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**SECURING ANIMAL
AGRICULTURE AMIDST
GLOBAL CHALLENGES****EFFECT OF MINTS LEAF BASED-SPICE ON PRODUCTS YIELD AND PHYSICOCHEMICAL PROPERTIES OF SUYA**¹Aka-Tanimo, H. A. ²Oshibanjo, D. O., ¹Adelowo V.O, ³Adediran Opeyemi, ⁴Ugwu B. K, ²Akwashiki, M. A.,
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ABSTRACT

In this research work, the products yield and physicochemical properties of the suya as affected by mint leaf extract powder were determined. Semi membranous muscle from a matured bull was sliced into a thin sheet. Mints leaf meal was prepared by cutting fresh mints leaves, shed dried, milled, and sieved to obtain leaf powder. The mint leaf meal was included in the suya spice at 0%, 2%, 4%, 6%, 8%, and 10%. The study comprised of five treatments with ten replicates in three batches in a completely randomized design. The results show that 10% mint leaf-based-spice shows the higher significant value of (87.55%) Products yield of suya followed by 6% 4% 8% and control respectively. The results show that there was a significant difference ($p>0.05$) in water holding capacity which was significantly higher in 2% and 6% mint leaves 75.00 and 73.05% respectively followed by control, 10% 8% and 4% respectively. The pH levels show no significant difference in the treatment. The Oxidative rancidity was significantly higher ($p>0.05$) 10% 8% and 2% mint leaf-based-spice respectively with a value of 4.32, 4.12, 4.05 mg/g) whereas control 4% and 6% show no significant difference ($p<0.05$). The result of this study showed that the use of mint leave meal powder between 2 to 4 % could be used in suya production due to its ability to reduce the rate of lipid oxidation.

Keywords: Mints leaf, products yield, physicochemical properties, meat, and suya**INTRODUCTION**

Suya is a popular, traditionally processed, ready-to-eat Nigerian meat product, which may be served or sold along the streets, in clubhouses, at picnics, parties, restaurants, and within Institutions. Igene J. O. and Mohammed I. D (2008). It is a mass consumer of fast food. Its preparation and sales along the streets are usually not done under strict hygienic conditions because they are still done locally with crude tools. Traditionally, processed meat products were produced and consumed in different countries throughout the world. Meat is a highly perishable food product, just like milk as described by Falegan, *et al.*, (2015) which unless correctly stored, processed, packaged, and distributed may spoil quickly and become hazardous to consumers due to microbial growth. Mints (*Menthaspicata L.*) is a common name for members of the Labiatae (*Lamiaceae* Family). It is a large family of annual or perennial herbs and is widely grown all over the world to reap its special herbal characteristics. The essential oils of mints are widely used as flavourings in the food, cosmetic, and pharmaceutical industries. Mint leaves are known for refreshing, antiseptic, antiasthmatic, stimulative, diaphoretic, stomachic, and antispasmodic features. They are used in both fresh and dried forms in different cuisines. Therefore, this research work evaluated the products yield and physicochemical properties of the suya as affected by mint leaf based-spices.



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MATERIALS AND METHODS

Experimental site

The experiment was conducted at the Federal College of Animal Health and Production, Livestock Investigation Department, Vom, Plateau State.

Preparation of mints leaf Powder

Fresh green mint leaf was purchased from Farin-Gada Market Jos, thoroughly washed with distilled water, and dried under shade (room temperature). The dried leaves were pounded in a mortar and sieved with 0.2mm fine mesh to obtain the mint leaves meal, which was then stored in an airtight container.

Inclusion levels: The mint leaf powder was included in the suya spice at 0%, 2%, 4%, 6%, 8%, and 10%.

Meat Preparation: A matured bull Semi membranous will be purchased at the Jos abattoir. The meat was deboned and trimmed off of all connective tissues. It was cut into pieces and sliced in the same direction of the muscle fiber. The meat was staked on already tag slender wooden sticks, meat sheets were weighed and randomly assigned into five treatments with ten replicates each

Preparation of Suya Ingredients

The spices in (Table1.) below were purchased at Farin-Gada Market, Jos, Plateau State, and were thoroughly mixed with hands.

Table 1. Ingredient composition of suya with the different levels of mint leaf extracts powder

Ingredients (%)	Control	2% mint leaf extract	4% mint leaf extract	6% mint leaf extract	8% mint leaf extract	10 % mint leaf extract
Groundnut cake	52.00	50.00	48.00	46.00	44.00	42.00
Leaf powder	0.00	2.00	4.00	6.00	8.00	10.00
Ginger	6.00	6.00	6.00	6.00	6.00	6.00
Garlic powder	6.00	6.00	6.00	6.00	6.00	6.00
Red dried pepper	12.00	12.00	12.00	12.00	12.00	12.00
Salt	8.50	8.50	8.50	8.50	8.50	8.50
Turmeric	6.00	6.00	6.00	6.00	6.00	6.00
Maggi	7.50	7.50	7.50	7.50	7.50	7.50
Groundnut oil	2.00	2.00	2.00	2.00	2.00	2.00

Determination of Product yield: Each of the roasted suya samples was cooled to room temperature, blotted dry and weighed. The product was calculated as:

$$\text{Product yield} = \frac{\text{Weight before roasting} - \text{Weight after roasting}}{\text{Weight before roasting}} \times 100$$

Determination of pH: The pH was determined using a digital pH meter (model PHS-25 Microfield England) according to the method described by AOAC (2000).

Determination of oxidative rancidity: Thiobarbituric acid value (TBA) of the meat was estimated by the modified method of Buege and Aust (1978).

Determination of Water Holding Capacity: The Water Holding Capacity of the suya was determined according to Wardlaw *et al.* (1973).

Experimental Design: The experiment was carried out in a completely randomized design.

Statistical Analysis:

Data collected was analyzed using the General linear model of SPSS (Version 25) with storage days and method as fixed factors. Statistical variations were observed and means was separated using Duncan’s multiple range test.

RESULTS

The products yield of suya prepared with different mint leaf based-spice is shown in figure 1. The results show that 10% mint leaf-based-spice shows the higher significant products yield (87.55%) followed by 6% 4% 8% and control respectively. The effect of different mint leaf based-spice on suya quality was shown in Table 1. The result shows that there was a significantly different ($p>0.05$) in water holding capacity which was significantly higher in 2% and 6% mint leaf 75.00 and 73.05% respectively followed by control, 10% 8% and 4% respectively. The pH levels show no significant difference in the treatment group with 2% and 6% (6.54 and 6.47) respectively. The Oxidative rancidity was significantly higher ($p>0.05$) 10% 8% and 2% mint leaf-based-spice respectively with a value of 4.32, 4.12, 4.05 mg/g) whereas control 4% and 6% show no significant difference ($p<0.05$).

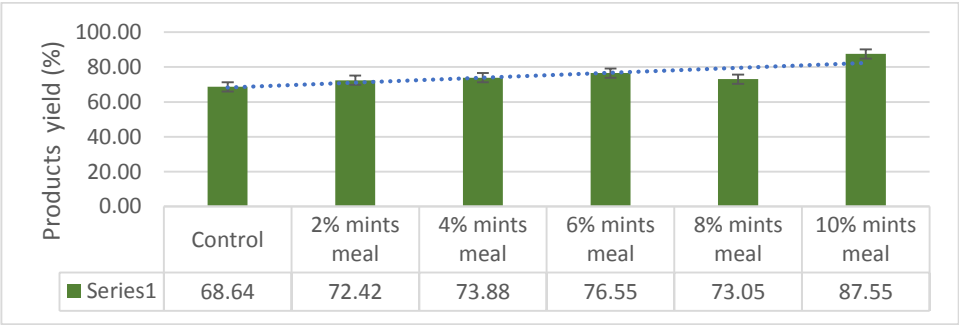


Figure 1: Product yield of Suya prepared with different mint leave meal

Table 1: Effect of different mint leave meal on Suya quality

Parameters	Control	2% mints meal	4% mints meal	6% mints meal	8% mints meal	10% mints meal	SEM
Water holding capacity (%)	72.50 ^{ab}	75.00 ^a	69.17 ^b	73.05 ^a	69.45 ^{ab}	69.91 ^{ab}	1.19
pH	6.59 ^a	6.54 ^b	6.62 ^a	6.47 ^b	6.58 ^a	6.58 ^a	0.01
Oxidative rancidity (mg/g)	3.60 ^b	4.05 ^a	3.06 ^b	3.57 ^b	4.12 ^a	4.32 ^a	0.09

^{abc}...Means with different superscripts on the same row are significantly different ($P<0.05$). SEM= Standard error of the mean

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DISCUSSION

The product yield percent was determined by calculating the weight difference of samples before and after roasting. This reflects the cooking loss which refers to the combination of liquid and soluble matter lost from the meat during cooking. Okubanjo *et al.*, (2003) said that water or cooking loss is of economic concern because it affects weight loss along the distributions chain. Tonberg (2005), reported that the extent of shrinkage increases with temperature and causes a great water loss, hence the direct relationships between products yield and cooking loss observed in this study. The results show that 10% mint leave meal shows the higher significant value of (87.55%) Products yield of suya followed by 6% 4% 8% and control respectively. This could be due to the ability of the mint leaves to retain water. Water holding capacity refers to the ability of meat to retain its water during the application of external forces (Hedrick *et al.*, 1994). Water holding capacity in this experiment was observed to have a direct relationship with other parameters such as the flavour, juiciness, and tenderness which agrees with the report by Omojola (2008). Omojola also reported that when the weight of ingredient uptake is lower, the Water Holding Capacity is higher so this will apply to the WHC values for the mints leave meal-based suya spices. This suggests that the natural antioxidants used in this study inhibit the denaturation of sarcoplasmic proteins, which plays an important role in determining water holding capacity.

The pH of meat is the measure of the degree of acidity or alkalinity of the meat and meat products. The result of this study follows the same trend with the work of Oshibanjo *et al.* (2019) who used moringa powder as part of suya ingredients. Oxidative rancidity value determines the extent of lipid oxidation. Results on oxidative rancidity of this research is similar to that of Zaki *et al.*, (2018) and Oshibanjo *et al.* (2019). An increase in pH over the storage period is attributed to the production of amines and other volatile bases by the autolytic and microbial action on protein and other compounds (Binsi *et al.* 2007). The highest inhibition on secondary oxidation was exhibited by mint extract as observed from its lowest TBARS values among the samples. Similar to our observations, the inhibitory effects of plant-derived extracts on secondary lipid oxidation of fish during chilled storage has been proven by several authors (Gao *et al.* 2014). Kanatt *et al.* (2007) reported that mint extract (0.1 %) has strongly inhibited secondary lipid oxidation in irradiated meat during chilled storage.

CONCLUSION

The result of this study showed that the use of mint leave meal powder between 2 to 4 % could be used in suya production due to its ability to reduce the rate of lipid oxidation.

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