

Ethnobotanical knowledge and use of *Coelocaryon oxycarpum* fruits in Côte D'Ivoire: Socio-cultural drivers, consensus and local perceptions

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Abstract

Non-timber forest products play a crucial role in food security, traditional medicine, and cultural practices across sub-Saharan Africa. *Coelocaryon oxycarpum*, an underutilized wild fruit species endemic to Côte d'Ivoire, remains poorly studied despite its nutritional, medicinal, and cosmetic potential. This study aimed to assess the level of knowledge, patterns of use, and socio-cultural factors influencing the valorization of *C. oxycarpum* in two contrasting agroecological regions: Gontougo (North-East) and Lôh-Djiboua (South-West).

A total of 800 households (400 per region) were surveyed between April and August 2023 using structured questionnaires. Data were analyzed through knowledge level (KL), use rate (UR), and informant consensus factor (ICF), with chi-square tests applied to assess associations between demographic variables and knowledge or use.

Results revealed that 51.5% of respondents were familiar with the fruit, but only 21.7% reported using it. Knowledge was higher in Gontougo (53.8%) compared with Lôh-Djiboua (49.2%), while usage followed a similar trend (26.8% vs. 16.6%). Knowledge and use were significantly associated with ethnicity, education, and gender. Indigenous groups (Koulango, Dida, Degha, Abron) accounted for over 80% of knowledge holders, while women were the main users (16.2%). The highest ICF values were recorded for food uses (0.91) and cosmetic applications (1.0), underscoring the species' multifunctional potential.

This study demonstrates that *C. oxycarpum* is culturally significant yet underexploited. Its valorization through biochemical characterization, nutritional assessment, and domestication efforts is critical to ensure sustainable conservation and enhance its contribution to local food and health systems.

Keywords: *Coelocaryon Oxycarpum*; Indigenous Knowledge; Food Security; Ethnobotany; Côte d'Ivoire

1. Introduction

In many regions of sub-Saharan Africa, non-timber forest products are central to food security, traditional medicine, and cultural practices [1,2]. Among these, wild edible fruit plants occupy a particularly important place in rural diets and local pharmacopoeias [3]. Yet, many of these species remain poorly known, underutilized, or threatened with

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extinction due to the lack of scientific, economic, and political valorization [4]. This situation poses risks to both food security and the preservation of indigenous knowledge systems in West Africa, particularly in Côte d'Ivoire [5,6].

One example is *Coelocaryon oxycarpum*, a wild tree species of the Myristicaceae family whose fruits are traditionally consumed by diverse communities in Côte d'Ivoire [7,8]. Beyond its nutritional role, the fruit is valued as a flavor enhancer [9,10], as well as for therapeutic uses such as anticoagulant and wound-healing properties [11]. Its richness in phenolic and azelaic acids also suggests promising cosmetic applications [12,13]. These attributes highlight the plant's potential economic and functional importance. Despite this, *C. oxycarpum* remains under-studied and undervalued. To date, few systematic studies have quantified local knowledge levels or documented patterns of use. Its status as an underutilized and threatened phylogenetic resource raises concerns about its conservation and the intergenerational transmission of associated knowledge [7].

Scientific documentation of regional and social variations in knowledge and use of *C. oxycarpum* is also scarce, despite its endemism in Côte d'Ivoire. This gap underscores the importance of assessing how socio-cultural factors shape its use and how such dynamics may guide conservation strategies.

This study therefore aims to evaluate the level of knowledge and usage practices of *C. oxycarpum* fruits in two contrasting agroecological regions of Côte d'Ivoire: Gontougo (North-East) and Lôh-Djiboua (South-West). Specifically, it seeks to identify the socio-cultural factors influencing its use, document its local applications, and contribute to its valorization, sustainable conservation, and the preservation of indigenous knowledge.

We hypothesize that knowledge and use of *C. oxycarpum* vary significantly between regions and social groups, reflecting differences in cultural practices and ecological contexts. Testing this hypothesis is essential for highlighting the plant's role in local livelihoods and for informing strategies to integrate neglected species into sustainable food and health systems.

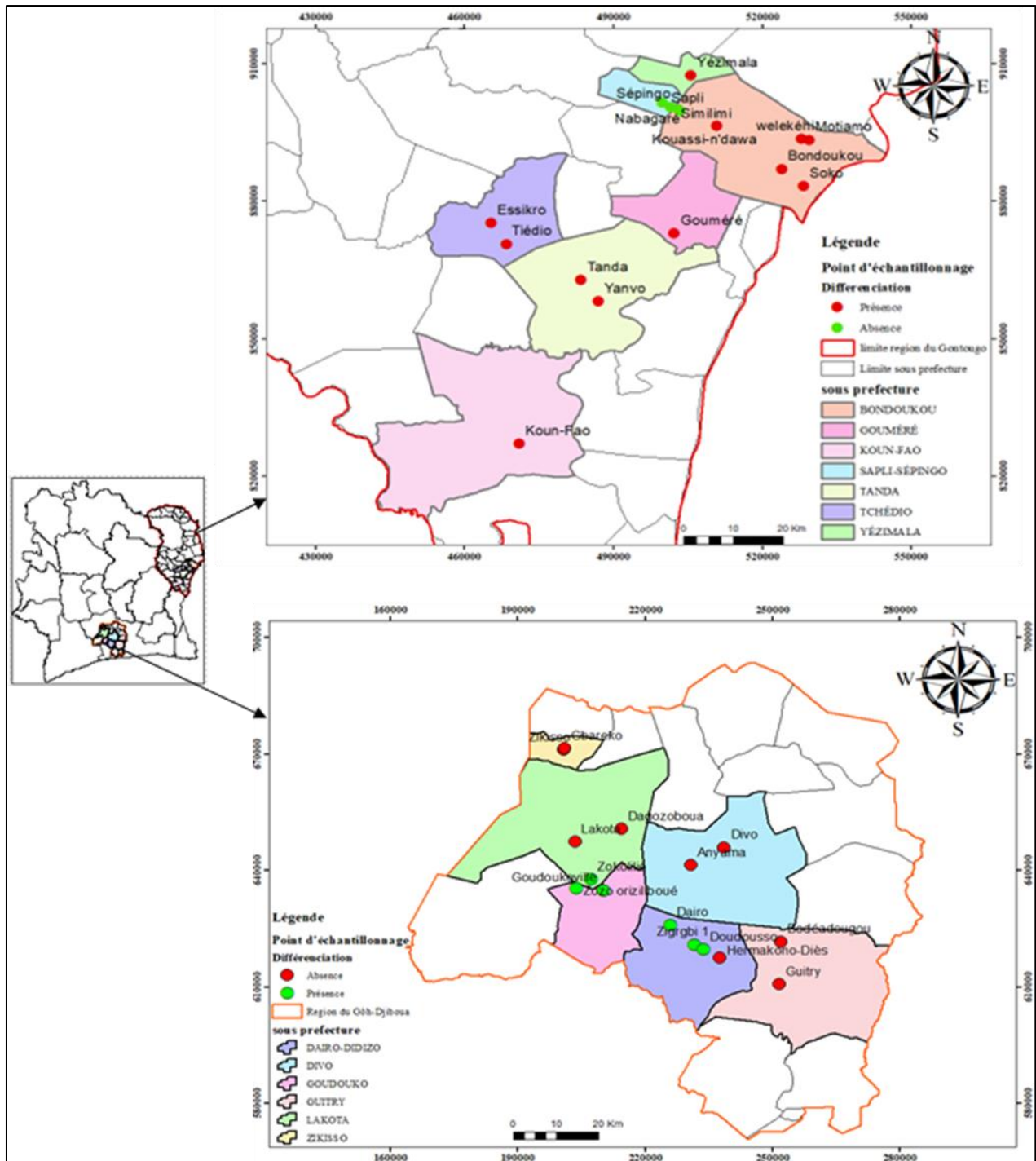
2. Materials and Methods

2.1. Study Area

The study was conducted in thirteen [13] localities located in two contrasting agroecological regions of Côte d'Ivoire : Gontougo (North-East) and Lôh-Djiboua (South-West). Gontougo is situated at 8°02' N and 2°47' W, while Lôh-Djiboua lies at 5°50' N and 5°22' W (Figure 1).

Lôh-Djiboua is characterized by an AW climate according to Köppen–Geiger classification, with a mean annual temperature of 26.1 °C and an average rainfall of 1069.4 mm. In contrast, Gontougo falls within the South-Sudanian climatic zone, which represents a transition between the Sudanian tropical climate and the humid tropical Baouléen type. Seasonal patterns in this region are irregular, alternating between two to four rainy/dry cycles per year [14].

Agricultural production is a major economic activity in both regions. Lôh-Djiboua is dominated by rubber (*Hevea brasiliensis*), oil palm (*Elaeis guineensis*), cocoa (*Theobroma cacao*), and banana (*Musa spp.*), whereas Gontougo is characterized by cashew (*Anacardium occidentale*), cocoa, and yam (*Dioscorea spp.*).



2.2. Plant Material

The research focused on the fruit of *Coelocaryon oxycarpum* (Figure 2), selected for its socio-cultural and utilitarian significance in the study regions.



Figure 2 Fruit of *Coelocaryon oxycarpum*

2.3. Survey Material

Data were collected using a structured questionnaire composed of

- Open-ended questions (free responses),
- Closed-ended questions (binary yes/no),
- Semi-open questions (multiple predefined options).

The questionnaire covered socio-demographic information (ethnicity, social status, etc.), knowledge of *C. oxycarpum*, modes of use (raw, processed), and purposes of use (food, medicinal, cosmetic).

2.4. Sampling and Data Collection

Fieldwork was carried out between April 4 and August 26, 2023, covering the main phenological and post-harvest phases of *C. oxycarpum* fruit

- Fruit maturity (February–April),
- Harvesting (mid-May–early June),
- Drying, storage, and marketing (mid-April until stocks were depleted).

Surveys were conducted in local markets at departmental capitals among vendors of wild edible plants, as well as in households from sub-prefectures, and villages within both regions. Localities were randomly selected.

A total 800 households were surveyed (400 per region), representing an estimated 2400 individuals (average household size of three). Only one questionnaire was completed per household to avoid response duplication. Interviews lasted approximately 25 minutes and were conducted in French by a PhD student in agroforestry, with assistance from interpreters when local languages other than Baoulé were spoken.

2.5. Analytical Parameters

2.5.1. Knowledge Level (KL)

Knowledge Level (KL) was calculated as the proportion of individuals familiar with *C. oxycarpum* relative to the total number of people surveyed, following the formula adapted from [15].

$$\text{KL (\%)} = \frac{N}{N_t} \times 100 \quad (1)$$

Where N = number of respondents knowing the fruit, N_t = total respondents

2.5.2. Use Rate (UR)

The usage rate was defined as the proportion of individuals who had ever used *C. oxycarpum* fruits relative to the total surveyed according to the formula used by Mbalula [16]

$$\text{UR (\%)} = \frac{U}{N_t} \times 100 \quad (2)$$

Where

U = number of users, N_t = total respondents.

2.5.3. Informant Consensus Factor (ICF)

$$\text{ICF} = \frac{N_a}{N_t} \quad (3)$$

For the present study, we adapted the formula proposed by Bayeli et al. [17], used to assess consensus on the uses of *C. oxycarpum* (food, medicinal, cosmetic) and on its vernacular naming across ethnic groups:

Where

N_a = number of informants citing a given use or vernacular name, N_t = total informants in the category

Note: Values range from 0 (no agreement) to 1 (full agreement), with higher values indicating stronger consensus.

2.6. Statistical Analysis

Survey data were processed using Sphinx Plus² V5 software and further analyzed with Microsoft Excel. Chi-square (χ^2) tests of independence were performed to examine associations between categorical variables (gender, education level, ethnicity) and binary variables (KL, UR). Statistical significance was set at $p < 0.05$.

3. Results

3.1. Sociodemographic characteristics of the study population

Table 1 summarizes the sociodemographic profile of the 800 respondents surveyed in the Gontougo and Lôh-Djiboua regions. Both men and women of varying marital status, age groups, ethnic backgrounds, and education levels were represented. Women were slightly more represented, ranging from 48.25% to 54.75%, compared with men (45.25–51.75%).

The age group most represented was 18–60 years (45–47.5%, or 370 individuals), followed by those over 60 years (235 individuals). The majority of respondents in Gontougo were indigenous groups (64.5%), mainly Abron, Koulango, and Degha. Educational levels were generally low: only 1.3% had attended university, 3.2% were literate through Quranic or adult literacy classes, 18.1% had secondary education, while the majority were illiterate (59.1%).

Table 1 Sociodemographic profile of the surveyed population in Gontougo and Lôh-Djiboua regions

Respondent Profile	Category	Gontougo (n = 400)	Lôh-Djiboua (n = 400)	Total (n = 800)
Sex of respondent	Female	219 (54.75%)	193 (48.25%)	412 (51.5%)
	Male	181 (45.25%)	207 (51.75%)	388 (48.5%)
Ethnic group	Indigenous (Abron, Koulango, Degha)	258 (64.5%)	–	258 (32.2%)
	Indigenous (Dida)	–	192 (48.0%)	192 (24.0%)
	Allochthonous (Baoulé, Agni, Lobi, Sénoufo, Nafana)	132 (33.0%)	153 (38.3%)	285 (35.7%)
	Allogenous (Mossi)	10 (2.5%)	55 (13.7%)	65 (8.1%)
Age group	<18 years	95 (23.8%)	100 (25.0%)	195 (24.0%)
	18–60 years	190 (47.5%)	180 (45.0%)	370 (46.3%)
	>60 years	115 (28.7%)	120 (30.0%)	235 (29.4%)
Education level	No formal schooling	369 (78.0%)	104 (22.0%)	473 (59.1%)
	Quranic / Literate	20 (5.0%)	6 (1.5%)	26 (3.2%)
	Primary	96 (65.8%)	50 (34.2%)	146 (18.3%)
	Secondary	64 (16.0%)	81 (20.3%)	145 (18.1%)
	Higher education	3 (0.75%)	7 (1.75%)	10 (1.3%)
Marital status	Married / Cohabiting	214 (53.5%)	293 (73.3%)	507 (63.4%)
	Single / Divorced	186 (46.5%)	107 (26.8%)	293 (36.6%)

n = sample size of respondents

3.2. Knowledge and use of *Coelocaryon oxycarpum* fruit

3.2.1. Overall knowledge and use

Although the fruit was widely known, its domestic use remained limited (Table 2). Of the 412 respondents (51.5%) who knew the fruit, only 174 (21.75%) reported using it. Knowledge was higher in Gontougo (53.8%) than in Lôh-Djiboua (49.2%). However, use rates were low in both regions, with 26.8% in Gontougo compared to 16.6% in Lôh-Djiboua.

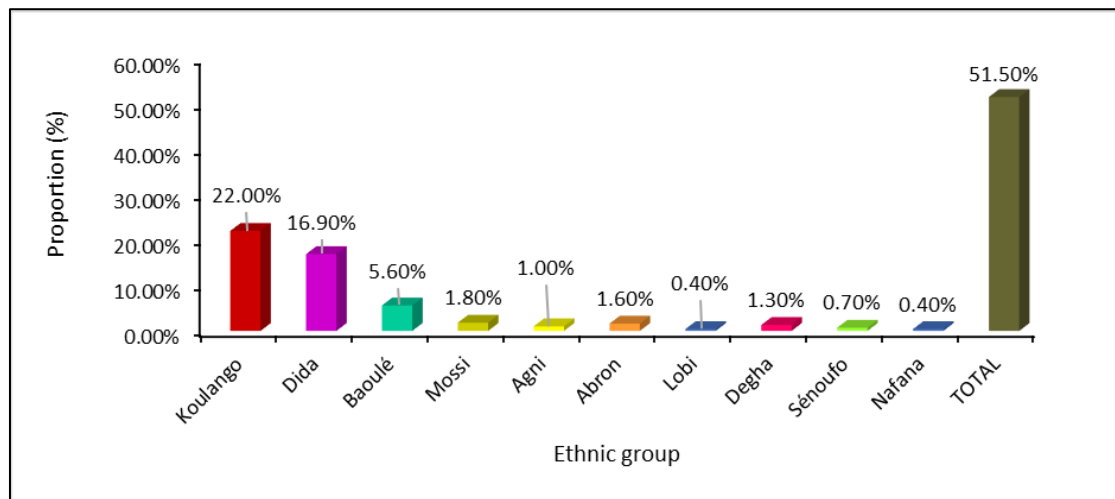
Table 2 Knowledge and use of *C. oxycarpum* fruit in the study regions

Parameter	Gontougo		Lôh-Djiboua		Average	
	Resp.	Per. (%)	Resp.	Per. (%)	Resp.	Per. (%)
KL (Knowledge Level)	215	53.80	197	49.20	412	51.5
UR (Use Rate)	107	26.8	67	16.6	174	21.75

Note: Respondents (Resp.) = number of individuals surveyed; Per. = Percentage

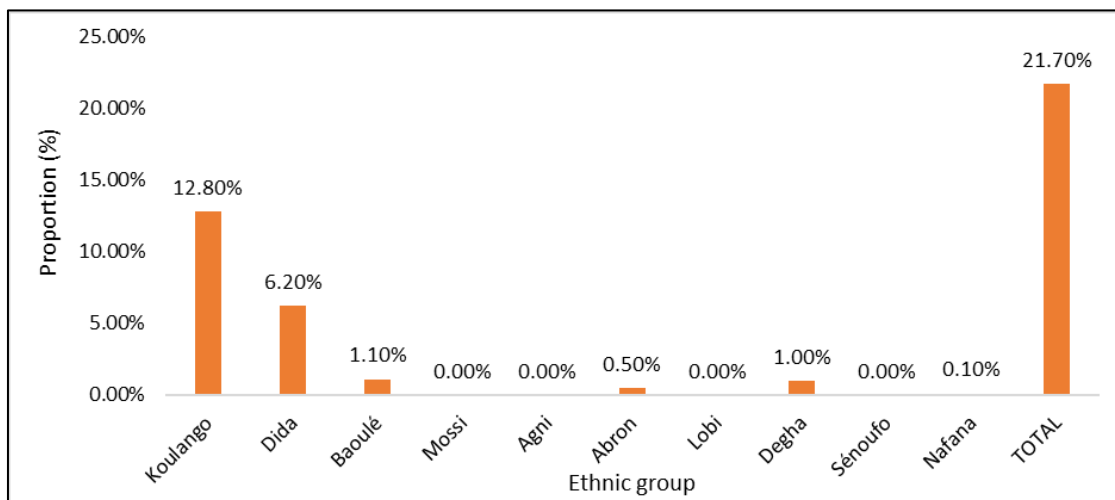
3.2.2. Distribution of knowledge of *Coelocaryon oxycarpum* fruit across ethnic groups

Figure 3 shows that indigenous groups were the primary custodians of knowledge about *C. oxycarpum*. The Koulango (22%), Dida (16.9%), Abron (1.6%), and Degha (1.3%) accounted for more than 81% of respondents with knowledge of the fruit. In contrast, allochthonous and non-indigenous groups demonstrated very limited familiarity.

**Figure 3** Proportion of respondents reporting knowledge of *C. oxycarpum* fruit across ethnic groups

3.2.3. Distribution of use of *Coelocaryon oxycarpum* fruit across ethnic groups

As shown in Figure 4, use was concentrated among Koulango (12.8%) and Dida (6.2%), with minor contributions from Baoulé, Degha, Abron, and Nafana groups, whose use rates did not exceed 1.1%.

**Figure 4** Frequency of respondents reporting the use of *C. oxycarpum* across ethnic groups

3.3. Sociodemographic factors influencing knowledge and use

3.3.1. Influence of educational level on knowledge of *Coelocaryon oxycarpum* fruit

Knowledge levels varied significantly with literacy ($\chi^2 = 15.83$; $p < 0.05$). Illiterate respondents represented the highest proportion of those familiar with the fruit (27.5%), whereas university-educated respondents accounted for only 0.6% (Figure 5).

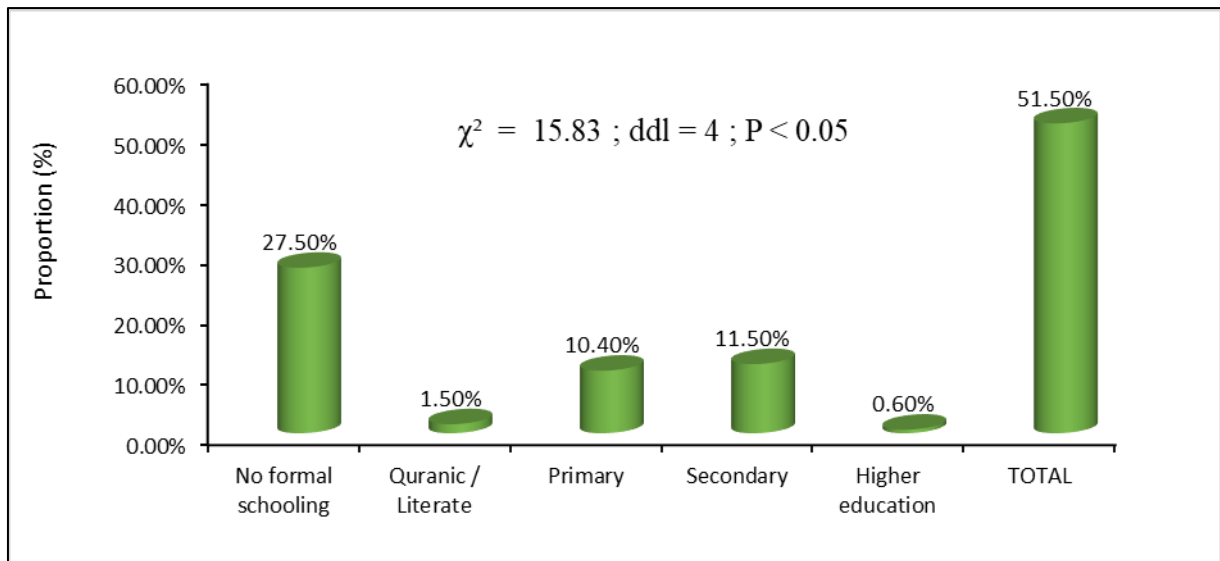


Figure 5 Knowledge of the *C. oxycarpum* fruit according to literacy level

3.3.2. Influence of gender on knowledge of *Coelocaryon oxycarpum* fruit

Both men and women reported knowledge of *C. oxycarpum* (Figure 6), but knowledge was significantly associated with gender. Women were more likely to be familiar with the fruit (30.5%).

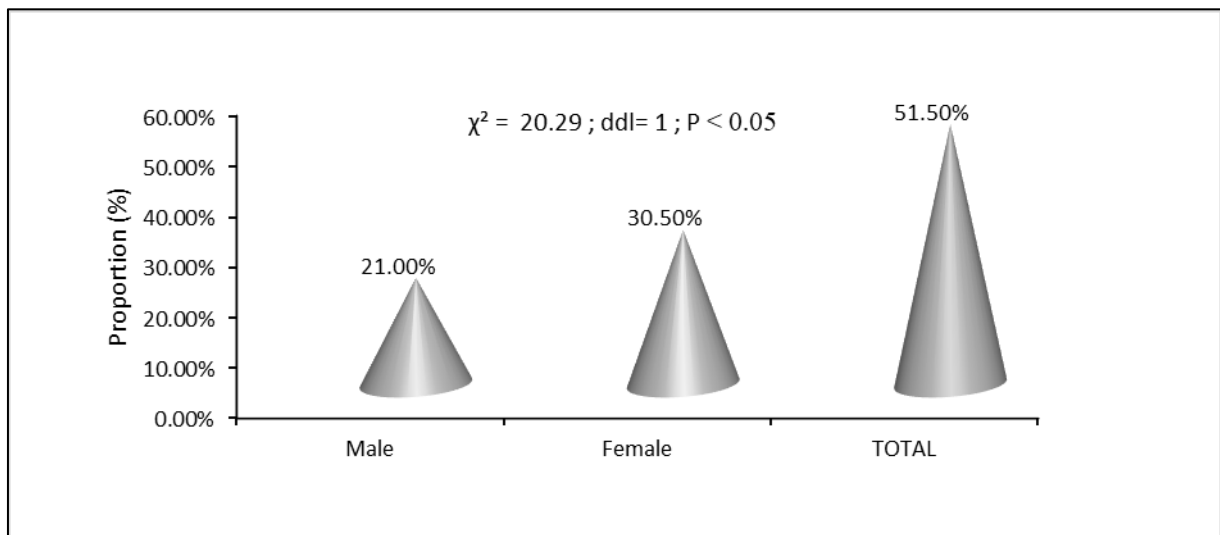


Figure 6 Knowledge of the *C. oxycarpum* fruit by gender

3.3.3. Influence of educational level on the use of *Coelocaryon oxycarpum* fruit

Use was strongly associated with education level (Figure 7). Illiterate respondents reported the highest usage rate (12%), while no use was recorded among university-educated respondents.

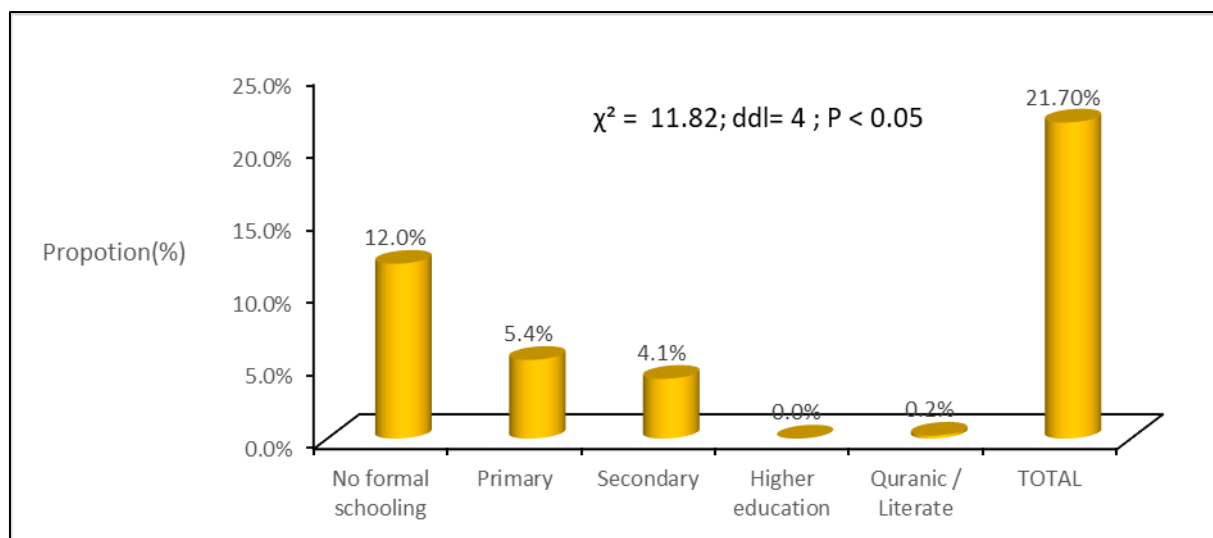


Figure 7 Use of the *C. oxycarpum* fruit according to educational level

3.3.4. Influence of gender on the use of *Coelocaryon oxycarpum* fruit

Use also varied significantly by gender ($\chi^2 = 29.92$; $p < 0.05$). Women were the main users of *C. oxycarpum* fruit (16.2%) compared with men (5.5%) (Figure 8).

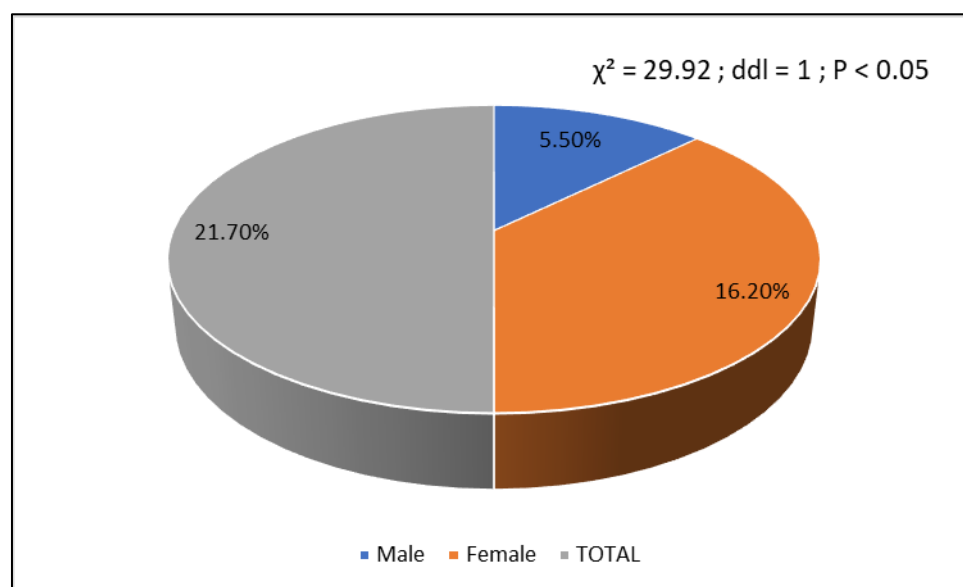


Figure 8 Use of the *C. oxycarpum* fruit by gender

3.4. Informant consensus

3.4.1. Local taxonomy of *Coelocaryon oxycarpum*

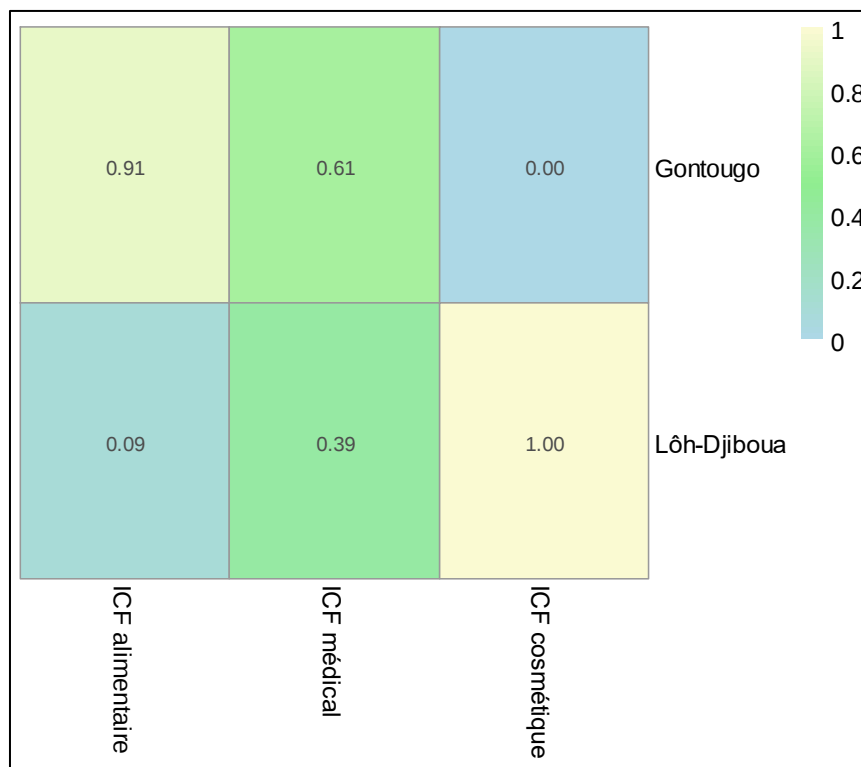
The fruit is known by different vernacular names depending on the ethnic group (Table 3). The name Blima (used by Koulango, Degha, and Abron) had the highest consensus (ICF = 0.60). Other names, such as Dagla, Soclopélia, Globier, and Odougbohnahoré, showed much lower agreement (ICF ≤ 0.22).

Table 3 Calculated ICF values for the vernacular names of the *C. oxycarpum* fruit

Ethnic group	Vernacular name	Na	ICF
Koulango, Degha, Abron	Blima	197	0.60
Dida	Dagla	73	0.22
	Soclopéla	38	0.12
	Globier	13	0.04
	Odougbognahoré	2	0.01
Dida and Ega	Olougbalégnahoré	6	0.02

3.4.2. Use categories and informant consensus factor (ICF) values

Three main categories of use were identified: food, medicine, and cosmetics (Figure 9). The highest ICF value (1.0) was recorded for the preparation of cosmetic ointments. Medicinal applications, particularly in Gontougo, reached an ICF of 0.60, reflecting their importance in local healthcare practices. Food uses also achieved a high consensus, with a consumption index of 0.91, indicating strong integration of the fruit into traditional diets.

**Figure 9** Informant consensus on the use of the *C. oxycarpum* fruit

4. Discussion

4.1. Familiarity of households with *Coelocaryon oxycarpum*

The gender distribution analysis in the 800 surveyed households revealed that women (51.5%) were slightly more represented than men (48.5%). This pattern echoes recent field studies showing not only higher female participation in household plant surveys but also, in many contexts, a quantitatively greater knowledge or use of plants related to food and medicinal resources. For example, a targeted community study in Brazil sampled 66 participants (33 women, 33 men) and reported that women possessed a broader plant repertoire while men's knowledge was more heterogeneous. This indicates that women tend to know more species relevant to domestic tasks related to food and health [18]. At broader scales, however, a systematic review and meta-analysis of ethnobiological studies found no

uniform overall effect of gender on medicinal plant knowledge. Instead, gender differences vary by country and cultural context, supporting the interpretation of our local results as context-dependent rather than universally generalizable [19]. Furthermore, empirical surveys in African contexts reinforce the local interpretation of our results. In Tabora, Tanzania, an ethnobotanical study of 244 informants found that 94.3% of respondents possessed strong knowledge of edible wild fruits and showed significant correlations between respondent gender and measures of knowledge and use of wild fruits used for food and medicine [16]. Similarly, a cross-sectional study in Zimbabwe reported that most respondents were women. In this study, 82% of women knew indigenous fruits from wild sources, 71.3% consumed them for nutritional reasons, while 70.6% cited medicinal uses. This highlights the role of women in the harvesting, processing, and domestic use of wild fruits [3]. Regarding ethnicity, our finding that indigenous groups are the primary custodians of knowledge about *C. oxycarpum* is consistent with multiple recent reports showing that long-term residence and cultural continuity predict higher local ecological knowledge. Comparative studies show that migrant or allochthonous groups generally report lower recognition and use rates than indigenous populations. The latter maintain intergenerational transmission practices and ritual or food uses related to landscape management [20]. Extensive cultivation practices and deforestation reduce the habitat of hygrophilous taxa such as *C. oxycarpum*. This amplifies the observed ethnic contrast because indigenous groups more often maintain residual management practices and in situ conservation that preserve both species and knowledge [16].

4.2. Use of the fruit across communities

Ethnocultural analyses in this study revealed clear associations between education level, gender, and the frequency of *Coelocaryon oxycarpum* use: only 21.7% of surveyed households reported having used the fruit, with the highest usage concentrated among uneducated respondents (12%) and women (16.2%). These results reflect consistent trends observed in other recent field studies on wild edible fruits and underutilized species, where poorer and less educated households, as well as women, disproportionately rely on wild resources for their daily diet, remedies, and occasional income.

Several recent comparative surveys provide quantitative context for these patterns. A multi-district study on indigenous fruits in Zimbabwe reported that 71.3% of respondents consumed indigenous fruits for nutritional purposes and 42% recognized medicinal uses, indicating that rural communities commonly use wild fruits as both food and traditional medicine [3]. A recent household survey in the Tabora region and related Tanzanian studies even reported a near-universal reliance of households on wild fruits in some communities, with 48.6% using them for both food and medicine. This highlights that local ecology and culture strongly condition reliance on wild species [21].

In the Midakegn district, Ethiopia, 62.3% of recorded underutilized wild edible plants were fruits and 67.3% of uses supplemented staple diets. This study found that illiterate respondents cited significantly more wild edible products than literate ones, confirming our results that a lower level of formal education is associated with greater use and knowledge of wild food species [22]. Similarly, Fandohan et al. documented the important role of women in the valorization and commercialization of tamarind in Benin, whose ethnobotanical use values ranged between 8.8% and 56.4% [23]. Other districts and countries show much higher reliance when fruits are both abundant and integrated into local diets. We note 71.3% nutritional use in Zimbabwe and 100% food use at the household level in a Tanzanian district [3]. These comparative figures clarify three points relevant to *C. oxycarpum* in Côte d'Ivoire. First, our overall usage rate of 21.7% likely reflects a mix of ecological availability, seasonality, and cultural preference rather than an intrinsic lack of value. Second, the higher usage among uneducated respondents and women aligns with a general pattern: lower formal education levels and women's domestic roles are correlated with more frequent harvesting, preparation, and use of wild edible plants in multiple African contexts [22]. Finally, where market and processing channels exist, as with tamarind, women's knowledge can translate into economic income [23].

4.3. Consensus and local perceptions

Among the three recorded use categories in our study, food consumption showed an exceptionally high informant consensus (ICF = 0.91), indicating near-unanimous agreement that *Coelocaryon oxycarpum* is primarily a food item and condiment in local diets. This strong culinary consensus is consistent with earlier work in north-eastern Côte d'Ivoire. Ouattara and al. documented that fruits constitute the most frequently consumed organ (57.1% of citations) in the Bondoukou area and specifically reported *C. oxycarpum* as an alimentary spice used in postpartum foods; evidence that the species' food role is longstanding and culturally embedded [9].

Comparative ethnobotanical surveys show that similarly high consensus values for food use are typical when a wild species is both abundant and culturally central. In a large, multi-village study of four Agni tribes in central-east and north-east Côte d'Ivoire, fruits represented 65.4% of cited edible plant parts and only 18.8% of species were common

across all tribes. A finding that highlights strong tribe-specific dietary traditions for wild fruits and explains why a high ICF for a single food use, as in our study, is plausible where cultural practice is concentrated [24].

Looking beyond Côte d'Ivoire, recent regional studies report similarly high ICF values for preferred food and therapeutic uses of wild fruits. In southern Ethiopia, informant consensus indices for edible/medicinal categories ranged between 0.83 and 0.94, reflecting tight agreement on which species are used as food and for which health problems. Such ranges are very close to our food ICF (0.91), reinforcing that strong consensus is a robust signal of cultural importance rather than a sampling artefact [11].

In miombo woodlands of Tabora, Tanzania, high utilisation frequencies were recorded for leading wild fruit taxa and whole-household dependence on wild fruits reached 100 % in some districts, with 48.6% of households using fruits both as food and medicine. Those values illustrate the range of possible reliance on wild fruits. Thus, where ecological availability and cultural integration are high, UR and ICF approach saturation; similar to our very strong dietary consensus for *C. oxycarpum* in communities that still value it [16].

Vernacular naming patterns in our data further corroborate cultural embedding: the name "Blima" (ICF = 0.60) predominated among Koulango, Degha and Abron, while Dida communities recorded multiple local names. A dominant shared name within some ethnic clusters and multiplicity of names in others, mirrors findings from Benin where food use dominated and women were principal custodians of use-knowledge. The Benin study also reported high use-value scores and heterogeneity of vernacular names across ethnic groups. Such correspondences indicate that shared vernacular names often reflect frequent use and intra-group knowledge transmission. On the other hand, multiple names generally signal dialectal diversity or fragmented cultural transmission [25].

Finally, the convergence of high dietary ICF and concentrated vernacular naming strongly suggests that *C. oxycarpum* occupies a functionally and culturally salient niche in some ethnic diets. However, where cultural practices decrease ecological availability, comparative studies show a rapid decline in frequency of use and consensus. This constitutes a warning that cultural value alone may not prevent decline without active conservation or enhancement measures [24].

5. Conclusion

This ethnocultural study highlights the significant influence of region, education level, ethnicity, and gender on the knowledge and use of *Coelocaryon oxycarpum* fruits in Côte d'Ivoire. More than half of surveyed households were familiar with the species, although only about one-third reported using it. Knowledge and use were strongly concentrated among indigenous groups (Koulango, Dida, Degha, Abron) and among women, who play a central role in domestic food systems.

The fruit's applications extend across food, medicinal, and cosmetic domains, with high consensus values particularly for culinary and therapeutic uses. These findings confirm the socio-cultural importance of *C. oxycarpum* and its potential as a functional food and health-promoting resource.

Given the species' underutilized and threatened status, future research should prioritize biochemical and nutritional analyses of the fruit, coupled with domestication and sustainable management strategies, to safeguard both the species and the indigenous knowledge systems associated with its use.

Compliance with ethical standards

Disclosure of conflict of interest

There is no conflict of interest.

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