

Evaluation of the local knowledge in the production and consumption of commercial soy cheese skewers as a street food in the West Region of Cameroon

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Keywords	Abstract
Soy Cheese Skewer; Street food; Plant-Protein; Sanitary practices.	Soy cheese (tofu) skewer is a ready-to-eat meal, sold as street food in many cities of Cameroon and locally known as "soybean soya". It is a rich source of plant proteins being produced locally for commercial purposes. This practice is considered as a job and source of revenue for individuals who partake in it and food for consumers. The aim of this study was to determine the current level of knowledge on the production conditions and the consumption habits of soy cheese skewers, commercialized in the streets of the West region of Cameroon. The survey consisted of using questionnaires to interview producers and consumers. Producers and consumers were randomly chosen to participate in this study. Results showed that about 81.63% (40) of producers were females, the majority had at least secondary level of education (57.14 %), the main age group 31 and 40 years (34.69%). The production conditions varied from one person to another, but the main steps were the same and included sorting, soaking, washing, draining, grinding, filtration, heating, coagulation, pressing, slicing, frying, stewing and packaging on skewers. Spices were mainly used for flavouring (100%) and the storage of unsold leftovers was done mostly at room temperature (65.31%) for less than 1 week (75.51%). Consumers of soy cheese skewer were of different age groups, gender, educational level, marital status and cultural background. Most often, it was purchased from the street (87.2%) at the price of 50 XCFA (87.66%). Many consumed it for its taste (75.32%) and very few for its nutritional value (8.44%). The texture appreciated by consumers and producers was tender (72.09%). The production and consumption of soy cheese skewer involves a series of steps whose application conditions vary from one producer to another, which may lead to variability in the products proposed to consumers.
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1. Introduction

Street foods are ready-to-eat foods and beverages prepared and/or sold by vendors or hawkers, especially in streets and other public places [1]. It plays a socio-economic role by supplying consumers with cheap, rapid, convenient and nutritious food products no matter their social class or background [2]. In Sub-Saharan Africa, sales and consumption of street foods has significantly increased in the past three decades due to rapid urbanization, population growth, changes in consumption habits, and little income to get enough food. Also, the absence of adequate jobs to earn a living has pushed people to rely on self-employment particularly street food vending, since it is the easiest and most viable and requires little capital and no formal education [3, 4]. Despite the economic, nutritional, social and cultural role played by street foods, their production process is not standardized, leading to variability in the quality of the final product. These variabilities are sometimes associated with serious risks of foodborne disease outbreaks, threatening the lives of many people, especially in developing countries due to poor sanitary practices [5]. Cameroon, like

many developing countries, offers a large variety of street foods with different origins, tastes and prices, among which soy cheese skewers was not listed according to the work carried by Edima et al [6] showing the growing importance people are giving to this food product.

Tofu, as called in Asian countries, or soy cheese elsewhere, is a cheese-like soy product obtained from the coagulation of soymilk with an appropriate coagulant to form soy curd. It is a nutritious meat analogue cholesterol-free, rich in proteins, minerals and fats of good quality and highly digestible [7, 8]. It is locally consumed as a meat substitute, especially by those who want to limit the consumption of meat proteins [9, 10]. In many developed countries, it is generally known as tofu, while in Africa, the name may vary from one country or one region to the other depending on the technology applied during processing. It is commonly called "soybean soya" in Cameroon, "soy kebab" in Ghana and "awara" or "Beske" in Nigeria. Its popularity is associated with the fact that consumers consider it as an inexpensive and tasteful meat alternative and a good source of protein for the poor, in both urban and rural areas [11]. Adeyeye et al. [7] and Yang et al. [12] reported that it possesses many health benefits, such as the ability to lower cholesterol levels, maintain good cardiovascular health, lower the risks of having cancer, anemia and maintain weight.

The high unemployment rate over the past years has led about 86.6% of unemployed people to turn to the informal sector in Cameroon [13], where many people have become interested in producing and selling ready-to-eat foods on the streets [3, 14],

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amongst which commercial soy cheese skewer is becoming very common. However, the ineffective implementation of government control in the sector of street food activities, has led each producer to use what they know locally during processing, resulting in the variability of the final product. This is as a result of lack of proper knowledge and skills in the production conditions, variability in the raw materials used and no training on good processing techniques [15]. Nowadays, consumers demand for quality food which will help in covering their needs is increasing, leading producers to ameliorate on what is already done in order to attract more and more consumers. It is therefore important for producers to know consumers preferences so as to improve on the quality of their products in order to provide consumers with quality products. This work was therefore initiated with the aim of assessing the current level of knowledge about the production conditions and the consumption habits of soy cheese skewers, commercialized in the streets of the West region of Cameroon.

2. Material and methods

2.1. Study area and design:

This study was conducted in the West region of Cameroon (Bafoussam, Bangangte, Dschang, and Mbouda), which occupies a surface area of 13,892 km² and an estimated population of 1,985,364 according to the Central Bureau of Census and Population Studies (Figure 1). These localities were chosen based on their diverse populations characteristics generally related to their population density. Indeed, Bafoussam is the regional capital of the West region, having an economical and administrative function with an estimated population density of 865.6 Hab/km². The Bamboutos Department with head quarter Mbouda is the second most densely populated Department. Dschang and Bangangte have an academic function with Dschang considered the University City ranking fourth in population density, since almost half of its population are students [16].

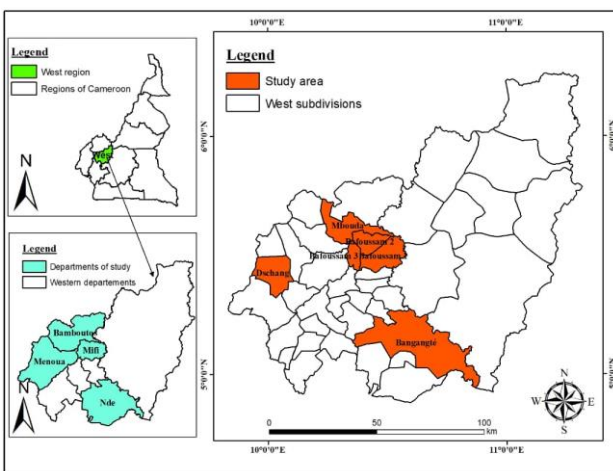


Figure 1: Map showing the area of study

2.2. Sample population

The participants of the study were randomly chosen and involved producers and consumers of soy-cheese (tofu) skewers. A total of forty-nine (49) local producers voluntarily participated in this study and were interviewed using a structured questionnaire. They were chosen based on their years of experience (at least one year of regular production). One hundred and fifty-four (154) consumers were also interviewed. Before the interview, respondents had to give their consent to participate in the study. Information obtained included: socio-demographic characteristics,

knowledge of production process, means of preservation and difficulties faced during production.

2.3. Conduction of survey and data collection

The study was undertaken from April to July 2022. The collection of data included the use of structured questionnaires and direct observations. Three separate questionnaires were used: the first for producers, the second for consumers and the last for assessing the level of hygiene of producers and vendors.

2.4. Informed consent

The participation in this study was voluntary and respondents had to give their consent. They were assured of the confidentiality of all the information. Those who refused the consent were excluded from the study. The inclusion criteria were to be a regular producer or consumer of soy cheese skewer. The third questionnaire was to evaluate the hygiene practices in food processing and vending. The non-inclusion criteria were the refusal to participate or incomplete answers given to the questions of the form.

2.5. Statistical analysis

Data collected were recorded and coded using Statistical Package for Social Science (SPSS) version 22 (developed by International Business Machine, Armonk, NY, USA 2020) where statistical analysis was done. This analysis consisted of using descriptive statistics with frequencies to describe the socio-demographic characteristics of both producers and consumers. Figures were produced using Microsoft Excel software version 2013.

3. Results

3.1. Sociodemographic characteristics of soy cheese producers

The socio-demographic characteristics of soy cheese producers in the West region of Cameroon are shown in Table 1.

Table 1: Socio-demographic characteristics of the seasoned soy cheese producers in the West region of Cameroon

Parameter	Modalities	Percentage % (frequency)
Gender	Female	81.63 (40)
	Male	18.37(9)
Age group (Year)	Age <20]	20.41 (10)
	[21-30]	22.44 (11)
	[31-40]	34.69 (17)
	[41-50]	14.28 (7)
	[Age >50[	8.17 (4)
Educational level	Primary	16.32 (8)
	Secondary	57.14 (28)
	University	26.54 (13)
Marital status	Married	65.30 (32)
	Single	34.70 (17)
Region of origin	West	97.95 (48)
	North	2.05 (1)
	Locality	Bafoussam	46.93 (23).
Profession	Bangante	8.16 (4)
	Dschang	34.70 (17)
	Mbouda	10.21 (5)
	Student	36.73 (18)
	Public workers	8.16 (4)
Type of producer	Private workers	55.1 (27)
	Regular	67.35 (33)
	Irregular	32.65 (16)
Years of experience (year)	] Age<1]	8.16 (4)
	[1-2]	10.5 (5)
	[3-4]	26.5 (13)
	[Age >5[	55.10 (27)
	Mode of training	Family member	51.02 (25)
Friend		24.50 (12)
Neighbour		18.36 (9)
Training		6.12(3)

It reveals that the majority 81.63% (40) engaged in this activity were females while only 18.37% (9) were males. The majority, 97.95% (48) originated from the West region. The age of most respondents 34.69% (17) was between 31 and 40 years old meanwhile only 8.17% aged more than 50 years old were involved in this activity. Moreover, 65.30% (32) of respondents were married and mostly, 46.93% (23) lived in Bafoussam also, concerning the educational level, all respondents had at least the primary school level of education and 67.35% (33) were regular producers. Respondents' main sector of activity revealed that 55.1% (27) worked in the private sector, 36.73% (18) were students, while only 8.16% (4) were in the public sector. It was equally noted that 55.10% (27) had more than 5 years of experience and 51% (25) were trained on the methods used by a relative.

3.2. Knowledge on seasoned soy cheese (tofu) skewer production conditions

➤ Schematic representation of seasoned soy cheese production process

Figure 2 shows the flow a diagram with different operational units involved in the soy cheese skewer production process. The steps involved were sorting of grains, washing, soaking of sorted grains, draining soaked grains, grinding, homogenization of slurry plus filtration, boiling of soymilk, coagulation of hot soymilk, pressing of soy curd, slicing of soy cheese cake, frying of slices, stewing and putting on skewers to form soy-cheese skewer as shown on the figure. Results obtained reported that only 24.48% (12) carried out sorting, 75.51% (37) didn't sort before soaking, 100% (49) soaked the grains, 100% drained the soaked soybean grains, ground with an electric grinder, homogenized with additional water before filtration to obtain soymilk, boiled the soymilk, added a coagulant or the formation of soy curd, pressed the curd immediately, sliced, fried and seasoned the soy cheese. Only 85.71% (42) packaged on skewers mainly for commercial purposes.

➤ Soaking conditions in the production of seasoned soy cheese skewers

Table 2 shows the soaking conditions used in the processing of seasoned soy cheese skewer. It shows that most 44.9% (22) mainly used water from hand dug wells during soaking and throughout the production process. 36.7% (18) used borehole water (16.3%) and river (2.04%). Irrespective of the source of water, it was used at ambient temperature (about 27°C) by all respondents (100%) for soaking. Generally, 65.3% (32) applied a soaking time between 6 to 12 h and only 8.16% (4) went above 12 hours of soaking. 34.69% (17) and 32.65% (16) mostly used 6-10 L and 1-5L of soybeans, respectively during a single production.

Table 2: Soaking conditions applied during the processing of soy-cheese

Parameter	Modalities	Percentage (%)
Soaking time	<6 h	26.543 (13)
	[6-12 h]	65.30 (32)
	>12 h	8.16 (4)
Water source	Borehole	16.33 (8)
	River	2.04 (1)
	Tap	36.73 (18)
	Well	44.9 (22)
Water temperature	Hot	0.00 (0)
	Cold	100 (49)
Quantity of soybeans (L)	<1	18.37 (9)
	[01 - 05]	32.65 (16)
	[06 - 10]	34.69 (17)
	[10 - 15]	14.25 (7)
Material used for filtration	Fine cloth	85.71 (42)
	Bag	14.29 (7)

The different materials used or filtration to obtain the soymilk were fine cloth 85.71% (42) and bags 14.29% (2) used a sieve only for filtration to separate the soymilk from the soy residue (*akara*).

➤ Soybean-to-water ratio and filtration conditions in the production of seasoned soy cheese skewers.

Figure 3 shows the soybean-to-water ratio during grinding and homogenization. Summarily, it is seen that the smallest quantities of soybeans (less than 1L) need the smallest volume of water and the largest quantities (between 1l and 15 L) need much more water.

➤ Heating and coagulation conditions of soy milk and pressing of curd cooking time of soymilk

Table 3 shows the different conditions involved during heating, coagulation and pressing. It was reported that all producers 100% (49) used firewood as the main source of heat to boil soymilk. Boiling time varied from 10 minutes to more than 30 minutes, with the majority heating between the interval of 21-25 minutes (42.2%) and more than 30 minutes by only 24.5%. Six different coagulants were commonly used by respondents during production: diluted acetic acid (28.57%), white vinegar (53.06%), lemon juice (6.12%), lime juice (6.12%), tamarind juice (4.09%) and fermented whey (2.04%). The choice of the coagulant to be used was focused mainly on habits (55.10%), availability (26.53), cost (26.53%), accessibility (22.9%), flavour (6.3%) and nutritional value (2.1%). 55.10 % (27) commonly used less than 5% of coagulant, 55.10 % (27) used between 5 and 10% while the rest 14.29 (7) used more than 10% for the same quantity of soybean grains, during curd formation. It was noted that 51.02% (25) took between 16 and 25 min, 34.69% (17) took more than 30min and 14.29% (7) took between 5 and 15 min for complete curd formation. After curd formation, pressing follows. 57.14% (28) of producers used bags while 42.85% (21) used fine clothe for this step. Pressing generally lasted between 1 to 2 h (44.9%), 3 to 4 h (24.49%), less than 1 h (10.20%) and more than 5 hours (20.41%).

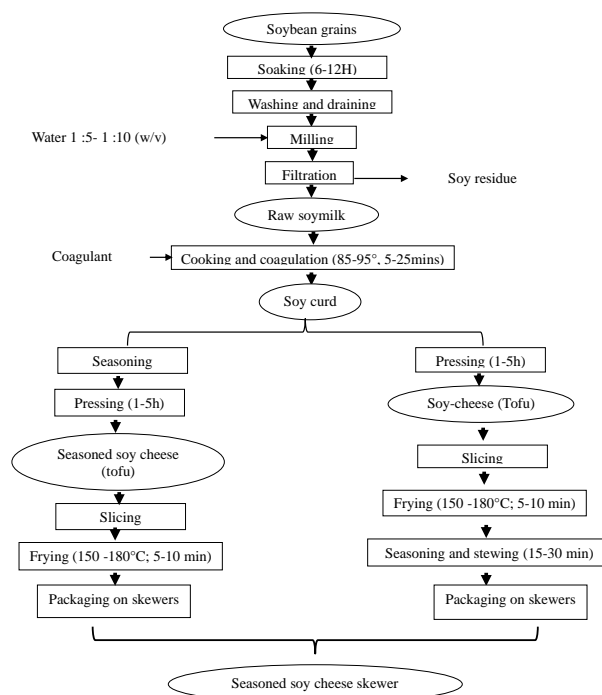


Figure 2: Flow diagram used in seasoned soy-cheese skewer

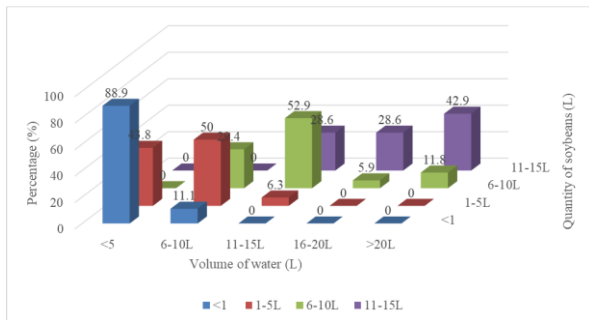


Figure 3: soybean-to-water ratio used for grinding and homogenizing

Table 3: Source of heat used and cooking time in the process of boiling soymilk

Parameters	Modalities	Percentage % (frequency)
Source of heat	Wood	100 (49)
Heating time	[10-15]	4.08 (2)
	[16-20]	8.16 (4)
	[21-25]	42.86 (21)
	[26-30]	12.24 (6)
Type of coagulant	[T>30]	24.49 (12)
	Acetic acid	28.57 (14)
	White vinegar	53.06 (26)
	Lemon or lime juice	12.24 (6)
Reason for this choice	Tamarind extract	4.09 (2)
	Fermented whey	2.04 (1)
	Availability	26.53 (13)
	Cost	26.53 (13)
	Flavour	6.12 (3)
Quantity of coagulant used (%)	Habit	55.10 (27)
	Accessibility	22.44 (11)
	Nutritional	2.04 (1)
	[volume <5%]	30.61 (15)
Coagulation time (minutes)	[5%-10%]	55.10 (27)
	[volume >3%]	14.28 (7)
	[5 - 15]	14.29 (7)
Pressing material	[16 - 25]	51.02 (25)
	[time>25]	34.69 (17)
Pressing time (Hours)	fine cloth	42.85 (21)
	Bag	57.14 (28)
Frying, seasoning, texture of soy cheese product and selling price of seasoned soy cheese skew.	[time<1]	10.20 (5)
	[01 - 02]	44.9 (22)
	[03 - 04]	24.49 (12)
	[T >5]	20.41 (10)

➤ **Frying, seasoning, texture of soy cheese product and selling price of seasoned soy cheese skew.**

Table 4: Frying, seasoning, texture of soy cheese product and selling price of seasoned soy cheese skew

Parameters	Modalities	Percentage % (frequency)
Type of oil used in frying	Refined oil	85.71 (42)
	Bleached palm oil	04.08 (2)
	Refined oil + bleached palm oil	10.20 (5)
Reason for adding spices	Seasoning	93.88 (46)
	Habit	6.12 (3)
	Types of spices used	<i>Solanum lycopersicum</i> (tomato)	100.00 (49)
Texture	<i>Allium cepa</i> (onions)	79.59 (39)
	<i>Capsicum annum</i> (pepper)	77.55 (38)
	<i>Allium sativum</i> (garlic)	55.10 (27)
	<i>Piper nigrum</i> (white pepper)	30.61 (15)
	Tender	93.87 (46)
Cost price	Soft	4.08 (2)
	Crispy	2.04 (1)
	Reasons for the purchase	50 XCFA	93.87 (46)
Fate of by-products (okara)	100 XCFA	6.12 (3)
	Taste	47.39 (23)
	Cost price	34.69 (17)
	Nutritional value	8.16 (4)
	Imitation	6.12 (3)
Curiosity	4.08 (2)	

The type of oil used for frying slices of soy cheese and the conditions of seasoning are shown in table 4. It reveals that 85.71% (42) used refined

palm oil while 4.08% (2) used bleached palm oil and 10.20% (5) refined +bleached oil. It was observed that different ingredients were added to soy cheese during processing. 100.00% (49) of producers used *Solanum lycopersicum* (tomato), 79.59% (39) used *Allium cepa* (onions), 77.55% (38) used *Capsicum* (pepper), 55.10% (27) used *Allium sativum* (garlic), 30.61% (15) used *Piper nigrum* (white pepper) and 30.61% (15) a mixture of green spices. For 93.88% (46) of respondents, the main reason for using spices was for seasoning to add more flavour to soy cheese. The most desired texture by 93.87% (46) was tender as the final texture of the product. The selling price of a piece of soy cheese skewer was 50 XCFA for 93.87% (46) of respondents and 100 XCFA for 6.12% (3).

3.3. Fate of unsold, methods of conservation and signs of degradation

The fate of unsold seasoned soy cheese, the methods of storage and different periods of conservation are shown in table 5. It reveals that the unsold products were either consumed (79.2%) at home by the family as household meals or stored (68.8%) for further use or sale. It reveals that 85.4% practiced a conservation method. Storage methods applied were room temperature 65.31% (32), against 16.33% (8) freezing and 18.37% (9) refrigeration. Products stored lasted or different periods according to the method of storage. 75.51% lasted for less than 1 week, 6.12% (3) or 1 - 2 Weeks and 12.24% (6) between 3 and 4 Weeks.

Table 5: Fate of unsold products methods of conservation and signs of deterioration

Parameters	Modalities	Percentage % (frequency)
Fate of unsold	Consumption	77.55 (38)
	Conservation	67.34 (33)
Methods of conservation	Room temperature	65.31 (32)
	Refrigeration	18.37 (9)
	freezing	16.33 (8)
Conservation period	< 1 week [	75.51 (37)
	[1 - 2 Weeks]	6.12 (3)
	[3 - 4 Weeks]	12.24 (6)
	[Period > 4Weeks]	6.12 (3)
Signs of deterioration	Color change	20.41 (10)
	Moisture	30.61 (15)
	Off flavours	28.57 (14)
	Textural change	20.41 (10)

3.4. Difficulties faced during production and consumers complains after consumption of seasoned soy cheese skew

The difficulties faced during production and are shown in table 6. The fact that too much is lost in the waste was a major problem faced by 87.75% (43) of respondents. Also, 69.39% (34) complained about the long time taken in the preparation, 55.10% (27) about poor filtration of milk, 34.69% (17) about failure to coagulate and 34.69 (17) about bad pressing of curd. About 71.43% (35) disposed of the by-product as waste, 24.49% (12) used it or animal feed and 4.08% (2) used for cooking food meant for human consumption.

Table 6: Difficulties faced during production and consumers complains after consumption

Parameters	Modalities	Percentage % (frequency)
Difficulties faced during production	Production process is long	69.39 (34)
	Too much soy lost in waste	87.75 (43)
	Poor filtration of soymilk	55.10 (27)
	Failure in coagulation	34.69 (17)
	Excess coagulant	20.40 (10)
	Bad pressing	6.12 (3)
	Fate of by-products (okara)	Thrown as waste	71.43 (35)
Used in cooking	4.08 (2)	
Used or animal feed	24.49 (12)	

3.5. Sanitary conditions and practices linked to the production and commercialization of soy cheese skewers

Table 7 presents the checklist used to evaluate the sanitary practices of respondents. It was observed that none of the respondents had this business registered by the government. 95.92% (47) of the respondents had no training in food hygiene and safety against 4.08% (2) who have been trained. 85.71% (42) had clean nails while 14.29% (7) had unclean nails. 89.8% (44) had their clean personal dresses without any aprons. 95.92(47) did not have any protective clothes while only 4.08% (2) had it. 71.43% (35) did not cover their head while 28.57% (14) covered their head. 81.63% (40) maintained their work environment clean against 18.37 % (9). All respondent did not prepare the food on site but at home. Only 16.33% (8) washed their hands frequently while 83.67% (41) didn't. 69.39% (24) did not dispose of waste properly. Wearing of rings and other jewelry was common amongst 22.45% (11) of respondents. All vendors handled money, did not wear gloves, prepared food at home and protected food from flies and other impurities by using covered buckets. 81.63 (40) used inappropriate packaging material during commercialization against 18.37% who used appropriate materials.

Table 7: Checklist applied to commercialization of soy cheese skewers in the West region of Cameroon to evaluate the level of hygiene.

Parameter	Variables	Frequency (%)
Food hygiene and safety principles	Variables	Frequency (%)
Business registration	Yes	00.00 (00)
	No	100 (49)
Training on food hygiene and safety	Yes	4.08(2)
	No	95.92(47)
Condition of finger nails	Clean	85.71 (42)
	Unclean	14.29 (7)
Wearing of clean dresses	Yes	89.80 (44)
	No	10.20 (5)
Protective clothing	Yes	4.08(2)
	No	95.92(47)
Head covering	Yes	71.43 (35)
	No	28.57 (14)
Cleanliness of working environment	Yes	59.14 (28)
	No	40.85 (21)
Food preparation on site	Yes	00.00 (0)
	No	100.00 (49)
Frequent hand washing with clean water	Yes	67.34 (33)
	No	32.65 (16)
Use of clean materials	Yes	81.63 (40)
	No	18.37 (9)
Proper waste disposal	Yes	30.61 (15)
	No	69.39 (24)
Food protection from flies and dust during commercialization	Yes	100 (49)
	No	00.00 (0)
Habit of handling money	Yes	100 (49)
	No	00.00 (0)
Wearing gloves	Yes	00.00 (0)
	No	100 (49)
Frequent hand washing	Yes	16.33 (8)
	No	83.67 (41)
Wearing of rings, and other jewellery	Yes	22.45 (11)
	No	77.55 (38)
Packaging material	Appropriate	18.37 (9)
	Inappropriate	81.63 (40)

3.6. Consumption habits, attitudes and knowledge of consumers on commercial seasoned soy cheese skewer

➤ Socio-demographic characteristics of consumers of Commercial seasoned soy cheese skewer

The socio-demographic characteristics of consumers are represented in Table 8. It was observed that all the age groups are involved in the consumption of seasoned soy -cheese. Different age groups were involved in the consumption of soy cheese. The majority (35.71%) of respondent were within the age range of 21 to 30 years. The majority of

respondents 57.14 (88), had a secondary school level. About 30.52 (47) had a university level 9.74% (15) had a primary level and had no formal education. Although consumers had various professions, most (37.34%) respondents were traders (35.71) and students (32.48). The private sector had 19.48% (30) while government workers were 12.33 % (19). For the marital status, 53.90% (83) were married against 39.61% (61) who were single and 6.49% (10) were either widow or divorced. Regarding the distribution of samples by locality, it was observed that 29.22% (45) lived in Bafoussam, 14.94% (23) from Bangangte, 37.66% (58) from Dschang and 18.18% (28) from Mbouda. Among the respondent, 84.4(130) of were from the West region of the country, 4.54% (7) from the littoral region and 3.89% (6) from the North-west region. Concerning the periods of consumption, 42.21% (65) had more than 5 years of ancientness in the consumption of seasoned soy cheese. The type of consumer shows that 71.42% (110) consumed regularly against 28.58% who were irregular consumers. In terms of frequency in consumption, the majority 31.17% (48) of respondents consume soy cheese skewer at least once in a month, 30.52% (47) occasionally, 18.18% (28) at least once in a week, 13.64 % (21) many times in a month and only 6.49 % (10) many times in a week.

Table 8: Socio-demographic characteristics of the seasoned soy cheese consumers in the West region of Cameroon

Parameters	Modalities	Percentage % (frequency)
Gender	Female	62.34 (96)
	Male	37.66 (58)
Age (Years)	] Age <20]	27.92 (43)
	[21-30]	35.71 (55)
	[31-40]	19.48 (30)
	[41-50]	10.38 (16)
	[Age >50[	6.49 (10)
Educational level	No education	2.60 (4)
	Primary	9.74 (15)
	Secondary	57.14 (88)
	University	30.52 (47)
Marital status	Married	53.90 (83)
	Single	39.61 (61)
	Widow or divorced	6.49 (10)
	Student	32.48 (50)
Profession	Trader	35.71 (55)
	Private worker	19.48 (30)
	Government worker	12.33 (19)
Localities	Bafoussam	29.22 (45)
	Bangangte	14.94 (23)
	Dschang	37.66 (58)
	Mbouda	18.18 (28)
	Region of origin	Center	3.89 (6)
East		1.29 (2)
Littoral		4.54 (7)
North		1.95 (3)
North-West		3.89(6)
West		84.4(130)
Regular		71.42 (110)
Type of consumer	Irregular	28.58 (44)
	[years<[	18.83 (29)
	[1-2 Years]	7.14 (11)
Ancientness	[3-4 Years]	31.82 (49)
	[Years >5[	42.21(65)
	Many times in a week	6.49 (10)
Frequency in consumption	At least once in a week	18.18 (28)
	Many times in a month	13.64 (21)
	At least one in a month	31.17 (48)
	Occasionally	30.52 (47)

➤ Consumers' profile, attitudes and knowledge of commercial soy cheese skewer

The level of knowledge and consumption habits are presented in Table 9. This study shows that most, 60.39% (93) respondents got to know about soy cheese skewers in the street, 54.55% (84) from a family member, 28.57 % (44) from a friend, 9.74% (15) in the neighborhood and only 2.60% (4) and 1.95% (3) from the media and culinary book respectively. Consumers had several reasons for appreciating and consuming soy

cheese skewer, which included taste 75.32 (116), cost 10.39% (16), nutritional value 8.44% (13) and hunger 5.84 (9). Those who did not appreciate said it was either tasteless, 50% (77) or bland, 50%, (77). The majority 87.20% (134) generally purchased soy cheese from the street at the price of 50 XCFA (87.66 %) and 100 XCFA (12.33%). All those who didn't buy were generally those who either produced personally or got it from home. The tender texture was the most appreciated texture by 72.09% (111). Soy cheese is preferably consumed simply without any complement by all respondents (100%). But it is sometimes consumed associated with other foods like bread 29.22% (35), in soup 7.14% (11) or with plantain and tubers 5.84% (9). After consumption, 37.01% (57) said they have had symptoms of food-borne diseases. 71.92% (41) have had stomach pain, 8.77 % (5) nausea and 19.30% (11) vomiting. Also, 85.71% (132) didn't know the processing steps necessary in the production of soy cheese skewer (Figure 4).

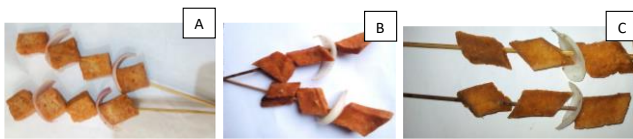


Figure 4: Different commercial soy cheese skewers samples (A, B, and C) produced by different

Table 9: Consumer's perception and knowledge of soy cheese in the West region of Cameroon

Parameters	Modalities	Percentage (%)
How you got to know about soy cheese skewers	Relative	54.55 (84)
	Friend	28.57 (44)
	Neighbourhood	9.74 (15)
	Street	60.39 (93)
	Media	2.60 (4)
Appreciation after first consumption	Culinary book	1.95 (3)
	Yes	90.26 (139)
Reasons for not appreciating	No	9.4 (15)
	Tasteless	50 (77)
Reasons for buying and consuming	Bland	50 (77)
	Tasteful	75.32 (116)
Cost price	Nutritional value	8.44 (13)
	Cost	10.39 (16)
	Hunger	5.84 (9)
	50 XCFA	87.66 (135)
Point of purchase	100 XCFA	12.33 (19)
	Buying from street	87.20 (134)
	Personal production or family	9.74 (15)
Texture	Neighbourhood	2.6 (4)
	Tender	72.09 (111)
	Soft	20.77 (32)
	Strong	7.14 (11)
Complement for consumption	Simply	100 (154)
	Bread	29.22 (35)
	Soup	7.14 (11)
	Plantain and tubers	5.84 (9)
Any symptoms of food borne disease after consumption	No	62.99 (97)
	Yes	37.01 (57)
Symptoms of food borne disease	Nausea	8.77 (5)
	Stomach pain	71.92 (41)
	Vomiting	19.30 (11)
Knowledge on the production process	No	85.71 (132)
	Yes	14.29 (22)

4. Discussion

The survey showed that majority (81.63%) of local soy cheese producers were females. Generally in the African society, food preparation is culturally a female issue, since they are the main actors handling the housewife's basket and this activity also enables them to get some finances to manage their needs [17]. Similar results were reported by Werkneh *et al.* [18] in South Africa and Monney *et al.* [19] in Ghana; contrarily in India, where males were greatly involved in street food

activities, probably due to their culture which consist partially in isolating them from the society especially from other men as revealed by Choudhury *et al.* [20] in India. The main (34.69%) age group of respondents was between between 31 and 40, closely followed by those between 21 and 30. This is in line with the findings of Nkosi and Tabit, [21] in South Africa and Azanaw *et al.*, [22] in Ethiopia where the majority of respondents were aged between 21 and 40 years representing the youth age, which is the economically active part of the population thereby reflecting the unemployment rate of the country. The sale of ready-to-eat foods such as soy cheese skewers in the streets therefore provides employment and needs energy for it to be effective [4]. It should be noted that many children of less than 20 years are mainly involved only during holidays to help contribute to the payment of school necessities when school resumes [23]. Secondary school educational level was the highest (57.47%) amongst respondents. The educational level is a factor that may significantly influence the attitudes and practices linked to the production of high-quality food and save for consumption [24]. This outcome corroborates the findings of Nkosi and Tabit, [21] in South Africa where the majority involved in street food businesses had a secondary school level. These results are contrary to those of Edima *et al.*, [6] and Zokou *et al.* [25] in Yaoundé Cameroon, where primary level was dominant. Respondents were from different cities in the West region of Cameroon, with the majority from Bafoussam (46.93%) followed by Dschang (34.70%). The multiple origins of producers could be explained by the fact that the localities surveyed have a high population distribution related to their economic, administrative and educational functions receiving people from many cultural backgrounds under the weight of rural exodus [13, 26]. Bafoussam is the headquarter and also the largest town of the West region receiving people from diverse origins, while the presence of a university in Dschang has made it one of the main towns of the region where we easily meet people from different backgrounds and culture.

The soy cheese skewers production process involves several consecutive steps, from the soybeans to the final product and whose applications conditions during production varied. These steps generally included soaking, grinding of soaked grains, filtration of slurry to obtain soymilk, heating of soymilk, coagulation of hot soymilk, molding and pressing of curd to remove whey, slicing, frying, and flavouring by stewing. Some of these processing steps are very determinant and susceptible to affecting the yield, protein and moisture contents and the texture of the final product. This corroborates the findings of Zhang *et al.* [27] and Zhang and Qin [28] who reported that soaking water quality, soaking time and temperature, soybean-to-water ratio, heating of soymilk, the type and concentration of the coagulant and the coagulation time and temperature were important parameters that should be monitored attentively, since they may have an impact on the quality of the final product. Grinding of soaked soybeans was done by all with an electric grinder, to obtain a paste generally known as slurry. This could be explained by the fact that an electric grinder is easy and fast to use as opposed to mechanical grinding which is fastidious and slow [25]. During and after grinding, water is generally added in a soybean-to-water ratio that varies. This will usually lead to either a more concentrated or more diluted soymilk, with consequences on the total solids, moisture content, volume of coagulant, yield and structural properties of soy cheese [14, 27]. Water used for processing had different origins with the majority coming from hand-dug wells (44.9%). The use of water from well by the majority could be explained by the fact that some of them come from quarters where access to potable water is difficult [29]. This result is directly in line with the reports of the FAO [3], which listed the sources of water used in the preparation of street foods and observed that hand-dug wells were the main source of water used in the preparation of some street foods.

After filtration, the soy milk was heated, using wood as the main source of energy by all respondents (100%). Firewood is usually considered the fastest and cheapest source of heat especially for cooking very large quantities of food in big pots [24]. Kaptso *et al.* [17] and Maguipa *et al.* [24] reported respectively that firewood was used by 61.2 % during the preparation of street foods sold in the South West region of Cameroon and by more than 60% of producers during the preparation of beef hides in the West region of Cameroon. Heating of soymilk lasted between 10 and 30 minutes independently on the volume of milk. Indeed, heating favors the denaturation of soy proteins, necessary for the formation of soy curd especially at appropriate temperatures and time [27]. Heating induces protein aggregation and protein-polysaccharide interaction, leading to the modification of protein particle size distribution, viscosity, surface hydrophobicity and solubility and altering the structure of soybean protein [12]. Heating is also an important stage because it significantly reduces the microbial load present in food and the quantity of anti-nutrients. It has been reported that insufficient boiling can lead to symptoms of food poisoning, such as digestive problems [3]. As soon as boiling starts, an appropriate coagulant was added to the boiling soymilk to form soy curd [8, 12]. Coagulation is one of the most important and critical steps in soy cheese production process. The type of coagulant, the time and the temperature of coagulation, the volume and concentration of coagulant and the stirring speed during coagulation are important factors that significantly affect the yield, texture, color and sensory attributes of soy cheese [14, 28]. The main type of coagulant used by producers were acid coagulants, including mostly white vinegar (53.1%) and diluted acetic acid (28.6%). The use of lemon or lime juice (12.24%), and tamarind (4.09%), considered as natural coagulant was very low. Acid coagulants provide hydrogen ions which help to lower the pH to the isoelectric point of that of soy proteins, facilitating isoelectric precipitation [27]. Pressing then followed to remove the whey and stabilize the gel network. The pressing time and pressure are known to affect the moisture content, yield and textural properties of soy cheese and the general acceptability [27, 30]. After pressing, the mass obtained is sliced into small ununiformed pieces of 2-3g and fried in deep hot fat to improve its texture which becomes either tender, soft or crispy according to the water content. This texture which is generally close to that of meat is very appreciated and accepted by both producers and consumers [31]. Fried soy cheese was then stewed with spices to improve its organoleptic properties, by enhancing the flavour, aroma and even the texture of the final product, since soybeans and soy products are known to have a bland taste, this helps to mask any off-flavours that may be present, thereby improving the organoleptic properties [32]. The use of spices such as *Solanum lycopersicum* (tomato), *Allium cepa* (onions), *Allium sativum* (garlic), *Piper nigrum* (white pepper) and *Capsicum* (pepper) in the preparation of soy cheese was frequent and reported by all respondents with the main aim of seasoning. Ndife *et al.* [33] reported the use of some ingredients (boullion, onion, pepper and salt) in the processing of soy cheese. The flavoured soy cheese obtained after seasoning was cooled and packed on skewers arranged for this purpose by all those who intended to sell. It was sold at 50 XCFA (93.8%) and 100 XCFA (6.3%). Street foods are generally cheap and affordable to many consumers [3]. At the end of the day, leftover soy cheese skewers were either stored (67.34%) in different conditions or consumed (77.55%). The composition of soy cheese makes it a highly perishable foodstuff reason why it should be stored properly to avoid contaminations and degradations. Unsold products were generally stored at room temperature (64.6%), refrigerated (18.8%) or freezed (14.6%). These results are in line with that of Zokou *et al.* [25] who found that leftover street foods were stored either at room temperature or placed in the freezer or fridge. This could

be explained by the fact that because of their precarious economic status and poor electricity supply, many street food traders lack household refrigeration facilities to store unsold leftovers so that they can be put back on the market, sometimes mixed with new production. The storage of unsold food at room temperature is inappropriate and should be avoided. They should be disposed or used for animal feeding [3].

Concerning training in food hygiene and safety, none of the respondents had ever received any formal training on sanitary practices needed to handle street food business, confirming the findings of the WHO [34]. Kaptso *et al.* [17] reported that 82.5% of street food vendors in Kumba and Buea had never received training on how to run a street food business. Indeed, each one manages processing and commercialization according to their know-how and habits used frequently, arousing many doubts about the hygiene and safety of this food. According to the FAO [35], the absence of training makes the application of good hygiene practices and the implementation of a HACCP system very difficult and may consequently render many foods unsafe for consumption.

During the preparation and commercialization of soy cheese skewers, many practices of bio-contamination were observed, relating to a lack of precautions, poor handling practices and hygiene rules that could alter their hygienic quality. All respondents produced food at home before being transported to the market. Some vendors and producers generally have no information about how to manage food safely [35]. The FAO [35] and Cortese *et al.* [36] reported that food prepared both at home and on the spot does not guarantee its safety if producers are not aware of good hygiene practices during production. Food should be processed in a place designed and adapted exclusively for the processing of particular foods and free from any contaminant. For commercialization, all vendors handled money parallel to selling and none wore gloves for sale. Frequent hand washing during commercialization was done by only 16.33%. According to the Legislation in the state of Rio Grande do Sul, these practices are inadequate. Food vendors and producers should cover their heads completely, have a good appearance, wear clean clothes, always keep their hands clean with short nails and avoid jewelry [37]. Samapundo *et al.* [38] and Silva *et al.* [39] reported that the majority of vendors served foodstuff without washing or disinfecting their hands and after handling money. since the hand are good transmission media, to avoid contamination, an alcoholic solution like 70% ethylic alcohol gel should be used to reduce the microbial load on the hands, especially at the moment of sale, after handling money, after using toilets or touching any material which could be a vector of foodborne diseases [4].

The creation of a business is meant to satisfy consumers' needs. Knowing what consumers prefer, may help producers to ameliorate the nutritional and sanitary quality of their products. From this study, it was noticed that, irrespective of age, gender, marital status, cultural background, level of education and profession, soy cheese skewer is an important street food appreciated by many and consumed at affordable prices mainly for its taste. These observations are in line with those of Hiamey *et al.* [40] and Haleegoah *et al.* [41] who reported that different classes of the population, both rich and poor, male or female, married or single, uneducated and educated, living in rural or urban areas, employed or unemployed are interested and concerned in street food consumption. Also, as a plant based protein, soy cheese skewer is considered by many as a meat substitute that can valuably replace meat in the diet, since it is cheap and accessible to all the classes of the population, especially in developing countries where many do not easily have enough money to purchase protein from animal source [10].

The majority bought and consumed soy cheese outside their homes (87.20%) at 50 XCFA (87.88%). Outdoor consumption of soy cheese skewers is due to changes in eating habits of the population motivated by

rapid urbanization, lack of time and knowledge of the production process, which favours street food consumptions rather than homemade foods at relatively low prices [42]. According to the FAO [14] and Bellia *et al.* [43] street foods are often sold at affordable prices to attract consumers, making them to easily purchase the foods. Six out of the seven regions of the country were involved in consumption. The multiple origins of the consumers could be explained by the fact that the towns studied, like many other towns of the country, are seeing their populations increasing daily for economical, administrative or educational reasons, with people coming from various origins [26].

A report of the FAO [14], says that the consumption of street foods has many reasons which may differ from one consumer to another. These reasons include convenience, closeness or proximity to vendors, availability, nutritional value, culture and cost. according to most (75.32%) respondents, the main reason for consuming soy cheese was related to the taste, which was gotten from the use of spices, since the latter has the capacity of improving the organoleptic properties of food [24]. After consumption, some consumers (37.01%) have reported they had suffered from digestive problems at least once after eating soy cheese skewer. The main symptoms were stomach pain (71.92%), implying that the consumption of soy skewers is involved in the onset of certain digestive problems, the duration and probable causes of which differ. These observations could be due to cross contaminations food by microorganisms such as Coliforms, *Salmonella* spp and many others responsible for the onset of food-borne diseases, especially during production and marketing, related generally to failure in applying good hygiene rules [44].

5. Conclusion

The results obtained provided valuable information on the different production conditions used in making soy cheese skewers in the West region of Cameroon from the raw material to the final product passing through operational units which include sorting, soaking, milling, filtrating, cooking, coagulating, pressing, slicing, frying and seasoning. Although these processing steps were the same, the conditions for each operational unit varied from one producer to the other. Its commercialization is a source of employment and income for those engaged in this street business. The conditions of production, transportation, commercialization and storage were potential risk factors which may lead to bio contamination of the final product. It was noticed that many consumers are becoming more interested in this product that they easily purchase in the street at very affordable prices. A mastery of standard production conditions and appropriate sanitary conditions will surely help in obtaining better products which attract more and more consumers, not only from the flavour, but on the high quality.

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References

1. Food and Agricultural Organization of the United Nation (FAO). (2009). Good hygiene practices in the preparation and sale of street food in Africa, Tools for training. FAO Press, Rome, Italy.
2. Okojie, P. W., and Isah, E. C. 2014. Sanitary conditions of food vending sites and food handling practices of street food vendors in Benin City, Nigeria: Implication for food hygiene and safety. *Journal of Environmental and Public Health*. 1–6. <https://doi.org/10.1155/2014/70131>.
3. Food and Agricultural Organisation (FAO). 2007. Promises and Challenges of the informal food sector in developing countries.
4. Kothe C.I., Schild C.H., Tondo E.C., Malheiros P.S. 2016. Microbiological contamination and evaluation of sanitary conditions of hot dog street vendors in Southern Brazil. *Food Control*, 62, 346-350. DOI:10.1016/j.foodcont.2015.11.005
5. Nayak, R., and Waterson, P. 2016. When Food Kills': A socio-technical systems analysis of the UK Pennington 1996 and 2005 E. coli O157 outbreak reports. *Safety Science*, 86, 36–47. DOI:10.1016/j.ssci.2016.02.007
6. Edima H. C., Tem RN, Awono ET, Biloa M, Ndjouenkeu R. 2014. Case Study of the Street Food Sector in the Metropolitan Areas of a Cameroonian City, Yaoundé. *International Journal of Current Microbiology and Applied Sciences*. 3(9), 740-751. https://www.researchgate.net/publication/340547202_Original_Research_Article_Case_Study_of_the_Street_Food_Sector_in_the_Metropolitan_Areas_of_a_Cameroonian_City_Yaounde.
7. Adeyeye S.A.O, Bolaji O. T, Abegunde T.A, Tihamiyu, H.K., Adebayo-Oyetoro A.O and Idowu-Adebayo, F. 2020. Effect of natural fermentation on nutritional and antinutrients in soy-wara (a Nigerian fried soy-cheese). *Food Research*. 4(2): 152-160. DOI:10.1080/15428052.2017.1418692
8. Raji A.O., Oluwanisil R.M., Oyebanji O.M., Sunmonu B.A. 2023. Nutrient composition, sensory properties and storage stability of processed Nigerian soy cheese (Beske). *Measurement: Food*. 10 2023 100088.
9. Malte B. Rödl. 2020. What's New? A History of Meat Alternatives in the UK The University of Manchester, UK (Chapter 11).
10. Possidonio C., Prada M., Graça J., Piazza J. 2021. Consumer perceptions of conventional and alternative protein sources: A mixed-methods approach with meal and product framing. *Appetite*. 156: 104860. DOI:10.1016/j.appet.2020.104860
11. Fasoyiro S. B. 2011. Assessment of hazards in local soy-cheese processing: implications on health and environment in Oyo State, Nigeria. *WIT Transactions on Ecology and the Environment*. 2011152. doi:10.2495/FENV110041.
12. Yang Y., Ji Z., Wu C., Ding Y. and Gu Z. 2020. Effect of the heating process on the physicochemical characteristics and nutritional properties of whole cotyledon soymilk and tofu. *RSC Advances*. 1, 4625–4636. DOI:10.1039/D0RA07911A
13. National Institute of Statistics (NIS). 2022. Main Report On The third Survey On Employment And The Informal Sector In Cameroon (EES13), Phase I: Employment Survey
14. Food and Agricultural Organisation (FAO). 2016. Street food in urban Ghana: A desktop review and analysis of findings and recommendations from existing literature. Accra, Ghana.
15. Zheng L., Regenstein J.M., Teng F., Li Y. 2020. Tofu products: A review of their raw materials, processing conditions, and packaging. *Comprehensive Reviews in Food Science and Food Safety*. 1–32. <https://doi.org/10.1111/1541-4337.12640>.
16. Central Bureau of Censuses and Population Studies (BUCREP). 2021. National Report On The Of The Population 2021 Edition
17. Kaptso K.G., Tchabo W., Chebelem M. B., Asoba N.G., Amungwa A.F. and Mbofung C.M.F. 2021. Assessment of Food Hygienic and Vending Practices among Street Food Vendors in Buea and Kumba City Council (South-West Region Cameroon). *Food Science and Nutrition Technology*, 6(2). <https://doi.org/10.23880/fsnt-16000263>.
18. Werkneh A.A., Tewelde M.A., Gebrehiwet T.A., Islam M.A., Belew M.T. 2023. Food safety knowledge, attitude and practices of street food vendors and

- associated factors in Mekelle city, Northern Ethiopia *Heliyon*, 9: e15126. DOI:10.1016/j.heliyon.2023.e15126
19. Monney I., Agyei D., Ewoenam B.S., Campaore P., Nyaw S. 2014. Food hygiene and Safety Practices among Street Food Vendors: An Assessment of Compliance, Institutional and Legislative Framework in Ghana. *Food and Public Health*, 4(6), 306-315. DOI:10.5923/j.fph.20140406.08.
 20. Choudhury M., L. Mahanta, J. Goswami, M. Mazumder, B. Pegoo. 2011. Socio-economic profile and food safety knowledge and practice of street food vendors in the city of Guwahati, Assam, India. *Food Control*, 22, 196-203. DOI:10.1016/j.foodcont.2010.06.020.
 21. Nkosi N.V. and Tabit F.T. 2021. The food safety knowledge of street food vendors and the sanitary conditions of their street food vending environment in the Zululand District, South Africa. *Heliyon*, 7: e07640. <https://doi.org/10.1016/j.heliyon.2021.e07640>.
 22. Azanaw J., Engdaw G.T., Dejene H., Bogale S., Degu S. 2022. Food hygiene knowledge, and practices and their associated factors of street food vendors in Gondar city, Northwest Ethiopia: a cross-sectional study, *Heliyon*, 8: e11707, <https://doi.org/10.1016/j.heliyon.2022.e11707>.
 23. Food and Agricultural Organization (FAO). 1994. Street food in West Africa. Final report on the informal sector of food. Cotonou, Benin.
 24. Maguipa T.C.L., Mbougueng P.D., Sokamte T.A. and Womeni H.M. 2020. Study of the local know-how of the use of beef hides in western Cameroon. *Cameroon journal of Experimental Biology*, 14(1): 50-60. DOI <https://dx.doi.org/10.4314/caeb.v14i1.6>.
 25. Zokou R., Mouafo H. T., Klang J. M., Simo N. B., Mouokeu R. S., and Womeni H. M. 2022. Microbiological Quality of Egusi Pudding, A Traditional Cake of Cucurbitaceae Sold in the City of Yaoundé, Cameroon. *Journal of Food Quality*, 2022: ID 4236921, 12 pages. <https://doi.org/10.1155/2022/4236921>.
 26. National Institute of Statistics (NIS) and ICF 2020. 2018 Cameroon Demographic and Health Survey, Yaoundé, Cameroun and Rockville, Maryland, USA: NIS and ICF.
 27. Zhang Q., Wang C., Li B., Li L., Lin D., Chen H., Liu J. 2018. Research progress in tofu processing: From raw materials to processing conditions. *Critical Reviews in Food Science and Nutrition*, 58(9), 1448-1467. DOI:10.1080/10408398.2016.1263823.
 28. Zhang Q. and Qin W. 2018. Tofu and Soy Products: The Effect of Structure on Their Physicochemical Properties DOI:10.1016/B978-0-08-100596-5.21700-9.
 29. Moussima Y.D.A., Tiemeni A.A., Zing Z.B., Nenkam J.T.L., Aboubakar A., Nzeket B.A., Tcholongl F.H.B., Mewouo C.Y. 2020. *Qualité physico-chimique et bactériologique des eaux souterraines et risques sanitaires dans quelques quartiers de Yaoundé VII, Cameroun. International Journal of Biological and Chemical Science*, 14(5), 1902-1920.
 30. Guan, X.; Zhong, X.; Lu, Y.; Du, X.; Jia, R.; Li, H.; Zhang, M. 2021. Changes of Soybean Protein during Tofu Processing. *Foods*, 10, 1594. <https://doi.org/10.3390/foods10071594>.
 31. Mustaniroh S A, Malingan J.M., Silalahi R.L.R., Santoso P.B. and Sari D.P. 2019. Quality improvement strategy of tofu sticks production using fuzzy analytical hierarchy process (Case study in a tofu stick SMEs cluster in Tinalan, Kediri. *Earth and Environmental Science*, 230, 012049. DOI:10.1088/1755-1315/230/1/012049.
 32. Shahidi, F. and Zhong, Y. 2015. Measurement of Antioxidant Activity. *Journal of Functional Foods*, 18, 757-781. <https://doi.org/10.1016/j.jff.2015.01.047>.
 33. Ndife J., Imade I., Samaila J. 2021. Production and quality evaluation of soy cheese (*tofu*) using various coagulants. *Croatian Journal of Food Science and Technology*, 13 (1), 36-42. DOI: 10.17508/CJFST.2021.13.1.05.
 34. WHO. 1996. Food safety Issues: Essential safety requirements for street vended food (Revised edition). Geneva: World Health Organization.
 35. Food and Agricultural Organisation (FAO) 2009. Good hygienic practices in the preparation and sale of street food in Africa-Tools for training (Roma).
 36. Cortese, R. D. M., Veiras, M. B., Feldman, C., and Cavalli, S. B. 2016. Food safety and hygiene practices of vendors during the chain of street food production in Florianopolis, Brazil: a cross-sectional study. *Food Control*, 62, 178-186. <http://dx.doi.org/10.1016/j.foodcont.2015.10.027>.
 37. Rio Grande do Sul. 2009. Portaria Estadual 78, de 30 de janeiro de 2009. Estabelece os procedimentos de Boas Praticas para Serviços de Alimentação, a fim de garantir as condições higiênicas-sanitárias do alimento preparado. Diário Oficial do Estado do Rio Grande do Sul.
 38. Samapundo, S., Climat, R., Xhaferi, R., & Devlieghere, F. 2015. Food safety knowledge, attitudes and practices of street food vendors and consumers in Port-au Prince, Haiti. *Food Control*, 50, 457-466. DOI:10.1016/j.foodcont.2014.09.010.
 39. Silva S.A., Cardoso R.C.V., Góes J.A.W., Santos J.N., Ramos F.P., Jesus R.B., Vale R.S., Silva P.S.T. 2014. Street food on the coast of Salvador, Bahia, Brazil: A study from the socioeconomic and food safety perspectives. *Food Control*, 40, 78-84. DOI:10.1016/J.FOODCONT.2013.11.022.
 40. Hiamey S E, Amuquandoh F E, Boison G A. 2015. Are we indeed what we eat? Street food consumption 73 in the Market Circle area of Takoradi, Ghana. *Nutrition and health*, 22(3). DOI:10.1177/0260106015599482/
 41. Haleegoah J., Akuoko K.D., Dwumah P., Marfo K.A., Forkuor J.B., Nsiah F.B., Asante B.O. and Brobbey L. 2020. Consumer Perceptions of Street-Vended Local Foods in Urban Ghana. *Food science and Nutrition research*, 3(1): 1-10. <https://doi.org/10.5897/AJFS2020.2029>.
 42. Nguendo Y.H.B 2018. Eating to live or eating to damage one's health: Microbiological risks associated with street vended foods in a subtropical urban setting (Yaoundé-Cameroon). *Nutrition and Food Science International Journal*, 6(4): 555695. DOI:10.19080/NFSIJ.2018.06.555695.
 43. Bellia C, Pilato M, Seraphin H. 2016. Street food and food safety: a driver for tourism? *Calitatea*, 17: 20-27.
 44. Mead P.S., Slutsker L., Dietz V., McCaig L.F., Bresee J.S., Shapiro C., Griffin P.M., Tauxe R.V. 1999. Food-related illness and death in the United States. *Emerging Infectious Diseases*, 5(5): 607-625.