Futo Journal Series (FUTOJNLS)
e-ISSN : 2476-8456 p-ISSN : 2467-8325
Volume-2, Issue-2, pp- 110 - 122
www.futojnls.org

Research Paper December 2016

Chemical Profile of *Picralima Nitida* Seeds used in Ethnomedicine in West Africa

Linus A. Nwaogu

Department of Biochemistry, Federal University of Technology, Owerri, Nigeria.
Emails: nwogulinus@gmail.com; nwogulinus@yahoo.com

Abstract

The chemical composition of the ground seeds of Picralima nitida were determined using standard methods. The results of the phytochemical analyses indicated the presence of alkaloids (5.33±0.57%), tannins (9.60±0.05%), cyanogenic glycosides (3.39±0.03%), oxalates (4.36±0.02%), saponins (13.50±0.50%), flavonoids (5.50±0.40%), phenols (1.79±0.03%) and phytates (0.17±0.004%). The moisture content of the seed was 10.67±0.34%, ash 3.67±0.34%, protein 3.50±0.18%, crude fiber 8.78±0.60% fat 3.49±0.10% and carbohydrate 69.90±078%. The seeds contained vital essential amino acids especially leucine (11.83%), phenylalanine (9.21%) and tyrosine (6.08%) and non-essential amino acids. The ground seed contained more unsaturated fatty acids (78.87%) than saturated fatty acids (20.13%). There were appreciable presence of macro and micro-elements with iron (172.40±0.70), zinc (55.70±0.30) and manganese (38.20±0.20) mg/kg being high. The ground seeds had vitamins A 123.40±0.30 and E 3285.70±0.05 µg/100 respectively. The study revealed that Picralima nitida seeds contain important phytochemicals, amino acids, fatty acids, vitamins and minerals which, if used, will not only offer medicinal benefits to its users but could also serve as a good source of nutrients.

Keywords*:* Amino acids, ethnomedicinal plant, fatty acids phytochemical, *Picralima nitida*

1.0 Introduction

Medicinal plants have been used for decades before the advent of orthodox medicine for the treatment of many illnesses. Various plants parts such as leaves, flowers, stems, roots, seeds, fruits and bark have all been used as constituents of herbal medicines. The medicinal values of these plant parts lie in their phytochemical

compositions, which produce definite physiological action on human body (Afolabi, Ibuun, Afor, Obuotor & Farobi, 2007).

Picralima nitida is the only species of the genus Picralima. It is related to Hunteria and Pleiocarpa. It belongs to the hunterieae tribe of the Apocynaceae family, and is commonly called Osi-Igwe in Ibo and Abere in Yoruba. In other parts of West Africa, the plant is called Gbe-Fon dangne in Benin Republic, Adangme in Ghana, Abure ebissi in Ivory Coast and Susu balunyi in Sierra Leone (Burkill, 1985). It is widely distributed in high deciduous forest of West-Central Africa, from Ivory Coast to West Cameroons, extending across the Congo basin and Uganda (Burkill, 1985; Ajanohoun, Abubakar, Diamante, Ebot, Ekpere & Enow-Orok,1996; NNMDA, 2008).

Picralima nitida is an under storey tree which reaches up to 4-35 meters in height. Its trunk is about 5-60 meters in diameter and is cylindrical in shape. The wood is pale yellow, hard, elastic and fine-grained. The plant bears white flowers (about 3 cm long) with ovoid fruits, which at maturity are yellowish in colour. The leaves are broad (3-10 cm) and oblong (6-20 cm long) with tough tiny lateral nerves of about 14 to 24 pairs (Burkill, 1985). *P. nitida* has varied applications in West African folk medicine. Various parts of the plant such as the leaves, seeds, stem bark and roots are used by traditional herbalists for the treatment of various ailments including fever, hypertension, jaundice, gastro-intestinal disorders and malaria. Despite the widespread abundance and numerous traditional uses of *P. nitida* plants especially the seeds in the treatment of various diseases, no study, to the knowledge of the author has evaluated the chemical composition of the seeds. This study therefore, was aimed at evaluating the chemical profile of seeds of this traditionally important medicinal plant.

2.0 Materials and Methods

2.1. Collection and Preparation of Plant Material

The matured fruits of *P. nitida* were purchased from Ekeonunwa market in Owerri metropolis, of Imo State, Nigeria. The fruits were identified by a plant taxonomist at the Department of Forestry and Wildlife, School of Agriculture, Federal University of Technology, Owerri. The seeds were removed from the pods, washed, air-dried to a constant weight, ground into a fine powder and then stored in a refrigerator at 4^{o}C until required for use.

Fig 1: The pods of *Picralima nitida* containing the seeds.

Fig. 2: The seeds of *Picralima nitida*

2. 2. 0. Chemical Analysis

2. 2.1. Phytochemical Determination

Quantitative phytochemical analyses for alkaloids, tannins, cyanogenic glycosides, oxalate, saponins, flavonoids, phenols and phytates in the processed seed sample were determined by the methods described by Harborne (1973) and Trease and Evans (1989).

2.2.2. Proximate Analysis

The proximate composition of the processed seed sample for carbohydrate, ash and moisture were determined as described in AOAC (1995). Crude protein, fiber and fat contents were determined by the methods described by Pearson (1976). Total ash content was determined by furnace incineration using the method of James (1995).

2.2.3. Amino acids composition

Amino acid composition of the processed seed sample was determined by the methods described by Nwaoguikpe and Ejele (2010).

2.2.4. Fatty acid composition

Fatty acid composition of the seeds was determined by the methods described in AOCS (1978).

2.2.4. Vitamin and Mineral Analysis

Vitamins A and E in the seed flour were determined by High Performance Liquid Chromatography (HPLC, Model CO30). The minerals; sodium and potassium in the processed seed sample were determined by Digital flame photometer (Model 2655-00). The other minerals; magnesium (Mg), calcium (Ca), phosphorus (P), iron (Fe), zinc (Zn), manganese (Mn) and selenium (Se) were determined with the aid of Atomic Absorption Spectrophotometer (AAS-Model-alpha 4).

2.3. Statistical Analysis

The results obtained are presented as mean ± standard deviation of triplicate determinations and were analysed by simple percentages.

3.0 Results and Discussion

Table 1 showed the phytochemical contents of the ground seeds of *P. nitida.* From the results, the seeds contain high percentage composition of saponins 13.50±0.50%, flavonoids 5.50±0.40% and alkaloids 5.33±0.57% respectively. The value of saponins obtained were lower 13.50±050% than that reported by Nwaogu *et al*, (2008) for *Persea americana* seeds 33.33±1.73%. Saponins have been shown to have hypocholesterolemic as well as anticarcinogenic effects (Koratkar and Rao, 1997). The cholesterol lowering effect of saponins in animals and humans is reported to be through the formation of mixed micelles and bile acids into micellar-bile acid molecules (Okenfull, Taopping, Illumen, & Fenwick, 1984). Plant alkaloids and their synthetic derivatives are used as basic medicinal agents due to their analgesic and anti-bacterial properties. Most plants used in the cure of diseases contain various amounts of alkaloids (Okwu, 2004). Flavonoids are simple phenolic compound which have been reported to possess a wide spectrum of biochemical activities such as antioxidant, antimutagenic, anti-carcinogenic, as well as the ability to modify gene expression (Beta, Nam, Dexter & Sepirstein 2005). Thus, the presence of these important phytochemicals in the seeds of *P. nitida* may confer it

with numerous pharmaceutical properties (Ezeamuzie, Ojinnaka, Uzogara, 7 Oji,1994; Fakeye, Itiola & Odelola, 2000). The anti-nutritional factors; oxalate, phytate and cyanogenic glycosides present in the seeds make the seeds to appear toxic. However, these factors were found to be in very low concentrations (Table 1).

Cyanogenic glycoside concentration in the seeds (3.39±0.03%) was much lower than the 36mg/100DM considered lethal to man. The oxalate concentration determined was quite low compared to the toxic levels of 2-5g as reported by Munro and Bassir (1969). Consumption of food-containing oxalic acid can cause corrosive gastroenteritis, shock, low plasma and renal damage (Eastwood, 1986). The phytate concentration of the seeds (0.17±0.004%) was found to be low. The knowledge of phytate concentration in food is necessary because high concentration can cause adverse effects on digestibility. Phytate forms complexes with ions of copper, zinc, cobalt, manganese, iron and calcium but the mechanism of the action has not been fully established.

Table 1: Phytochemical composition of *Picralima nitida* seed extract

Phytochemical Composition	%Value
Alkaloid	5.33±0.57
Tannin	9.60±0.05
Cyanogenic glycoside	3.39±0.03
Oxalate	4.36±0.002
Saponin	13.50±0.50
Flavanoid	5.50±0.50
Phenol	1.79±0.03
Phytate	0.17±0.004

Values are means ± standard deviation of three determinations

Table 2 shows the proximate composition of the seeds of *P. nitida* which revealed that the seeds contain appreciable nutrients which may confer added advantage to

its medicinal properties. The seeds contain appreciable quantity of crude protein, ash, fiber and carbohydrate.

The amino acid composition of *P. nitida* seeds. A close study of the amino acid distribution revealed that the seed is a rich source of both essential and non-essential amino acids. The seed was found to contain high contents of the following essential amino acids; leucine (11-83%), valine (9.76%) and phenylalanine (9.21%) while non-essential amino acids are tyrosine (6.08%) and cysteine (3.92%). The presence of these amino acids especially phenylalanine confers a potentially good property to the seeds as phenylalanine and other essential amino acids have the ability to scavenge free radicals via the ability to supply reducing power by dehydrogenation (Nwaoguikpe and Ejele, 2010). However, the essential and non-essential amino acid compositions in *Picralima nitida* seeds were found to be low compared to those present in melon seeds (*Citrullus vulgaris)* and fluted pumpkin seeds (*Telfaria occidentalis)* as reported by Achinewhu (1998).

Table 2: Proximate Composition of *P. nitida* seeds

Nutrient composition	% Mean composition
Moisture	10.67 ± 0.34
Ash	3.67 ± 0.34
Protein	3.50 ± 0.18
Crude fibre	8.78 ± 0.68
Fat	3.49 ± 0.10
Total Carbohydrate	69.9 ± 0.78

Values are means ± standard deviation of three determinations

Table 4 shows the fatty acid composition of *P. nitida* seeds. The fatty acids of these seeds are made up of 20.13% saturated and 78.87% unsaturated fatty acids. Like the African oil bean (*Pentaclethra macrophlla*) and *Mucuna sloanei* seeds, *P. nitida* seeds contain behenic and lignoeric acids, though at very low percentage. The seeds also contain appreciable percentage of linoleic acid, an essential fatty acid which formed about 33.45% of the total fatty acids in the seeds.

Table 3: Percentage amino acid composition of *Picralima nitida* seeds

Amino acids	Abbreviations	Value (%)
Essential Amino Acids		1.25
Arginine	Arg	
Histidine	His	4.15
Leucine	Leu	11.83
Lysine	Lys	3.24
Methionine	Met	1.64
Phenylalanine	Phe	9.21
Threonine	Thr	0.75
Thryptophan	Try	0.93
Isoleucine	Ile	5.44
Valine	Val	9.76
Total EAA		**48.2**
Non-Essential		
Alanine	Ala	0.64
Cysteine	Cys	3.92
Glycine	Gly	0.69
Proline	Pro	0.81
Tyrosine	Tyr	6.08
Serine	Ser	1.11
Glutamate	Gln	2.36
Aspartate	Asp	1.14
Total NEAA		**16.75**
TEAA + TNEAA		**64.95**
% Essential		74.2
% Non- Essential		25.79

Where: EAA, Essential amino acids; NEAA, Non-essential amino acids; TNEAA, Total Non-essential amino acids.

Table 4: Percentage fatty acid composition of *Picralima nitida* seeds

Fatty acids		% composition
Saturated		1. 41
8. 0	Caprylic acid	
10.0	Capric acid	1. 24
12. 0	Lauric acid	1. 95
14. 0	Myristic acid	0. 83
16. 0	Palmitic acid	12. 05
17. 0	Margaric acid	1. 07
18. 0	Steric acid	5. 36
22. 0	Behenic acid	0. 05
24. 0	Lignoceric acid	0. 11
Total Saturated fatty acids		**24. 07**
Unsaturated Fatty Acids		
16. 1	Palmitoleic acid	12. 05
18. 1	Oleic acid	37. 85
18.2	Linoleic acid	40. 75
18.3	Linolenic acid	2. 75
20. 3	Arachnidonic acid	2. 02
21. 1	Erueic acid	0. 09
Total		**95. 51**
Total fatty acids		**119. 58**
% Saturated fatty acids		**20. 13%**
% Unsaturated fatty acids		**78. 87%**

The vitamin content of *P. nitida* seeds is presented in Table 5. The seeds contain very important fat-soluble vitamins though at low concentrations with vitamins A and E 3285.70 and 123.40 µg/100g, respectively. Vitamin A is essential for normal growth, development and maintenance of epithelial tissues. It is also necessary for vision as well as normal bone and teeth development. These vitamins are important antioxidants used to scavenge free radicals in a living system. Furthermore, intake of the seeds may help to alleviate vitamins A and E deficiencies.

Table 5: The vitamin composition of *P. nitida* seeds

Vitamin composition	Values (µg/100g)
Vitamin A	3284.70 ± 0.50
Vitamin E	123.40 ± 0.30

Values are means ± standard deviation of three determinations

Table 6 shows the mineral composition of *P. nitida* seeds. The seeds contain among other minerals: sodium, potassium, magnesium, calcium, and phosphorus though at very low percentage.

Table 6: Mineral composition of *P. nitida* seeds

Mineral	% Composition
Sodium	10.67 ± 0.34
Potassium	0.846 ± 0.30
Magnesium	0.359 ± 0.18
Calcium	0.578± 0.68
Phosphorus	0.367± 0.10
Iron	172.40± 0.70
Zinc	55.40±0.30
Manganese	38.20±0.20
Selenium	0.007±0.10

Values are means ± standard deviation of three determinations

The combination of these minerals in the presence of fluoride has been reported to have protective as well as preventive roles in human dentition problems (Olabanji *et al.,* 1996; Okwu and Ekeke, 2003). The seeds also contain high percentage iron, zinc and manganese, while selenium was found to be low (0.007%). It is known that iron, zinc, manganese and selenium help to strengthen the immune system (Talwar *et al*., 1989). Iron is an important component of heamoglobin necessary for oxygen transport. Heamoglobin and ferroxidin play important roles in human metabolism. Similarly, manganese, zinc and selenium are known to prevent muscle degeneration,

growth retardation, immunologic dysfunction, gonadal atrophy, impaired spermatogenesis and bleeding disorder (Chaturvedi *et al*., 2004).

4.0 Conclusion

The study revealed that *P. nitida* seed flour is a good source of phytochemicals which have been reported to have various biochemical and physiological effects. The seed is apparently a good source of essential and non-essential amino acids, saturated and unsaturated fatty acids, minerals and antioxidant vitamins. The use of this plant especially the seeds in herbal medicine do not only offer medicinal benefits but also nutritional benefits to users. No wonder, the seed and even the fiber are commonly used in ethno-medicine for the treatment of many diseases in West Africa.

References

Achinewhu, S. C. (1998). Nuts and seeds In: Nutritional quality of plant foods (A. U. Osagie & O. U. Eka (eds). Published by Post Harvest Research Ltd, Department of Biochemistry, University of Benin, Nigeria. 134-159.

Afolabi, C. A., Ibuun, E. O., Afor, E., Obuotor, E. M. & Farobi, E. O. (2007). Phytochemical constituents and antioxidants activity of extract of leaves of *Ocimum gratissimum. Sci. Research and Essay*. 2(5), 163-166.

Ajanohoun, J. E., Aboubakar, N., Diamante, K., Ebot, M. E., Ekpere, J. A. & Enow-Orock, E. G.(1996). Contribution to ethno-botanical and floristic studies in Cameroun:. Traditional medicine and pharmacopoeia. *Tech. and Res. Comm. of the Org. of African Unity*. (OAU/STR) .60-61.

AOAC (1995). *Official method of analysis*. Washington, DC, USA: Association of Official Analytical Chemists.

AOCS (1978).The Association of the American Oil Chemist's Society, (3rd ed). Champaign, Illinois, USA.

Beta, C., Nam, S., Dexter, J. E. & Sepirstein, H. D. (2005). Phenolic content and antioxidant activity of pearled wheat and roller-milled fraction. *Cereal Chem*. 82(4), 390-393.

Burkill, H. M. (1985). The useful plants of West Tropical Africa. *Royal Bot. Gardens*. 456-596.

Chaturvedi, V. C., Shrivastava, R & Upreti, R. K. (2004). Viral infection and trace elements: A complex interaction. *Curr. Sci*; 87, 1536-1554.

Eastwood, T. (1986). *Oxalate In: Toxicants occurring naturally in foods*. Washington, D. C: National Academy of Science.

Ezeamuzie, I. C., Ojinnaka, M.C., Uzogara, E.O. & Oji, S.E. (1994). Anti-inflammatory, antipyretic and anti-malarial activities of a West African medicinal plant-*Picralima nitida*. *African Journal of Medicinal Science*. 23(1), 85-90.

Fakeye, T. O, Itiola, O. A. & Odelola, H. A, (2000). Evaluation of the antimicrobial property of the stem bark of *Picralima nitida* (Apocynaceae). *Phytother. Res*. 14(5), 368-370.

Harborne, J. B. (1973). *Phytochemical methods*. London. (1st ed): Chapman and Hill. 288-290.

James, C. S. (1995). *Analytical chemistry of food.* New York: Chapman and Hill. 20-25.

Koralkar, R. & Rao, A. V. (1997). Effect of soya bean saponins on azoxymethane-induced preneoplastic lesionin the colon of mice. *Nautri. Cancer*. 27, 206-209.

Munro, A. & Bassir, D. (1969). Phytin in vegetables. *West African Journal of Biology and Applied Chemistry.* 121, 14-18.

Nigeria Natural Medicine Development Agency (NNMDA). (2008). Medicinal plants of Nigeria, South-East zone. Nigeria Natural Medicine Development Agency . 1, 8-15.

Nwaoguikpe, R. N. & Ejele, E. A. (2010). Amino acid profile of some anti-sickling plant extracts and their haemoglobin polymerization inhibition. *Nigeria Journal of Biochemistry and Molecular Biology*. 25(2), 53-59.

Nwaogu, L. A., Alisi, C. S. & Ojiako, O. A. (2008). Studies on the nutritional and phytochemical properties of *Persea americana* seed. *Bio-Research*. 6(1), 320-322.

Okenfull, D. G., Taopping, D. C.,Illumen, R. J. & Fenwick, D. E. (1984). Prevention of dietary hypercholesterolaemia in rats by soya and quillaja saponins. *Nutrition. Research. International*. 29, 1039-1041.

Okwu, D. E. (2004). Phytochemicals and vitamin content of indigeous specices of South Eastern Nigeria. *J. Sust Agric. Environ*. 6 (1), 30-37.

Okwu, D. E. & Ekeke, O. (2003). Phytochemical screening and mineral composition of chewing stick in South Eastern Nigeria, *Global Journal of Pure and Applied Science*. 9, 235-238.

Olabaiji, S. O., Mankanju, O. V., Heque, D. C., Buoso, M. C., Ceccato, D., Cherubini, R. & Moshini, G. (1996). PIGE, PIXE analysis of chewing sticks of pharmacological importance. *Nucl. Instrum. Methods Phys. Res*.133, 368-372.

Pearson, D. (1976). Chemical analysis of foods. (7th ed) London Churchill Livingstone, 7-11.

Trease, G. E. & Evans, W. C. (1989). Trease and Evans' pharmacognosy: A physician's guide to herbal medicine, (13th ed). London: Bailliere Tindall.

Talwar, G. P., Srivastava, L. M. & Mudgil, K. D. (1989). Textbook of Biochemistry and human biology. India: Prentice Hall of India Private Ltd.