World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(RESEARCH ARTICLE)

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Traditional Uses and Ethnobotanical Survey of the Fermented Fruit of *Coelocaryon oxycarpum* in Southern Côte d'Ivoire

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World Journal of Advanced Research and Reviews, 2025, 28(02), 288-299

Publication history: Received on 12 September 2025; revised on 19 October 2025; accepted on 22 October 2025

Article DOI: https://doi.org/10.30574/wjarr.2025.28.2.3586

Abstract

Background: *Coelocaryon oxycarpum* is used to varying degrees by populations in southern Côte d'Ivoire, where its importance in households is steadily increasing.

Objectives: This study aimed to document the ethnobotanical knowledge and traditional uses of the fermented fruit of *Coelocaryon oxycarpum* in three regions of southern Côte d'Ivoire (La Mé, Lagunes, and Agnéby-Tiassa).

Methods: A semi-structured survey was conducted with 405 participants using questionnaire forms.

Results: The results reveal a strong local knowledge of the fruit, which is used for both food and medicinal purposes. Traditional fermentation, carried out in closed pots or bags for 3 to 7 days, enhances the flavor and shelf life of the product. Respondents attributed several therapeutic properties to the fermented pulp, notably against hypertension, hemorrhoids, and cough.

Conclusions: These findings highlight the socio-cultural and medicinal value of *Coelocaryon oxycarpum* and call for biochemical characterization to scientifically validate the reported uses.

Keywords: Spice; *Coelocaryon oxycarpum*; Food Fermentation; Wild Plant; Traditional Condiment; Côte d'Ivoire

1. Introduction

The importance of wild plants for the diet of rural populations is widely recognized in tropical countries. Their role is unquestionable, as they are not only used in construction, carpentry, traditional medicine, and the production of local beverages, but also continue to contribute to poverty reduction and food security among forest populations in Central Africa. The edible parts include leaves, fruits, roots, stems, rhizomes, and bark. These plants constitute an essential nutritional source, improving the nutritional status of both rural and urban populations. They provide a valuable source of nutrients and thus contribute to enhancing the nutritional well-being of communities in both rural and urban settings [1]. Owing to their medicinal properties, they also serve as an alternative means of addressing chronic diseases and malnutrition [2].

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The valorization of fermented foods produced from low-cost substrates with appreciable nutritional value represents a promising approach. Such foods can help improve the diets of vulnerable populations and reduce malnutrition. This is the case with *Coelocaryon oxycarpum*, an edible plant more widely used in traditional medicine for relieving common ailments such as inflammatory diseases, asthma, pain, fever, wounds, or abscesses [3]. Although numerous studies on the ethnobotany of edible plants exist [4], such research is still at an early stage in some regions of Africa. Consequently, the diversity of species and the range of their uses among sociocultural groups remain poorly documented [5]. This is particularly true for fermented *Coelocaryon oxycarpum*, for which scientific information on knowledge and use of the fruit is still scarce.

This underlines the relevance of the present survey conducted in southern Côte d'Ivoire, specifically in the departments of Abidjan, Agboville, and Alépé. The aim of this study is to document the knowledge, uses, and virtues of the fermented fruit of *Coelocaryon oxycarpum*.

2. Materials and Methods

2.1. Study Material

This survey was carried out using a questionnaire designed with Sphinx Plus^2 v5 software.

2.2. Study site

The survey was conducted in southern Côte d'Ivoire, specifically in the regions of La Mé, Lagunes, and Agnéby-Tiassa. In the Agnéby-Tiassa region, the locality of Azaguié was visited. In the La Mé region, the localities of Montezo and Grand-Alépé were also explored. Finally, in the Lagunes region, the survey was conducted in Anyama-Ahouabo and Anyama-Adjamé. The selection of these three regions was guided by a preliminary survey conducted among some fruit consumers residing in Abidjan.

2.3. Questionnaire survey

Semi-structured interviews (individual and group) were conducted randomly between March and June 2023 in markets, households, and public places, with the aim of assessing ethnobotanical knowledge and traditional uses of the fermented fruit of *Coelocaryon oxycarpum*. The questionnaire consisted of 31 questions divided into three sections: (i) sociodemographic information (age, gender, occupation, ethnic affiliation), (ii) knowledge of the fruit (*Coelocaryon oxycarpum*), including vernacular names and modes of acquisition, and (iii) traditional uses, fermentation techniques, and associated therapeutic properties.

2.4. Sample size

$$n = \frac{t^2 \times p(1-p)}{e^2}$$

Due to the spatial distribution and the size of the study area, a subdivision was necessary. The sample size was estimated using the formula from [6]

With

n: required sample size,

t: 1.96 at a 95% confidence level,

e: margin of error (set at 0.05),

p: estimated proportion of the population familiar with the fruit of *Coelocaryon oxycarpum* (since p was unknown, p = 0.5 was used).

Thus, a minimum of 385 participants was required; considering a 5% non-response rate, the final sample was set at 405 individuals (135 per region). Participants were randomly selected in markets, households, and public places, ensuring the inclusion of both adult men and women (>18 years). Oral consent was obtained before each interview [7].

2.5. Data analysis

The data were analyzed using XLSTAT 2024 software. Comparisons between qualitative variables were performed using the Chi-square test (χ^2), with a significance level set at 5% ($p < 0.05$). In addition, multivariate analyses were conducted to further interpret the correlations between sociodemographic factors and uses.

3. Results

3.1. Sociodemographic profile of respondents

(Table 1) below presents the sociodemographic characteristics of the individuals surveyed. The results show that the majority of participants were women in the three regions studied: 58.00% in Agnéby-Tiassa, 64.24% in La Mé, and 71.72% in the Lagunes region.

Regarding occupation, agriculture emerged as the dominant activity in Agnéby-Tiassa (52.63%) and La Mé (33.11%), while in the Lagunes region, respondents were mainly traders (34.34%). Other socio-professional categories identified included civil servants, individuals engaged in small trades, and the unemployed.

From an ethnic standpoint, the survey revealed a predominance of the Akan group across all study areas: 96.49% in Agnéby-Tiassa, 90.07% in La Mé, and 76.77% in the Lagunes region. The Krou (0.00–11.11%) and Mandé (3.51–12.12%) groups were weakly represented in the different regions.

With regard to age distribution, the majority of respondents were over 45 years old: 59.65% in Agnéby-Tiassa, 59.60% in La Mé, and 38.39% in the Lagunes region.

Table 1 Sociodemographic characteristics

Characteristics (%)	**Region**		
	Agnéby Tiassa	La Mé	Lagunes
Gender			
M	42.00	35.76	28.28
F	58.00	64.24	71.72
Occupation			
Civil servant	1.75	3.31	6.06
Trader	19.30	17.22	34.34
Farmer	52.63	33.11	20.21
Small trade	10.53	17.88	9.09
Unemployed	15.79	28.48	30.30
Ethnic group			
Akan	96.49	90.07	76.77
Krou	0.00	0.00	11.11
Mandé	3.51	9.93	12.12
Age group			
[18–25 years]	3.51	5.30	12.12
[26–35 years]	10.52	10.60	14.14
[36–45 years]	26.32	24.50	35.35
Above 45	59.65	59.60	38.39

3.2. Knowledge of fermented *Coelocaryon oxycarpum* and vernacular names of the fruit

The level of knowledge of the fermented fruit of *Coelocaryon oxycarpum* by region is illustrated in Figure 1. This knowledge varied significantly (χ^2 = 70.895; p < 0.05) across regions: 51.69% in La Mé, 34.08% in the Lagunes, and 14.23% in Agnéby-Tiassa. Two vernacular names were mainly attributed to the fruit. All respondents (100%) referred to it as "Amassoba" in the Lagunes region, compared to 61.59% in La Mé. In contrast, the majority of respondents in Agnéby-Tiassa (68.42%) called it "Atchoko" (Table 2).

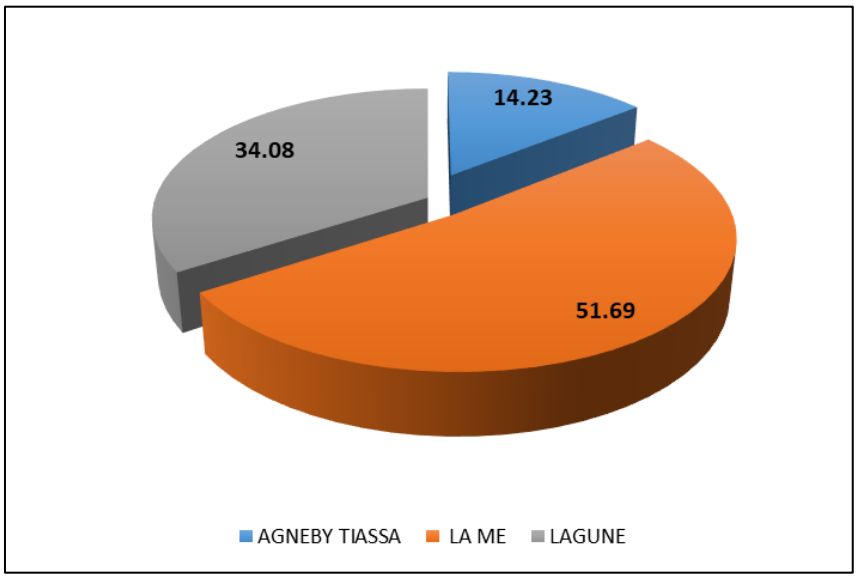

Figure 1 Knowledge of the fermented fruit of *Coelocaryon oxycarpum* by locality

Table 2 Vernacular name by region

Vernacular Name	Region				Chi-square test	
	La Mé	Lagunes	Agneby-Tiassa	χ2	df	*P*
Amassoba	61.59^{b}	100^{c}	31.58^{a}	70.895	2	<0.0001
Atchoko	38.41^{b}	0^{a}	68.42^{c}	70.95	2	<0.0001

Values sharing the same letter within the same row do not differ significantly at the 5% level according to the Chi-square test. χ^2: Chi-square, P: Probability value, df: Degree of freedom.

3.3. Harvesting period and collection method of *Coelocaryon oxycarpum* fruit

The harvesting period of *Coelocaryon oxycarpum* fruit varies by region, with a peak observed between June and July (Figure 2). Indeed, almost all respondents, regardless of their region of origin, indicated that this period corresponded to the time when the fruit is most available.

Furthermore, the survey revealed that in the La Mé region, most respondents obtained the fruit through both gathering and purchase, with a rate of 47.83%. In the Lagunes and Agnéby-Tiassa regions, most respondents obtained it mainly through purchase, with respective rates of 40.66% and 44.74% (Table 3).

Table 3 Collection methods of *Coelocaryon oxycarpum* fruit by region

Collection Methods	Region			Chi-square test		
	La mé	Lagune	Agnéby-Tiassa	χ2	df	*P*
Purchase (%)	13.77^{b}	40.66^{a}	44.74^{a}	26.711	2	<0,0001
Gathering and purchase (%)	47.83^{a}	30.77^{b}	15.79^{c}	15.687	2	<0,0001
Gathering (%)	38.40^{a}	28.57^{a}	39.47^{a}	2.679	2	0.262

Values sharing the same letter within the same row do not differ significantly at the 5% level according to the Chi-square test. χ^2: Chi-square, P: Probability value, df: Degree of freedom.

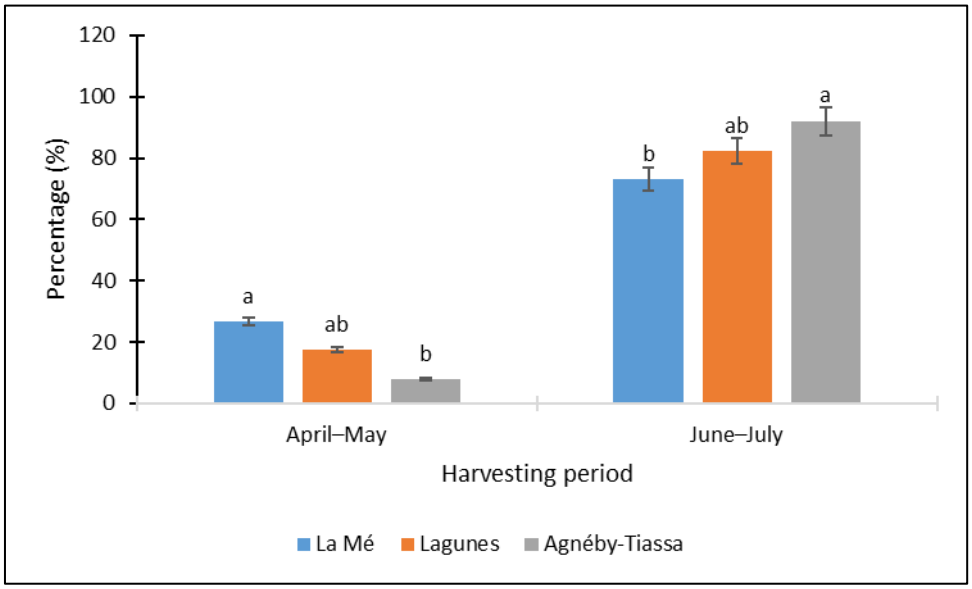

Figure 2 Harvesting period of *Coelocaryon oxycarpum* fruit

3.4. Field of use of the fermented fruit of *Coelocaryon oxycarpum* by region

The field of use of the fermented fruit of *Coelocaryon oxycarpum* showed no significant differences among the three regions studied (Figure 3). In all regions, the fruit was mainly used for both food and medicinal purposes, with proportions ranging from 43.96% to 65.79%. In contrast, exclusive medicinal use remained marginal, varying between 14.28% and 18.42% depending on the region.

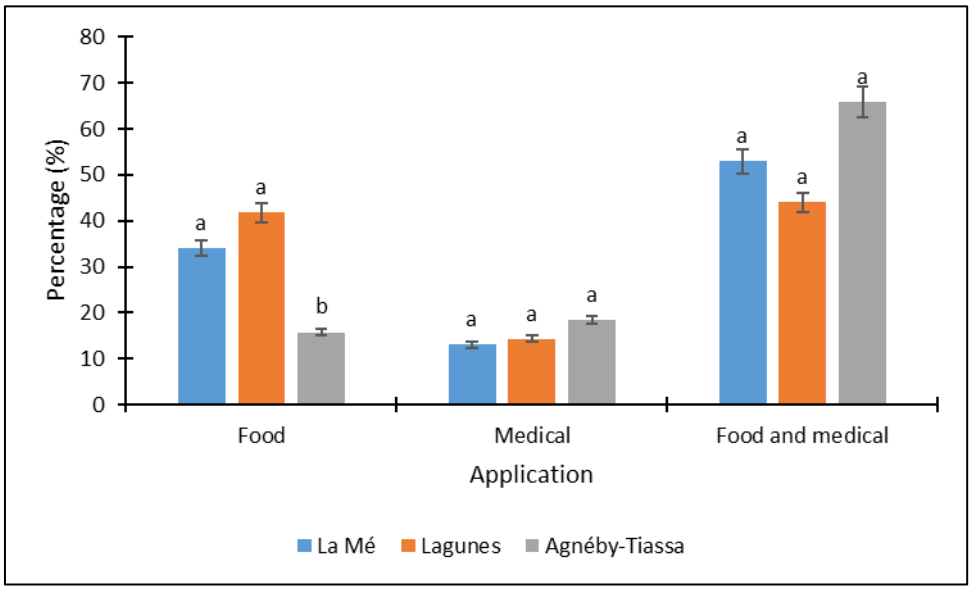

Figure 3 Field of use of the fermented fruit of *Coelocaryon oxycarpum* by region

3.5. Mode and forms of consumption

The mode of consumption of the fermented fruit of *Coelocaryon oxycarpum* was analyzed by region (Figure 4). The survey results show that, regardless of the region, the fruit is mainly used as a condiment or seasoning in dishes. In the Lagunes and La Mé regions, the powdered form is the most commonly consumed, with respective rates of 53.85% and 53.62%. However, in the Agnéby-Tiassa region, consumption is mainly based on fresh pulp, with a rate of 55.26%. Dried

pulp, on the other hand, is the least common form of consumption, with proportions ranging from 2.18% to 10.53% across the three regions (Table 4).

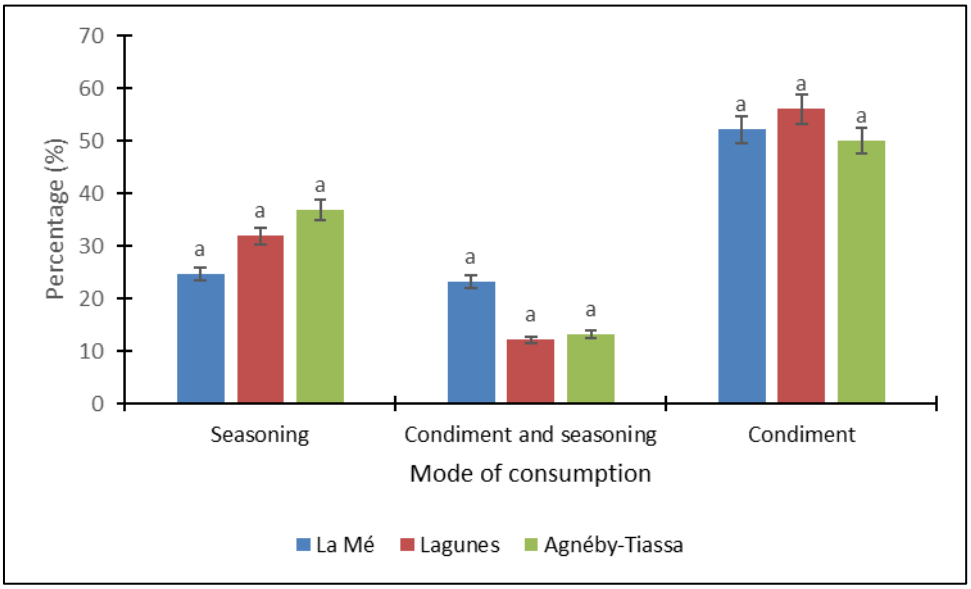

Figure 4 Mode of consumption by region

Table 4 Preferred form of fruit consumption by region

Form	Region			Chi-square test		
	Lagunes	La Mé	Agneby-Tiassa	$\chi 2$	df	*P*
Fresh pulp	36.26[a]	44.2[a]	55.26[a]	4.096	2	0.129
Powdered pulp	53.85[a]	53.62[a]	34.21[a]	4.961	2	0.084
Dried pulp	9.89[a]	2.18[b]	10.53[a]	7.413	2	<0.05

Values sharing the same letter within the same row do not differ significantly at the 5% level according to the Chi-square test. χ^2: Chi-square, P: Probability value, df: Degree of freedom.

3.6. Sensory preferences and fermentation practices of *Coelocaryon oxycarpum* fruit by region

Respondents indicated that the fermentation of *Coelocaryon oxycarpum* had a beneficial effect on certain organoleptic properties, particularly flavor and odor. However, regional differences were notable: the majority of respondents from La Mé and Lagunes appreciated the fermented fruit for both its flavor and odor, while those from the Agnéby-Tiassa region (68.42%) valued it mainly for its flavor only (Table 5).

With regard to fermentation precautions and methods, a common practice was identified: most respondents reported allowing the fruit to soften completely before use, with rates varying by region (Agnéby-Tiassa: 81.58%; La Mé: 56.52%; Lagunes: 60.44%). Furthermore, regardless of the region, the most widespread technique consisted of fermenting the fruits in closed bags.

The fermentation duration was also evaluated. It was most often 5 to 7 days, a practice reported by more than 64% of respondents, carried out in closed bags or airtight pots (Figure 5). Conversely, a minority (28.95% to 35.5%) reported a shorter duration, ranging from 3 to 4 days.

Table 5 Reasons and Method of Fermentation

	Regions			Chi-square test		
	La Mé	Lagune	Agneby-Tiassa	χ2	df	p-value
Reason for fermentation						
Flavor	35.51[b]	36.26[b]	68.42[a]	14.404	2	<0.001
Flavor and Odor	37.68[a]	38.46[a]	15.79[b]	7.092	2.000	<0.05
Odor	26.81[a]	25.28[a]	15.79[a]	1.968	2.000	0.374
Precaution						
None	18.12[a]	25.27[ab]	13.16[a]	3.014	2	0.222
Firm texture	25.36[a]	14.29[b]	5.26[a]	9.697	2	<0.01
Complete softening	56.52[a]	60.44[b]	81.58[a]	7.951	2	<0.05
Fermentation site						
Closed bag	60.14[a]	61.54[a]	73.68[a]	2.391	2	0.302
Closed pot	39.86[a]	38.46[a]	26.32[a]	2.391	2	0.302

Values sharing the same letter within the same row do not differ significantly at the 5% level according to the Chi-square test. χ^2: Chi-square, P: Probability value, df: Degree of freedom.

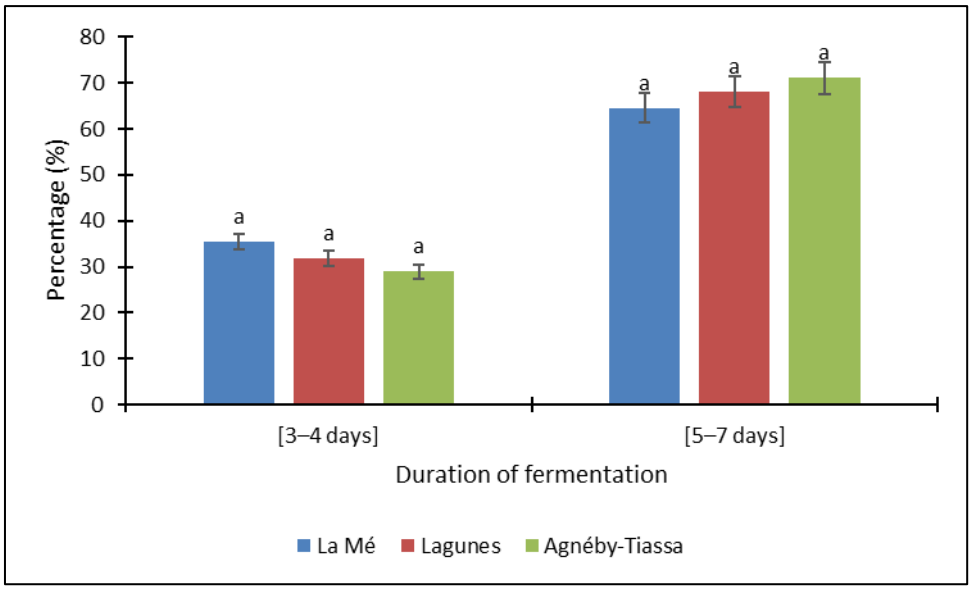

Figure 5 Duration of whole fruit fermentation by region

3.7. Therapeutic properties by region

The fruit of *Coelocaryon oxycarpum* is mainly used in the study areas for the treatment of hemorrhoids and hypertension. However, in the La Mé region, it is more frequently employed as a postpartum tonic, as well as for relieving hip pain and cough. In the Agnéby and La Mé regions, it is commonly used to treat abdominal wounds. In contrast, in the Lagunes region, *Coelocaryon oxycarpum* is especially renowned for its aphrodisiac properties (Figure 6).

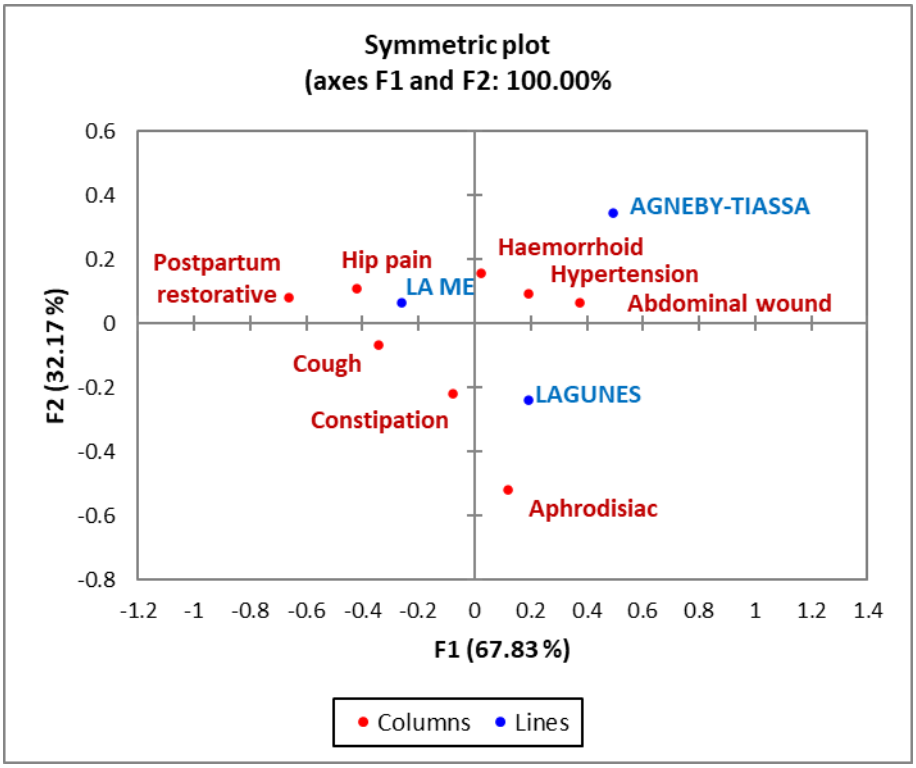

Figure 6 Therapeutic properties by region

3.8. Traditional process of producing fermented *Coelocaryon oxycarpum* powder

The analysis of the production diagram (Figure 7) highlights the process of transforming *Coelocaryon oxycarpum* fruit into fermented powder. This process follows a sequence of steps, starting from the harvesting of ripe fruits to the packaging of the final product.

Across all the regions studied, the traditional process of producing fermented powder is similar, with one notable exception. In the La Mé and Lagunes regions, most respondents reported fermenting, grinding, and then pressing the liquid contained in the ground pulp before proceeding with sun-drying. In contrast, in the Agnéby-Tiassa region, most respondents directly sun-dried the ground pulp without prior pressing.

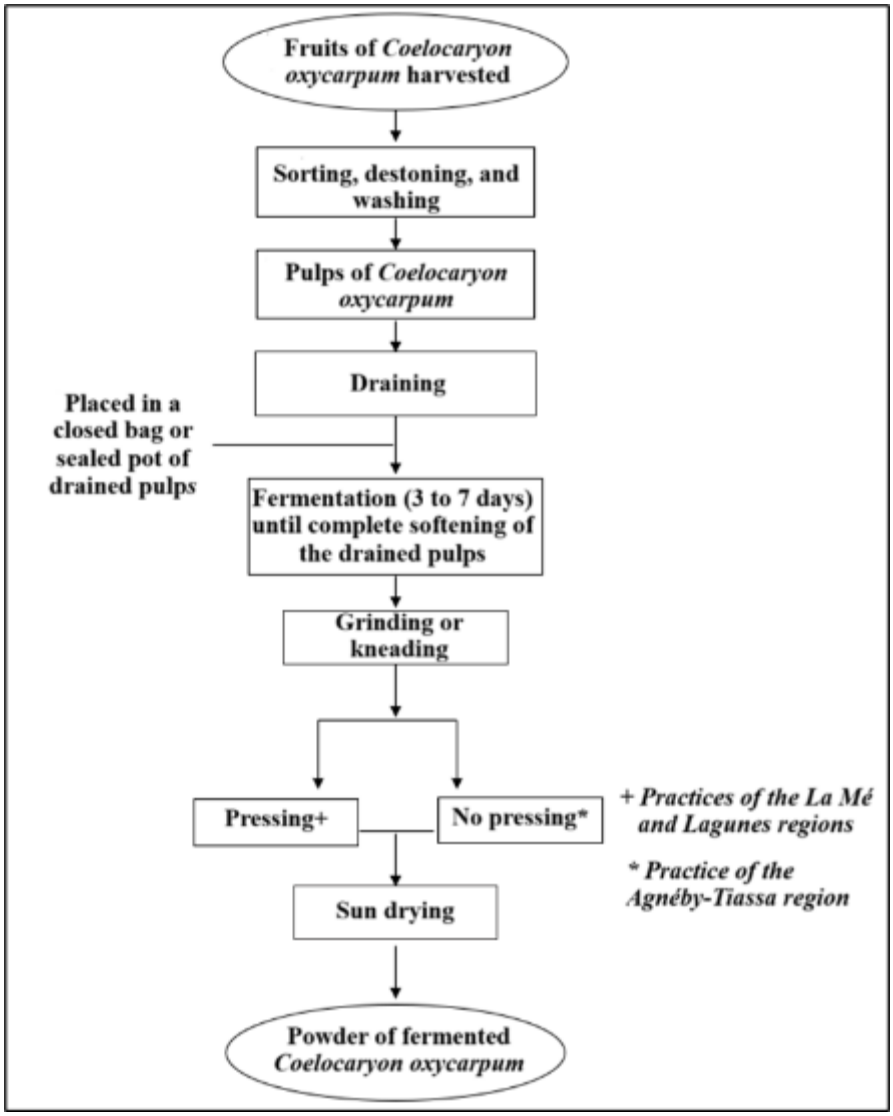

Figure 7 Processing Method of Fermented *Coelocaryon oxycarpum* Fruit

3.9. Shelf life of fermented *Coelocaryon oxycarpum* powder

With regard to the shelf life of fermented *Coelocaryon oxycarpum* powder, the majority of respondents (70.33–81.58%) reported storing the powder for several years, while a minority (18.42–26.81%) kept it for only a few months (Figure 8).

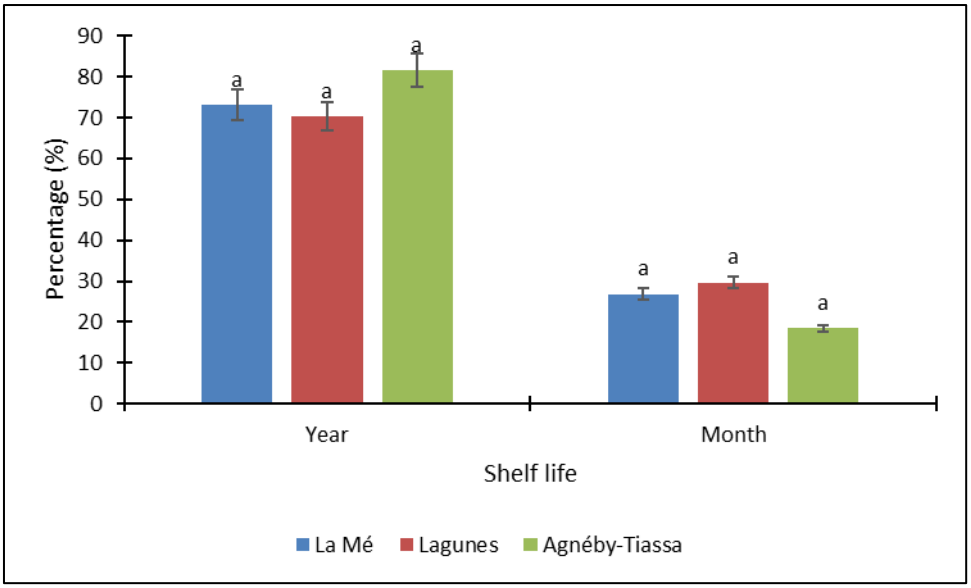

Figure 8 Storage duration of powdered pulp (spice)

4. Discussion

The findings of this study highlight the dual cultural and nutritional importance of *Coelocaryon oxycarpum* in southern Côte d'Ivoire. The strong representation of women and elderly respondents confirms their major role in the transmission and preservation of ethnobotanical knowledge. This observation is consistent with previous reports indicating that women play a central role in the management of plant resources and often possess in-depth knowledge of the medicinal uses of plants [8]. Similarly, N'zebo et al. [9] noted that elderly people have a higher level of knowledge, linked to their status as custodians of ancestral wisdom, transmitted mainly through oral tradition.

Furthermore, the study reveals that the Akan ethnic groups stand out for their greater mastery of the uses of this fermented fruit compared to other groups. This trend corroborates the results of [10], who observed that the Akan people of central Côte d'Ivoire were the main consumers of Hydrocotyle bonariensis. Such specificity may be related to the local availability of species, as highlighted by [11], who argued that the abundance of a plant resource in a given area favors its knowledge and utilization.

With regard to local names, the survey indicates that in the study areas, the fruit is mainly referred to as "Amassoba" and "Atchoko." The predominance of the Akan population in these regions explains the widespread use of these vernacular names, in line with the observations of [12], who reported other appellations in the northeast of the country. These linguistic variations reflect the ethno-cultural anchoring of both food and therapeutic uses associated with the fruit.

On the culinary side, participants demonstrated strong knowledge of the fermented form, explaining the marked preference for fermented pulp—consumed fresh or in powdered form—over dried pulp. Traditional fermentation not only enhances flavor but also extends shelf life, enabling the fermented powder to be stored and used as a condiment for several years. These results are consistent with those of [13], who emphasize the nutritional and functional interest of fermented foods as sources of probiotics and unique aromatic compounds.

The therapeutic properties attributed to the fermented fruit are numerous: treatment of hypertension, hemorrhoids, and abdominal wounds; relief of pain (cough, hip pain); libido stimulation; and postpartum toning. These traditional uses echo practices observed in other contexts, notably in Togo, where local plants are employed for similar purposes [14]. However, it is necessary to subject this empirical knowledge to scientific validation through rigorous biochemical and pharmacological analyses.

Finally, the analysis of the production diagram highlights a structured process of transforming pulp into fermented powder. Fermentation, carried out over 3 to 7 days in airtight containers, is the key step that imparts the product's organoleptic profile (flavor and odor). The diagram also reveals technical variability related to pressing, which may or may not be performed after grinding, reflecting adaptations of practices to local preferences. The drying stage appears

crucial for product stability, although it requires improvements to reduce contamination risks. Drying also contributes to the intensification of aromas, through the concentration of volatile compounds responsible for the characteristic odor [15]. According to respondents, the resulting powder can be stored for several years, which may be explained by the inhibitory effect of drying on microorganisms responsible for spoilage.

5. Conclusion

This study highlighted the importance of *Coelocaryon oxycarpum* in the dietary and medicinal practices of southern Côte d'Ivoire. The fermented fruit, mainly processed into powder, is widely used as a traditional condiment, carrying strong cultural and socio-economic value. Its reported therapeutic uses, particularly in the treatment of hypertension, hemorrhoids, and cough, emphasize its central role in traditional medicine.

However, these findings are based on declarative knowledge and remain limited to three regions. They deserve to be further explored and strengthened through biochemical and pharmacological analyses in order to identify the bioactive compounds, assess their safety, and scientifically confirm the attributed properties. Such an approach represents a crucial step toward the sustainable valorization of this local resource.

Compliance with ethical standards

Disclosure of conflict of interest

All other authors report no conflicts of interest.

Data availability

Data-access procedures can be provided upon request.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

[1] A. Aubréville, CTFT, La flore forestière de la Côte d'Ivoire. (3 tomes). Centre technique forestier tropical (CTFT), 1959.

[2] M. Conrad, Rosmarinus officinalis L. contribution à l'étude de la flore en Corse. Le Monde des Plantes, Intermédiaire des botanistes, Centre Régional de Phytosociologie / Conservatoire Botanique National de Bailleul - Art. n°3383, (431) (1988) 23-24

[3] J.R.S. Tabuti, P.V. Damme, Review of indigenous knowledge in Uganda: implications for its promotion, Afr. Focus 25 (1) (2012) 29–38, https://doi.org/10.21825/af.v25i1.4961.

[4] A.I. Saraka, D. Camara, K. Bene, G.N. Zirihi, Enquête ethnobotanique sur les euphorbiaceae médicinales utilisées chez les baoulé du district de Yamoussoukro (Côte d'Ivoire), J. Appl. Biosci. 126 (2018.) 12734-12748, https://dx.doi.org/10.4314/jab.v126i1.11.

[5] A. Atato, K. Wala, K. Batawila, N. Lamien, K. Akpagana, Edible Wild Fruit Highly Consumed during Food Shortage Period in Togo: State of Knowledge and Conservation Status. J. Life Sci. 5 (2011) 1046-1057.

[6] FAO, Conduite de petites enquêtes nutritionnelles Manuel de terrain, Numéro 5 de Nutrition et agriculture, Rome, 1992.

[7] Y.H. Kouadio, K.N. Kouassi, Y. Konan, Y.D. N'Dri, N.G. Amani, Impacts of Field Harvesting and Conservation Practices on the Physical Quality of Yam "Kponan" (Dioscorea cayenensis-rotundata) of Côte d'Ivoire, Open J. Appl. Sci. 12 12 (2022) 1979-1994, https://doi.org/10.4236/ojapps.2022.1212138

[8] A. Alaoui, S. Laaribya, N. Gmira, F. Benchekroun. Le rôle de la femme dans le développement local et la préservation des ressources foresters : Cas de la commune de Sehoul au Maroc. Revue de la forêt méditerranéenne, 33 (4) (2012) 369-378.

[9] N.J-M. N'zebo, K.M. DJE, A.P. AHI, État des connaissances et usages traditionnels des fruits de Tetrapleura tetraptera ((Schumach. & Thonn.) Taub., 1891), plante spontanée aromatique alimentaire du sud-est de la Côte d'Ivoire. J. Anim. Plant Sci. 38 (1) (2018) 6190-6205.

[10] E.D. Monyn, A. Bakayoko, F. H. Tra Bi, K. Yao, M. W. Kone. Niveau de connaissance et composition minérale de Hydrocotyle bonariensis Lam. (Araliaceae), une plante utilisée dans les ménages du District d'Abidjan (Côte d'Ivoire). Int. J. Biol. Chem. Sci. 10 (5) (2016) 2046-2061, http://dx.doi.org/10.4314/ijbcs.v10i5.9.

[11] L. Traoré, I. Ouedraogo, A. Ouedraogo, A. Thiombiano. 2011. Perceptions, usages et vulnérabilité des ressources végétales ligneuses dans le Sud-Ouest du Burkina Faso. Int. J. Biol. Chem. Sci., 5(1): 258-278. http://dx.doi.org/10.4314/ijbcs. v5i1.68103.

[12] N.D. Ouattara, E. Gaille, F. W. Stauffer, A. Bakayoko, (2016). Diversité floristique et ethnobotanique des plantes sauvages comestibles dans le Département de Bondoukou (Nord- Est de la Côte d'Ivoire). J. Appl. Biosci. 98, 9284-9300, https://doi.org/10.4314/jab.v98i1.5.

[13] M.R. Swain, M. Anandharaj, R. C. Ray, R. P. Rani, Fermented fruits and vegetables of Asia: A potential source of probiotics. Biotechnol Res Int. (2014) 250424. https://doi.org/10.1155/2014/250424.

[14] S. Effoe, E.H. Gbekley, M. Mélila, A. Aban, T. Tchacondo, E. Osseyi, D. S. Karou, K. Kokou, Etude ethnobotanique de certaines plantes alimentaires utilisées en médecine traditionnelle dans la région maritime du Togo. Int. J. Biol. Chem. Sci. 14(8): 2837-2853, https://dx.doi.org/10.4314/ijbcs.v14i8.15.

[15] A.C. Aprotosoaie, S.V. Luca, A. Miron, Flavor Chemistry of Cocoa and Cocoa Products—An Overview, Compr. Rev. Food Sci. Food Saf. 15 (1) (2016) 73-91, https://doi.org/10.1111/1541-4337.12180