
MINERALS AND PROXIMATE ESTIMATIONS OF THE STEM AND LEAVES OF
ANDROGRAPHIS PANICULATA (King of Bitters)

Abasiokong B. O¹, Osabor V. N²

Department of Pure and Applied Chemistry
University of Calabar
Calabar, Nigeria

ABSTRACT

Andrographis Paniculata stem and leaf was analyzed for its proximate composition and mineral contents, using various standard techniques. The proximate analysis result revealed that crude protein, crude fat, crude fibre, Ash, Carbohydrate and moisture contents were 5.88 ± 0.30 , 1.44 ± 0.00 , 12.40 ± 0.64 , 8.13 ± 0.01 , 72.15 ± 0.01 and 68.00 ± 0.02 (%) respectively for stem and 14.88 ± 0.01 , 9.71 ± 0.00 , 6.22 ± 0.01 , 4.15 ± 0.04 , 65.04 ± 0.04 and 71.65 ± 0.04 (%) respectively for the leaves. The energy obtained for the stem is 325.08 and 407.07 for the leaves. While the mineral analysis showed the composition of Ca, Mg, Na, K, P, Cu, Zn, Mn and Fe as 80.20 ± 0.05 , 110.27 ± 0.43 , 60.58 ± 0.10 , 51.12 ± 0.20 , 24.00 ± 0.36 , 31.10 ± 0.00 , 11.90 ± 0.09 , 32.80 ± 0.20 and 340.68 ± 0.04 (mg/kg) respectively for the stem. While the leaves show 80.20 ± 0.00 , 100.24 ± 0.46 , 50.48 ± 0.17 , 14.38 ± 0.20 , 42.00 ± 0.20 , 25.30 ± 0.07 , 12.80 ± 0.17 , 37.50 ± 0.00 and 337.60 ± 0.17 for the corresponding elements. The presence of these nutritional chemicals is an indication that the stem and leaves of this plant can be useful ingredient in either human or animal food industries or even as useful spices.

Keywords: Stem, Proximate, Mineral, *Andrographis paniculata*

INTRODUCTION

Nutrition is the provision of materials needed or necessary to support life in cells and organisms in the form of food. The availability of healthy diet can prevent or alleviate so many common health challenges confronting man particularly in the developing countries. The science of nutrition aims at investigating the effect of any diet to the body in terms of metabolic and physiological responses.

The nutrient in food can be classified into the proximate composition of food (the six major classes) called: the macro nutrients and the micro nutrients which includes minerals and vitamins (Berg *et al.*, 2002). The Deficiency or excess of some of these nutrients in diet can result in some serious health problems (Nelson and Micheal, 2000) leafy vegetable also referred to as green vegetable are plants leaves consumed as vegetable and sometimes accompanied by the tender petioles and shoots (Ujowundu *et al.*, 2008). Green vegetable constitute an indispensable constituent of human diet in Africa generally. Nigeria is blessed with abundant supply of both cultivated and non-cultivated leafy vegetable that grow seasonally or all year round. *Andrographis paniculata* is one of the 2500 species belonging to the *Acanthaceae* family. Many of which are natives of India and South Asia. This plant is known by various names, however the name Mahatita literally “King of Bitters” in North eastern India stands out as it testifies to the highly bitter taste all parts of the plants import (Levita *et al.*, 2011). This plant is easily cultivated from seed of all types of soil and a mere sampling of the plant pharmacological properties including diverse healing potential (Abhishek *et al.*, 2010). It is also a powerful immune booster.

Though this plant has found its way into this country in the 21st century, its medicinal benefit has strongly gained the confidence of many Nigerians particularly in the South eastern region, where all its uses are based on self medication. Though a lot of research on the medicinal activity of this plant (leaves, stem and root) has been established but little or no nutritional information on the plant has been documented.

MATERIALS AND METHOD:

PROXIMATE ANALYSIS: Crude protein (Total nitrogen % x 6.25) was estimated using the Kedjahl method (AOAC 1984) of determining the total nitrogen. Ash by the incineration of 2g of the sample in a muffle furnace maintained at 550°C for about 2hours and moisture estimated by weighing 10g of the sample in a crucible placed in an oven maintained at 105°C until constant weight was obtained. Crude fat, by ether extract using Soxhlet extraction and crude fiber by acid digestion (AOAC 2000). Finally to determine the total soluble carbohydrate, the method based on difference was used which involves total carbohydrate = 100 – (crude protein + crude fibre + crude fat + total ash) % and energy value Kcal/kg was calculated by multiplying the values obtained for carbohydrate, protein and fat by 4, 4 and 9 respectively and adding up the values. All the analysis were carried out in duplicate and reported in percentage.

MINERAL ANALYSIS

The samples were digested by wet digestion method using a combination of perchloric acid nitric acid and sulphuric acid (AOAC 2000).

The elements Ca, Mg, Cu, Zn, Mn and Fe were determined using the Atomic Absorption spectro photometer. K and Na where determined by the flame photometer while P was determine by the colorimetric method using vanadium molybdate. All the determinations were done in triplicates.

RESULTS AND DISCUSSION**RESULTS**

The results of the proximate and mineral composition of the stem and leaves of *Andrographis paniculata* is as shown in Table 1 and 2

Table 1: Percentage composition of the proximate nutrient in the samples

Nutrients	Stem	Leaves
Crude protein %	5.88±0.30	14.88±0.01
Crude fat %	1.44±0.00	9.71±0.00
Crude fibre %	12.40±0.64	6.22±0.01
Ash %	8.13±0.01	4.15±0.04
Carbohydrate %	72.15±0.01	65.04±0.04
Moisture %	68.00±0.02	71.65±0.04
Energy (KCalorie)	325.08	407.07

Mean± standard deviation

Table 2 : Results of the Mineral Element

Elements	Values in Stem (Mg/Kg)	leaves (Mg/Kg)
Ca	80.20 ± 0.05	80.20 ± 0.00
Mg	110.27 ± 0.43	100.24 ± 0.46
Na	60.58 ± 0.10	50.48 ± 0.17
K	51.12 ± 0.20	14.38 ± 0.20
P	24.00 ± 0.36	42.00 ± 0.20
Cu	31.10 ± 0.00	25.30 ± 0.07
Zn	11.90 ± 0.09	12.80 ± 0.17
Mn	32.80 ± 0.20	37.50 ± 0.00
Fe	340.68 ± 0.04	337.60 ± 0.17

Mean ± Standard deviation

DISCUSSION

The nutrient composition of any food, determine its quality.

The value of proteins in the leaves $14.88 \pm 0.01\%$ is higher than 5.88% in the stem. These are in the domain of values $12.60 \pm 0.22\%$ obtained for *diplazium summatti* (Osabor 2010) and 11.73% reported for *cucurbita maxima* peel (Olayemi and Salihu 2014) but lower than the range of values $21.35 \pm 0.4 - 26.13 \pm 0.7$ obtained for some Nigerian condiment (Dosumu *et al.*, 2012). It has been a known fact that any plant food that provides about 12% of their caloric value from protein are considered good source of protein (Effiong *et al.*, 2009). Therefore the leaves and not the stem of this plant can be considered a good source of protein. The values of crude fat are 1.44% and 9.71% for stem and leaves respectively. These values are low compared to the range of values 10.12%- 55.09% obtained for some Nigerian condiment (Dosumu *et al.*, 2012), but are in order with 3.11% reported for *C. maxima* peel by Olayemi and Salihu, 2014). However they are higher than 0.51% reported by Eze and Okonkwo (2012) for hibiscus leaves, while the leaves and not stem is higher than the range of values 6.00- 6.58% reported by Yusuf and Ayedim (2008) for roasted Nigeria Beniseed. Though lipids are essential because they provide the body with maximum energy (Olayemi *et al.*, 2006). This low level is good for people suffering from obesity. Excess fat is associated with certain cardiovascular disorder. The crude fiber content of the stem and leaves are 12.40% and 6.22% respectively, with the stem showing higher level of fiber than the leaves. These values are much lower than the value 35.95% obtained for *C. maxima* peel (Olayemi and Salihu) and both are higher than the range of values (2.00 – 4.00)% obtained for some vegetables grown in Jos (Etonihu *et al.*, 2010). These values are not too far from the 14% of fiber per day recommended by the American Dietary guideline. (ADG 2005) High level of dietary fiber is advantageous for their active role in the regulation of intestinal transit. (Ayoala and Adeyeye., 2009). The crude ash content of the stem and leaves of king of bitter were found to be 8.13% and 4.15% respectively. The stem is higher while the leaves are lower than the value 6.32% reported for *C. maxima* peel while both are far higher than the range of values (0.06 – 0.3)% obtained for edible vegetables grown in Jos (Etonihu *et al.*, 2010). 1.5 to 2.5% ash content in vegetables for human food is recommended (Pomraz and Clifton., 1981). Therefore both leaves and stem are high mineral (ash) source.

Moisture is an indication of water activity which is used as a measure of stability and susceptibility of microbial contamination. The stem and leaves of this plant has high moisture of 68.00% and 71.65% respectively. This implies that the leaves and even the stem have storage disadvantage with high cost of handling and short term storage. Though these values are yet lower than the range (86-94)% obtained for vegetable in Jos. They can be regarded as short lived perishable plant.

The result of the carbohydrate content shows that the stem is higher in carbohydrate content 72.15% than the leaves 65.04% DM. These values competes with 73.45% (Osabor *et al.*, 2010), and the values 61.3 to 86% reported by Oguntona (1998) for green leafy vegetables and higher than 24.60% reported by Osabor and Essien (2012) for *D. summatti* leaves. Carbohydrates are good sources of energy.

The result of the macro mineral elements composition in table II above shows that potassium has the highest value of 1483.00, and 511.20 (mg/kg) for leaves and stem, followed by magnesium with 1002.40 and 1102.70 (mg/kg) for leaves and stem, then calcium with 802.70 and 802.0 (mg/kg) for leaves and stem, sodium 504.80 and 605.80 (mg/kg) and phosphorus 420.00 and 240.00 for leaves and stem respectively. The stem is higher in Mg and Na, lower in P and K which is outstandingly concentrated in the leaves. These minerals play major roles in regulating various body activities, they constitute central component of various tissues and organs such as bones, teeth, blood, muscles, etc. they also regulate enzymes activities in the body as well as enhance immune system, prevention and control of various diseases such as hypertension, anemia, bleeding, diabetes, etc (NRC, 1978).

Andrographis paniculata contains more iron 337.58 and 340.68 (mg/kg) for leaves and stems, followed by manganese with 37.50 and 32.80 (mg/Kg), copper 25.30 and 31.10 (mg/kg) and finally zinc 12.80 and 11,90

(Mg/Kg) for leaves and stem among the micro minerals. The stem is slightly higher in Fe and Cu and slightly lower in Zn and Mn as compared with the leaves.

This show that *Andrographis paniculata* (King of bitter) contains high level of micro nutrients which can be useful for both humans and animals. These micro nutrients play major role in prevention of disease such as anemia, cholinergic response i.e. nerve impulse transportation. They also aid enzyme activity (co factors) and constitute the central components of blood, bones, muscles, spiral cord, brain, etc (James, 1984)

CONCLUSION

In conclusion therefore, this plant has revealed itself a high source of both proximate and mineral source of vegetable and thus its inclusion in any diet would mean a very highly nourishing diet. In addition to all the medicinal benefits earlier revealed by many researchers worldwide, the continuous cultivation and popularization of this plant can contribute greatly in the medical and nutritional enhancement of any population thus helping to jerk an economy out of recession.

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