PHYSICO-CHEMICAL PROPERTIES OF SUYA PREPARED WITH CINNAMON

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ABSTRACT

This study was carried out to evaluate the physico-chemical properties of suya (tsire) processed with cinnamon (cinnamomum verum). Semi membranous muscles from a mature bull were sliced into thin sheet and dried cinnamon bark was prepared to obtain its powder. The study comprised of five treatments with twenty-five (25) replicates per treatment in completely randomized design. Suya prepared was analyzed for water holding capacity (WHC), pH and oxidative rancidity. T2 at 2.5% cinnamon-based suya has the highest water holding capacity with the value of 70.00% and least value record T4 at 7.5% cinnamon-based suya of 53.33%. Treatment (T2) of 2.5% cinnamon-based suya recorded the highest value of 6.82 and the least recorded at treatment four (T4) with 6.52 at 7.5% cinnamon-based suya. Treatment five (T5) had the highest oxidative rancidity (4.04) while the least oxidative rancidity was obtained in treatment one (control). In conclusion, 2.5% to 5% cinnamon could be added to suya because it improves the water holding capacity, pH and oxidative rancidity.

Keywords: Water holding capacity, pH, Oxidative rancidity, Cinnamon, Suya

INTRODUCTION

Suya is a boneless lean meat stacked on sticks, coated with sauces, oiled and then roasted over wood using a fire from charcoal. It originated from the Hausa people of Northern Nigeria where cattle rearing is an important preoccupation and a major source of livelihood for the people (Edema *et al.,* 2009).

Suya (Tsire), a popular West African grilled and spiced meat delicacy, faces concerns regarding its quality and safety, particularly related to microbial contamination and harmful substances. Enhancing the quality and safety of Suya is crucial for consumer health and satisfaction. Cinnamon, known for its antimicrobial and antioxidant properties, could potentially improve Suya's quality and safety. However, the impact of cinnamon on Suya's sensory attributes, microbial load, and nutritional composition is not well understood.

It is therefore essential that adequate preservation technologies are applied to maintain its safety and quality (Uzeh, R.E *et al* 2016). The processes used in meat preservation are principally concerned with inhibiting microbial spoilage, although other methods of preservation are sought to minimize other deteriorative changes such as color and oxidative changes.

Cinnamon could lower your triglycerides and your total cholesterol levels, which could help prevent heart disease. If you take supplements with at least 1.5 grams of cinnamon a day, it may lower your total cholesterol, LDL (or bad) cholesterol, triglycerides, and blood sugar if you have metabolic disease.

Cinnamon have antioxidant compounds: polyphenols, phenolic acid and flavonoids give the health benefits for cinnamon as antioxidants, and prevent oxidative stress in the body by its respond to free radicals and reduce damage from metabolic diseases in the body (Chen *et al.,* 2012). Many antioxidant that have been indicated in cinnamon camphene, eugenol, salicylic acid, and epicatechin. In contemporary time, natural antioxidants are the concentrate of major interesting different studies that indicated it's effected. and fixed how it can be using there as effective foods and can block oxidative damage in the organism (Ledward 2013).

This study aims to assess the quality of Suya (Tsire) when affected by the addition of cinnamon. By evaluating the sensory characteristics, microbial quality, and nutritional content of Suya prepared with and without cinnamon, this research seeks to determine the potential benefits and limitations of using cinnamon in Suya production.

Material and methods

The experiment was conducted at the Animal Products and Processing Laboratory and the Pharmaceutical Microbiology lab, Faculty of Pharmaceutical Sciences University of Jos, Plateau, Nigeria. This study is located at 90^0 53' N and 8^0 51' E on altitude above sea level (Ministry of Information, Plateau, Nigeria, 2001). The study area has a monsoonal climate characterized by two well defined seasons: Rainy (May – October) and Dry (October – May) seasons. The mean annual rainfall is 1099.0mm while the mean temperature range is 18.33^0C – 32.39^0C (FAO, 2010).

Preparation of Powder: Dried cinnamon was purchased from the Farin-Gada Market Jos, thoroughly cleaned and dried under shade. The dried cinnamon was then pounded and sieved with 0.2mm fine mesh to obtain the cinnamon powder which were then stored in air tight containers and properly labelled.

Meat Preparation: Meat was purchased from Jos Abattoir. The meat was deboned and trimmed of all connective tissues. It was cut into pieces and sliced in the same direction of the muscle fibre. Meat was staked on already tag slender wooden sticks. Meat sheets were weighed and randomly assigned into five treatments with ten replicates.
Preparation of Suya Ingredients: Spices were purchased at the Jos farin-Gada Market, Jos, Plateau State and were thoroughly mixed with hands.
Preparation of Suya: The already staked meat was properly coated with the formulated ingredients seen in table 1 and each treatment were labelled using a masking tape at the bottom of the sticks. An individual suya stick, which was about 30 cm long, was weighed and the thin sheets of meat inserted into the suya stick. Formulated ingredient was spread on a neat flat tray and each stick meat was properly dusted with the ingredient. After proper coating with the ingredient, the stick meats were reweighed and spread back on the tray. About 2 ml of groundnut oil was sprinkled on each meat prior to roasting. The labelled stick meats were arranged round a glowing, smokeless fire made from firewood. The distance of the stick meat from the fire point was 2.3-2.12 cm. The sticked meats were allowed to stay on the fire for 20 min with intermittent turning of the products. Additional groundnut oil was sprinkled on the meat while roasting continued
Experimental Design: Complete randomized design was used for this study.
Parameters measured
Oxidative rancidity: Thiobarbituric acid value (TBA) was estimated by modified methods of Buege and Aust (1978)
Water Holding Capacity (WHC): Water Holding Capacity (WHC) was determined according to Wardlaw, Maccaskill, and Acton (1973).
pH: The pH was determined using a digital pH meter model PHS-25 Micro field England according to the method described by AOAC.

Statistical Analysis: Data collected were analyzed using ANOVA in SPSS version 25.

RESULTS

Physicochemical properties of Suya prepared with cinnamon

Table 1 show the Physico-chemical properties of Suya. Water holding capacity obtained was significantly higher at 2.5% cinnamon-based suya with the value of 70.00% and the least value record at 7.5% cinnamon-based suya of 53.33%. Oxidative rancidity (OR) shows that the more the inclusion level of cinnamon, the increase the oxidative rancidity. OR was higher in 10.00% cinnamon-based suya. pH, 2.5% cinnamon-based suya recorded the highest pH value of 6.82 and 7.5% cinnamon-based suya record the least value of 6.52%

Table 1: Physicochemical properties of suya prepared with cinnamon

Parameters	Control	2.5% Cinnamon-based suya	5.0% Cinnamon-based suya	7.5% Cinnamon-based suya	10.0% Cinnamon-based suya	SEM	P-value
Water holding capacity (%)	56.67[b]	70.00[a]	55.00[b]	53.33[b]	66.67[a]	1.94	0.000
Oxidative rancidity (mg/kg)	3.71[d]	3.92[c]	3.75[d]	3.97[b]	4.04[a]	0.03	0.000
pH	6.57[c]	6.82[a]	6.65[b]	6.52[c]	6.58[b]	0.03	0.000

[a, b] Means in the same row not sharing superscript are significantly different at P<0.05.
SEM = Standard error mean

DISCUSSIONS

The water holding capacity (WHC) is the ability of meat to hold all or part of its water and one of the most important traits of meat quality. Weight loss due to purge or drip loss range from 2% to 10% when meat is cut into chops. Water holding capacity in meat is influenced by the changes in muscle cellular and extracellular components (Chang *et al* 2016). Generally, a reduction in meat water holding capacity could be resulted from storage duration (Wardlaw *et al.,* 1973). Oshibanjo (2019) recorded similar range of values (34.26% and 37.95%) for suya prepared with *Moringa olifera* leave powder on day 0 with T5 having the highest value and T1 have the least value
Oxidative rancidity is best controlled by the addition of antioxidants. The heat treatment experienced during extrusion is usually sufficient to destroy these enzymes. Most antioxidants are added before extrusion even though there may be minor destruction during the process depending on the time and temperatures employed. There is a

growing trend to utilize natural antioxidants such as mixed lemon extract juice, rosemary, and other unique ingredients.

The result obtained in this study was in agreement with the finding of (Chidanandaiah *et al.,* 2009) who reported TBARS values increased significantly ($p<0.05$). Similar findings were stated by Yadav *et al*. (2018) who found a significant increase in TBARS value of control and fiber enriched sausage with an increase in storage period.

The pH of meat is the measure of the degree of acidity or alkalinity of a meat and meat products. Meat pH is one of the most important meat quality parameters, which is also associated with the rate of glycolytic pathway during post slaughtering. The flesh of animals prior to slaughter has a pH value of 7.1 after slaughter some of the glycogen in the meat turns into lactic acid. After slaughtering, the anaerobic glycolysis resulted in accumulation of lactate, which contribute to the increased concentration of hydrogen ions (H+), as well as the protein denaturation, which release H+, thus leading to the changes in muscle pH value (Matarneh *et al.,* 2017).

Also, the result obtained is in line with the result reported by Disha *et al.* (2020), who stated that a slight decrease in raw pH values for all treatments and an increase in the acidity values for all samples along with storage time during 90 days of storage as a result of increasing of FFAs due to rancidity. The result obtained could be due to the growth of microorganisms. The result observed is 7.5% cinnamon-based suya having 6.52 and 2.5% cinnamon-based suya having 6.8%. This result is in agreement with result reported by Oshibanjo (2019) which had the same, T1 having the least value of 6.30 and T4 having the highest value of 6.36.

CONCLUSION

In conclusion, 2.5% to 5% cinnamon could be added to suya because it improve the water holding capacity, pH and oxidative rancidity.

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