Vol. 14(7) pp. 201-208, August 2020
DOI: 10.5897/AJFS2020.1977
Article Number: 53D7E0164583
ISSN: 1996-0794

http://www.academicjournals.org/AJFS

ACADEMIC JOURNALS
expand your knowledge

African Journal of Food Science

Full Length Research Paper

Evaluation of the nutritional and antioxidant potentialities of *Capparis corymbosa*

Edwige N. ROAMBA, Crépin I. DIBALA*, Marcel D. BENGALY, Mamounata DIAO, Kiessoun KONATE and Mamoudou H. DICKO

Laboratory of Biochemistry, Biotechnology, Food Technology and Nutrition (LABIOTAN), University of Joseph Ki-Zerbo, 09 P. O. Box: 848, Ouagadougou 03, Burkina Faso.

Received 1 June, 2020; Accepted 13 July, 2020

The study was undertaken with the objective of contributing to the search for new sources of dietary antioxidants. It aimed to assess the dietary potential, bioactive compound levels and antioxidant activities of the leaves and fruits of *Capparis corymbosa*, a plant food from Burkina Faso. Standard methods were used to assess the nutritional potential of leaves and fruits as well as the levels of bioactive compounds and antioxidant activities of leaf and fruit fractions. Levels of total sugar were 765.40 ± 134.67 mg/100 g for leaves and 2208.65 ± 194.55 mg/100 g for fruits. Protein levels were 22.722 ± 0.95 mg/100 g for leaves and 13.442 ± 0.91 mg/100 g for fruits. Both organs also had interesting contents of minerals and essential amino acids. Total phenolic levels ranged from 18.36 ± 0.90 g GAE/100 g to 16.46 ± 1.15 g GAE/100 g for leaves and from 4.58 ± 0.15 g GAE/100 g to 1.03 ± 0.31 g GAE/100 g for fruits while those of flavonoids ranged from 2.83 ± 0.23 g EQ/100 g to 2.08 ± 0.25 g EQ/100 g and from 1.78 ± 0.25 g EQ/100 g to 0.93 ± 0.41 mg EQ/100 mg, respectively for leaves and fruits. The butanol extraction fractions had the highest levels of polyphenols of both organs. Monitoring antioxidant activities using DPPH, FRAP and ABTS models showed that leaves and fruits displayed high antioxidant activities but leaves had higher antioxidant activities than the fruits. Antioxidant activity was correlated with total phenolic levels. These results reveal that *C. corymbosa* is an important source of phytonutrients, bioactive compounds and has good antioxidant activity and is therefore an alternative for the fight against diseases linked to oxidative stress and as a food supplement.

Key words: *Capparis corymbosa*, micronutrients, macronutrients, antioxidant activity, oxidative stress.

INTRODUCTION

In Burkina Faso, *Capparis corymbosa* (Capparidaceae) is a plant with great nutritional importance. The species is used as a dietary supplement, gathering or as a food supplement (Ayessou et al., 2018). In addition, many health benefits such as child care (colic and general tiredness) related to the consumption of *C. corymbosa* leaves and fruits have been reported (Busson, 1965; Zerbo et al., 2007). This species is used as a dietary

*Corresponding author. E-mail: dibalacrepin@gmail.com. Tel: 0022670141596.

supplement in children and type-II diabetic patients (Busson, 1965). Leaf extracts are suggested to be effective against kidney disease, biliary inflammation, rheumatism, etc., and good antioxidants (Zerbo et al., 2007). These different properties of the plant are certainly linked to its chemical composition. Indeed, Nacoulma (1996) and Sereme et al. (2001) reported that the richness of plants in secondary metabolites (tannins, flavonoids, saponosides) and active ingredients would be at the origin of their different properties. Despite all this high potential, little data exist on the phytochemistry, nutritional and antioxidant potential of *C. corymbosa*. Knowledge on antioxidant activities of the plant tissues could allow a better food valorization of the species.

The metabolism of aerobic organisms generates reactive oxygen species (ROS). The main ROS are hydroxyl radical, superoxide radical, and hydrogen peroxide. These ROS can also be generated by exposure to certain exogenous factors such as ionizing radiation, certain drugs, environmental pollutants and some synthetic food additives. ROS impair cellular function, particularly in the inflammatory process, phagocytosis and cellular signal transduction (Garait, 2006). The consequences of chronic exposure to high ROS levels are generally undesirable for the cells. The studies have reported that the accumulation of free radicals is the fundamental root cause of many age-related diseases (tumor proliferation, cataract, pulmonary edema) and affects several organs (muscles, heart, blood vessels, skin, etc). ROS are also factoring which potentiate the development of multifactorial conditions such as degenerative diseases (Parkinson's, Alzheimer's), type-II diabetes, osteoarthritis phenomena, cardiovascular disease, etc (Favier, 2003).

Fortunately, fruits and vegetables are a good source of dietary antioxidants (Valko et al., 2006). Well known natural antioxidants include phenolic compounds, glutathione, nicotinamides, ubiquinone (coenzyme Q_{10}), vitamins (C, E, A and K) and some enzymes (copper, zinc and manganese-dependent superoxide dismutase, catalase, selenium-dependent glutathione peroxidase, etc). Plants (leaves and fruits) are sources of phenolic compounds, vitamins, trace elements and especially beneficial natural antioxidants. Epidemiological studies have shown a positive correlation between the consumption of foods rich in polyphenols and lower risk of developing diseases like age-related neurodegenerative diseases (Mohamed and Darbar, 2010). This is often attributed to the antioxidant potential of phenolic compounds, those containing ortho-dihydro-benzene (catechols) due to their redox properties for eliminating reactive oxygen species or to chelate divalent metals (Atanasova, 2009). In addition, flavonoids and other phenolic compounds may also induce the expression of genes encoding antioxidant enzymes and proteins (superoxide dismutase, glutathione peroxidase, catalase, glutathione, etc). In research perspectives of dietary antioxidants, plant species still underexploited but accessible to rural populations constitute an interesting line of investigation (Garait, 2006).

Therefore, an investigation was conducted on the chemical composition and bioactivities of *C. corymbosa* leaves and fruits.

MATERIALS AND METHODS

Plant

Biological material consisted of leaves and ripe fruits of *C. corymbosa*. Sample collection was conducted during the months of June and July 2018 in the city park Bangréweogo (Ouagadougou). The species has been identified in plant biology laboratory of the University Joseph Ki-Zerbo. The leaves and fruits were dried by ventilation at room temperature (20-25°C) and ground into flour in a microanalytical mill to pass a screen of 0.5 mm. Milling was done at 4°C, and was performed carefully to avoid overheating. The flours were stored at -20°C prior to analysis to prevent endogenous enzymatic or nonenzymatic reactions, after the powders were subjected to different extraction solvents.

Preparation of extracts

Fifty grams (50 g) of powdered plant material as described earlier were extracted with 80% aqueous ethanol (500 ml) in ratio 1/10 (w/v) for 48 h under mechanic agitation (SM 25 shaker, Edmund BÜHLER, Germany) at room temperature (20-22°C). After filtration, ethanol was removed under reduced pressure in a rotary evaporator (BÜCHI, Rotavopor R-200, Switzeland) at approximately 40°C and freeze-dried with Telstar Cryodos 50 freeze-dryer. These ones were filtered and freeze-dried. The extract residues were weighed before packed in waterproof plastic flasks and stored at 4°C until use. The yields of different crude extract were calculated and expressed as grams of extract residues/100 g of dried plant materials.

Fractionation

The aqueous extracts were subjected to sequential liquid-liquid extraction with petroleum ether, dichloromethane, ethyl acetate and n-butanol. Each fraction was then collected and concentrated to dryness under reduced pressure to obtain hexan fraction, dichloromethane fraction, ethyl acetate fraction and n-butanol fraction. The fractions were freeze-dried. The fraction residues were packed in waterproof plastic flasks and stored at 4°C until use.

Determination of carbohydrate content

500 mg of sample were homogenized in 5 ml of 80% hot ethanol. After cooling, the homogenate was centrifuged at 4000 rpm for 10 min. The supernatant was used to estimate the soluble sugar content of fresh leaves. The soluble sugar content was determined using the phenol-sulfuric acid method as described by Dubois et al. (1965) and the absorbance was red at 490 nm. The total sugar content was expressed as µg glucose equivalent/100 gram of sample (µg GE/ 100 g of sample).

Determination of total protein

For proteins extraction, 500 mg of powder of leaves or fruits were

homogenized in 5 ml of 0.1 M NaCl for 5 h at 150 rpm/min at room temperature. The samples were centrifuged at 10000 g during 30 min and the supernatant were collected to determine the protein content. The estimation of water-soluble protein content was performed according to the assay method of Bradford (1976). A volume of 50 µL of sample is added to 250 µL of Bradford reagent (Coomassie Brillant Blue G250). The reading is made using a spectrometer at 595 nm against a blank consisting of 50 µL of sample and 250 µL of buffer solution. BSA served as the standard for the preparation of the calibration curve (0-250 µg/mL (y = 0.0537x + 0.6136; R^2 = 0.9997). Results were expressed in mg per 100 mg of sample.

Determination of minerals and oligo-elements content

The minerals and oligo-elements determination were carried out according to a classical method (Norme international ISO 2171, 2007). A mass of 3 g of the sample was introduced into crucibles before being calcined at 550°C in the muffle furnace for 24 h. The ash obtained was recovered in beakers and dissolved in 5 ml of concentrated hydrochloric acid, add 3 drops of hydrogen peroxide (H_2O_2). The whole was transferred to 100 mL volumetric flasks and made up to the mark with distilled water. Centrifugation was then carried out and the supernatant was recovered in sterile sampling tubes for spectrometric reading. The reading was taken with a Flame Atomic Absorption Spectrophotometer connected to a computer. The analyses permitted the determination of minerals such as calcium, magnesium, potassium and zinc.

Determination of amino acid content

The determination of amino acids was carried out by the PICO-TAG method (Thordser, 2011). For the determination of the complete amino acid profile, 500 mg sample was weighed and placed in a 20 mL volumetric flask. The volumetric flask is filled up to the mark with 0.1 M hydrochloric acid. Approximately 1 mL of the diluted sample is filtered through the 0.45 µm filters and then derivatized with phenylisothiocyanate (PITC) to produce the amino acids phenylthiocarbamyl (PTC). The derivatized sample were added 200 µl of PICO-TAG dilution solution (0.38 µg/µL), the amino acid derivatives were then separated by HPLC (2.3 µg sample/µL and detected by absorption spectrophotometry at values as low as 1 pmol using a wavelength at 254 nm.

Total phenolic content

Total polyphenols were determined by Folin-Ciocalteu method (Lamien-Meda et al., 2008). Aliquots (125 µL) of solution from extract or each fraction in methanol (10 mg/mL) were mixed with 62.5 µl Folin-Ciocalteu reagent (0.2 N). After 5 min, 500 µL of aqueous Na_2CO_3 (75 g/L) were added and the mixture was vortexed. After 2 h of incubation in the dark at room temperature, the absorbencies were measured at 760 nm against a blank (0.5 ml Folin-Ciocalteu reagent + 1 ml Na_2CO_3) on a UV/visible light spectrophotometer (CECIL CE 2041, CECIL Instruments, England). The experiments were carried out in triplicate. A standard calibration curve was plotted using gallic acid (Y= 0.0289x - 0.0036; R^2 = 0.9998). The results were expressed as g of gallic acid equivalents (GAE)/100 g of extract or fractions.

Determination of flavonoid content

The total flavonoids were estimated according to the Dowd method, slightly modified (Hinnebourg et al., 2006). To an aliquot of 0.5 ml of methanol/$AlCl_3$ (2%, w/v) were mixed 0.5 ml of extract or each fraction solution (0.1 mg/mL). After 10 min, the absorbencies were measured at 415 nm against a blank (mixture of 0.5 ml extract solutions and 0.5 mL methanol) on a UV/visible spectrophotometer (CECIL CE 2041, CECIL Instruments, England) and compared to a quercetin calibration curve (Y= 0.0289x-0.0036; R^2 = 0.9998). The data obtained were the means of three determinations. The amounts of flavonoids in plant extracts were expressed as g of quercetin equivalents (QE)/100 g of extract or fractions.

Determination of *in* vitro antioxidant activity

DPPH radical method

Radical scavenging activity of extract or each fraction against stable DPPH (2, 2'-diphenyl-1-picrylhydrazyl, Fluka) was determined with a UV/visible spectrophotometer (CECIL CE 2041, CECIL Instruments, England) at 517 nm as described by Hinnebourg et al., (2006). Extract solutions were prepared by dissolving 10 mg of dry extract in 10 mL of methanol. The samples were homogenized in an ultrasonic bath. Afterwards, 0.5 mL of aliquots which were prepared at different concentrations from each sample of extract were mixed with 1 mL of methanolic DPPH solution (20 mg/mL). After 15 min of incubation in the dark at room temperature, the decrease in absorption was red. All experiments were performed in triplicate and expressed in mmol of ascorbic acid equivalent per mass of extract or fraction.

ABTS radical cation decolorization assay

For the assay (Hinnebourg et al., 2006), ABTS was dissolved in water to a 7 mM concentration. ABTS radical cation ($ABTS^{\cdot+}$) was produced by reacting ABTS with 2.45 mM potassium persulfate (final concentration) and allowing the mixture to stand in the dark at room temperature for 12 h before use. This mixture was diluted with ethanol to give an absorbance of 0.7 ± 0.02 at 734 nm using a UV/visible spectrophotometer (CECIL CE 2041, CECIL Instruments, England). Afterwards, 10 µL of the diluted sample (1 mg/mL^{-1} in methanol) which was allowed to react with 990 µl of fresh $ABTS^{\cdot+}$ solution and the absorbance was taken 6 min exactly after initial mixing. Ascorbic acid was used as standard. Quercetin was used as positive control.

Ferric reducing antioxidant power (FRAP) assay

The FRAP assay was performed as previously described (Velazquez et al., 2003). To an aliquot of 0.5 mL of extract or each fraction (1 mg mL^{-1}) was mixed with 1.25 mL of phosphate buffer (0.2 M, pH 6.6) and 1.25 mL of aqueous potassium hexacyanoferrate [$K_3Fe(CN)_6$] solution (1%). After 30 min of incubation at 50°C, 1.25 mL of trichloroacetic acid (10%) was added and the mixture was centrifuged at 2000 × g for 10 min. Then, the upper layer solution (0.625 mL) was mixed with distilled water (0.625 mL) and a freshly prepared $FeCl_3$ solution (0.125 mL, 0.1%). Absorbances were red at 700 nm on a UV/visible spectrophotometer (CECIL CE 2041, CECIL Instruments, England) and ascorbic acid was used to produce the calibration curve (Y= 0.008x-0.0081; R^2 = 0.9999). The iron (III) reducing activity determination was performed in triplicate and expressed in mmol Ascorbic Acid Equivalent per g of extract or fractions. Trolox, a reference compound was used as positive control.

Statistical analysis

The analysis of variance (ANOVA) was performed using XL-STAT

Table 1. Content of carbohydrates and total proteins.

Capparis corymbosa	Carbohydrates (mg/100 g)	Total proteins (mg/100 g)
Leaves	765.41 ± 134.67[b]	22.72 ± 0.95[a]
Fruits	2304.14 ± 194.54[a]	13.44 ± 0.91[b]

The results shown in the previous figure by different letters are statistically distinct (p<0.0001).

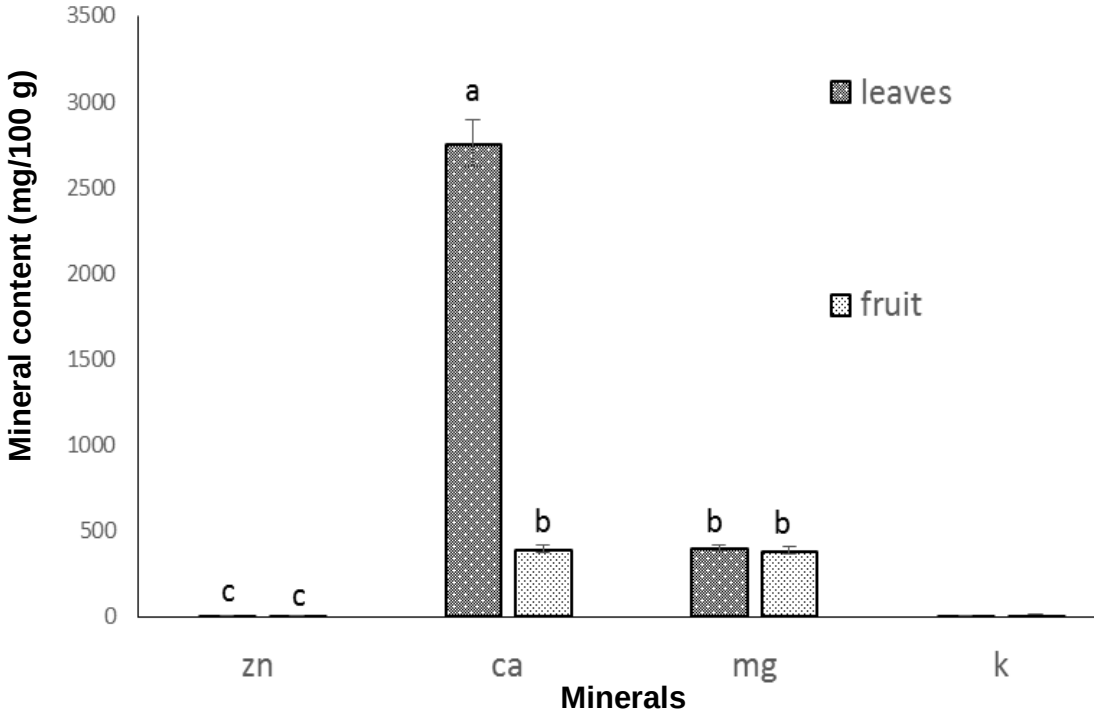

Figure 1. Mineral content of the leaves and fruit. Zn: Zinc, Ca: Calcium; Mg: Magnesium; K: Potassium.

2016 software to determine the variability of the parameters studied. Tukey's test at the 5% threshold was performed for means comparison.

RESULTS

Carbohydrates and protein content

The carbohydrates were determined using glucose as standard. Table 1 presents the carbohydrate and total protein contents expressed, respectively in mg GE/100 g fruit extract and mg GE/100 g leaf or fruit extract. The different contents varied significantly depending on the organs. Thus, in terms of total sugars, the fruits presented the best value (2304.144 mg GE/100 g) while in terms of total protein, the leaves presented the best content (22.722 ± 0.95 mg GE/100 g). The lowest values for total sugars (765.405 ± 19.54 mg GE/100 g) and protein (13.442 ± 0.91 mg GE/100 g) were recorded for leaves and fruit, respectively.

Mineral content of leaves and fruit

The mineral contents (Zn, Ca, Mg and K) expressed in mg/100 g of leaf and fruit powder are as shown in Figure 1. The mineral contents (Zn, Ca, Mg and K) expressed in mg/100 g of leaf and fruit powder are as shown in Figure 1. The results (Figure 1a and b) showed on one hand significant differences between the contents as a function of the minerals and on the other hand as a function of the organs. Calcium had the highest content while Zn and K had the lowest mineral content. In addition, the leaves had the highest Ca content compared to the fruit, which had the highest K content. No significant difference was recorded between the Zn and Mg contents of the leaf and fruit extracts.

Amino acid composition of leaves

The quantification of amino acids was limited to leaf samples only; fruits were not included in this analysis.

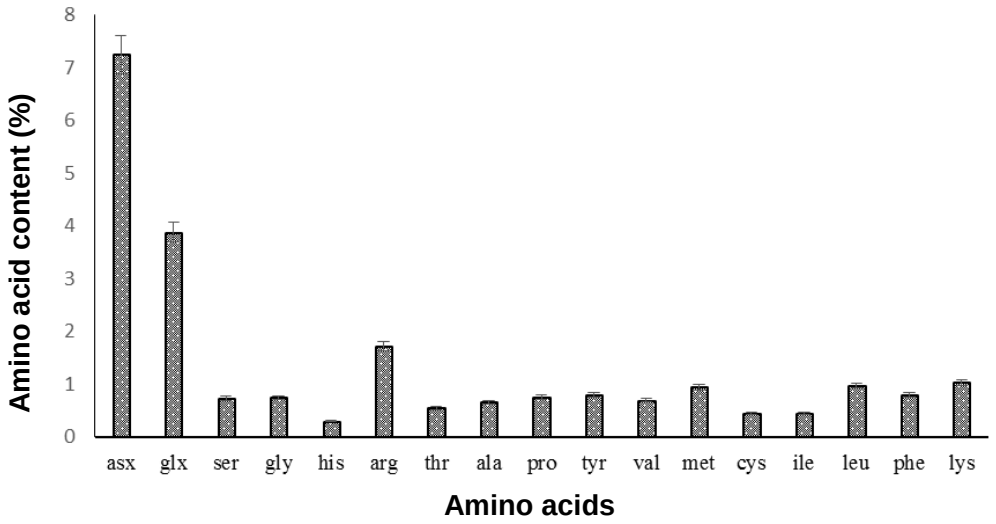

Figure 2. The amino acid composition of leaves *Capparis corymbosa*.

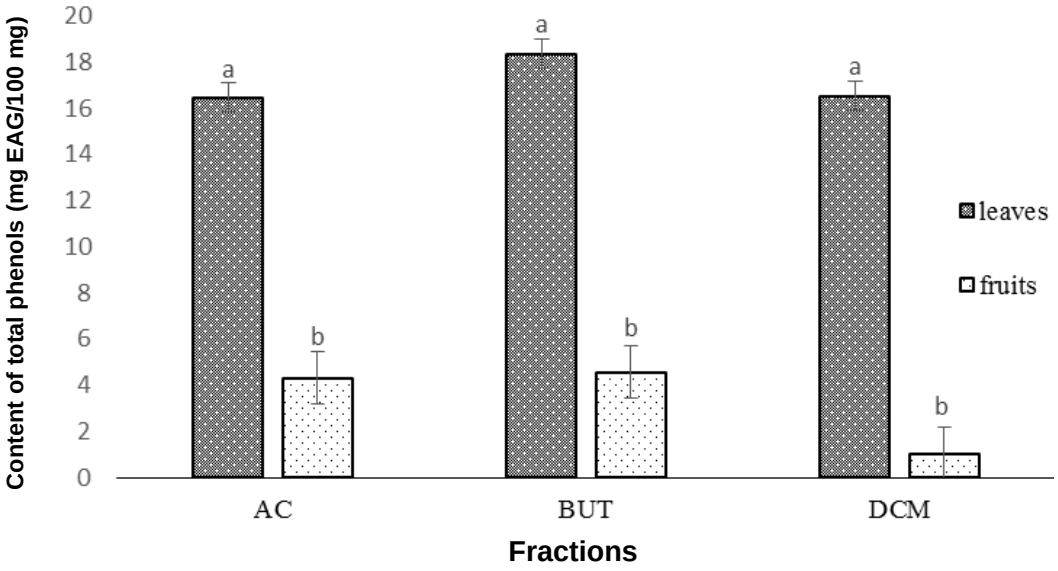

Figure 3. Contents of total phenols. The results shown in the previous figure by different letters are statistically distinct ($p<0.0001$). AC: Ethyl Acetate fraction; BUT: butanolic fraction; DCM: dichloromethane fraction.

Amino acid levels in the leaves are as shown in Figure 2. The analyses detected and quantified 17 amino acids with levels ranging from 0.30 to 7.24%. The highest content was recorded by aspartic acid (7.24%) followed by glutamic acid (3.87%), arginine (1.71%), lysine (1.02%) while the lowest content was observed in histidine (0.29%). The high levels of glutamic acid and aspartic acid could be explained by the conversion of glutamine and aspartate into their respective acids during the derivation process. In addition, apart from Tryptophan, all essential amino acids were detected and quantified in the leaves of *Capparis spinosa*. Their contents ranged from 0.43% for Isoleucine to 1.02% for Lysine.

Total phenolics and flavonoids contents of leaves and fruits

The total phenolic contents of the fractions of the different organs (leaves and fruits) expressed in g AG/ 100 g fraction are as shown in Figure 3. The total phenolic

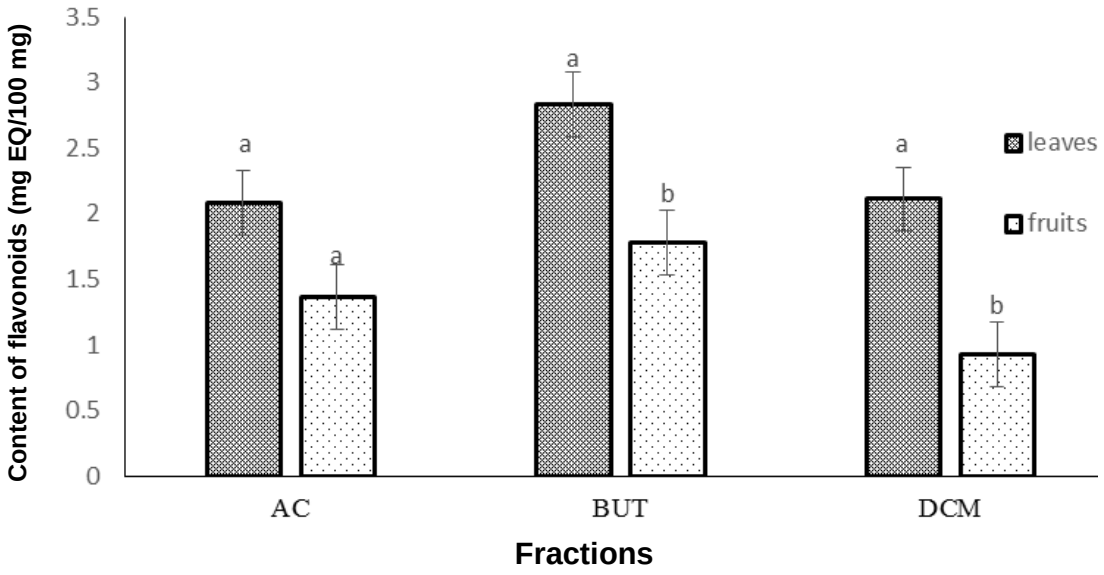

Figure 4. The total flavonoid content. The results shown in the previous figure by different letters are statistically distinct ($p<0.0001$). AC: Ethyl Acetate fraction; BUT: butanolic fraction; DCM: dichloromethane fraction.

contents varied significantly by organ and also by fraction. In general, the different leaf fractions showed higher levels than the fruit fractions. The butanolic fraction had the highest content of phenolic compounds (181.962 ± 3.62 g EAG/100 g for the leaf fraction and 96.947 ± 2.57 g EAG/100 g for the fruit fraction) while the lowest value was recorded in the DCM fraction. (165.316 ± 2.76 g EAG/100 g for the leaf fraction and 37.414 ± 5.28 g EAG/100 g for the fruit fraction).

The total flavonoid content expressed in mg EQ/100 mg of fraction of different fractions of leaves and fruits are as shown in Figure 4. The results show that the total flavonoid content of the leaves and fruit varied significantly in organ function and fractions. The butanol fraction of the leaves (2.83 ± 0.23 g EQ/100 g fraction) presented the best flavonoid content while the lowest concentration was recorded at the fraction DCM fruit (0.93 ± 0.41 g EQ/100 g fraction). In addition, the contents of total flavonoids in leaves were relatively higher than those fruit for all fractions.

Antioxidant activities

In the body, various types of oxidation occur and result in the accumulation of free radicals in the body. Also, the diversity and specificity of antioxidants (radical scavengers, electron donor or hydrogen) necessitate the evaluation of the antioxidant activity by various methods. Thus, three methods (DPPH, FRAP and ABTS) were used to evaluate the antiradical activity of the various fractions. The antioxidant activity of the different fractions is shown in Table 2. Except for the FRAP method, the variation of the various antioxidant activities is not a function of the organ. At the anti-radical activity DPPH (mg EAA/g) while the lowest activity was observed with the DCM fraction (9.54 ± 0.33 mg EAA/g) leaves. At the reducing power of the ABTS radical cation^{+}, the best activity has been recorded with the fraction of the butanol fraction (17.03 ± 0.03 mg EAA/g) fruit while the lowest activity was observed with the DCM fraction (8.01 ± 0.56 mg EAA/g) of the body. For the reduction of Fe^{3+}, the acetate fraction (0.48 ± 0.19 mg EAA/g) of the sheets presented the lowest activity whereas the highest activity with the butanol fraction (1.73 ± 0.18 mg EAA/g) leaves.

The Pearson correlation matrix between the amounts of phenolic compounds, flavonoids and antioxidant activities of the three methods is shown in Table 3. The results showed that the levels of phenolic compounds are negatively correlated respectively to levels of flavonoids ($r = -0.642$) and positively to iron reducer FRAP ($r = 0.643$). In addition, the flavonoid content is negatively and significantly ($r = -0.528$) correlated with iron reducing power while anti-radical activities determined by DPPH and ABTS methods are strongly ($r = 0.811$) correlated positively with each other.

DISCUSSION

This study focused on the evaluation of the nutritional and antioxidant potential of the leaves and fruits of *C. corymbosa*, a food plant of Burkina Faso flora. The study revealed protein and carbohydrate contents ranging from 13.44 to 22.72 mg/100 g and 765 to 20304.144 mg/100 g, respectively. The levels of total phenolics and

Table 2. Comparative table of different methods for antioxidant activity**.**

Capparis corymbosa	Fractions	DPPH	ABTS	FRAP
Leaves	Acetate fraction	11.03 ± 0.19[b]	8.92 ± 0.77[b]	0.48 ± 0.19[b]
	Butanolic fraction	12.28 ± 0.19[a]	16.90 ± 0.12[a]	0.64 ± 0.25[b]
	DCM fraction	9.54 ± 0.33[a]	5.48 ± 0.25[b]	1.07 ± 0.02
Fruits	Acetate fraction	11.55 ± 0.22[a]	14.95 ± 0.35[a]	0.90 ± 0.14[a]
	Butanolic fraction	10.94 ± 0.66[b]	17.03 ± 0.03[a]	1.73 ± 0.18[a]
	DCM fraction	10.52 ± 0.71[a]	8.01 ± 0.56[a]	3.07 ± 0.09[a]

DCM: Dichloromethane. The results shown in the previous figure by different letters are statistically distinct ($p<0.0001$).

Table 3. Pearson correlation matrix (fruit and leaves).

Variable	Polyphenols	Flavonoids	DPPH	ABTS	FRAP
Total phenol	1				
Flavonoids	-0,642	1			
DPPH	0,039	0,267	1		
ABTS	0,419	0,130	0,811	1	
FRAP	0,643	-0,528	-0,362	-0,218	1

The values in bold are different to 0 at a level of significance alpha = 0.05.

flavonoids ranged from 37.414 ± 5.28 to 181.962 g EAG/100 g and 0.93 ± 0.41 to 2.83 g EQ/100 g for total phenolics and flavonoids, respectively. Compared to the values reported on cowpea and *Moringa oleifera*, two plants with a recognized high nutritional potential, *C. corymbosa* appears to be a good source of nutrients, especially proteins and carbohydrates. Indeed, Sombie et al. (2019) reported protein contents ranging from 25.63 to 5.41 mg/100 g and 111 to 551 mg/100 g of fresh cowpea leaves, respectively. In addition, the results generally showed a significant variation in protein, carbohydrate, total phenolic and flavonoid contents between the leaves and fruits. The leaves had higher levels of protein, total phenolics and flavonoids than the fruits, which had higher levels of carbohydrates compared to the leaves.

It appeared that leaves and fruit of *C. corymbosa* are also a good source of micronutrients, essential amino acids and mineral elements such as calcium, zinc, magnesium and potassium that highlight obviously its nutritional potential. This variation in nutrient concentrations in organ function may be due to various factors including genotype and ecotype orders. The found high macronutrient and micronutrient contents in both leaves and fruits of the plant may justify the use of the species as a food. The particularly high concentrations of lysine, histidine, phenylalanine and methionine pave the way for recovery of the species in the human diet given the important physiological roles of these amino acids in the body. These minerals are also essential for the proper functioning of our body. In fact, they contribute to the structure of bones and teeth and are associated with heart rate, muscle contraction, nerve conduction and in the water balance and acid-base of the body (Stadtman, 1992).

The fractions of leaves and *C. corymbosa* fruit presented some interesting levels of total polyphenols and total flavonoids. The presence of bioactive compounds in interesting amounts in fruits and leaves of *C. corymbosa* could be beneficial to health. Indeed, polyphenols and flavonoids are able to counteract the production of reactive oxygen species by neutrophils and therefore reduce the risk of disease (Manallah, 2012). They may inhibit the enzymes involved in the activation of cancer cells (Crozier et al., 2007). In addition, the leaves of fractions exhibited higher levels of polyphenols and flavonoids both in sheets at the level of fruit. The levels of bioactive compounds in organ function have been reported by many authors. Indeed, many secondary metabolites have a protective role for antioxidant plants against environmental aggressors or those pathogens (Garait, 2006). So they were found often in greater concentrations in the skin of the fruit or the outer leaves of leafy vegetables (Al-Snafi, 2015). This variability in levels of compound interest, variable therefore recommends a diet based on the two bodies to benefit both compounds in the leaves than in fruits.

The different fractions of leaves and *C. corymbosa* fruit showed good antioxidant activities. In addition, our results showed that the antioxidant activity evaluated by the FRAP method was strongly correlated with the

polyphenol content. Similar results have been reported. Indeed, numerous studies have shown that the antioxidant properties of a plant product were strongly correlated with their content of phenolic compounds (Cai et al., 2004). The antioxidant potential of the latter is due ALUES redox properties that allow them to act as reducing agents hydrogen donors or electron and metal chelators (Meziti, 2009). The *Capparis* genus species is rich in phenolic compounds which are responsible for many biological activities including antioxidant activity, anticancer and antimicrobial (Turgut et al., 2015). The promising effect of antioxidants from plant health may result from their protective effect based on their ability to eliminate ROS. Some earlier reports *C. corymbosa* of antioxidant activity are very rare in the literature. Therefore, it is very difficult to compare our results with those of previous studies.

Conclusion

C. corymbosa may be good source of essentials amino-acids and also phenolic compounds that display *in vitro* high antioxidant activities. While leaves are rich in proteins, calcium and magnesium, fruits have high level of carbohydrates and minerals (calcium and magnesium). Additionally, butanol fractions of the two bodies have presented the best levels of total flavonoids and total polyphenols. The study also showed a significant variation in nutrient compounds concentrations in organ function which suggests a simultaneous consumption of both bodies.

ACKNOWLEDGEMENT

The West African Biotechnology Network (RABIOTECH, ISP/IPICS project) is appreciated for supporting publication fees and academic mobilities.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

REFERENCES

Al-Snafi AE (2015). The Chemical Constituents and Pharmacological Effects of *Capparis Spinosa*-an Overview. India Journal of Pharmaceutical Science and Research 5:93-103.

Atanasova M (2009). Revue de Génie Industriel Phénols et flavonoïdes totaux dans les extraits secs des feuilles des bouleaux argentés bulgares (*Betula pendula*). Revue de Génie Industriel 4:21-25.

Ayessou NC, Cissé M, Gueye M, Ndiaye C, Diop CM (2018). Nutritional Potential of Two Leafy Vegetables *Leptadenia hastata* Decne and *Senna obtusifolia* Link Consumed in Senegal. Food and Nutrition Sciences 9:77-85.

Bradford MM (1976). A Rapid and Sensitive Method for the Quantitation of Microgram Quantities of Protein Utilizing the Principle of Protein-Dye Binding. Analytical Biochemistry 72:248-254.

Busson FF (1965). Etude chimique et biologique des végétaux alimentaires de l'Afrique noire de l'Ouest dans leurs rapports avec le milieu géographique. Thèse de Doctorat ès Sciences Naturelles, Université Aix-Marseille, 567p.

Cai Y, Luo Q, Sun M, Corke H (2004). Antioxidant activity phenolic compounds of 112 traditional Chinese medicinal plants associated with anticancer. Life Science 74:2157-2184.

Crozier S, Woimant F (2007). Infarctus cérébral grave: Quelle prise en charge? Acute management of severe is chemic stroke. Réanimation 16:441-451.

Dubois M, Gilles K, Hamilton JK, Rebers PA, Smith F (1965). Colorimetric method for determination of sugars and related substances. Analytical Chemistry 28:350-356.

Favier A (2003). Le stress oxydant : Intérêt conceptuel et expérimental dans la compréhension des mécanismes des maladies et potentiel thérapeutique. L'actualité Chimique, pp. 108-115.

Garait B (2006). Le stress oxydant induit par voie métabolique (régimes alimentaires) ou par voie gazeuse (hyperoxie) et effet de la Glisodin. Thèse de l'Université Joseph Fourier Grenoble I, 5p.

Hinnebourg I, Damien Dorman HJ, Hiltunen R (2006). Antioxidant activities of extracts from selected culinary herbs and spices. Food Chemistry 97(1):122-129.

Lamien-Meda A, Lamien CE, Compaoré MMY, Meda RTN, Kiendrebeogo M, Zeba B, Millogo-Rasolodimby J, Nacoulma OG (2008). Polyphenol content and antioxidant activity of fourteen wild elible fruits from Burkina Faso. Molecules 13:581-594.

Manallah A (2012). Activités antioxydante et anticoagulante des polyphénols de la pulpe d'olive *Olea europaea* L. Mémoire de Magister de l'Université Ferhat Abbas Setif 1:39-45.

Meziti A (2009). Activité antioxydante des extraits des graines de *Nigella sativa* L étude in vitro et in vivo. Mémoire de magister en Biochimie appliquée, Université de El Hadj Lakhdar, Batna, Algeria, 22p.

Mohamed STS, Darbar BS (2010). Red wine: A drink to your heart. Journal of Cardiovascular Disease Research 1(4):171-176.

Nacoulma OG (1996). Plantes médicinales et Pratiques médicales Traditionnelles au Burkina Faso : cas du plateau central/ Tomes I & II. Thèse d'Etat en Biochimie, Université de Ouagadougou (Burkina Faso), 320p et 260 p.

Norme internationale ISO 2171 (2007). Céréales légumineuses et produits dérivés. Dosage du taux de cendres par incinération à 550°C, 6p.

Sereme A, Millogo-Rasolodimby J, Kouda-Bonafos M, Guinko S, Nacro M (2001). Vertus thérapeutiques des Anacardiaceae en liaison avec leurs métabolites et leur richesse en tanins. Annales de Botanique de l'Afrique de l'Ouest, 00(0):63-71.

Sombie PAED, Sama H, Sidibe H, Kiendrébeogo M (2019). Effect of Organic (Jatropha Cake) and NPK Fertilizers on Improving Biochemical Components and Antioxidant Properties of Five Cowpea (Vigna unguiculata L. Walp.) Genotypes. Journal of Agricultural Science 11(10):48-62.

Stadtman ER (1992). Protein oxidation and aging. Science 257:1220-1224.

Thordser KL (2011). Amino acid analysis of savannah tree seeds. Danish Technological Institute 31p.

Turgut NH, Kara H, Arslanbaş E, Mert DG, Tepe B, Güngör H (2015). Effect of *Capparis spinosa* L . on cognitive impairment induced by D-galactose in mice via inhibition of oxidative stress. Journal of Medical Sciences 45:1127-1136.

Valko M, Rhodes CI, Moncol I, Izakovic M, Mazur M (2006). Free radicals, metals and antioxidants in oxidative stress-induced cancer. Chemico-Biological Interactions 160:1-40.

Velazquez E, Tournier HA, Mordujovch de Buschhiazzo P, Saavedra G, Schinella GR (2003). Antioxidant activity of Paraguayan plant extracts. Fitoterapia 74:91-97.

Zerbo P, Millogo-Rasolodimby J, Nacoulma-ouedraogo OG, Van Damme P (2007). Contribution à la connaissance des plantes médicinales utilisées dans les soins infantiles en pays San, au Burkina Faso. International Journal of Biological and Chemical Sciences 1(3):262–274.