

An Assessment of the Phytochemical and Nutrient Composition of the Pulverized Root of *Cissus Quadrangularis*

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Abstract

The phytochemical and nutrient composition of the pulverized dried root of *Cissus quadrangularis* (an edible Nigerian vegetable) were determined. Phytochemical tests on the plant revealed the presence of alkaloids, saponins, tannins, flavonoids, glycosides with the absence of cyanogenic glycosides. Proximate analysis showed $11 \pm 0.01\%$ moisture content, $3.33 \pm 0.58\%$ fat, $7.50 \pm 0.17\%$ crude protein, $68.89 \pm 1.16\%$ carbohydrate, $3.33 \pm 0.10\%$ ash, $5.97 \pm 0.1\%$ fibre, and 335.50 ± 3.43 kcal/100g energy content.

The root powder also constituted a rich source of mineral elements (mg/100g dry matter): Potassium 67.5, calcium 39.5, zinc 3.0, sodium 22.5, Iron 7.5, lead 3.5, cadmium 0.25, copper 0.5, magnesium 1.15, chromium 0, cobalt 0. Analysis of the toxicants also revealed that the oxalate, tannin, phytate, saponin contents were 135, 0.3, 20, 0.16 mg/100g dry matter, while hydrocyanic acid was not detected. The results are discussed in terms of the nutritive value as well as the public health implication of having this vegetable as part of the diet.

Key words: *Cissus quadrangularis*, nutritional evaluation.

Introduction

In Nigeria, a variety of unprocessed foodstuffs are eaten by different communities, regardless of the nutritive value and potential toxic hazards posed to health by some of the constituents.

The pulverized dried roots of *Cissus quadrangularis* (Guil and Perr: *Ampelidaceae*) is one of such foodstuffs and is an edible vegetable eaten widely in some parts of Nigeria (Ekpechi, 1967). It is used as a soup condiment. The objective of this study is to carry out both chemical and nutritional evaluation of this plant foodstuff with a view to accessing its nutritive value and potential health hazards.

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Materials and Methods

All reagents and chemicals used were of analytical grades. Plant material was collected from Nsukka, Enugu State Nigeria and identified at the Botany Department of the University of Nigeria, Nsukka. A voucher specimen is retained in the Department of Botany herbarium, University of Nigeria, Nsukka.

Determination of Toxicants

Phytic acid was determined by the method of McCance and Widdowson (1953) while the method described by Dye (1956) was used for the determination of oxalate.

Phytochemical Analysis

The phytochemical tests for alkaloids, saponins, flavonoids, tannins, glycosides and cyanogenic glycosides were carried out according to the methods described by Harborne (1973).

Proximate Analysis

The proximate analysis of the dried pulverized root for crude fat, crude protein, carbohydrate, ash, crude fibre and moisture was carried out using the methods described by AOAC (1984). The calorific value was the sum of multiplied value of percentage crude protein, crude lipid and carbohydrate with At-water factor of 4,9,4 kilocalories per gram (Osborne and Voogt, 1978). Tannin was estimated by the method of Burns (1971) and hydrocyanic acid (HCN) was estimated by the alkaline titration method of AOAC (1984).

Elemental Analysis

Elemental analysis was performed using atomic absorption spectrophotometry (AOAC, 1984).

Results and Discussion

The results are shown in Tables 1-5. Table 1 shows the phytochemical composition of the root of *Cissus quadrangularis*. These secondary plant metabolites are known to exhibit diverse pharmacological, biochemical and pharmacological actions in animals. For instance, alkaloids which are present in the plant are known to have numerous beneficial pharmacological actions (Trease and Evans, 1983). The most striking observation is the absence of cyanogenic glycosides which are known to possess some toxicological activity.

The proximate composition and calorific value of the plant material are shown in Table 2. The plant contains high carbohydrate and calorific values and the level of protein is low when compared to another edible Nigeria vegetable –*Vernonia amygdalina*– with protein content $21.70 \pm 0.70\%$ and $23.10 \pm 0.05\%$ for the bitter and non-bitter varieties respectively (Ijeh *et al*, 1996). The crude fibre, ash and moisture content compare closely with the values reported for *Vernonia*

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amygdalina while the fat content is higher in *Cissus quadrangularis*. The *Cissus* plant under investigation can serve as a rich source of carbohydrates in the diet.

Table 1: Qualitative Phytochemical screening of *Cissus quadrangularis* seed powder.

Components	
Alkaloids	+
Saponins	+
Flavonoids	+
Tannins	+
Glycosides	+
Cyanogenic glycoside	ND

+ = presence of component tested

ND = Not detected

Table 2: Proximate composition (mg/100g dry weight) and calorific value (kcal/100g) of *Cissus quadrangularis* root powder.

Components	Mean \pm Standard deviation
Fat	3.33 \pm 0.58
Crude protein	7.50 \pm 0.17
Carbohydrate	68.89 \pm 1.16
Ash	3.33 \pm 0.10
Fibre	5.97 \pm 0.10
Moisture	11.00 \pm 0.01
Calorific value	335.50 \pm 3.43

Values are means of 3 determinations \pm S.D.

The mineral composition (Table 3) show that the powdered root of *Cissus quadrangularis* is a rich source of sodium, potassium, calcium, iron and also contains reasonable amount of other bulk and trace elements. These minerals play very important role in metabolic activities (Enechi, 2001). However their bioavailability should be ascertained since a number of phytochemicals are capable of complexing with nutrients thus reducing the bioavailability of the nutrients (Enechi *et al*, 1996).

Table 3: Mineral content of *Cissus quadrangularis* root powder (mg/100g)

Mineral Elements	Content(mg/100g)
K	67.5
Ca	39.5
Zn	3.0
Na	22.5
Fe	7.5
Pb	3.5
Cd	0.25
Cu	0.5
Mg	1.15
Cr	ND
Co	ND

Values are means of 3 determinations.

ND = Not detected.

Table 4 reveals the levels of toxicants in the powdered roots of *Cissus quadrangularis*. The oxalate content of the plant is strikingly high as revealed by the result, while the levels of other toxicants: phytates, saponins, tannins were low and within the limits acceptable as safe by World Health Organization (Munro and Bassir, 1969).

Table 4: Levels of some toxicants in *Cissus quadrangularis* root powder (mg/100g sample).

Toxicants	Composition
Oxalate	135.00 ± 0.12
Tannin	0.30 ± 0.08
Phytate	2.00 ± 0.03
Saponin	0.16 ± 0.06
Hydrocyanic acid	ND

Values are mean of 3 determinations

Although the oxalate level in this vegetable is high, it is unlikely that the oxalate will pose toxicity problems in animals since it is much below the toxic levels (Munro and Bassir, 1969). The absence of hydrocyanic acid in this vegetable is

remarkable.

Conclusion

In conclusion, the present study showed that the pulverized root of *Cissus quadrangularis* is a good source of carbohydrates as well as some minerals including sodium, potassium, calcium and iron. Study also revealed that although the oxalate content of the vegetable is high it is not likely to pose any health hazard especially at the level at which the vegetable is usually used in the diet.

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