

Comparative evaluation of the effects of three local spices on nutrient and organoleptic qualities of rabbit meat

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Abstract

A study was conducted to evaluate the effects of three different spices of *Monodora myristica* (African Nutmeg), *Zingiber officinale* (Ginger), and *Piper guineense* (African Black Pepper) on nutrient composition and organoleptic characteristics of dried rabbit meats. The three spices collected as seeds were processed into meals and applied on the fresh meat cut (loin) obtained from 10 rabbit bucks. The treatments were arranged as: T₁ (200g meat without spice) which served as control, T₂ (200g meat +5% Nutmeg) T₃ (200g meat + 10% Nutmeg) ,T₄ (200g meat + 5% African Black Pepper) T₅ (200g meat +10%) T₆ (200g meat +5% Ginger) T₇ (200g meat +10% Ginger). Each treatment was oven-dried before presented to taste panel that adjudged the test for colour, flavour, tenderness, juiciness and overall acceptability. Samples of each spice and the processed meat were analyzed for nutrient composition. Result obtained showed that the meat is made up of protein, 50.52%, fat 6.45%, ash 5.05%, fibre 3.23%. Proximate composition of Ginger showed that it was significantly ($P<0.05$) higher in protein and Ash but lowest in fat and fibre while Nutmeg recorded highest fat and lowest protein level. African Black Pepper however recorded highest ($P<0.05$) level of fibre. The mineral and Phytochemical results of the spices indicated that Ginger and Nutmeg contained moderate levels of Phenols, saponins and glycoside. However, Ginger was higher in flavonoid and Ca even as Nutmeg was higher in flavonoid and K. African black pepper was high in Saponins, Alkaloid, Cu and Na than other spices. Results also indicated that there were significant ($P<0.05$) differences in terms of flavour, tenderness and overall acceptability even as meat spiced with *Zingiber officinale* scored highest ($P<0.05$) in tenderness, flavour and overall acceptability at 5% and 10% level using a 9-point hedonic scale, followed by *Monodora myristica*, which was not different ($P>0.05$) from the control while the least score was recorded in *Piper guineense*. Similarly, nutritional composition of meats improved in terms of protein, ash and fibre significantly ($P<0.05$) especially *Zingiber officinale* in terms of increased protein, minerals and fibre while reducing fat compared to other spices.

Keywords: Ginger, Black-pepper, Nutmeg, meat, organoleptic

Introduction

Meat is the most important source of protein and includes the flesh or entire musculature and organs of any animal used for food. It is composed essentially of nutrients vis-à-vis water, fat, minerals and vitamins apart from protein. However, meat is often processed before consumption and spices are commonly used during meat processing to enhance

organoleptic composition of meat in Nigeria. This implies that when meat is spiced, its palatability, flavour, juiciness, colour and tenderness may be altered, thereby enhancing or decreasing the overall acceptability of the meat by a consumer. Sensory evaluation plays an important role in the examination of meat products. Not only does scientific sensory evaluation with skilled panelists using special test programs and point systems give reliable results, but

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results can also be obtained in a simple way at the consumer level. For the average consumer, sensory evaluation is the only way to decide whether or not he or she should buy or eat a certain product. Rabbit meat as reported by Cheek *et al.* (1987) is fine grained, nutritious and appetizing. It is ranked best in quality as it is low in fat (10-12%), compared to other meats like poultry (11-13%), pork (42-48%), and beef (27-29%) but high in protein (20-22) compared to chicken (19-21%), pork (10-12%) and beef, 15-17% (Fielding, 1991). Even though rabbit meat is rated the most nutritious meat, its consumption level by the Nigerian populace is still very low (Ekpo *et al.*, 2016). One of the ways to boost the rabbit meat consumption therefore is to apply spices and oven dried or smokes dried (Bamgbose, 2006). Basically, three local spices namely: *Zingiber officinale* (Ginger), *Monodora myristica* (Nutmeg), and *Piper guineense* (African Black Pepper) are available which potentials can be tested on the chemical composition as well as sensory qualities of rabbit meat. This study is, therefore, an attempt to evaluate the potentials of some local spices and their effects on the proximate composition as well as organoleptic attributes of oven dried rabbit meat. These local spices include: *Zingiber officinale* (Ginger), *Monodora myristica* (Nutmeg), and *Piper guineense* (African Black Pepper).

Materials and methods

The study was carried out at the Teaching and Research laboratory of the Akwa Ibom State University. The area is situated between latitude 4°30 and 5° 30N and longitude 7° 30 and 8°00 East of the Greenwich Meridian (SLUK-AK, 1989). The Local spices (Ginger rhizomes, Nutmeg seeds, and African black pepper seeds) were bought from Uyo urban

market, Akwa Ibom State, Nigeria. The meats were obtained from 10 slaughtered rabbit bucks in the Rabbitry unit of the farm. *Zingiber officinal* (Ginger), *Monodora myristica* (Nutmeg seeds) as well as *Piper guineense* (African black pepper seeds) were bought fresh from local market. They were washed, chopped into 2cm and sundried for one day before ground into meal using the electric grinder (AS3101 model) as described by Akinloye *et al.* (2000). Each of the processed spices was included in 200g fresh rabbit meat at 5% and 10% level (meat weight basis). Treatments were arranged as: T₁ = control; T₂ = 5% Nutmeg + meat; T₃ = 10% Nutmeg + meat; T₄ = 5% African Black Pepper + meat; T₅ = 10% African Black Pepper + meat. T₆ = 5% Ginger + meat; T₇ = 10% Ginger + meat; were subjected to oven drying at a temperature of 80°C for 1 hour and 30 minutes using compact oven (PR305225M model). Sensory evaluation was conducted using the 9-point hedonic scale as described by Ihekoronye *et al.* (1985). A 7-member pre-trained taste panel was set up to carry out the sensory evaluation. Meats were rated for colour, flavor, tenderness, juiciness, and overall acceptability. Samples of each of the spiced meat from each treatment were also subjected to proximate analysis according to AOAC (1990). Phytochemical tests of the spices i.e. flavonoids, saponins, phenols, glycoside and Alkaloid were carried out using standard procedures as described by Harborne (1973) and enunciated by Trease and Evans (2002). Data from the organoleptic evaluation were subjected to analysis of variance using completely randomized design, and treatment means where differences manifested were separated by Fisher LSD using SAS (2000). Results of influence of spices on chemical composition of rabbit meat presented in Table 1 indicated that

highest crude protein was obtained in T₆ followed by T₇, T₅ and T₄ which were not significantly (P>0.05) different. The least value was obtained in T₁ (control). Similarly, highest values of ash were recorded in T₆ and T₃ followed by T₄, T₇ and T₂ but did not differ significantly (P>0.05). However, all the values recorded were significantly (P<0.05) higher than the T₁ (control). These express the positive effect

of the spices on the rabbit meats' mineral content. Similar trend was also observed for the meat fibre. For the meat's fat content, it was observed that the values reduced in the treated meat compared to the control. This suggest fat-reducing effect of the spices and also revealed that the meat may be safer for human consumption compared to the meat without spice, T₁ (control).

Table 2: Effect of spice on nutrient composition of meat samples

Parameter (%)	Treatments							SEM
	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	T ₇	
DM	91.58	92.82	91.28	90.93	91.72	90.75	89.98	3.71
Ash	5.05 ^d	6.82 ^b	7.10 ^a	6.80 ^{ab}	6.10 ^{bc}	7.45 ^a	6.48 ^{bc}	0.49
Fat	6.45 ^a	4.45 ^d	5.00 ^c	3.90 ^d	5.80 ^{bc}	2.25 ^d	3.15 ^{ab}	0.81
Protein	50.52 ^{bc}	48.20 ^{cd}	51.38 ^{bc}	52.51 ^{bc}	54.16 ^b	57.92 ^a	54.64 ^b	2.91
Fiber	3.23 ^c	4.53 ^b	4.77 ^b	4.45 ^b	4.65 ^b	4.25 ^b	5.13 ^a	0.43
NFE	34.75 ^b	36.00 ^a	31.75 ^c	31.89 ^c	32.34 ^d	28.13 ^d	30.60 ^d	1.71

^{abcd} Means with different superscripts along the same row differed significantly (P<0.05)

Table 3: Sensory Evaluation of Treatment Samples

Parameters	Treatments							SEM
	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	T ₇	
Colour	7.00 ^b	7.29 ^b	7.14 ^b	6.57 ^c	5.57 ^d	7.86 ^a	7.14 ^b	0.58
Flavor	5.14 ^c	6.71 ^b	4.86 ^c	4.86 ^c	3.74 ^d	7.29 ^{ab}	8.14 ^a	0.74
Tenderness	3.57 ^{cd}	5.17 ^b	5.29 ^b	3.14 ^d	4.14 ^c	6.20 ^a	5.94 ^{ab}	0.80
Juiciness	3.33 ^d	5.71 ^{bc}	5.14 ^{bc}	4.43 ^c	4.26 ^c	7.00 ^a	6.00 ^b	0.81
Overall acceptability	5.86 ^{bc}	6.57 ^b	5.57 ^{bc}	3.86 ^d	3.29 ^d	8.00 ^a	7.15 ^a	0.53

^{abcd} Means with different superscripts along the same row differed significantly (P<0.05)

Results as presented in Table 2 indicated significant (P<0.05) differences among the treatments. The T₆ and T₇ were rated the overall best (P<0.05) compared to all other treatments. This was followed by T₂, T₃ and T₁ which were statistically similar (P>0.05). T₄ and T₅ recorded least significant (P<0.05) means value for all the parameters. This implies that, meats spiced with *Piper guineense* were least accepted by the consumers while *Zingiber officinale* were most preferred. Result of tenderness as presented also showed that there were significant (P<0.05) difference among

treatments. Highest mean value was recorded in T₆ followed by T₇, T₃, and T₂ which were not significantly different (P>0.05). However, T₄ recorded the least. The highest tenderness obtained in T₆ may be related to the high calcium content of *Zingiber officinale* which is responsible for tenderization of meats (Mendiratta *et al.*, 2000). *Zingiber officinale* had earlier been reported to boost tenderization in mutton, and chicken meat respectively (Mendiratta *et al.*, 2000). The result presented also indicated that meat spiced with *Zingiber officinale* (T₆ and T₇) were significantly

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($P < 0.05$) juicy followed by T_2 , T_3 , T_4 and T_5 which did not differ significantly ($P > 0.05$). T_1 (control) was however the least juicy. This implies that spices significantly enhanced juiciness of the rabbit meat. In terms of flavour and colour, similar trend was followed but for T_4 (10%) which scored the least. This suggests that adding *Piper guineense* on rabbit meat above 5% had negative influence on flavor. These results confirm that spices generally influence meats' organoleptic characteristics.

Conclusion

The study has shown that consumers preferred spiced rabbit meats especially *Zingiber officinale* spice. Spices specially *Zingiber officinale* increased mineral, fibre and protein contents of the meat while reducing fat content both at 5% and 10% inclusion levels. *Zingiber officinale* is therefore recommended because of its significant influence on both the organoleptic and the nutritive composition of rabbit meat...

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Received: 15th July, 2018

Accepted: 21st December, 2018