NATIONAL BOARD FOR TECHNICAL EDUCATION
NIGERIAN JOURNAL FOR TECHNICAL EDUCATION
Volume 24 Nos. 2 2025
ISSN No. 2992 - 3522

Nutritional and phytochemical properties of wild custard apple (*Annona senegalensis*) leaf

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Abstract

The proximate composition, vitamin content, mineral content and phytochemical compounds present in wild custard apple (*Annona senegalensis*) leaf were investigated using the standard methods described by Association of Analytical Chemists AOAC (2000) and Association of Vitamin Chemists (1987). The result of proximate composition showed that wild custard apple (*Annona senegalensis*) leaf contains crude protein 8.85 ± 0.01%, crude fibre 4.93 ± 0.01%, fat content 1.51 ± 0.01%, ash content 2.63 ± 0.01%, moisture content 9.74 ± 0.01% and carbohydrate content 72.34 ± 0.02%.

The result of vitamin analysis also showed that wild custard apple (*Annona senegalensis*) leaf contains the following vitamins; A 0.024 ± 0.001%, B_1 0.041 ± 0.001%, B_2 0.034%, B_6 0.162%, B_{12} 0.022%, C 8.78 ± 0.02%, E 0.011% and K 0.006%.

The result of mineral analysis indicated that wild custard apple (*Annona senegalensis*) leaf contains Sodium (Na) 4.36 ± 0.01%, Potassium (K) 165.45 ± 0.92%, Calcium (Ca) 2.81 ± 0.05%, Magnesium (Mg) 91.28 ± 0.65%, Manganese (Mn) 1.21 ± 0.01%, and Copper (Cu) 2.36 ± 0.01%.

The result of phytochemical analysis revealed that wild custard apple (*Annona senegalensis*) leaf contains Alkaloid 4.616 ± 0.007%, Saponin 0.284 ± 0.003%, Phytate 0.311 ± 0.001%, Tannin 0.576 ± 0.002%, Oxalate 0.218 ± 0.000%, Flavonoid 0.676 ± 0.001%, and Cyanoglycoside 0.003 ± 0.000%. Therefore, wild custard apple (*Annona senegalensis*) leaf is a good source of carbohydrate, protein, vitamin C, vitamin B_6, potassium, magnesium, alkaloid and flavonoid.

Keywords: wild custard apple (*Annona senegalensis*), phytochemical compound, proximate composition, vitamin, minerals.

Introduction

The world is faced with the problem of food insecurity especially in the developing countries where many people can no longer afford to purchase nutritious food. This is due to increase in population, poverty, unemployment, diseases (e.g. COVID 19),

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NIGERIAN JOURNAL FOR TECHNICAL EDUCATION
Volume 24 Nos. 2 2025
ISSN No. 2992 - 3522

devaluation of currencies, hyper inflation, etc. The U S Department of Agriculture reported that as at 2020, 10.5% of Americans were food insecure (StudySmarter, 2024). In Nigeria, many people no longer have the purchasing power to buy nutritious food because of hyper inflation, high cost of fuel, banditry, and adverse climatic conditions. In lieu of this, it is necessary for scientific researchers to search for other food materials which will be available to everybody. Many workers like Fowomola *et al., (*2023)a and Fowomola *et al., (*2023)b had reported the information on the nutritional and phytochemical compounds present in some underutilized leafy vegetables. It has been reported by Enloe (2024) that eating leafy green vegetables regularly can prevent the risk of cardiovascular diseases and also boost brain health as well as prevent obesity.

Wild custard apple plant (*Annona selegalensis*) belongs to the custard apple family (*Annonacea*). The Yoruba speaking people of Nigeria call it 'Abobo', 'Ubunu-ocha' in Igbo language and 'Gwandar-daji' in Hausa language, also in Nigeria (Jones, 1994). In Africa, *Annona selegalensis* is used as food for both humans and animals and as herbal medicine for the treatment of numerous ailments (AgroForestry, 2013). However, its usage as food is limited to a small populace due to lack of information on its nutritional and phytochemical properties. Therefore, the present research work is aimed at providing the information on the proximate composition, mineral constituents, vitamin constituents and phytochemical compounds present in wild custard apple (*Annona selegalensis*) leaves.

Materials and Methods

Fresh leaves of wild custard apple (*Annona senegalensis*) were purchased at Owode market, Offa, Kwara state, Nigeria. The leaves were identified by a botanist at the department of Science Laboratory Technology, Federal Polythecnic, Offa, Kwara State. They were thoroughly washed with distilled water, dried in the laboratory oven at 60^{o}C for 24 hours. The dried leaves were grinded using laboratory mortar and pestle and stored in a clean plastic container for analysis.

BDH Chemicals, London, UK. supplied all the chemicals used for the analysis.

The proximate composition, mineral content and phytochemical compounds present in the sample were determined using the standard methods described by Association of Analytical Chemists (2000), while the vitamins were determined using the methods described by Association of Vitamin Chemists (1987).

Table 1: Proximate composition of wild custard apple (*Annona senegalensis*) leaf in percentage dried sample.

S/N	Parameter	Amount (%)
1	Crude protein	8.85 ± 0.01
2	Crude fibre	4.93 ± 0.01
3	Fat content	1.51 ± 0.01
4	Ash content	2.63 ± 0.01

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5	Moisture content	9.74 ± 0.01
6	Carbohydrate content	72.34 ± 0.02

Each value is a mean of three determination ± SEM

Table 1 shows the result of proximate composition of wild custard apple (*Annona senegalensis*) leaf in percentage dried weight. The result of proximate composition showed that wild custard apple (*Annona senegalensis*) contain crude protein 8.85 ± 0.01%, crude fibre 4.93 ± 0.01%, fat content 1.51 ± 0.01%, ash content 2.63 ± 0.01%, moisture content 9.74 ± 0.01% and carbohydrate content 72.34 ± 0.02%. Carbohydrates serves as source of energy, participates in the normal functioning of the nervous system and production of neuro transmitters in the brain (Schneeman, 1995; Hill & Peters, 1996; American Diabetes Association, 1997). Protein is another source of energy, it serves as the building block of the body tissues, and is also used for the synthesis of essential proteins such as enzymes, hormones, DNA, ferritin, anti-bodies, etc. (Ward et al., 2004; Williams & Lovell, 2009; Brown et al., 2010; Siltberg-Liberles, 2011).

Table 2: Some vitamin contents of wild custard apple (*Annona senegalensis*) leaf in mg/ 100g dried weight

S/N	Parameter	Amount (%)
1	Vitamin A	0.024 ± 0.001
2	Vitamin B_1	0.041 ± 0.001
3	Vitamin B_2	0.034
4	Vitamin B_6	0.162
5	Vitamin B_{12}	0.022
6	Vitamin C	8.78 ± 0.02
7	Vitamin E	0.011
8	Vitamin K	0.006

Each value is a mean of three determination ± SEM

Table 2 depicts some vitamin contents of wild custard apple (*Annona senegalensis*) leaf in mg/ 100g dried weight. The result of vitamin analysis showed that wild custard apple (*Annona senegalensis*) leaf contains the following Vitamins: A 0.024 ± 0.001%, B_1 0.041 ± 0.001%, B_2 0.034%, B_6 0.162%, B_{12} 0.022%, C 8.78 ± 0.02%, E 0.011% and K 0.006%.

Table 3: Some mineral contents of wild custard apple (*Annona senegalensis*) leaf in mg/ 100g dried weight.

S/N	Parameter	Amount (%)
1	Sodium (Na)	4.36 ± 0.01
2	Potassium (K)	165. 45 ± 0.92
3	Calcium (Ca)	2.81 ± 0.05
4	Magnesium (Mg)	91.28 ± 0.65
5	Manganese (Mn)	1.21 ± 0.01
6	Copper (Cu)	2.36 ± 0.01

Each value is a mean of three determination ± SEM

Table 3 reveals some mineral contents of wild custard apple (*Annona senegalensis*) leaf in mg/ 100g dried weight. The result of

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mineral analysis showed that wild custard apple (*Annona senegalensis*) leaf contain Sodium (Na) 4.36 ± 0.01%, Potassium (K) 165.45 ± 0.92%, Calcium (Ca) 2.81 ± 0.05%, Magnesium (Mg) 91.28 ± 0.65%, Manganese (Mn) 1.21 ± 0.01%, and Copper (Cu) 2.36 ± 0.01%. Potassium ion is present in intracellular fluid where it serves to balance acid /base together with sodium ion, muscle contraction and osmotic pressure regulation (Murray *et al.*, 2000). Magnesium plays important role in the functioning of the nervous system, heart, kidneys, normal muscular functioning and regulation of glucose metabolism in the body. (Chubanov *et al.*, 2005; Bohl & Volpe, 2002; McCarty, 2005).

Table 4: Phytochemical contents of wild custard apple (*Annona senegalensis*) leaf in mg/ 100g dried weight

S/N	Parameter	Amount (%)
1	Alkaloid	4.616 ± 0.007
2	Saponin	0. 284 ± 0.003
3	Phytate	0.311 ± 0.001
4	Tannin	0.576 ± 0.002
5	Oxalate	0.218 ± 0.000
6	Flavonoid	0.676 ± 0.001
7	Cyanoglycoside	0.003 ± 0.000

Each value is a mean of three determination ± SEM

Table 4 indicates the phytochemical compounds present in wild custard apple (*Annona senegalensis*) leaf in mg/ 100g dried weight. The result of phytochemical contents showed that wild custard apple (*Annona senegalensis*) leaf contains Alkaloid 4.616 ± 0.007%, Saponin 0. 284 ± 0.003%, Phytate 0.311 ± 0.001%, Tannin 0.576 ± 0.002%, Oxalate 0.218 ± 0.000%, Flavonoid 0.676 ± 0.001%, and Cyanoglycoside 0.003 ± 0.000%.

Vitamin B_6 (Pyridoxine) is essential for liver detoxification activities, carbohydrate metabolism, synthesis of red blood cells, etc. (Combs, 2007). Vitamin C (ascorbic acid) is an antioxidant that works scavenge on free radicals in the body, it protects the eyes against damage, and for the prevention of a disease condition known as scuvy (WHFoods, 2017). Alkaloids are used for the treatment of certain diseases in animals and humans (Dey et al., 2017). Some flavonoids are known to inhibit the growth of certain cancer cells (Wang et al., 2017, Patil & Masand, 2019).

Conclusion

In conclusion, the present research work has shown that wild custard apple (*Annona senegalensis*) leaf is a good source of carbohydrate, protein, vitamin C, Vitamin B_6, potassium, magnesium, alkaloid and flavonoids. *When compared with the nutritive values of amaranthus vegetable (Amaranthus tricolor), wild custard apple* (*Annona senegalensis*) leaf is inferior in terms of crude protein, vitamin C, potassium, alkaloid and flavonoid to the former but comparable in terms of carbohydrates, vitamin B6 and magnesium content (Kumar et al., 2017; Singh et al.,

2017; Vega et al., 2017; Sahitya et al., 2018; Afolabi et al., 2020; Zhang et al., 2020)

Acknowledgement

We hereby acknowledge the support of the laboratory technologists and the management of the Federal Polytechnic Offa, for creating enabling environment for research.

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Volume 24 Nos. 2 2025
ISSN No. 2992 - 3522

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