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Evaluation of spices used in meat products in Sokoto metropolis, Nigeria

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Target Audience: *Processors, Food vendors, Researchers*

Abstract

Spices and proportions of individual spice used in meat products in Sokoto metropolis were identified for consumer awareness and preference. Data were obtained through a questionnaire given to meat product producers, spice merchants and processed meat consumers within Sokoto metropolis. Cluster sampling was used to select spice merchants in Sokoto central market, snowball and multistage sampling were used to select meat products producers and consumers, respectively. The spices identified were ginger, garlic, chilli, nutmeg, black pepper, cloves and alligator pepper. Proportion of the spices used in a spice mix was found to follow the order ginger (53.89%), chilli (19.98%), garlic (12.63%), nutmeg (5.88%), black pepper (4.58%), cloves (2.42) and alligator pepper (0.61%) respectively. Based on the result of the awareness of spices, the species were found to follow the awareness order of ginger (100%), chilli (100%) garlic (76.7%), nutmeg (67.5%), black pepper (66.9%), cloves (65%) and alligator pepper (50%) while in preference for spices, the species differed ($P<0.05$) in all except for chilli and cloves ($P>0.05$) which were preferred equally. However, ginger was most preferred and alligator pepper was least preferred. There was a positive relationship between awareness and preference.

Key words: *Ginger, Garlic, Chilli, Nutmeg, Black dove, Pepper.*

Description of Problem

Spices are aromatic flavourings made from parts of plants. It frequently includes herbs, which are fragrant leaves of herbaceous plants (1). The famous spice author Rosen Garten describes a spice as a product which enriches or alters the quality of a thing, for example altering the taste of food to give it zest or pungency, a piquant or lasting flavouring, or a relish. The term 'spice' is thus used to cover the use of spices, herbs and certain aromatic vegetables to impart odour and flavour to foods. The common spices used in processed meat are paprika, chilli, pimento, mace, ginger, nutmeg, cloves, cinnamon, thyme, cardamom, cumin, coriander seeds, garlic, ginger, turmeric, black pepper (2). Spices come from almost any part of the plants including bark (cinnamon), root (ginger, onion, garlic), buds (cloves), seeds (yellow mustard, sesame), berry (black pepper), or the fruit (allspice, paprika) of tropical plants and trees (3, 4). Spices can be used alone or in combination with other spices to impact characteristic flavour and colour to foods (5). They provide micro-nutrients and are used to increase food palatability. Varieties of spices, seasonings and flavourings are used in meat products (6). Spices and herbs have been used for centuries by many cultures to enhance the flavour and aroma of foods.

Early cultures recognized the value of using spices and herbs in preserving food for their medicinal value (4, 7) and described spices as having many applications; as flavouring, medicinal, preservative and colouring agents. Spices also possess antibacterial, antifungal, antiviral and antioxidant properties in different food systems. Cinnamon can easily replace industrial preservatives which are dangerous to human health. Some spices like coriander, fennel, turmeric and cloves are also medicinal in treating dental and skin problems, glaucoma, insulin resistance and sugar level reduction (8). The processing of spices has developed into an important support industry for food processing enterprises in order to meet consumer's preferences. Mixtures of seasonings were developed to serve as flavouring agents for various meat products (9). Meat products are obtained when raw or preserved meat are changed in form by grinding, pressing, drying and other processes then enhanced in flavour by smoking, spicing, or blending with other food. These meat products are subjected to different basic processing before reaching final form, therefore termed processed meat (10). Several forms of meat products exist ranging from industrially processed corned beef, ham, bacon and sausages to the indigenous Nigeria traditionally processed ready to eat meat products namely "balangu" (roasted meat), "kilishi" (beef jerky), "danbun nama" (meat floss), "suya" and many more (11). Kilishi is traditionally produced in parts of Northern Nigeria where cattle raising plays a dominant role in the economy (12). In Nigeria, the main production centres of kilishi are in urban and to a smaller degree, in rural areas in the northern part of the country. Suya (sometimes also called tsire) is a traditional meat product gotten -from boneless meat hung on stick and spiced followed by roasting around a glowing charcoal fire 1981(13). Dambun nama is a delicious, spicy-savoury Nigerian dried beef floss originating from Northern Nigeria (14)

Materials and Method

The study was carried out in Sokoto metropolis located in North western Nigeria near the confluence of Sokoto River and Rima River. Sokoto has an estimated population of 4.2 million (15)**.** I t is located between longitudes $4^0$8' SE and 6^0 54' EW and latitudes 12 ^{0} and $13^0$58' NS with a total land area of 25,973km^2 and 23 local government areas, Sokoto state is surrounded by sandy savannah with an annual average temperature of 23.8°C, maximum daytime, temperatures for most of the year is generally under 40^0C. The warmest months are February to April and rainy season from June to October. From late October to February during the cold season, the climate is dominated by harmattan wind (16, 17). Livestock species kept include: cattle, camel, sheep, goats and poultry. The state has a number of 1.18 million cattle, 1.98 million sheep, 2.90 million goats, 2 million poultry, 34, 532 horses, 51,388 donkeys, 1.18 million camels (18). Processed meat products are produced by many retail outlets in Sokoto metropolis and consumed frequently ranging from Beef jerky (kilishi), meat floss (Danbun nama), balangu and tsire. Spices are used in garnishing the processed meat to improve the smell, taste, colour and impart some antioxidant and medicinal properties to the meat products (19). Common spices in the study area includes; ginger, garlic, thyme, nutmeg, cinnamon, turmeric, peppers, cloves and bay leaves. Spice trading is an emerging business in the study area with a considerable number of spice traders who sell to the meat processors. Questionnaires were administered to three groups; the processed meat manufacturers, the spice merchants and consumers of meat products. Multistage sampling was employed to get information from the processed meat

consumers in Sokoto metropolis, the 5 local government areas (Sokoto North, Sokoto South, Wamakko, Dange-Shuni and Kware) were selected purposively in the first stage. In the second stage, different wards were selected from the local governments proportionately as presented in Table 1. In the third stage, the consumers were selected conveniently.

Snowball sampling method was employed to locate manufacturers of meat products such as kilishi, danbun nama, tsire and balangu by asking one processor the location of the next. Cluster sampling method was used for the spice merchants located in Sokoto central market. A checklist was employed and the data from manufacturers and consumers of meat products and the spice merchants are all descriptive. The consumers were asked what spices they know and were asked to rank them according to their preferences using numbers. Also, the processors were asked the spices they are aware of, the type they use in their products and the quantities they use in their various meat products. The spice merchants were also asked what spices they know, spices and spice mixture they have in stock and the quantities of individual spice in the mix, a weighing scale was then used to measure each spice in a mix. The interviews were conducted in a fairly open frame work to allow for a focused, conversational two-way communication. The data collected were analysed using descriptive statistics. For identification, the spices were listed with the quantities of spices used. In a mix, spices were weighed individually with a digital weighing scale and the result was computed per l00 g

$$\text{Calculating the quantities} = \frac{\text{weight of individual spice}}{\text{Total weight of spice mix}} \times 100$$

The consumer knowledge on spices was determined and calculated into a percentage, the spices were also ranked by consumers according to preferences for their scores. The treatment means were compared for the preferences using General Linear Model Univariate procedure and significant means were separated using Duncan Multiple Range Test. Local, common, botanical and family names were noted and then described by colour, appearance, nature, part of plant it comes from, flavour, shape and size.

Table 1: Distribution of respondent base on multistage sampling procedure.

Multistage	1st Stage (LGA)	2nd Stage (Wards)	3rd Stage (Consumers)
Sokoto	Sokoto north	4 wards	40
	Sokoto south	4 wards	40
	Wamakko	3 wards	25
	Dangen Shuni	2 wards	10
	Kware	1 ward	5
Sample Techniques	Purposively	Proportionately	Conveniently
Total	5	14	120

Results and Discussion

The major spices used in processed meat products such as Kilishi, Meat floss, Balangu and Tsire are Ginger, Garlic, Cloves, Nutmeg, Chilli, black peppers and Alligator pepper. The botanical, family and local names, plant part, nature, appearance, size, shape and flavour are presented in Tables 2 – 8.

Table 2: Ginger

Botanical name:	*Zingiber officinale*
Family:	Zingiberaceae
Local names:	Chitta (Hausa), Ata ile (Yoruba), Jinja (Igbo)
Plant part:	Rhizome
Appearance:	Yellow colour, shrunken and wrinkled
Flavour:	Earthy, pungent and spicy.
Shape:	Irregular

Table 3: Garlic

Botanical name*:*	*Allium sativum*
Family:	Amaryllidaceae
Local names:	Tafruwa (Hausa), Aayu (Yoruba), Ayo-ishi (Igbo)
Plant part;	Bulb
Appearance:	Ranges between white and pale cream.
Flavour:	Distinct sulphuric pungent smell
Shape:	Round, consists of smaller bulblets called cloves that breaks

Table 4: Black pepper

Botanical name:	*Piper nigrum*
Family:	Piperaceae
Local names:	Masoro (Hausa), Iyere (Yoruba), Oziza (Igbo)
Plant part:	Berry
Size:	5mm in diameter
Appearance:	Colour ranges from black to dark brown
Flavour:	Pungent, aromatic and hot
Shape:	Round

Table 5: Cloves

Botanical name:	*Syzygium aromaticum*
Family:	Myrtaceae
Local names:	Kanunfari, Hancin kade (Hausa), Kananfuru(Yoruba)
Plant part:	Unopened flowers
Nature:	It is used in dried form
Size	1.5 to 2.0 cm long
Shape:	Straight, Stalk- like, looks like a match stick
Appearance:	Rust brown colour, it has of a long stalk and unopened petals that form a central ball in the middle.
Flavour:	Strongly pungent and aromatic

Table 6: Chilli

Botanical name:	Solonaceae
Family:	Capsicum annuum
Local names:	Tanka (Hausa), Shambo (Yoruba)
Plant part:	Fruit
Shape:	Stalk like and slightly bent Straight.
Appearance:	It is reddish in colour with a small green stalk attached to it and easily cracked in its dried form. It contains small yellow coloured seeds when opened
Flavour:	Pungent, intense and very spicy.

Table 7: Nutmeg

Botanical name:	*Myristica fragrans*
Family:	Myristicaceae
Local names:	Diyan miya (Hausa), Ariwo (Yoruba), ehuru Ofia (Igbo)
Plant part:	Seed
Nature:	It is used in dried form
Size	5 to 10g 1.5
Shape:	Spherical
Appearance:	It is hard, large and smooth to touch. Dark brown in colour
Flavour:	An intense warm, acrid, spicy aroma Strongly pungent and

Table 8: Alligator Pepper

Botanical name:	*Aframomum melegueta*
Family:	Zingiberaceae
Local names:	Yajin gora (Hausa), Atare (Yoruba), Ose oji (Igbo)
Plant part:	Seed
Nature:	It is used in dried form
Size	9 to 10g
Shape:	Straight, Stalk- like, looks like a match stick
Appearance:	A large round pod that is cracked open to reveal small brown seeds. Seeds have coarse skin
Flavour:	Very hot and bitter

The spices used in processed meat products are; ginger, chilli, garlic, nutmeg, black pepper, alligator pepper and are mixed in different quantities for the production of different meat products (Table 9). Proportion of spice ranged from 0.61 g in alligator pepper to 53.89 g in garlic. Ginger, chilli and garlic have the largest quantity of all the spices probably because they are the most popular and cheapest spices found in Sokoto. Ginger is largely grown in Nigeria, according to (18) statistics, ginger is a widely grown spice and Nigeria is the third largest ginger producing nation. Chilli and garlic are grown in Sokoto. (21) reported that garlic and chilli are grown in Sokoto in high quantities. Nutmeg is added in smaller quantities probably because it has an intense acrid aroma and if used in higher quantities it could surpass the aroma of other spices. It was reported by (22) that a little quantity of the nutmeg is usually enough so that the

fragrance does not over power other flavours of food. Black pepper is added in smaller quantities, less than nutmeg probably because it is very spicy and most consumers in Sokoto do not like excessively spicy foods. (23) indicated that black pepper is very spicy due to its chemical component "piperine". Cloves and Alligator pepper are added the least probably because they are bitter and if added in higher levels could make the meat product bitter. Raw cloves have a camphor-like aroma and are bitter which could result in overpowering other flavours in food (24) while (25) showed that alligator pepper has small dark seeds with bitter pepper flavour.

Table 9: Proportion of spices g/100g used for meat product in Sokoto metropolis

Spice	Proportion per 100g(g/g)
Ginger	53.89
Chilli	19.98
Garlic	12.63
Nutmeg	5.88
Black pepper	4.58
Cloves	2.42
Alligator pepper	0.61
Total	100

Processed meat product consumers in Sokoto are aware of a number of spices as shown in Table 10. Ginger and chilli had the highest awareness scores of 100% with the lowest score of 50% recorded for alligator pepper. The preferences for the spices also differ significantly ($p<0.05$) as ginger had highest score of 4.46 and alligator pepper had the lowest (0.95). Ginger and chilli are the most popular and have the most awareness probably because of familiarity, they are seen more often. (26) reported that in Nigeria, the popularity of ginger is high, not only for fresh but for dried and powdered products too. Also, (27) reported that garlic is one of the most popular sought after crops in Sokoto. Alligator pepper had the least awareness probably because it has very low popularity and it is not cultivated in the region majorly because the climate is unsuitable (28). Alligator pepper is a rainforest understorey plant grown best partially in shade. Ginger is the most preferred probably because of their variety of uses (food and health), and in the many forms they can be attained. Ginger and garlic are available in many forms such as dried, fresh, powdered, brined, and pickled (29). They have multiple uses: to treat ailments, aid digestion, treat stomach upset, diarrhoea and nausea according to (3). Alligator pepper is least preferred probably because of health reasons and its bitter taste (31). The seeds of alligator pepper also have a sharp peppery flavour and the consumption of alligator pepper has negative health implications in pregnant women and lactating mothers (32, 33). Chilli and cloves are preferred probably because they serve different functions and complement each other in food, cloves for its aroma and chilli for its spiciness. Cloves was reported to have dry pungent aromatic floral buds while chilli is known for spiciness and bright colour (34). The relationship between awareness and preference in spices is probably due to the fact that the consumer have prior knowledge of a spice. (35) reported that there is a correlation between knowledge and preference for a career in health care. In other words, those who had knowledge about the profession had a preference for a career in it.

Table 10: Awareness and preferences for spices used for meat products in Sokoto metropolis

Spice	Awareness (%)	Preference
Ginger	100	4.46[a]
Chilli	100	3.99[b]
Garlic	76.7	2.63[c]
Nutmeg	67.5	2.18[d]
Black pepper	66.9	1.91[e]
Cloves	65	1.72[e]
Alligator pepper	50	0.95[f]
SE		3.02

abcdef = Means bearing different superscript along the same column differ (p>0.05)
SE = Standard error.

Conclusion and Applications

Result of this study shows that;

1. The most aware and most preferred spice is ginger and it is also the spice with the largest portion used in spice mixture for meat products in Sokoto metropolis, Nigeria.
2. The least popular and preferred spice is alligator pepper.

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