



Evaluation of Nutritional Potential and Phytochemical contents of Girdle Pod (*Mitracarpus Scaber*) Leaves.

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Abstract: The nutritional potential and phytochemical contents of Girdle pod (*Mitracarpus scaber*) Leaves were investigated using standard methods of (A.O.A.C.,1990) and others. The results of proximate analysis of Girdle pod (*Mitracarpus scaber*) Leaves revealed that, Carbohydrate has the highest value of $69.68 \pm 2.03\%$, which was followed by crude protein ($13.5 \pm 0.04\%$), moisture content ($8.88 \pm 0.03\%$), crude fibre ($3.92 \pm 2.03\%$), ash content ($2.12 \pm 0.003\%$) and hexane extract content ($1.9 \pm 0.03\%$). The results of determination of vitamin content of Girdle pod (*Mitracarpus scaber*) Leaves gave the followings; Vitamin A ($0.021 \pm 0.001\text{mg}/100\text{g}$), Vitamin B1 ($0.173 \pm 0.001\text{mg}/100\text{g}$), Vitamin B2 ($0.047 \pm 0.002\text{mg}/100\text{g}$), Vitamin B6 ($0.368 \pm 0.001 \pm 0.001\text{mg}/100\text{g}$), Vitamin B12 ($0.863 \pm 0.001\text{mg}/100\text{g}$), Vitamin C ($24.14 \pm 0.02\text{mg}/100\text{g}$), Vitamin E ($0.603 \pm 0.001\text{mg}/100\text{g}$) and Vitamin K ($0.005 \pm 0.001 \text{mg}/100\text{g}$). The results of mineral content of Girdle pod (*Mitracarpus scaber*) leaves depicted that, Potassium has the highest value of $629.30 \pm 3.50\text{mg}/100\text{g}$ and this was followed by Calcium ($31.88 \pm 1.02\text{mg}/100\text{g}$). Sodium also has the value of ($28.25 \pm 0.21\text{mg}/100\text{g}$) while magnesium and manganese have $21.55 \pm 0.03\text{mg}/100\text{g}$ and $4.84 \pm 0.02\text{mg}/100\text{g}$ respectively. The results of phytochemical analysis showed that alkaloid has a highest value of $7.03 \pm 0.22\text{mg}/100\text{g}$ and this is followed by saponin $0.42 \pm 0.01\text{mg}/100\text{g}$, flavonoid $0.153 \pm 0.003\text{mg}/100\text{g}$, phytate $0.144 \pm 0.001\text{mg}/100\text{g}$, tannin $0.28 \pm 0.003\text{mg}/100\text{g}$, oxalate $0.14 \pm 0.004\text{mg}/100\text{g}$ and cyanoglycoside $0.003 \pm 0.001\text{mg}/100\text{g}$. **Therefore,** Girdle pod (*Mitracarpus scaber*) Leaf is a good source of carbohydrate, vitamin C, potassium and calcium.

Keywords: Proximate composition, vitamin, minerals, nutritional, potential, Girdle pod, *Mitracarpus scaber*, phytochemical

Introduction

According to WCF (2016), the global food security challenge is straight forward: by 2050, the world [must feed 9 billion people](#). The demand for food will be 60% greater than it is today. In view of the above is necessary for government and researchers to search into alternative sources of food materials that will be readily available to all and sundry in addition to promoting sustainable agriculture. Girdle Pod with the botanical name *Mitracarpus scaber* is called *Irawo ile* by Yoruba speaking people of Nigeria. It is a common perennial herb with a height of 30 cm when fully grown. Accordig to naijagists.com (2018), Some of the benefits of this herb include It's antibacterial and antifungal activities which have been proven to treat skin infections. As a result of these properties, this herb can be used to treat skin

infections like ringworms and scabies. Girdle pod can also be used to treat aches and pains such as headaches, toothaches, arthritis pain , amenorrhea, hepatitis as well as sexually transmitted diseases.

However, there is paucity of information on its nutritional potential. This paper aimed at providing the information on the nutrition potential phytochemical contents of Girdle pod (*Mitracarpus scaber*) Leaves

Materials and Methods

Collection and treatment of sample

Girdle pod (*Mitracarpus scaber*) leaves were harvested from the Biological garden, Science Technology department, Federal Polytechnic, Offa, Kwara State, Nigeria. They were identified and authenticated by a Botanist in Biology /Microbiology Unit, Science Technology Department, Federal

Polytechnic Offa. The leaves were dried in an Oven at 60°C for 12

Hours and ground into powder using laboratory mortar and pestle and sieved with 1mm muslin sieve. The powder obtained was then kept in a clean polythene bag prior for analysis.

All the chemicals used for analysis were analytical grades, supplied by BDH chemicals London.

Methods

Proximate analysis, Determination of minerals, vitamins, and phytochemical contents were carried out using standard methods described by A.O.A.C (1990), Perkin-Elmer (1982), Association of Vitamin Chemists (1987) and Harborne (1998) respectively.

Statistical analysis

Statistical analysis: Results of analysis were presented as mean ±SD of three determinations.

Results and Discussion

Table 1: Proximate composition of Girdle pod (*Mitracarpus scaber*) Leaves(dried weight)

Parameters	Amount (%)
Carbohydrate	69.68 ± 2.03
crude protein	13.50 ± 0.04
moisture	8.88± 0.03
crude fibre	3.92± 2.03
ash	2.12± 0.003
hexane extract	1.90 ± 0.003
energy	352.0±0.14 kj/100g

Each value is a mean of three determinations ±SD.

Table 1 shows the results of proximate analysis of Girdle pod (*Mitracarpus scaber*) Leaves.

The results of proximate analysis of Girdle pod (*Mitracarpus scaber*) Leaves revealed that, Carbohydrate has the highest value of 69.68 ± 2.03%, this was followed by crude protein (13.5 ± 0.04%), moisture content (8.88± 0.03%), crude fibre (3.92± 2.03%), ash content (2.12± 0.003%) and hexane extract content (1.9± 0.003%).

The results of Proximate analysis of *Amaranthus hybridus* Leaves showed that it contains moisture (2.87%), ash (13.80%), crude protein (17.92%), crude lipid (4.62%), crude fibre (8.61%) and carbohydrate (52.18%) (Akubugwo *et.al.*, 2007). It can be seen that Amaranthus leaves contain more crude protein, ash, crude fibre and crude lipid than Girdle pod leaves. However the latter is very rich in carbohydrate. The moisture content of food is used as a measure of stability and susceptibility to microbial contamination

(Awodi *et. al.*, 2017).

Proteins from plant sources have lower quality but their combination with many other sources of protein such as animal protein may result in adequate nutritional value (Choudhary *et. al.*, 2014). Ash content is a reflection of the mineral contents preserved in food (Oke, 2014).

Crude fibre in food or plant is an indication of the level of non-digestible carbohydrate and although crude fibre enhances digestibility, its presence in high level can cause intestinal irritation, lower digestibility and decreased nutrient usage (Choudhary *et. al.*, 2014).

The four primary functions of carbohydrates in the body are to provide energy, store energy, build macromolecules, and spare protein and fat for other uses (M.L.T.O., 2020).

The results of analysis also shown that Girdle pod (*Mitracarpus scaber*) Leaves can release 352.0±0.14 kj/100g energy.

Table 2: Some Vitamin contents of Girdle pod (*Mitracarpus scaber*) Leaves (dried weight)

Parameters	Amount (mg/100g)
Vitamin A
Vitamin B ₁
Vitamin B ₂
Vitamin B ₆
Vitamin B ₁₂
Vitamin C
Vitamin E
Vitamin K	0.005 ± 0.001

Each value is a memean of three determinations ±SD.

Table 2 depicts the results of determination of vitamin content of Girdle pod (*Mitracarpus scaber*) Leaves. The results of determination of vitamin content of Girdle pod (*Mitracarpus scaber*) Leaves gave the followings; Vitamin A ($0.021 \pm 0.001\text{mg}/100\text{g}$), Vitamin B1 ($0.173 \pm 0.001\text{mg}/100\text{g}$), Vitamin B2 ($0.047 \pm 0.002\text{mg}/100\text{g}$), Vitamin B6 ($0.368 \pm 0.001 \pm 0.001\text{mg}/100\text{g}$), Vitamin B12 ($0.863 \pm 0.001\text{mg}/100\text{g}$), Vitamin C ($24.14 \pm 0.02\text{mg}/100\text{g}$), Vitamin E ($0.603 \pm 0.001\text{mg}/100\text{g}$) and Vitamin K ($0.005 \pm 0.001\text{mg}/100\text{g}$). According to Akubugwo *et.al.*, (2007), Amaranthus leaves contain vitamin A (β -carotene) , ($3.29\text{ mg}/100\text{g}$), vitamin B₁(thiamine) ($2.75\text{ mg}/100\text{g}$), vitamin B₂ riboflavin ($4.24\text{ mg}/100\text{g}$), vitamin B₃(niacin) ($1.54\text{ mg}/100\text{g}$), vitamin B₆ (pyridoxine) ($2.33\text{ mg}/100\text{g}$), vitamin C (ascorbic acid) ($25.40\text{ mg}/100\text{g}$) and vitamin E (α -tocopherol) ($0.50\text{mg}/100\text{g}$). From the

above results, Amaranthus leaf is very rich in vitamins when compared with that of Girdle pod leaf.

Vitamin C, ascorbic acid helps in the growth and repair of tissues, synthesis of collagen (an important protein for making skin, blood vessels, cartilages, repair and maintenance of bones and teeth) (UNSCN (2009).

Niacin (Vitamin B3) helps to lower cholesterol levels and stabilize blood sugar (Nduche *et. al.*, 2015). Riboflavin (vitamin B1), thiamin (Vitamin B2) and niacin (Vitamin B3) are three vitamins working closely with each other to break the carbohydrates, fats and proteins in food down into energy (Okwu, 2004). Deficiency symptoms of these vitamins can include weakness and fatigue, eye disorders, chest pain, constipation, loss of appetite and weight loss, diarrhea, swollen tongue or gum and depression (Stray, 1998).

Table.3: Some Mineral contents of Girdle pod (*Mitracarpus scaber*) Leaves(dried weight)

Parameters	Amount (mg/100g)
Potassium	629.30 ± 3.50
Calcium	31.88 ± 1.02
Sodium	28.25 ± 0.21
magnesium	21.55 ± 0.03
manganese	4.84 ± 0.02

Each value is a mean of three determinations \pm SD.

Table 3, reveals the results of mineral content of Girdle pod (*Mitracarpus scaber*) Leaves. The results of mineral content of Girdle pod (*Mitracarpus scaber*) Leaves depicted that, Potassium has the highest value of $629.30 \pm 3.50\text{mg}/100\text{g}$ and this was followed by Calcium ($31.88 \pm 1.02\text{mg}/100\text{g}$). Sodium also has the value of ($28.25 \pm 0.21\text{mg}/100\text{g}$) while magnesium and manganese has the value of $21.55 \pm 0.03\text{mg}/100\text{g}$ and $4.84 \pm 0.02\text{mg}/100\text{g}$ respectively..

The report of Akubugwo *et.al.*, (2007) indicated that Amaranthus leaves contained sodium ($7.43\text{mg}/100\text{g}$), potassium ($54.20\text{ mg}/100\text{g}$), calcium ($44.15\text{ mg}/100\text{g}$), Magnesium ($231.22\text{ mg}/100\text{g}$), The present study showed that Girdle pod leaves are richer in sodium and potassium than those of

Amaranthus leaves .The latter is richer in magnesium than the former.

Sodium and potassium are important extra cellular cations responsible for the regulation of blood pressure and volume in the body (Yusuf *et. al.*, 2007). Calcium, potassium and magnesium are needed for the repair of worn out tissues, strong bones and teeth and for body mechanization in human (WHO, 1996). Phosphorus is present in the blood and acts as buffer that disallow change in the acidity level of body fluid due to its ability to combine with extra hydrogen ion. It also aids the permeability of the cell membrane thereby allowing easy passage of nutrients (Awodi *et. al.*, 2017). Zinc is essential for the synthesis of DNA, RNA, insulin , function of several enzymes, Cell reproduction and growth

especially the sperm cells (Mutayoba *et. al.*, 2011). Iron is also a necessary component of hemoglobin and myoglobin for oxygen

transport and cellular processes of growth and division (Foidl *et. al.*, 2001).

Table 4: Phytochemical contents of Girdle pod(*Mitracarpus scaber*) Leaves(dried weight)

Parameters	Amount (mg/100g)
Alkaloid	7.03±0.22
saponin	0.42±0.01
flavonoid	0.153±0.003
phytate	0.144±0.001
tannin	0.28±0.003
oxalate	0.14±0.004
Cyanoglycoside	0.003± 0.001

Each value is a memean of three determinations±SD.

Table 4 shows the results of phytochemical analysis of Girdle pod(*Mitracarpus scaber*) Leaves.

The results of phytochemical analysis showed that alkaloid has a highest value of 7.03±0.22mg/100g and this is followed by saponin 0.42±0.01mg/100g, flavonoid 0.153±0.003 mg / 100 g , phytate 0.144±0.001mg/100g, tannin 0.28±0.003 mg / 100 g , o x a l a t e 0.14±0.004mg/100g and cyanoglycoside 0.003±0.001mg/100g.

The phytochemical composition in mg/100 g (DW) for alkaloid, flavonoid, saponin, tannins, phenols, hydrocyanic acid and phytic acid were 3.54, 0.83, 1.68, 0.49, 0.35, 16.99 and 1.32, respectively (Akubugwo *et.al.*, 2007).the results showed that Girdle pod leaf is richer in Alkaloid than Amaranthus leaf. However the latter contained more cyanoglycoside than the former.

The medicinal values of the plants useful for healing and curing of human diseases had been attributed to the presence of phytochemical compounds in them (Nostro *et. al.*, 2000). The compilation of useful drugs derived from medicinal plant is impressive; these include :heart drugs, analgesics, anesthetics, antibiotics, anticancer and anti-parasitic compounds, anti-inflammatory drugs. Oral contraceptive hormones as well as diuretics (Choudhary *et. al.*, 2014). The presence and quantities of alkaloids, flavonoids, tannins, saponins, terpenoids and cardiac glycosides in leaves of *P. longifolia* in this study suggests that it could be useful in

discovery and development of new drugs.

Alkaloids are vital constituents in drug production and are used in the production of steroidal drugs (Maxwell *et.al.*, 1995). Pure isolated alkaloids and their synthetic derivatives are used as basic medicinal agents for their analgesic, antispasmodic and bacterial effects (Okwu and Okwu, 2004). Flavonoids have been referred to as nature's biological response modifiers because of strong experimental evidences of their inherent ability to modify the body's action to allergen, virus and carcinogens (Oke, 2014). Studies have shown that flavonoids prevent the oxidation of low density lipoprotein and thereby prevent the development of atherosclerosis. Tannins have the ability to form a leather resistance on exposed tissues and helps in protecting the wounds from being affected further (Rajesh *et. al.*, 2016). Several studies confirmed that tannins exhibit anti-oxidant, anti-microbial and anti-inflammatory properties (Okwu and Okwu, 2004).

Saponin has been shown to have hypocholesterolaemic, hypotensive and cough depressant activities (Mensah *et. al.*, 2013). Terpenoid compounds have been used to treat cancer, malaria, inflammation and variety of infectious disease (viral and bacteria) (Selvaraj *et. al.*, 2014). Terpenoid promotes glutathione – S- transferase and cancer cell apoptosis; hence, terpenoids have been used for anti-cancer properties (Dillard and German, 2000). Glycosides are potent signal transducers acting on several intracellular targets thus modulating the activities of enzymes and hormones (Neer,

1995).

Conclusion

The present study has shown that ,Girdle pod (*Mitracarpus scaber*) Leave is a good source of carbohydrate, vitamin C , potassium and calcium.

Recommendation

We hereby recommend that, the toxicity and biological evaluations of Girdle pod (*Mitracarpus scaber*) Leaves be investigated before use as an alternative source of food for animals and human.

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References

Akubugwo, I. E.*, Obasi, N. A., Chinyere G. C. and Ugbogu A. E.(2007). African Journal of Biotechnology Vol. 6 (24),: 2833-2839.

A.O.A.C (1990) official methods of analysis of analytical chemists. 13th edition Washington, D.C.

Ahmed, R.S., Seth, V., Benerjee B.D (2000). Influenced of dietary ginger (*ZingiberofficinalesRosc*) on antioxidant defense system in rat: comparison with ascorbic acid. Indian J Exp Biol. 38 (6): 604-606.

Ann,L.G.(2010)http://curezone.com/foods/salt/understanding_salt_and_sodiuhm1.(Accessed 2010).

ANR(2017).(www.allnigeriarecipes.com/howto/suya_spice.html } Accessed, 2017.

Association of vitamin chemists (1987). Methods of vitamin assay. Inter science. New York. : 1-55

Adebessin, A.A., Saromi, O.T. Amusa N.A. and Fagede S.O (2001). Microbiological Quality of some groundnut product hawked in Bauchi, a Nigerian city. The Journal of Food

Technology in Africa. 6 (2) 53-55.

Awodi, P. A., Awodi, P.I. and Larayetan, R.A. (2017). Assessment of Proximate Mineral and Anti-Nutritional Compositions of Myrianthus arboreus leaves. *International Journal of Bioorganic chemistry*, 2(3): 125-129

Choudary, S., Bisla, G. and Chaudhary, V. (2014). Proximate, Nutrient Composition and Antinutrient Analysis of Catharanthus roseus (Sadabahar) leaves. *ChemXpress*, vol.7(3): 86-91.

Dillard, C.J. and German, J.B. (2000). Phytochemicals: Nutraceuticals and Human Health. *Journal of the science of Food and Agriculture*, vol. 80(12):. 1744-1756.

Harborne J.B. (1973). Phytochemical methods. In Isolation and determination of Alkaloid. Chapman and Hall Ltd. London. 190-192.

Harbone, J.B. (1998). Phytochemical Methods. 3rd edition. Chapman and Hall London: 60, 135, and 203.

Horwitz, W. (1980): Official Methods of Analysis (13th edition). Association of Official Analytical Chemical, Washington D.C. U.S.A.

Halstrom F, Moller KD (1945). Content of cyanide in human organs from cases of poisoning with cyanide taken by mouth with contribution to toxicology cyanides. *Acta Pharmacol and Toxicol.* 1:18-28.

Harbone JB (1998). Phytochemical Methods. 3rd edition. Chapman and Hall London. 60: 135-203.

Howes, F.N. (1953). Vegetable tannin materials. Butter Worth London.

Ikediodi, C. O., Olugboji, O. and Okoh, P.N. (1988). Cyanide profile of component parts of sorghum (*sorghum bicolor L. Moench*) sprouts. *Food Chemistry*. Vol. 27, 167–175.

Jefferson P. P., Amy S. Hearn, Diane E. C., Harry S. N., John A. Tand David L.G.(2010)http://curezone.com/food/s/salt/understanding_salt_and_sodium.html(Accessed 2010).

- Maxwell, A., Seepersand, M., Pingal, R., Mootoo, D. R. and Reynolds, W.F. (1995).** 3-Beta-Amino Spirosolane Steroidal Alkaloids from *Solanum triste*. *Journal of Natural Products*. Vol. 58: 625-628.
- Mensah, J.K. Irenyen, J.O., and Okhiure, M. O. (2013).** Nutritional, Phytochemical and Antimicrobial Properties of Two Wild Aromatic Vegetables from Edo State. *J. Nat. Prod. Plants Res.*, vol. 3(21): 8-14.
- M.L.T.O. (2020).** The Functions of Carbohydrates in the Body. [https://med.libretexts.org/Courses/American Public University/APUS%3A An Introduction to Nutrition \(Byerley\)/Text/03%3A Carbohydrates/3.04%3A](https://med.libretexts.org/Courses/American_Public_University/APUS%3A_An_Introduction_to_Nutrition_(Byerley)/Text/03%3A_Carbohydrates/3.04%3A) (Accessed june,2021).
- Nduche, M. U., Edeoga, H. O., Omosun, G., and Nwankwo, D. (2015).** Evaluation of the Chemical Composition of Five Nigerian Medicinal Plants. *IOSR Journal of Pharmacy and Biological Sciences*, vol.10(2): 27-31.
- Naijagist.com (2018).** Nigeria herbs and their uses. www.naijagist.com (accessed july,2019).
- Okoye, Z.S.C. (1992).** Chemical and Biochemical indices of food quality. In *Biochemical Aspects of Nutrition*. Prentice –Hall of India. Private Ltd, New Delhi –110001: 136-137.
- Ogata, M., Hoshi, M., Urano, S. and Endo T. (2000).** Antioxidant Activity of Eugenol and Related Monomeric and Dimeric Compounds. *Chem. Pharm. Bull.* 48(10):1467-1469.
- Oke, D.G. (2014).** Proximate and Phytochemical Analysis of *Cajanus Cajan* (Pigeon Pea) leaves. *Chemical Science Transactions*, 3(3): 1172-1178.
- Okwu, D.E. and Josiah, C. (2006).** Evaluation of the Chemical Composition Of Two Nigerian Plants. *African Journal of Biotechnology*, 5(4): 351-357.
- Okwu, D. E. and Okwu, M.E. (2004).** Chemical Composition of *Spondias mombin* Linn Plant Parts. *J. Sustain Agric. Environ.*, 6(2): 140-147.
- Osagie AU, Eka OU (1988).** Antinutritional factors (Oxalate, Saponins, trypsin inhibitor and Alkaloid). *Nutritional Quality of Plant foods. post harvest unit.* University of Benin. Benin City. Nigeria:233-235.
- Perkin-Elmer (1982).** Analytical Methods for Atomic Absorption Spectrophotometry. U.S.A. Perkin-Elmer corporation.
- Price KR, Johnson IT, Fenwick GR (1987).** Effects of saponin on plasma and hepatic cholesterol levels and body weight changes. The chemistry and biological significance of saponins in foods and feeding stuffs. *CRC Crit. Rev. Food Sci. Nutr.* 26(1): 1-7.
- Savage, J.E, Yohe ,J.M, Pickett, E.E and O'Dell BL (1964).** Zinc metabolism in the growing chicks. Tissue concentration and effect of phytate on absorption. *Poult. Sci.* 43: 420-426.
- Selvaraj, S., Chittibabu, C. V. and Janarthnam, B. (2014).** Studies on Phytochemical Screening, Antioxidant Activity and Extraction of Active Compound (Swertiamarin) from Leaf Extract of *Enicostemma littorale*. *Asian Journal of Pharmaceutical and Clinical Research*, vol. 7(4):64-69.
- UNSCN (2009).** Global financial and economic crisis – The most vulnerable are at increased risk of hunger and malnutrition. United Nations Standing Committee on Nutrition: http://www.unscn.org/en/publications/nutrition_briefs/#Nutrition_impacts_of_global_food_and_financial_crises
- WEF (2016).** **Food security and why it matters.** <https://www.weforum.org/agenda/2016/01/food-security-and-why-it-matters/> Size and Stomach,”