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COMPARATIVE PROXIMATE COMPOSITION, ANTI-NUTRITIONAL ANALYSES AND ANT-MICROBIAL SCREENING OF SOME NIGERIAN MEDICINAL PLANTS

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ABSTRACT

The food insecurity in the world/Nigeria paves the way for more research to remedy human hunger /diseases caused by weather conditions / greenhouse effects. This study compares and validates the proximate composition, the anti-nutritional and anti-microbial screening of crude methanol extracts of three Nigerian medicinal plants; *Lactuca taraxacifolia*; [moisture (10.68 ± 00%), Ash (19.48 ± 0.03%), Crude fibre (39.16 ± 0.10%), Crude Protein (7.97± 0.03%), Lipid (11.77± 0.02%), Carbohydrate (29.91± 0.13%), Oxalate > Phylate > Tannin; the inhibition zones for the most effective concentration of 50 mg / mL : *Staphylococcus. aureus* 45.66 ± 0.00, *Escherichia coli* 49.40 ± 0.01, *Salmonella typhi* 42.30 ± 0.00, *Streptococcus faecalis* 41.90 ± 0.01]. *Aframomum melegueta;* {Moisture (4.36 ± 0.04 %), Ash (6.75 ± 0.03%), Crude fibre (19.92 ± 0.11 %), Protein (5.48 ± 0.04 %), Crude fat (3.60 ± 0.13%), Carbohydrate (59.49 ± 004%), Tannin > Phylate > Oxalate; *S. aureus* 20.22 ± 0.01, *E. coli* 30.21 ± 0.30, *S. typhi* 15.24 ± 0.11, *S. faecalis* 15.61 ± 0.13} and *Ocimum gratissimum*; [Moisture (12.43 ± 0.22%), Ash (17.77 ± 0.04%), Fibre (19.91± 0.15%), Protein (1.92 ± 0.26%), Fat (11.80 ± 0.02%), Carbohydrate (42.63 ± 0.06%), Tannin > Phylate > Oxalate; *S. aureus* 35.03 ± 0.00, *E. coli* 34.22 ± 0.71, *S. typhi* 32.02 ± 0.01, *S. faecalis* 30.01 ± 0.42]. Considering the proximate analyses, it's seen that, *A. melegueta* carbohydrates is the greatest followed by *O. gratissimum,* then *L. taraxacifolia.* Their anti-nutritional investigation showed *A. melegueta* and *O. gratissimum* also have more tannins compared to *L. taxacifulia.* These Nigerian plants will be potential sources of therapeutics and nutrients, especially during this era of food insecurity.

Keywords: proximate composition, Anti-nutritional analyses, *Lactuca taraxacifolia Aframomum melegueta, Ocimum gratissimum*, antimicrobial activity

INTRODUCTION

People value plants due to the ancient conviction that plants were / are created to supply man with food, medical treatment, and other effects, as long before mankind discovered the existence of microbes; the idea that certain plants had healing potential was well accepted (Rios and Recio, 2013).The world Health Organization (2017) estimates that about 80% of these people rely almost exclusively on traditional medicine for their primary health care needs. Medicinal plants are the backbone of traditional medicine, which means more than 3.3billion people in the less developed countries utilized medicinal plants on a regular basis (Iran, 2012).There are nearly 2000 ethnic groups in the world, and almost every group has its own tradition medical knowledge and experiences (Iran, 2012). Man's life and survival would be impossible without "symbiosis" with, and extensive use of plants and plant products. The relationship between food and medicine was quoted as "Let food be thy medicine and medicine be thy food" (Rajeswari *et al.*, 2012, Soheil *et al.*, 2015). Led by instinct, test and experience, primitive people treated illnesses by using plant & animal parts and minerals that were not part of their diet (Usang *et al.*, 2015).

Contemporary medicine uses biomedical sciences, biomedical research, genetics and medical technology to diagnose, treat, and prevent injury and disease, typically through pharmaceutical surgery, but also through therapies as diverse as psychotherapy, external splints and traction, medical devices, biologics, and ionizing radiation, amongst others. (Sawadogo and Diederich 2012. In line with Edeoga *et al*., (2005), medicinal plants play important roles in human health, some of which are used as spices and food plants. The study on the medicinal plants is essential to promote the proper use of herbal medicine in order to determine their potential as a source for the development of new drugs (Rajeswari *et al.*, 2012). These pharmaceutical and nutritional values of plants emanates from their phytochemical components such as alkaloids, tannins, flavonoids and other phenolic compounds, which produce a definite physiological action on the human body (Anyasor *et al*., 2011). For instance, some Phytochemicals have been reported to protect the cell constituents against destructive oxidative damage, inhibition of hydrolytic and oxidative enzymes including lipid peroxidation, thus limiting the risk of various degenerative diseases associated with oxidative stress (Vinary *et al*., 2010). The above plants are valued for their anti-diabetic, anti-inflammatory and anti-arthritic properties in South-East and South-West Nigeria (Soladoye *et al*., 2010). They are also widely used in Nigeria for the treatment of cough, malaria, venereal diseases, skin eruption and inflammation (Okoko, 2009).

Lactuca (Launaea) taraxacifolia (*Compositae*) known as Dandelion green, wild lettuce, a perennial herb and member of the *Asteraceae* family, is mainly found in the Tropics. Known as 'Efo yanrin' by the Yoruba's in Southern Nigeria 'Nononbarya'/'Namijindayii' by the Hausa's and 'Ugu'by the Igbo's. Used as salad or freshly eaten or cooked in soups or sauces, is an annual herb of Tropical West African origin. Whole plant is very rich in a milky sap (*lactucarium*) that flows freely from any wound of the plant and changes its color to yellow at first and then brownish, hardens and dried when

in contact with air (Burkill, 1985, Obi *et al.,* 2006, Sakpere *et al.,* 2011 and Adinortey *et al.,* 2012)

Aframomum melegueta is a West African plant, with common (local) names such as "*alligator pepper*," "*guinea pepper*" and "grain of paradise." It is a member of the family *Zingiberaceae* and is locally called '*atare*' (Yoruba). It is widely spread across tropical rain forest regions of Africa including Nigeria, Liberia, Sierra Leone, Ghana, Cameroon, Cote D' Ivoire and Togo.

Ocimum. gratissimum (L) is an herbaceous plant which belongs to the *Labiatae* family. The plant is indigenous to tropical areas especially India and West Africa. In Nigeria, it is found in the Savannah and coastal areas, cultivated in Ceylon, South Sea Islands, and also within Nepal, Bengal, Chittagong and Deccan (Akinmoladun *et al.,* 2012, Ijeh *et al.,* 2013).

The aim of this work is to harness the therapeutics and nutritional use of Nigerian plants, especially during this era of food, financial, moral and social insecurity.

MATERIALS AND METHODS

Collection and Identification

Lactuca taraxacifolia fresh leaves were collected from Oke-Ogun Polythecnic Saki Atisbo Local Government Area, Oyo State, Nigeria in March 2021. The plant was subsequently identified by Botanist of the Botany Department of Federal University Lokoja, it was vouchered by Mr Akanni Gbenga with Herbarium number 0162 and a sample was kept for reference in the University herbarium, while the working samples were carried to laboratory.

Aframomum melegueta was harvested from Agbeji Anyigba Kogi State in April 2021. The plant was duely identified and authenticated by Botanist Mr. Omomoh Bernard of the Botany Department of Federal University of Technology Akure with herbarium number 0314 and a voucher was kept for reference in the University herbarium and the sample carried to Lokoja.

Ocimum gratissimum was harvested from Ogbese, Ondo State Nigeria. The plant was identified, by Botanist Gbenga of the Botany Department of Federal University Lokoja and a vouchered with herbarium number 0007 Sample was kept for reference in the University herbarium and sample carried to the Chemistry laboratory.

Extraction and Preparation of plants

The samples were rinsed in water to remove dust and were dried under shade after then pulverized into fine powder using laboratory mortar and pestle. The pulverized crude samples were then analyzed for:

Qualitative Phytochemical Screening

Standard analytical procedures as described by Sofowora, (2008) and Ayola *et al*., (2010) were adopted for the identification of the constituents

Proximate Analysis

The recommended methods of the Association of Official Analytical Chemists were adopted for the proximate analysis (Robert, 2010 & AOAC, 2015).

Anti-Nutritional Analysis

Chemical tests were carried out on the various extracts using standard procedures to identify the anti-nutritional factors (tannin, oxalae and phytate) present. (Soetan, 2014 and Etong, 2018)

Anti-microbial Screening

Organisms were clinical isolates obtained from the Department of Medical Microbiology, Ahmadu Bello University Teaching Hospital, Zaria, Nigeria and antimicrobial screening was carried out using current standard procedures, Khan *et al*., 2017, Osigbemhe *et al*., 2021and Izuagbe *et al*., 2022).

RESULTS AND DISCUSSIONS

Results of all experimental values carried out in triplicates are in the tables below.

Plate 1: L taraxacifolia leaves

Plate 2: A. meleguelata seeds

Plate 3: *O. gratissimum* flowering plant.

Table 1: Results of Phytochemical Screening of crude methanol extracts of the three plants.

Test	*L. taraxacifolia*	*A. meleguelata*	*O. gratissimum*
Flavonoids	+	-	-
Cardiac Glycosides	-	+	+
Tannins	+	+	+
Saponins	+	+	+
phlobatanins	-	-	-
Phytoterols	-	-	+

Alkaloids (a)Mayer`s	+	+	+
(b)Wgner`s test	+	+	+
Carbohydrates (Molisc`s test)	+	+	+
Terpenoids	-	+	+
Resins	-	-	-
Glycosides	+	+	+
steroids	+	+	+

Key: + = present, - = BDL (below detection limit)

Table 2: Proximate Composition (%)

Sample	Moisture	Ash content	Crude fibre	Crude Protein	Crude fat	carbohydrates
L. taraxacifolia	10.68 ± 0.00	19.48 ± 0.03	39.16 ± 0.10	07.97 ± 0.03	11.77 ± 0.02	29.91 ± 0.13
A. meleguelata	04.36 ± 0.04	06.75 ± 0.03	19.92 ± 0.11	05.48 ± 004	03.60 ± 0.14	59.49 ± 0.04
O. gratissimum	12.43 ± 0.22	17.77 ± 0.04	1991 ± 0.15	01.92 ± 0.26	11.80 ± 0.02	42.63 ± 0.06

Values are means of three trials ± Standard Error.

Table 3: Ant-Nutritional Analysis (mg /mL)

Sample	Phytate	Oxalate	Tannin
L. taraxacifolia	++	+++	+
A. meleguelata	+	++	+++
O. gratissimum	++	+	+++

Table 4: Anti-Microbial Activity (mg / mL)

	Zones of inhibitions (mm)			
Sample	***L. taraxacifolia***	***A. meleguelata***	***O. gratissimum***	**Std. Control**
S. aureus	45.16 ± 0.00	20.22 ± 0.01	35.03 ± 0.00	Gentamycin x50 (20.00)
E. coli	49.40 ± 0.01	30.21 ± 0.30	34.22 ± 0.71	Gentamycin x50 (20.00)
S. typhi	42.30 ± 0.00	15.24 ± 0.11	32.02 ± 0.01	Ampiclox x50 (15.00)
S. faecalis	41.90 ± 0.01	15.61 ± 0.13	30.01 ± 0.42	Ampiclox x50 (15.00)

Values are means of three trials ± Standard Error.

DISCUSSIONS

Figure 1, showed the part of the plant used: For *L taraxacifolia* and O. *gratissimum* plants, the leaves were used, but for *A. meleguelata* plant, since the leaves are not eaten, their seeds were used as the comparison is done on the part of the plant that edible.

The phytochemical screening of the plants (Table 2) showed that they are rich in tannins, flavonoids, saponins, phenols, steroid and cardiac glycoside which are common constituents of many traditionally prepared herbal medicines, leafy and seed vegetables. The presence of these compounds in plants has been attributed to their biological activities, responsible for protective health benefits in man and animals (Obadoni and Ochuko, 2011) Saponins, possess immune-stimulatory and anti-carcinogenic properties. In addition, they reduce the risk of heart diseases in humans. Terpenoids are said to help in preventing metabolic disorders, fight cancer and exert antiaging benefits. Terpenoids are responsible for a wide variety of flavors and aromas, and have been found to possess analgesic, anti-inflammatory, anti-fungal, anti-microbial, anti-viral and anti-parasitic properties. Alkaloids & Flavonoids have a wide range of pharmacological activities including antimalarial, antiasthma, anticancer, vasodilatory, antiarrhythmic, analgesic antibacterial, antihyperglycemic, anti-inflammatory and antioxidant activities. Many have found use in traditional or modern medicine, or as starting points for drug discovery,(Edeoga and Okoli, 2010).

Results of the proximate composition showed that in all the plants, carbohydrate contents are higher than other parameters measured. This indicates that the plants can be used as food for both man and animal because of their nutritional benefits and medicinal advantages.

Comparatively, *A. meleguelata*, has the highest carbohydrate content followed by O. *gratissimum*, with *L taraxacifolia* being the least. This gives their nutritive quality. In their protein and fibre contents, *L taraxacifolia*, is the best. Thus, in terms of their proteinous and fibrous contents, it's the best to consume. It was also seen that these essential nutrients and phytochemicals compete / compare favorably with other conventional edible vegetables which are commonly used in these localities. This provided evidence why these vegetables are always recommended for diabetic patients in these communities because of their low caloric values.

Anti-nutritional results indicated the presence of high amount of tanins followed by oxalates and phylates. The presence of anti-nutritional factors implies that although these plants contain nutrients but the bioavailability of the nutrients will be low when consumed. This is because when anti nutrients are present in substances, they binds to the nutrients in food substances thereby making the nutrients unavailable to the body, (Okwu, 2004, Agbaire, 2012).

The phytochemical content found in this analysis justifies the use of the plants in traditional medical practice for cure or prevention of diseases such as in wound healing, and ant diabetic activity, lowering of cholesterol level. This gives credence to their ethno medicinal usages as shown in their inhibitory effects on all bacterial species tested; viz, *Staphylococcus aureus, Escherichia coli, Salmonella typhi, Streptococcus faecalis*. In all the plants, a reasonable antibacterial / antifungal activity was witnessed. In any single plant many active secondary metabolites are present and their medicinal effect(s) can be attributed to a single compound or combined effect(s) of many compounds / synergistic effect of different phyto-constituents (Soheil *et al*., 2015, Kuatsienu *et*

al., 2012). As the modern antibiotics have various toxic / side effects, these plants extracts could serve as better alternative anti-microbial agents. (Oyagade, 1999, Ola, 2016, Bello, 2018).

Comparatively for the anti-microbial activity, comparing the various zones of inhibition, *L taraxacifolia* has the highest / widest zones of inhibition, followed by O. *gratissimum*, then *A. meleguelata*, respectively. Its inferred that this couldbe due to greater quantity of phytochmicals in the plant resulting from the environment of growth of the plant.

CONCLUSION

The investigation on methanol extracts of the plants revealed the presence of phytochemicals like carbohydrates, tannins, steroid, cardiac glycoside, flavonoids, alkaloids, proteins and saponins and also showed a reasonable anti-microbial activity on *Staphylococcus aureus, Escherichia coli, Salmonella typi and Streptococcus faecalis.* This work also revealed the presence of some nutrients such as moisture content, Ash content, crude fiber, crude protein, Lipid and carbohydrate and anti-nutrient such as oxalate, tannin, phytate. Traditional healing system has provided many important herbs that have the potentials to cure many diseases. Hence effective work should be done to isolate various phyto inhibitors. This thus validated the use of the plants in traditional and alternative medicines. The large concentration of carbohydrates indicated that the plants can be a good source of energy in human and animal foods. Nutritional and Anti-nutritional properties of the plants should be conducted at different stages of harvest i.e. pre-maturity, maturity and post maturity. General awareness should be created by food and agriculture organization FAO on the importance of the leaves of *L taraxacifolia* and *O. gratissimum*, as high crude fiber content indicated the treatment of obesity, diabetes, cancer, and gastrointestinal disorders.

CONFLICTS OF INTEREST

All the authors declare that there is no conflict of interest

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