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RESEARCH ARTICLE

A STUDY OF THE FACTORS INFLUENCING THE CONSUMPTION OF RAPHIA SESE DE WILD FRUIT PULP IN THE CITY OF KIKWIT IN DR CONGO: EXAMINING THE LINK BETWEEN ITS TRADITIONAL MEDICINAL USES AND ITS ROLE IN URBAN NUTRITION

¹Balowa Tshibuabua Clémence, ¹Balow'a Kalonji Kamuna Ignace and
²Kodondi Kule-Koto Fridolin

¹Higher Institute of Medical Techniques of Kinshasa, Department of Food Science, Nutrition and Dietetics, Democratic Republic of the Congo; ²University of Kinshasa, Faculty of Biopharmaceutical and Food Sciences, Democratic Republic of the Congo

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*Corresponding author:

Balowa Tshibuabua Clémence

ABSTRACT

The expansion of local resources is one of the greatest challenges to food security in Africa. Among these, the pulp of the *R. sese* De Wild fruit is practically considered an important staple food in certain communities. The objective of this study is to assess consumption patterns, sociodemographic indicators, and perceptions of this pulp in the city of Kikwit. A descriptive and analytical cross-sectional study was conducted on 320 households selected through stratified sampling. We collected data using a face-to-face questionnaire and analyzed the collected data using descriptive and inferential statistics. Statistical analyses showed that most respondents were over 30 years old (90.3%) and female (72.8%). The fruit in question is known to the majority of respondents (88.8%) and is consumed by most of them (87.2%); nearly half of the respondents (47.5%) consume it regularly. The pulp is primarily used as food (95%), but also as medicine (90%) and for cultural reasons, including in the production of traditional wine (70%). The main reasons for consumption include regulating blood sugar levels (88.8%), treating hepatitis (34.4%), and treating spleen disorders (31.6%). Data from statistical analyses revealed statistically significant correlations between knowledge of and consumption of the pulp under study and several sociodemographic variables such as gender, educational level, occupation, and household size ($p < 0.05$). Statistics show as well as that the likelihood of consuming this pulp is 12.37 times higher among patients with spleen disorders and 5.2 times higher among patients with diabetes. In summary, the pulp under study represents an important local food resource known for its use and cultural significance. Nevertheless, its nutritional properties remain unexplored. Its promotion could contribute to improving food and nutritional security in urban areas.

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INTRODUCTION

Local plant resources remain important for ensuring food security for populations in tropical Africa, particularly in contexts where access to industrial foods is limited. Among these, palms of the genus *Raphia* play an essential role in traditional socio-economic systems. Some of these are used for their fiber content, fermented sap, wood, and fruits, which are considered indispensable sources of nutrients. Although little research has been conducted on it, the pulp of the *R. sese* De Wild fruit has attracted significant scientific interest due to its nutritional value and its use in the diet in several rural and urban areas of Central and West Africa. However, the scientific literature contains little research focused on specific urban settings such as the city of Kikwit, where dietary practices remain influenced by socioeconomic, cultural, and environmental factors. (Ougbuagu, 2008) demonstrated that this pulp is consumed in certain regions of Africa and can be used for both human and animal consumption due to its high nutritional value. It contains several vitamins, including vitamin E and niacin, as well as phytochemicals such as flavonoids, phenols, and saponins. It is also low in fat, which confirms its edibility after proper preparation. The pulp is richer in essential nutrients such as protein, carbohydrates, and fiber ; it contains minerals such as potassium, calcium, and zinc, as well as vitamin C, which confirms its value as a local food source (Edem et al., 1984). However, the pulp also contains antinutritional factors such as

tannins, hydrocyanic acid, oxalates, and phytates, whose concentrations decrease after cooking, which explains the traditional processing practices prior to consumption (Edem et al., 1984 ; Blombery & Rodd, 1983). On the other hand, cooking causes a decrease in some nutrients, such as vitamin C and carotene, but improves food safety by reducing the concentration of antinutritional and toxic compounds (Edem et al., 1984). Experimental studies on the consumption of extracts from this pulp have shown quantifiable physiological effects in animals (on lipid profiles). These findings illustrate that human consumption, practiced in several African societies, is not merely cultural but also likely to have nutritional and metabolic consequences. The city of Kikwit is a major urban center with strong links to rural areas, which contributes to the circulation of non-timber forest products, including the fruits of the pulp in question. In this context, this pulp is :

- An accessible food source
- A culturally valued product
- A seasonal nutritional supplement.

However, despite this likelihood of use, no systematic study has documented :

The frequency of consumption

Preparation methods

Socioeconomic determinants

The local population's nutritional perception of this product. This lack of scientific data creates a gap in our understanding of local urban food systems. Research highlights the vital importance of *Raphia sese De Wild* fruit pulp as a multifaceted resource in the city of Kikwit. Nevertheless, research remains focused on chemical composition or experimental studies, leaving little room for the analysis of actual consumption practices in specific urban environments. Thus, the study of the consumption of *R. sese De Wild* fruit pulp in the city of Kikwit is part of a relevant effort to fill this data gap, document the local dietary behaviors of its inhabitants, and better understand the role of this resource in community nutrition.

METHODS

Study Type and Setting

The study will be a **descriptive and analytical cross-sectional** study, aimed at evaluating dietary consumption practices related to the fruit pulp under study.

•**Quantitative approach** : estimation of frequency, patterns, and determinants of consumption

The study will be conducted in various representative neighborhoods of the city to cover diverse socioeconomic categories.

Study Population

Target population

All households residing in the study area.

Inclusion criteria

- Adults (≥ 18 years) responsible for food preparation or knowledgeable about household habits
- Residents of the area for at least 6 months
- Signed informed consent

Exclusion criteria

- Refusal to participate
- Inability to complete the questionnaire

Sampling methods

Sample size

Calculated using the standard formula for prevalence surveys :

$$n = \frac{Z^2 \times p(1 - p)}{d^2}$$

Where :

- $Z = 1.96$ (95% confidence level)
- P = estimated proportion of consumers (if unknown : 0.5)
- d = desired precision (e.g., 0.05)

A 10% margin of error will be added to account for non-response.

Sampling technique

- Stratification by neighborhood
- Random selection of households within each stratum
- Systematic or cluster sampling possible depending on accessibility

Data collections techniques and tools

Structured questionnaire

Administered face-to-face, including :

- Socio-demographic characteristics
- Product knowledge
- Frequency of consumption
- Culinary forms used
- Amount consumed
- Season of availability
- Motivations and constraints
- Perceived health effects

RESULTS

DESCRIPTIVE RESULTS

Table I. Distribution of respondents by demographic characteristics

Parameters (n=320)	Frequency (%)	Mean \pm Standard Deviation
1 Age (years)		34.43 \pm 5.97 years
< 30	31(9.7)	
> 30	289 (90.3)	
2 Gender		
Female	233(72.8)	
Male	87(27.2)	
3 Marital status		
Married	73 (22.8)	
Unmarried	247 (77.2)	
4 Household size (persons)		
< 5	59 (18.4)	
> 5	261(81.6)	

The results in Table I indicate that 90.3% of participants were over 30 years old, with a mean age of 34.43 ± 5.97 years. Regarding gender, 72.8% of participants were female. As for marital status, the results show that 22.8% of respondents were married. The same table reports that 81.6% of participants lived in households with more than five people.

Table II. Distribution of Respondents by Social Characteristics

Parameters (n=320)	Frequency (%)
1 Educational level	
High	306 (95.6)
Low	14(4.4)
2 Occupation	
Unemployed	105(32.8)
Employed	215(67.2)
3 Religion	
Catholic	219 (68.4)
Non-Catholic	101 (31.6)

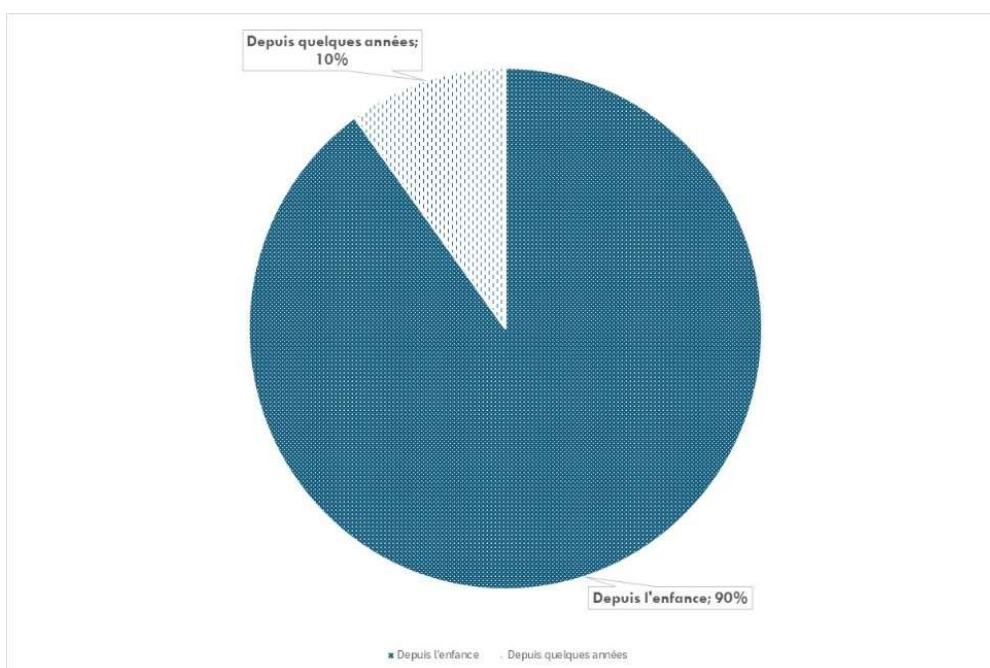
Table II presents the distribution of respondents according to certain social characteristics.

The results indicate that 95.6% of respondents had a high level of education. Regarding occupation, 67.2% of respondents were employed. Regarding religion, the results show that 68.4% of participants were Catholic

Table III : Knowledge of the pulp of the *R. sese* De Wild fruit

Parameter (n=320)	Frequency (%)
Knowledge of the pulp of the <i>Raphia sese</i> De Wild fruit	
No	36 (11.3)
Yes	284 (88.8)

Table III shows that 88.8% of respondents reported being familiar with the pulp of the *R. sese* De Wild fruit. Figure 1 illustrates the length of time respondents have been familiar with the pulp of *the R. sese* De Wild fruit. The results of this figure indicate that 90% of participants have been familiar with the fruit in question since childhood.



Graph 1 : Time elapsed since becoming familiar with the pulp of the *Raphia sese* De Wild fruit

Figure 2 presents the various information channels regarding the fruit of *R. sese* De Wild. The results show that parents (90%), community radio (80%), and neighbors and/or friends (60%) were the main sources of information for respondents regarding the fruit under study.

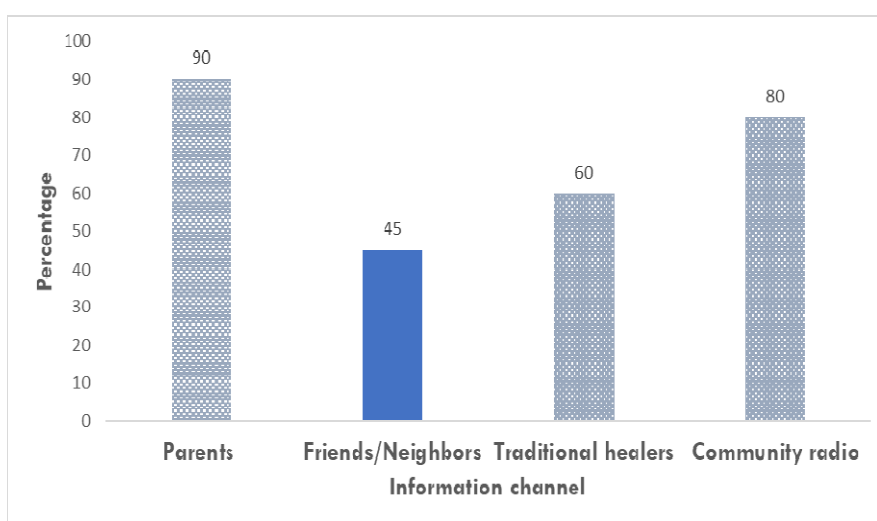


Figure 2. Channels through which respondents learned about the pulp of the *Raphia sese* De Wild fruit

The results in Figure 3 below show that food consumption (95%), medicinal use of the pulp (90%), and Raphia wine production (70%) were the various ways respondents used the pulp of the *R. sese* De Wild fruit.

Figure 3 presents the nature of the pulp's use. The results show that food use (95%), medicinal use (90%), and wine production (70%) constitute the different ways this pulp is used in this study.

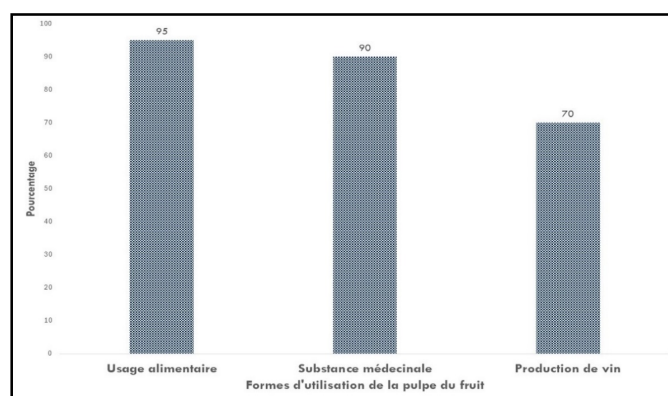


Figure 3. Uses of the pulp of the *Raphia sese* De Wild fruit

Table IV : Knowledge of the reasons for consuming the pulp of *R. sese* De Wild fruit

Parameter (n=320)	Frequency (%)
Knowledge of reasons for consuming the pulp of <i>R. sese</i> De Wild fruit	
No	10 (3.1)
Yes	310 (96.9)

Table IV reveals that 96.9% of respondents reported having a reason for consuming the pulp of the *R. sese* De Wild fruit. Figure 4 below shows that the pulp of the fruit under study was most commonly consumed as a medicinal substance used in the treatment of diabetes (88.8%), hepatitis (34.4%), yellow fever (34.7%), and spleen disorders (31.6%).

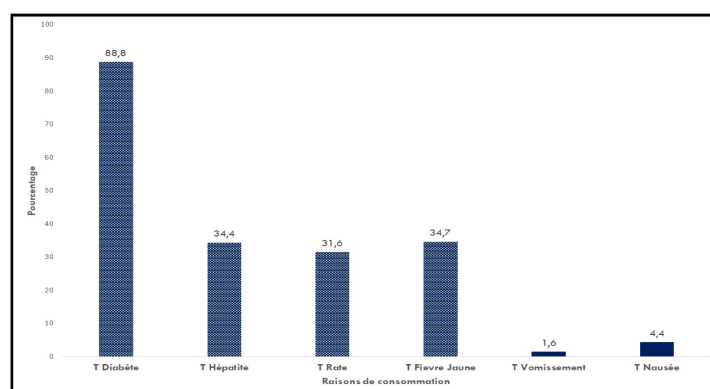


Figure 4 : Reasons for consuming the pulp of *Raphia sese* De Wild fruit

Table V : Consumption of the pulp of the *R. sese* De Wild fruit

Parameters (n=320)	Frequency (%)
1 Being accustomed to consuming the pulp of <i>R. sese</i> De Wild fruit	
No	41 (12.8)
Yes	279(87.2)
2 Knowledge of edible parts	
Fruit pulp	295(92.2)
Pith of the trunk	7(2.2)
Seeds	18(5.6)
3 Weekly consumption frequency	
Once a week	9(2.8)
2 times a week	53(16.6)
3 times a week	106.0(33.1)
Every day of the week	152.0 (47.5)
4 Source of supply	
Foraging in the bush	2.0(0.6)
The neighborhood market	318(99.4)

The results in Table V regarding the consumption of the pulp of the studied fruit show that 87.2% of participants were in the habit of consuming the pulp of *R. sese* De Wild and, and that 47.5% of respondents consumed it every day of the week. Regarding knowledge of edible parts and the place of purchase, the results indicate that the fruit pulp (92.2%) was the only edible part and

that 99.4% of participants purchased it at the neighborhood market. Figure 5 below shows that 85.3% of respondents used the fruit pulp to season meat sauce, while 80.3% of participants incorporated it into vegetables during preparation.

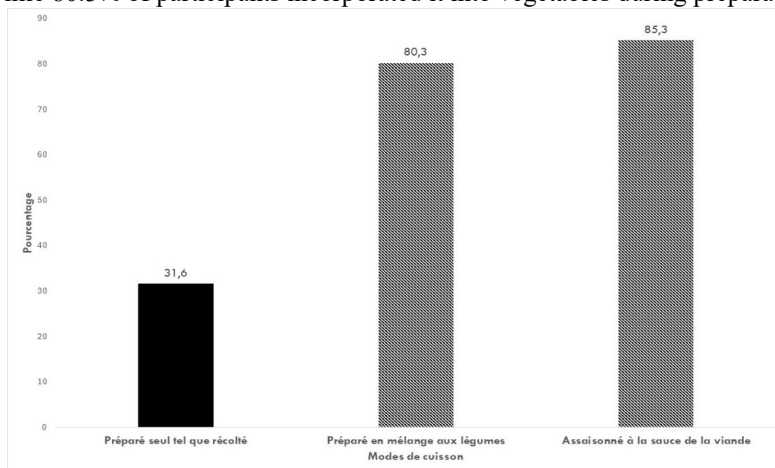


Figure 5. Cooking methods for the pulp of the *Raphia sese* De Wild fruit

Table VI : Awareness of Nutritional Benefits and Financial Expenditure for Purchasing the Studied Fruit Pulp

Parameters (n=320)	Frequency (%)
1 Knowledge of the nutritional benefits of the pulp of the fruit under study	
No	235 (73.4)
Yes	85 (26.6)
2 Financial expenditure on purchasing the pulp of the fruit under study	
< 3,000 FC	231 (72.2)
> 3,000 FC	89(27.8)
3 Taste assessment of the pulp of the fruit under study	
Excellent	315(98.4)
Good	5(1.6)

Table VI shows that only 26.6% of respondents were aware of the nutritional benefits of the pulp of the fruit under study, 27.8% of participants spent more than 3,000 FC per week on purchasing the pulp of the fruit under study, and 98.4% of respondents rated the taste of the pulp of *R. sese* De Wild as excellent.

ANALYTICAL RESULTS

Table VII : Analysis of the mean age according to sociodemographic characteristics

Parameters (n=320)	Sample	Mean age ± Standard deviation (years)	p-Value Significance
1 Gender			
Female	233	31.65±1.97	0.0001 S
Male	87	41.90±6.67	
2 Educational level			
Low	14	34.17±5.32	0.106 NS
High	306	40.29±13.15	
3 Occupation			
No occupation	215	32.54±4.59	0.0001 S
With occupation	105	38.30±6.61	
4 Marital status			
Unmarried	247	34.92±5.61	0.007 S
Married	73	32.79±6.87	
5 Household size			
< 5 people	59	34.19±3.79	0.631 NS
> 5 people	261	34.49±6.37	
6 Religion			
Catholic	219	33.95±5.22	0.083 NS
Non-Catholic	101	35.40±7.23	

Table VII shows a statistically significant difference ($p < 0.05$) in the mean age among participants based on gender, occupation, and marital status. This indicates that males had a mean age of 41.90 ± 6.67 years, which was higher than that of females, respondents who were employed had a higher average age (38.30 ± 6.61 years) compared to the unemployed, and unmarried individuals had a higher average age (34.92 ± 5.61 years) than married individuals.

Table VIII shows a statistically significant difference ($p < 0.05$) in average food expenditure by gender. Men have a higher average food expenditure (3137.93 ± 1304.5) than women (2834.76 ± 827.6). With regard to educational level, a statistically significant difference ($p < 0.05$) is observed. Participants with a low educational level have a significantly higher average food expenditure (3571.43 ± 937.61) than those with a high educational level (2887.25 ± 980.73).

Table VIII : Analysis of average food expenditure (FC) for the purchase of wild game meat based on sociodemographic characteristics

Parameters (n=320)	Sample (n=320)	Average age \pm SD (in Congolese francs)	Significance p-value
1 Gender			
Female	233	2834.76 \pm 827.6	0.046 S
Male	87	3137.93 \pm 1304.5	
2 Educational level			
Low	14	3571.43 \pm 937.61	0.011 S
High	306	2887.25 \pm 980.73	
3 Occupation			
No occupation	215	2909.30 \pm 887.30	0.853 NS
With occupation	105	2933.33 \pm 1170.69	
4 Marital status			
Unmarried	247	2900.81 \pm 1076.01	0.465 NS
Married	73	2,972.60 \pm 600.29	
5 Household size			
< 5 people	59	2,871.65 \pm 944.52	0.083 NS
> 5 people	261	3,118.64 \pm 1,145.19	
6 Religion			
Catholic	219	2885.84 \pm 883.45	0.453 NS
Non-Catholic	101	2985.15 \pm 1184.1	

Table IX : Relationship between the habit of consuming *R. sese* De Wild and the sociodemographic characteristics of the respondents

Parameters	Sample size	Habit of consuming <i>R. sese</i> De Wild		Test Chi-square	p-value
		No (%)	Yes (%)		
1 Sex					
Feminine	233	41 (17.6)	192 (82.4)	16.02(*)	0.000 S
Male	87	0 (0)	87 (100)		
2 Age (years)					
< 30	31	2 (6.5)	29 (93.5)	0.693(*)	0.397 NS
> 30	289	39 (13.5)	250 (86.5)		
3 Educational level					
High	306	32 (10.5)	274 (89.5)	34.72	0.000 S
Low	14	9 (64.3)	5 (35.7)		
4 Occupation					
With employment	105	2 (1.9)	103 (98.1)	15.22 (*)	0.000 S
Unemployed	215	39 (18.1)	176 (81.9)		
5 Religion					
Catholic	219	28 (12.8)	191 (87.2)	0.0005	0.983 NS
Non-Catholic	101	13 (12.9)	88 (87.1)		
6 Household size					
< 5 people	59	19 (32.2)	40 (67.8)	24.35	0.000 S
> 5 people	261	22 (8.4)	239 (91.6)		
7 Marital status					
Married	73	6 (8.2)	67 (91.8)	1.79	0.181 NS
Unmarried	247	35 (14.2)	212 (85.8)		

Legend: (*) = Fisher's Exact Test

Table IX shows that the habit of consuming *R. sese* De Wild was significantly associated with gender, educational level, occupation, and household size.

Table X : Relationship between the habit of consuming *R. sese* de Wild pulp and knowledge of its use in treating illnesses

Variables	Habit of consuming <i>R. sese</i> de Wild pulp		Chi-Square Test	p-Value
	No n(%)	Yes n(%)		
1. Diabetes treatment			3.215	0.073
Yes	33 (11.6)	251 (88.4)		
No	8 (22.2)	28(77.8)		
2. Hepatitis treatment			1.892	0.169
Yes	18(16.4)	92 (83.6)		
No	23(11)	187(89)		
3. Treatment of the spleen			0.145	0.703
Yes	14(13.9)	87(86.1)		
No	27(12.3)	192(87.7)		
4. Treatment of vomiting			0.746	0.501
Yes	0(0)	5(100)		
No	41(13)	274(87)		
5. Treatment of nausea			11,830	0.001
Yes	6 (42.9)	8 (57.1)		
No	35 (11.4)	271(88.6)		
6. Treatment of yellow fever			52,182	0.000
Yes	35(31.5)	76 (68.5)		
No	6(13)	199(87)		

Analysis of the table shows a statistically significant association ($p < 0.05$) between the habit of consuming the pulp of *R. sese de Wild* and knowledge of its use in treating nausea and yellow fever. This means that the habitual consumption of this pulp is particularly linked to the recognition of its therapeutic properties in treating certain specific conditions.

Tableau XI : Factors influencing the consumption of *R. sese de Wild* pulp based on its use in the treatment of certain diseases

Variables	B	Wald	Adjusted OR	95% CI		Significance p-value
				Lower Limit	Upper Upper	
Spleen treatment	2,516	10,177	12,373	2,638	58,030	<0.001
Diabetes treatment	1,649	4,568	5,201	1.47	23,590	<0.033
Occupation in 2	-4,207	13.203	0.015	0.002	0.144	<0.000
Constant	-23.97	0.000	0.000			<0.999

The table shows that the probability of consuming the pulp under study increases significantly (adjusted OR = 12.373; 95% CI : [2.638 – 58.030] ; $p < 0.001$) in the treatment of spleen (adjusted OR = 5.201; 95% CI : [1.47 – 23.590] ; $p < 0.033$) in the treatment of diabetes. Furthermore, respondents who were employed also influenced this consumption (adjusted OR = 0.015; 95% CI : [0.002 – 0.144] ; $p < 0.000$) and were associated with a significant reduction in the likelihood of consuming this pulp. Overall, these results suggest that the consumption of *R. sese de Wild* pulp is strongly influenced by both knowledge of its therapeutic uses and certain social characteristics of the respondents.

DISCUSSION

The results of this study indicate a significant prevalence of knowledge and consumption of *R. sese De Wild* pulp among the study population. Indeed, the majority of respondents (88.8%) reported having knowledge of this resource, and 87.2% consume it regularly. This is consistent with findings from various African contexts where non-timber forest products play a significant role in traditional food and medicinal systems (FAO, 2022 ; Jamnadass et al., 2020). The high proportion of women in the sample (72.8%) illustrates their importance in the management of food and natural resources in African households. Previous research highlights women as the primary source of knowledge regarding medicinal food plants (Powell et al., 2012). Furthermore, the high proportion of households with a large number of members (>5 people) may explain the high prevalence of consumption observed in this study, given that access to local resources is prioritized to better meet the food needs of communities. Furthermore, while the respondents' educational level is generally high (96.6%), their knowledge of the nutritional value of the pulp remains low (26.6%). This paradox has also been noted in the literature, where it has been demonstrated that knowledge of traditional uses regarding various forms of dietary consumption is not dependent on a scientific understanding of nutritional values (Akinola et al., 2020). This indicates a need to improve local nutrition education. Statistics also show that information sharing regarding *R. sese De Wild* is primarily intergenerational (parents : 90%) and community-based (radio and friends). This mode of dissemination is typical of indigenous knowledge in sub-Saharan Africa, where informal social networks play a predominant role (Kansiime et al., 2021). The pulp studied is widely used as food (95%) and also as medicine (90%), particularly for diabetes, hepatitis, and yellow fever. These results support recent research confirming the importance of local plants for disease management in resource-limited settings (WHO, 2023). However, the statistically significant association between consumption and certain therapeutic factors such as nausea and yellow fever suggests that perceptions of medicinal efficacy directly influence dietary behavior.

An examination of associated factors shows that consumption of this pulp is significantly influenced by gender, educational level, occupation, and household size. In this study, men with lower levels of education were the most likely consumers, and households with more than five members showed a high probability of consumption. These results align with those found by Herforth and Ahmed (2022), who demonstrated that socioeconomic determinants strongly influence food choices, particularly in low-income settings.

Multivariate analysis shows that the use of the plant for medicinal purposes significantly increases the likelihood of consuming its pulp. These results corroborate the observations of Termote et al. (2011), who highlight the importance of wild plants in the pharmacopoeia of populations in the Central Congolese Basin. This close link between therapeutic use in the treatment of spleen disorders (adjusted OR = 12.373) and dietary consumption is a major characteristic of non-timber forest products in Central Africa, where the boundary between food and medicine is often porous, as demonstrated by Leaman et al. (2012). The use of this pulp to treat diabetes (adjusted OR = 5.201) is part of a regional trend of using palm trees as health supplements, a phenomenon documented by Bitsindou and Lejoly (1996) in their work on the uses of Arecaceae. The decline in consumption observed among respondents with a profession (adjusted OR = 0.015) may reflect a nutritional transition. According to Mazinginga et al. (2021), urbanization and access to formal employment in Kwilu Province often shift dietary preferences toward imported products, thereby neglecting traditional forest resources such as *raphia*. Finally, despite high organoleptic acceptance (98.4%), weekly expenditures remain low, indicating that this food item is economically accessible. This confirms its potential as a strategic resource for food and nutritional security, as asserted by several authors (HLPE, 2023). In closing, this study addresses the importance of *R. sese De Wild* in locally used dietary and medicinal practices, emphasizing sociocultural and economic factors. It highlights the need to integrate this pulp into nutrition and public health policies, while valuing local knowledge.

CONCLUSION

The study underscores the vital importance of *Raphia sese* De Wild fruit pulp as a multidimensional resource in the city of Kikwit. The results show an 88.8% awareness rate and 87.2% consumption of this natural non-timber forest product among the surveyed households, with deep roots in local customs. An analysis of local practices indicates that this resource is not only a widely consumed food, often eaten with meat or vegetables, but also a cornerstone of traditional medicine. Its use in traditional treatments for diabetes (88.8%), hepatitis, and spleen disorders is a major factor influencing its consumption. Statistics show that the likelihood of consuming this pulp is 12.37 times higher among patients with spleen disorders and 5.2 times higher among patients with diabetes. However, in this study, we found that although the product is present in the study area, awareness of its nutritional benefits remains low and is unknown to 73.4% of respondents. Furthermore, the research indicates the onset of a transition, where access to formal employment is leading to a decrease in the consumption of the traditional resource studied and an increased reliance on imported products. In conclusion, the pulp studied in this article is an innovative lever for food security and the health of the Kikwit community, due to its availability and cultural richness. Its marketing, combined with greater awareness of its nutritional profile, could contribute to strengthening food resilience in urban areas of the Democratic Republic of the Congo.

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