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Assessment of knowledge, attitudes, and practices of populations regarding the consumption of camel meat in the Sahel of Niger

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ABSTRACT

Camel meat, a food with high nutritional value, is still subject to socio-cultural considerations within certain Nigerien communities. Thus, this study of knowledge, attitudes, and practices (KAP) regarding the consumption of this meat was carried out to rule out these socio-cultural considerations. To do this, a sample of 236 households, distributed according to the weight of urban households, was the subject of a cross-sectional survey in three (3) large cities in Niger (Niamey, Tahoua, and Agadez). The results reveal that camel meat is not highly appreciated for its organoleptic quality and certain beliefs and customary taboos. Indeed, this meat is perceived by pregnant Nigerien women (71.9%) as a food that "prolongs the pregnancy by one year." Additionally, knowledge and attitudes towards camel meat are based on its perception. However, two categories of consumers have been identified: occasional and regular. These two categories of consumers perceive camel meat in their diet differently. Thus, 43% of consumers attribute nutritional and therapeutic virtues to camel meat, while 32.6% of consumers consider that camel meat is similar to other red meats. Furthermore, 3.3% of consumers advocate the Islamic benefits of camel meat to justify its consumption. However, it was noted that 14.1% of consumers reject camel meat because they are not accustomed to it, and 7% of consumers reject camel meat due to its poor organoleptic quality. Thus, the perceptions observed by consumers about camel meat are much more cultural than real. In short, this study can contribute to changing social behavior towards camel meat.

Contribution/Originality: This study is the first of its kind in Niger. Its originality lies in providing data on the population's perceptions of camel meat consumption. This study differs from previous research in that it focuses on the reasons that limit or favor the consumption of this meat in order to contribute to behavioral change.

1. INTRODUCTION

Camel breeding is an underdeveloped activity in Niger despite its socio-economic importance. However, ancestrally, the dromedary constituted capital, a means of transport, and a source of food for the population that used it (Xavier, Gilles, Benard, & Olivier, 2000). Thus, over the last few decades, the Nigerien herd has evolved to adapt to food constraints for the benefit of camel breeding and small ruminants (Xavier et al., 2000). The Nigerien camel herd is estimated at 1,834,943 heads in 2019. However, the consumption of camel meat is growing (from 32,818 camel

heads in 2013 to 34,601 heads in 2019) (INS-Niger, 2020). Thus, some households show feelings of reluctance in choosing this meat. The low importance of camel meat is linked, on the one hand, to the perception of its organoleptic quality and, on the other hand, to food taboos and prohibitions (Djenane, 2023).

Camel meat is considered hard to chew and is subject to food taboos, which are all reasons for its rejection for consumption (Amadou, 1988; Djenane, 2023). Currently, the use of camel meat is largely attributed to its therapeutic or medicinal virtues (Ayyash et al., 2019; Kadim & Sahi, 2018; Popova et al., 2021; Sahraoui et al., 2014). Indeed, camel meat is known for its low cholesterol content (50 mg/100g) (Benatmane, 2012; Raiymbek et al., 2015) and its high content of polyunsaturated fatty acids, which play a favorable role in human health (Sahraoui et al., 2014). In short, this meat is considered lean due to the accumulation of most of its fat in the hump, which promotes the consumption of red meats to limit animal fats (Amadou, Diadie, Gbadamosi, & Akanbi, 2019; Djenane, 2023; Faye, Abdelhadi, Raiymbek, & Kadim, 2013). Although dromedary meat is appreciated and consumed in several localities in Niger, it remains among the food taboos in certain cultures. Thus, these erroneous and unfounded considerations greatly limit Nigeriens from consuming this nutritionally important meat. However, very few studies to date have focused on camel meat, particularly on consumer perceptions. This study aimed to present to the audience the consumer knowledge, attitudes, and perceptions that help promote camel meat in the three cities of the Sahel region of Niger: Niamey, Tahoua, and Agadez.

2. MATERIEL AND METHODS

2.1. Materiel

The collection of data on consumers' knowledge, attitudes, and perceptions of camel meat in the Sahel region of Niger was carried out using an interview form. This form covers the respondents' socio-demographic characteristics, the eating behaviors of consumers of camel meat, knowledge, attitudes, perceptions, and food taboos or prohibitions. A form for evaluating the level of knowledge of camel meat, including the specific characteristics (color, location of fat) of this meat.

2.2. Methods

Study Framework: The study was carried out in the Sahel region of Niger, in three cities namely Niamey, Tahoua, and Agadez (Figure 1).

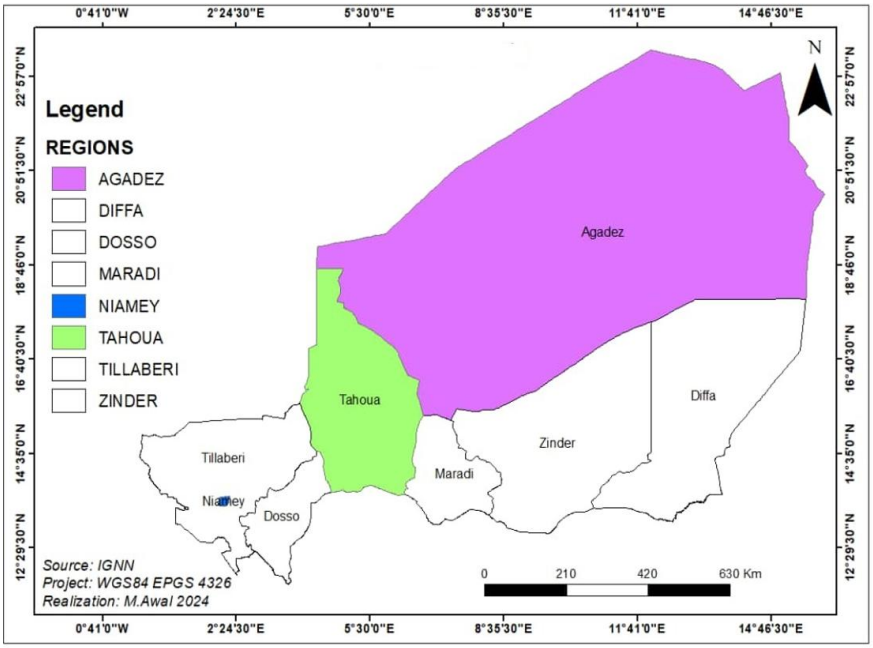

Figure 1. Map of the three cities (Niamey, Tahoua and Agadez) in the Sahel region of Niger.

The choice of these cities was based on the high camel slaughter statistics (Project for the Development of Exports and Agro-sylvo-pastoral Marches (PRODEX-NIGER), 2008; Xavier et al., 2000). Indeed, Niamey is the capital of Niger, located on the Niger River in the far west of the country. This city is situated between 13°28' and 13°35' north latitude and 2°03' and 2°10' east longitude. The city of Tahoua, commonly called the capital of Ader, is located northeast of Niamey and is situated between 14°53'40" North and 5°15'52" East. Thus, Agadez is the most important city in northern Niger, located between the Sahara and the Sahel. It is situated between 16°58'00" north and 7°59'00" east with an altitude of 520 m (INS-Niger, 2014).

Type and Period of Study: This is a cross-sectional study on the consumption of camel meat based on eating behavior. The survey lasted 40 days and was carried out over the period from September 12 to October 22, 2022, in the three cities of Niamey, Tahoua, and Agadez.

Target Population: The present survey was carried out in households of the urban population. The target surveyed is the woman responsible for household culinary preparation.

Sampling: The Schwartz (1969) formula was used to calculate the sample size (Number of households to survey):

$$N = \frac{eZ2P(1-P)}{I2}$$

N: Sample size.

Z: Parameter linked to the risk of error.

Z = 1.96; P: Estimated proportion of camel meat consumers.

P = 50%; i: Corresponding to the precision.

I = 8%.

e: Cluster effect, e = 1.5.

N = 1.5 *(1.96)2 *0.5 *0.5/ (0.08)2 = 225.09 ~ 225.

Non-response rate (5%).

$$= \frac{225 * 5}{100} = 11.25 \sim 11.$$

N = 225 + 11= 236 households.

It was considered that 15 households per locality made it possible to calculate the number of localities to be surveyed (236/15 = 15.73 ~ 16 localities). Thus, a total of sixteen (16) localities were obtained and distributed across the three cities according to their weight of urban households (Niamey with 160,702 urban households, Tahoua with 49,914 urban households, and Agadez with 35,129 urban households) (INS-Niger, 2014). In the end, the determination of localities and households to be surveyed in each city was carried out using the "rule of three" method. Indeed, the neighborhoods were drawn based on an exhaustive list of all the neighborhoods within each city to precisely obtain the collection of localities. Thus, households were selected by systematic random sampling according to the sampling interval (P). Table 1 presents the final sample size as well as the distribution of the localities surveyed according to the city.

Table 1. Distribution of survey by city of study.

Cities	Size of urban households	Weight of urban households	Number of localities	Number of households surveyed
Niamey	160 702	0.66	11	154
Tahoua	49 914	0.20	3	48
Agadez	35 129	0.14	2	34
Total	245 745	1	16	236

Data Collection: Data was collected through individual interviews conducted with the target population in households. Indeed, all surveys were carried out in local languages (Hausa, Zarma) with the respondents' informed consent. Thus, upon consent, certain interviews were subject to voice recording using a smartphone (Samsung M12).

Statistical Analysis: The data collected were entered and processed using SPSS software version 25 for the descriptive analysis of parameters on the behavior of camel meat consumers. Additionally, R software version 3.6.0 enabled the execution of multiple component analysis (MCA) and ascending hierarchical classification (AHC). Thus, Microsoft Excel version 2013 was used for creating graphs and tables.

3. RESULTS AND DISCUSSION

3.1. Results

Socio-demographic characteristics of the consumers surveyed are summarized in Table 2 of the targeted population in the study.

Table 2. Sociodemographic characteristics of households.

Characteristics	Nº	(%)	Characteristics	Nº	(%)
Age group (Years)			Marital status		
≤ 30	68	28.3	Single	44	18.3
31 - 50	127	52.9	Married	178	74.2
51 - 70	39	16.3	Divorced	6	2.5
≥ 71	6	2.5	Widow	12	5.0
Ethnic			Education level		
Hausa	156	65.0	Primary	44	18.3
Zarma	45	18.8	Secondary	77	32.1
Peul	16	6.7	Higher	30	12.5
Tuareg	17	7.1	Quranic	73	30.4
Tubu	3	1.3	None	16	6.7
Kanuri	3	1.3			

Knowledge of Camel Meat: Figure 2 shows the level of recognition of camel meat by the population surveyed. Indeed, camel meat has similar characteristics to those of cattle. However, the criteria for evaluating camel meat are based on organoleptic quality (odor, taste, color, and texture). Thus, this quality generally concerns the impression given by the sensory evaluation organs on different types of meat (fresh, cooked), especially meat at the time of consumption.

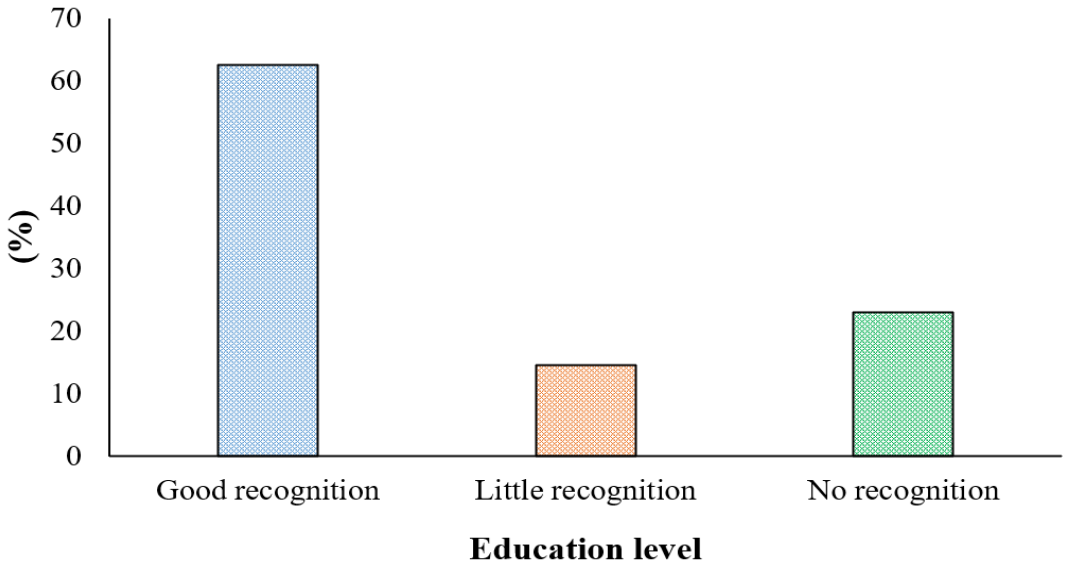

Figure 2. Knowledge of camel meat.

It appears from this study that more than 62% of respondents have a good knowledge of camel meat through the visual aspect. Indeed, this meat is generally distinguished by the quantity of its fat, its large filaments constituting its flesh, and its less reddish color. Furthermore, there is a widespread practice among butchers of substituting camel meat in place of beef to deceive the vigilance of unwary consumers. However, the difference observed between camel meat and beef is much more psychological than real.

Table 3. Ration between knowledge of camel meat and sociodemographic characteristics.

		Knowledge (%)			Pearson chi-square tests		
		Good	Little	No	X^2	ddl	P-value
Sex	Male	76.7	85.7	67.3	4.121	2	0.127
	Female	23.3	14.3	32.7			
Marital status	Single	14.0	22.9	27.3	7.646	6	0.265
	Married	78.0	68.6	67.3			
	Divorced	2.0	5.7	1.8			
	Widow	6.0	2.9	3.6			
Origin	Native	54.7	60.0	58.2	0.436	2	0.804
	Non-native	45.3	40.0	41.8			
Ethnic group	Hausa	66.0	74.3	56.4	9.902	10	0.449
	Zarma	18.7	11.4	23.6			
	Peul	5.3	5.7	10.9			
	Tuareg	8.0	8.6	3.6			
	Tubu	0.7	0.0	3.6			
	Kanuri	1.3	0.0	1.8			
Education level	Primary	19.3	20.0	14.5	9.283	8	0.319
	Secondary	32.7	34.3	29.1			
	Higher	9.3	11.4	21.8			
	Quranic	32.7	31.4	23.6			
	None	6.0	2.9	10.9			
Main occupation	Farmer	3.3	17.1	3.6	24.053	10	0.007
	Merchant	46.7	45.7	43.6			
	Artisan	14.0	5.7	12.7			
	Civil servant	12.7	8.6	7.3			
	None	7.3	11.4	23.6			
	other	16.0	11.4	9.1			

It appears from the analysis of the results in Table 3 that knowledge of camel meat presents a very significant link with the main consumer activity (P-value less than 0.05). However, the other variables do not influence knowledge of this meat. Thus, the particularities of camel meat perceived by consumers are much more psychological.

Purchasing Attitudes towards Camel Meat for Consumption: Parameters such as meat-to-bone ratio (68.9%) and color (84.4%) of the meat are the most appreciated by consumers (Figure 3).

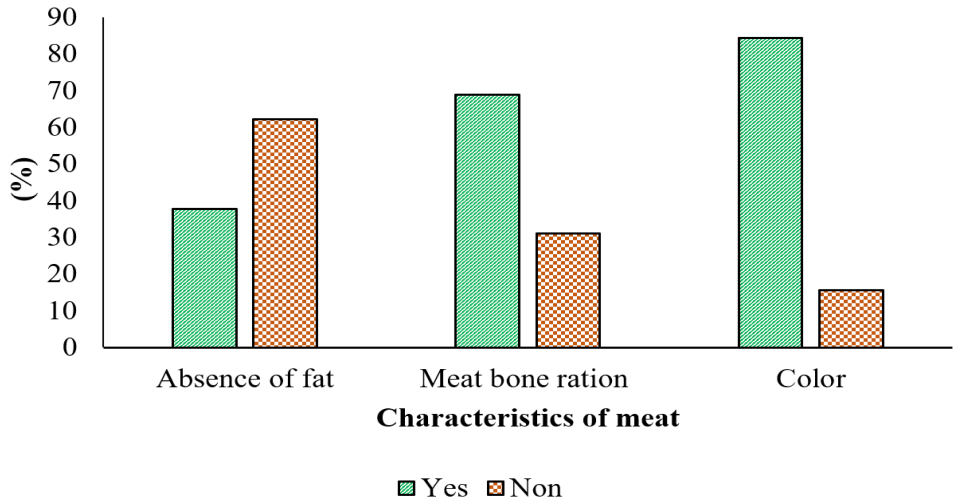

Figure 3. Criteria for the preference of camel meat when purchasing.

These results show that color is the best indicator of quality when purchasing camel meat. Thus, the fat content is poorly considered by consumers. Furthermore, Table 4 illustrates all the parameters that determine consumers' attitudes toward camel meat when purchasing.

Table 4. Attitudes towards purchasing and consuming camel meat.

Parameters		**(%)**
Part preferences	Fillet	28.5
	Thigh	31.2
	Shoulder	18.1
	Chops	13.2
	Innards	7.2
	No preference	1.8
Consumption method	Soup	65.8
	Grilled	20.0
	Both	14.2
Purchasing criteria	Nutritional and/or therapeutic aspect	39.9
	Color (Freshness)	21
	Affinity with the butcher	20
	Proximity	10.1
	Price	9
Reason for consumption	Food	65.4
	Medicinal	34.6
Meat supply	Occasional	69.6
	Regular	30.4

The supply of meat is done occasionally (69.6%) by the population surveyed. On the other hand, 30.4% of consumers regularly buy camel meat (Table 4). Thus, consumers learn about the quality of good meat through color. Furthermore, the results in Table 4 show that consumers attach great importance to the quality (nutritional and therapeutic), the color/freshness of the meat, and the affinity with the sellers, respectively presenting 39.9%, 21%, and 20%. Indeed, the distance separating households from the place of sale and the price of meat play a considerable role in purchasing, with 10.1% and 9% respectively.

However, 65.4% of consumers of camel meat use it in their dietary habits like any red meat. On the other hand, 34.6% of the sample consume this meat for its therapeutic or medicinal virtues (Table 4).

Analysis of the results in Table 4 above showed that color is the first sign of appreciation of good quality meat and the main indicator of the freshness and tenderness of the product, which determines the age of the animal. Indeed, the light red color of the meat signifies tenderness, while the dark red or brownish color indicates poor quality meat (tough, weak taste, etc.) or meat coming from an old camel. Furthermore, the analysis of Table 4 shows that the part of the camel carcass is a criterion that influences the purchase of meat. All consumers have a preference at the time of purchase, most often requesting the part rich in meat, less fatty, and mixed with bones. However, it appears from Table 4 that most households (77.8%) prefer the fillet, thigh, or shoulder part due to its tenderness, while 20.4% opt for the chops part and sometimes the viscera (Table 4).

The results in Table 4 showed that there are two (2) main modes of consumption of camel meat in Nigerien urban households: grilling and soup preparation. Indeed, the soup mode (stew with vegetables and sauce) is the form commonly practiced, with 65.8%, while the grilled mode, commonly referred to as 'balango', is less appreciated (34.2%) by consumers of camel meat.

Consumer Perceptions of Camel Meat: It appears from Figure 4 that households perceive camel meat differently and are divided into five (5) main groups. Indeed, almost half (43%) of the sample perceive the consumption of this meat for therapeutic and nutritional purposes as virtuous, while those who consider camel meat like any red meat account for 32.6%, without any particularity regarding whether to consume it or not. A significant proportion of

14.1% of households qualify camel meat as unfit for consumption (not liking it when consumed). Additionally, a small proportion of households (7%) blame this meat for its poor organoleptic quality (tough when cooking and eating, unpleasant smell). Thus, 3.3% of the sample, strongly attached to the Muslim religion, perceive camel meat as necessary and important for consumption (because the animal is blessed by the prophet who consumed its meat) (Figure 4). However, all consumers of camel meat surveyed are unanimous and convinced of its nutritional, dietary, and medicinal quality.

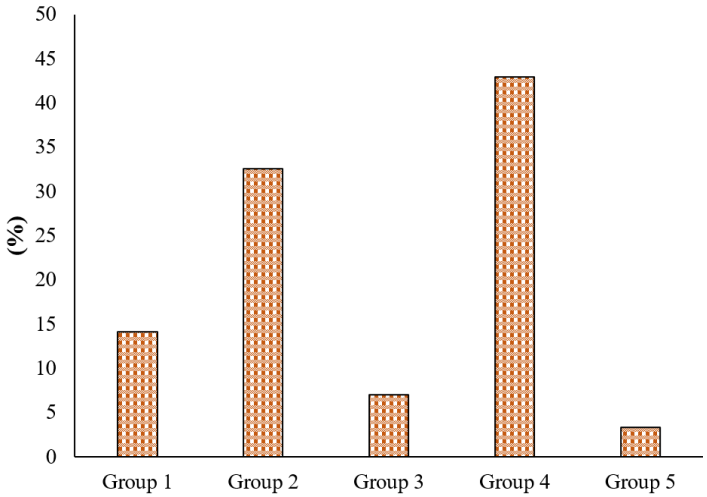

Figure 4. Distribution of consumers according to perceptions of camel meat.

Taboos and Prohibitions against Camel Meat: Taboos and food prohibitions persist increasingly and create an obstacle to the consumption of camel meat. To this end, most of the respondents (71.9%) do not consume camel meat for reasons of belief and the sayings of certain traditions: "the consumption of camel meat prolongs the duration of childbirth for pregnant women by a year."

On the other hand, 28.1% of respondents believe that this meat is:

- Causes heaviness in the feet.
- Interrupts ablutions after consumption.
- Causes intense pain following a scorpion bite.
- Generates pronounced nastiness (nervousness).

3.2. Camel Meat Consumer Practices

Consumption of Camel Meat and Other Meats: Figure 5 shows that poultry (35.2%) remains the main meat that consumers prefer. Additionally, the red meat most consumed among city dwellers is that of sheep (38.8%), followed by beef (32.1%). Thus, the consumption of camel meat is 23.3% (Figure 5).

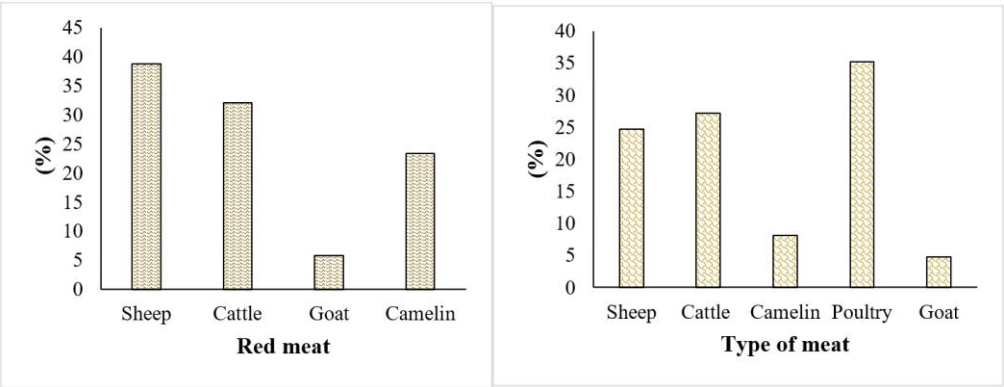

Figure 5. Meat consumption preference and choice.

Consumption of Red Meat in the Three Localities: It appears from this study that consumers in Agadez and Tahoua prefer camel meat more than those in the city of Niamey (Figure 6). Indeed, the majority of the population in the cities of Agadez and Tahoua (respectively 73.4% and 60%) mainly choose camel meat to the detriment of others. Thus, consumers in the city of Niamey prefer sheep and beef meat, with proportions of preferences of 46.1% and 41.2%, respectively (Figure 6).

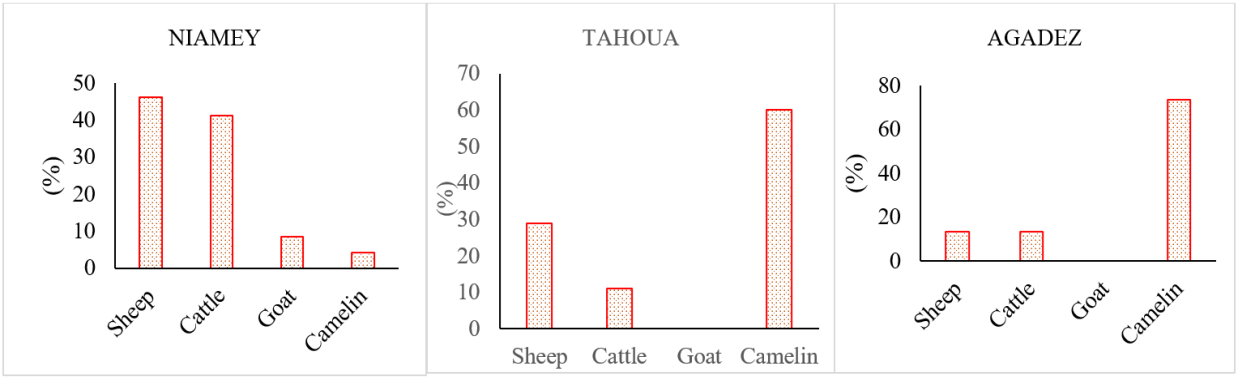

Figure 6. Consumption of red meat in the three Sahel regions of Niger (Niamey, Tahoua and Agadez).

In all localities combined, the results in Figure 7 showed that 66.7% of the Tubu prefer camel meat, which gives them first place, followed by the Tuareg (47%). On the other hand, the Kanuri (66.7%), the Hausa (39.1%), and the Zarma (48.9%) prefer sheep meat in their culinary habits. Additionally, 43.7% of Fulani consumers opt for beef (Figure 7).

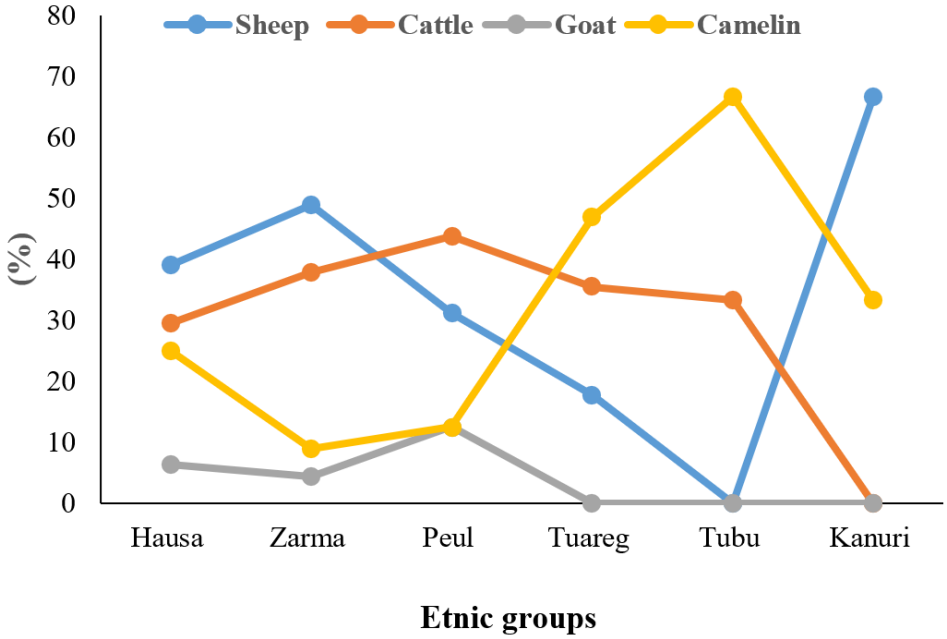

Figure 7. Distribution of red meat consumption rate by ethnic groups in the Sahel of Niger.

Depending on the ethnic group, Figure 7 illustrates that the Tubu, followed by the Tuaregs, consume more camel meat. Thus, the link between ethnicity and meat consumption is not significant.

Typology of Camel Meat Consumers: Figure 8 presents the different types of consumers according to the frequency of consumption (regular or occasional).

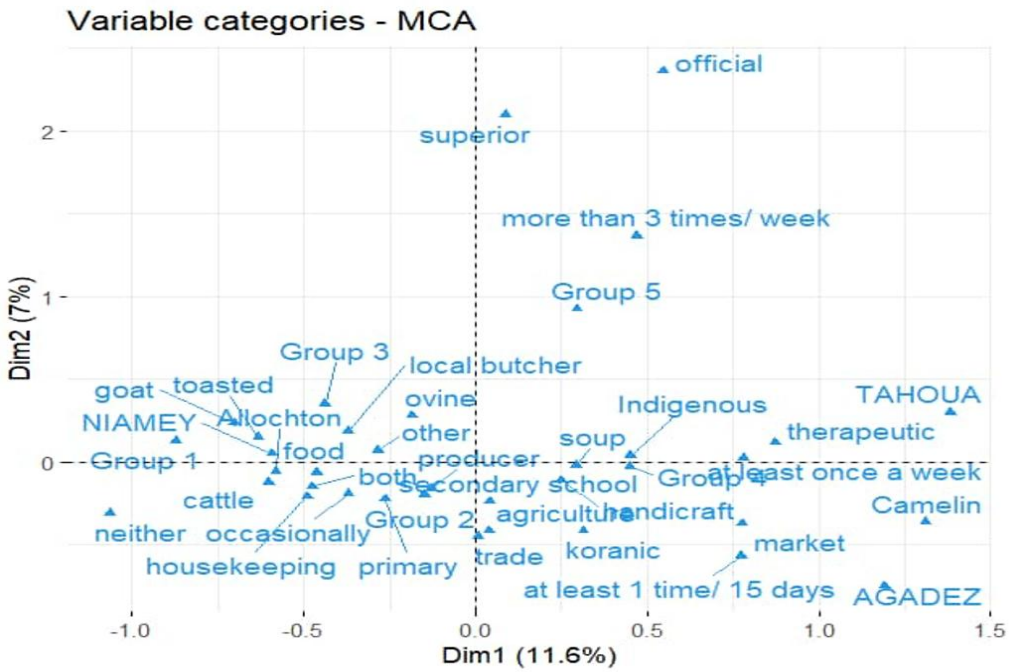

Figure 8. Projection of the modalities of variables contributing significantly to multiple component analyses (MCA).

The first axis, which totals the greatest amount of information, opposes:

- On the right are regular consumers of camel meat (consumption of camel meat more than three times a week and at least once a week, religious beliefs for consumption, use of camel meat in the preparation of dishes for therapeutic virtues).
- On the left of the factorial plan, occasional consumers of camel meat (occasional consumption, perception: absent in the eating habit and of low organoleptic quality, purchase of camel meat for food purposes).
- The second axis separates occasional consumers of camel meat according to the type of red meat most consumed, the main activity of the consumers, the level of education, and the locality.
- At the top of the factorial plan are occasional consumers in the towns of Tahoua and Niamey (with a higher level of education, civil servants as the main activity, and consumption of sheep and goat meat).
- As for occasional consumers in the city of Agadez, they prefer beef compared to all other red meats. They are mainly traders or farmers with a low level of education (none, Koranic).

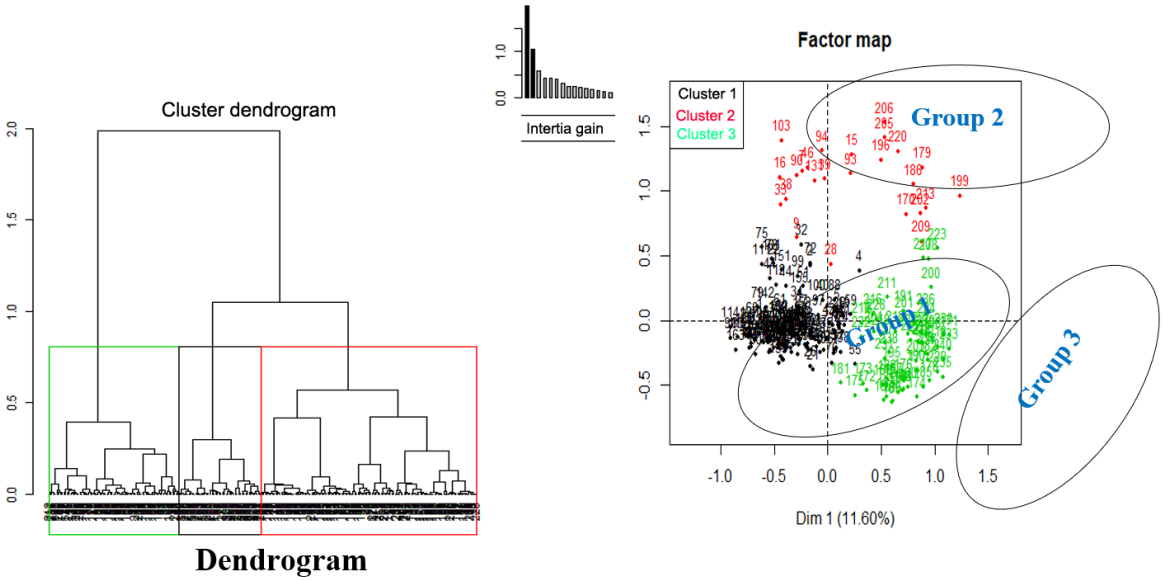

Figure 9. Typology of the 3 consumer groups in the cities of Niamey, Tahoua, and Agadez.

Figure 9 illustrates a typology of camel meat consumers grouped as follows:

Group 1: Comprising 41.3% of respondents, they are occasional consumers of camel meat. They are of non-native origin, possess a secondary education level, and have a preference for sheep and beef meat. However, this group consumes camel meat mainly for its nutritional and therapeutic virtues. Finally, the respondents in this group have commerce as their main activity.

Group 2: Presented by 38.3% of respondents; they are occasional consumers of camel meat, mainly indigenous people living in the city of Agadez. Additionally, they have a higher level of education and are state civil servants with other secondary activities. This group also has a preference for sheep and beef. Dromedary meat is only used for its therapeutic virtues through the occasional preparation of traditional dishes. These consumers perceive that camel meat is used in the prevention and treatment of numerous diseases (gout, hypercholesterolemia, high blood pressure, heart failure, stroke).

Group 3: Represented by 20.4% of the consumers surveyed, they are regular consumers of camel meat. They are generally of indigenous origin. They reside largely in the town of Tahoua and prefer camel meat to all other types of red meat. This meat is consumed more than three times a week. Thus, this group advocates the therapeutic virtues of camel meat, like the two previous groups, as the reason for its consumption. They source camel meat mainly from markets.

3.3. Discussion

The socio-demographic characteristics of camel meat consumers showed that 65% of respondents are represented by the Hausa ethnic group, while the Tubu and Kanuri are less represented, with 1.3% and 1.3%, respectively. These results are based on the fact that the Hausa represent 55.4% of the population of Niger, while the Kanuri and the Tubu are respectively at 4.2% and 0.1% (Leclerc, 2017).

The study on perceptions of camel meat revealed a high preference for poultry meat among consumers. This could be explained by nutritional education interventions carried out by Non-Governmental Organizations (NGOs) and associations that work for behavior change, integrating the consequences of excessive consumption of red meat. These results are in line with those of Zakaria and Mohamed (2021), which demonstrated that the reduction in the purchasing power of populations and the excessive increase in the prices of red meats have disrupted local eating habits. This has led to a high consumption of chicken meat, the price of which is affordable.

The inventory of camel meat consumption carried out in the three cities of Tahoua, Agadez, and Niamey made it possible to determine the behavior of consumers of this meat. Thus, a high degree of consumption was observed in the city of Agadez, followed by the city of Tahoua. Additionally, the lowest rate of consumption of camel meat was noted in Niamey. This difference in the consumption of camel meat can be explained by the large number of camel heads raised in the two zones (Agadez and Tahoua) due to their more favorable conditions for extensive breeding of this animal species compared to Niamey. Furthermore, in Niamey, dietary habits based on excessive consumption of grilled sheep meat were noted. Thus, this study showed that belonging to an ethnic group does not influence the consumption of camel meat; it is rather linked to the eating habits and the social environment of the person.

Indeed, these first two localities (Agadez and Tahoua) are characterized by high accessibility to camels, influencing the eating habits of the populations towards the consumption of camel products and meat in particular. However, camel meat occupies a predominant place in the regions of Tahoua and Agadez. These results corroborate those of Sadoud, Nefnouf, and Hafaoui (2019) mentioned in the regions of Tamanrasset (Hoggar) and Ghardaïa (M'Zab) in Algeria.

A significant proportion of households (62.5%) have a good knowledge of camel meat based on its color (less red) and the superficial presence of fat. On the other hand, according to Faye, Abdelhadi, Raiymbek, Kadim, and Hocquette (2013) and Kadim, Mahgoub, and Purchas (2008), camel meat has a raspberry-red color and is often brown for older

subjects. However, camel and bovine carcasses of the same physiological age have comparable organoleptic properties when cut from the same anatomical region (Ibtissem, 2009; Kamoun, 2011).

In this study, consumers described camel meat as tough when cooking and chewing and as having a bad smell. These results corroborate those of Kadim et al. (2006) and Faye, Abdelhadi, Raiymbek, Kadim, et al. (2013), where they demonstrated that the tenderness and palatability of camel meat decreased with age. However, meat from young camels provides tender meat that is highly appreciated by consumers, particularly because of its low cholesterol content (Sadoud et al., 2019).

The current preference for consuming camel meat is linked to its multiple therapeutic or medicinal virtues (Ayyash et al., 2019; Kadim & Sahi, 2018; Kamoun, 2011; Popova et al., 2021; Sahraoui et al., 2014). However, unlike the results of this study, which took into account a certain number of food taboos and prohibitions that prevent its consumption, there are reasons that hinder the consumption of camel meat, such as the extension of the duration of childbirth by one year in pregnant women. The results of the study showed that public perceptions of this meat strongly discourage its consumption by pregnant women. These results could be explained by the population's attachment to traditions (customs, beliefs, food taboos) and the influence of the social environment. These findings are contrary to those shared by Trizek (2017), who affirmed in Somalia that it is only the camel's testicles and heart that are forbidden to women, while men's feet are prohibited. Indeed, the camel hump is generally offered first to men because of its high-fat content (Trizek (2017).

Furthermore, the Muslim religion does not include camel meat, even though in the neighboring Pakistani province of Sindh, some Muslim camel drivers do not consume it (Trizek (2017). On the other hand, according to Trizek (2017), a food taboo based on religion prohibits camel meat for Coptic Christians in Egypt, Christians in Ethiopia, Jews, Hanbalites, followers of Zoroastrianism in Iran, as well as Mandaeans.

Indeed, several ethnic groups and beliefs do not authorize the consumption of camel products for their followers, even if they are breeders of this animal. Thus, only camel milk is permitted in small quantities in exceptional situations. These results could not be explained by faith, since even Muslims do not eat this meat in the neighboring Pakistani province of Sindh, while this same meat is consumed in the capital (Trizek (2017).

It appears from this study that consumers exhibit a certain number of behaviors and practices that are most important to them based on color, freshness, muscle-to-bone ratio, part of the carcass, and price when purchasing camel meat. These results corroborate those obtained by Babiker and Yousif (1990), who reported that the choice of camel meat is based on the quantity of flesh in relation to bone. Thus, this study demonstrates that consumers prioritize color and freshness to assess the quality of meat. However, according to Faye, Abdelhadi, Raiymbek, Kadim, et al. (2013) and Kadim et al. (2008), camel meat is described as "raspberry red" in color and sometimes brown in older animals (due to a high concentration of myoglobin). This generally results in a sweet taste, which could be due to a relative richness in glycogen (Kadim et al., 2008).

For this study, consumers always have requirements when purchasing and directing butchers to the desired parts. Indeed, a considerable part of the sample (34.6%) chose meat for medicinal purposes. However, a similar observation was made in 2023 in Algeria, according to which camel meat is considered a nutraceutical and that all households are unanimous in its dietary quality (Djenane, 2023).

Regarding the reasons for the rejection of camel meat, they are based on unfounded and poorly clarified beliefs and interpretations that do not reflect any scientific knowledge.

The study showed that the consumption of camel meat is very traditional despite its relatively affordable price. Indeed, the price of camel meat is, on average, lower than that of cattle, generally with a difference of 500 Franc CFA. However, the same observation was made in Algeria by Oulad Belkhir, Bouziane, Chehma, and Faye (2013), who reported that beef sells for 900 DA/Kg and that of camel at 800 DA/Kg (a 100 DA difference).

As for consumer classification, motivational reasons, frequencies, and consumer perceptions are three factors that could have a direct impact on the consumption of camel meat in Niger. Thus, two main types of consumers have been

identified based on their motivations and their reluctance: regulars and occasional ones. This difference is considerably linked to behaviors, eating habits, and the effects of the environment on consumers. In fact, occasional consumers (79.6%) reject camel meat on the one hand because of its low organoleptic quality and on the other hand because of their lack of eating habits. Thus, this type of consumer generally opts for sheep and beef meat, which is appreciated for its organoleptic quality and is present in eating habits. These results are similar to those found by Brahimi (2021) and Bendania and Nouha (2016) in Algeria, where the excessive increase in the price of red meat has disrupted local eating habits and led to a preference for chickens, which are more affordable. On the other hand, in Tunisia, according to Kamoun (2011) in his study, half of consumers request camel meat for its dietary qualities.

As for regular consumers (20.4%), they purchase camel meat regularly for the preparation of dishes. Indeed, regular consumers are motivated, on the one hand, by their strong attachment to the Muslim religion, according to which the Prophet and his companions used the camel in their activities and consumed its products (meat and milk). On the other hand, this type of consumer seeks camel meat for its therapeutic virtues (treatment of certain cardiovascular diseases). Thus, regardless of the type of consumer (regular or occasional), the use of camel meat is generally encountered among natives due to their eating habits. These results corroborate those of Kamoun (2011) in Tunisia and Brahimi and Senoussi (2020), who confirmed that the consumption of camel meat remains essentially on an indigenous scale (Brahimi & Senoussi, 2020; Kamoun, 2011).

The method of preparing camel meat is generally in the form of soup and/or as an accompaniment to a dish. Similarly, according to the study by Bendania and Nouha (2016) and Sadoud et al. (2019), camel meat is mostly prepared using wet cooking methods. However, the method of cooking the meat is not only linked to consumption habits; furthermore, it is important to avoid the weight loss of camel meat during the grilling process (Brahimi, 2021).

4. CONCLUSION

It is concluded that consumer knowledge, attitudes, and perceptions of camel meat influence its consumption. Additionally, a high trend of poultry preference is observed to the detriment of other types of red meat. Indeed, consumers base their evaluations of meat quality on extrinsic characteristics (animal species, color, freshness) to judge its consumption. According to the results obtained, the appreciation and consumption of camel meat vary depending on the locality; this consumption is much greater in the cities of Tahoua and Agadez. The interviews conducted also demonstrated that consumer attitudes and perceptions favor, on one hand, the consumption of camel meat and, on the other hand, create a feeling of reluctance towards it. Prejudices are mainly based on organoleptic quality (taste, tenderness, smell, texture, etc.) as well as on certain poorly clarified food taboos. The results concluded that camel meat is not customary in the eating habits of the Sahel people of Niger. However, camel meat remains a meat for occasional consumption, generally intended to accompany family dishes and for the production of *kilishi*. Thus, the Sahel region of Niger is a camel breeding country that could make camel products (meat and milk) of significant importance available, but the factors leading to the rejection of this product (attitudes, food taboos, and consumer perceptions) remain the main concerns. However, nutritional education is intended to be effective in changing the behavior of the population. More research perspectives are needed on the processing of camel meat products to enhance their profitability, acceptability, and availability.

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