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Morphological and Biochemical Characteristics of Ripe *Sarcocephalus Latifolius* Fruits Harvested in Three Towns in the North of Côte d'Ivoire

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Abstract The fruits of the Sarcocephalus latifolius (African peach) are said to be rich in both nutritional and therapeutic properties, thanks to its high phenolic and mineral content. To be used in food, the fruit is either processed into powder for herbal teas or eaten raw when ripe. However, no scientific study has yet reported on the biochemical composition of the fruit of this species. This study focused on characterising the fruit of the African peach harvested in three towns in northern Côte d'Ivoire. To do this, Morphological, physicochemical and phytochemical parameters were determined using standardised conventional analysis methods. In terms of morphological parameters, the results show that the endocarp, mesocarp and exocarp do not differ significantly and have an overall length of 0.64 cm, 1.27 cm and 0.25 cm respectively. However, the mass, length, width and circumference differed significantly. Indeed, the mass varies from 64.77 ± 2.18 to 79.3 ± 2.96 g, the circumference from 14.25 ± 0.35 to 17.10 ± 0.14 cm, the width from 4.15 ± 0.13 to 5.25 ± 0.07 cm and the length from 4.77 ± 0.38 to 5.45 ± 0.07 cm. In terms of physicochemical parameters, there were significant variations in fibre, total sugars, reducing sugars, ash content and energy value. Thus, fibre content varied from 12.6 ± 0.4 to 13.3 ± 0.6%, total sugars from 68.3 ± 0.04 to 68.77 ± 0.02%, reducing sugars from 4.6 ± 0.06 to 5.16 ± 0.03%, ash from 6.9 ± 0.01 to 7.12 ± 0.03% and energy value from 98.15 ± 1.75 to 114.21 ± 2.06%. With regard to phytochemical parameters, only the flavonoid content differed significantly between towns. However, the content of these compounds was around 1386 mgEQ/100g for total polyphenols, 2.53 mgEQ/100g for tannins and 114.21 ± 2.06 mgEQ/100g for flavonoids. In view of its composition, eating the fruit of the African peach tree can help prevent certain dietary imbalances and deal with certain diseases.

Keywords: *Sarcocephalus latifolius, morphological parameters, physicochemical characterisation, phytochemical parameters*

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1. Introduction

In Côte d'Ivoire, as in most developing countries, food security remains a major challenge. Concerned about the health of its population, the government is allocating large investments to overcome this problem [1,2,3]. However, nutritional deficiencies in certain areas of northern Côte d'Ivoire reach rates of around 40% for global acute malnutrition and more than 5% for severe acute malnutrition [4,5]. The social groups most affected are pregnant women and children [5,6,7]. Faced with this scourge, the promotion of local food products from wild fruits is becoming a promising alternative for reducing nutritional deficiencies. These local products include baobab (*Adansonia digitala*), néré (*Parkia biglobosa*), tamarind (*Tamarindus indica*), zaban (*Saba senegalensis*), etc… [8,9,10]. Following the example of these plant products, African peach trees, and more specifically *Sarcocephalus latifolius*, could make a contribution. The African peach (*Sarcocephalus latifolius*) is a shrub that produces fleshy, red fruit with a spherical or ovoid shape that looks like a large red-black strawberry [11]. The flesh is pink inside and has a strawberry-like odour [12]. This shrub has long been known in traditional African medicine for its therapeutic benefits. In addition to its therapeutic potential, the fruit of *S. latifolius* has also been the subject of several nutritional studies. The work by [13] has shown that the fruit contains vitamins A and E and a high level of vitamin C (ascorbic acid). Consumption of *S. latifolius* fruit therefore covers the daily vitamin C requirements of children and adolescents, estimated at between 42 and 93 mg/d [14]. However, to avoid the undesirable effects of excessive vitamin C consumption, such as oxalate kidney stones, [12] suggests moderate consumption of this fruit. What's more, this shrub became better known to the general public thanks to the discovery of tramadol in the bark of its roots [12].

Moreover, the fruit of *S. latifolius* is naturally consumed by the population in the towns of northern Côte d'Ivoire. However, to date there is no published scientific data on the biochemical composition of these fruits in Côte d'Ivoire. It was with this in mind that the study was initiated, focusing on the physico-chemical characterisation of ripe *Sarcocephalus latifolius* fruit harvested in three towns (Boundiali, Ferkessédougou and Korhogo) in the north of Côte d'Ivoire.

2. Materials and Methods

2.1. Biological Material and Chemicals

The plant material used in this study (Figure 1) consisted of the fruit of the African peach*(Sarcocephalus latifolius*) harvested in three (3) towns in northern Côte d'Ivoire (Boundiali, Ferkessédougou and Korhogo). All other chemicals and reagents used were of analytical quality

Figure 1. Fruits of Sarcocephalus latifolius

2.2. Sampling

The towns of Korhogo, Boundiali and Ferkessédougou were chosen as the sampling area on the basis of a preliminary survey of farmers in the town of Korhogo. From this direct interview survey, it emerged that the fruits of the African peach tree are easily found in the north of Côte d'Ivoire in the savannahs of the Korhogo, Boundiali and Ferkessédougou departments. The fruit was collected in the surrounding localities of Gandouman (Korhogo), Kanitélégué (Boundiali) and Pissakaha (Ferkéssedougou). The fruit collection was carried out with two (2) volunteer village guides per locality. The fruits (50 fruits) were harvested manually in a non-random way according to availability and put in labelled packages and transported to the laboratory for conservation in a freezer.

2.3. Determination of Morphological Parameters

Morphological parameters were measured on sixteen (16) fruits. For each fruit, the circumference was measured by wrapping the tape measure around the fruit. The length and width of the fruit, expressed in cm, were determined using a calliper. The length was measured from the point of attachment of the fruit to the stalk to the basal end. The width is measured at the largest diameter of the fruit. The average ratio of fruit length to fruit width (L/w) has been calculated to define the shape of the fruit [15]. If the ratio (L/l) tends towards 1 then the shape is said to be spherical, otherwise it is ovoid. The whole fruit was then weighed using an electronic balance (Sartorius, Washington, USA), then divided at the largest diameter with a stainless steel knife to measure the length of the mesocarp, endocarp and exocarp with a graduated ruler (Figure 2).

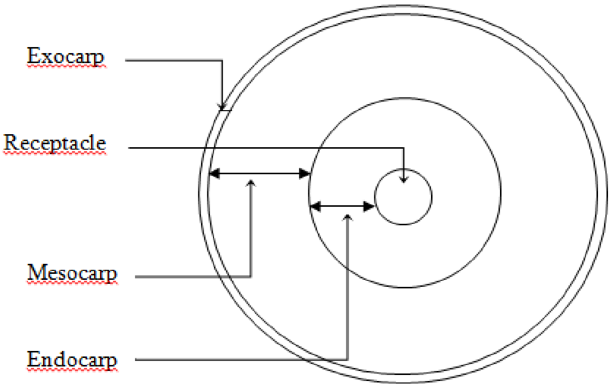

Figure 2. Diagram of the different parts of the fruit of *Sarcocephglus latiflius*

2.4. Determination of Physico-chemical Parameters

Apart from the moisture content and dry matter determined directly on the fruit, the protein content, fat content, total fibre, sugars, ash, acidity, energy value, minerals and phytochemical compounds were determined on the fruit powder obtained by drying at 45°C for three (3) days [16]. To this end, after harvesting, the various samples of ripe S. latifolius fruit free of debris were sliced and dried at room temperature in the laboratory (around 25°C) for ten (10) days using the slightly modified method of [17]. After drying, the slices were ground using a mill (Mill IKA Germany/Deutschland). The crushed material obtained was sieved to obtain a powder. The powder obtained was packaged in a glass bottle that had been dried in an oven at 45°C for one day and hermetically sealed. The vial was stored in a closed cabinet until its next use.

2.4.1. Determination of Moisture and Dry Matter Content

The moisture content and dry matter of ripe *S. latifolius* fruit were determined in accordance with standard 925.10 [16]. This method consisted of evaporating the water contained in the raw material by heating in an oven at 105°C to constant mass. The clean crucibles were dried in an oven and then cooled in a desiccator. For each sample, approximately ten (10) g of *S. latifolius* fruit powder placed in the crucible (M_1)was then placed in an oven (MMM Med Center Venticell, Germany) at 105°C until constant mass was reached. The dried sample crucible was then cooled in a desiccator for 30 min. The mass of the crucible containing the dried pulp sample (M_2) was determined. Dry matter and moisture content were calculated using the following formulae:

$$\text{Moisture}(\%) = \frac{M_1 - M_2}{M_1 - M_0} \times 100$$

$M_{0:}$ Mass of empty crucible (g);
$M_{1:}$ Mass (crucible + fruit powder) before steaming (g);
$M_{2:}$ Mass (crucible + fruit powder) after steaming (g).

$$\text{Dry mattere}(\%) = 100 - \text{Moistur}(\%)$$

2.4.2. Determination of *Ash* Content

The ash content of the powder obtained from ripe *S. latifolius* fruit was determined in accordance with standard 925.10 [16]. A test sample of five (5) grams of flour weighed into a porcelain crucible of known mass (M_0) was incinerated in a muffle furnace at 550°C for 6 h. After this incineration, the crucible was removed and cooled in a desiccator for 30 min, then weighed (M_2). The ash content was calculated using the following formula:

$$\text{Ash}(\%) = \frac{M_2 - M_0}{M_1 - M_0} \times 100$$

M_0 : mass of empty crucible ;
M_1: mass (crucible + sample) before incineration (g);
M_2: mass (crucible + sample) after incineration (g);

2.4.3. Determination of Titratable Acidity

Titratable acidity (TA) was determined according to the method of [16]. One (01) gram of the powder from the ripe fruits of S. latifolius was dissolved, after being well shaken, in 50 mL of distilled water contained in an Erlenmeyer flask. The mixture was filtered through Whatman filter paper and the filtrate collected in an Erlenmeyer flask. Next, 10 mL of the filtrate was taken and titrated with a solution of NaOH (0.1N) in the presence of phenolphthalein until the colour changed to pink. The percentage of total titratable acidity was calculated using the following mathematical expression :

$$\text{TA}(\%) = \frac{\text{N} \times V_2}{V_1} \times 100$$

V_2: Volume of titrating soda (mL);
V_1: Volume of sample (mL);
N: Normality of the titrant solution (0.1N).

2.4.4. Dosage of Ethanosoluble Sugars

• Extraction of ethanosoluble sugars

The sugars in the powder from ripe *S. latifolius* fruit were extracted using the technique described by [18]. 1 g of sample is placed in a centrifuge tube and 10 mL of ethanol (80%, v/v) were added. The mixture was homogenised vigorously for 24 h and then centrifuged for 30 min at 3000 rpm. The supernatant obtained was stored in a 50 mL Erlenmeyer flask. The pellet was then recovered in 10 mL of ethanol (80% v/v) under the same conditions as previously. The new supernatant is added to the first supernatant in the 50 mL Erlenmeyer flask. The ethanol in this mixture was evaporated in a sand bath for 10 min. The concentrate obtained was used for the determination of the ethanosoluble sugars.

• Dosage of total sugars

Total sugars were determined according to the method described by [19] using phenol and concentrated sulphuric acid. The ethanosoluble sugar extract (15µL) was taken and placed in a test tube. To this volume, 1 mL of phenol (5% w/v) and 1 mL of concentrated sulphuric acid (97%) were added respectively. The reaction medium is homogenised and left to cool for 5 min. The optical density is then read at 490 nm using a spectrophotometer (JASCO V530) against a control containing all the products except the ethanosoluble sugar extract. The optical density is then converted into the quantity of total sugars using a calibration line obtained from a glucose solution (1 mg/mL).

• Dosage of reducing sugars

Reducing sugars were determined according to the [20] method using 3,5 dinitrosalycilic acid (DNS). The ethanosoluble sugar extract (300 µL) is taken and placed in a test tube. To this volume, 300 µL of DNS solution were added. The mixture is placed in a boiling water bath for 5 min. After cooling on the bench for 5 min, 2 mL of distilled water are added to the reaction medium. The absorbance was read at 540 nm using a spectrophotometer (JASCO V530) against a control containing all the products except the ethanosoluble sugar extract. The absorbance was converted into the quantity of reducing sugars using a calibration line obtained from a glucose solution (1 mg/mL).

2.4.5. Determination of Fiber Content

The fiber dosage was carried out according to the method of [16]. Two (2) grams of powder (Ma) are weighed into a flask containing 50 mL of 0.25 N sulfuric acid. The mixture is homogenized and brought to the boil for 30 min under a reflux condenser. Then, 50 mL of 0.31 N sodium hydroxide are added to the contents of the flask, brought to the boil again for 30 min under reflux condenser. The extract obtained after boiling was filtered through Whatman N^{o}.4 filter paper and the residue was washed several times with hot water until the alkalis were completely eliminated. The residue (Mr) is dried in an oven at 105°C for 8 h, cooled for 30 min in a desiccator, then weighed before being incinerated in a muffle furnace at 550°C for 3 h to obtain an ash (Ma). The crude fiber content of the powder samples expressed as a percentage is given by the equation:

$$\text{Crude fibres}(\%) = \frac{\text{Mr} - \text{Ma}}{\text{Ms}} \times 100$$

2.4.6. Determination of the Energy Value

The energy value (EV) of the feed was calculated by applying the thermal coefficients of Merril and Watt according to [21]:

EV (Kcal) = [(% carbohydrates x 4) + (% proteins x 4) + (% lipids x 9)]

2.4.7. Dosage of Minerals

The mineral elements in the powder from ripe S. latifolius fruit were determined by atomic absorption spectrophotometry according to standard 965.09 [16] using strong acids. A 0.5 g test portion of the powder was dissolved in 31 mL of an acid mixture consisting of perchloric acid (11.80 mol/L), nitric acid (14.44 mol/L) and sulphuric acid (18.01 mol/L). The mixture was stirred well in a fume hood and heated on a hot plate (P SELECTA AGIMATIC-N) until thick white fumes appeared. After this heat treatment, the reaction medium was cooled on the bench for 10 min and then diluted with 50 mL of distilled water. It was brought back to the boil for 30 min on the same hot plate and then cooled under the same conditions. The mixture was then filtered through Whatman No. 4 filter paper. The filtrate thus obtained was made up to the mark with distilled water. The level of each mineral was determined using a flame atomic spectrophotometer (VARIAN AA.20) at a specific wavelength by comparison with standard solutions containing the minerals to be determined.

2.5. Determination of Phytochemical Compounds

2.5.1. Preparation of Ethanolic Extracts

Ten (10) grams of the powder from ripe S. latifolius fruits were macerated at approximately 25°C for 24 hours in 50 mL of 80% (v/v) ethanol under mechanical agitation. The mixture obtained after incubation was centrifuged at 4000 rpm for 5 min using a refrigerated centrifuge (Refrigerated centrifuge TGL-16). The supernatant was recovered and the pellet extracted twice in succession under the same conditions. The various ethanol extracts obtained were concentrated by evaporating the ethanol at 35°C to obtain 50 mL of solution, using a rotary evaporator (rotary evaporator HEILDOLPH Laborata 4003 Control, Schwabach, Germany). The various extracts were then transferred to new tubes and stored at -20°C.

2.5.2. Determination of Total Phenolic Compound Content

One test portion (1 mL) of each sample was used for the determination of total phenols. The sample was extracted with 10 mL of an acetone/water mixture (70/28; v/v) for 10 minutes. The operation was repeated twice. The fractions were pooled and filtered through filter paper. The assay was carried out using the Folin-Ciocalteu reagent according to the method developed by [22]. Five microlitres (5 µL) of filtrate was made up to 500 µL with methanol and then assayed with Folin-Ciocalteu reagent. At the same time, 500 µL of filtrate was added to 3500 µL of water and 2 mL of this mixture was deposited on an OASIS cartridge and washed with 2 mL of water. The total volume of the eluted fraction was measured and 500 µL of this fraction was then assayed. Absorbances were measured at 760 nm using a 7200 UV spectrophotometer (Cecil Instrument, United Kingdom).

2.5.3. Determination of Total Flavonoid Content

The total flavonoid content was determined using the method described by [23] using aluminium chloride. To a volume of 0.5 mL of ethanolic extract, 0.5 mL of distilled water, 0.5 mL of aluminium chloride (10% w/v), 0.5 mL of sodium acetate (1 M) and 2 mL of distilled water were added successively. The tube was then left to stand for 30 min at room temperature. The optical density was read using a spectrophotometer at 415 nm against a blank (ethanolic extract + distilled water). Finally, a range of quercetin concentrations from 0 to 0.1 mg/mL was used for the calibration curve. The results were expressed as mg quercetin equivalent (QE)/100g dry matter (DM) from the calibration curve.

2.5.4. Determination of Gall Tannin Content

The gallic tannin content was determined according to the method used by [24]. A volume of one (1) mL of each ethanolic extract was taken and to this volume was added 5 mL of vanillin reagent (0.1 mg/mL vanillin in 70% (v/v) sulphuric acid). The tube was left to stand in the dark for 20 min. The optical density was read using a spectrophotometer at 500 nm against the blank (ethanolic extract + distilled water). Finally, a tannic acid concentration range from 0 to 0.1 mg/mL was used for the calibration curve. The results were expressed as mg tannic acid equivalent (TEA)/100g dry matter (DM).

2.6. Statistical Processing of Data

The results are presented in the form of averages followed by standard deviations. The one-factor analysis of variance (ANOVA), the Duncan test and the Newman Keuls test at the 5% threshold were used to compare and differentiate the means using STATISTICA version 99 software. The tables were drawn up using Excel.

3. Results

3.1. Morphological Parameters of Harvested Fruits

The morphological parameters of ripe *Sarcocephalus latifolius* fruits harvested in Boundiali, Ferkessédougou and Korhogo present different characteristics (Table 1). The fruits from the different towns are ovoid in some cases and spherical in others.

Statistical analysis showed a significant difference ($p \leq 0.05$) in the mass of the samples analysed. Indeed, the highest fruit mass was observed in Korhogo (79.3 ± 2.96 g) and Boundiali (74.04 ± 3.65 g). On the other hand, the lowest mass was observed in Ferkessédougou (64.77 ± 2.18 g).

In terms of circumference, the results indicate a significant difference ($p \leq 0.05$). Boundiali had the largest fruit circumference (17.10 ± 0.14 cm) compared with Ferkessédougou (14.25 ± 0.35 cm) and Korhogo (14.72 ± 1.65 cm).

As far as width is concerned, the harvested fruits are statically different. Fruits from Boundiali are wider (5.25 ± 0.07 cm) than those from Korhogo (4.15 ± 0.13 cm) and Ferkessédougou (4.4 ± 0.14 cm), which are statically identical.

Regarding length, the highest value was observed in Boundiali (5.42 ± 0 .11 cm) and Ferkessédougou (5.45 ± 0 .07 cm). On the other hand, the lowest length was observed in Korhogo (4.77 ± 0.38 cm).

Furthermore, there was no significant difference between the endocarp, exocarp and mesocarp of fruits harvested in Boundiali, Ferkessédougou and Korhogo (Table 1).

Table 1. Morphological parameters of ripe *Sarcocephalus latifolius* fruit

Caractéristiques	Boundiali	Ferkessédougou	Korhogo
Fruit mass (g)	74.04 ± 3.65[a]	64.77 ± 2.18[b]	79.3 ± 2.96[a]
Circurmference (cm)	17.10 ± 0.14[a]	14.25 ± 0.35[b]	14.72 ± 1.65[b]
Width (cm)	5.25 ± 0,07[a]	4.4 ± 0.14[b]	4.15 ± 0.13[b]
Length (cm)	5,42 ± 0.11[a]	5.45 ± 0.07[a]	4.77 ± 0.38[b]
Endocarp (cm)	0.95 ± 0.07[a]	0.64 ± 0.01[a]	0.6 ± 0.11[a]
Exocarp (mm)	0.25 ± 0.71[a]	0.25 ± 0.07[a]	0.25 ± 0.07[a]
Mesocarp (cm)	1.27 ± 0.035[a]	1.35 ± 0.07[a]	1.07 ± 0.17[a]
Fruit shape	Ovoid, spherical	Ovoid, spherical	Ovoid, spherical

3.2. Biochemical Parameters of Harvested Fruit

3.2.1. Physico-chemical Parameters of Harvested Fruit

Moisture and dry matter content were determined directly on the ripe fruit. Table 2 shows that the moisture content and dry matter content of the fruit did not differ significantly between the fruit harvested in the three towns. The overall moisture content was around 77.43%, while the dry matter content was around 22.57%.

Table 2. Physicochemical parameters of ripe *Sarcocephalus latifolius* fruit

Physicochemical properties	Boundiali	Korhogo	Ferkessédougou
*Moisture (%)	77.43 ± 0.1[a]	77.52 ± 0.1[a]	77.5 ± 0.3[a]
*Dry matter (%)	22.57 ± 0.01[a]	22.48 ± 0.01[a]	22.42 ± 0.1[a]
Protein (%)	8.7 ± 0.03[a]	8.7 ± 0.02[a]	8.75 ± 0.04[a]
Fat (%)	3.5 ± 0.02[a]	3.1 ± 0.02[a]	3.17 ± 0.03[a]
Total fibre (%)	12.6 ± 0.4[a]	13.3 ± 0.6[a]	12.96 ± 0.03[a]
Total sugars(%)	68.3 ± 0.04[b]	68.77 ± 0.02[c]	68.23 ± 0.04[a]
Reducing sugars (%)	4.6 ± 0.06[a]	4.67 ± 0.06[a]	5.16 ± 0.03[b]
Ash (%)	6.9 ± 0.01[a]	7.08 ± 0.02[b]	7.12 ± 0.03[b]
Acidity (%)	4.1 ± 0.05[a]	4.16 ± 0.03[a]	4.08 ± 0.03[a]
Energy value (Kcal/100g DM)	101.24 ± 2.23[b]	98.15 ± 1.75[a]	114.21 ± 2.06[c]
Iron (mg/100g)	422 ± 1[a]	423.03 ± 0.31[a]	421.63 ± 0.55[a]
Sodium (mg/100g)	715.2 ± 2.5[a]	714.83 ± 3.21[a]	713.6 ± 1.54[a]
Potasium (mg/100g)	2250 ± 1.5[a]	2250.23 ± 1.1[a]	2250 ± 1.51[a]
Calcium (mg/100g)	109.7 ± 1.5[a]	109 ± 1[a]	111 ± 1[a]
Phosphorus (mg/100g)	253.3 ± 3.5[a]	253 ± 0[a]	253.93 ± 2.25[a]
Magnesium (mg/100g)	194.7 ± 1.5[a]	195 ± 1[a]	193.67 ± 3.06[a]

Trials: n = 3; means ± standard deviation with different lower case letters on the same line are significantly different at $p < 0.05$ according to Duncan's test.

*: Parameter determined directly on the fruit

In terms of protein, the results obtained do not differ significantly. The overall protein content of fruit in the three towns was around 8.7%.

There was no significant difference in fat content ($p \leq 0.05$). Fruits from Boundiali, Ferkessédougou and Korhogo had fat contents of around 3.5%.

With regard to total crude fibre content, analysis of the results shows that there is no significant difference between the samples analysed. The samples analysed had an overall crude fibre content of 13.3% in the three towns.

The lowest reducing sugar content was found in Boundiali and Korhogo, at around 4.6%. On the other hand, the highest reducing sugar content was found in Ferkessédougou (5.16 ± 0.03%).

The lowest ash content was found in Boundiali (6.9 ± 0.01%). In contrast, the highest ash content was observed in Korhogo (7.08 ± 0.02%) and Ferkessédougou (7.12 ± 0.03%).

The acidity of the fruit harvested in the three towns did not differ significantly ($p < 5\%$). In fact, the acidity of fruit from the different towns was around 4.1% overall.

As for energy value, the results obtained differ significantly. Fruit harvested in Ferkessédougou had the highest energy value (114.21 ± 2.06 Kcal/100g DM), followed by Boundiali (101.24 ± 2.23 Kcal/100g DM) and Korhogo (98.15 ± 1.75 Kcal/100g DM).

This study shows that the mineral content of fruit harvested in Boundiali, Ferkessédougou and Korhogo is not significantly different. The levels were 422; 715.2; 2250; 109.7; 253.3 and 193.67 mg/100g respectively for iron, sodium, potassium, calcium, phosphorus and magnesium.

3.2.2. Phytochemical Parameters of Harvested Fruit

The phytochemical properties of the ripe fruit in the different towns are shown in Table 3. The results show that the polyphenol and tannin contents do not differ. The total polyphenol content of the harvested fruit was around 1391.17 mgEAG/100 g DM and the tannin content was around 2.53 ± 0.05 mgEAG/100 g DM.

Flavonoid content also differed significantly. It was higher in Boundiali (153.17 ± 0.22 mgEAG/100g DM) and lower in Korhogo (105.45 ± 0.61 mgEAG/100g DM).

Trials: n = 3; means ± standard deviation with different letters on the same line are significantly different at $p < 0.05$ according to the Newman Keuls test.

Table 3. Phytochemical properties of ripe *Sarcocephalus latifolius* fruit

Parameters	Boundiali	Korhogo	Ferkessédougou
Total polyphenols (mgEAG/ 100g DM)	1385.6 ± 1.1[a]	1387.97 ± 0.76[a]	1391.17 ± 5.51[a]
Tannins (mgEQ/100g DM)	2.53 ± 0.05[a]	2.53 ± 0.02[a]	2.57 ± 0.15[a]
Flavonoids (mgEQ/100g DM)	153.17±0.22[c]	105.45 ±0.61[a]	126.12 ± 0.28[b]

Trials: n = 3; means ± standard deviation with different letters on the same line are significantly different at $p < 0.05$ according to Duncan's test.

4. Discussion

The African peach fruit is rich in macronutrients and micronutrients. Its consumption can cover several nutritional needs. At the end of the experiments, the average dimensions observed for the length of the fruit were larger in Boundiali and Ferkessédougou (5.45 cm) and smaller in Korhogo (4.77 cm). This difference can be explained by the shape of the fruit harvested in each town. Some of the fruits from these towns are ovoid, while others are spherical. The variability of the "Length/Width" ratio of the fruits, which reflects their shape, reveals that the fruits produced are of different shapes. The values obtained for this ratio, ranging from 0.6 to 1, reveal a spherical and an ovoid shape for *S. latifolius* fruits. It should be remembered that the physical parameters of fruit are important indicators of ripeness [25] (Bhaskar and Shantaram, 2013). The pulp sampled from the fruits studied was characterised overall by a high water content (77.43%). These results are higher than those reported by [26] Eze and Obinwa (2014) with the same species (44.72%) in Nigeria. The difference between our results and those of these authors could be due to the fruit harvesting area. Indeed, [27] Ruiz-Rodriquez *et al.* (2011) reports that the variation in water content may be due to geographical distribution. This high water content in *S. latifolius* fruit is a parameter that reflects the high perishability of this type of fruit and limits its suitability for storage at room temperature. The protein content of the fruit collected in the three towns (Boundiali, Ferkessédougou and Korhogo) was identical overall. This overall content (8.7%) is much closer to that reported by [28]. The observed protein content of *S. latifolius* is much higher than that of widely consumed fruits such as papaya (0.5% DM) and passion fruit (2.6% DM) [29,30]. Consumption of *S. latifolius* would therefore cover the body's daily protein requirements, estimated at 0.75 g/kg weight/day [31]. Regarding fat content, the results obtained show that the fruit of *S. latifolius* has a low fat content (3.1%). However, our results are higher than those of [26] with the same species (1.74%). Thus, the values obtained reflect the less fatty character of the fruit which would allow the improvement of fruit digestibility. Consequently, *S. latifolius* pulp can be recommended for people with a sedentary lifestyle and those suffering from cardiovascular disease and diabetes [32]. According to [33], fibre contributes to the proper functioning of the digestive system by facilitating intestinal transit and also preventing the absorption of excess cholesterol by the body. The fibre contents obtained in our work (12.6-13.3%) are significantly higher than those determined in dried Momordica charantia fruit (1.19%) by [34] and in vegetables (2.34%) by [35]. Consumption of *S. latifolius* would therefore help to enrich our diet with fibre for healthy body function. Sugars are responsible for the sweet taste of food and their consumption provides energy to the body [36,37,38]. Fruits from the town of Korhogo (68.77 ± 0.02%) were richer in total sugars than those from Boundiali and Ferkessédougou (68.3%). According to the levels obtained in this study, the fruits of *S. latifolius* are a source of sugars that supply calories to the body. In fact, the particularity of *S. latifolius* pulp seems to be its high energy value (98.15 ± 1.75 to 114.21 ± 2.06 kcal/100g DM). This makes *S. latifolius* fruit an excellent source of energy. Consequently, these characteristics could make them more interesting for biotechnological, food, pharmaceutical and medical applications [39,40,41]. In addition, the pulp of the fruits from the different towns is acidic. This acidity seems to be linked to an increase in the content of acids such as amino acids, fatty acids and vitamin C [42]. Moreover, according to [38], fruit acidity is also linked to the harvesting period and the colour of the fruit. Thus, transforming the pulp of these fruits into juice would give juice with a favourable acidity for its stabilisation against the process of degradation by yeasts and moulds. In this study, the mineral content did not differ significantly between fruits from different towns. *S. latifolius* pulp (2250 mg/100g) is an excellent source of potassium, especially as the daily requirement for an adult is estimated at 380 mg/day [43]. Despite the lower levels of other minerals compared with potassium in these fruits, their presence is still useful for consumers. These minerals are crucial for enzymatic activities, protecting cells against free radical attack, regulating homeostatic glucose, etc… [44,45].

Phytochemical analysis revealed the presence of phenols, tannins and flavonoids in *S. latifolius* fruits. Total phenol content was relatively high (1385.6 mgEAG/100 g DM) in fruit from three towns (Boundiali, Ferkessédougou and Korhogo). However, these levels are much higher than those reported by [46] on *Vitex doniana* fruit with a maximum value of 193.33 mg Eq A.G/100g. Consumption of *S. latifolius* fruit is thought to help prevent oxidative stress-related disorders such as degenerative diseases [47,48]. Flavonoid content varied from 105.45 ± 0.61 to 153.17 ± 0.22 (mgEQ/100g) DM. However, these contents are close to those reported by [46] on the fruit of *Vitex doniana* with a minimum value of 106.67 ± 2.31 mg Eq A.G/100g and a maximum value of 157.33 ± 0.58 mg Eq A.G/100g. This concentration is an asset for health, since flavonoids, by virtue of their function, protect blood vessels from cholesterol-related damage [49].

5. Conclusion

The study was used to determine the morphological and biochemical parameters of ripe *Sarcocephalus latifolius* fruit from three towns in northern Côte d'Ivoire (Boundiali, Ferkessédougou and Korhogo). The morphological parameters of the fruits were identical in the towns of Boundiali, Korhogo and Ferkessédougou, with ovoid and spherical shapes. Protein and mineral fraction contents were identical regardless of origin. The high levels of total sugars and reducing sugars indicate a significant calorie intake. The presence of phytochemicals (total polyphenols, flavonoids and tannins) in *S. latifolius* fruits makes them a reservoir of molecules of interest that could play an important role in food valorization.

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