

Survey Study Of Spontaneous Wild Leafy Vegetables Consumed By The Indigenous Batwa People Living In The Equatorial Forest Near The City Of Mbandaka/DR Congo

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Abstract – This work focuses on the importance of leafy vegetables consumed in 3 localities BOLENGE, BANTOY and BOYEKA 1 and BOYEKA 2 located in the equatorial forest near the city of Mbandaka (DR Congo). The objective of this study is to identify the main spontaneous leafy vegetables gathered by the indigenous Batwa people and to carry out a food and nutritional characterization. On the one hand, an ethnonutritional survey on eating habits was conducted among this indigenous Batwa population, consumers of spontaneous leafy vegetables. The leafy greens that were investigated are: *Ipomea batatas* (L) Lam, *Solanum aethiopicum* L., *Talinum triangulare* (jacq) Wild, *Amaranthus viridis* L.; *Hibiscus Sabdariffa*, *Manihot esculenta* L. Grantz, *Colocasia esculenta* (L) Schott, *Cecropia concolor* miq, *Lasimonda senegalensis* schott, *Erythrococca atrovirens* (Pax) Prain, *Celosia trigyna* L. On the one hand, a survey was conducted among 200 households with reference to some ethnonutritional data on the use and consumption of these leafy vegetables. The results reveal that these leafy vegetables are consumed in descending order by adults whose average age is over 40 years old (50.5%), followed by people whose age is between 30 and 40 years old (32%) and young people whose age is less than or equal to 30 years (17.5%). From the education point of view of the respondents, the most represented class is made up of people with no schooling (50%), followed successively by those with secondary schooling (25%), primary (23.5%) and higher (1.5%). The socio-demographic analysis reveals that females are the majority consumers of these spontaneous vegetables (52.5%) against (47.5%) males in the 3 villages. The marital status of respondents reveals that married people are the most represented (60.5%). Slightly more than a third of people surveyed (34%) work as a lumberjack. The average percentage of consumption of leafy vegetables of these three villages (Bolenge, Bantoy, Boyeka) reveals that the population of Bolenge consumes more leafy vegetables (15.32%) compared to Bantoy (11.9%) and Boyeka (5.36%). Endogenous knowledge of the virtues of three most consumed leafy vegetables (*Ipomea batatas* (L) Lam, *Solanum aethiopicum* L., *Talinum triangulare* (jacq) Wild) in the three villages, reveals that the population of Boyeka presents a higher knowledge (39.3%) than Bantoy (24.66%) and Bolenge (14%). It is observed that knowledge of the nutritional value of leafy vegetables does not correspond to the consuming population of the village, except in the Bolenge village. Mots clés : chenilles, éléments minéraux, micronutriments, insectes comestibles, oligoéléments

Keywords – Survey, Ethnobotany, Leaf Vegetable, Native, Batwa, Forest.

I. INTRODUCTION

In Africa in general and particularly in the DRC, spontaneous or wild plants represent one of the main sources for human food in rural areas [1, 2, 3, 4].

Leafy greens are part of the diet of many African families. They represent considerably of plants in the wild and semi-wild state from the quantitative and qualitative point of view serving as a very important dietary supplement consumed by the populations [4, 5, 6]. Leafy vegetables include about 1025 cultivated or wild species in Africa, of which 275 vegetable species come from tropical Africa. Of these, 238 of the best known are eaten for their leaves and 68 are used for other purposes [1, 5, 7, 9].

In DR Congo, there are more than 160 species belonging to 50 families of food plants consumed in different localities [5, 6]. Within this group of vegetables, traditional African leafy greens are higher in vitamins, minerals, crude fiber and macromolecules than European leafy greens [1, 2, 5].

Feeding the world's population is one of the most pressing challenges facing humanity in the 21st century. The Food and Agriculture Organization of the United Nations (FAO) in 2010 estimated that 925 million people in the world suffered from food insecurity, or approximately one in six people of the world's population [10].

At the Millennium Development Goals (MDGs) summit held in New York in September 2010, countries reiterated their commitment to achieving, among other things, the eradication of extreme poverty and hunger.

There is little documented information on leafy vegetables in DR Congo and documented descriptions are generally lacking [10, 16]. The quality of food products has become a concern for consumers. Cheap agro-industrial products are increasingly consumed, especially in developing countries [1, 5, 6]. However, spontaneous traditional leafy vegetables are generally a source of micronutrients [2, 5, 6]. In fact, to meet their food needs, rural African populations resort to subsistence agriculture, which they supplement with edible wild species, including spontaneous leafy vegetables.

According to FAO (2011) [15, 16], food security is achieved when all people at all times have economic, social and physical access to sufficient, safe and nutritious food that meets their nutritional needs and food preferences to enable them to lead active and healthy lives [15]. Thus, the pillars of food security are availability, access, utilization and stability. The nutritional aspect is incorporated into the concept of food security.

This study was initiated with the aim of analyzing the degree of endogenous knowledge of the nutritional value of traditional vegetables in the DR Congo associated with their place in the dietary habits of the populations of three villages of Mbandaka. The interest of this work is to inventory and characterize the spontaneous food plants consumed by the population of the different localities around the city of Mbandaka in the equatorial forest. This research provides information on the contribution of volunteer food plants to the health of consumer populations [1, 2].

This work focused mainly on the most consumed leafy vegetables in the three villages.

II. MATERIAL AND METHODS

2.1. Study environment

Ethnobotanical surveys were conducted among the population of Bolenge , Bantoy , Boyeka1 and 2, villages located around the city of Mbandaka in Equateur Province [1, 2, 8].

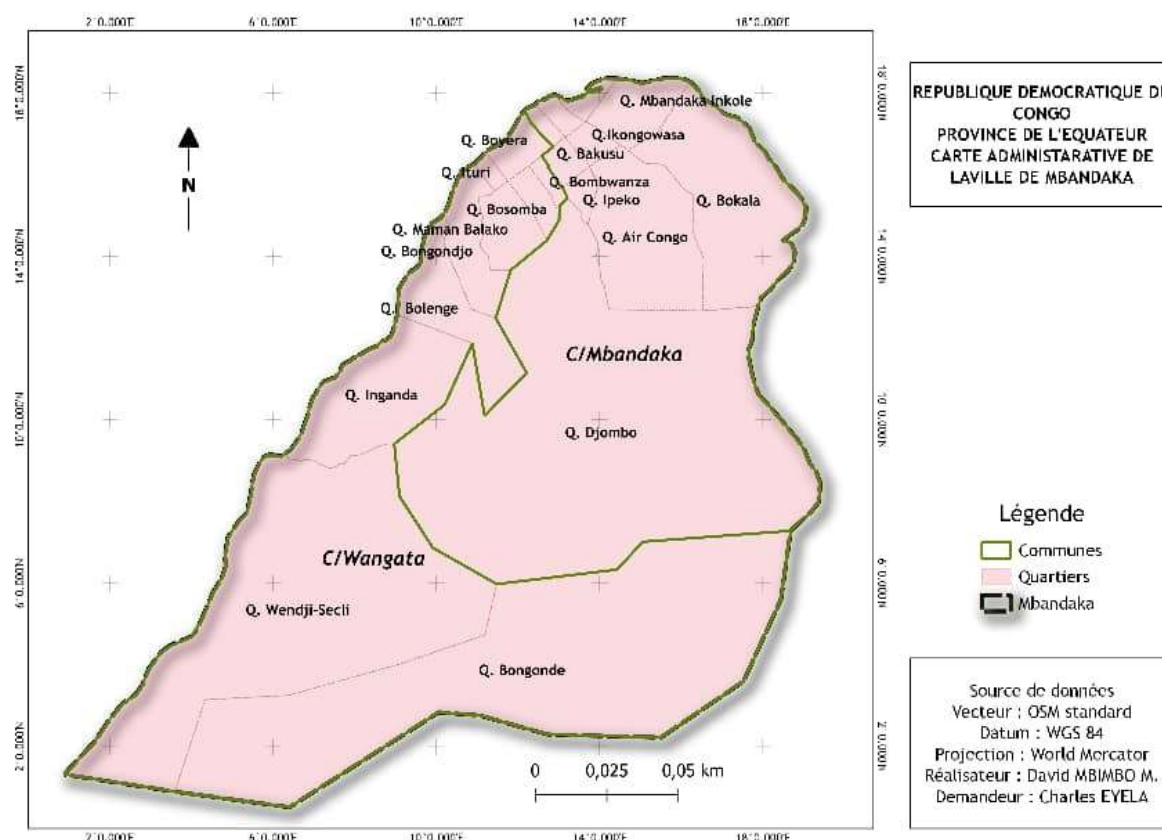


Fig. 1. Administrative map of the City of Mbandaka, May 2023

These localities are inhabited by people of different ethnic groups. This population is made up of three ethnic groups, within which there are numerous sub-groups.

2.2. Sudanese group

1.1 This group lives in the savannahs of the north of the province and is represented by the NGWAKA, NGBANDI, MBANZA, MONO, LIKULA tribes [11]

2.3. Pygmy indigenous people

Is formed in small isolated groups through the equatorial forest.

2.4. Bantu Group

Most importantly, the Bantu group inhabits the great equatorial forest. It is made up of two important sub-groups: MONGO and BANGALA. The Mongo live mainly in the localities of the province of Equateur, and the Bangala mainly along the Congo River and the Ubangui. In this Bantu group there are MONGO, EKONDA, NKUNDO, NTOMBA, BASENGELE, MPAMA, LIBINZA, NGOMBE and BUDJA. The indigenous Batwa people of the Bolenge, Bantoy and Boyeka villages were the main tribe targeted by the ethnobotanical survey mission. The population is mainly Lumberjack vocation and people with various social activities. The survey concerned 200 households for a total of 1200 people (Children and Adults), ie a theoretical average of 6 people per household who consume leafy vegetables of all sexes and ages as described elsewhere [5].

2.5. Plant material

The surveys were oriented towards the leafy vegetables consumed in these three localities because of their importance in the staple diet [7, 8].

2.6. Method

The leafy vegetables were harvested and subjected to systematic identification at the Biology laboratory at the National Pedagogical University (UPN). The survey material is summarized in a survey sheet made up of open questions and closed questions which are put to the respondent and whose answers have been noted or checked off on a sheet by the surveyor.

The main parameters of this sheet were: age, level of school education, endogenous knowledge of leafy vegetables and their nutritional properties [1, 5, 6].

2.6.1. Household survey

The survey took place from December 15, 2020 to January 15, 2021 in households in Bolenge , Bantoyi and Boyeka in their living environment. In each household, only one consumer was interviewed, designated by the person in charge of the kitchen. The respondent submitted to the questionnaire according to the chronology of the survey sheet and the answers were noted by the interviewer. The dialogue took place in the official language (French) or in the national language (Lingala) or another local language depending on the language spoken by the respondent [4, 5, 6].

2.6.2. Counting of the survey

This cross-sectional survey was chosen because it was carried out on part of the population [6].

The counting was carried out by a simple sorting after encoding of the questions [4, 11].

III. RESULTATS AND DISCUSSION

Table 1: Sociodemographic characteristics of consumers of traditional vegetables in Bolenge , Bantoy and Boyeka 1 and 2 villages

Variables		Effective	%
Age	<30 years	35	17.5
	<30 years <40 years	64	32
	>40 years	101	50.5
Sex	Male	95	47.5
	Feminine	105	52.5
Educational level	Primary	47	23.5
	Secondary	50	25
	Graduate studies	3	1.5
	Never attended school	100	50
Marital status	Bride)	121	60.5
	Bachelor	18	9
	free Union	24	12
	Widowed _ _	37	18.5
Professional activity	Official	5	2.5
	Daily (st) / all work	22	11
	Lumberjack	69	34.5

	Trader		0
	Fisherman	12	6
	Unemployed	52	26
	Salesperson (wood, vegetables, etc.)	26	13
	Farmer/cultivator	2	1
	Driver	3	1.5
	Seamstress	2	1
	Mason	1	0.5
	Household	5	2.5
	Sentinel	1	0.5
Parity	Primiparous	22	11
	Multiparous	100	50
	Grand multiparous	71	35.5
	Without children	7	3.5

The analysis of the socio-demographic characteristics of the 200 representatives of leafy vegetable consumers surveyed (Table 1) reveals that among those surveyed, those of the female sex are the most numerous (52.5%).

Regarding parity, the people surveyed in this study were primiparous (11%), multiparous (50%), grand multiparous (35.5%) or childless (3.5%); the most representative were the multiparous. Leafy vegetable consumers live in households with an average of 6 people.

Food practice of these leafy vegetables consumed in the three villages (Bolenge , Bantoyi and Boyeka 1 and 2).

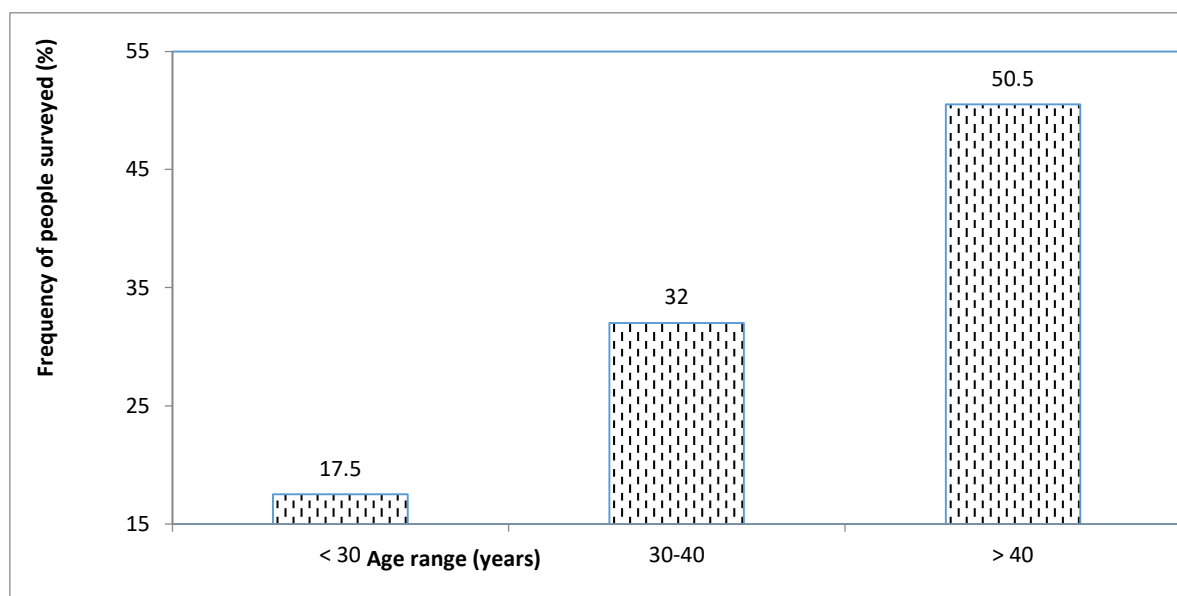


Fig. 2. Frequency of people surveyed in relation to age group.

The age group of people whose age is less than or equal to 30 years is the least represented (17.5%), followed by those whose age is between 30 and 40 years (32%). The most represented age group is that whose age is over 40 years (50.5%) (fig2).

Although the most representative were the multiparous, we observe that 96.5% of this population have at least one child. Thus, from a demographic point of view, each childbearing couple has at least four children out of the average household size of six people: this indigenous Batua population is made up of 66.7% of people from a younger generation.

Educational level of leafy vegetable consumers

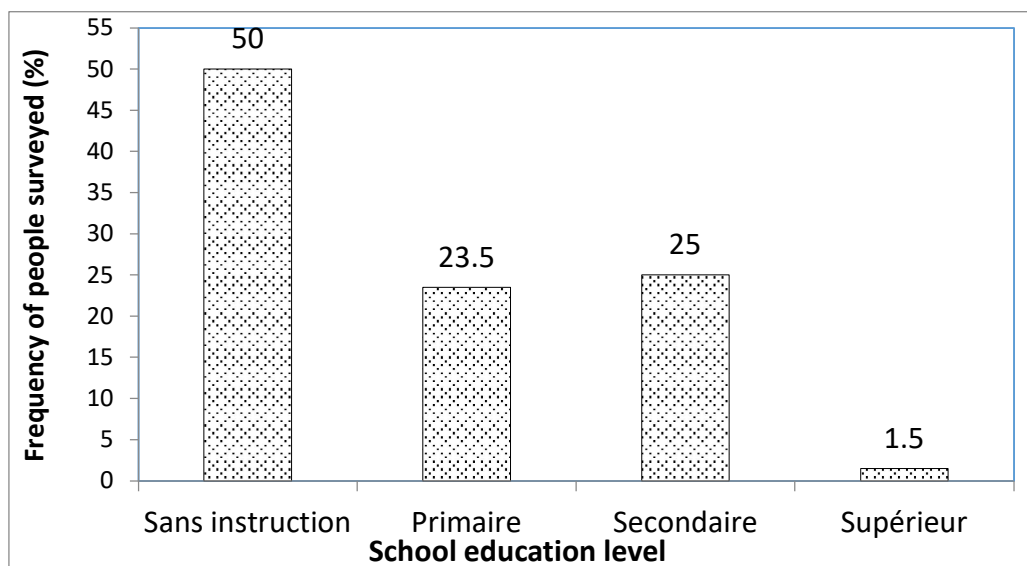


Fig. 3. Frequency of people surveyed in relation to the level of school education

Among the consumers surveyed, 23.5% have primary education, 25% have secondary education, 1.5% have higher education while 50% have never been to school (fig3). This segment of the population would be the one who holds the endogenous knowledge of the indigenous Batua population on the spontaneous leafy vegetables of this region.

Marital status of leafy greens consumers

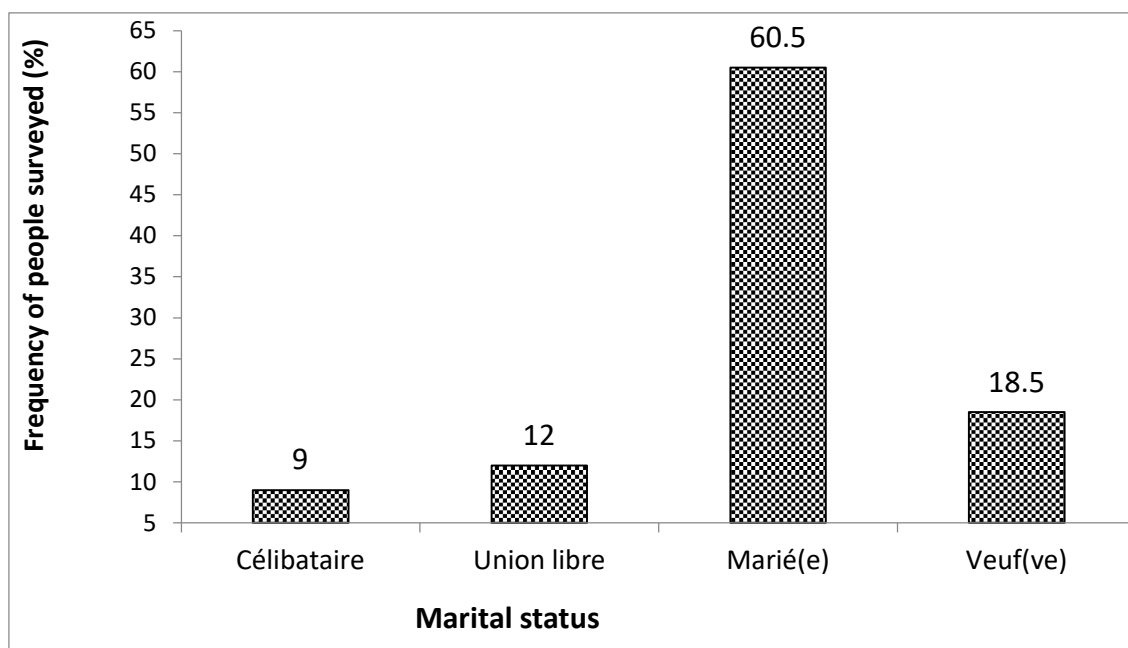


Fig. 4. Frequency of people surveyed in relation to marital status

Most of the consumers in our study are married (60.5%), single (9%), common-law (12%) or widowed (18.5%) (fig.4).

Professional activities of the indigenous Batwa populations of Bolenge, Bantoyi and Boyeka

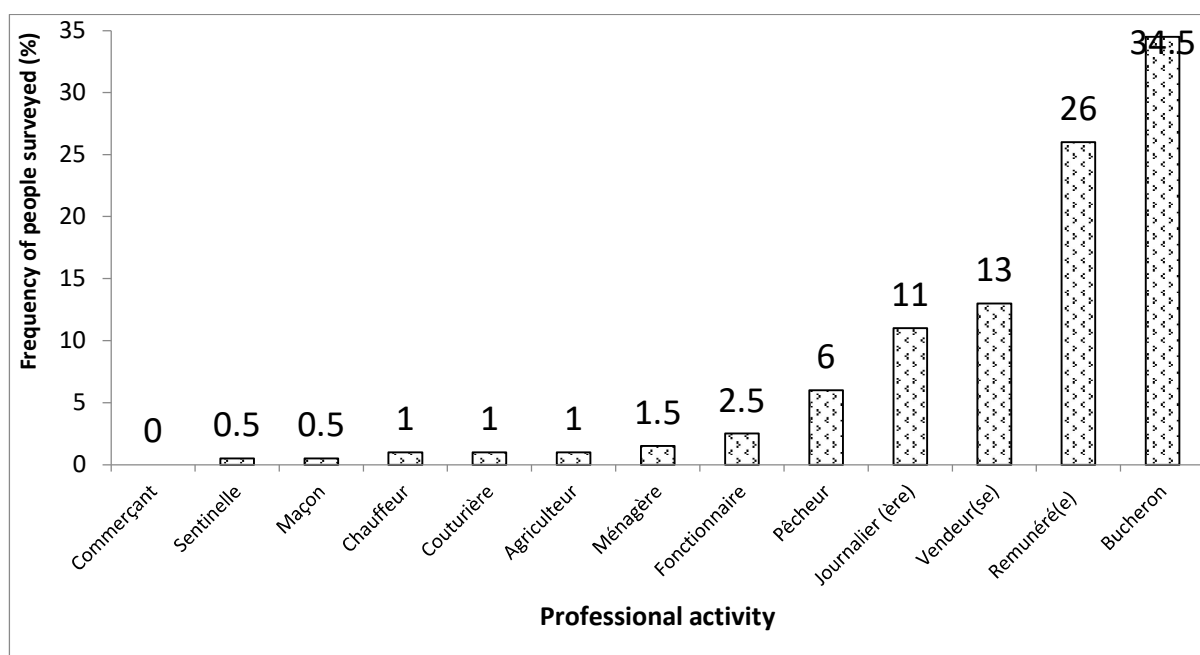


Fig. 5. Frequency of people surveyed in relation to professional activity.

The Batwa natives carrying out professional activities are organized in the following descending order: Lumberjacks (34.5%), unemployed (26%), seller (13%), day laborers (all works) (11%), fishermen (6%), civil servant (2.5%), housekeeper (2.5%), driver (1.5%), farmer (cultivator) (1%), seamstress (1%), mason (0.5%) and sentry (0.5%): The most representative professional category being lumberjacks (fig.5), the indigenous Batwa population dealing very little with Agriculture (1%). This neglected

professional activity could justify the picking of spontaneous leafy vegetables by these populations in their immediate environment.

Consumption of leafy vegetables in Bolenge

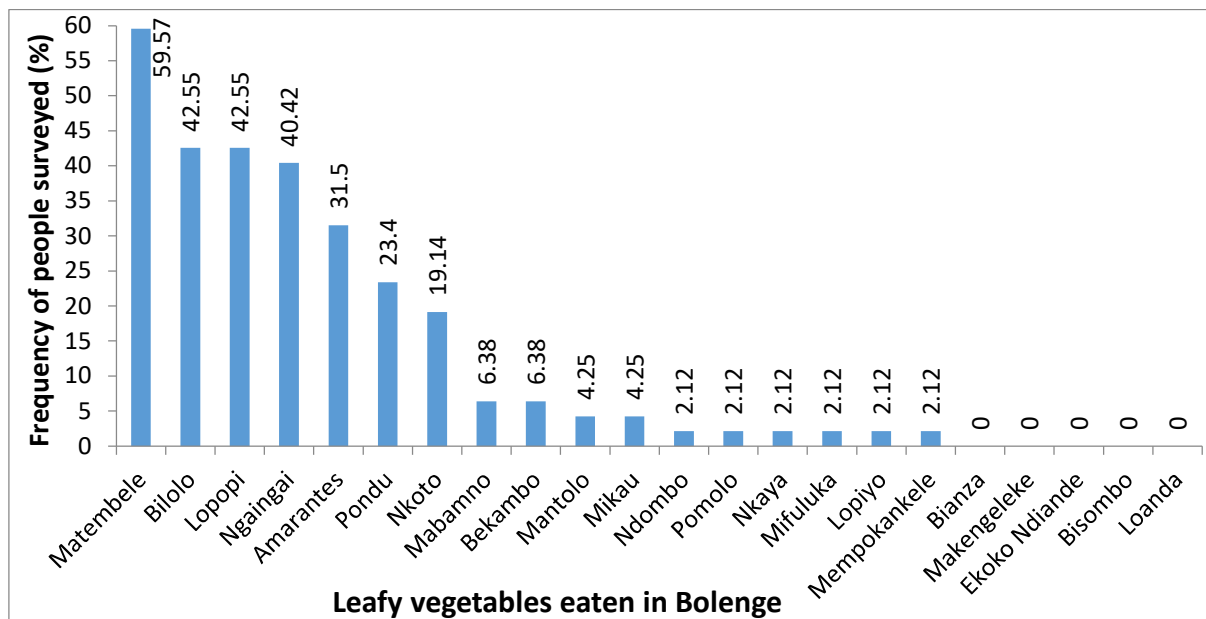


Fig. 6. Frequency of people surveyed in relation to consumption in Village Bolenge.

The inhabitants of the Bolenge village preferentially consume the following seven leafy vegetables: *Ipomoea batatas* (L) Lam (Matemebe) (59.57%), *Solanum aethiopicum* (Bilolo 42.55%), *Talinum triangulare* (jacq) Wild (Lopopi 42.55%), *Hibiscus sabdarifa* (Ngaingai 40.42%), *Amaranthus viridis* L. (Amaranth 31.5%), *Manihot esculenta* (Pongu, Cassava leaves 23.4%) and *Nymphae lotus* L. (Nkoto 19.14%) (fig.6).

NB : a leafy vegetable consumed by less than 10% of the population can be considered a neglected food.

Consumption of leafy vegetables in Bantoyi

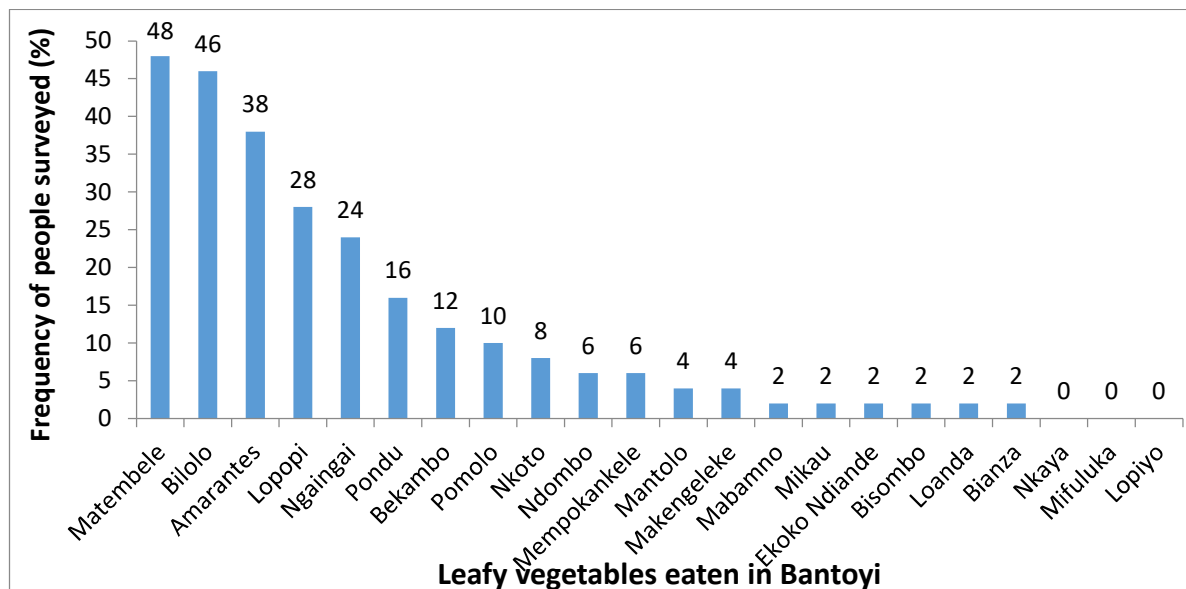


Fig. 7. Frequency of people surveyed in relation to consumption in Village Bantoyi

Bantoyi village preferentially consume the following eight leafy vegetables: Ipomoea batatas (L) Lam (Matemeble) (48%), Solanum aethiopicum (Bilolo 46%), Amaranthus viridis L. (Amaranths 38%), Talinum triangulare (jacq) Wild (Lopopi 28%), Hibiscus sabdarifa (Ngaingai 24%), Manihot esculenta (Pondu, Cassava leaves 16%), Bekambo 12% and Erythrococa atrovirens (pax) prain (Pomolo) 10% (fig.7).

Consumption of leafy vegetables in Boyeka

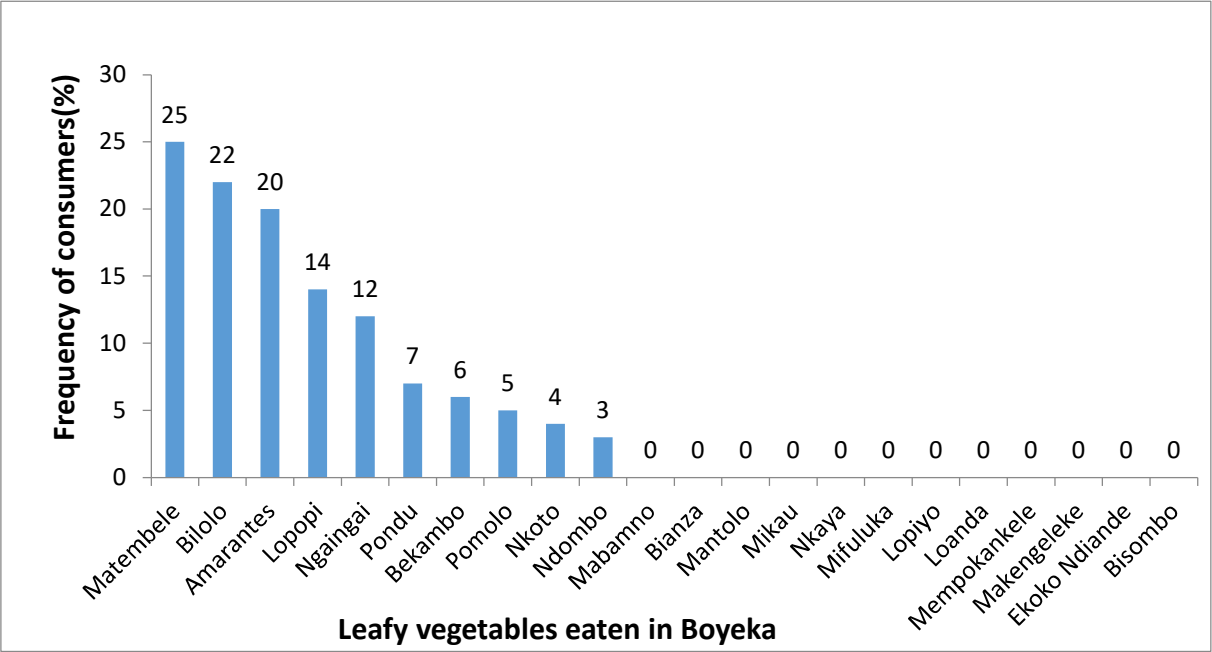


Fig. 8. Frequency of people surveyed in relation to consumption in Village Boyeka

Here, leafy vegetables are consumed less compared to the other two villages. The population of Boyeka consumes more Ipomoea batatas (L) Lam (Matemeble 25%), Solanum aethiopicum L (Nzenze or Bilolo 22%), Amaranthus spinosus L (Amaranths 20%), Talinum triangulare (Jacq) Wild (Lopipi 14%) and Hibiscus sabdarifa (Ngaingai 12%) (fig.8).

Consumption of leafy vegetables in the three villages

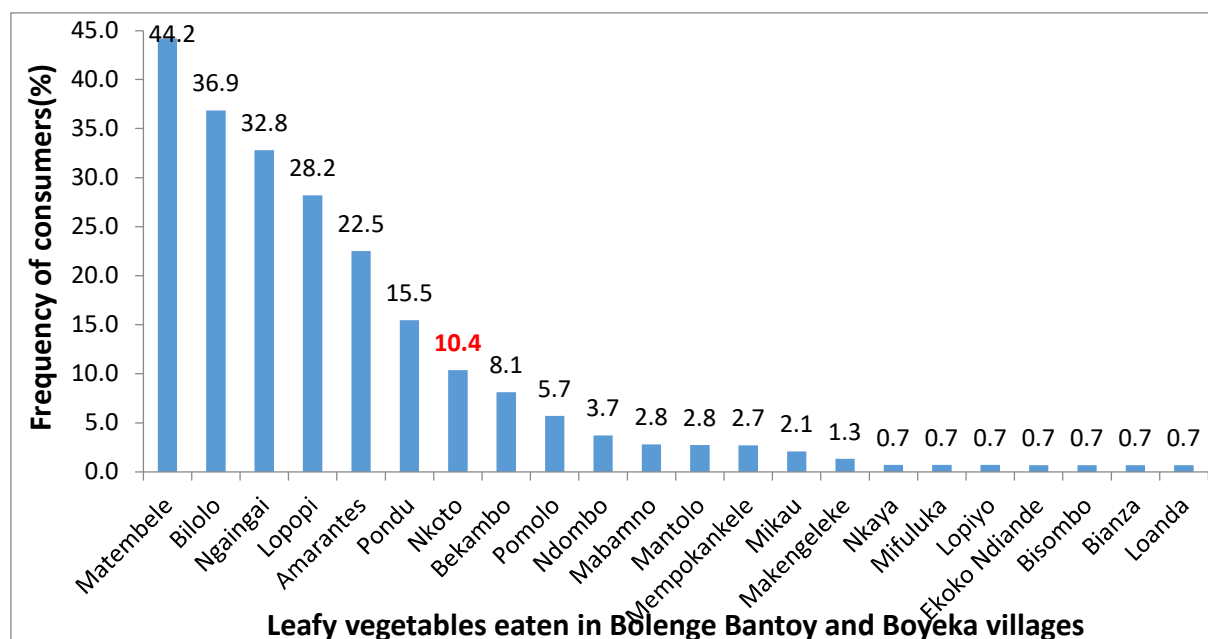


Fig. 9. Consumption of leafy vegetables compared to the endogenous knowledge of the populations of 3 villages

More than 25% of the indigenous Batua population of three villages Bolenge , Bantoyi and Boyeka preferentially consume the following leafy vegetables: Ipomoea batatas (L) Lam (Matemeble 44.2%), Solanum aethiopicum L (Nzenze or Bilolo 36.9%), Hibiscus sabdariffa (Ngaingai 32.8%) and Talinum triangular (Jacq) Wild (Lopipi 28.2%) (fig.9).

Correlation between endogenous knowledge of the virtues and consumption of leafy vegetables in the 3 villages

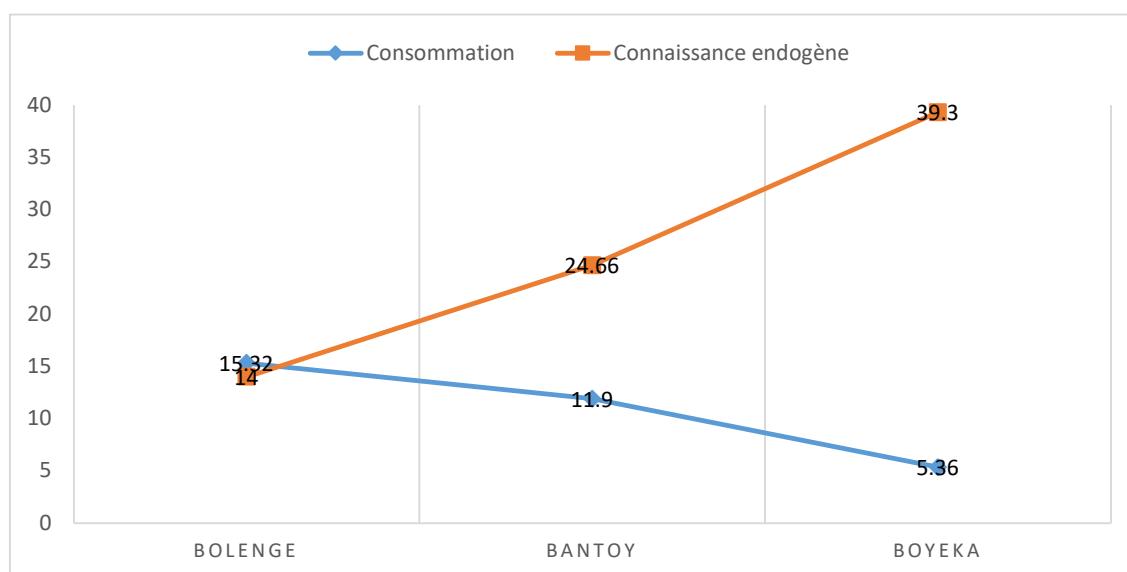


Fig. 10. Correlation between endogenous knowledge of virtues and consumption of leafy vegetables in the 3 villages

The correlation between consumption and endogenous knowledge varies inversely: from Bolenge to Boyeka: the greater the endogenous knowledge, the less the population consumes these leafy vegetables and vice versa (fig.10).

Batua people seem to neglect wild spontaneous leafy vegetables in contact with the Bantu populations trading on the Congo River.

IV. DISCUSSION

Our results show that the most represented age group of respondents is that whose age is over 40 (50.5%). The results obtained are superior to those obtained by Itoua Okouango et al 2019 on a dietary and nutritional characterization study of the traditional vegetable *Lagenaria siceraria* and Elenga et al 2016 [12] on a study of *Salacia pynaertii*. Female respondents are more representative (52.5%) in our study. The discussions were oriented much more towards women, are they the ones who take care of the kitchen, which corroborates the Itoua Okouango 2019 results [6]. Food-related activities are almost exclusively reserved for women.

Among the consumers surveyed, concerning the level of education, 50% are uneducated, 23.5% are at the primary level, 25% at the secondary level and 1.5% at the university level.

The results obtained by Itoua Okouango et al 2019 on a food and nutritional characterization study for the secondary level 37.3% and university level 22.9% are higher than our results.

Our results are also lower than the 72% obtained by Ngbolua et al (2021) on an ethnobotanical survey study on the consumption of wild food plants in the territory of Mobayi-Mbongo (Nord-Ubangi) in the DRC.

Most of the leafy vegetable consumers in this research are married (60.5%), the results obtained are higher than those obtained by Itoua Okouango et al 2019 (22.4%) [6]. These results affirm the adage that in “Africa people often have recourse to plant species to meet their food needs and ensure food security” supported by Van Rensburg WJ et al 2004 [10].

The consumers surveyed exercise a professional activity like the most representative lumberjacks (34%), followed by the unemployed (28%), seller (13%), all work (informal) (11%), fishermen (6%), civil servant (2.5%), housewife (1.5%), driver (1%), farmer (cultivator) (1%), seamstress (1%), mason (0.5%) and sentry (0.5%).

Our results obtained are lower compared to those obtained compared to Itoua Okouango et al 2019 for those carrying out an informal activity (48%).

V. CONCLUSION

The field survey highlights the ethno-nutritional importance of wild leafy vegetables for the populations of the villages of western DR Congo surrounding the city of Mbandaka. The results of the surveys showed the importance of spontaneous leafy vegetables in its ethno-nutritional character and is part of the dietary habits of these populations.

Among the three villages consuming wild leafy vegetables, the inhabitants of two villages (Bolenge and Bantoyi) consume on average more wild leafy vegetables than those of Boyeka; this would be due to the fact that the inhabitants of the first two live almost in the equatorial forest and eat more leaves, fruits and vegetables while those of Boyeka living along the Congo River, eat more fish from fishing but also probably industrial foods (canned fish, salted fish) offered by the trade of merchants or itinerant people sailing on boats and whaleboats. This gap is reversed by considering the level of education of consumers. Indeed, the inhabitants of Boyeka have a higher level of education (the only academics in the region according to surveys) than those of Bolenge and Bantoyi ; the same goes for the level of knowledge of the virtues of these leafy vegetables: the inhabitants of Boyeka are better informed of the nutritional virtues than those of the other two villages who are content only to consume.

Batwa people of this region, being little or no farmers, encounter the mineral and macronutrient intakes of plant origin in leafy vegetables from their immediate or nearby environment known in their endogenous knowledge.

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