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Research Article

NUTRITIVE POTENTIAL OF THE PULP OF THREE WILD FRUIT SPECIES COMMONLY CONSUMED IN CÔTE D'IVOIRE

A. K. Kouassi[1], N. K. Kouassi*[2], M. A. G. Beugré[1], D. Y. N'Dri[2], G. N. Amani[2], D. Gnakri[1]

[1]Agrovalorisation Laboratory, Agroforestry Department, Jean Lorougnon Guédé University, P.O. Box 150 Daloa, Côte d'Ivoire

[2]Food Biochemistry and Tropical Products Technology Laboratory, Department of Food Science and Technology, University Nangui Abrogoua, P.O. Box 801 Abidjan 02, Côte d'Ivoire

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ABSTRACT

Baobab (*Adansonia digitata*), Tomi (*Tamarindus indica*) and Néré (*Parkia biglobosa)* are trees whose fruits are highly appreciated in Côte d'Ivoire but there are threatened with extinction. The objective of this study was to evaluate the nutritional properties of these fruits for their valorization. For this purpose, a physicochemical characterization of the pulp of these fruits collected in a north of Côte d'Ivoire was carried out. Data showed that fruits pulp was mainly characterized by low water (8.66–19.90%), fat (0.64–1.42%), protein (2.53–4.50%) and ash (1.36–5.06%) content while high levels of total carbohydrate (71.50–81.93%), total sugars (30.35–71.66 %), total fiber (22.65–41.14 %) and energy (309.72–353.90 Kcal/100g) are noticed. Pulps acidity varied from 12 meq.g/ Kg to 160 meq.g/Kg with richness in tannin (518.75-1020.90 mg/100 g) and total phenol (430.55–1226.19 mg/100 g).

Keywords: *sira*; *néré*; *tomi*; nutritional value; valorization.

Author Correspondence, e-mail: nestorkksi@yahoo.fr

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1. INTRODUCTION

In Côte d'Ivoire, many wild fruits are eaten by local populations. In the past, these fruits have contributed to the survival of these populations during difficult times (especially periods of famine, war, drought, bush fires, invasion of crops by desert locust) [1]. Still today, they have a great interest in food security and continue to provide quality nutrients such as proteins, fats, carbohydrates, amino acids, vitamins, dietary fiber and minerals for a better nutritional balance of local populations [2]. Among these wild species fruit productions, the Baobab (*Adansonia digitata),* the Néré (*Parkia biglobosa)* and the tamarind (*Tamarindus indica)* are more appreciated. They are known under the respective names of *sira, néré*, and *tomi* in vernacular name *dioula* in Côte d'Ivoire [3]**.** Their contribution to food and income generation for local populations (especially women) is well established [4]. However, as in many parts of Africa, despite their importance, these three natural fruit resources are faced with the regression of their population or even their disappearance in favor of economically profitable crops.

On the over hand, population growth and climate change have become factors that could soon reorient agricultural policy and practice in many tropical countries, including ours. Moreover, famine, malnutrition and poverty still threaten rural populations. Thus, meeting the food needs of these becomes an important challenge to relieve for these countries. These needs increase considerably with the pace of natural disasters and the emergence of armed conflicts [5]. Yet, the capacity of food crops available to meet the demand of this growing population of food remains uncertain. To face these major challenges, it seems appropriate to promote these three endangered wild fruit species in order to meet these ever-increasing needs. One of the means to achieve this is the association of the biochemical knowledge of their various fruits until then poorly known, to the exploitation of their botanic and their ecology. This is why a chemical study to highlight their nutritional potential appears more than necessary today in Côte d'Ivoire. The present work aims to characterize mainly the pulp of Baobab, Tomi and Néré fruits for nutritional and anti-nutritional investigation.

2. MATERIAL AND METHODS

2.1. Sample collection and Preparation

Our study focused on the pulp of Baobab (*Adansonia digitata*), of Tomi (*Tamarindus indica*) and of Néré (*Parkia biglobosa*) fruits harvested in Korhogo (Northem Côte d'Ivoire). After harvest, they have been cleared of their shell, their seeds and their fibers. The pulps obtained were packed in plastics bags and transported of the laboratory for the preparation of the samples.

2.2. Chemical characterization

2.2.1. Nutritional composition

Dry matter content, protein, crude fat, crude fiber and ash contents of the pulps were determined by AOAC methods [6], while carbohydrate was determined by difference [7]. The method using the phenol-sulfuric was used for the total sugars contents analysis [8]. Energetic value was determined according to Atwater and Rosa coefficients [9].

Minerals (K, Na, Ca, Fe, Mg and Zn) were determined on an atomic absorptions spectrophotometer. The total phosphorus (P) was determined as orthophosphate by the ascorbic acid method after acid digestion and neutralization using phenolphthalein indicator and combined reagent [10].

Vitamins A and C were determined by HPLC (Shimadzu SPD 6A, Jupon) according to this method described. For the extraction of vitamin A, a solution of retinol acetate at 1µg/µL in methanol was prepared and kept cool (-20°C) in tinted vial. A standard solution of 0.01µg/mL vitamin A was immediately prepared by simple dilution in methanol to constitute the control solution. Exactly measured sample mass is transferred to a breaker of 100 mL. 20 mL of methanol was added. The beaker was protected from light with aluminum foil. The solution obtained was stirred with a barb liked for 2h 30 min at room temperature. The methanol is filtered off and put in 25 mL flask to from the test solutions. As for vitamin C, it was extracted with metaphosphoric acid/acetic acid 100/80 (v/v). A mass of pulp (3 g) was homogenized in 30 mL of a metaphosphoric solution with gentle stirring for 30 min. The samples were filtered using a filter paper (Whatman paper). For the analysis by HPLC, a Lichrosorb column (MH2 25 x 4.6.10 µm) was used with a mobile phase (Acetonitrile/tampon: KH2PO40.005M (73:27) to a constant flow rate of 1.00 ml /min. A UV detector (SPP-20A) allowing the detection of peaks, using a wavelength of 268 nm. The injection volume is 20 µL with a detection limit of 0.007 mg/Kg. The column temperature was maintained at 40°C.

Organic acid (Gallic acid, citric acid, benzoic acid) were analyzed by HPLC. Samples weighed in 25 mL flasks and extracted with purified water are centrifuged at 4000 rpm for 30 min. the supernatant is collected and filtered on Whatman paper no 4. And then through a Millipore filter 0.45 µm (Sartorius AG, Goëhingen-Germany). The sample thus treated, are stored at -20°C before the analysis. The HPLC apparatus (Shimadzu Corporation, Jupon) used consists of a pump (Shimadzu LC-20A Liquid Chromatograph) a detector UV (Shimadzu SPD-20A UV Spectrophotometric detector). The chromatographic separation of the organic acids is carried out with a column ODS (250x4 mm, Interchrom) maintained at 20°C using an oven Meta therm. TM (Interchrom, France). The eluent is 0.0125 M sulfuric acid/solution containing 70 g/L of potassium dihydrogenphosphate, 14 g / L of sulfate ammonium and adjusted to pH 2.1 by addition of phosphoric (50:50) and at an elution debit of 0.80 Ml /min and the detector is selected at 264 nm. The detection limit is 0.008 mg/kg.

The composition of phenolic compounds was analyzed according to this method: The samples to be analyzed were filtered through on Whatman paper no 4 then through a Millipore membrane 0.45 µm (Carl Roth. Karlsruhe, Germany). The HPLC apparatus (Shimadzu, France) is a system with a binary pump (LC-20A) coupled to a detector UV-VIS (SPD-20A). The column used for this analysis is hypersyl ODS C18, 250 x 4.6 mm, 5 µm (Thero, Runcom, Angleterre). The separation was carried out as an eluent gradient. The mobile phase consists of 5 mmol/L of potassium dihydrogenphosphate solution, a solution of acetonitrile (82/8, V/V). The flow is 1.00 mL/min. The injected volume is 10 µL with a detection limit of 0.006 mg/Kg. the oven temperature is 40°C. The peaks are then identified by comparing the retention times and spectra with the authentic reference substances.

2.2.2. Anti-nutritional composition

The contents of total phenolic compounds were measured using the Folin-Ciocalteu reagent based on colorimetric essay [11]. Flavonoids were determined by colorimeter method [12]. The absorbencies of the Tannins were read after color development on a Spectrophotometer (Shimadzu Spectrophotometer UV-120-02) at a wavelength of 760 nm [13]. The total oxalates content was determined by the method developed by Ukpabi and Ejidoh [14].

2.3. Statistical analysis

Statistically significant differences between measurement parameters and samples were verified with one-way analysis of variance using the Statistical Products and Service Solutions Software (SPSS version 17.0, Chicago, USA). The Tukey's honesty significant differences (HSD) multiple range tests used to determine the differences between group means at the 95.0 % confidence level.

3. RESULTS

3.1. Nutritional composition

3.1.1. Proximate composition

The macromolecular and energy profile of the pulp of Baobab, Néré and Tomi is presented in table 1. The contents of protein, fat and ash are low for the tree different fruits. Protein content was between 2.53 ±0.55 % (Tomi) and 4.50±0.37 % (Néré). Fat content varied between 0.64±0.04 % (Néré) and 1.42±0.03 % (Baobab). Ash ranged from 1.36±0.02 % (Tomi) to

5.06±0.05 % (Baobab). In the other hand, their contents in total carbohydrates, total sugar, are proving important. They oscillated respectively between 71.50±0.11 % (Néré) and 81.93±0.23 % (Baobab), and 30.35±0.06 % (Néré) and 71.66±0.77 % (Tomi). The crude fibers content of the pulp of Tomi was the lowest (3.46±0.09 %) and that of Néré pulp (41.14±0.06 %) and of baobab pulp (22.65± 0.13 %) were the highest. Moreover, these fruits are identified themselves by their sizable content in dry matter 80.10±0.40 % (Néré) – 91.34±0.00 % (Baobab). The water content of the pulp of these fruits was low. It varied from (8.66±0.04 % (Baobab) to 19.90±0.04 % (Néré). Acidity is high in the pulps of Tomi (160.83±1.32méq.g/ kg) and Baobab (106.06±0.05 meq.g/ kg) where the correspondent pH varied to 2.42±0.38 (Tomi) at 5.00±0.50 (Néré). Energy values recorded by each of the three fruits ranged from 309.72±0.81 kcal/100 g (Néré) to 353.90±2.95 kcal/100 g (Baobab).

3.1.2. Mineral composition

The mineral contents of the pulp of fruits indicated very impressive potassium concentrations relative to those of other minerals determined (table 2). These potassium (K) levels ranged from 92.29.±2.48 mg/100 g (Néré) to 2815.11±0.25 mg/100 g (Tomi). The higher levels of calcium (Ca) ((84.23±2.95 mg/100 g (Néré)–320 ±0.20 mg/100 g (Tomi)), Phosphorus (P) ((83.03±2.95 mg/100 g (Néré)–277.12±20.84 mg/100 g (Baobab)) and Magnesium (Mg) ((54.84±0.52 mg/100 g (Néré)-192.27±1.97 mg/100 g (baobab)) were also obtained in the pulp of the fruits. Sodium (Na) content varied from 21.00±0.03 mg/100 g (Néré) to 24.67±0.78 mg/100 g (Tomi). Iron and Zinc (Zn) were also present in the different fruitsat fairly low. The iron (Fe) varied from 4.57±0.10 mg/100 g (Baobab) to 8.32±0.20 mg/100 g (Néré) and zinc was between 2.07±0.38 mg/100 g (Néré) and 2.64±0.09 mg/100 g (Tomi).

Table1. Biochemical composition and energetic value of Baobab, Tomi and Néré fruit pulps

Pulps	Protein (g/100 g)	Fat (g/100 g)	Dry Matter (g/100 g)	Ash (g/100 g)	Fiber (g/100 g)	Carbohydrate (g/100 g)	Total Sugar (°Brix)	pH	TitratableAcidity (meq.g/K)	Energy (Kcal/100 g)
Baobab	3.08±0.03^{ab}	1.42±0.03^{c}	91.34±0.0^{b}	5.06±0.05^{c}	22.65±0.13^{b}	81.93±0.23^{c}	57.27±0.32^{b}	3.32±0.28^{b}	106.06±0.05^{b}	353.90±2.95^{c}
Tomi	2.53±0.55^{ab}	0.70±0.02^{ab}	81.20±0.34^{c}	1.36±0.02^{a}	3.96±0.09^{a}	76.61±0.76^{b}	71.66±0.77^{c}	2.42±0.38^{a}	160.83±1.32^{c}	322.82±1.97^{b}
Néré	4.50±0.37^{c}	0.64±0.04^{ab}	80.10±0.40^{a}	3.46±0.04^{b}	41.14±0.06^{c}	71.50±0.11^{a}	30.35±0.06^{a}	5.00±0.50^{c}	12.67±0.60^{a}	309.72±0.81^{a}

The average values assigned to the same letter in the same column are not significantly different from the 5%

Table 2. Mineral composition of Baobab, Tomi and Néré fruit pulps (mg/100 g)

Pulps	Potassium	Sodium	Calcium	Phosphorus	Iron	Magnesium	Zinc
Baobab	2353.42±45.08^{b}	22.39±0.07^{b}	310.12±35.99^{b}	277.12±20.84^{c}	4.57±0.10^{ab}	192.27±1.97^{c}	2.49±0.04^{bc}
Tomi	2815.11±0.25^{c}	24.67±0.78^{c}	320.85±0.20^{c}	169.53±0.45^{b}	4.67±0.08^{ab}	112.50±0.50^{b}	2.64±0.09^{bc}
Néré	92.29±2.48^{a}	21.00±0.03^{a}	84.23±0.25^{a}	83.03±2.95^{a}	8.32±0.20^{c}	54.84±0.52^{a}	2.07±0.38^{a}

The average values assigned to the same letter in the same column are not significantly different from the 5%

3.2. Organic acids, phenolic compounds and Vitamins contents

The organic acids contents of the pulp of the three different fruits studied are returnable in table 3. With a value of 1.08 g/100 g, the pulp of Néré was recorded the highest content in malic acid. It is followed by the pulp of Tomi (0.85 g/100 g) and of the Baobab pulp (0.17 g/100 g). For the tartric acid, his stronger content was uncovered in pulp of Baobab (8.04 g/100 g) and followed by Tomi pulp (7.20 g/100 g) and Néré (7.04 g/100 mL). As regards citric acid, its highest content is observed in the pulp of Tomi (3.01 mg/100 g). It is followed by Néré pulp (2.15 g/100 g) and Baobab pulp (2.05 g/100 g).

A very great variability of phenolic compounds was observed between the three different pulps (table 4). The catechin was the most important with a highest content has been revealed in Tomi pulp (141.03 mg/100 g). It is followed by the pulp of baobab (123.45 mg/100 g) and of Néré (73.01 mg /100 g). Likewise, the highest content of coumarin was observed in the pulp of Tomi (11.49 mg/100 g) and followed by Baobab pulp (9.32 mg/100 g) and Néré juice (2.93 mg/100 mL). The benzoic acid and gallic acid were only seen in the the pulp of Tomi and Néré juices. Benzoic acid varied from 3.06 mg/100 g (Tomi) to 4.00 mg/100 g (Néré). The gallic acid oscillated between 6.75 mg/100 g (Néré) and 7.43 mg/100 g (Tomi) while quercetin was only detected in baobab pulp (4.91 mg/100 g).

Vitamin A & C contents of these fruits studied are shown in table 5. The vitamin A contents were between 21 mg/100 g (Néré) and 98 mg/100 g (Baobab) while those of vitamin C varied from 28 mg/100 g (Tomi) to 311 mg/100 g (Baobab).

Table 3. Levels of organic acids in Baobab, Tomi and Néré fruit pulps (g/100 g)

Characteristics		Organic acids	Fruit pulps		
Retentions Time (min)	Samples Area		Baobab	Tomi	Néré
2.355/818/477	137809-235435-8409	Malic Acid	0.17	0.85	1.08
3.346/314/380	3007009-2370177-21432	Tartric Acid	8.04	7.20	7.04
4.416/197-3868	562670-1327231-9103	Citric Acid	2.05	3.01	2.15

Table 4. Phenolic compounds content in Baobab, Tomi and Néréfruit pulps (mg/100 g)

Characteristics		Phenolics content	Fruit pulps		
Retentions Time (min)	Samples Area		Baobab	Tomi	Néré
2.185/189	270859-222900	Benzoic acid	nd	3.06	4.00
3.346-2955	665073-367540	Gallic acid	nd	7.43	6.75
3.789/726/583	28018225-278381-1454079	Catechin	123.45	141.03	6.75
5.112/054/4.875	1993827-1659482-796621	Coumarin	9.32	11.49	73.01
4.538	65993	Quercetin	4.91	nd	nd

nd: not detected

Table 5. Vitamins A and C content in Baobab, Tomi and Néré pulps (mg/100 g)

Characteristics		Vitamins	Fruit pulps		
Retentions Time (min)	Samples Area		Baobab	Tomi	Néré
2.425-2.552	787-106	Vitamin A	98	nd	21
3.897-4.215-4.287	12042-122-134	Vitamin C	311	28	48

nd: not detected

3.3. Anti-nutritional composition

The anti-nutritional components of the juices studied are presented in table 6**.** The tannin content was between 518.75±14.49 mg/100 mL (Tomi) and 1020.90±7.36 mg/100 mL (baobab) while flavonoids contents ranged from 105.04±1.59 mg/100 mL (Baobab) to 162.25±12.29 mg/100 mL (Néré). The total phenols varied from 430.55±19.81 mg/100 mL (Néré) to 1226.19±31.32 mg/100 mL (Baobab) and oxalate oscillated between 25.66±6.35 mg/100 mL (Néré) and 187.00±11.00 mg/100 mL (Baobab).

Table 6. Anti-nutritional content in fruit pulps (mg/100 g)

Fruit pulps	Tannins	Flavonoids	Total phenols	Oxalates
Baobab	1020.90±7.36^{c}	105.04±1.59^{ab}	1226.19±31.32^{c}	187.00±11.00^{c}
Tomi	518.75±14.49^{a}	119.49±4.79^{ab}	653.10±25.22^{b}	44.00±11.00^{b}
Néré	554.60±11.25^{b}	162.25±12.29^{c}	430.55±19.81^{a}	25.66±6.35^{a}

The average values assigned to the same letter in the same column are not significantly different from the 5%

4. DISCUSSION

The amounts of protein present in the pulp of the three fruits studied are low. They are between 2.53 % and 4.50 %. Protein levels obtained in these pulps are weak particularly as the daily requirement of protein from healthy adult is 0.75 g of protein per kg body weight per day [15]. The content of 4.50 % of Néré pulp is slightly above that of 3.4 % reported by Azokpota [16]**.** The content of 3.08% of baobab pulp is similar to those of 3.03-3.6 % reported in literature [17-18]. The protein content (2.53 %) of Tomi pulp is lower than that of 6.3 % DM reported by Grollier et al. [19]. Fat content varied between 0.64 % and 1.42 %). These fat levels indicate that the pulp of these three fruits is very poor content in lipid. The content (1.42 %) of baobab pulp is substantially close to 0.94 % reported by Cissé [17]. The rate of 0.64 % of Néré pulp is comparable to those of 0.32 % to 1 % reported by Ouédraogo [20] and Azokpota [16]. The content of 0.70 % (1.00 % dry matter) revealed in Tomi pulp is substantially similar of that of 1.4% determined by Grollier et al. [19]. In addition, their water content is overall low. It is between 8.66 % and 19.90 %**.** This relative poverty in water reflects the non-succulent nature of these three fruits in which, the maturity coincides with the great dry season of the north (January-June) in the make-up remover is in a state of very advanced dehydration. This low humidity gives them the advantage of being preserved for long time [21]**.** In the other hand, high levels of total carbohydrates were revealed in the pulp of each fruit studied (71.50 % - 81.93 %). These values indicate that pulps of these three fruits are important sources of carbohydrate. Due to its richness in carbohydrates, the consumption of these fruits would beneficial especially that carbohydrates provide most of the energy of the body. The total sugars are between 30.35 % and 71.66 %. The pulp of Tomi contains the highest level of total sugars (71.66%). However, studies in Thailand [22] have indicated values ranging from 4.80 to 38.94 % for acidic varieties and from 39.06 % to 47.71 % for sweet varieties. Therefore, on the basis of these criteria, Tomi fruits harvested in the Korhogo department could belong to the sweet varieties. In addition, the pulp of these fruits has also recorded very high energy values (309.72-353.50 kcals). These important energy values are largely attributable to their high carbohydrate content. Some authors [16, 20] reported almost similar energy values (272-305 kcals) in the Néré pulp. Osman [23] obtained similar value (320.30 kcal) in the Baobab pulp. However, De Caluwé et al. [24] found lower values (115kcals) in Tomi pulp. For the total crude fiber, the pulp of these three fruits analyzed, recorded very variable contents (3.96 % - 41.14 %). The fiber content (41.14 %) of the Néré pulp is much higher than that of 12.6 % reported by Bonkoungou [25]**.** The content of Tomi pulp (3.06 %) is slightly below that of 5.6 % reported by De Caluwé [24]. As for the Baobab pulp, its fiber content (22.65%) is higher than that of 14.6 % reported by Cissé et al [26] and comparable that of 25.25 % found by Cissé [17]**.** Acidity titrable of the pulp of these oscillates between 12.67 % and 160.83 %. The low acidity (12.67 %) of the Néré pulp caused its pH to rise (5.00). This value is greater than the value of 3.00 reported by Ouattara [27]**.** The titrable acidity (106.06 meq.g/kg) and pH (3.32) of the Baobab pulp are in agreement with the values reported by Cissé [17] (acidity: 95 meq.g/kg, pH=3.3). The titrable acidity (160.83 meq.g/ kg) of the Tomi pulp gave it a very low pH (2.42). Indeed, unlike other fruits, the acidity of tamarind does not fade with ripening. That’s why Tomi’s fruit is known as the most acidic and sweet fruit at the same time [19]**.** The pulp of these fruits contains fairly low ash content (1.36 %-5.06 %). The ash content (5.06 %) of the Baobab pulp is close to that of 5.2% found by Cissé [17] and those of 5.1 % and 5.7 % reported respectively by Lockett et al. [18] and Murray et al. [28]. The content of the Néré pulp (1.36 %) is much lower than that of 2.9 % reported by Bonkoungou [25]. The content (3.46 %) observed in Tomi pulp is comparable that of 3.5 % found by Grollier et al. [19].

The mineral profile of these three fruits is impressive with predominant potassium content (92.29-2815.11 mg/100 g). The content (2815.11 mg/100g) of the Tomi pulp is much higher than that of 587.8 mg/100g reported by Grollier et al. [19]. As for the Baobab pulp, its content (2353.42 mg/100g) is in agreement with the contents oscillating between 2252 and3050 mg/100g reported by Cissé [17] in the Malagasy species. Interesting contents of calcium (84.23–320.85 mg/100g), phosphorus (83.03–277.12 mg/100g) and magnesium (54.84–192.27 mg/100g) were also determined in the pulp of these three different fruits.

Moreover, the pulp of these three different fruits has revealed interesting content of organic acids of which tartaric acid was the most important (7.04 g/100g–8.04 g/100g). Significant amounts of malic acid (0.17 g/100g–1.08 g/100g) and citric acid (2.05 g/100g–3.01 g/100g) were also obtained. These important levels could provide them with important antioxidant properties [17]. In addition, organic acids lower the pH in the stomach, reducing the growth of certain pathogenic bacteria [29]. These fruits have recorded appreciable quantities in phenolic compounds. They contain benzoic acid (3.06-4.00 mg/100g), gallic acid (6.75-7.43 mg/100 g), catechin (73.01-141.03 mg/100 g), coumarin (4.21-11.49 mg/100 g) and quercetin 4.91 mg/100 g (Baobab). In fact, fruits rich in phenolic compounds effectively contribute to preserving the health of consumers because these compounds protect the human body by eliminating free radicals [30]. This study revealed the presence of vitamin A and C in the pulp of these three fruits analyzed. The vitamin C content was between 28 mg/100 g (Tomi) and 311 mg/100 g (Baobab). The vitamin C content of the Baobab pulp (311 mg/100 g) is similar to that of 300 mg/100 g found by Wehmeyer [31].This makes them foods that could help prevent cardiovascular disease via their antioxidant properties [17]. Vitamin A for its part is between 21 mg/100g (Néré) and 98 mg/100g (Baobab). The no less important levels of vitamin A represented in the pulp of these fruits could play an important role in the body of the consumer because it is involved in the treatment of visual impairment disorders in the dark and certain mucosal or cutaneous affections [32].

The pulp of these has also recorded anti-nutrients with very appreciable contents whose contents of polyphenol (430.55–1266.19 mg/100g) and tannin (518.75–1020.90 mg/100g) are the most important. The amount of polyphenols (1266.19 mg/100g) in Baobab pulp is as important as that of 1084 mg/ 100g DM found by Cissé [17]. Scalbert et al. [33] have also reported that polyphenols participate in the prevention of cardio-vascular disease. Concerning the tannins, their strong presence in these fruits is an advantage for the consumers because they make leave of the compounds with antioxidant, ant-carcinogenic and anti-radical properties [34]. As for flavonoids, they are between 105.04 mg/100g (Baobab) and 162.25 mg/100g (Néré). According Hii et al. [35], they would be responsible for the presence of astringent flavors in a food. The oxalate content of the pulp of these three fruits varied between 25.66 mg/100g and 187.00 mg/100g. Hassan et al. [36] have shown that oxalate has properties to influence the bioavailability of certain minerals (Ca, Fe, Zn…) for the body. Therefore, populations with a diet based on these three fruits should take this into account in order to apply efficient treatment before consumption.

5. CONCLUSION

The pulps of Baobab, Tomi and Néré are rich in many nutrients including carbohydrates (total sugars, total crude fibers), minerals (K, Ca, P and Mg) and phenolic compounds (Catechin). It also has a good anti-nutritional profile (polyphenols and tannins) and organic compounds (Tartric acids). The pulp of these three wild fruits is therefore quantitatively and qualitatively nutrious to satisfy the food and commercial requirements.

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