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# Characterization of the physicochemical properties of sweet pepper (*Capsicum annuum*) cultivated in Korhogo in the North of Côte d'Ivoire

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## Abstract

Sweet peppers are consumed less in Korhogo, in the north of Côte d'Ivoire, than other hotter peppers. In addition, the sweet pepper is underexploited, it encounters problems of conservation, distribution. This study is a valorization of the sweet pepper. The physical properties are: 5.8-6.93 cm for length, 14.21-15.03 cm for circumference, 34.28-42.65 g for weight, 91.19-91.80 % for humidity, 0.49-0.61 % for ash content. The contents of biochemical elements are: 5.42-5.54 for the pH, 2.92 meq / 100 g on average for the titratable acidity, 177.45-254.57 mg / 100g for reducing sugars, 3,42-4.29 % for total sugars, 0.36 % on average for lipids, 0.73-1 % for proteins, 2.03-3 % for fibers, 6.62-6.93 % for total carbohydrates, 32.64-34.7 Kcal / 100 g for energy value.

The amounts of vitamin C, polyphenols, flavonoids, tannins are respectively: 26.67-51.25 mg / 100 g; 116.16-131.28 mg / 100 g; 1.97-4.43 mg / 100 g; 14.74-19.12 mg / 100 g. The contents of anti-nutritional compounds are 363-388.67 mg / 100 g for oxalates, 20.08-22.20 mg / 100 g for phytates. Sweet pepper contains 0.14 % DM on average phosphorus, 0.33-0.37 % DM for potassium, 0.30-0.31 % DM for calcium, 0.167-0.174 % DM for magnesium, 2.76 -3.80 ppm copper, 7.5-7.92 ppm iron, 0.59-0.69 ppm manganese, 16.24-16.34 ppm zinc, 6.46-20.15 ppm sodium. Processed before consumption, Sweet pepper constitutes a significant source of food fibre, natural antioxidant, and mineral elements for local population.

**Keywords:** Sweet pepper; *Capsicum annum*; Physicochemical properties; Korhogo

## 1. Introduction

*Capsicum annuum* is a species comprising various varieties producing fruits with the sweetest to the most pungent flavors. Thus this species is the source of sweet peppers and a large number of peppers [1]. Sweet peppers are distinguished from peppers by generally larger and more fleshy fruits, especially devoid of pungent substances (capsaicin) [2,3]. Sweet peppers are eaten raw in salads, but more commonly cooked, fried or mixed with other foods [4]. World production for the year 2009 is estimated at 28,000,000 tonnes [5]. In Côte d'Ivoire, and more precisely, in Korhogo, sweet peppers are consumed less than traditional hot peppers. In addition, the sweet pepper has the same problems as other peppers, namely that it is underexploited and the income collected by the actors, namely the farmers and market vendors, is meager. However, significant quantities of sweet peppers still rot during the distribution chain before being purchased by consumers. Conservation problems prevail in the distribution chain; better control of

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physicochemical and nutritional parameters could help ensure better profitability of the sweet pepper. In addition, people are not familiar with the nutrients provided by sweet peppers or their composition.

However, the sweet pepper could replace the pepper in the consumption of people who cannot stand the hot taste of the pepper. This study on this other variety of *Capsicum annuum* is a valorization of the sweet pepper. It will consist for the sweet pepper, to determine:

- Its physical properties
- Its biochemical properties
- Its composition in antioxidants
- Its composition in antinutrients
- Its composition in minerals

## 2. Material and methods

### 2.1. Plant material

The study was performed on fruits of sweet pepper (*Capsicum annuum*) collected from Korhogo in northern Côte d'Ivoire.

### 2.2. Methods

#### *2.2.1. Sampling*

The sweet pepper samples were purchased from three (3) main markets of Korhogo City: Sinistré market, Soba market, and Koko market. Per market, the sweet pepper samples were purchased from three various sellers, four (4) kg each. Thus, 12 kg of sweet pepper were gathered per market, leading to 36 kg for overall samples purchased. The samples were then conveyed into laboratory for further analyses.

#### *2.2.2. Physical Characterization of sweet pepper (Capsicum annuum)*

Five (5) physical parameters were assessed on the sweet pepper fruits, namely length, circumference, weight, moisture, and ash. The length and the circumference of the full fruit were estimated using a meter tape. The fruit's weight was measured using a 2 digits scale (Sartorius,). The method of determining moisture is that proposed by AOAC (1990) [6]. The moisture was assessed by drying 5 g of sweet pepper into an oven at 105 °C till constant weight resulted after 24 h. The ash content was measured by incinerating five (5) g of oven-dried pepper into a muffle furnace at 550 °C for 12 h [6].

#### *2.2.3. Chemical trend of the sweet pepper fruits*

Acidity

The acidity traits (pH and titratable acidity) were measured using AOAC (1990) method [6]. Ten (10) grams of crushed sample are slurried in 100 mL of distilled water. The solution obtained is filtered on filter paper (Whatman). The pH measurement is carried out directly by immersing the previously calibrated pH meter (HANNA) electrode in the filtrate obtained. Then, 10 mL of the filtrate are taken and this test sample is titrated with a solution of NaOH (0.1 N) in the presence of phenolphthalein until turning pink. The titratable acidity is given in mEq/100g of dried sample.

Total soluble carbohydrates and reducing carbohydrates contents

Ethanosoluble carbobydrates were extracted from 1 g of ground dried sweet pepper with 20 mL of 80% (v/v) ethanol, 2 mL of 10% (m/v) zinc acetate and 2 mL of 10% (m/v) oxalic acid, according to the method of Agbo et al. (1985) [7]. The extract was centrifuged at speed of 3,000 rpm for 10 min. The ethanol residue was evaporated from the extract upon a hot sand bath. Then, the extracted total soluble carbohydrates were measured out using the method of Dubois et al. (1956) [8]. The operation consisted in adding 0.9 mL of distilled water, 1 mL of 5 % (m/v) phenol, and 5 mL of 96% sulfuric acid into 100 µL of extract, then measuring the absorbance at 490 nm with a spectrophotometer (PG instruments). For the reducing sugars, 1 mL of extract was processed with 0.5 mL of distilled water and 0.5 mL of 3, 5-dinitrosalycilic acid [9] prior to the recording of the absorbance from the final solution at 540 nm with a spectrophotometer (PG instruments). Calibrations were performed with standard solutions of glucose and sucrose for recovering the final total carbohydrates and reducing carbohydrates contents in the studied samples.

### Lipids content

Lipids were quantified from 10 g of ground dried sweet pepper sample by solvent extraction using 300 mL of n-hexane reagent and a Soxhlet device for 7 h [10]. The hexan-oil mixture resulted from the extraction was recovered and separated with a rotavapor apparatus (Heidolph). The difference between the sample weight before and after the experiment allowed the estimation of the lipids content.

### Proteins content

Crude proteins content was determined as the total nitrogen using the Kjeldhal method (AOAC, 1990) [6]. Thus, 1 g of sweet pepper mash was mineralized at 400 °C for 2 h, with adding of concentrated sulfuric acid (H2SO4) and potassium sulfate (K2SO4) catalyst. The mineralizate was diluted and distilled for 10 min. Thereafter, the distillate collected into a flask containing boric acid and methylen bromocresol reagents ion, was titrated for the total nitrogen using ammonium sulfate ((NH4)2SO4). The crude protein content of the sweet pepper was deduced from the nitrogen level using 6.25 as conversion coefficient.

### Fibers content

The determination of the crude fibers content consisted in treatment of 2 g of ground sweet pepper sample with 50 mL of 0.25 N sulfuric acid and 50 mL of 0.31 N sodium hydroxide and filtration of the resulting solution upon Whatman paper. The residue was dried for 8 h at 105 °C then incinerated at 550 °C for 3 h into ovens [11]. The final residue was weighed as crude fibers and expressed in percentage.

### Total carbohydrates content and energy value

Total carbohydrates and energy values were determined using calculation formulas [12] accounting the moisture, fat, protein, ash contents and the energy coefficients for macromolecules. TCC (%) = 100-[P(%) + M(%) + F(%)+A(%)] CEV (kcal/100g) = [(4×P) + (9×F) + (4×C)] With: TCC, total carbohydrates content; CEV, caloric energy value; P, protein content; M, moisture content; F, fat content; A, ash content; C, total carbohydrates content.

### Vitamin C content

The vitamin C was evaluated from the sweet peppers using 2,6- dichlorophenol-indophenol (DCPIP) reagent [13]. Ten (10) grams of ground dried sweet pepper sample were dissolved into 40 mL of metaphosphoric acid-acetic acid solution (2%, w/v). The resulted mixture was centrifuged at 3,000 rpm for 20 min. Thus, the supernatant was recovered, added with boiled distilled water for 50 mL, and titrated with 2, 6- DCPIP solution (0.5 g/L) previously calibrated with a pure vitamin C solution

### Oxalates content

The oxalate content was determined with the standard AOAC method (1990) [6]. Two (2) grams of ground dried sweet pepper sample were homogenized into 200 mL of distilled water and added with 20 mL of 6N hydrochloric acid (HCl). The mixture was heated in boiling water bath for 1 h, cooled, and filtered. Fifty (50) mL of the filtrate were then homogenized into 20 mL of 6 N HCl, and filtered again. The 2nd filtrate was treated with methyl red (0.1%, w/v), concentrated ammonia, heated, and filtered. The 3rd filtrate was boiled, treated with calcium chloride (5%, w/v) for the formation of calcium oxalate crystals, and then filtered once more. The residues deriving from the filtration steps were successively washed with distilled boiling water, dried into an oven; dissolved into 10 mL of diluted sulfuric acid, and titrated with 0.05N potassium permanganate solution

### Phytates content

The phytates were measured according to the method processed by Mohammed et al. (1986) [14]. A slight ground sweet pepper sample (0.5 g) was treated with 25 mL of TCA solution at 3% (w/v) and centrifuged at 3,500 rpm for 15 min. Five (5) mL of the supernatant was removed, treated with 3 mL of ferric chloride 1% (w/v) reagent, heated in a boiling water bath, cooled and also centrifuged at 3,500 rpm for 10 min. The 2nd supernatant was treated with 5 mL of 0.5N hydrochloric acid, 5 mL of 1.5N sodium hydroxide, heated in a boiling water bath and centrifuged once more at 3,500 rpm for 10 min. Thus, 1 mL of the final supernatant was added with 4.5 mL of distilled water and 4.5 mL of orthophenantroline reagent and then measured for the absorbance at 470 nm with a spectrophotometer against standard Mohr salt solution treated likewise and taken as phytates ferric control.

Polyphenols contents

The phenol compounds were extracted from sweet pepper with methanol reagent. One gram of dried pepper sample was homogenized in 10 mL of methanol solution 70% (v/v). The resulting mixture was centrifuged at 1,000 rpm for 10 min. The pellet was recovered and treated likewise. The deriving supernatants were thus gathered into a marked flask and added with distilled water at 50 ml.

The total polyphenols content was measured using Folin-ciocalteu reagent, sodium carbonate solution (20% w/v) and distilled water [15]. Essays were measured for their absorbance at 745 nm with a spectrophotometer against standard gallic acid solutions taken as polyphenols control.

The tannins content was deducted from the total polyphenols using vanillin reagent [16]. Essays were measured for their absorbance at 500 nm with a spectrophotometer against standard tannic acid solutions taken as tannins control. Flavonoids content was also determined from the total polyphenols using aluminum chloride (10% w/v), potassium acetate (1 M) and distilled water [17]. Essays were measured for their absorbance at 415 nm with a spectrophotometer against standard quercetin solutions taken as flavonoids control

Determination of mineral elements

The determination of the mineral elements was performed according to the IITA method (1981) [18]. Finely ground sweet pepper sample (0.4 g) previously oven dried at 60 ° C was incinerated into a muffle furnace at 550 °C for 3 h. The resulting gray-white ash was cooled, added with 2 mL of half-diluted HCl, placed on a sand bath at 120 °C until full evaporation, and then ovened at 105 °C for a 1 h. The final dry extract was recovered with 2 mL of half-diluted HCl, filtered, and the resulting filtrate added with distilled water, and lanthanum chloride. The mineral elements in the solution were then measured using Atomic Absorption Spectrometry (AAS 20 type VARIAN).

*2.2.4. Statistical analysis*

All chemical analyses and essays were performed in triplicate. The data were statistically analyzed using Statistical Program for Social Sciences software (SPSS 22.0, USA). The statistical treatment consisted in a one-way analysis of variance (ANOVA-One way) according to market of perception of the sweet pepper taken as source of variation at 95% significance. Then, the means were compared using Student Newman Keuls post-hoc test.

## 3. Results

### 3.1. Physical properties (Table 1)

For length, sweet peppers from the Sinistré and Soba markets have statistically identical and higher values. On the other hand, sweet peppers from the Koko market have the lowest value (5.8 cm). Regarding the circumference, the sweet peppers from the Soba market have the highest value (15.03 cm), while the sweet peppers from the Sinistré and Koko markets have the lowest values which are not significantly different. The weight of the sweet peppers in the Soba market is the highest (42.65 g) and the weights of the Sinistré and Koko markets are lower with no significant difference. The highest moisture content is determined for sweet peppers from the Sinistré market (91.80 %) while sweet peppers from the Soba market have the lowest moisture content (91.19 %). Sweet peppers from the Sinistré market have the lowest ash content (0.49 %), unlike sweet peppers from the Soba market have the highest content (0.61 %).

**Table 1** Physical properties

| Parameters | Sinistré Market | Soba Market | Koko Market | P value |
|---|---|---|---|---|
| Length (cm) | 6.70±0.15b | 6.93±0.44b | 5.8±0.23a | 0.008 |
| Circumference (cm) | 14.21±0.09a | 15.03±0.1b | 14.28±0.46a | 0.02 |
| Mass (g) | 35.90±2.23a | 42.65±1.36b | 34.28±1.9a | 0.03 |
| Moisture (%) | 91.80±0.04c | 91.19±0.04a | 91.43±0.09b | 0.000 |
| Ashes (%) | 0.49±0.006a | 0.61±0.02c | 0.56b | 0.000 |

Per raw, values with various lower scripts are different at 5% significance. P-value, statistical value of the probability test.

### 3.2. Biochemical properties (Table 2)

The sweet peppers from the Soba market have the highest pH (5.54) and the sweet peppers from the Sinistré market have the lowest pH (5.42). The titratable acidity of sweet peppers from the three (3) markets is not significantly different with an overall average of 2.92 mEq / 100 g). For the content of reducing sugars, sweet peppers from the Koko market have the highest value (254.57 mg / 100 g) while sweet peppers from the Soba market have the lowest value (177.45 mg / 100 g). The total sugar content is higher in sweet peppers from the Sinistré and Koko markets and it is not significantly different, while it is lower in sweet peppers from the Soba market (3.42 %). The lipid content is not significantly different at the 5 % threshold in sweet peppers from the three (3) markets with an overall average of 0.36 %.

The highest protein content is determined for sweet peppers from the Koko market (1%) while sweet peppers from the Sinistré market have the lowest content (0.73%). The sweet peppers from the Sinistré and Koko markets have fiber contents which are not significantly different but they are minimal; conversely, the sweet peppers from the Soba market have the highest fiber content (3 %). For total carbohydrates, sweet peppers from the Soba market have the highest content (6.93 %) while sweet peppers from the Sinistré and Koko markets have the lowest levels which are not significantly different. The highest energy value is determined for sweet peppers from the Soba market (34.7 Kcal / 100 g) and the minimum value is determined for sweet peppers from the Sinistré market (32.64 Kcal / 100 g).

**Table 2** Biochemical properties

| Parameters | Sinistré Market | Soba Market | Koko Market | General average | Pvalue |
|---|---|---|---|---|---|
| pH | 5.42±0.02a | 5.54±0.03c | 5.48±0.006b | | 0.002 |
| Acidity (mEq/100g) | 3.17±0.29a | 2.67±0.29a | 2.92±0.14a | 2.92 | 0.125 |
| Reducing sugars (mg/100g) | 221.75±1.59b | 177.45±2.11a | 254.57±0.94c | | 0.000 |
| Total sugars (%w/w) | 4.09±0.02b | 3.42±0.14a | 4.29±0.13b | | 0.000 |
| Lipids (%w/w) | 0.36±0.02a | 0.38±0.02a | 0.35±0.01a | 0.36 | 0.206 |
| Proteins (%w/w) | 0.73±0.08a | 0.89±0.14ab | 1±0.06b | | 0.047 |
| Total fibers (%w/w) | 2.03±0.05a | 3b | 2.27±0.25a | | 0.000 |
| Total carbohydrates (%w/w) | 6.62±0.059a | 6.93±0.15b | 6.66±0.1a | | 0.028 |
| Energy value (Kcal/100g) | 32.64±0.006a | 34.7±0.12c | 33.79±0.27b | | 0.000 |

Per raw, values with various lower scripts are different at 5% significance. P-value, statistical value of the probability test.

### 3.3. Antioxidant composition (table 3)

For the vitamin C content, the lowest is expressed by sweet peppers from the Koko market (26.67 mg / 100 g) and the highest by sweet peppers from the Sinistré market (51.25 mg / 100 g). The highest polyphenol contents were observed in sweet peppers from the Sinistré and Koko markets; these contents are not significantly different at the 5% level. Conversely, the lowest content was observed in sweet peppers from the Soba market (116.16 mg / 100 g). Sweet peppers from the Koko market have the highest flavonoid content (4.43 mg / 100 g) while the lowest content is found in sweet peppers from the Sinistré Market (1.97 mg / 100 g). Regarding tannins, sweet peppers from the Soba market have the highest content (19.12 mg / 100 g) while sweet peppers from the Sinistré market have the lowest content (14.74 mg / 100 g).

**Table 3** Antioxidant composition

| Parameters | Sinistré Market | Soba Market | Koko Market | Pvalue |
|---|---|---|---|---|
| Vitamin C (mg/100g) | 51.25c | 46.25±1.25b | 26.67±0.72a | 0.000 |
| Polyphenols (mg/100g) | 130.30±1.13b | 116.16±0.81a | 131.28±0.7b | 0.000 |
| Flavonoids (mg/100g) | 1.97±0.01a | 2.45±0.09b | 4.43±0.26c | 0.000 |
| Tannins (mg/100g) | 14.74±0.21a | 19.12±0.15c | 16.97±0.26b | 0.000 |

Per raw, values with various lower scripts are different at 5% significance. P-value, statistical value of bthe probability test.

### 3.4. Anti-nutrient composition (table 4)

Sweet peppers from the Sinistré and Koko markets have the highest content of oxalates, these levels are not statistically different. The sweet peppers from the Soba market have the lowest content (363 mg / 100g). Sweet peppers from the Sinistré market express the lowest phytate value (20.08 mg / 100g) while sweet peppers from the Soba and Koko markets have the lowest phytate values without significant difference.

**Table 4** Anti-nutriment composition

| Parameters | Sinistré Market | Soba Market | Koko Market | Pvalue |
|---|---|---|---|---|
| Oxalates (mg/100g) | 381.33±6.35b | 363a | 388.67±6.35b | 0.002 |
| Phytates (mg/100g) | 20.08±0.35a | 22.13±0.66b | 22.20b | 0.003 |

Per raw, values with various lower scripts are different at 5% significance. P-value, statistical value of bthe probability test.

### 3.5. Mineral content of sweet pepper (table 5)

There is no significant difference between the phosphorus contents of the three markets with a general average of 0.14 % D.M. The sweet peppers from the Soba market have the highest potassium content (0.37 % D.M) and the sweet peppers from the Koko market have the lowest content (0.33% D.M). Regarding calcium, it is the sweet peppers from the Soba market that have the highest content (0.31 % D.M) and the sweet peppers from the Sinistré and Koko markets have the minimum content without significant difference (0.30 % M.S). As for the magnesium content, the highest content is expressed by peppers from the Koko market (0.174 % D.M) while the lowest content is expressed by sweet peppers from the Sinistré market (0.167 % D.M). For copper, sweet peppers from the Koko market have the highest content (3.80 ppm) while sweet peppers from the Sinistré market have the lowest content (2.76 ppm).

Iron is present in greater quantity in the sweet peppers of the Soba market (7.92 ppm) and in smaller quantities in the sweet peppers of the Koko market (7.5 ppm). The manganese content is maximum in sweet peppers from the Sinistré market (0.69 ppm) and minimum for sweet peppers from the Soba market (0.59 ppm). The zinc content is higher in sweet peppers from the Sinistré and Soba markets without significant difference (16.34 ppm) and lower in peppers from the Koko market (16.24 ppm). For sodium, the highest content is expressed by sweet peppers from the Koko market (20.15 ppm) while sweet peppers from the Sinistré market have the lowest content (6.46 ppm).

**Table 5** Mineral content of Sweet pepper

| Parameters | Sinistré Market | Soba Market | Koko Market | General average | P value |
|---|---|---|---|---|---|
| Phosphorus (% D.M) | 0.15±0.01a | 0.14±0.006a | 0.14±0.008a | 0.14 | 0.111 |
| Potassium (% D.M) | 0.35±0.001b | 0.37±0.001c | 0.33±0.001a | | 0.000 |
| Calcium (% D.M) | 0.30±0.0006a | 0.31±0.0006b | 0.30±0.0006a | | 0.000 |
| Magnesium (% D.M) | 0.167a | 0.170±0.006b | 0.174±0.0006c | | 0.000 |
| Copper (ppm) | 2.76±0.01a | 3.36±0.006b | 3.80±0.006c | | 0.000 |
| Iron (ppm) | 7.71±0.006b | 7.92±0.006c | 7.5±0.01a | | 0.000 |
| Manganese (ppm) | 0.69±0.006c | 0.59±0.01a | 0.62±0.006b | | 0.000 |
| Zinc (ppm) | 16.34±0.006b | 16.34b | 16.24±0.01a | | 0.000 |
| Sodium (ppm) | 6.46±0.006a | 10.86±0.01b | 20.15±0.006c | | 0.000 |

Per raw, values with various lower scripts are different at 5% significance. P-value, statistical value of bthe probability test.

## 4. Discussion

The moisture percentage of sweet peppers (91.19-91.80 %) is close to the moisture of the varieties V1310 (90.44 %) and V1325 (90.34 %) of onion (Allium cepa L.) revealed by M. Konaté et al in 2017 [19]. The very high water content of sweet peppers is a parameter which reflects its high perishability [20] and limits its storage at ambient temperature. The pH of the sweet pepper (5.42-5.54) is higher than the pH (4.17) of the local tomato variety Gbogan in Benin studied by Dossou et al, in 2007 [21]. Coliforms of the Escherchia coli type can develop on sweet peppers since the minimum pH required for the development of such microorganisms is 4.3 according to Rozier et al, 1985 [22].

The lipid content of sweet pepper (0.36%) is lower than the lipid content given by Okouango et al. (2015) [23] for the leaves of Phytolaccado dodecandra or wild spinach (1.6 %). The protein content of sweet peppers (0.73-1%) is lower than that of butter beans (1.8 %) given by Ciqual, 2021 [24].

The total carbohydrate content (6.62- 6.93%) is lower compared to the 18.9 % carbohydrates values of potato [25]. Ultimately, the Sweet pepper contains macromolecules (carbohydrates, lipids, proteins) essential for life, albeit in small quantities. It could be recommended for persons against gain of weight.The fiber content of sweet pepper (2.03-3 %) is close to that of eggplant Solanum aethiopicum anguivi (2.43-3.31 %) reported by Niamke et al, in 2018 [26].

Sweet pepper may be a significant source of dietary fiber that is removed more slowly from the stomach and improves bowel movement. These dietary fibers are absolutely essential to the balance of the digestive tract and that of the body. They represent a factor of good health. Studies have shown an inverse correlation between dietary fiber consumption and colon cancer. Indeed, fibers have the capacity to complex with carcinogenic molecules, thus preventing their contact with the colon and facilitating their excretion [27, 28]. They play a protective role against constipation and also against colorectal cancer. Consumption of sweet pepper may therefore increase gastric volume and constitute a post-ingestive state to reach a state of satiety more quickly [28, 29]. The vitamin C content of sweet peppers (26.67-51.25 mg / 100 g) is close to that of raw pineapple pulp (46.1 mg / 100 g) (Ciqual, 2021) [24]. Vitamin C is involved in major body functions: defense against viral and bacterial infections, protection of the blood vessel wall, iron assimilation, antioxidant action (capture of free radicals), healing. Vitamin C also promotes the absorption of iron. [30]. The contents of flavonoids (1.97-4.43 mg / 100 g) and polyphenols (116.16-131.28 mg / 100 g) in sweet pepper are interesting. Flavonoids can neutralize free radicals and reduce the risk of cancer by stopping cell growth in tumors [31].

Polyphenols are credited with many health benefits, such as reduction of risks of cardiovascular, inflammatory or neurodegenerative diseases, cancer prevention, antiplatelet effects, blood pressure regulation, etc [32]. Sweet peppers contain anti-nutritional compounds: Oxalates (363-388.67 mg / 100 g) and phytates (20.08-22.20 mg / 100 g). These compounds alter the digestibility of nutrients (antiproteases), they are also chelators which decrease the bioavailability of minerals [33]. On the other hand, food preparation methods, particularly cooking or heat treatment, are the most effective way to inactivate them [34]. The study showed that sweet pepper contains numerous minerals. Generally, the markets investigated display different mineral values. Thus, the usual availability of sweet pepper along seasons on markets in rural areas is favorable for its consumption in various diets for populations. In fact, a diet richer in calcium and phosphorous is a beneficial in the prevention of osteoporosis and also the reduction in the risks of hypertension and prostate [35]. The mineral potassium increases the cardiovascular well-being, while the magnesium is recommended for the prevention of many concerns involving myocardial infarction [36].

## 5. Conclusion

This study has shown that the sweet peppers cultivated in Korhogo, in the North of Côte d'Ivoire contain macronutrients (lipids, proteins, carbohydrates), fibers, antioxidants and minerals that put in evidence their nutritional potential which is beneficial for local populations. Anti-nutrients are inactivated by cooking meals.

## Compliance with ethical standards

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### *Disclosure of conflict of interest*

The authors declare that they have no conflict of interest.

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