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ETHNOBOTANIC INVESTIGATION, DETERMINATION OF PHYSICAL CHARASTERISTICS AND ANTI-NUTRITIONAL FACTORS OF FRUITS OF *MYRIANTHUS ABOREUS* FROM COTE D'IVOIRE

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ABSTRACT

The aim of this study was the valuation of the underexploited said plants still called " spontaneous plants " through the realization of the ethnobotanic study and the determination of physical Charasteristics and antinutritional factors of fruits of *M.aboreus*. Results showed that Fruits of *Myrianthus arboreus* were known of the population of Côte d'Ivoire. The vernacular names were different from an ethnic group in an other one. The mode of obtaining of fruits were stay the picking and the collection. Fruits of *Myrianthus arboreus* were consumed under the fresh forms. On the other hand seeds remain unexploited. The seeds of *Myrianthus arboreus* had 1,23 cm long and 0,97 cm wide. As for fruits, they had a length of 13,56 cm and a width of 10,29 cm. The masses of fruits and seeds of *Myrianthus arboreus* were respectively of 360,15 g and 0,30 g. These high masses of fruits of *Myrianthus arboreus* could give some explanation by their strong moisture contents. Indeed, the moisture content (85,5 %) fruits was widely superior to the rate authorized for a good conservation of fruits (12 %). The analysis of the antinutritional factors results showed that the studied samples had of very low content in these parameters. Indeed, the rate of Phytate varied to 15,49 ± 0,83 to 20,25 ± 0,39 mg/100g of the MS with the strongest value observed in the boiled seeds. The oxalates contents were between 54,38 ± 12,55 to 270,4 ± 0,01mg/100g of MS, whose low rate most was recorded in the pulp of the fruit. The polyphénoloxydasique activity of the enzymatic raw extract of seeds is significantly superior to that of the raw extract of the pulp at the threshold of 5 %.

KEYWORDS: *Myrianthus aboreus,* pulp, ethnobotanic study, polyphenoloxydasic activity, antinutritional factors, fruits.

I-INTRODUCTION

Myrianthus arboreus is a fruit plant being a part of spontaneous food botanical species. In Africa, this plant covers mainly regions Guinéo-Congolaises extending from the Sierra Leone to the Gabon (Dewitt, 1966). Numerous ethnobotanic studies (Aké-Assi, 2001 and 2002; Kouamé, 2008) showed that *M. arboreus* is a spontaneous food plant known in Côte d'Ivoire. Fruits, seeds, barks, leaves and wood are variously used in several regions of Côte d'Ivoire but also by numerous populations of West and central Africa (Merigini, 2005; Bukola et *al* ., 2008). The leaves of *M.arboreus*, marketed on numerous African markets are consumed in sauce (Ruffo, 2002). However, contrary to leaves, whose nutritional importance was revealed by several authors (Busson, 1965; Bonnéhin, 2000; Kouamé et *al* ., 2008), very few studies were led on fruits of *M. arbreus*. So, aim of this study is the valuation of the underexploited said plants still called " spontaneous plants " through the realization of the ethnobotanic study and the determination of physical Charasteristics and antinutritional factors of fruits of *M.aboreus*.

II-MATERIAL AND METHODS

II-1-Material

The biological material used in this work consists of ripe mature fruits picked in the region of tonkpi exactly in the city of Danané (Côte d'Ivoire). These fruits were transported after the pickings in the Laboratory of Biocatalysis and the Bioprocesses of the Nangui Abrogoua University (Abidjan, Côte d'Ivoire).

Figure 1: Mature fruit of *Myrianthus arboreus.*

Figure 2: Dried seeds of *Myrianthus arboreus.*

Figure 3: Fresh seeds of *Myrianthus arboreus.*

Figure 4: Dried pulp of *Myrianthus arboreus.*

II-2- METHODS

II-2-1- Ethnobotanic study

II-2-1-1- Site of investigation

Before the ethnobotanic inquiries themselves, prospecting was made in departments. The investigation took place in the cities of the west central, the West and the South regions of Côte d'Ivoire. In every region, several cities and villages were visited. As regards the region of tonkpi, they were Man, Mahapleu, Sanguiné and Danané. In south region, locality visited were: Abidjan (Abobo, Anyama), Bonoua and Dabou.

II-2-1-2-Technique of investigation with the aim of the choice of sub-prefectures and villages

The information was obtained through ethnobotanic interviews with the people living in the visited sites. This work of investigation took place during the period of fruiting (June to August) during 2015 and 2016. Six hundred people were questioned. The time dedicated to every interrogation was 20 min. by locality, 50 people were questioned. The investigation carried on:

- the vernacular name, the number of variety,
- the use, forms of consumption in the visited zone;
- the place, the form and the mode of sale;
- the mode, the form, the shelf life and the conservation time.

To present better the obtained results, we combined the criteria of knowledge and real consumption according to Ambé (2001). The level of knowledge and rustic consumption were estimated in percentage. The percentage (P) of every species was calculated with regard to the number of people recognizing the species (n) by the total number of respondents (N). It is translated by the formula

$$P=(n/N) \times 100$$

II-2-2- Physical analyses methods

II-2-2-1-Détermination of masses

The masses of 20 whole fruits, 50 péricarpes and 50 seeds of *Myrianthus arboreus* were determined by means of type SARTORIUS's balance.

II-2-2-2-Mesure of dimensions

The dimensions of 20 whole fruits, 50 capsules and 50 seeds of *Myrianthus arboreus* were measured by means of a caliper with electronic display (STAINLESS STEEL HARDENED) with the measure ranged of 0 to 150 mm with a 0,03 mm precision The moderate dimensions were the length and the diameter.

II-2-3-antinutritionals factors

II-2-3-1-Oxalates

The oxalate content of the flour was determined according to the method of (Day and Underwood, 1986)

II-2-3-2- Phytates

The phytate content was determined according to the method described by INRA (1994).

II-2-3-3- Tannins
The content in tannin was determined according to the method of Bainbridge and *al.*, (1996).

II-2-3-4- Flavonoïdes
The content in flavonoid is determined according to the method described by Meda et *al.* (2005).

II-2-3-5- Acide cyanhydrique
The content in cyanhydrique acid was determined according to the method of AOAC (1990).

II-2-3-6- Alcaloïdes
The content in alkaloid of the flour was determined according to the method described by Harborne (1973).

II-2-4-Statistical analysis
All analyses were carried out in triplicates. Results were expressed by means of ± SD. Statistical significance was established using one-way analysis of Variance (ANOVA) models to estimate the physical Charasteristics and some anti-nutritional factors, of the fruit of *Myrianthus arboreus* at 5% level. Means were separated according to Duncan's multiple range analysis ($p \leq 0.05$), with the help of the software STATISTICA 7 (StatsoftInc, Tulsa-USA Headquarters).

III-RESULTS
III-1- Ethnobotanic investigation of *Myrianthus arboreus*
III-1-1- Rate of knowledge of fruits
The rates of knowledge of fruits of *Myrianthus arboreus* were higher in the west and west central region (About 100 % of the population questioned in the West against 65,67 % in the west central region) that those of the South. These populations know better these fruits than those of Abidjan (Abobo 20 % and Anyama 40 %) (Table 1).

Table 1: Distribution of the rates of knowledge of *Myrianthus arboreus* fruits by the population of some villages of Côte d'Ivoire.

Visited localities	Size of people asked	People knowing fruits of *Myrianthus arboreus*		People not knowing fruits of *Myrianthus arboreus*	
		Nomber	Rate(%)	Nomber	Rate (%)
West-central					
Divo	50	35	70	15	30
Didoko	50	50	100	0	0
Datta	50	43	86	07	14
Hiré	50	25	50	25	50
Oumé	50	16	32	34	68
Douaville	50	28	56	22	44
Subtotal	**300**	**197**	**65,67**	**103**	**34,33**
West					
Podiagouiné (Man)	50	50	100	0	0
Sangouiné(Man)	50	50	100	0	0
Deindeu (Man)	50	50	100	0	0
Mahapleu	50	50	100	0	0
Blizreu (Danané)	50	50	100	0	0
Déamanhanpleu	50	50	100	0	0
Subtotal	**300**	**300**	**100**	**0**	**0**
South					
Abobo (abidjan)	50	10	20	40	80
Ayaman(Abidjan)	50	20	40	30	60
Subtotal Zone	**100**	**30**	**30**	**70**	**70**
West Central	300	197	65,67	103	34,33
West South	300	300	100	0	0
Total	**600**	**99**	**16,50**	**501**	**83,5**

III-1-2- Some vernacular names of fruits
Following the investigation, 14 vernacular names (local naming) of fruits of *Myrianthus arboreus* were listed (Table 2).

Table 2: Some vernacular names of fruits of *Myrianthus arboreus* from Côte d'Ivoire.

Ethnics Groups	Ethnies	vernacular names
Akan	Abbey	Wougnan
	Abouré	Atolahié
	Attié	Djin
	Agni	Kumaniangama, niangama
	Aladjan	Ehuiwi
	Adjoukrou	Kénou
	Baoulé	Angaman
	Tchima	Yanguma
Krou	Bété	Tikriti
	Guéré	Tonohue
	Kroumen	Tobo-ué
	Wobé	Tébo
	Dida	Pissia
	Yacouba	Gbohor

III-2- physical Charasteristics

The average mass of fresh mature fruits of *Myrianthus arboreus* was 360,15±0,05 g. Those of their fresh and dry seeds were respectively of 0,3±0,25[a] g and 0,2±0,1[a] g. The average masses of fresh and dry hulls of the fruits of *Myrianthus arboreus* were respectively of 0,70±0,1[c] g and of ±0,40 0, 05[b] g. The average length and the width of fresh fruit were respectively 13,56±0,04 cms and 10,29±0,09 cms. The length and the width of the fresh seeds were respectively of 1,23±0,03[a] cm and of 0,97±0,03[d]cm. Those of the dry seeds were of 1,15±0,05[a] cm and of 0,52±0,02[a] cm (Table 3). For fresh hulls, the length and the average width were respectively of 2,1±0,17[b] cm and of 0,97±0,01[d] cm. As for their dry shape, a length of 2±0,05[b] cm and a width of 0,70±0,01b cm were obtained. All these values were significantly different at the threshold of 5 %.

Tableau 3: *Physical characteristics of Myrianthus arboreus.*

Physical characteristics	Organs	Fresh	dry
Mass (g)	Whole fruit	360,15 ± 0,05[a]	nd
	seed	0,30 ± 0,25[a]	0,2± 0,1[a]
	Coque hull	0,70 ± 0,1[c]	0,40± 0,05[b]
Longueur length (cm)	Whole fruit	13,56 ± 0,04[a]	nd
	seed	1,23 ± 0,03[a]	1,15± 0,05[a]
	Coque hull	2,10 ± 0,17[b]	2,0± 0,05[b]
Largeur width (cm)	Whole fruit	10,29 ± 0,09[a]	nd
	seed	0,85 ± 0,01[a]	0,52± 0,02[a]
	Coque hull	0,97 ± 0,03[d]	0,7± 0,01[b]

Average ± standard deviation, n = 3; on lines, affected by different letter are significantly different at the threshold of 5 % according to the test of Duncan.

III-3- Content in antinutritional factors

The content in antinutritional factors (phytate, oxalate, tannin, Flavonoid, Polyphenol and cyanhydric acid) was determined in flours of fruits of *Myrianthus arboreus*, to estimate the bioavailability of the constituent elements of the pulp and the seeds of *Myrianthus arboreus*. The analysis of the results showed that the studied samples had of very low content in these parameters. Indeed, the rate of Phytate varied to 15,49 ± 0,83 to 20,25 ± 0,39 mg/100g of the MS with the strongest value observed in the boiled seeds. The oxalates contents were between 54,38 ± 12,55 to 270,4 ± 0,01mg/100g of MS, whose low rate most was recorded in the pulp of the fruit. As for the rates of Tannin, Flavonoid and cyanhydric acid, they varied respectively of 17,5±0,71-18,07 ± 0,06mg/100g; 13,98±0,53 to 17,85 ± 0,76mg/100g and 10,65 ± 0,05 to 10,65 ± 0,05mg/100g). Lastly Polyphenols were present in proportions going of 789 ± 6-1478,33±77,28 mg/100g. These values were significantly different at the threshold of 5 %. (Table 4).

Table 4: *Antinutritional factors of flours of the pulp and the seeds of the fruits of Myrianthus arboreus.*

Parameters	Rate (mg/100g)		
	Flour of the pulp of fruits	Flour of the seeds Dried	Flour of the seeds cooked in the water
Phytate	15,49 ± 0,83[a]	19,022 ± 0,01[b]	20,25 ± 0,39[c]
Oxalate	54,38 ± 12,55[a]	260,7 ± 0,61[b]	270,4± 0,01[c]
Tanin	17,5±0,71[a]	18,03±0,03[b]	18,07 ± 0,06[b]
Flavonoïde	13,98±0,53[a]	15,78±0,4[b]	17,85 ± 0,76[c]
Polyphenol	1478,33±77,28[c]	899 ±3,05[b]	789 ± 6[a]
hydrocyanic acid	10,65± 0,05[a]	13,5± 0,1[c]	12,75± 0,25[b]

Average ± standard deviation, n = 3; on lines, affected by different letter are significantly different between them at the threshold of 5 % according to the test of Duncan.

III-4-polyphenoloxidase activity

The polyphénoloxydasic activities of the enzymatic raw extract of the fresh seeds and the pulp of *Myrianthus arboreus* were studied by using the pyrocathecol, the pyrogallol and the dopamine as the substrata. The dopamine oxydasique activity was 30 ± 0,1 UI in seeds and of 11 ± 0,5 in the pulp. As for the pyrogallol oxydasiques activities, they were 266 ± 2 UI and of 16 ± 0,5 UI respectively in seeds and pulp. Lastly the activities pyrocathecol oxydasique in seeds and pulp of *Myrianthus arboreus* were 60,6 ± 1 UI and of 1,5 ± 0,5 UI respectively. The polyphénoloxydasique activity of the enzymatic raw extract of seeds is significantly superior to that of the raw extract of the pulp at the threshold of 5 % (Table 5).

Table 5: polyphenoloxidasic activity of Seeds and pulp of fruits of *Myrianthus arboreus.*

substrates	enzymatic activity (UI)	
	Fresh pulp	Fresh seed
Pyrocathecol	1,5 ± 0,5[a]	60,6 ± 1[b]
Dopamine	11±0,5 [a]	30±0,01[b]
Pyrogallol	16± 0,5[a]	266± 2[a]

Average ± standard deviation, n = 3; on lines, affected by different letter are significantly different between them at the threshold of 5 % according to the test of Duncan

IV-DISCUSSION

Outcomes of the investigation ethnobotanics revealed that *Myrianthus arboreus* was known for the population of Côte d'Ivoire in general, but more populations of forest areas. This situation could give some explanation by the fact that *Myrianthus arboreus* is a forest fruit (Bonnehin, 2000; Aké Assi, 1998, 2001, 2002). The meditative vernacular names, were very different from each other, in spite of the ethnic brewing in the country.

Fruits of *Myrianthus arboreus* are known of the population of Côte d'Ivoire. The vernacular names were different from an ethnic group in an other one. The mode of obtaining of fruits were stay the picking and the collection. Fruits of *Myrianthus arboreus* were consumed under the fresh forms. On the other hand seeds remain unexploited.

The seeds of *Myrianthus arboreus* had 1,23 cm long and 0,97 cm wide. As for fruits, they had a length of 13,56 cm and a width of 10,29 cm. The masses of fruits and seeds of *Myrianthus arboreus* were respectively of 360,15 g and 0,30 g. These high masses of fruits of *Myrianthus arboreus* could give some explanation by their strong moisture contents. Indeed, the moisture content (85,5 %) fruits was widely superior to the rate authorized for a good conservation of fruits (12 %). Considering their high moisture content, fruits of *Myrianthus arboreus* could be an middle favorable to the development of microorganisms, because, a strong activity of the water would favor the development of the microorganisms generally responsible of the deterioration of fruits (Soloviev et *al* ., 2004).

Concerning the antinutritional factors, the analysis of the results showed that fruits of *Myrianthus arboreus* contained phytates present in samples with contents between 14,53 and 20,25mg / 100g of MS, comparable to those obtained by Andriamasinandraina (2012) for Tsaramaso vanda and antaka. This phytates were localized in cotyledons where they were associated to the protein bodies (Reddy et al.,1996). The knowledge of the content in phytate and especially in oxalate of a food is useful because a raised content in these compounds can have harmful effects on the digestibility (Adeola and *al* ., 1995). Indeed, the phytate and the oxalate form complexes with essential minerals, so returning unavailable minerals for the body. But in view of the low content phytate and oxalate of the flours of the pulp and the seeds of *Myrianthus arboreus*, their consumption shall be without major risk because the lethal dose of the oxalate in a food is situated between 2000 and 5000 mg / 100g of food (Agiang and *al* ., 2010).

Enzymes are essential biocatalysts, occurring in diverse stages of the evolution of living beings (Terra and Ferreira, 1994). To vegetables, their actions are perceptible in the physiological and metabolic phenomena during the seeding, the growth, the blooming, the maturation, etc. That is why, a variety of enzymatic activities present in seeds and pulp of fruits of *Myrianthus arboreus* were highlighted. It is the polyphénoloxydase. Some of these enzymatic activities were highlighted already in the seeds of the melon (Bernard and Buret, 1991), of the mango (Ali and *al*., 1995), of the olive (Juan and *al.*, 1995), of the tomato (Badamaranahalli and *al.*, 2004), some fruit of the breadfruit tree (Ahi and *al*., 2007), of the yam D.cayenensis-rotundata cv Longbô (Gnangui and *al*., 2009).

V-CONCLUSION

Fruits of *Myrianthus arboreus* were known of the population of Côte d'Ivoire. The vernacular names were different from an ethnic group in an other one. The mode of obtaining of fruits were stay the picking and the collection. Fruits of *Myrianthus arboreus* were consumed under the fresh forms. The high masses of fruits of *Myrianthus arboreus* could give some explanation by their strong moisture contents. Indeed, the moisture content (85,5 %) fruits was widely superior to the rate authorized for a good conservation of fruits (12 %).

The analysis of the antinutritional factors results showed that the studied samples had of very low content in Phytate and oxalates. The polyphénoloxydasique activity of the enzymatic raw extract of seeds is significantly superior to that of the raw extract of the pulp at the threshold of 5 %.

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