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NUTRITIONAL AND PHYTOCHEMICAL PROFILES OF *FICUS DICRANOSTYLA* AND *BOERHAVIA DIFFUSA*, TWO WILD LEAFY VEGETABLES FROM NORTHERN CÔTE D'IVOIRE

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ABSTRACT

In sub-Saharan Africa, wild leafy vegetables contribute substantially to food security and diversification, although many local species remain scientifically underexplored. This study aimed to evaluate and compare the nutritional, mineral, phytochemical, and antinutritional potential of *Ficus dicranostyla* Mildbr. and *Boerhavia diffusa* L., two wild plants consumed in northern Côte d'Ivoire. Physicochemical and biochemical analyses were performed on dried leaf powders using standard AOAC methods. Results revealed distinct and complementary nutritional profiles, with significant differences observed for several parameters ($p<0.05$). *Ficus dicranostyla* showed higher levels of crude protein (23.53 % DW), crude fiber (19.57 % DW), vitamin C (45.83 mg/100g DW), and iron (23.80 mg/100g DW), together with a higher total polyphenol content (1950.87 mg GAE/100g DW). In contrast, *B. diffusa* exhibited higher levels of major minerals, particularly calcium (2703.08 mg/100g DW), potassium (1601.53 mg/100g DW), and phosphorus (449.21 mg/100g DW), as well as higher levels of flavonoids (689.40 mg QE/100g DW) and tannins (922.30 mg TAE/100g DW). The two species also differed in their antinutritional profiles, with *F. dicranostyla* showing higher phytate levels substantially lower oxalate concentrations than *B. diffusa*. Despite these differences, both exhibited Ca/P ratios greater 1 (21.43 and 6.02, respectively), indicating a favorable calcium-to-phosphorus balance. Overall, these findings highlight the nutritional and phytochemical potential of *F. dicranostyla* and *B. diffusa*. Their valorization could contribute to dietary diversification and increased access to locally available sources of micronutrients in Côte d'Ivoire.

Keywords: *Ficus dicranostyla*, *Boerhavia diffusa*, Wild Leaf Vegetables, Nutritional Value, Phytochemicals, Côte d'Ivoire

1 INTRODUCTION

In Côte d'Ivoire, leafy vegetables play a prominent role in dietary habits and traditional culinary practices. This food group includes both cultivated species and wild plants collected from natural environments, the use of which varies according to region, sociocultural practices, and seasonal availability [1].

These traditional leafy vegetables represent promising plant genetic resources for dietary diversification and the valorization of local biological heritage [2,3]. From a nutritional perspective, they are attracting growing interest due to their significant contribution to the intake of macronutrients (proteins, fiber) and micronutrients (vitamins, minerals). Previous studies conducted in Côte d'Ivoire have notably highlighted significant levels of proteins, as well as calcium, potassium, magnesium, phosphorus, and iron, confirming their strategic role in the nutritional security of local populations [4].

Among these wild species, *Ficus dicranostyla* Mildbr. (Moraceae) and *Boerhavia diffusa* L. (Nyctaginaceae) are of particular importance in northern Côte d'Ivoire. *Ficus dicranostyla* is among the wild plants consumed in Korhogo region [5,6], whereas *B. diffusa* has been widely documented for its traditional medicinal uses [7,8].

However, despite the proven ethnobotanical relevance of wild plants in Côte d'Ivoire, the available scientific data remain limited for many local species. Existing studies focus primarily on usage inventories or limited aspects of their composition. Integrated characterizations that simultaneously combine physicochemical, nutritional, mineral, phytochemical, and antinutritional properties are still lacking. This scientific gap is particularly significant for *F. dicranostyla* and *B. diffusa*, for which there are virtually no comparative data obtained under standardized experimental conditions. It is therefore imperative to jointly evaluate the nutritional and functional profiles of these two species.

To address this gap, the present study aims to evaluate the nutritional potential of the leafy vegetables *F. dicranostyla* and *B. diffusa* consumed as food resources in northern Côte d'Ivoire. Specifically, the study aimed to determine and compare their nutritional, mineral, phytochemical, and antinutritional characteristics in order to assess their overall nutritional quality.

2 MATERIAL AND METHODS

2.1 Plant material and study area

The plant material consisted of *Ficus dicranostyla* Mildbr. (Moraceae) and *Boerhavia diffusa* L. (Nyctaginaceae) (Figure 1), which are leafy vegetables consumed in northern Côte d'Ivoire. The samples were harvested fresh and at maturity from a field located in Niakaramandougou in the Hambol region (North, Côte d'Ivoire) (Figure 2). This region is characterized by a tropical savanna climate (or Sudano-Guinean climate). The collected leaves were then transported to the National Center for Floristics (CNF) at Felix Houphouët Boigny University (Abidjan, Côte d'Ivoire) for identification.

Figure 1: Leaves of *Ficus dicranostyla* (A) and *Boerhavia diffusa* (B)

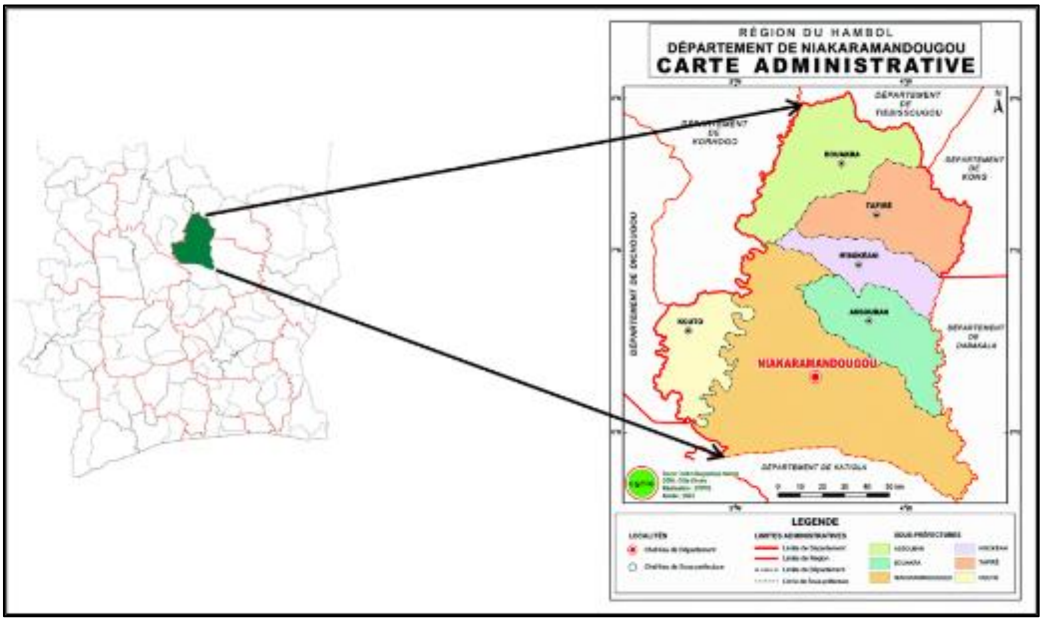

Figure 2: Map showing the location of the study area

2.2 Sample preparation

The freshly collected leaves were sorted and washed with distilled water to remove any traces of impurities. Then, they were air-dried in the shade in a well-ventilated area before being ground into a fine powder using a blender (NASCO, model BJ 1008A-CB, China). The resulting powders were sieved using a 250-µm mesh and stored at room temperature in Stomacher bags before analysis.

2.3 Proximate analysis

Proximate analysis of the samples was performed in triplicate according to AOAC standard methods [9]. The pH was determined using a pH-meter. Moisture content was determined by drying the samples in an oven at 105 °C until a constant weight was reached. Total ash was quantified by incinerating the dried biomass in a muffle furnace at 550 °C for 4 h. For crude fiber estimation, the insoluble residue remaining after acid (H_2SO_4, 0.25 M) and alkaline (NaOH, 0.3 M) digestions was weighed. Crude protein content was derived from the total nitrogen quantified via the Kjeldahl method, applying a conversion factor of 6.25. Crude lipid content was carried out using Soxhlet extraction method. Total carbohydrates were established by difference method. All proximate composition value were expressed as a percentage of dry matter basis. The energy value was estimated using the Atwater's conversion factor [10].

2.4 Determination of vitamin C content

Vitamin C content was quantified using the 2-6-dichlorophenolindophenol (DCPIP) titrimetric method adapted from Pongracz et al. [11]. Briefly, a 10 g fresh leaf sample was macerated in 40 mL of metaphosphoric acid-acetic acid solution (2%, w/v) for 10 min. The resulting homogenate was centrifuged at 3000 rpm for 20 min. A 1 mL aliquot of the supernatant was then titrated against a 0.5 g/L DCPIP solution until a stable light pink endpoint was achieved. For calibration, a standard solution of ascorbic acid (1 mg/mL) was titrated under identical experimental conditions.

2.5 Phytochemical analysis

2.5.1 Extraction of phenolic compounds

Phenolic compounds were extracted using the method described by Bala et al. [12], with minor modifications. A 10 g sample of leaf powder was subjected to maceration under continuous stirring for 24 h in 100 mL of an ethanol/water mixture (80/20, v/v). The mixture was then centrifuged at 4000 rpm for 10 min and filtered. The resulting filtrate was evaporated to dryness at 45 °C for 24 h to yield the crude dry extract. Finally, a 0.01 g aliquot of this extract was dissolved in 10 mL of ethanol to obtain the stock ethanolic extract solution.

2.5.2 Determination of total polyphenol content

Total polyphenol content was quantified using the Folin-Ciocalteu colorimetric method [13]. Briefly, a 1 mL aliquot of the ethanolic extract was oxidized with 1 mL of Folin-Ciocalteu reagent, followed by neutralization with 1 mL of Na_2CO_3 (20 %, w/v). The resulting mixture was incubated in the dark for 30 min at room temperature. The absorbance was subsequently measured at 765 nm using a spectrophotometer (BK-UV 1000). The polyphenol content was calculated from a calibration curve generated with gallic acid (1 mg/mL) as standard and expressed as gallic acid equivalents (GAE).

2.5.3 Determination of total flavonoid content

Quantification of total flavonoid content was performed via the aluminum chloride colorimetric assay [14]. A 0.5 mL aliquot of the ethanolic extract was sequentially mixed with 0.5 mL of distilled water, 0.5 mL of aluminum chloride (10 %, w/v), 0.5 mL of sodium acetate (1 M) and 2 mL of distilled water. After incubating the mixture in the dark at room temperature for 20 min, the absorbance was recorded at 415 nm using a spectrophotometer (BK-UV 1000). Flavonoid content was calculated from a calibration curve prepared with quercetin (0.1 mg/mL) as a standard and expressed as quercetin equivalents (QE).

2.5.4 Determination of total tannin content

Condensed tannin content was determined using the vanillin-HCl assay reagent [15]. A 1 mL aliquot of the ethanolic extract was mixed with 5 mL of vanillin reagent and incubated in the dark for 30 min. The absorbance of the reaction mixture was subsequently measured at 500 nm using a spectrophotometer (BK-UV 1000). The tannin concentration was estimated using a calibration curve generated with tannic acid (2 mg/mL) as a standard and expressed as tannic acid equivalents (TAE).

2.6 Determination of mineral composition

Mineral composition was determined following dry-ashing of the leaf powders in a muffle furnace (typically at 550 °C). The resulting ash was dissolved in an acid mixture of HCl/HNO_3, prior analysis. The concentration of individual mineral elements was quantified using a flame Atomic Absorption Spectrophotometer (Varian, model AA-20, Japan) [16].

2.7 Analysis of antinutritional factors

2.7.1 Determination of oxalate content

Oxalate content was determined using the potassium permanganate titrimetric method [17]. A 1 g sample of oven-dried and ground leaf powder was mixed with 75 mL of H_2SO_4 (3 M). The mixture was magnetically stirred for approximately 1 h and then filtered through Whatman No.1 filter paper. A 25 mL aliquot of the resulting filtrate was subjected to hot titration with a $KMnO_4$ (0.05 M) solution until a persistent pink endpoint was achieved.

2.7.2 Determination of phytate content

Phytate content was determined using the colorimetric method with Wade's reagent [18]. Briefly, a 1 g portion of dried and ground sample was homogenized in 20 mL of HCl (0.65 N). The mixture was continuously stirred for 12 h at room temperature and then centrifuged at 3000 rpm for 40 min. A 0.5 mL aliquot of the resulting supernatant was mixed with 3 mL of Wade's reagent and incubated in the dark for 20 min. The absorbance was subsequently measured at 490 nm using a spectrophotometer (BK-UV 1000). Phytate concentration was calculated from a calibration curve prepared with phytic acid (10 mg/mL) as a standard.

2.8 Statistical analysis

Statistical analysis was performed using Statistica software 8 version 7.1. Data were expressed as mean ± standard deviation. Significant differences between the means of the studied parameters were determined using Duncan's multiple range test at a 95 % confidence level. Probability values of less than 0.05 ($p<0.05$) were considered statistically significant.

3 RESULTS

3.1 Proximate composition

The physicochemical characteristics of the leafy vegetables studied are presented in Table 1. The statistical analysis revealed significant differences ($p<0.05$) between leaves form *F. dicranostyla* and *B. diffusa* for almost all the evaluated parameters, with the exception of the carbohydrate content. Regarding pH, *F. dicranostyla* has a value of 6.13 ± 0.15, which is significantly lower than that of *B. diffusa* (7.13 ± 0.21). These values indicate a slightly acidic nature and near-neutrality, respectively. In terms of macronutrients, *F. dicranostyla* is characterized by higher crude fiber (19.57 ± 0.11 % DW) and crude protein (23.53 ± 3.17 % DW) contents. Conversely, *B. diffusa* distinguished itself by higher levels of moisture (85.79 ± 0.14 %), total ash (14.33 ± 0.02 % DW), and crude lipids (6.94 ± 0.13 % DW), resulting in a higher overall energy value (334.56 ± 1.73 kcal/100g DW). However, total carbohydrate content remains comparable between the two species (33.56 ± 0.44 % DW and 34.83 ± 2.79 % DW).

Table 1: Physicochemical characteristics of the leaves of *F. dicranostyla* and *B. diffusa*

Parameters	Leafy vegetables	
	F. dicranostyla	*B. diffusa*
pH	6.13 ± 0.15^{a}	7.13 ± 0.21^{b}
Moisture (% DW)	78.57 ± 0.15^{a}	85.79 ± 0.14^{b}
Ash (% DW)	12.71 ± 0.87^{a}	14.33 ± 0.02^{b}
Crude fiber (% DW)	19.57 ± 0.11^{b}	16.96 ± 0.76^{a}
Crude lipids (% DW)	5.63 ± 0.03^{a}	6.94 ± 0.13^{b}
Crude proteins (% DW)	23.53 ± 3.17^{b}	21.94 ± 2.71^{a}
Carbohydrates (% DW)	33.56 ± 0.44^{a}	34.83 ± 2.79^{a}
Energy value (kcal/100g DW)	322.96 ± 1.56^{a}	334.56 ± 1.73^{b}

Values obtained are means ± SD for three determinations. On the lines of each parameter, the means assigned different letters are significantly different at p<0.05 according to Duncan's test.

3.2 Vitamin C content

The vitamin C contents of the two leafy vegetables studied (*F. dicranostyla* and *B. diffusa*) are shown in Figure 3. A statistically significant difference ($p<0.05$) was observed between the two species. Indeed, *F. dicranostyla* displayed a significantly higher vitamin C concentration (45.83 ± 3.14 mg/100g DW) compared to *B. diffusa* (28.33 ± 1.19 mg/100g DW).

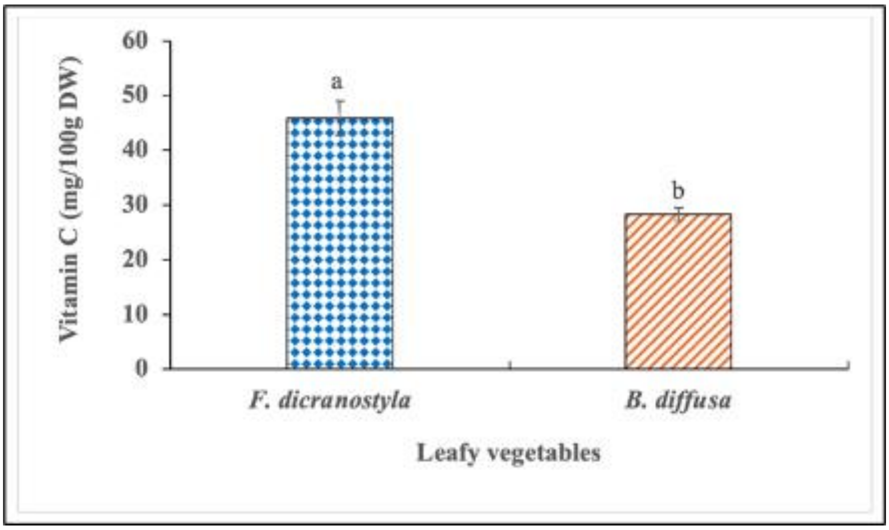

Figure 3: Vitamin C content of *F. dicranostyla* and *B. diffusa*

3.3 Phytochemical composition

Figure 4 presents the phytochemical profile of the leaves from *F. dicranostyla* and *B. diffusa*. The data reveal statistically significant differences ($p<0.05$) between the two species for all quantified compound families. *Ficus dicranostyla* is distinguished by a significantly higher concentration of total polyphenols (1950.87 ± 15.35 mg GAE/100g DW) than that of *B. diffusa* (1228.30 ± 7.47 mg GAE/100g DW). Conversely, *B. diffusa* showed a higher concentration than *F. dicranostyla*, regarding total flavonoids (689.40 ± 12.07 mg QE/100g DW versus 556.76 ± 11.70 mg QE/100g DW) and condensed tannins (922.30 ± 14.26 mg TAE/100g DW versus 660.86 ± 13.13 mg TAE/100g DW).

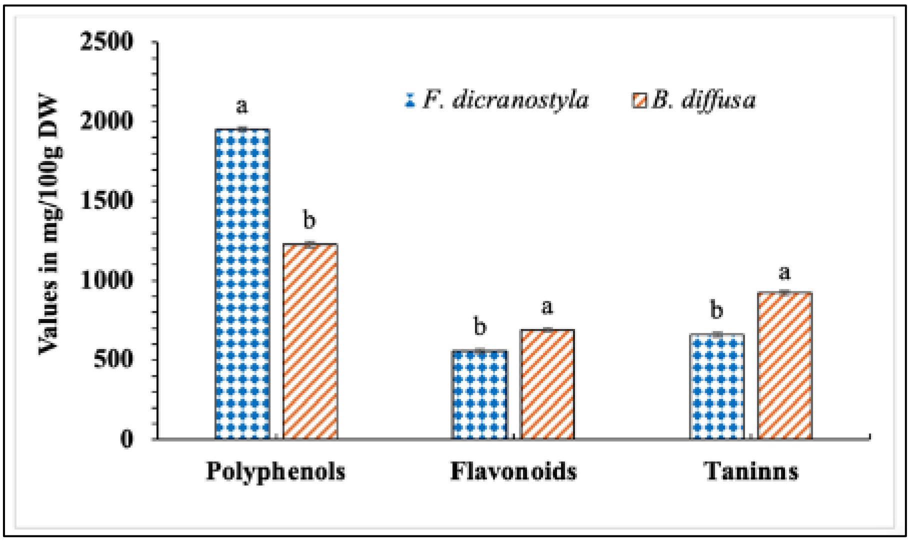

Figure 4: Phytochemical compounds of *F. dicranostyla* and *B. diffusa*

3.4 Mineral composition

The mineral profile of the two leafy vegetables (*F. dicranostyla* and *B. diffusa*) is presented in Table 2. Highly significant differences ($p<0.05$) were observed between the two species, with a clear predominance of mineral content in *B. diffusa*. Indeed, *B. diffusa* exhibits the highest concentrations of calcium (2703.08 ± 7.02 mg/100g DW), phosphorus (449.21 ± 3.85 mg/100g DW), potassium (1601.53 ± 2.56 mg/100g DW), and sodium (2612.45 ± 5.42 mg/100g DW), compared to *F. dicranostyla* (1654.01 ± 5.12 mg/100g DW, 77.17 ± 1.56 mg/100g DW, 1201.62 ± 4.5 mg/100g DW, and 2214.65 ± 6.02 mg/100g DW, respectively for calcium, phosphorus, potassium, and sodium). In contrast, *F. dicranostyla* is distinguished by an iron content twice as high (23.80 ± 1.32 mg/100g DW) as that of *B. diffusa* (11.80 ± 1.67 mg/100g DW). A comparison of the nutritional ratios of the two species reveals that the Ca/P ratio is significantly higher for *F. dicranostyla* (21.43) than for *B. diffusa* (6.02). Similarly, the Na/K ratio is 1.84 for *F. dicranostyla*, compared with 1.43 for *B. diffusa*.

Table 2: Mineral composition of the leaves of *F. dicranostyla* and *B. diffusa*

Mineral (mg/100g DW)	**Leafy vegetables**	
	Ficus dicranostyla	*Boerhavia diffusa*
Calcium (Ca)	1654.01 ± 5.12^{a}	2703.08 ± 7.02^{b}
Phosphorus (P)	77.17 ± 1.56^{a}	449.21 ± 3.85^{b}
Potassium (K)	1201.62 ± 4.5^{a}	1601.53 ± 2.56^{b}
Sodium (Na)	2214.65 ± 6.02^{a}	2612.45 ± 5.42^{b}
Iron (Fe)	23.80 ± 1.32^{b}	11.80 ± 1.67^{a}
Ca/P	21.43	6.02
Na/K	1.84	1.43

Values obtained are means ± SD for three determinations. On the lines of each parameter, the means assigned different letters are significantly different at $p<0.05$ according to Duncan's test.

3.5 Antinutritional factors

The concentrations of antinutritional factors (phytates and oxalates) in the two leafy vegetables are shown in Figure 5. The results reveal statistically significant differences ($p<0.05$) between the two species for all analyzed compounds. Regarding the phytate content, *F. dicranostyla* exhibited the highest level at 72.51 ± 6.87 mg/100g DW, compared to *B. diffusa*, which contained 51.31 ± 10.87 mg/100g DW. Conversely, a diametrically opposite trend is observed for oxalates. Indeed, *B. diffusa* is characterized by a high accumulation of oxalates, reaching 256.67 ± 3.19 mg/100g DW, a value nearly three times higher than that of *F. dicranostyla* (73.33 ± 3.01 mg/100g DW).

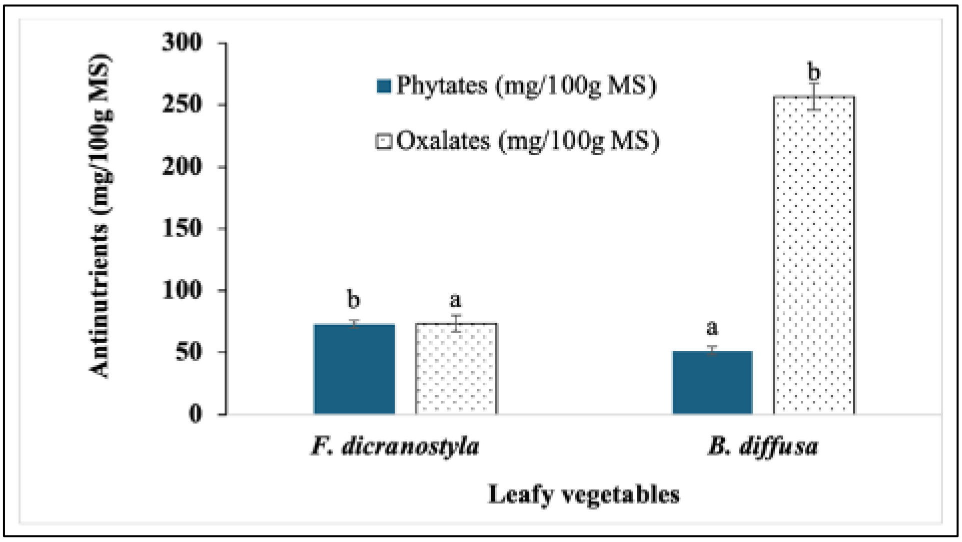

Figure 5: Antinutritional compounds of *F. dicranostyla* and *B. diffusa*

4 DISCUSSION

Leafy vegetables are a mainstay of food security in sub-Saharan Africa due to their nutritional density and contribution to dietary diversification [6]. The present study highlights the nutritional potential of *F. dicranostyla* and *B. diffusa* leaves, although marked differences were observed for several of evaluated parameters.

The pH of *F. dicranostyla* (6.13) was lower than that of *B. diffusa* (7.13). This lower pH may provide a less favorable environment for the growth of certain microorganisms compared with the near-neutral pH observed in *B. diffusa*. However, the high moisture contents of both species (78.57 % and 85.79 % for *F. dicranostyla* and *B. diffusa*, respectively) remains a major factor contributing to their perishability [3].

Furthermore, the higher ash content in *B. diffusa* (14.33 % DW) compared to *F. dicranostyla* (12.71 % DW) suggests a more pronounced overall richness in mineral elements, which corroborates the findings of Jayachitra et al. [19]. In contrast, *F. dicranostyla* showed a higher crude fiber content (19.57 % DW), highlighting its potential contribution to dietary fiber intake [1]. Regarding macronutrients, *B. diffusa* had a slightly higher lipid content (6.94 % DW), whereas the value obtained for *F. dicranostyla* (5.63 % DW) was consistent with that reported by Tabi et al. [20]. Additionally, *F. dicranostyla* (23.53 % DW) showed a higher crude protein content than *B. diffusa* (21.94 % DW), supporting its potential as a plant-based source of dietary protein and agreeing with observations reported for wild leafy vegetables form northern Côte d'Ivoire [1]. Although total carbohydrate concentrations were comparable between the two species, they remain lower than those reported by Koné et al. [3]. Together with the lipid fraction, these macronutrients contributed to the slightly higher energy value recorded for *B. diffusa* (334.56 kcal/100g DW) compared with *F. dicranostyla* (322.96 kcal/100g DW).

Regarding vitamin C, *Ficus dicranostyla* exhibited a significantly higher content (45.83 mg/100g DW) than *B. diffusa* (28.33 mg/100g DW). This difference enhances the nutritional interest of *F. dicranostyla*, although vitamin C concentrations in plant tissues are strongly influenced by development stage, environmental factors, and postharvest handling because ascorbic acid is highly sensitive to oxidation, light, and heat [21].

The phytochemical profiles also differed between the two species. *Ficus dicranostyla* showed a higher total polyphenol content (1950.87 mg GAE/100g DW) than *B. diffusa* (1228.30 mg GAE/100g DW). This high content suggests a greater contribution of phenolic compounds to the antioxidant activity of the *F. dicranostyla* leaf extract. This finding is consistent with the phenolic potential previously reported for *F. dicranostyla* [20]. However, the higher polyphenol concentration should not be interpreted directly as evidence of greater antioxidant activity in the absence of a specific antioxidant assay. Variations in phenolic contents among studies may result from differences in geographical origin, plant material, extraction solvent, extraction method, and reference standards [22]. In contrast, *B. diffusa* contained higher levels of flavonoids (689.40 mg QE/100g DW) than *F. dicranostyla* (556.76 mg QE/100 g DW). This result shows that total polyphenol content does not necessarily reflect the relative abundance of flavonoid within a plant matrix. The notable accumulation of flavonoids in *B. diffusa* is consistent with the findings of Bhardwaj et al. [23]. Similarly, tannin content was higher in *B. diffusa* (922.30 mg TAE/100g DW) than in *F. dicranostyla* (660.86 mg TAE/100g DW). Tannins and other phenolic compounds are involved in plant defense and may contribute to the antioxidant properties of plant, although their nutritional effects depend on their concentration and interaction with other dietary constituents [24,25].

Such differences may reflect both biological variability and methodological differences, particularly extraction methods and spectrophotometric assays [22,26].

Mineral analysis reveals clear differences between the two species, while *B. diffusa* exhibiting higher concentrations of calcium, phosphorus, and potassium, than *F. dicranostyla*. Calcium is essential for skeletal mineralization, muscle contraction, and nerve signaling [27], whereas potassium plays important roles in hydroelectrolytic balance and neuromuscular function [19]. Both species exhibited Ca/P ratios greater than 1 (21.43 for *F. dicranostyla* and 6.02 for *B. diffusa*), indicating a favorable calcium-to-phosphorus balance. However, the actual bioavailability of calcium may be influenced by the presence of chelating antinutritional factors, particularly phytates and oxalates [28]. Regarding the Na/K ratio (1.84 for *F. dicranostyla* and 1.43 for *B. diffusa*), it should be viewed as descriptive indicators of the plant's electrolyte profile rather than as direct clinical biomarkers of cardiovascular benefit, even though the literature generally associates a low dietary Na/K ratio with a reduction in blood pressure [29]. The relatively high sodium concentrations observed in both species (2612.45 mg/100g DW in *F. dicranostyla* and 2214.65 mg/100g DW in *B. diffusa*) should also be considered when evaluating their overall mineral profiles, although interpretation on a dietary basis requires consideration of the actual portion size and preparation methods.

Furthermore, *F. dicranostyla* contained approximatively an iron content (23.80 mg/100g DW) that is twice that of *B. diffusa* (11.80 mg/100g DW), with values within the range reported for traditional leafy vegetables [30]. Because plant-derived iron is predominantly non-heme iron, its absorption may be inhibited by phytates but enhanced by ascorbic [31,32]. The combination of relatively high iron and vitamin C contents in *F. dicranostyla* may therefore be nutritionally advantageous, although its relatively higher phytate concentration could partially counteract this potential benefit effect. Direct assessment of mineral bioavailability or phytate-to-mineral molar ratios would be required to confirm this assumption.

The two species also exhibited contrasting antinutritional profiles. Phytate content was higher in *F. dicranostyla* (72.51 mg/100g DW) than in *B. diffusa* (51.31 mg/100g DW), whereas oxalate content was markedly higher in *B. diffusa* (256.67 mg/100g DW) than in *F. dicranostyla* (73.33 mg/100g DW). Phytates and oxalates are known to chelate divalent cations (iron, zinc, calcium), thereby reducing their intestinal bioavailability depending on their concentrations and molar relationships with minerals [32,33,34]. The phytate and oxalate contents observed in *B. diffusa* were higher than those reported by Gupta and Yadav [35], which may reflect differences in plant developmental stage, growing conditions, soil characteristics, sample processing, and analytical methods used. Importantly, it should be noted that appropriate thermal processing, particularly boiling or cooking, has been reported to reduce oxalate levels substantially, with reductions ranging from 30 to 87 % depending on processing conditions [1,34]. Such processing may therefore reduce the potential inhibitory effects of oxalates and improved the nutritional usability of these vegetables, although the actual effects on mineral bioavailability should be experimentally verified.

5 CONCLUSION

This study highlights the substantial nutritional and phytochemical potential of *Ficus dicranostyla* and *Boerhavia diffusa*, two wild leafy vegetables consumed in northern Côte d'Ivoire. Comparative analyses showed that *F. dicranostyla* had higher levels of protein, fiber, vitamin C, iron, and total polyphenols, together with substantially lower oxalate concentration. In contrast, *B. diffusa* was characterized by higher concentrations of major minerals (Ca, K, and P), as well as flavonoids and tannins. The two species also exhibited distinct antinutritional profiles, with higher phytate levels in *F. dicranostyla* and markedly higher oxalate levels in *B. diffusa*. Both species exhibited Ca/P ratios greater than 1, indicating a favorable calcium-to-phosphorus balance. Overall, these findings provide new comparative data on locally consumed wild leafy vegetables and support their potential contribution to dietary diversification and micronutrient intake in northern Côte d'Ivoire. Further studies should investigate the effects of commonly used local cooking methods on nutrient retention, mineral bioavailability, and the reduction of antinutritional factors, with a view to developing appropriate culinary recommendations.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

Acknowledgments

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Disclosure of conflict of interest

The authors declare that they have no conflict of interest.

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