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CAMEL MEAT PERCEPTION AND THE FACTORS INFLUENCING ITS CONSUMPTION WILLINGNESS AMONG ALGERIAN CONSUMERS

Brahim Hamad[1,2,*], Leyla Hadef[1,2], Smail Amara[3]
[1] Department of Agronomy, Faculty of Life and Natural Sciences, University of El Oued, El Oued, Algeria
[2] Laboratory of Hygiene and Animal Pathology, Institute of Veterinary Sciences, University of Tiaret, Tiaret, Algeria
[3] Health and Hygiene Office, Municipality of Taleb Larbi, El Oued, Algeria

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Abstract
The purpose of this research was to evaluate Algerian consumers' perceptions of camel meat and identify the variables driving their intention to consume it. A survey of 142 participants selected at random through in-person interviews and a self-administered questionnaire in El Oued district located in the southeast of Algeria assisted in this study. The data revealed that 93.7% of the participants had consumed camel meat previously at least once; however, merely 6.3% of participants had never consumed this meat before. The majority of participants (83.1%) held a favorable perception of camel meat and expressed a willingness to consume it again (80.3%). Conversely, 59.2% of the participants said that eating camel meat was often linked with particular occasions, like religious and sociocultural activities. Taste (65.5%) was the primary factor influencing customers' choice of red meat varieties, while tenderness (58.5%) was the most strongly correlated attribute with camel meat perception. Analysis of the determinant variables showed that males were willing to eat camel meat at a higher rate than females (92.1% vs. 66.7%; $\chi^2 = 14.440$; $p = 0.000$). A substantial beneficial impact was also evident due to prior consumption and the favorable perception of this meat among consumers ($\chi^2 = 29.043$; $p = 0.000$ and $\chi^2 = 52.857$; $p = 0.000$). The willingness to indulge in camel meat consumption was also significantly impacted by ascertaining how frequently consumers consume this meat. Altogether, this investigation offers a clear understanding of how consumers perceive the quality of camel meat and the factors that influence its consumption.

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Introduction

Camels are well adaptable in dry and semi-dry climates that are unsuitable for taming other livestock species and are thus considered as a valuable domestic creature serving as an excellent alternative for livestock production [1,2]. Camels are exceptional as they can endure crude environmental conditions with high temperatures, sustain amidst variable and poor food and water supplies, and thrive upon fibrous plants that have low nutritional benefits and are unpalatable to other animals [3,4]. Camel farming offers a feasible solution to protein scarcity in dry areas, given the implications of global warming and the spread of dry and semi-arid climates in numerous regions worldwide [5].

Camel meat consumption is typically prevalent in the Middle East and northeastern Africa [6,7]. Unlike other commercialized red meats like beef and sheep, it has a higher content of polyunsaturated fatty acids (PUFA) and a smaller proportion of fat and cholesterol, making it one of the finest meats with fewer detrimental implications to human health [8,9]. Conversely, the greater toughness of camel meat compared to other varieties of meat becomes its drawback [10]. According to Husain et al. [7], there is a high demand for fresh camel meat, which is anticipated to account for 22% of the global market share by 2022. Camel meat accounts for 45% of the market in Africa, the Middle East, and Europe. By 2022, it is expected that camel meat will also be highly popular in the Asia Pacific area [11]. The camel meat market is primarily concentrated in Africa, the Middle East, and Europe covering almost 45% share, with a projection of expansion in Asia Pacific countries in the years coming ahead [11]. Although camels may be raised more profitably compared to other livestock in dry and semi-dry environments, serving as a viable substitute for meat, camel meat is sometimes misinterpreted as having less nutritional content and poor quality than other red meats.

As a result, the majority of research conducted until now has revolved around evaluating consumer attitudes and behaviors regarding different kinds of red meat, particularly those derived from cattle, sheep, and goats [12,13,14]. Fur-

thermore, it is noteworthy to point out that there is a lack of research focusing on the global and Algerian consumers' perceptions of camel meat and the variables that may impact their purchase decisions concerning camel meat.

This emphasizes the necessity of conducting an investigation to have a deeper understanding of customers' perceptions of this meat. Thus, the current study sets out to evaluate consumers' opinions on camel meat and explore the variables influencing their propensity to eat it.

Objects and methods

Study area

The Ethics Committee of the Life and Natural Sciences Faculty at the University of El Oued in Algeria governed the execution of the study. The study participants were informed in advance regarding the confidentiality of the data shared by them that would be utilized exclusively for research purposes. El Oued situated in the southeastern regions of Algeria (located at 3322′16.823″ N latitude and 650′52.686″ E longitude) which is 630 kilometers away from the capital city, Algiers, served as the geographical location for this survey conducted from January to May 2024. Given the district's prominence in breeding and marketing activities pertaining to camels, it was deemed an ideal location for this investigation. Additionally, the socio-demographic characterization of the study location also aligned well with the research goals.

Survey and data collection

The current research was performed with the contributions of 142 survey participants from diverse socio-demographics who had undergone random sampling for this study (Table 1).

Table 1. Socio-demographic characteristics of the participants (n = 142)

Characteristics	Frequency (n)	Percentage (%)
Gender		
Female	66	46.5
Male	76	53.5
Age (years old)		
18–25	35	24.6
26–35	34	23.9
36–45	42	29.6
46–55	18	12.7
> 56	13	9.2
Region of residence		
Urban	67	47.2
Rural	75	52.8
Educational level		
Primary and lower	5	3.5
Middle	11	7.7
Secondary	39	27.5
Higher	87	61.3
Income level perception		
Low	73	51.4
Acceptable	69	48.6

The trivial overrepresentation of men in the sample (53.5%) compared to women (46.5%) falls in line with the findings of earlier surveys carried out in Algeria, which could be attributed to the societal context of the research area's population, within which men restrict women from participating in projects led by foreigners. Age distribution of participants was about equal across the board, with the exception of those between the ages of 46 and 55 (12.7%) and people older than 56 years (9.2%). The various demographic pyramids in the research region may be the root cause of this occurrence. Comparable demographics were observed with regard to the educational levels of survey participants. Higher-educated respondents made up 61.3 percent of the study sample, exceeding all the other educational level categories. A balanced representation of respondents from both urban and rural areas was observed while analyzing their residential demographics. Prior to the initiation of the survey, each participant was granted verbal authorization to participate in the study. The survey was conducted in close collaboration with participants who expressed enthusiasm for participating in the study and had attained 18 years of age in order to ensure legitimacy. In order to ensure the confidentiality and consistency of the participants (each person participated in the study only once), the questionnaires were flagged with unique codes devoid of any personal information. A self-managed, structured questionnaire was used in face-to-face interviews with the study subjects to collect data on consumer opinions regarding camel meat and the variables influencing their desire to consume it. There were 2 parts in the questionnaire, both with multiple-choice questions.

The initial segment of the survey asked questions to gather data concerning participants' sociodemographic characteristics, including gender, age, place of residence, degree of education, and household income. The questions in the second section sought information on customers' perceptions of camel meat and the variables that influence their propensity to purchase it. The questionnaire comprised both closed (single-choice and multiple-choice) and open-ended (questions without any prospective answers) options. For issues that demanded additional details and clarification, open-ended questions were used to enable participants to share their ideas in their own words. Nominal data, such as selecting "female" or "male", "yes" or "no" was gathered through closed-ended questions. For polytomous data, participants were allowed to choose from lists of options with greater complexity, such as "daily", "more than once a week", "festive" and "never".

Statistical analysis

The statistical analyses were conducted utilizing the Package SPSS, Version 27.0 software. In order to determine the variables influencing consumers' propensity to purchase camel meat, Fisher's exact test or Chi-square analysis was used to examine survey data. Fisher's test was run in cases wherein more than 20% of the cells have predicted

frequencies less than 5. Conversely, if less than 20% of the cells had anticipated frequencies <5, the Chi-square method was employed. A significance threshold of $p < 0.05$ was deemed appropriate for all tests.

Results

Table 2 depicts the participants' opinions regarding camel meat. The survey outcomes revealed the frequent consumption of camel meat by most of the participants (93.7%) in their lifetime. Alternatively, regardless of the camel meat being favorably perceived by the majority of the participants (83.1%), they expressed willingness for its repeated consumption (80.3%), whereas it was graded fourth in preference by 41.5% of participants ensuing sheep, beef, and goat meats, respectively. Additionally, for many participants (59.2%), camel meat intake was more closely associated with jubilant occasions. On the scale of quality attributes, the respondents ranked taste as the most significant factor (65.5%) during selection of red meats, whereas the soft texture of camel meat (58.5%) was largely responsible for the consumer's fulfillment and was seen as the biggest obstacle diminishing camel meat intake.

Table 2. Participants perception of camel meat (n = 142)

Questions	Responses	Frequency (n)	Percentage (%)
Did you consume the camel meat previously?	Yes	133	93.7
	No	9	6.3
Which rank was taken by the camel meat among the others: sheep, beef and goat?	1st	12	8.5
	2nd	20	14.1
	3rd	51	35.9
	4th	59	41.5
Are you willing to eat the camel meat again?	Yes	114	80.3
	No	28	19.7
How do you appreciate the camel meat?	Good	118	83.1
	Not good	24	16.9
What are the main attributes driving your decision toward meat?	Taste	93	65.5
	Fat level	12	8.5
	Habit	10	7.0
	Tenderness	7	4.9
	Health reasons	6	4.2
	Nutritional reasons	5	3.5
	Quality	5	3.5
	Religious reasons	2	1.4
	Availability	1	0.7
	Bone level	1	0.7
What are the main attributes limiting your choice for camel meat?	Tenderness	83	58.5
	Taste	51	35.9
	Color	7	4.7
	Odor	1	0.7
How often do you consume camel meat?	Daily	1	0.7
	More than once a week	9	6.3
	More than once a month	39	27.5
	Festive	84	59.2
	Never	9	6.3
How do you perceive the price of camel meat?	Affordable	65	45.8
	Not affordable	77	54.2

The impact of the sociodemographic variables on consumers' willingness to eat camel meat is shown in Table 3. The findings reflected that out of all the parameters, only the customers' gender had an important bearing ($p < 0.05$) on their camel meat consumption decision. It is also noteworthy to note that, in comparison to the females, the males exhibited a statistically significant higher inclination for camel meat consumption (OR = 5.833; $p = 0.000$). Nevertheless, age, place of residence, education, income level, and perception of pricing did not impact consumers' willingness to eat camel meat significantly ($p > 0.05$) (Table 3).

Table 4 provides a summary of the variables influencing willingness to consume camel meat in association with generic eating practices. Consequently, the participants' overall opinion of camel meat intake became the most crucial variable influencing their consumption decisions ($\chi^2 = 52.857$; $p < 0.05$). Respondents with an unfavorable perception were less inclined to consume camel meat in contrast to consumers perceiving it favorably (OR = 0.021; $p = 0.000$). The second most significant variable influencing consumers' willingness to eat camel meat was correlated to the experience of its intake ($\chi^2 = 29.043$; $p < 0.05$). Customers having previous experience of eating camel meat appeared to be more likely to have repeat consumption rather than those who had never tasted it (OR = 0.022; $p = 0.000$). Conversely, people who either never tasted camel meat or ate it only on rare occasion-specific days exhibited a lesser inclination to consume it ($p < 0.05$) than people who consumed it frequently (every month, every week, or every day). Lastly, consumers' willingness was not significantly impacted by camel meat availability ($p > 0.05$) (Table 4).

Discussion

Apparently, this research may indicate camel meat consumption by all the interview participants. This trend aligns with the findings of the study by Brahimi et al. [15] conducted to analyze the camel meat consumption patterns in regions with high prevalence of camel meat consumption, particularly dry and semi-dry parts of the nation, demonstrating that it was an attractive component that might be effectively enhancing the local population's access to food. Previous research endeavors elaborate on the autochthone background of the majority of the participants residing in the study area which justifies the traditions and practices associated with the use of camel meat [15]. Baba et al. [6] assert that the ethnic importance of camel meat is liable for its predominant consumption trend in the Middle East and northeastern Africa. According to Faye [16], an apparent sociocultural connection exists between dromedary and its derivatives and the inhabitants of desert nations. Additionally, recent investigation by Bahwan et al. [9] pointed out that camel meat is often consumed in Asian and African nations because of its scarcity. A total of 898.150 camels

Table 3. Impact of socio-demographic variables on camel meat consumption willingness (n = 142)

Variables	Consumption willingness (Yes) n (%)	Consumption willingness (No) n (%)	Odds Ratio	*F*-Value /χ^2	*p*-value
Gender					
Female	44(66.7)	22(33.3)	1	14.440	0.000
Male	70(92.1)	6(7.9)	5.833		
Age (years old)					
18–25	24(68.6)	11(31.4)	1	7.693	0.094
26–35	25(73.5)	9(26.5)	1.273		
36–45	37(88.1)	5(11.9)	3.391		
46–55	17(94.4)	1(5.6)	7.791		
> 56	11(84.6)	2(15.4)	2.520		
Region of residence					
Urban	53(79.1)	14(20.9)	1	0.111	0.739
Rural	61(81.3)	14(18.7)	1.150		
Educational level					
Primary and lower	4(80.0)	1(20.0)	1	3.582	0.283
Middle	8(72.7)	3(27.3)	0.666		
Secondary	35(89.7)	4(10.3)	2.187		
Higher	67(77.0)	20(23.0)	0.837		
Income level perception					
Low	59(80.8)	14(19.2)	1	0.028	0.868
Acceptable	55(79.7)	14(20.3)	0.932		
Price perception					
Affordable	54(83.1)	11(16.9)	1	0.592	0.442
Not affordable	60(77.9)	17(22.1)	0.718		

Table 4. Impact of variables related to consumption practice on camel meat consumption willingness (n = 142)

Variables	Consumption willingness (Yes) n (%)	Consumption willingness (No) n (%)	Odds Ratio	*F*-Value /χ^2	*p*-value
Consumption experience					
Yes	113(85.0)	20(15.0)	1	29.043	0.000
No	1(11.1)	8(88.9)	0.022		
Overall perception					
Good	109(92.4)	9(7.6)	1	52.857	0.000
Not good	5(20.8)	19(79.2)	0.021		
Consumption frequency					
Never	1(11.1)	8(88.9)	1	26.361	0.000
Festive	67(79.8)	17(20.2)	31.529		
More than once a month	37(94.9)	2(5.1)	148.000		
More than once a week	8(88.9)	1(11.1)	64.000		
Daily	1(100.0)	0(0.0)	/		
Availability					
Available	64(86.5)	10(13.5)	1	3.758	0.053
Not available	50(73.5)	18(26.5)	0.434		

were processed for meat production in Asian, African, and Middle East countries in 2020 [17].

Regardless of camel meat's fourth ranking on the preference list following sheep, beef, and goat meat, sheep meat still remains the most popular variety of meat among the participant population. These findings are consistent with the results of the study by Benaissa et al. [18], claiming that the consumption rate of camel meat was extremely low in Algeria, accounting for 33% of the country's red meat consumption with fluctuating patterns. In the same perspective, Brahimi et al. [15] noted that camel meat accounts only for 1.24% of overall red meat consumption by Algerians, regardless of its anticipated production of 6000 tons/year in 2017 [19]. In urban areas, butchers' primary focus is on marketing other red meat varieties, specifically beef, which remains the most favored choice among consumers. They consider the marketing of camel meat as a supplementary effort to approach a diverse range of red meat consumers, particularly in rural regions, still experiencing a demand for camel meat [15]. Nonetheless, the taste of sheep meat rendered it the most frequently chosen option by customers of rural areas in comparison to alternative kinds of red meat [15]. The issues raised by research participants, particularly with regard to the tenderness of camel meat, are

attributed to its latest rating against other red meat variants. Therefore, for the majority of people, camel meat's hardness is one of the main barriers to its consumption. As a result, it has been noted by Bahwan et al. [9] that camel meat is typically thought to be fibrous and rough. The findings of an additional study conducted recently reflect camel meat's greater hardness ratings along with more roughness in contrast to beef and mutton meat, respectively [5]. Thus, it is noteworthy to emphasize that camel meat from older animals tends to have higher shear force values and tougher texture than younger animals' meat [5,20]. Conversely, Brahimi et al. [15] reported consumers' perception of a higher meat-to-bone ratio in beef rather than camel meat, which renders camel meat less desirable to consumers.

Likewise, Mohamed Ali [21] highlighted camel meat's property of losing its volume by 50% during cooking which makes it bonier. As a result, buyers opine camel meat as a costly variety because of its larger percentage of bones and cooking shrinkage, thus forcing them to spend more money on beef for its larger edible portion [15].

The majority of the study participants held a favorable perception of camel meat and a greater proportion of them with a willingness to eat this meat pointed towards camel meat's increasing popularity owing to its unique attributes and health benefits. As a result, people experiencing chronic heart ailments, those undergoing weight loss programs, and health-conscious customers are likely to prefer camel meat over other red meat variants [6]. Osaili et al. [22] speculate that these advantages of camel meat may have contributed to its increased demand. Consistent with the above assertion, newer research in Somalia has revealed extensive consumption of camel meat by Somali customers in comparison to other red meat alternatives due to the health and nutritional benefits of camel meat [23]. According to Husain et al. [7], people in Saudi Arabia assumed that camels were immune to the majority of livestock-related illnesses, which justifies the heightened demand for camel meat.

Our study reflected that camel meat's taste was the determinant trait driving consumers' preference for its consumption over other red meat variants. This aligns with the findings of other studies conducted in the same area as the present study, establishing that consumers' delight after red meat intake was mostly driven by its flavor [15,24]. Previous studies conducted in different nations have also emphasized that the taste of red meat, particularly that of sheep, correlates with consumers' perceptions and propensity to consume it [13,25,26].

Consistent with our study findings, Manheem et al. [5] and Bahwan et al. [9] highlighted, that camel meat's hardness is still a common constraint that restricts customers' inclination toward its consumption. Brahimi et al. [15] specified that in contrast to aged camel meat, consumers frequently opt for the tender meat owing to its ease of cooking. Thus, some recent research recommended pretreatments and cooking techniques that have a good impact on camel meat's tenderness [27,28]. In order to increase the tenderness of the meat, an appropriate cooking procedure should be followed, especially for preserved camel meat [5]. In another study, Maqsood et al. [29] explored the use of plant proteases offered to increase the tenderness of camel meat.

Although camel meat holds an obvious position in the culinary culture of people residing in dry and semi-dry regions, most of the study participants acknowledged infrequent intake of camel meat. This could be the consequence of recently evolved dietary patterns as well as limited breeding and supply of camel meat in our study region. This was in line with study findings published by Bougherara et al. [30], claiming minimal consumption of camel meat at the study location because it is poorly marketed and manufactured. According to a recent study by Lamri et al. [31], including an online poll of 665 consumers, camel meat is not often consumed by customers of the Kabylia (Algeria) district with 54.3% of residents who had never tasted it, 1.6% who consumed it regularly, 35% occasionally, and 9.1% seldom. Brahimi et al. [15] claim that camel meat was largely bought and utilized to celebrate festivals by preparing the well-known traditional food known as couscous. The residents of the study location follow a custom of celebrating the onset of fall by serving couscous made of camel meat. Kadim and Mahgoub [32] highlighted a similar pattern in which the pastoral societies avoided slaughtering other than for ceremonial contexts.

While analyzing the variables impacting consumers' propensity to consume camel meat, our research revealed that out of all the sociodemographic attributes, only the consumers' genders had a substantial bearing. Although consumers' age, dwelling locations, educational attainment, family income, and perceived price do not have a considerable implication, the reduced frequency of camel meat intake among the survey participants may induce a minor influence on their propensity to purchase it. Women exhibited a low likelihood to consume camel meat compared to men, potentially due to their higher innate sensitivity regarding animal welfare concerns [33]. Consequently, Topcu and Elmi [23] noted that customer satisfaction resulting from camel meat intake may be significantly impacted by issues involving animal welfare. Studies analyzing consumer behavior have consistently shown a higher likelihood of women to exhibit animal-friendly thinking compared to men, along with different points of view among men and women pertaining to significant ethical concerns of animal care [34,35].

This investigation made it readily apparent that the general impression of the product was the primary element driving the consumption practice influencing the customers' inclination to consume camel meat. Furthermore, our study's findings validated that consumers favorably perceiving camel meat are more inclined to eat it rather than those with an unpleasant hedonistic experience of its

consumption. This was in line with the observations published by Topcu and Elmi [23], who discussed how satisfaction after eating camel meat is influenced by the feelings and actual quality attributes of the food. As per the preceding researchers, the term "sensory quality" refers to a broad spectrum of sensory experiences, including visual accuracy and genuineness of quality along with the area of genesis bolstering the consumers' fulfillment after camel meat intake [23]. Additionally, it was determined that the hedonic attractiveness successfully influenced customers' propensity to consume camel meat. It is worth noting that a recent study conducted in the same area correlated the desire to eat camel meat with a favorable view of its hedonistic features [24].

Undoubtedly, customer expectations regarding a food product's quality indicators serve as the primary factor driving their desire to consume it. Moreover, de Andrade et al. [13] have observed that customers' expectations stemming from their prior experience with a specific variety of meat can impact their consumption decisions favorably or unfavorably. Our study indicates that consumers' prior experiences of eating camel meat render it appropriate for their consumption. Apparently, participants with prior experience of camel meat consumption exhibited a higher propensity to eat it rather than those without any prior experience.

Our study critiqued that the frequency of consumption had a substantial impact on consumers' willingness to consume camel meat. Consequently, it was discovered that consistent and frequent intake of this meat was significantly and positively correlated with a favorable propensity to consume it. Consistent with this outcome, prior research has indicated that intermittent consumption of sheep and goat meat might act as a barrier to satisfying consumers' appetite for these meats [13,24,31]. This can be attributed to the familiarity aspect of this meat, which has been previously emphasized in several other papers and even in this investigation [12,25,31].

Conclusion

This research imparted a general summary of how people perceive camel meat and the variables affecting their purchase decisions. In a nutshell, the current research shows that camel meat continues to be widely consumed and holds a significant and integral spot in the dietary habits and lifestyles of the consumers residing in the research region, yet other red meat variants are preferred over this meat type. Additionally, the majority of the survey participants expressed favorable views of this meat and were likely to consume it repeatedly throughout the course of their lives. Although camel meat was less consumed in the study region in comparison to other red meat variants or demonstrated an infrequent routine of consumption, the majority of respondents acknowledged its occasional intake. However, the research revealed that the tenderness of camel meat was the main factor restricting its consumption. While analyzing the influential variables, the results showed that males exhibited more inclination toward camel meat consumption than females. Furthermore, a strong beneficial association has been observed across all the facets of consumption practices, including the willingness to eat camel meat, the frequency and experience of consumption, and the general perception of this meat. The study findings provide insightful data on the dietary intake of camel meat, which will be useful in identifying the best marketing tactics to increase consumer acceptability of camel meat and thus expand its commercial sale beyond traditional markets.

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AUTHOR INFORMATION

Brahim Hamad, Doctor of Veterinary Sciences, Senior Lecturer, Department of Agronomy, University of El Oued. P. O. Box 789, El Oued 39000, Algeria. Tel.: +213662850095, E-mail: brahim.hamad@yahoo.fr; brahim-hamad@univ-eloued.dz
ORCID: https://orcid.org/0000-0003-3139-4754
* corresponding author

Leyla Hadef, Doctor of Veterinary Sciences, Senior Lecturer, Department of Agronomy, University of El Oued. P. O. Box 789, El Oued 39000, Algeria. Tel.: +213696161132, E-mail: leila.hadef@yahoo.fr
ORCID: https://orcid.org/0000-0002-8100-9634

Smail Amara, MSc of Veterinary Sciences, State Veterinarian, Health and Hygiene Office, Municipality of Taleb Larbi. El Oued 39030, Algeria. Tel.: +213665510299, E-mail: s84212672@gmail.com
ORCID: https://orcid.org/0009-0007-1245-6418
All authors bear responsibility for the work and presented data.

Brahim Hamad: Conceptualization, data curation, formal analysis, investigation, methodology, validation, visualization, writing — original draft, writing — review and editing. **Leyla Hadef:** Data curation, formal analysis, investigation.
Smail Amara: Investigation.

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