



SENSORY CHARACTERISTICS AND NUTRITIONAL QUALITIES OF PORK SAUSAGE TREATED WITH BOILED 'PREKESE' (*TETRAPLEURA TETRAPTERA*) POD EXTRACT

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Abstract

This study was conducted to assess the effect of "prekese" pod extract (PPE) prepared from ground, cut or whole boiled 'prekese' on the sensory characteristics and nutritional qualities of pork sausages. Four (4) kg of minced pork was obtained and was divided into four batches of 1 kg each. Each batch was spiced and 10 ml of PPE added. These were stuffed into casing and vacuum sealed in transparent polythene bags and refrigerated at 4°C for nutritional and sensory analyses. A five point category scale was used for the sensory analyses. The inclusion of 10 ml of PPE from the various treatments had no effect ($P > 0.05$) on the acceptability of the sausages. It was also observed from the proximate analysis that, there were no significant differences in the protein content of the products but there were significant differences in terms of moisture, crude fat and the pH. The use of 'prekese' pod extract in the preparation of pork sausages had no adverse effect on the sensory attributes of the sausages. 'Prekese' pod extract could not improve upon the protein content of the pork sausages. Moisture and pH contents of pork sausages prepared without boiled 'prekese' was lower than pork sausages prepared using boiled 'prekese'.

Keywords: Boiled 'prekese', Nutritional qualities, Pork sausage, Sensory characteristics

INTRODUCTION

Meat is the animal tissue suitable for food (Taylor & Field, 1998; Teye, 2007; Adzitey *et al.*, 2015). These are mainly the soft tissues of the carcass which comprises of the skeletal muscles (30-65 %), fatty tissues (10-45 %) and connective tissues (FAO, 1991). Meat can be categorized into red and white meat. Red meat is obtained from cattle, sheep and goat while white meat is obtained from poultry such as chicken and turkey (Taylor & Field, 1998). In Ghana, meat is commonly obtained from cattle, sheep, goat and poultry (Adzitey, 2013). Meat is an excellent source of many nutrients, especially protein, B vitamins, iron and zinc (Boyle, 1994). Meat processing is the procedure such as addition of ingredients and or mechanical action that converts flesh of an animal into specific products (Teye, 2007). The purposes of processing meat are to preserve the meat for a longer storage life, to change the flavour and to increase variety in the diet

(FAO, 1991). Meat processing can also add value to poor quality meats such as PSE and DFD meats (Adzitey, 2011; Adzitey & Nurul, 2011; Adzitey & Huda, 2012). Spices are pungent or aromatic seasonings obtained from bark, buds, fruits, roots, seeds or stems of various plants and trees (Herbsts, 1995). Different types of spices are used to improve taste, as flavourings and preservatives in meat and meat products (Herbsts, 1995; Adu-Adjei *et al.*, 2014; Amanfo *et al.*, 2015). *Tetrapleura tetraptera* plant also has many medicinal uses (Steentoft, 1988). Adu-Adjei *et al.* (2014) indicated that in order to replace artificial spices, some indigenous plants such as 'akokobesa' (*Ocimum basilicum*), 'dawadawa' (*Parkia biglobosa*) and 'prekese' (*Tetrapleura tetraptera*) are used as spices in the preparation of local dishes and can be used as replacement for seasoning meat products.

Sausage is an example of a meat product which is minced, blended with spices and seasonings, and usually stuffed into natural or artificial casing. They are made from edible part of carcass and a series of non-meat ingredients. The degree of comminuting differs among various processed products and is often of a unique characteristic of a particular product ranging from coarsely comminuted to finely comminute to form an emulsion (FAO, 1991). Cutting up scrap of meat, salting and sealing it in casings made from the intestines and other organs of animals was one of the first discoveries of early pastoralists (Nordan, 2010). Recent work done by Lartey (2012) showed a significant difference among treatments using prekese pod powder. Adu-Adjei *et al.* (2014) also found that prekese pod extract (prepared without boiling) in a sausage at 10 ml/1kg of pork sausage improved the protein content of the products. This work was carried out to determine the effect of “prekese” pod extract (PPE) prepared from ground, cut or whole boiled ‘prekese’ on the sensory characteristics and nutritional qualities of pork sausages.

MATERIALS AND METHODS

Study area

The study was conducted at the Meat Processing Unit and Spanish laboratory of the University for Development Studies (UDS), Nyankpala Campus.

Materials and extract preparation

The meat was obtained from the UDS Meat Unit and the spices and ‘prekese’ from the Tamale market. Spices such as black pepper, white pepper, chili pepper, curing salt and Adobo® were used for the experiment. The boiled whole, cut or ground ‘prekese’ pod extracts (PPE) were prepared by weighing three pods of ‘prekese’, 50 g each with a length of about 25 cm each.

ii) The first pod was left whole or fully intact (T1).

iii) The second pod was cut into pieces about 5 cm long (T2).

iv) The third pod was ground into powdery form (T3).

The whole, cut or ground prekese was boiled in 0.5 litres of water at a temperature of 100°C for twenty minutes. After which 10 ml of each extract was used in the preparation of the pork.

Sausage preparation

The meat was thawed overnight at a temperature of 4°C, cut into smaller sizes and mixed using a 5 mm sieve table top mincer (Talleras Rammon, Spain). The meat of 4 kg weight was divided into four batches of 1kg each and placed in a metal pan labeled 1 to 4 to represent the treatments. The spices (15 g curing salt, 1 g black pepper, 1 g white pepper, 0.5 g chili and 2 g adobo for each kg of meat), together with the various types of the prekese extract were added and mixed manually until the meat was thoroughly mixed with the extract. The inclusion levels of prekese extract in mm per 1 kg of meat were as follows: Treatment 1 = 10 ml PPE of ground and boiled; Treatment 2 = 10 ml PPE of cut and boiled; Treatment 3 = 10 ml PPE of whole and boiled; and Treatment 4 = 0 ml of the PPE to serve as the control product.

The thoroughly minced meat and spices were stuffed into natural casing using a hydraulic stuffer (Talleres Rammon, Spain) and manually linked into similar sizes of about 10 cm. The sausages were hanged on labeled smoking rack and smoked for an hour after which they were allowed to cool under room temperature.

Panel selection and training

A total of (15) panelists were selected and trained according to the British Standard Institution guidelines for panel selection and training to form the sensory panel for evaluating the products (British Standard Institution, 1993). The prospective panelists were screened and trained for their tasting acuity. The screening was done by presenting to the potential panelists with three products wrapped in coded aluminum foils; two of which were the same. Each individual was supposed to pick the odd one out of the three, and those who were unable to accurately detect the odd product out of the three, were disqualified.

Product preparation and sensory analysis

The products were removed from the refrigerator and allowed to thaw for three (3) hours under room condition. They were then grilled in an electric oven (Turbofan, Blue seal, UK) and sliced into uniform sizes of about 2 cm in length and were wrapped with coded aluminum foil to keep them warm and to maintain their flavour. The cooked products were

presented to each of the panelists, and they were made to sit under controlled lightning condition, so that the panelists would not be influenced by another. Each panelist was provided with water and piece of bread to serve as neutralizers between the products. A five-point category scale was used to

evaluate the products based on the following parameters (Table 1). Sensory analyses were conducted in triplicates.

Table 1: Five (5)-point scale used for the sensory

Attribute	Scale
Colour	1-Very Red 2-Pale Red 3-Intermediate 4-Dark Red 5-Very Dark Red
Aroma	1-Very Offensive 2-Offensive 3-Intermediate 4-Pleasant 5-Very Pleasant
Flavour intensity	1-Very Weak 2-Weak 3-Intermediate 4-Pleasant 5-Very Pleasant
Flavour liking	1-Dislike Very Much 2-Dislike 3-Intermediate 4-Like 5-Like Very Much
Overall liking	1-Dislike Very Much 2-Dislike 3-Intermediate 4-Like 5-Like Very Much

Laboratory analysis of the products

The sausages were analyzed for moisture, crude protein, and fat (ether extract) contents according to the method of International Association of Official Analytical Chemists (AOAC, 1999). Analyses were conducted in triplicates. All reagents were of analytical grade.

Determination of the pH of product

Sensory analysis, the samples, 10 g each were ground with a laboratory pestle and mortar, and homogenized with 50 ml distilled water. pH values were measured with a digital pH-meter (CRISON, Basic 20, Spain). Analyses were conducted in triplicates.

Data analysis

Data obtained from the study were analyzed using the General Linear Model (GLM) of the Analysis of Variance (ANOVA) of the Minitab Statistical Package, Version 15.

RESULTS AND DISCUSSION

Sensory characteristics of smoked pork sausage

The results on the sensory characteristics of the pork sausage product are shown in Table 2. The results showed no significant differences ($P > 0.05$) among the four treatments. The insignificant difference may be due to the inclusion levels of the PPE which might not be high enough to have a significant effect.

Colour is the visual appraisal of meat products, and is one of the important criteria to attract consumers (Feiner, 2006). Colour is an essential indicator of the quality of fresh or cooked meat, as the appearance influences the acceptability by consumers (Van Oeckel *et al.*, 1999). The insignificant difference in terms of colour may be due to the lower level of the PPE that rendered the colour the same as the control product. This shows that, sausage products with an inclusion level of 10 ml PPE will be patronized as the control products.

Table 2: Sensory characteristic of smoked pork sausages

Parameters	T1	T2	T3	T4	Sed	P-value
Colour	1.70	2.20	2.20	2.00	0.404	0.566
Aroma	2.90	3.40	3.50	3.50	0.282	0.120
'Prekese' Flavour	2.80	3.00	2.80	2.70	0.502	0.944
Flavour Liking	2.20	1.80	2.00	2.00	0.343	0.717
Overall Liking	2.50	2.10	2.30	2.10	0.368	0.657

Sed = Standard error of difference; P-value = Probability value;

Treatment 1 = 10 ml “prekese” pod extract (PPE) of ground and boiled; Treatment 2 = 10 ml PPE of cut and boiled; Treatment 3 = 10 ml PPE of whole and boiled; and Treatment 4 = 0 ml of the PPE to serve as the control product.

Aroma refers to the smell or odour of substances perceived by people. It also gives an indication of the degree of attraction or repulsion of people to substances. According to McWilliam (1997), a pleasant odour invites consumers, while a strong irritation discourages consumers. There was no significant difference in the aroma ($P > 0.05$), and the people described the products as pleasant. This insignificant difference obtained in the aroma implies that sausage products prepared with the PPE at the level of 10ml would be accepted as the standard products on the market.

It was expected that the taste of the products would be altered as a result of the strong aroma of the

Table 3: Proximate composition of smoked pork sausages

PARAMETER	T1	T2	T3	T4	Sed	P- value
Moisture (g)	40.77 ^a	42.77 ^a	41.57 ^a	34.06 ^b	0.735	0.001
Crude Fat (g)	23.04 ^d	32.23 ^c	39.82 ^a	35.20 ^b	1.008	0.000
Crude Protein (g)	12.75	12.25	10.73	15.46	1.802	0.209
pH	6.22 ^{ab}	6.26 ^a	6.24 ^a	6.18 ^b	0.017	0.031

Sed = Standard error of difference; P-value = Probability value; Means in the same row with different superscript are significant; Treatment 1 = 10 ml “prekese” pod extract (PPE) of ground and boiled; Treatment 2 = 10 ml PPE of cut and boiled; Treatment 3 = 10 ml PPE of whole and boiled; and Treatment 4 = 0 ml of the PPE to serve as the control product.

Moisture refers to the amount of water contained in a product, which influence juiciness and storability of products (Cross *et al.*, 1986; McEwen and Mandell, 2011). The addition of the PPE at 10 ml level might have contributed to the significant difference recorded in the moisture content. The lowest moisture was reported in T4 and this could be due to the absence of PPE.

Protein level of the sausage products decreased from T1 to T3 at 10 ml level of PPE but increased in T4 (control). Though, T4 showed a higher level of protein, the differences were not significant to alter the protein levels of the products. Adu-Adjei *et al.* (2014) observed a significant effect on protein content of pork sausages prepared using non-boiled prekese pod extract. Additionally, the protein values as reported by Adu-Adjei *et al.* (2014) were higher (13.45 g – 16.08 g) than that of this study (10.73 g – 12.75 g), which may be due to losses in protein as a result of boiling the ‘prekese’. They showed that, there was an improvement in the

prekese during boiling but that was not the case. There was no significant difference in the ‘prekese’ flavour, flavour liking and the overall liking but the description of the products as good by the panelists indicate that sausage products prepared with an inclusion of 10 ml PPE would be equally patronized as the standard meat products on the market.

Proximate compositions of the sausages

The results on the proximate analysis of the pork sausage product are shown in Table 3. There was a significant difference among the treatments with the exception of the crude protein.

nutritional quality of the pork sausages prepared using PPE in terms of protein content.

In fresh pork, fat contributes to flavour, juiciness, and texture. In addition, changes in fatty acid profile may be responsible for subjective firmness and sensory tenderness differences of pork (Leick, *et al.*, 2010; Teye, *et al.*, 2006). Significant differences were reported among the treatments in terms crude fat with T3 having the highest. The significant difference recorded in the crude fat may be due to the already high percentage of crude lipids (4.98% - 20.36%), present in the prekese as reported by Okwu (2003).

pH is a measure of the acidity or alkalinity of water containing substances. MAFRA (2011), reported that high pH in meat products causes’ shorter shelf life. Low pH on the other hand, deters microbial activities and therefore enhances storability. The data recorded a non-significant difference in T2 and T3 but not in T4. T1 did not differ with T2, T3 and T4. Hamm (1986) suggested that increase in pH

causes the repulsion of protein chains to increase and thereby enabling them to attract water molecules. FAO (1985) indicated that the pH of meat products are important for their storage, the lower the pH, the less favorable condition for microbial growth and therefore storability is enhanced for longer time. It can clearly be seen that T4 (control) has the chance of doing better than the others in terms of storage.

Conclusion

This study indicates that the addition of boiled PPE at 10ml had no significant difference on the sensory characteristics of the products. However, the treatments significantly influenced the nutritional qualities in terms of moisture, crude fat and pH. This shows that, the extract of prekese can be used as a spice at a level of 10 ml without altering consumer demand for such products.

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