in *Tetrapleura tetraptera*, 45.00% and the least in *Mangifera indica*, 1.80%. Ash was excessively high, 60.00% in *Annona muricata*, *Mangifera indica* came last with a score of 1.95%. Outcome will be beneficial to users.
Conclusion: The fruits were rich in nutrients with nutraceutical and pharmacological properties, justifying its use as native medicine.

KEYWORDS: *Anacardium occidentale, Ananocia muricata, Chrysophyllum albidum,* Comparative analysis, chemical composition, herbal plants, *Mangifera indica, Carica papaya,* native medicine, nutrient composition, *Tetrapleura tetraptera*.

1. INTRODUCTION

There is a rising cost of providing healthcare to communities across the world including the rich countries, Average health care spending per person in the United States, $15,275 CAD, next was Germany, $8,938 CAD, Netherlands, $7,973 CAD, Canada, $7,507 CAD, Sweden, $7,416 CAD and Australia, $7,248 Cad (56). Many countries are now seeking alternative ways to restore health to cut down costs. Plants used in Africa for controlling diseases are promising, and the rising demand for alternative medicines worldwide necessitated a need for this research essentially, as 80% of poor populations in developing countries carry a heavy burden of healthcare costs, which often comes from individuals' purses. Also, side and adverse effects of some drugs are standing in the way too. Clinical evidence showed that natural remedies when properly administered not only show small and no side effects, they are nutritionally rich, with pharmacological properties, which possess the capacity to restore health. In this systematic review, the authors sought to determine the nutritional and chemical composition of six popular plants used as traditional medicine for treating disease in West Africa namely, *Anacardium occidentale, Ananocia muricata, Mangifera indica, Carica papaya, Chrysophyllum albidum* and *Tetrapleura tetraptera*. The fruits were ranked based upon the nutritional and chemical concentration to promote right choices for various body conditions. For a reason that evidence has suggested that the fruits possess nutritional and chemical compositions, which have strong potency against diseases and not all health conditions need very strong potent remedies to treat, some may need something mild or moderate. Thus, the levels of nutrient and chemical concentration of each was determined. The

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 10 October 2023
DOI: 10.47191/ijcsrr/V6-i10-34, Impact Factor: 6.789
IJCSRR @ 2023

purpose was to inform users, which include the public, health practitioners, researchers, farmers, manufacturers and policy decision makers.

2. METHODOLOGY

This is a systematic review. This research determined the nutritional and chemical composition of six fruits used as native medicines for treating various diseases in West Africa and made a comparative analysis of the nutritional and chemical composition of the fruits studied such as, *Anacardium occidentale, Annona muricata, Mangifera indica, Carica papaya, Chrysophyllum albidum* and *Tetrapleura tetraptera.* Search engines used for the search were google scholar, Bing, Firefox, Google. The articles examined were peer reviewed articles that investigated the compositions of the fruits. The search words were, "*Mangifera indica, Carica papaya, Anacardium occidentale, Chrysophyllum albidum, Tetrapleura tetraptera,* and *Annona muricata,* fruits chemical composition, and specific nutrient such as, "Iodine composition of specific plant". Vitamin B1 composition of *Annona muricata*" Only peer reviewed articles were selected and included in the data used for this investigational analyses. Conditions for exclusion, non peer reviewed and article not available online. The nutritional and chemical composition of the fruits were analyzed and synthesized comparatively.

2.1 Results

A rich concentrations of some macro and micronutrients were found in the fruits, which clinical evidence suggested to have nutraceutical and pharmaceutical capacities that supports its use as native medicines for various diseases management. Authors deemed the need for proper education as essential to fill gaps and prompt attention of users for right use. A comparative synthesis of the findings were presented in four subheadings such as, macronutrient, micronutrient minerals, trace elements, and micronutrient vitamins. Tables 1-3 contains details of the nutrient and chemical compositions of the fruits, which were comparatively synthesized.

2.1.1. Macronutrients

Six fruits examined in this research constituted small to large and acceptable macronutrients in different compositional levels. Moisture was high in all but *Tetrapleura tetraptera*, with only 3% moisture. *Carica papaya, Magnifier indica, Anacardium occidentale, Annona muricata* and *Chrysophyllum albidum* scored 88.75%, 86.51%, 85.15%, 82.80% and 75.90% respectively. Least carbohydrates occurred in *Annona muricata*, 3.00% and the highest score, 86.00% occurred in *Anacardium occidentale* next was Tetrapleura tetraptera, 39.79%, Carica papaya scored 29.20% and *Chrysophyllum albidum* and *Mangifera indica* scoring 18.39% and 17.00% respectively. Crude protein occurred generally low in all fruits, with *Annona muricata* scoring lowest, 1.00% and *Chrysophyllum albidum*, scored highest, 7.00%, then *Carica papaya, Anacardium occidentale, Tetrapleura tetraptera and Mangifera indica* that scored 6.50%, 5.96%, 5.60%, and 5.00% respectively. Just like protein the crude fat concentrations among the fruits were generally low, *Tetrapleura tetraptera* scored highest, 4.00%, next was *Anacardium occidentale*, 2.64%, followed closely by Carica papaya, 2.01% then Mangifera indica, 1.60% and the least scores occurred in Annona muricata and *Chrysophyllum albidum*, that came almost bracket 0.97% and 0.86% respectively. *Tetrapleura tetraptera* showed the highest fibre concentration, 45.00%, next was Anacardium occidentale, 11.52% then, Annona muricata 5.77%, followed by Carica papaya and *Chrysophyllum albidum* with equal score of, 2.31% each and *Mangifera indica*, 1.80%. A disproportionate amount of Ash 60.00% was located in *Annona muricata*, next was *Tetrapleura tetraptera*, 9.00%, then *Anacardium occidentale*, 3.17%, followed by *Chrysophyllum albidum*, 3.00%, *Carica papaya*, 2.18%, and *Mangifera indica*, 1.95%.

Table 1. Chemical Composition of A*nacardium occidentale, Annona muricata, Mangifera indica, Carica papaya, Chrysophyllum albidum* and *Tetrapleura tetraptera* Fruit.

Nutrients	Mangifera indica	Anacardium occidentale	Annona muricata	Carica papaya	Chrysophililum Albidum	Tetrapleura Tetraptera
Macronutrients	gm/100 g	%	%	%	g/100 g	%
Moisture	86.51	85.15	82.80	88.75	75.90	3.00
Carbohydrates	17.00	86.00	14.63	29.20	18.39	39.79

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 10 October 2023
DOI: 10.47191/ijcsrr/V6-i10-34, Impact Factor: 6.789
IJCSRR @ 2023

Crude Protein	5.00	5.96	1.00	6.50	7.00	5.60
Crude fat	1.60	2.64	0.97	2.01	0.88	4.00
Crude fibre	1.80	11.52	5.77	2.31	2.31	45.00
Ash	1.95	3.17	60.00	2.18	3.00	9.00

(1, 2, 3, 4, 5, 6, 7, 8, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47).

Table 2. Micronutrient Mineral Composition of Anacardium occidentale, Annona muricata, Mangifera indica, Carica papaya, *Chrysophyllum albidum* and Tetrapleura tetraptera Fruit

Nutrients	**Mangifera indica**	**Anacardium occidentale**	**Annona muricata**	**Carica papaya**	**Chrysophyllum albidum**	**Tetrapleura Tetraptera**
Micro Nutrients	mg/100 g	mg/100 g	mg/100 g	Mg/100 g	mg/100 g	mg/100g average
Minerals mg/L						
Calcium	10.00	39.60	14.00	21.38	37.00	199.66
Potassium mg/100 g	204.30	2132.60	278.00	182.00	38.00	278.11
Sodium mc/cup	41.20	38.50	32.00	8.00	21.00	25.16
Magnesium	11.20	184.00	58.00	21.00	5.00	97.22
Phosphorus (%/100 g)	15.60	225.50	27.70	19.45	8.00	41.45
Iron	5.63	6.97	119.00	2.15	11.03	17.47
Manganese	0.16	6.40	2010.00	0.04	31.90	333.75
Zinc	0.13	11.20	35.00	0.08	0.57	15.88
Copper (Cu) (mg/kg)	0.85	0.85	17.00 ug/g	0.05	0.99	9.85
Cobalt (mg/kg)	NF	NF	NF	NF	1.20	44.00
Chromium (Cr)	0.02	0.03	0.79	0.71	1.90	NF

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 10 October 2023
DOI: 10.47191/ijcsrr/V6-i10-34, Impact Factor: 6.789
IJCSRR @ 2023

Boron	NF	NF	NF	0.10	NF	3.69
Selenium (Se) (mg/kg)	+ve	NF	NF	0.60 ug	5.40	2.97
Lead (Pb)	0.36	0.06	NF	NF	NF	NF
Nickel	NF	NF	NF	NF	5.00	NF

*+ve: Present
NR: Not found
(1, 2, 3, 4, 5, 6, 7, 8, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49).

2.1.2 Macrominerals

All fruits are rich in micronutrient minerals. Calcium (Ca) concentration was highest in *Tetrapleura tetraptera*, 199.66 mg/100 g, next was *Anacardium occidental* 39.60 mg/100 g, *Chrysophyllum albidum*, 37.00 mg/100 g, *Carica papaya*, 21.38 mg/100 g, then *Annona muricata*, 14.00 g/100 mg, *and Mangifera indica* with a lowest score of 10.00.00mg/100 g.

Potassium (K) was disproportionately high in *Anacardium occidentale*, 2132.60 mg/100 g, next was Tetrapleura tetraptera, 278.11mg/100 g, followed by Annona muricata, 278.00 mg/100 g, Mangifera indica, 204.30 mg/100 g, then *Carica papaya*, 182.00 mg/100 g and *Chrysophyllum albidum*, with a least score of 38.00 mg/100 g.

The highest level of Sodium (Na), 41.20mg/100 g occurred in *Mangifera indica*, then *Anacardium occidentale*, 38.50 mg/100 g, followed by *Annona muricata*, 32.00 mg/100 g, *Tetrapleura tetraptera*, 25.16 mg/100 g, then, *Chrysophyllum albidum*, 21.00 mg/100 g, *C*arica papaya scored lowest, 8.00 mg/100 g.
Magnesium (Mg) occurred highest in 184.00 mg/100 g *Anacardium occidentale*, next was, *Tetrapleura tetraptera*, 97.22 mg/100 g, then *Annona muricata*, 58.00 mg/100 g, *Carica papaya*, 21.00 mg/100 g, Mangifera indica, 11.20 mg/100 g, and the least score, 5.00 mg/100 g occurred in *Chrysophyllum albidum.*

The highest concentration of phosphorus (P), 225.50 mg/100 g occurred in *Anacardium occidentale*, next was *Tetrapleura tetraptera*, 41.45 mg/100 g, then, *Annona muricata*, 27.70 mg/100 g, *Carica papaya*, 19.45 mg/100 g, *Mangifera indica*, 15.60 mg/100 g, and *Chrysophyllum albidum* with the least score of 8.00 mg/100 g.

2.1.3.Microminerals (Trace elements)

Annona muricata showed the highest concentration of Iron (Fe), 119.00 mg/100 g, next was *Tetrapleura tetraptera*, 17.47 mg/100 g, then, *Chrysophyllum albidum* 11.03 mg/100 g, *Anacardium occidentale*, 6.97 mg/100 g, *Mangifera indica*, 5.63 mg/100 g, and *Carica papaya* with lowest score of 2.15 mg/100 g.

A disproportionate amount of Manganese (Mn) occurred in *Annona muricata*, 2010.00 mg/100 g, another high concentration was found in *Tetrapleura tetraptera*, 333.75 mg/100 g, next was *Chrysophyllum albidum* 31.90 mg/100 g, *Anacardium occidentale*, 6.40 mg/100 g, and low concentrations in *Mangifera indica* and *Carica papaya*, which scored 0.16 and 0.04 mg/100 g, respectively.

Highest concentration of Zinc (Zn), 35.00 mg/100 g occurred in *Annona muricata*, next, was *Tetrapleura tetraptera*, 15.88 mg/100 g, then *Anacardium occidentale*, 11.20 mg/100 g and low levels in *Chrysophyllum albidum Mangifera indica*, and *Carica papaya* that scored 0.57, 0.13, and 0.08 mg/100 g, respectively.

Annona muricata got the highest score of Copper (Cu), 17.00 ug/1g, next was *Tetrapleura tetraptera*, 9.85 mg/kg, then *Chrysophyllum albidum*, 0.99 mg/kg, *Anacardium occidentale*, and *Mangifera indica*, with bracket score of 0.85 mg/kg and *Carica papaya* with lowest score of 0.05 mg/kg.

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 10 October 2023
DOI: 10.47191/ijcsrr/V6-i10-34, Impact Factor: 6.789
IJCSRR @ 2023

Cobalt (Co) was not found in all fruits but two namely, *Chrysophyllum albidum*, 1.20 mg/kg with the lowest score and *Tetrapleura tetraptera*, with the highest score of 44.00 mg/100 g. Chromium (Cr) was not found in *Tetrapleura tetraptera*, but occurred in the rest, though at low concentrations, with a highest score in *Chrysophyllum albidum*, 1.90 mg/kg, then, *Annona muricata*, 0.79 mg/kg, next was *Carica papaya*, 0.71 mg/kg, and *Anacardium occidentale*, and *Mangifera indica* with almost bracket scores of 0.03 and 0.02 mg /kg, respectively.

Boron (B) was not found in all the fruits but two, namely, *Tetrapleura tetraptera*, with highest level, 3.69 mg/kg and Carica papaya with the lowest score of 0.10 mg/kg.

Selenium (Se) was not found in *Anacardium occidentale*, and *Annona muricata*, it was found in *Mangifera indica*, least score occurred in *Carica papaya*, 0.60 mg/kg, the concentration in *Tetrapleura tetraptera*, 2.97 mg/kg was higher than the level in *Carica papaya*, the largest amount, 2.97 mg/kg was found in *Chrysophyllum albidum*.

Nickel (N) was not found in all the fruits but in Chrysophyllum albidum, 5.00 mg/kg.

Table 3. Micronutrient Vitamins Composition of *Anacardium occidentale, Annona muricata, Mangifera indica, Carica papaya, Chrysophyllum albidum* and Tetrapleura tetraptera Fruit.

Nutrients	**Mangifera indica**	**Anacardium occidentale**	**Annonamusicata**	**Carica papaya**	**Chrysophililum Albidum**	**Tetrapleura tetraptera**
Micronutrient	mg/100 g	mg/100 g	mg/100 g	mg/100 g	mg/100 g	mg/g
Vitamins						
Vitamin C mg/100 g	27.70	378.45	20.00	60.90	91.92	0.41
Vitamin A ug/100 g	765.00	NF	NF	47.00 ug	89.00	0.007
Beta-carotene (mg/g)	+	580.00	NF	274 ug	240.19	0.014
Vitamin B1 (Thiamin)	+	15.50	0.11	0.24	18.68	0.05
B2 (riboflavin)	+	2.90	0.05	0.05	0.87	0.03
B3 (Niacin) mg/100 g	0.60	0.23	1.28	0.36	1.50	0.10
B5	+ve	NF	NF	NF	NF	NF
B6	+ve	NF	NF	NF	3.26	NF
B9 (Folate) (ug/100 g)	14.00	NF	NF	NF	2.02	NF

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 10 October 2023
DOI: 10.47191/ijcsrr/V6-i10-34, Impact Factor: 6.789
IJCSRR @ 2023

Vitamin E (4 vitamers (ug/100 g)	1.12	5.80	NF	0.42	20.52	0.013
Vitamin k (phylloquinone)) (ug/100 g	4.20	NF	NF	2.60 ug	35.36	NF
Choline	+ve	NF	NF	+ve	NF	NF
Lycopene	NF	294.50	NF	1928 ug	NF	NF
Lutein + Zeaxanthin	NF	NF	NF	89.00 ug	NF	NF

(1, 2, 3, 4, 5, 6, 7, 8, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50).
+ve: Present
NR: Not found

Micronutrient Vitamins

Results revealed that all the fruits are rich in vitamin C except *Tetrapleura tetraptera, which showed a* very low content of 0.41 mg/100 g. The rest were high. A disproportionate amount 378.45 mg/100 g occurred in *Anacardium occidentale*, high concentration was found in *Chrysophyllum albidum*, 91.92 mg/100 g, next was *Carica papaya*, 60.90 mg/100 g, then *Mangifera indica*, 27.70 mg/100 g and *Annona muricata*, 20.00 mg/100 g

Vitamin A occurred in all the fruits but two. A very high concentration of vitamin A occurred in *Mangifera indica*, 765 ug/100 g, *Chrysophyllum albidum* was next with a score of 89.00 ug/100 g, then *Carica papaya*, 47.00 ug/100 g, and very low amount in *Tetrapleura tetraptera*, 0.007 ug/100 g. Beta carotene occurred in all but one, *Annona muricata*. The highest amount was reported in *Anacardium occidentale*, 580.00 ug/100 g, then *Carica papaya*, 274.00 ug/100 g, next *was Chrysophillum albidum, 240*.19 ug/100 g and *Tetrapleura tetraptera*, 0.014 ug/100 g with the lowest score.

Vitamin B occurred in all the plants. Vitamin B1 occurred highest in *Chrysophyllum albidum*, 18.68 mg/100 g, next was *Anacardium occidentale*, 15.00 mg/100 g, then *Carica papaya*, 0.24 mg/100 g, *Annona muricata*, 0.11 mg/100 g, and *Tetrapleura tetraptera*, 0.014 mg/100 g . B2 was present in all, *Annona muricata*, scored highest score, 2.90 mg/100 g, next was *Chrysophyllum albidum*, 0.0.87 mg/100 g, *Annona muricata* and *Carica papaya* made a bracket low score of 0.50 mg/100 g each, and *Tetrapleura tetraptera*, 0.03 mg/100 g. No specific amount was reported in *Mangifera indica*. B3 was present in all fruits at low concentrations. *Chrysophyllum albidum* came first, 1.50 mg/100 g, followed by *Annona muricata*, 1.28 mg/100 g, then *Mangifera indica*, 0.60 mg/100 g, next *Carica papaya*, 0.36 mg/100 g, *Anacardium occidentale*, 0.23 mg/100 g, and *Tetrapleura tetraptera*, 0.10 mg/100 g. B5 was found only in *Mangifera indica* but level was not specified. It was not reported in the rest of the fruits. B6 occurred only in two fruits; only *Mangifera indica* concentration was not specified. The concentration in *Chrysophyllum albidum* was 3.26 mg/100 g. B9 occurred only in two fruits namely, *Mangifera indica* scoring highest, 14.00 ug/100 g and *Chrysophyllum albidum* was 2.02 ug/100 g. B 7 and B12 were not reported in all the fruit.

Vitamin E was reported in all but one, *Annona muricata*. The least score was found in *Tetrapleura tetraptera*, 0.013 ug/100 g, next low score was *Carica papaya*, 0.42 ug/100 g, followed by *Mangifera indica*, 1.12 ug/100 g, then *Anacardium occidentale*, 5.80 ug/100 g, and *Chrysophyllum albidum* with the highest score of 20.52 ug/100 g

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 10 October 2023
DOI: 10.47191/ijcsrr/V6-i10-34, Impact Factor: 6.789
IJCSRR @ 2023

Vitamin K was reported in three fruits only and none was reported in three namely, *Anacardium occidentale*, *Annona muricata*, and *Tetrapleura tetraptera*. It occurred only in three with the highest score, 35.36 mg/100 g occurring in *Chrysophyllum albidum*, next was *Mangifera indica*, 4.20 ug/100 g and *Carica papaya*, 2.60 ug/100 g with lowest score. Choline was indicated in two fruits only but the quantities were not mentioned. The fruits were *Mangifera indica* and *Carica papaya*. Lycopene was found in two fruits only, *Anacardium occidentale*, with lowest score of 294.50.80 mg/100 g and *Carica papaya* with highest score of 1928.00 mg/100 g. Lutein and zeaxanthin was reported only in one fruit, *Carica papaya*, 89.00 ug/100 g.

3. DISCUSSION

The fruits were rich in vitamins essentially, vitamins A, C and E which are powerful antioxidants. While vitamins generally provide nutritional and biochemical functions in the body to keep the body safe and healthy, antioxidants scavenge free radicals, neutralize its harmful effects to the body and protect the body from cell oxidation. Free radicals do significant harm to the genetic composition of human beings called deoxyribonucleic acid (DNA) and cell oxidation for a long period of time lays the foundation for the body to develop metabolic syndrome diseases namely cancer, diabetes, coronary heart diseases. Antioxidants prevent inflammation, spasm and growth of microorganisms (51, 52, 53, 55). Vitamin E is essential for female and male reproductive health and vitamin A is essential for growth, eye and reproductive health. Thus, the use of the fruits will provide nutrients for the body and keep the body healthy (51, 52, 53, 55). Additionally, new clinical studies have suggested that vitamin E lowered conditions susceptible to aging. One hundred, 100 g of cashew nuts contains 46 mg of vitamin E (46 mg/100 g). Vitamin E of Cashew nut offers extraordinary strength to the body, it is useful in the treatment of premature aging, skin remineralization, lines and wrinkle prevention in the face (54, 55).

There were large concentrations of macronutrients in all the fruits namely, moisture, carbohydrates, protein, lipids, fibre and ash, which are essential for body nourishment and disease prevention. And health restoration in situations of nutrients' deficiencies (51, 52, 53).

The fruits were composed of moderately high amounts of minerals and some of the minerals have both nutritional and pharmacological properties and values. For example the fruits are high in iron and iron is an essential component of haemoglobin, which plays a vital role in the oxygenation of red blood cells. Low levels of iron in the blood result in anemia (51, 52, 53). The fruit contains zinc, which is involved in many metabolic activities in the body. It is needed for female and male reproduction, as well as fertility and sex organ health. Sodium (Na) and potassium (K), which regulates the body fluid and acid-base balance in the body were found in all the fruits. Calcium concentration of each fruit varied. Calcium works jointly with vitamin D as well as phosphorus and protein to perform various metabolic functions in the body. Calcium is good for healthy bones and teeth. Deficiency of calcium causes osteoporosis in humans and animals, rickets in children and diabetes across ages (51, 52, 53).

Moderate to high fibre composition of the fruits make the fruits very suitable food for the body. High fibre diet lowers the risks of metabolic syndrome diseases namely, type II diabetes, obesity and cardiovascular diseases. High fibre diet reduces blood sugar and lipids levels and significant reduction in weight. Fibre has both nutritional and pharmacological properties and values (51, 52, 53, 54).

4. CONCLUSION

All the fruits constituted macronutrients in significant amount, which are capable of satisfying the nutritional needs of human being and animals alike. Moderate to high concentration of micronutrients minerals in most of the fruits indicated that fruits possess nutraceutical and pharmacological properties. Clinical evidence suggested that the minerals have a capacity for health restoration. The micronutrient vitamins were reported in some of the plants and the vitamins reported in some of the plants were suggested by evidence to possess a capacity to restore health to the body. The presence of nutrients in varying concentrations provides a clue for easy choices based on suitability of needs. General public, researchers, public health, health practitioners, farmers, manufacturers, investors and policy decision makers are to benefit from the findings.

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 10 October 2023
DOI: 10.47191/ijcsrr/V6-i10-34, Impact Factor: 6.789
IJCSRR @ 2023

ACKNOWLEDGEMENTS
Authors were thankful to Walden University**,** faculty of Health Sciences and Dept of Public Health, Minneapolis Minnesota, USA and Federal University of Technology, Owerri, Nigeria for providing the platforms for the execution of this study.
Authors were grateful to the Editor-in-Chief and editors that reviewed this manuscript. Further clarity of this paper was gained through professional feedback.

Authors were indebted to families and friends for support and endless prayers.
Authors were grateful to The Greater Being, God for the grace to complete this study successfully.

COMPETING INTERESTS
Authors declared zero conflict of interests.

AUTHORS' CONTRIBUTIONS
Author1* designed the study, performed the analysis, wrote the protocol, and wrote the first draft of the manuscript. Author 1* managed the analyses of the study and managed the literature searches. Author 2 Participated in the reviewing of the draft and the manuscript. Author 2 participated in the analyses of the study, in managing the analyses of the study and in literature searches and management of literature searches. Authors read and approved the final manuscript.

CONSENT
This is a systematic review, written consent was not applicable.

ETHICAL APPROVAL
This is a systematic review, ethical approval is not applicable. This study was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

REFERENCES

1. Adeyemi SB, Afonja AI, Ijaduola AK. Phytochemical and nutritional composition of commonly used medicinal plants during pregnancy in Kwara state, Nigeria. International Journal of Phytofuels and Allied Sciences. 2014; 3(1), 1-19. Accessed on November 09, 2021. Available from https://www.academia.edu/22461934/Phytochemical_and_Nutritional_Composition_of_Commonly_used_Medicinal_Plants
2. Adusei S, Otchere JK, Oteng P, Mensah RQ, Tei-Mensah E. Hpytochemical analysis, antioxidant and metal chelating capacity of Tetrapleura tetraptera. Elsevier Science Direct Heliyon. 2019; 5(), e02762. Accessed on November 14, 2021. Available from https://reader.elsevier.com/reader/sd/pii/S2405844019364229?
3. Aladesanmi AJ. Tetrapleura tetraptera: Molluscidal Activity and chemical constituents. African Journal of Complementary and Alternative Medicines. 2007; 4(1), 23-36. Accessed on November 14, 2021. Available from https://www.africanethnomedicines.net
4. Adesina AK, Iwalewa EO, Johnny II. Tetrapleura tetraptera Taub-Ethnopharmacology, chemistry, medicinal and nutritional values-A review. British Journal of Pharmaceutical Research. 2016; 12(3), 1-22. Accessed on November 14, 2021. Available from https://www.sciencedomain.org
5. Adeola MO. The reproductive toxicity of the ethanol extract of Tetrapleura tetraptera pods on Male and female Swiss Albino Mice (Mussculus). Journal of Herbal Medicine, 3(1), p-p. Doi: 10.22087/hmj.v3i1.675. Accessed on November 16, 2021. Available from http://hmj.lums.ac.ir/index.php/hmj/article/view/675
6. Oteng P, Otchere JK, Adusei S, Mensah RQ, Tei-Mensah E. Vitamin analysis, trace element, and their extractabilities in tetrapleura tetraptera. Journal of Chemistry. 2020, () ID 1608341, 8. Doi: 10.1155/2020/1608341. Accessed on November 16, 2021. Available from https://www.hindawi.com/journals/jchem/2020/1608341/

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 10 October 2023
DOI: 10.47191/ijcsrr/V6-i10-34, Impact Factor: 6.789
IJCSRR @ 2023

7. Chikezie UN. Phytochemical and proximate compositions of Tetracarpidium conophorum [African Walnut] seeds. Doi: 10.20431/2349-0365.0510005. International Journal of Research Studies in Biosciences (IJRSB). 2017; 5(10), 25-31. Accessed on November 17, 2021. Available from https://www.arcjournals.org
8. Kalita P. An overview on Mangifera indica: Importance and its various pharmacological action. Pharma tutor. 2014; 2(12), 72-76. Accessed on November 14, 2021. Available from https://www.ijpsr.com
9. Larbie C, Mills-Robertson FC, Quaicoe EB, Opoku R, Kabiri NC, Abrokwah RO. Tetrapleura tetraptera of Ghanian Origin: Phytochemistory, antioxidant and antimicrobial activity of extracts of plant parts. Journal of Pharmaceutical Research International. 2020; 32(35), 78-96. Doi: 10.9743/JPRI/2020/v3213530981. Accessed on November 23, 2021. Available from http://www.sdiarticle4.com/review-history/63124
10. Igbe I, Ching F, Eromon A. Anti-inflammatory activity of aqueous fruit pulp extract of Hunteria umbellata K. Schum in acute and chronic inflammation. Acta Poloniae Pharmaceutica. 2010; 67(1), 81-85. Accessed on November 23, 2021. Available from https://www.researchgate.net/publication/41823475_Antiinflammatory_activity_of_aqueous_fruit_pulp_extract_of_Hunteria_umbellata_K_Schum_in_acute_and_chronic_inflammation
11. Igbe I, Ozolua RI, Okpo OS, Obasuyi O. Antipyretic and anti analgesicEffects of the aqueous extract of the fruit pulp of Hunteria Umbellata K. Schum (Apocynaceae). Tropical Journal of Pharmaceutical Research. 2009; 8(4), 331-336. Accessed on November 23, 2021. Available from http://www.tjpr.org
12. Srivastava AK, Singh VK. Carica papaya-A herbal medicine. International journal of Research Studies in Biosciences (IJRSB). 2016; 4(11), 19-25. Doi: 10.20431/2349-0365.0411004. Accessed on November 23, 2021. Available from https://www.arcjournals.org
13. Ahajumobi EN. Nutrition for Chronic diseases prevention and control. 2018; Lulu Press, U. S. A. https://www.lulu.com
14. Islam M, Bari W, Hossain I, Matin A, Siddique KH, Islam MA. Hypoglycemic and hypolipidemic activities of Carica papaya fruits in Streptozotocin induced diabetic mice. Doi: 10.20959/wjpps20197-14066. World Journal of Pharmacy and Pharmaceutical Sciences. 2019; 8(7), 332-343. Accessed on November 24, 2021.
15. Akintola OO, Bodede AI, Ogunbanjo OR. Nutritional and medicinal importance of Tetrapleura tetraptera fruits (Ariddan). African Journal of Science and Research. 2015; 6(4), 36-41. Accessed on November 24, 2021. Available from http://ajsr.rstpublishers.com
16. Nwofia GE, Ojimelukwe P, Eji C. Chemical composition of leaves, fruit pulp and seeds in some Carica papaya (L) morphotypes. International Journal of Medicinal and Aromatic Plants. 2012 March. 2. 1: 200-206. Accessed on December 26, 2021. Available from https://www.researchgate.netpublication236646755_Chemical_composition_of_leaves_fruit_pulp_and_seeds_in_some_Carica_papaya_L_morphotypes
17. Rajasekhar P. Nutritional and medicinal value of papaya (Carica Papaya Linn.). World Journal of Pharmacy and Pharmaceutical Sciences. 2017 August 1.6. 8: 2559 - 2578DOi:10.20959/wjpps20178-9947. Accessed on December 26, 2021. Available from https://www.researchgate.net/publication 319048781_NUTRITIONAL_AND_MEDICINAL_VALUE_OF_PAPAYA_CARICA_PAPAYA_LINN
18. Gyesi JN, Opoku R, Borquaye LS. Chemical Composition, total phenolic content, and antioxidant activities of the essential oils of the leaves and fruit pulp of Annona muricata L. (Soursop) from Ghana. Journal Biochemistry Research International. 2019 September 02. 2019. 4164576: p-p. Doi: /10.1155/2019/4164576. Accessed on December 27, 2021. Available from https://www.hindawi.com/journals/bri/2019/4164576/
19. Ana V. C, Efigenia M-G, Elhadi M, Yahia EN. Obledo-Vázquez,Annona muricata: A comprehensive review on its traditional medicinal uses, phytochemicals, pharmacological activities, mechanisms of action and toxicity,Arabian Journal of Chemistry.
20. Ana VC, Efigenia M-G, Elhadi M, Yahia EN. Obledo-Vázquez,Annona muricata: A comprehensive review on its traditional medicinal uses, phytochemicals, pharmacological activities, mechanisms of action and toxicity,Arabian Journal of Chemistry. 2018 July.11.5: 662-691. Doi: 10.1016/j.arabjc.2016.01.004. Accessed on December 27, 2021. Available from (https://www.sciencedirect.com/science/article/pii/S1878535216000058)

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 10 October 2023
DOI: 10.47191/ijcsrr/V6-i10-34, Impact Factor: 6.789
IJCSRR @ 2023

21. Nweke EO, Akpuaka FC. The effect of ethanol extract of Annona muricata leaf on the basal ganglia. GSC Biological and Pharmaceutical Sciences. 2019 March 8.6.3: 40-44. Doi: 10.30574/gscbps.2019.6.3.0025. Accessed on December 27, 2021. Available from https://www.gsconlinepress.com/journals/gscbps
22. Agu KC, Okolie PN. Proximate composition, phytochemical analysis and in vitro antioxidant potentials of extract of Annoa muricata (soursop). Food Science and Nutrition. 2017 June 29.5.5: 1026-1036. Doi: 10.1002/fsn3.498. Accessed on December 27, 2021. Available from https://onlinelibrary.wiley.com/doi/full/10.1002/fsn3.498
23. Onimawo IA. Proximate composition and selected physicochemical properties of the seed, pulp and oil of sour sop (Annona muricata). Plant Foods Human Nutrition. 2002 Spring. 57. 2:165-71. doi: 10.1023/a:1015228231512. PMID: 12049148. Accessed on December 28, 2021. Available from https://pubmed.ncbi.nlm.nih.gov/12049148/
24. Salehi B, Gültekin-Özgüven M, Kırkın C, Özçelik B, Morais-Braga MFB, Carneiro JNP., …, Sharifi-Rad J. Anacardium Plants: Chemical, Nutritional Composition and Biotechnological Applications. Biomolecules. [Internet]. 2019. [Accessed on January 01, 2022]; 9(9):465. Available from https://doi.org/10.3390/biom9090465
25. Nadzmng.blogspot.com. Literature Review of Mangifera indica. 2011 June 13. [Accessd on January 3rd, 2022]; blog. Available from https://nadzmng.blogspot.com/2011/06/litrature-review-of-mangifera-indica.html
26. Khandare MS. Mango (Magifera indica) a medicinal and whole plant. Journal of Medicinal Plants Studies [Internet]. 2016 [Accessed on January 3rd 2022]; 4(4): 44-46. Available from https://www.plantsjournal.com
27. Pyar H, Peh KK, Min-Tze L. Proximate Composition of Mango (Mangifera indica L.) and Honeydew (Cucumis melo) Wastes Fermented with Monoculture of Probiotics Lactobacillus Species. In: Gnanamalar Sarojini Daniel E. (eds). Biology Education and Research in a Changing Planet. Springer, Singapore. [Internet]. 2015. [Accessed on January 4, 2022]; v(i): 143-153. Available from https://doi.org/10.1007/978-981-287-524-2_15
28. Samanta S, Chanda R, Ganguli S, Reddy AG, Banerjee J. Anti-diabetic activity of mango (Mangifera): a review. MOJ Bioequivalence & Bioavailability [Internet]. 2019. [Accessed on January 4, 2021]; 6(2): 23-26. Doi: 10.15406/mojbb.2019.06.00131. Available from https://doi.org/10.15406/mojbb.2019.06.00131
29. Shaikh RN, Agarkar BS, Kshirsagar RB, Bachate AH. Studies on physical, chemical and mineral evaluation of mango (Mangigera indica L.). The Pharma Innovation Journal [Internet]. 2021. [Accessed on January 4, 2022]; 10(6): 446-449. Available from http://www.thepharmajournal.com
30. Ibrahim HO, Osilesi O, Adebawo OO, Onajobi FD, Karigidi KO, Mohammade LB. Nutrients composition and phytochemical content of edible parts of Chrysophyllum albidum fruit. Journal of Nutrition and Food Sciences. 2017, 7(2): 1-9. Doi: 10.4172/2155-9600.1000579. Accessed on February 12, 2023. Available from
31. Akinmoladun AC, Falaiye OE, Ojo OB. et al. Effect of extraction technique, solvent polarity, and plant matrix on the antioxidant properties of Chrysophyllum albidum G. Don (African Star Apple). Bull Natl Res Cent 46, 40 (2022). https://doi.org/10.1186/s42269-022-00718-y
32. Jayeoba OJ, Ige MM. "Chemical composition and physical properties of African star apple (Chrysophyllum albidum)." ASSET: An International Journal (Series A)} 7.1 (2010): 37-42. Pdf Accessed on February 12, 2023.
33. Falodun A, Nworgu ZA, Ikponmwonsa MO. Phytochemical components of Hunteria umbellata (K. Schum) and its effect on isolated non-pregnant rat uterus in oestrus. Pakistan Journal of Pharmacological Sciences. 2006 Jul;19(3):256-8. PMID: 16935835. Accessed on February 12, 2023
34. Krishna KL, Paridhavi M, Patel JA. Review on nutritional, medicinal and pharmacological properties of papaya (carina papaya Linn). Indian Journal of Natural Products and Resources (IJNPR). 2008, 7(4): 364-373. Accessed on February 15, 2023. Available from https://nopr.niscpr.res.in/handle/123456789/5695
35. Duru IA, Duru CE. Identification and quantification of phytochemical from carica papaya linn (caricaceae) Root Extract using GC-FID. Journal of Chemical Society of Nigeria. 2019, 44(7): 1291-1297. Accessed on February 15, 2023. Available from https://journals.chemsociety.org.ng/index.php/jcsn/article/view/406/468
36. Anyamele T, Onwuegbuchu PN, Eziuche A, Ugbogu EA, Ibe C. Phytochemical composition, bioactive properties, and toxicological profile of Tetrapleura tetraptera,Journal of Bioorganic Chemistry. 2023, 131 (2): 106288. Accessed on February 16, 2023

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 10 October 2023
DOI: 10.47191/ijcsrr/V6-i10-34, Impact Factor: 6.789
IJCSRR @ 2023

37. Dakuyo R, Konate K, Sanou A, Kabore K, Sama H, Bazie D…, Diko, et al. M. H. Comparison of Proximate and Phytonutrient compositions of Cashew Nuts and apples from different geographical areas of Burkino Faso. Journal of Biomedical Research International. 2022. 2022(1800091): 12 p. ID 1800091. Doi: 10.1155/2022/1800091. Accessed on February 17, 2023. Available from https://doi.org/10.1155/2022/1800091
38. Salehi B, Gültekin-Özgüven M, Kırkın C, Özçelik B, Morais-Braga MFB, Carneiro J. N. P., Bezerra CF, Silva T. G. d. , Coutinho H. D. M., Amina B., Armstrong L, Selamoglu Z., Sevindik M., Yousaf Z., Sharifi-Rad J., Muddathir A. M., Devkota H. P., Martorell M., Jugran A. K., Martins N., Cho W. C. Anacardium Plants: Chemical,Nutritional Composition and Biotechnological Applications. Biomolecules. 2019; 9(9): 465. https://doi.org/10.3390/biom9090465
39. Uyoh EA, Ita EE, Nwofia GE. Evaluation on the chemical composition of Tetrapleura tetraptera (Schum and Thom) Taub. Accessions from Cross River State, Nigeria. International Journal of medicinal Aromatic Plants. 2013, 3(3): 386-394. ISSN 2249-4340. Accessed on February 17, 2023. Available from https://www.researchgate.net/publication/344503980_Evaluation_of_the_chemical_composition_of_Tetrapleura_tetraptera_Schum_and_Thonn_Taub_accessions_from_Cross_River_State_Nigeria
40. Adusei S, Otchere JK, Oteng P, Mensah RQ, Tei-Mensah E. Phytochemical analysis, antioxidant and metal chelating capacity of Tetrapleura Tetraptera. Heliyon, Research Article. 2019, 5(11): e02762. Doi: 10.1016/j.heliyon.2019.e02762. Accessed on February 18, 2023. Available form https://www.cell.com/heliyon/fulltext/S2405-8440(19)36422-9
41. Akin-Idowu PE, Ibitoye DO, Ademoyegun OT, Adeniyi OT. Chemical composition of the dry fruit of Tetrapleura tetraptera and its potential impact on human health. Journal of Herbs, Spices & Medicinal plants. 2011, 17(1): 52 - 61. Doi: 10.1080/10496475.2011.560087. Accessed on February 18 2023
42. Chinatu LN, Okoronkwo CM, Davids ECM. Assessment of Chemical composition, variability, heritability and genetic advance in Tetrapleura tetrapteraa fruits. Global Journal of Agricultural Research. 2018, 6(4): 12-23. Accessed on February 18 2023. Available from https://www.eajournals.org/wp-content/uploads/Assessment-of-Chemical-Composition-Variability-Heritability-and-Genetic-Advance-in-Tetrapluera-Tetraptera-Fruits.pdf
43. Ojewele J AO, Adewunmi CO. Anti-inflammatory and hypoglycaemic effects of Tetrapleura tetraptera (Taub) [Fabaceae] fruit aqueous extract in rats. Elsevier Journal of Ethnopharmacology. 2004, 95(2-3): 177-182. Doi: 10.1016/j.jep.2004.06-026. Accessed on February 18, 2023. Available from https://www.sciencedirect.com/science/article/abs/pii/S0378874104003137
44. Irondi AE, Anokam KK, Chukwu PC, Akintunde JK, Nurain IO. Variation in Nutrient composition of Tetrapleura tetraptera fruit at two maturity stages. International Journal of Bioscience. 2013, 3(9): 304-312. Doi: 10.12692/ijb/3.9.304-312. Accessed on February 20, 2023. Available from https://www.researchgate.net/publication/282858918_variation_in_nutrients_composition_of_tetrapleura_tetraptera_fruit_at_two_maturity_stages
45. Abara PN, Aloke C, Ekpono EU, Eneh CP, Offor CE, Ugwu OPC. Vitamin and Mineral Composition of Annona muricata. International Digital organization for Scientific Research IDOSR Journal of Scientific Research. 2017, 2(1): 76-82. Aaccessed on February 23, 2023. Available from https://www.idosr.org/wp-content/uploads/2017/02/IDOSR-JSR-21-76-82.pdf
46. Dotto JM, Abihudi S. A.Neutraceutical value of Carica papaya: A Review. Elsevier Journal of Scientific African. 2021, 13(2021): e00933. ISSN 2468-2276. Doi: 10.1016/j.sciaf.2021.e00933. Accessed on February 23, 2023. Available from https://www.sciencedirect.com/science/article/pii/S2468227621002374#tbl0001
47. Okwu DE. Evaluation of the chemical composition of indigenous spices and flavouring agents. Global journal of Pure and Applied Sciences. 2001, 7(3): 455-459. Accessed on February 23, 2023. Available from 16293-Article Text-14187-1-10-20040518.pdf
48. Mujahid HL, Saghir AS, Noor-un-nisa M, Ajaz HS, Ajaz K. Quality attributes of Immature Fruit of Different mango Varieties. Journal of Basic & Applied Sciences. 2013, 9(2013): 52-56. Aaccessed on March 03, 2023. Available from https://www.researchgate.net/profile/Aijaz-Hussain-Soomro/publication/284180601_Quality_Attributes_of_Immature_Fruit_of_Different_Mango_Varieties.pdf

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 10 October 2023
DOI: 10.47191/ijcsrr/V6-i10-34, Impact Factor: 6.789
IJCSRR @ 2023

49. Roger D, Kiessoun K, Kabakdé K, Abdoudramane S, Frédéric AK, David B, Hemayoro S, Mamoudou HD. Ascorbic acid, pigments, anti-nutritional factors, and nutraceutical potential of Anacardium occidentale fruits as affected by temperature, International Journal of Food Properties. 2023, 26:1, 471-488, DOI: 10.1080/10942912.2022.2163661 Accessed on March 05, 2023
50. Adepoju OT, Adeniji PO. Nutrient composition and micronutrient potential of three widely grown varieties of African Star Apple (Chrysophyllum albidum) from Nigeria. African Journal of Food Science. 2012, 6(12): 344-351. Accessed on March 5 2023. Available from https://academicjournals.org/journal/AJFS/article-full-text-pdf/3D4F1CA11835
51. Ahajumobi NE. A. Comparative Analysis of Phytochemical Composition of Seven Seeds Used to Treat Diseases in Eastern Nigeria. International Journal of Recent Advances in Multidisciplinary Research. 2023; 10(08): 8783-8791. Available from https://www.ijramr.com/sites/default/files/issues-pdf/4566_0.pdf
52. Ahajumobi NE. A Comparative Analysis of Phytochemical Composition of Eight Leaves Used as Native Medicine in Africa. International Journal of Recent Advances in Multidisciplinary Research. 2023; 10(08): 8774-8782. Available from http://ijramr.com/sites/default/files/issues-pdf/4565.pdf
53. Ahajumobi NE. Nutrients, Vitamins, Mineral and Hydration for Health Restoration.2022; iUniverse, Liberty Drive Bloomington, IN 47403 ISBN: 9781663237408. Available from https://www.iuniverse.com/en/bookstore
54. Roger D, Kiessoun K, Abdoudramane S, Kabakdé K, Hemayoro S, David B, Mamounata D, Mamoudou HD. Comparison of Proximate and Phytonutrient Compositions of Cashew Nuts and Apples from Different Geographical Areas of Burkina Faso. BioMed Research International, 2022; 2022(1800091): p-p. Doi: 10.1155/2022/1800091
55. Zarqa I, Muhammad A, Muhammad MS, Marium A, Muhammad D, Aamir S, …Muhammade R et al. Medicinal use of cashew (Anacardium occidentale): Review. Journal of Science Technology and Research. 2021; 2(1): 4-10
56. Canadian Institute for Health Information. National health expenditure trends, 2022-snapshot. Canadian Institute of Health Information. 2023; V():p-p. Accessed on September 23, 2023. Available from https://www.cihi.ca/en/national-health-expenditure-trends-2022-snapshot.
57. Ahajumobi NE, Oparaocha ET. A Comparative Analysis of Nutritional and Chemical Composition of Eight Seeds Used as Native Medicine in West Africa. International Journal of Biochemistry Research & Review. 2023; 32(7): 1–15. https://doi.org/10.9734/ijbcrr/2023/v32i7823.