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Full Length Research

Quantitative assessment of phytochemicals and nutritional potential of leaves and seeds *of Cleome viscosa* from Abakaliki, Nigeria

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ABSTRACT: The phytochemicals and nutritional potential of the leaves and seeds of *Cleome viscosa* were assessed by determining phytochemical, proximate, vitamin and mineral compositions. Results indicate alkaloid contents of the leaves and seed as 0.21 and 6.12 mg/100g respectively. Other findings are flavonoids 0.02 and 0.45, tannins 0.08 and 1.18, phenol 0.50 and 0.04, steroids 2.66 and 0.37, saponon 0.35 and 2.77, oxalates 0.01 and 0.66, cyanide 0.61 and 1.07 mg/100g for the leaves and seed respectively. Also, the results indicate carboydrate contents of the leaves and seed as 56.44 and 40.00% respectively. Others include: Crude Protein 13.52 and 6.41, Fats 4.29 and 1.32, Crude fibre 12.52 and 27.35, Ash 4.96 and 13.10, Moisture 8.26 and 11.83%. Vitamin content indicate the order vit A<vit B_9<vit E< vit C<vit B_3< vit B_2<vit B_5<vitB_1 in the leaves while that of seeds were vit B_9<vit A<vit C< vit B_3<vit B_1< vit B_2<vit B_5<vit E. Mineral analysis revealed the order P<K<Ca<Na<Mg<Fe<Zn in the leaves and P<K<Na<Mg<Ca<Fe>Na<Zn in the seeds. Phytochemical analysis revealed high oxalate, phenol but low sterol content in the studied plant materials. Oxalate and cyanide levels were higher in the seeds compared to the leaves. These results suggest that *Cleome viscosa* is awfully nutritive despite the presence of some anti-nutrients like oxalate and cyanide.

Key words: *Cleome viscosa*, nutritional composition, phytochemical.

INTRODUCTION

The involvement of diverse plant sort to health-care services can not be over-emphasized. These plants have been sources of numerous phytochemicals and nutrients in capricious magnitude. Phytocompounds are essential in drug breakthrough and their functions are given ample thoughtfulness in human body. This is because dearth of some nutrients in the body can lead to prime and resultant diseases. Alots of these plants are used to treat and prevent some of these diseases. A good number of these plants have had their phytochemical and nutritional composition analysed while others have not. There is a paucity of information if any in the literature on the phytochemical and nutritional compositions of *Cleome viscosa.*

Cleome is a genus of flowering plants in the family Cleomaceae. This genus had previously been placed in the family Capparaceae, until DNA studies found that Cleomaceae genera are more closely related to Brassicaceae than Capparaceae (Stevens, 2012). The family Cleomaceae is of about 12 genera and 250 species are distributed in tropical and warm temperate regions (The Plant List, 2013). Members of this family are herbaceous or shrubby plants with palmately compound leaves (Stevens, 2012). *C. viscosa* is a native to Asia, but now has a pantropical distribution and is naturalized in tropical and subtropical regions in Asia, Africa, the Americas, and Oceania (Acevedo-Rodriguez and Strong, 2012; Flora of China Editorial Committee, 2015; PIER, 2015; USDA-ARS, 2015). According to Flora of China Editorial Committee (2015), *C. viscosa* is a fast-growing

Figure 1. Leaves (A) and Seeds (B) of *Cleome viscosa*.

annual herb of humid and warm habitats that grow up to 160 cm tall. It is commonly found growing as a weed in disturbed sites, gardens, rice paddies, pastures, orchards, abandoned lands, and along roadsides (Flora of China Editorial Committee, 2015; PROTA, 2015).

In tropical Africa, *C. viscosa* is occasionally used as a leaf vegetable. The bitter leaves are eaten fresh, dried or cooked. In India, the seeds which have a pleasant flavour are used as a condiment substitute for mustard seed and cumin in the preparation of pickling spices, sausages, vegetables, curries and pulses. In Sumatra, the dried and powdered leaves and seeds are added to tobacco to enhance its narcotic properties (Windadri, 2001). In Asia, the leaves and seeds are used medicinally to treat infections, fever, rheumatism and headaches (PROTA, 2015). In Ebonyi State Nigeria, *C. viscosa* is used as mosquito repellent by the rural dwellers. According to them, it is done by detaching the stem from the whole plant and allows to wither for them to repel mosquito.

Notwithstanding the popular uses of *C. viscosa,* there is little or no information on phytochemical, proximate, vitamin and mineral contents in literature. Hence, this research was aimed at studying the compositions of phytochemical, proximate, vitamin and mineral of *C. viscosa* leaves and seeds that make them constructive in curing some ailments and in use as food.

MATERIALS AND METHODS

Fresh leaves and seeds (Figure 1a and b) of *Cleome viscosa* were gotten from Democracy Estate in Abakaliki Local Government Area of Ebonyi State, Nigeria. The plant samples were identified and authenticated by Dr. Nnamani, K., a taxonomist in the Department of Biological Science, Biology Option of Ebonyi State University, Abakaliki, Ebonyi State, Nigeria.

Preparation of plant material

The leaves and seeds of *cleome viscosa* were sorted, washed thoroughly with distilled water to remove dirt and debris, cut into smaller pieces before it was shade dried at room temperature (28±3ºC). After drying, the leaves and seeds were ground separately into a fine powder using a manual grinder, sieved and stored in an air-tight contained, kept in a desiccators until analyzed.

Quantitative phytochemical analysis

The method of AOAC (2004) as described Akubugwo et al. (2007) was adopted to assay for the quantitative phytochemicals.

Measurement of proximate parameters and selected vitamins and minerals

The proximate and selected vitamin compositions were determined by the metod of Association of Official Analytical Chemist (AOAC.), (2004) while minerals were determined using Atomic Absorption Spectrophotometer (AAS).

RESULTS AND DISCUSSION

The leaves and seeds of *Cleome viscosa* were analyzed for phytochemical contents. The results of phytochemicals of the leaves and seeds of *Cleome viscosa* presented in Table 1 showed that phenol and steroid contents were higher in the leaves relative to the seeds. According to the report of Akubugwo et al. (2007) on nutritional potential of the leaves and seeds of Black

Table 1. Phytochemical compositions of *Cleome viscosa in leaves and seeds.*

Phytochemicals	Composition in mg/100g of leaves	Composition in mg/100g of seeds
Alkaloids	0.21 ±0.01	6.12±0.02
Flavonoids	0.02 ±0.00	0.45±0.02
Tannins	0.08 ±0.00	1.18±0.01
Phenola	0.50 ±0.80	0.04±0.01
Steroids	2.66 ±0.28	0.37±0.01
Saponons	0.35±0.00	2.77±0.02
Oxalates	0.01±0.02	0.66±0.14
Cyanides	0.61±0.01	1.07±0.00

Values are mean ± standard deviation of the triplicate determinations.

Table 2. Proximate compositions of *Cleome viscosa in leaves and seeds.*

Parameters	Composition in percent of leaves	Composition in percent of seeds
Carbohydrate	56.44 ±0.07	40.00±0.00
Crude Protein	13.52 ±0.02	6.41±0.01
Fat	4.29 ±0.07	1.32±0.01
Crude fibre	12.52±0.14	27.35±0.01
Ash	4.96±0.00	13.10±0.02
Moisture	8.26±0.02	11.83±0.02

Values are mean ± standard deviation of the triplicate determinations.

Nightshade- *Solanum nigrum* L. Var *virginicum,* the leaves and seeds of *Solanum nigrum* L. Var *virginicum* had higher amounts of flavonoid, phenol, oxalate and cyanide compared to the leaves and seeds *of Cleome viscosa w*hile steroid and saponin contents of both leaves and seeds of *cleome viscosa* were higher to that of *Solanum nigrum.* Also, alkaloids and tannins content of the leaves of *Cleome viscosa* were lower compared to *Solanum nigrum* L. Var *virginicum.* Offor et al. (2015) revealed appreciable high levels of phytochemicals analyzed on leaves of *Terminalia catappa* which in disagreement with the result of this study. Though, the leaves and seeds contain relatively high levels of oxalate and cyanide, the processing methods prior to consumption which may include cooking reduces their final consumed amount.

Proximate contents as shown in Table 2 indicated that carbohydrate, crude protein and fats were of higher amounts in the leaves comparative to the seeds. The quantity of carbohydrate in the leaves and seeds of *C. voscosa* compared favorably with that of *Solanum nigrum* L. Var *virginicum* as asserted by Akubugwo *et al.* (2007). Similarly, the crude protein and fat contents of the leaves of *Cleome viscosa* compared favorably with the *Solanum nigrum* L. Var *virginicum* but disagreed with others while the seeds conflicted in general with all other proximate contents. The report of Igwenyi et al. (2017) on nutritional potential of *Azadirachta indica* seed revealed high concentrations of carbohydrate which aligned with the result obtained in this study. Conversly, the report of Igwenyi et al. (2017) was in divergence with the result obtained in concentrations of crude protein and fibre, fat, ash and moisture. Offor et al. (2015) on proximate and phytochemical analysis of *Terminalia catappa* leaves recorded high concentration of carbohydrate, moderate concentration of crude fibre and moisture and low concentration of ash. This report was in concurrence with the result of this study. The report of Uraku et al. (2016) on the assessment of nutritional value of *culcasia scandens p*. beauv leaves concurred with the result of the proximate analysis obtained in this research.

Table 3 showed the results of vitamin constituents. It posited that vitamin A and E were higher in the leaves than in the seeds. The leaves and seeds of *Cleome viscosa* had equal amounts of vitamin B_2 and B_5. Vitamin A and B_9 contents of *C. viscosa* were higher in both leaves and seeds to that of *Solanum nigrum* while B_1, C and E were lower in both leaves and seeds of *C. viscosa.* Uraku et al. (2016) on assessment of nutritional value of *Culcasia scandens p*. beauv leaves recorded high levels of vitamin A, B_9 and low levels of vitamin C and other B vitamins. This report is in affirmation with the obtained result and disagreed with the quantity of vitamin C recorded.

The result of mineral contents of the leaves and seeds of *Cleome viscosa* as presented in Table 4 demonstrated

Table 3. Vitamin compositions of *Cleome viscosa in leaves and seeds.*

Vitamins	Composition in mg/100g of leaves	Composition in mg/100g of seeds
Vitamin A	104.60 ±0.00	6.00±0.00
Vitamin B_1	0.07 ± 0.00	0.34±0.40
Vitamin B_2	0.13 ± 0.00	0.13±0.00
Vitamin B_3	0.17±0.00	1.08±0.00
Vitamin B_5	0.12±0.00	0.12±0.00
Vitamin B_9	18.13±0.02	20.13±0.01
Vitamin C	0.28±0.00	2.43±0.01
Vitamin E	1.04±0.00	0.02±0,00

Values are mean ± standard deviation of the triplicate determinations.

Table 4. Mineral compositions of *Cleome viscosa in leaves and seeds.*

Minerals	Composition in mg/100g of leaves	Composition in mg/100g of seeds
Ca	42.74±0.21	0.72±0.01
Na	19.57±0.00	10.44±0.02
K	392.00±0.00	12.55±0.14
Mg	13.54±0.08	0.87±0.00
P	450.13±0.20	16.68±0.14
Fe	8.24±0.00	0.49±0.14
Zn	1.81±0.00	0.13±0.01

Values are mean ± standard deviation of the triplicate determinations.

that all the selected elements analyzed were higher in the leaves compared to the seeds. Ca and K contents of *C. viscosa* were higer in the leaves comparable to *Solanum nigrum* but lower in the seeds of *C. viscosa* compared to *Solanum nigrum.* Na and Zn were higer in both leaves and seeds of *C. viscosa* similar to *Solanum nigrum.* Mg and Fe were lower in both leaves and seeds of *C. viscosa* to that of *Solanum nigrum* while P contents of *Solanum nigrum* compared favorably with that of *C. viscosa.* Igwenyi et al. (2017) recorded high concentrations of P and low concentrations of Fe and Mg which is in accordance with the result obtained in this work but in discrepancy with the concentrations of Ca.

Conclusions

In précis, the leaves and seeds of *C. viscosa* contained substantial quantities of phytochemicals, proximate contents, vitamins and mineral elements but in variable amounts. Therefore, the plant is recommended as a cheap source of carbohydrate, protein, energy, vitamins and minerals.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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