

Physicochemical Properties of Some Traditional Vegetables in Cote d'Ivoire: Seeds of *Beilschmiedia mannii* (Lauraceae), Seeds of *Irvingia gabonensis* (Irvingiaceae) and Mushroom *Volvariella volvaceae*

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Abstract: Samples of fresh mushrooms *Volvariella volvaceae*, dry seeds of *Irvingia gabonensis* (Irvingiaceae) and dry seeds of *Beilschmiedia mannii* (Lauraceae), three traditional vegetables found on the market in Abidjan were studied in relation to their nutrients compositions (water, ash, protein, fat, carbohydrates, energy value) and minerals (Ca, Na, K, Mg, Fe). The results show that the mushroom *Volvariella volvaceae* is characterized by a high water content (81±0.53%), high carbohydrate content (79.44±0.24% dm) and protein content (17±0.04% dm) very significant. Mineral composition contains more Na (1.880±0.02% dm) and K (1.260±0.12% dm). Seed of *Irvingia gabonensis* is rich in lipid (63.61±0.70% ms) but it also contains appreciable levels of carbohydrates (23.25±0.17% ms), protein (7.23±0.80% DM) and mineral matter (5.91±0.30% dm). These seeds of *Irvingia gabonensis* contain more K (0.678±0.01% ms) and Ca (0.452±0.09% ms). Seed of *Beilschmiedia mannii* is rich in carbohydrates (92.08±1.20% ms) and has a significant protein content (7.16±0.11% ms), its mineral composition contains more than K (0.872±0.05% ms).

Key words: Traditional, mushroom, seeds, nutrient, minerals, vegetables

INTRODUCTION

The word vegetable is any edible part of a plant, mushroom or algae which is not sweet to taste. Also the plants supplying the condiments and herbs are included under this name.

In Africa about 4000 plant species have the potential to produce food crops. African traditional or local vegetables are one part. They are more and more known for their importance in contributing to food security of millions of Africans in rural and urban areas (Rubaihayo, 2002). These are the vegetables that the rural African population produces for consumption as local foods. According Rubaihayo (2002) they are considered as traditional vegetables for at least two reasons:

- Although, some of these plants are cultivated, others are easily found and harvested in their natural habitat
- Many of these plants have been consumed for many generations, reflecting their importance in local culture

Three categories of meats contribute to food in tropical Africa. The staple foods that provide the bulk of the energy ration, accompaniment foods that modify the taste qualities and provide essential elements (minerals,

vitamins, supplements protein) and booster foods that take a leading role in wards or famine. Vegetables are classified in the second category, namely that of accompaniment foods.

Traditional vegetables contribute significantly, though rarely acknowledged, the food security of rural and urban populations in many African countries. They have a very high nutritional value. They contain vitamin A, B and C, proteins and minerals such as iron, calcium, phosphorus, iodine and fluorine in varying amounts but adequate for health (Rubaihayo, 2002). Traditional vegetables bring to the populations who have at their disposal only some few meat or fish, necessary proteins.

The study focuses on the physicochemical characterization of three traditional vegetables found on the market in Abidjan. These are samples of mushroom *Volvariella volvaceae*, seeds of *Beilschmiedia mannii* and *Irvingia gabonensis*.

MATERIALS AND METHODS

For this study researchers used samples of traditional vegetables, fresh mushrooms *Volvariella volvaceae*, dry seeds of *Irvingia gabonensis* (Irvingiaceae) and dry seeds of *Beilschmiedia mannii* (Lauraceae), bought in Abidjan market (Cote d'Ivoire).

Physicochemical analysis: The water content was determined by drying in an oven at 105°C for 24 h to constant weight (AOAC, 1980), the ash content was determined by incineration at 650°C muffle furnace (AOAC, 1980), the protein content was determined by the Kjeldahl method using as a conversion factor 6.25, the lipid content was determined by Soxhlet extraction with ether; the total carbohydrate content was determined by difference according to the equation {100-(% protein+% lipid+% ash+% water)}. The energy value was calculated using the equation {(4×protein)+(9×fat)+(4×carbohydrate content)} (Atwater and Rosa, 1899); mineral elements Ca, Na, K, Mg, Fe were determined with atomic absorption spectrophotometer varian 5, after digestion of ash to hot into acid middle.

RESULTS AND DISCUSSION

The nutrient composition of the three traditional vegetables is shown in Table 1. The contents are reported in percentage of dry matter.

The mushroom *Volvariella volvaceae* is a species of mushroom rich in water (81.00±0.53%) and in carbohydrate (79.44±0.24% dm), its protein contents (17.01±0.04% dm) and fat content (3.44±0.02% dm) are remarkable, its mineral content (0.11±0.01% dm) remains scarce. its energy value (397.93±4.82 cal/100) is appreciable.

Seeds of *Irvingia gabonensis* contain carbohydrates (23.25±0.17% dm), protein (7.23±0.80% dm) and ashes (5.91±0.30% dm) with appreciable levels and a significant quantity of fat (63.61±0.70% dm). The energy value (707.68±3.19 cal/100) of these seeds is high.

Beilschmiedia mannii seeds contain a big quantity of carbohydrates (92.08±1.20% dm), of average rates of protein (7.16±0.11% dm), of ashes (3.89±0.24% dm) and of a small quantity of lipids (0.61±0.04% dm). The energy value (379.61±1.90 cal/100) is appreciable.

The composition of mineral elements of traditional vegetables is shown in Table 2. Element contents are reported in percentage of dry matter. The mushroom

(*Volvariella volvaceae*) contains more Na (1.880±0.02% dm), K (1.260±0.12% dm), slightly less Ca (0.120±0.04% dm), Mg (0.130±0.01% dm) and very little iron (0.010±0.00% dm).

Irvingia gabonensis seeds contain more K (0.678±0.01% dm), Ca (0.452±0.09% dm), slightly less Mg (0.213±0.01% dm) and very little Na (0.061±0.00% dm), Fe (0.012±0.00% dm).

Beilschmiedia mannii seeds contain more K (0.872±0.05% dm), slightly less Ca (0.104±0.02% dm) and very little Na (0.061±0.01% dm), Mg (0.071±0.00% dm), Fe (0.029±0.00% dm).

Mushroom *Volvariella volvaceae*: Mushroom *Volvariella volvaceae* is a species of fungus that has high carbohydrate content (79.44±0.24% dm). This value is above that one given by Parent and Thoen (1977) for species *Cantharellus cibalus* (64% dm) and *Russula* sp. (55% dm) picked in D.R of Congo. And it approaches the value found by Azema in the inedible species *polyporus sulfureus* (73% dm). The appreciable protein content 17±0.04% dm is between those of mushrooms *Cantharellus cibalus* (15% dm) and *Russula* sp. (29% dm) that were given by Parent and Thoen (1977).

The rate of fat 3.44±0.02% dm, is lower than those of fungi *Cantharellus cibalus* (6% dm) and *Russula* sp. (6% dm) of Parent and Thoen (1977) and *Lactarius phlebophyllum* species (9% dm) found by Harkonen *et al.* (1994).

Contrariwise, the species *Clitopilus prunulus* (0.00% dm) and *Fistulina hepatica* (0.06% dm) studied by Azema contain less fat. With 0.11±0.01% dm.

The rate of mineral matter is scarce, it is outside the range 1.76% dm (*Clitocybe gigantea*) 34% dm (*Cortinarius praestans*) of different fungi's contents studied by Azema.

The high value of water content (81±0.53%) shows that the mushroom *Volvariella volvaceae* like all specimens with hat (50-90%) according Azema is also rich

Table 1: Nutrients composition (% of dry matters)

Samples	Elements					
	Water	Proteins	Lipids	Carbohydrates	Ashes	Energy (calories)
<i>Volvariella volvaceae</i>	81.00±0.53	17.01±0.04	3.44±0.02	79.44±0.24	0.11±0.010	397.93±4.82
<i>Irvingia gabonensis</i>	4.97±0.50	7.23±0.80	63.61±0.70	23.25±0.17	5.91 ±0.30	707.68±3.19
<i>Beilschmiedia mannii</i>	11.40±0.72	7.16±0.11	0.61±0.04	92.08±1.20	3.89±0.240	379.61±1.90

The indicated values represent the average of three determinations (n = 3)

Table 2: Mineral composition (% dry matter)

Samples	Elements				
	Ca	Na	K	Mg	Fe
<i>Volvariella volvaceae</i>	0.120±0.04	1.880±0.02	1.260±0.12	0.130±0.01	0.010±0.00
<i>Irvingia gabonensis</i>	0.452±0.09	0.061±0.00	0.678±0.01	0.213±0.01	0.012±0.00
<i>Beilschmiedia mannii</i>	0.104±0.02	0.061±0.01	0.872±0.05	0.071±0.00	0.029±0.00

The indicated values represent the averages of three determinations (n = 3)

in water. In conclusion, this mushroom is characterized by its high water content (81±0.53%), its high carbohydrate content (79.44±0.24% dm) and its protein content (17±0.04% dm) appreciably.

Mushroom *Volvariella volvaceae* contains high concentrations of Na (1.880±0.02% dm) and K (1.260±0.12% dm). These values are higher than those of ears Fungus (Na: 0.985% ms; K: 0.310% dm). The contents of Ca (0.120±0.04% dm) and iron (Fe) (0.010±0.00% dm) are lower than those of ears Fungus (Ca: 0.310% dm) (Fe: 0.042% dm).

Seeds of *Irvingia gabonensis*: Seeds of *Irvingia gabonensis* contain lots of fat (63.61±0.70% dm). A value close to those found by Ekpe *et al.* (2007) 66.60±0.80% dm and by Kouame and Gnahoua (2008) 65.84% dm.

The protein content (7.23±0.80% dm) is also significant. Its value lies between those given by Ekpe *et al.* (2007) 7.6% dm and Women *et al.* (2006) 8.40% dm. But it remains below the rate of 5.83% dm found by Kouame and Gnahoua (2008).

The total carbohydrate content (23.25±0.17% dm) is also significant in this traditional vegetable. With a slightly higher rate of carbohydrate to that given by Women *et al.* (2006) 19.20% dm.

The seeds of *Irvingia gabonensis* have a remarkable mineral content (5.91±0.30% dm). Its value is lower than that one found by Ekpe *et al.* (2007) 9.50±0.30% dm, it is above the data of Kouame and Gnahoua (2008) 2.31% dm and of Women *et al.* (2006) 2.21% dm

The energy value (707.68±3.19 cal/100) of seeds of *Irvingia gabonensis* is remarkable. That could be explained by the relatively high levels of fat, protein and total carbohydrate. In conclusion we note that seeds *Irvingia gabonensis* are a vegetable rich in fat but contain levels of carbohydrates, protein and mineral matter equally remarkable.

Seeds of *Irvingia gabonensis* contain more K (0.678±0.01% dm) and Ca (0.452±0.09% dm), a little less of Mg (0.213±0.01% dm), very little Na (0.061±0.00% dm) and Fe (0.012±0.00% dm). These different contents are in approximate proportion to those given by Kombou and Joseph (1984) related to the kernel of *Irvingia gabonensis* in Cameroon Fe: 0.06% dm; Mg: 0.63% dm; Ca: 0, 60% dm.

Seeds of *Beilschmiedia mannii*: Seeds of *Beilschmiedia mannii* contain high level of carbohydrates (92.08±1.20% dm). This value is slightly above that given by Leung *et al.* (1968) 88.76% dm.

The protein content (7.16±0.11% dm) has a value between those found by Kouame and Gnahoua (2008) 6.67% dm and by Leung *et al.* (1968) 8.92% dm. This

vegetable has a low fat content (0.61±0.04% dm), a lower result than that of Gnahoua and Kouame 2.04% dm. But close to that given by Leung *et al.* (1968) 0.59% dm.

The rate of mineral matter (3.89±0.24%) has a value less than that given by Gnahoua and Kouame 5.70% dm. The energy value 379.61±1.90 cal/100 of this vegetable is also significant and is similar to that given by Leung *et al.* (1968) 389 cal/100. We will note that the seeds *Beilschmiedia mannii* are a traditional vegetable rich in carbohydrates with a significantly protein content.

Seeds of *Beilschmiedia mannii* contain more K (0.872±0.05% ms), a little less Ca (0.104±0.02% dm), very little of Mg (0.071±0.00% dm), Na (0.061±0.01% dm) and Fe (0.029±0.00% dm).

Leung *et al.* (1968) gives a calcium content of the *Beilschmiedia mannii* seeds equal to Ca: 0.258% dm. A value greater than that found in the study Ca: 0.104±0.02% dm).

CONCLUSION

The mushroom *Volvariella volvaceae* is characterized by high water content, high carbohydrate content and significant protein content. This mushroom is relatively rich in Na and K.

The seeds of *irvingia gabonensis* are rich in fat and contain a level of carbohydrates, protein and mineral matter equally remarkable. The seed of *irvingia* contains less Na and more K, Ca, Mg. *Beilschmiedia mannii* seeds are a food rich in carbohydrates with significant protein content. The seed of *Beilschmiedia* contains less Na, Mg K and Ca.

In order to better know the nutritional value of these traditional vegetables, the study of nutrients and mineral elements should be completed by vitamins, amino acids and antinutritional factors.

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