

## Full Length Research Paper

# Evaluation of the consumption and physicochemical characteristics of the leaves of *Salacia pynaertii* in the food practices of populations of Brazzaville (Congo)

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The objective of this study was to evaluate the place of *Salacia pynaertii* in the consumption of vegetables in Congo-Brazzaville, like its nutritional quality. With this intention, an investigation of consumption based on a card was carried out near 117 consumers of *S. pynaertii*. The data collected carried on the sociodemographic data of the consumers, on the knowledge of this vegetable, and on their consumption like on their frequency. In addition, the physico-chemical analysis related to the morphology of the leaves, the determination of the contents of macronutrients and some minerals. It comes out from this study that *S. pynaertii* is a vegetable known and consumed by all social categories: grooms 47%, single people 41% whose age varies between 48 and 53 years. The consumption of the leaves of *S. pynaertii* is not dependent to the educational level or on the social standing. The sheets of *S. pynaertii* are used like one alicament in the treatment of some diseases. The consumption of the leaves of *S. pynaertii* is made mainly believed (100%). This preference of consumption is acquired by practice (84.6% and for statistics:  $\chi^2 = 42,818$ , ddl=116,  $p=0.00000$ ). Their consumption is frequently done with dishes made up of salted fish (37.6%), followed by fried fish (36.8%). The test of student reveals a highly significant difference  $p < 0.001$ . These consumers have preferences directed towards the dishes containing fish salted (51.3%), of preserve fish (25.6%), of fish fried (23.1%). As a whole, the difference is highly significant,  $p < 0.001$ . Concerning the morphological parameters, they arise that the leaves of *Sa. pynaertii* have one length of  $2.90 \pm 4.14$  cm and a width of  $5.91 \pm 2.23$  cm. These morphological parameters are close to those of *Gnetum africanum*. Concerning the contents of nutrients, *S. pynaertii* contains a significant quantity of in nutrients and contains in particular  $34.25 \pm 0.35$  g of proteins/100 g of dry matter,  $39.28 \pm 0.55$  g of carbohydrates/100 g of dry matter,  $722.22 \pm 0.03$  mg of phosphorus/100 g of dry matter and  $54.33 \pm 0.45$  mg of calcium/100 g of dry matter. The knowledge of this vegetable and especially its frequency of consumption would constitute an advantage with the nutritional balance of the populations because of her contribution in micronutrients and macronutrients.

**Key words:** Vegetable-leaves, *Salacia pynaertii*, investigation of consumption, Brazzaville, nutritional quality.

## INTRODUCTION

The local leaves vegetables are cheap and easily accessible at many communities, in the rural, periurban

and urban zones. They are also rich in micronutrients and can be crucial for the food and nutritional safety of the

poor families (Jansen et al., 2004).

In Africa, the populations often have recourse to the vegetable species (Ambé, 2001). Among the vegetable species, forest products not ligneous family, represents the most significant share of the edible products (FAO, 2002; Canadian Food Inspection Agency, 2001). According to experts' in nutrition of the French-speaking countries of sub-Saharan Africa, the vegetables constitute a source of micronutrients in general (FAO/OMS, 2007). They can also constitute from their composition an appreciable rock salt complement and proteins in the food (Ern, 1979).

The consumption of vegetables plays a capital role in the nutritional balance of the populations and this because of their strong content of micronutrients and some macronutrients (Batawila, 2007).

In Congo, there is an abundance remarkable consumable vegetables, that is to say, 166 food vegetable species (Profizi et al., 1993) which contribute to the daily food of the population. Among the forest products not ligneous, Celastraceae occupy a significant place in the cover of the food needs in Republic for Congo. Celastraceae set out again in 50 kinds and 800 species of which *Salacia pynaertii* vegetables sheets which lead to the wild state in the forests. They form a unit made up of the Chlorophyllian parts to the example of the fruits, leaves, stems and inflorescences (Bressani et al., 1980). This vegetable-leafy generally returns in the food consumption of the populations of Brazzaville. So, the objective of this study was to evaluate the place of *S. pynaertii* in the food consumption of the populations of Brazzaville, like its nutritional quality.

## MATERIALS AND METHODS

### Target population

The choice of the household considered as statistical unit, made it possible to collect desired information (information on the consumers of the leaves of *Salacia pynaertii*). Each surveyed consumer was identified by a code. The questioned people must agree to take part in the study, to be old of less than 18 years and to be consumers.

### Vegetable material

The investigation was directed into *S. pynaertii*, vegetable-sheet consumed with Brazzaville because of its importance in the food practices of the population.

### Didactic material

The didactic material is summarized in a card of investigation being

presented in the form of questionnaires posed at the surveyed consumers of *S. pynaertii* and whose answers are noted or notched on the card by the investigator. This card is made up of the open questions and closed questions. The great points of this card are the statute sociodemographic, the age and the educational level of the consumers, the knowledge of *S. pynaertii*, the consumption of the sheets of *S. pynaertii*, the preference of consumption of vegetable-leaves, the preference of consumption of the dishes with the leaves of *S. pynaertii*, the interdictions to consume the leaves of *S. pynaertii*, the advantages of the consumption of the leaves of *S. pynaertii*, the intention and the spending patterns and its frequency of consumption.

### Inquire in the households

The investigation was carried out in the urban district of Brazzaville from May to June of the year 2015. It is about an investigation of consumption of the sheets of *S. pynaertii* into a population of 117 households in the nine districts of Brazzaville. The investigation is of transversal type, with a survey with three degrees for the drawing of lots of the zones of enumeration, the blocks and the statistical units on the level of the pieces retained in the zone of enumeration. The investigation was held so that an investigator was charged to work near all the households concerned with the geographical area gathering the unit with zones of enumeration. For each listed household, the investigator had as a task to evaluate the characteristics of the household and the consumption of these leaves.

The questionnaires relating to the consumers were submitted to the people who consume usually the leaves of *S. pynaertii* in their household. A household where the principal housewife missed or who refused to answer the interview was replaced at once by the household nearest, by geographical proximity, in the direction of the step of progression of the investigation.

In each household, only one consumer was questioned. The questioned consumer was appointed by the person who usually deals with the meals. In the case of a building, each apartment is regarded as a household. The interviews were possibly carried out in official language (French) or national languages (Lingala and Kutuba). The starting point of each zone to inquire was the intersection of the streets nearest to the definite point of fall. The first piece to begin the interview was determined by the method crushes or face (with a coin). The direction of progression of the investigation was defined according to the direction growing of the numbers of pieces until obtaining ten households. The houses were surveyed gradually according to a step of five houses for the pieces with an even number and three houses for the pieces with an odd number.

### Preparation of the sample for the chemical analysis

The leaves of *S. pynaertii* were weighed then dried with the drying oven at the temperature of 70°C until stabilization of the mass. With the resulting one from this drying, the sheets were crushed. The powder obtained was used in this form for the chemical analysis.

### Determination of the water content

The water content was determined by a drying of the leaves of *S.*

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*pynaertii* to the drying oven of mark thermosi SR3000. A mass  $M_f$  of fresh sheets was weighed and placed at the drying oven at the temperature of 70°C. Drying was stopped after obtaining constant mass  $M_s$  and the difference in weight gives the water content reported to 100 g of fresh matter.

#### Determination of the content of lipids

The content of lipids of the sample was determined by extraction according to the method with the soxhlet by using cyclohexane like solvent of extraction according to the protocol hereafter: 50 g of the powder resulting from the crushing of the leaves of *S. pynaertii* was placed in a cartridge, which in its turn is placed in the soxhlet. In an empty balloon of 250 ml weighed beforehand ( $M_0$ ), one pours 150 ml solvent. The balloon is heated for 4 h, and then cooled. The solvent is evaporated by rotovapor. After evaporation, the balloon containing of lipids is weighed ( $M_1$ ). The difference in mass between the balloon containing of lipids and the empty balloon gives the mass of lipids reported at 100 g of vegetable matter.

#### Determination of the content of proteins

The total nitrogen content was determined by the method of kjeldahl (AOAC, 1990) which consists of the mineralization of the organic matter by the concentrated sulphuric acid, in the presence of a catalyst.

The contents of proteins were determined by the method of Kjeldahl by using a coefficient of conversion of nitrogen in protein of 6.25.

#### Determination of the content of carbohydrates

The carbohydrates were extracted by their solubility in ethanol after delipidation of the broyat of the sheets of *S. pynaertii*.

#### Determination of the content total rock salt (ashes)

The contents of total rock salt were determined by incineration with the muffle furnace at a temperature of 550°C for 8 h. Once the 8 h passed, the furnace was extinct and the ashes obtained was allowed to cool until the ambient temperature. Ashes were left in the furnace, and then weighed with a balance of precision.

#### Determination of the contents rock salt: Ca, Fe, P

The minerals (Ca, Fe, and P) were analyzed starting from the solution of ashes by atomic absorption spectrometry (S.A.A) or of emission of flame. For the determination of these minerals, the solution of lanthanum with 1% and one range standard which differ compared to each mineral were used.

#### Determination of the energy value

The corresponding energy value was calculated by using the specific coefficient of Merrill and Watt (1955) for proteins, lipids, and carbohydrates.

#### Treatment and analyzed data

Processing the data collected as well as the seizure and the

production of the rough tables were carried out using the software Excel 2003, EPI-INFO.6.04d Fr-2001. The variables were expressed in the form of percentages. The significant differences perceived between two percentages were checked according to traditional tests' of the differential statistics. The comparison of more than two percentages is carried out using the Student test.

For this, the compare value  $\chi^2 (h-1)$  is given by the tables of  $\chi^2$  to  $(h-1)$  degree of freedom, with a threshold of significant of 5%.

## RESULTS

### Statute sociodemography of the population

Table 1 presents the statute sociodemography of the surveyed population. Three parameters are observed: the matrimonial situation, the household structure and the number of participants cooking in the household.

Concerning the matrimonial situation, the most significant consumers are the grooms with a proportion of 47.0%; followed by single people with 41.0%; then widowers with 6.8%. The statistical test reveals a highly significant difference with  $p < 0.001$ .

Concerning the size of the household, it arises that the households having 3 and 4 people consume more sheets of *S. pynaertii* with a percentage of 20.5%; followed by households having 5 people with a percentage of 17.1%. Then the households come having 6 people with 16.2%; then those having 2 people with a percentage of 12%. The statistical test gives a value of 25,505. The difference is highly significant,  $p < 0.001$ .

With regard to the cooking, the households having two people consume more leaves of *S. pynaertii* with a percentage of 51.3%; followed by households having a person with a percentage of 43.6%. The participation in the cooking appears as an activity which returns exclusively to the only head of household and to the joint one. Among these households, 2.6% contribute to a cooking from 3 to 4 people. The statistical test gives a value of 26,790. The difference is highly significant,  $p < 0.001$ .

### Age and educational level of the consumers

The age and the educational level of the consumers of the leaves of *S. pynaertii* are shown in Table 2.

The results show that the age bracket surveyed represented the consumption of leaves of *S. pynaertii* ranging between 48 and 53 years with a percentage of 20.5%, followed that whose age is higher than 65 years with a proportion of 19.7%. The statistical test reveals a highly significant difference,  $p < 0.001$ .

The results also show that the educational level of the consumers of the leaves of *S. pynaertii* more represented secondary education I (first cycle) with a percentage of 43.6%, followed primary education with percentage of 29.1%. The statistical test gives a highly significant difference ( $p < 0.001$ ).

**Table 1.** Statute sociodemographic.

Parameter	Variable	Frequency	Percentage	Confidence interval at 95%	Value of the student test
Matrimonial situation	Married	55	47.0	37.7-56.5	$\chi^2=18,944$ ; ddl=116; p= 0.00000
	Free union	3	2.6	0.5-7.3	
	Single person	48	41.0	32.0-50.5	
	Divorced	3	2.6	0.5-7.3	
	Widower	8	6.8	3.0-13.0	
Household structure	1 People	7	6.0	2.4-11.9	$\chi^2=25,508$ ; ddl=116; p= 0.00000
	2 People	14	12	6.7-19.3	
	3 People	24	20.5	13.6-29.0	
	4 People	24	20.5	13.6-29.0	
	5 People	20	17.1	10.8-25.2	
	6 People	9	7.7	3.6-14.1	
	≥7 People	19	16.2	10.1-24.2	
Number of people taking part in the cooking	1 People	51	43.6	34.4-53.1	$\chi^2=26,790$ ; ddl=116; p= 0.00000
	2 People	60	51.3	41.9-60.9	
	3 People	3	2.6	0.5-7.3	
	4 People	3	2.6	0.5-7.3	

**Table 2.** Age and educational level of consumers.

Parameter	Variable	Frequency	Percentage	Confidence interval at 95%	Value of the student test
Age of the consumers (years)	18-23	1	0.9	0.0-4.7	$\chi^2=32,773$ ; ddl=116; p= 0.00000
	24-29	4	3.4	0.9-8.5	
	30-35	5	3.4	1.4-9.4	
	36-41	18	15.4	9.4-23.2	
	42-47	14	12.0	6.7-19.3	
	48-53	24	20.5	13.6-29.0	
	54-59	17	14.5	8.7-22.2	
	60-65	11	9.4	4.8-16.2	
	≥65	23	19.7	12.9-28.0	
Educational level of the consumers	Primary education	34	29.1	21.0-38.2	$\chi^2 = 23,698$ ; ddl=116; p=0.00000
	Secondary education I	51	43.6	34.4-53.1	
	Secondary education II	20	17.1	10.8-25	
	Tertiary education	11	9.4	4.8-16.2	
	None	1	0.9	0.0-4.7	

### Characteristics related to the sheets of *S. pynaertii*

#### Knowledge of *S. pynaertii*, modality of consumption and preference food of *S. pynaertii*

Table 3 presents the results on knowledge, parts used, the mode of consumption of the leaves of *S. pynaertii* and the others types of consumed vegetables. It gets clear that on the whole of the surveyed people, 100% know leaves of *S. pynaertii* and use all the part of the sheet for consumption.

These sheets are often consumed raw with a percentage of 100%. This preference of consumption is acquired by practice with a percentage of 84.6% and for statistics:  $\chi^2 = 42,818$ , ddl=116, p=0.00000

Among the other types of vegetables consumed by the population in this study, *Gnetum africanum* occupies the first place with a percentage of 64.1%, followed by *Trilepisium madagascariense* with a percentage of 11.1%. This consumption is generally justified either by the availability on the market (60.7%), or by their good taste (33.3%), with a highly significant difference (p < 0.001).

**Table 3.** Knowledge, mode of consumption of the leaves of *Salacia pynaertii* and Other types of consumed vegetables.

Parameter	Variable	Frequency	Percentage	Confidence interval at 95%	Value of the Student test
Knowledge of the leaves of <i>Salacia pynaertii</i>	Yes	117	100.0	96.9-0.0	-
Parts used of this plant	Leaves	117	100.0	96.9-0.0	-
Mode of consumption more used	Vintage	117	100.0	96.9-0.0	-
Reasons	Good taste	15	12.8	7.4-20.3	$\chi^2=42,818$ ; ddl=116; p=0.00000
	practice	99	84.6	76.8-90.6	
	Does not know	3	2.6	0.5-7.3	
Consumption of other types of vegetables	Yes	116	99.1	95.3-100.0	$\chi^2=118,000$ ; ddl=116; p= 0.00000
	Not	1	0.9	0.0-4.7	
Types of vegetable-leaves often consumed	Gnetum a. luméricié	75	64.1	54.7-72.8	$\chi^2=12,855$ ; ddl=116; p= 0.00000
	Trilepisium	6	5.1	1.9-10.8	
	others	13	11.1	6.1-18.3	
Reasons	Available	23	19.7	12.9-28.0	$\chi^2=15,958$ ddl=116 p= 0.00000
	Quantity	71	60.7	51.2-69.6	
	Good taste	5	4.3	1.4-9.7	
	Others	39	33.3	24.9-42.6	
		2	1.7	0.2-6.0	

### Dishes consumed with the leaves of *S. pynaertii*

Table 4 presents the various dishes consumed with the sheets of *S. pynaertii*. The results show that the surveyed people frequently consume the dishes with the leaves of *S. pynaertii*. These dishes composed of salted fish (37.6%), followed by fried fish (36.8%). The test of the student reveals a highly significant difference ( $p < 0.001$ ). These consumers have preferences directed towards the dishes: salted fish (51.3%), preserve fish (25.6%), fried fish (23.1%). As a whole, the difference is highly significant ( $p < 0.001$ ).

### Advantages, prohibited and other utilities of the consumption of the leaves of *S. pynaertii*

The advantages, prohibited and other utilities of the consumption of the leaves of *S. pynaertii* are shown in Table 5. Concerning the advantages, the results show that the leaves of *S. pynaertii* are mainly a source of the micronutrients (64.1%). Being the interdicts, the results show that the leaves of *S. pynaertii* almost do not present interdicts at consumption (96.6%;  $p < 0.001$ ). Concerning the other utility of the leaves of *S. pynaertii*, the results show that apart from the food aspect, the leaves of *S. pynaertii* are used with a medicinal aim. So, *S. pynaertii* is considered like one alicament.

### Recall of 24 h, frequency of consumption and perspective of culinary improvement of the leaves of *S. pynaertii*

Consumption the day before, the frequency of consumption and the perspective for culinary improvement of the leaves of *S. pynaertii* are shown in Table 6. The results show that low consumption has the sheet day before *S. pynaertii*. (25.6%) and the frequency of the most significant consumption is twice in the month (32.5%); although 11.1% of the households consume this vegetable 7 times per month. This frequency of consumption is varied.

Concerning the perspectives of culinary improvement, 82.1% of the households are favorable to the cooking of the sheets of *S. pynaertii* as it is the case of the majority of the consumed vegetables. These households would wish to prepare these leaves of *S. pynaertii* in the groundnut dough (46.9%), in the nut juice of palm (32.3%).

### Morphological characteristics of the leaves of *S. pynaertii*

Table 7 presents the morphological characteristics of the large leaves of *S. pynaertii*. The results show that the sheets of *S. pynaertii* show the following characteristics:

**Table 4.** Dishes consumed with the leaves of *Salacia pynaertii*.

Parameter	Variable	Frequency	Percentage	Confidence interval at 95%	Value of the student test
Existence of dishes frequently consumed with the leaves of <i>Salacia pynaertii</i>	Yes	117	100.0	96.9-0.0	
If so, which	Fried fish	43	36.8	28.0-46.2	$\chi^2=22,223$ ; ddl=116; p=0.00000
	Salted fish	44	37.6	28.8-47.0	
	Preserve fish	18	15.4	9.4-23.2	
	Smoked fish	12	10.3	5.4-17.24	
Existence of dishes consumed preferably with the leaves of <i>Salacia pynaertii</i>	Yes	117	100.0	96.9-0.0	
Existence of preferred dishes consumed with the leaves of <i>Salacia pynaertii</i>	Yes	117	100.0	96.9-0.0	
If so, which	Fried fish	27	23.1	17.2-32.1	$\chi^2=23,073$ ; ddl=116; p=0.00000
	Salted fish	60	51.3	44.2-60.6	
	Preserve fish	30	25.6	18.0-34.5	
Reasons of this preference	Good taste	107	91.5	84.8-95.8	$\chi^2=23,480$ ; ddl=116; p=0.00000
	Bad taste	1	0.9	0.0-4.7	
	Practice	8	6.8	3.0-13.0	
	Does not know	1	0.9	0.0-4.7	

**Table 5.** Advantages, prohibited and other utilities of the consumption of the leaves of *Salacia pynaertii*.

Parameter	Variable	Frequency	Percentage	Confidence interval at 95%	Value of the student test
Advantages of the consumption of the leaves of <i>Salacia pynaertii</i>	Good taste	-	0.9	0.0-4.7	$\chi^2=30,320$ ; ddl=116; p=0.00000
	Source of minerals and vitamins	-	64.1	54.7-72.8	
	Stop the hunger	-	1.7	0.2-6.0	
	Does not know	-	33.3	24.9-42.69	
Existence of prohibited on the consumption of the leaves of <i>Salacia pynaertii</i>	Yes	0	0	0	$\chi^2=57,245$ ; ddl=116; p=0.00000
	Not	113	96.6	91.5-88.1	
	Does not know	4	3.4	0.9-8.5	
Utilities of the leaves of <i>Salacia pynaertii</i>	Alicament	117	100.0	96.9-0.0	-
	Does not know	0	0		

length  $12.90 \pm 4.14$  cm, width  $5.91 \pm 2.23$  cm, length of the petiole;  $0.59 \pm 0.13$  and number of ribs  $9.50 \pm 2.22$ .

#### Nutritional values of the leaves of *S. pynaertii*

The nutritional values in macronutrients and some micronutrients of the leaves of *S. pynaertii* are presented

in Table 8. It is deduced from this table, that the leaves of *S. pynaertii* show the water content of 57.97%, content of proteins  $34.25 \pm 0.37$  g/100 g dry matter, content of carbohydrates  $26.18 \pm 0.55$  g/100 g of dry matter and in lipids of 0.70 g/100 g of dry matter. The leaves of *S. pynaertii* present an energy value of 301.02 kcal is 1258.26 kJ.

This vegetable presents an ash content of  $5.05 \pm 0.86$

**Table 6.** Recall of 24 H, frequency of consumption and Perspectives of culinary improvement of the leaves *Salacia pynaertii*.

Parameter	Variable	Frequency	Percentage	Confidence interval at 95%	Value of the Student test
Yesterday, you consumed dishes accompanied by the leaves of <i>Salacia pynaertii</i>	Yes	30	25.6	18.0-34.5	$\chi^2=43,007$ ; ddl=116; p=0.00000
	Not	87	74.4	65.5-82.0	
How much time you consumed the leaves of <i>Salacia pynaertii</i> during the last month	1 time	22	18.8	12.2-27.1	$\chi^2=13,580$ ; ddl=116; p=0.00000
	2 times	38	32.5	24.1-41.8	
	4 times	13	11.1	6.1-18.3	
	7 times	13	11.1	6.1-18.3	
	Does not know	31	26.5	18.0-34.5	
Does the frequency of consumption remain about constant all the month?	Yes	12	10.3	5.4-17.2	$\chi^2=36,381$ ; ddl=116; p=0.00000
	Not	44	37.7	28.0-46.2	
	Does not know	61	52.1	42.7-61.5	
Which are the shapes of culinary consumption of the leaves of <i>Salacia pynaertii</i> which you would recommend?	Cooked with water	96	82.1	73.9-88.5	$\chi^2=4,845$ ; ddl=116; p=0.00000
	Does not know	21	17.9	9.9-30.53	
	Others	18	15.4	9.4-23.2	
How you prepare them?	Groundnut paste	45	46.9	27.7- 64.7	$\chi^2=5,289$ ; ddl=116; p=0.00000
	Juice of nut of palm	31	32.3	24.5-57.3	
	Others	20	20.8	10.8-25.2	
In which quantity?	Heap	70	72.9	59.1-96.7	$\chi^2=5,289$ ; ddl=116; p=0.00000
	Paquet	26	27.1	23.3-40.9	

**Table 7.** Morphological characteristics of *Salacia pynaertii*.

Physical characteristics	<i>Salacia pynaertii</i>
Length (cm)	12.90±4.14
Width (cm)	5.91±2.27
Length of the petiole (cm)	0.59±0.13
Number of ribs	9.50±2.21

**Table 8.** Food values in macronutriments, ashes (g/100 g) and in some biogenic salts (mg/100 g) of the leaves of *Salacia pynaertii*.

Moisture and macronutriments		Ash and micronutriments	
Moisture (%)	57.97	Ashes (g)	5.05 ± 0.86
Proteins (g/100 g)	34.25± 0.35	Phosphorus, P (Mg)	722.2 ±0.03
Lipids (g/100 g)	0.70± 0.23	Iron, Fe (Mg)	4.075 ±0.00
Carbohydrates (g/100 g)	39.28±0.55	Calcium,Ca (Mg)	543.3 ± 0.45
Energy in Kcal	301.02	-	-

g/100 g of dry matter, a phosphorus content of 722.2±0.03 mg/100 g of dry matter, a content of iron of 4.075 mg/100 g of dry matter and a calcium content of 543.3±0.4 mg/100 g of dry matter.

## DISCUSSION

The objective of this study was to describe the consumption of the leaves of *S. pynaertii*. To this end, the

surveys of consumption of the leaves of *S. pynaertii* was carried out and to evaluate the nutritional characteristics of this vegetable.

Our study showed the importance of *S. pynaertii* in the feeding of the population of Brazzaville. This importance of vegetables in the feeding of the populations was confirmed by several authors (Ambé, 2001; Malaisse, 1997).

The results of our study show that *S. pynaertii* is consumed by all the social categories. This observation is in agreement with the studies undertaken on other vegetables by Soro et al. (2012) and Mensah et al. (2008). The consumers of *S. pynaertii* in general have the age bracket ranging between 48 and 53 years, a secondary level and are in the households having 4 to 5 people. The consumption of the leaves of *S. pynaertii* is not related to the social standing of the hearth nor on the educational level of the subject. Thus, we accept the assertion according to which "in Africa, the populations often have resorts to the vegetable species for which vegetables meet their food needs and to ensure the food safety" evoked by unquestionable people who consume the vegetables (Jansen et al., 2004; Ambé, 2001).

The consumers affirm that apart from the food aspect, *S. pynaertii* is used in the medicinal aspect. So *S. pynaertii* is regarded as one alicament. Thus, our results coincide with the assertions according to which "the consumption of the fruits and vegetables can help to prevent several no transmissible diseases related to the feeding (FAO/OMS, 2007); the vegetables sheets are a source of fibers, intervening on the level of the digestive tract and prevent the absorption of an excess of cholesterol" evoked by Soro et al. (2012) and Mensah et al. (2008).

The leaves of *S. pynaertii* are often consumed raw (100%). This form of consumption could avoid the disappearance of some micronutrients which are sensitive to the temperature or their reduction by diffusion of the water-soluble components in the water of cooking as reported by Causeret (1986).

The food interdicts have a negligible influence on the rate of consumption of the vegetable-leaves. The leafy of *S. pynaertii* does not have prohibitions of consumption. Several authors showed that there are interdicts of consumption of vegetables. Thus, Batawila (2005) reported that at Mossi and Togo, the ritual one precede the consumption of the leaves of *Adansonia digitata*; Dansi et al. (2008) reported that in the north of Benin, *Cerototheca sesamoides* is interdict with the men who have supernatural capacities.

The frequency of the most significant vegetable consumption is twice in the month (32.5%). This matter is encouraged by certain authors (Tirilly and Bourgeois, 1999; FAO, 2002) who evoked that "the vegetables leaves, that they are wild or are cultivated, resulting from lianas, of the tuber or of trees, also bring to the populations which have at their disposal only of very little

meat or fish, of essential proteins, especially with the women pregnant or nursing and or to the period infants of growth. The vegetable-sheets especially play a significant role in the maintenance of the food balance of the underprivileged populations".

The results on the morphological aspects show that the leaves of *S. pynaertii* have a length of  $12.90 \pm 4.14$  cm, a width of  $5.91 \pm 2.23$  cm, a length of the petiole of  $0.59 \pm 0.13$  cm and a number of ribs of  $9.50 \pm 2.22$ ) found in our study are close to those of *G. africanum* (length:  $12.92 \pm 0.94$  cm; width:  $06.87 \pm 0.49$  cm a number of ribs:  $10.50 \pm 0.86$ ) announced by Mbemba et al. (2013) and those of domestic *G. africanum* (length:  $8.50 \pm 0.70$  cm, width:  $3.35 \pm 0.25$  cm, a number of ribs:  $3.00 \pm 00.00$ ) announced by Elenga et al. (2016).

The water content of the leaves of *S. pynaertii* is 57%. This content is lower than that of certain vegetable sheets studied by Dorosz (1999) having found variations of the water content between 70 and 90%.

The leaves of *S. pynaertii* constitute a significant source of plant proteins. Indeed, their content of proteins is  $34.25 \pm 0.35$  g/100 g of dry matter. But, this value is lower than that of *Vigna unguiculata* ( $26.48$  g/100 g of dry matter dry) observed by Tchiégang and Kitikil (2004) and near to some vegetables studied by Adu-Dupaah (1999) for which the content of proteins varies between 28 to 34 g/100 g of dry matter.

The quantities of the carbohydrates ( $39.28 \pm 0.55$  g/100 g of dry matter) obtained in the leaves of *S. pynaertii* are lower with those of sheets of *Moringa oleifera* ( $49.52 \pm 0.00$  g/100 g) found by Tchiegang and Kitikil (2004).

Phosphorus is the only mineral quantitatively most significant after calcium. It plays a plastic role because it constitutes a combination with calcium and the mineral screen of the bones. The needs for phosphorus are about 800 mg per day in the adult (Dorosz, 1999). *S. pynaertii* presents the phosphorus content of about  $722.2 \pm 0.03$  mg/100 g of dry matter. The values found in our study are close to these recommendations.

The calcium content ( $543.3$  mg/100 g) found in *S. pynaertii* is close to that of *M. oléifera* ( $531$  mg/100 g) observed by Toury et al. (1963).

Our study shows that the content of iron in the vegetable-sheets of *S. pynaertii* is of  $4.075 \pm 0.0$  mg/100 g of dry matter. Iron prevents ferriprive anemia (Dansí et al., 2008). It plays a very significant role in the constitution of hemoglobin and it constitutes myoglobin of the muscles. In the sub-Saharan countries where the populations suffer from frequent anemia caused by paludism, the contribution of the iron is very significant and recommended.

## Conclusion

This study made it possible to show that the leaves of



*S. pynaertii* are vegetable-leafy green, known and consumed or cooked in the households of the population of Brazzaville. The results of the investigation of consumption showed their importance in the food of the population of Brazzaville and it does not matter the social standing and instruction. The share taken by this vegetable-sheet is in the diets; in fact the frequency of consumption can be significant for the balance of the nutritional needs for the poor populations and could play a role with food safety. The sheets of *S. pynaertii* are considered by certain people as alement used in traditional medicine in the palliative curative treatment: gastritis (epigastric pains) like a gastric bandage; diabetes (hyperglycemia) like anti hyper glycemie; constipations like a laxative.

The sheets of *S. pynaertii* studied are rich in proteins, in carbohydrates and in some minerals elements, particularly, phosphorus and calcium. The high percentage of these minerals, the leaves of *S. pynaertii*, is of great interest on the nutritional level especially for the fight against the deficiencies in micronutrients.

### Conflict of Interests

The authors have not declared any conflict of interests.

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