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EFFECT OF DIFFERENT WOOD TYPES ON ORGANOLEPTIC PROPERTIES OF ROASTED BEEF (*TSIRE*) FROM THE FORE AND HIND LIMBS

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ABSTRACT

A study was carried out to determine the effect of different wood type on the organoleptic qualities of roasted beef (*tsire*) from fore and hind limbs stored for 7 days. Raw beef from fore and limbs was collected from two years old White Fulani cattle and roasted with mahogany (*Khaya senegalensis*), shea butter (*Vitellaria paradoxa*) and locust bean (*Parkia biglobosa*) woods. Ninety sticks of *tsire* samples were prepared, thirty sticks of beef were roasted with each of the wood type as fifteen sticks comprised of each part. A 3 (wood types) x 2 (meat part) factorial arrangement in a completely randomized design was used for the study. The results of the study showed that organoleptic properties scored on a nine-point hedonic scale were rated lowest (4.60) in the *tsire* samples roasted with locust bean wood while highest (7.32) with mahogany wood. In conclusion, the score for overall acceptability indicates that the consumers preferred *tsire* roasted with mahogany and shea butter tree which were significantly ($P < 0.05$) different.

Keywords: *tsire*, organoleptic qualities, *Khaya senegalensis*, *Vitellaria paradoxa*, *Parkia biglobosa*

INTRODUCTION

Meat is a nutritious protein-rich food that is highly perishable and has a short shelf life unless preservation methods are used (Mekonnen, 2015). About 36 percent of the food energy and between 36 and 100 percent of each of the major nutrients in the food supply come from animal products (Anna *et al.*, 2005). The link between diet, maintenance of health, and the development of chronic disease has become increasingly evident in recent years (McCance and Widdowson, 2002).

Tsire is a spicy skewered meat which is a popular food item in West Africa (Eke *et al.*, 2013). It is traditionally prepared by the Hausa people of Northern Cameroon, Nigeria, Niger, and some parts of Sudan. It is a grilled meat product that is commonly consumed as delicacies in Nigeria. *Tsire* is one of the products that the part of meat used and material used for its preparation alters its organoleptic properties and nutritive value (Marin, 2014). Many spices such as groundnut cake, salts, ginger and pepper are usually used as additives during preparation of *tsire* (Olaoye and Onilude, 2010).

Roasting is one of the processing methods that help to increase its shelf life and maintain its nutritional value, texture and flavour of meat. *Tsire* is roasted meat that exact nutritional composition can be influenced using the fore and the hind limb, and firewood made from different wood type such as Mahogany, Locust bean and Shea butter tree. The influence of these wood types on the nutrient composition is not known. This study determined the organoleptic qualities of the *tsire* from the fore and hind limb of beef using firewood from different wood types.

MATERIALS AND METHODS

The study was carried out at the Animal Production Laboratory of the Federal University of Technology, Minna latitude 9° 37' North and longitude 6° 33' East; 258.5 m above sea level, in the southern Guinea Savanna Zone of Nigeria.

Source of Materials

A two year old White Fulani bull (identified by dentition) was slaughtered at Minna main abattoir, Bosso, Niger state, Nigeria. Ten kilogrammes of fresh samples of beef from biceps brachii and femoris muscles of the fore and the hind limbs that was used for this research work were obtained from the bull. They were brought to the laboratory in sterile polyethylene bags for immediate use. The meat was conveyed using ice crystals to prevent possible deterioration due to microbial activity. The samples were then thoroughly washed in clean



cool water. Spices namely; ginger (*Zingiber officinales*), alligator pepper (*Aframomum melegueta*), black pepper (*Piper guineense*), red pepper (*Capsicum frutescens*), groundnut cake powder (*Arachis hypogea*), salt (*Sodium chloride*) and seasoning (*Monosodium glutamate*) were purchased from the Minna Central Market. Mahogany, shea butter and locust bean wood were gotten from Gidan-Kwano village.

Experimental Design

The experimental design used for this study was 3 × 2 factorial (3 – wood types: mahogany, shea butter and locust bean wood; 2 – meat parts: hind and fore limbs).

Preparation of Tsire Ingredients

The spices and other ingredient constituents were milled individually and mixed together in the proportion presented on Table 1 as described by Igene and Ekanen (1985).

Table 1: Composition of Tsire Ingredients

Ingredients	Proportion by weight (g)	Percentage proportion in mixture (%)
Groundnut cake powder	450.00	63.83
Ginger powder	60.00	8.51
Alligator pepper	10.00	1.42
Black pepper	10.00	1.42
Red pepper	60.00	8.51
Table salt	70.00	9.93
Monosodium glutamate	45.00	6.38
TOTAL		100.00

Processing of Tsire

A total of ninety sticks of *tsire* were prepared in the Animal Production Laboratory of the Federal University of Technology, Minna using beef muscle from biceps brachii and femoris muscles of the fore and hind limbs cut as described by Omojola (2008). Ten kilograms meat samples were sliced into thin sheets (strips) with the following dimensions, 1 cm thickness, 5 cm wide, and 8 cm long, and were inserted into the weighed *tsire* sticks. Fifteen (15) sticks for each wood type per part (fore and hind limb) were stacked. The ingredients were spread on a flat tray and each stick of meat was pressed on the ingredient to be properly soaked into the meat. Fifteen (15) sticks of meat each were labeled as T1A (forelimb roasted with mahogany wood), T1B (hind limb roasted with mahogany wood), T2A (forelimb roasted with shea butter wood), T2B (hind limb roasted with shea butter wood), T3A (forelimb roasted with locust bean wood) and T3B (hind limb roasted with locust bean wood) as five millilitres of groundnut oil was sprinkled on each meat stick before roasting according to the method described by Omojola (2008).

Roasting of Tsire

Labeled sticked meats were arranged around a glowing fire made from Mahogany, shea butter, and locust bean wood. The sticked meats were allowed to stay on the fire of 90 °C for 40 minutes at a distance of 90 cm from the centre of the fire and intermittent turning off the product at five minutes intervals. Additional five millilitres of groundnut oil was sprinkled on the meat while roasting continued (Omojola, 2008). All necessary hygienic precautions were observed.

Sensory evaluation

Organoleptic evaluation of the *tsire* samples was done for colour, juiciness, appearance, flavour, aroma, texture (tenderness) and overall acceptability using a 9 - point non - descriptive Hedonic scale (9 - liked extremely; 8 - liked very much; 7 - liked moderately; 6 - liked slightly; 5 - neither like nor dislike; 4 - disliked slightly; 3 - disliked moderately; 2 - disliked very much; 1 - disliked extremely) as described by Mahendraker *et al.* (1988) and used by Nasiru *et al.* (2011). *Tsire* samples were cooled to room temperature (27 °C). A panel of 30 semi - trained judge were constituted by randomly selected students and staff of the Department. The order of presenting the *tsire* samples to the judges was randomized and the meat samples were coded to hide their identity.

Statistical Analysis



Data obtained from this study were statistically analyzed with 3 X 2 PROGLND (Pro General Linear Model), while the means were separated using Duncan Multiple Range test of SAS (2013 version).

RESULTS

The result of organoleptic parameters of *tsire* meat from fore and hind limbs roasted with different wood types is shown in Table 2. The results revealed that all organoleptic parameters were significantly ($P < 0.05$) affected by the wood type except appearance which was not significantly ($p > 0.05$) different. Flavour and general acceptability were similar when mahogany and shea butter wood were used but differed significantly ($p < 0.05$) from those roasted with locust bean wood. Colour, juiciness and tenderness were significantly ($p < 0.05$) higher with mahogany than shea butter and locust bean wood which were similar. For the meat part, only colour and tenderness had significant ($p < 0.05$) differences with the fore limb having the higher values while flavor, juiciness, appearance and acceptability were not significantly different ($p > 0.05$).

Table 2: Organoleptic properties of Roasted beef (*Tsire*) from the Fore and Hind Limbs Roasted with Different Wood Types

Parameters		Flavour*	Colour*	Juiciness*	Appearance*	Tenderness*	Acceptability*
Wood type	Mahogany	6.55 ^a	6.89 ^a	7.04 ^a	6.74	7.32 ^a	7.15 ^a
	Shea butter	6.55 ^a	6.27 ^b	6.54 ^b	6.65	7.03 ^b	7.05 ^a
	Locust bean	4.60 ^b	6.40 ^b	6.50 ^b	6.67	7.09 ^{ab}	6.72 ^b
	P-value	0.0001	0.0004	0.0009	0.7489	0.0062	0.0068
	SEM	1.59	0.75	0.42	0.01	0.22	0.32
Meat part	Fore limb	5.93	6.82 ^a	6.67	6.68	7.82 ^a	6.95
	Hind limb	5.87	6.21 ^b	6.71	6.69	6.47 ^b	6.99
	P-value	0.4930	0.0001	0.6296	0.9173	0.0001	0.7042
	SEM	0.07	0.38	0.05	0.01	1.35	0.03
Interaction	M × W	0.0215	0.3724	0.0207	0.0371	0.1065	0.0003

*All values are means of duplicate determinations. ab= means with different superscripts on the same column are significantly different ($P < 0.05$), M = Meat part, W = Wood type, SEM= Standard error of mean.

Discussion

The acceptability was highest in the *tsire* samples roasted with mahogany and shea butter wood. This agreed with the report of Gandhi (2014) that there was significant difference in the overall acceptability of meat product using different wood types. The colour is the first criterion a customer uses in judging meat acceptability and to an extent, the quality (Omojola, 2007). As revealed by the panelist, higher colour rating in the *tsire* roasted with mahogany could be attributed to some specific volatile compounds, in particular phenolic compounds that are related to the different smoking colour and directly influenced the *tsire* colour. Omojola (2007) also added that, colour could also be influenced by the physical and chemical state of the muscle and the myoglobin content. This agrees with the report of Gandhi (2014) who also reported a significant difference in the colour of smoked beef (*kundi*) prepared with different wood types. *Tsire* flavour and tenderness were judged to be highest in *tsire* samples roasted with mahogany. The flavor and tenderness might have been influenced by the smoke released from the wood on cooking. This could be one of the reasons why samples roasted with mahogany wood had the highest numeric overall acceptability as reported by Omojola (2007) and Guerrero *et al.* (2013). Significant difference observed in juiciness as affected by wood type might be due to the high percent of moisture and fat in the *tsire* roasted with mahogany. Omojola (2008) reported juiciness as directly related to the moisture and fat content since water and fat combine to form a broth and its release when chewing the *tsire*. The most critical of the eating quality which is tenderness was majorly influenced by the meat part-use. Generally, from this study, *tsire* prepared with the fore limb tends to have higher colour and tenderness value compared to the ones prepared with the hind limb. This could be due to the fact that fore limb is less stressed while the animal is trekking compare to the hind limb which is more stressed. This agreed with



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the report of Omojola (2007) that the degree of tenderness observed in the fresh meat differs greatly in various muscles.

CONCLUSIONS

It was concluded from this study that organoleptic qualities of roasted beef (*Tsire*) using mahogany were better than the *Tsire* obtained using shea butter and locust bean woods, with *Tsire* from the fore limb having a comparative advantage over the hind limb.

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