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Effect of Prekese (*Tetrapleura tetraptera*) Seed Powder on the Sensory Characteristics and Nutritional Qualities of Pork Sausage

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ABSTRACT

This study was carried out to determine the effect of Prekese (*Tetrapleura tetraptera*) Seed Powder (PSP) on the sensory characteristics and nutritional qualities of smoke pork sausage. A total of 4 kg of minced pork was used. The pork was divided into four equal parts (1 kg per treatment). Each treatment contain the following: (T1) Control (without PSP), (T2) with 3 g of PSP, (T3) with 4 g of PSP and (T4) with 5 g of PSP. The sausages were stuffed into casing and vacuum sealed in transparent polythene bags and refrigerated at 2°C for laboratory and sensory analysis. The sensory analysis was conducted to determine the effect of Prekese seed powder on the sensory characteristics of the product. Crude fat, crude protein, moisture content and pH were determined to find out the effect of the seed powder on the nutritional qualities of the products. The results showed that, the inclusion of up to 5 g of PSP has no significant effects on taste, colour, prekese flavour, aroma and overall-liking. There were no significant differences ($p>0.05$) in the crude fat of the products but there were significant differences ($p<0.05$) in terms of moisture, crude protein and pH. Crude protein of T1, T3 and T4 were significantly higher ($p<0.05$) than T2. The moisture content of T2 product was the highest followed by T4, T1 and T3. pH of the products T1, T2 and T3 were significantly higher ($p<0.05$) than T4.

Key words: Nutritional qualities, pork sausage, Prekese, sensory characteristics

INTRODUCTION

Meat is a vital source of essential amino acids and also contains vitamins such as vitamin B for human health (Warriss, 2000). Meat protein is closely related to that of human protein. Meat can be processed into a variety of products. Processed meats are described as products in which the properties of the fresh meat have been modified by the use of procedures such as mixing, grinding or chopping, salting and curing, addition of seasonings and other materials and in many instances heat treatment. Processed meat products include; sausages, burgers, meatballs, grilled meat etc. (Al-Bahouh *et al.*, 2012; Mohammed *et al.*, 2013; Adzitey *et al.*, 2014; Bulambaeva *et al.*, 2014; Ismail *et al.*, 2014; Haslia *et al.*, 2015a, b; Muktar *et al.*, 2015). 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 (Heinz, 2007). Meat processing in Ghana can provide livestock farmers with a ready market thereby providing the necessary encouragement for improved and increased production.

Some indigenous plants, such as Prekese (*Tetrapleura tetraptera*), 'Dawadawa' (*Parkia biglobosa*), 'Akokobesa' (*Ocimum basilicum*), 'Hwentea' (*Xylopia aethiopica*), whose parts

are used as spices in the preparation of local dishes can be used to replace imported spices for seasoning meat products (Akin-Idowu *et al.*, 2011; Adu-Adjei *et al.*, 2014; Teye *et al.*, 2014, 2015; Amanfo *et al.*, 2015). In West Africa, the plant *Tetrapleura tetraptera* (locally known as Prekese) is used as a spice, a medicine and as a dietary supplement rich in vitamins (Cangao, 2011; Abugri and Pritchett, 2013). The fruit shell, fruit pulp and the seed of *Tetrapleura tetraptera* (Prekese) contain varying amounts of nutrients, such as protein, lipids and minerals, which are comparable with some popular spices, such as red pepper, onion, curry and ginger, so it use as spice to replace imported spices in meat products may not affect consumer acceptance (Akin-Idowu *et al.*, 2011; Abugri and Pritchett, 2013).

Lartey (2012) reported that the use of Prekese pod powder as a spice in sausage and burger showed a promising result in the sensory characteristics and nutritional qualities of the products. There were increases in the protein and fat content of the product (sausage) but the colour of the product became darker as inclusion levels of the Prekese pod powder increased in the sausages (Lartey, 2012). This work aimed at determining the effect of Prekese seed powder on the sensory characteristics and nutritional quality of pork sausage.

MATERIALS AND METHODS

Study area: The study was conducted at the Meat Processing Unit of the University for Development Studies (UDS), Nyankpala Campus. Chemical analysis of meat products were conducted at the Spanish laboratory of UDS, Nyankpala.

Sausage preparation: The meats were thawed overnight at a temperature of 1°C, cut into smaller sizes and minced using a 5 mm sieve table top mincer (Talleras Rammon, Spain). The inclusion level of the test spice, Prekese Seed Powder (PSP) in grams per 1 kg meat, was as follows:

- Treatment one (T1-control): 1 kg of meat and 0 g of PSP
- Treatment two (T2): 1 kg of meat and 3 g of PSP
- Treatment three (T3): 1 kg of meat and 4 g of PSP
- Treatment four (T4): 1 kg of meat and 5 g of PSP

Four kilogram of meat was divided into four batches of 1 kg each and placed in separate plastic containers. The containers were labeled, treatment 1-4. Each treatment contained pork (1 kg), curing salt (20 g), black chilli (2 g), red chilli (2 g), white chilli (2 g), garlic (2 g), Adobo (4 g) plus Prekese or no Prekese thoroughly minced together. They were immediately stuffed into natural casings, using a hydraulic stuffer (Talleres Rammon, Spain) and manually linked into sizes of about 10 cm long. The sausages were hanged on labelled smoking racks and smoked for an hour after which they were allowed to cool under room temperature. The products were bagged in transparent polythene bags and sealed using an electronic vacuum sealer (Busch, RAMON, Spain), labelled and stored in a freezer for sensory and chemical analysis.

Sausages preparation for sensory evaluation: The products were removed from the refrigerator and allowed to thaw for an hour under room temperature. The products were then grilled in an electric oven (Turbofan, Blue seal, UK) at 105°C for 30 min and then sliced into uniform sizes of about 2 cm in length. They were wrapped with coded aluminium foils to keep them warm and also to maintain the flavour. A total of fifteen (15) panelists were selected and trained

according to the British Standard Institution (BSI., 1993) guidelines for panel selection and training, to form the sensory panel for evaluation of the products.

Sensory analysis of the sausages: Sensory evaluation of the products was carried out using a five-point category scale based on the following parameters:

- Taste: (1) Very pleasant, (2) Pleasant, (3) Intermediate, (4) Bitter and (5) Very Bitter
- Colour: (1)Very pale red, (2) Pale red, (3) Intermediate, (4) Dark red and (5) Very dark red
- Prekese flavour: (1) Very strong, (2) Strong, (3) Intermediate, (4) Weak and (5) Very weak
- Aroma: (1) Very pleasant, (2) Pleasant, (3) Intermediate, (4) Offensive and (5) Very offensive
- Overall-liking: (1) Like very much, (2) Like, (3) Intermediate, (4) Dislike and (5) Dislike very much

Laboratory analysis of the products: The sausages were analyzed for moisture, pH, crude protein and crude fat (ether extract) content according to the methods of the International Association of Official Analytical Chemists (AOAC., 1999). The analyses were conducted in duplicates. All reagents were of analytical grade.

Data analyses: The data obtained was analyzed using ANOVA of GenStat statistical package (GenStat Discovery 4th Edition).

RESULTS

Sensory characteristics of the sausage: The sensory characteristics of the pork sausages prepared with and without Prekese are shown in Table 1. From Table 1, there were no significant differences ($p>0.05$) in taste, colour, Prekese flavour, aroma and overall-liking of the sausages. In absolute terms, the taste, flavour, aroma and overall-liking of T1 was preferred to T2, T3 and/or T4 by the panelists.

Proximate composition of the pork sausages: The proximate composition of the pork sausages is presented in Table 2. The result shows that there were significant differences ($p<0.05$) in the moisture, pH and crude protein of the pork sausages but no significance different ($p>0.05$) in the crude fat. The moisture content of T2 was significantly higher ($p<0.05$) than T1, T3 and T4. The pH

Table 1: Sensory characteristics of the pork sausages

Parameters	T1	T2	T3	T4	Sed	p-value
Taste	2.07	2.87	2.67	2.87	0.36	0.094
Colour	1.73	1.73	2.00	2.20	0.34	0.449
Prekese flavour	3.33	3.47	3.33	3.53	0.35	0.922
Aroma	2.27	3.07	2.67	2.80	0.32	0.093
Overall-liking	2.07	2.67	2.73	2.73	0.31	0.099

Sed: Standard error of difference, T: Treatment

Table 2: Proximate composition of the pork sausages

Treatment	T1	T2	T3	T4	Sed	p-value
Moisture	44.50 ^c	54.00 ^a	43.00 ^c	49.00 ^b	2.15	0.022
pH	5.98 ^a	6.01 ^a	6.03 ^a	5.66 ^b	0.04	0.002
Crude fat	21.80	25.30	28.70	20.50	4.75	0.414
Crude protein	12.60 ^a	10.78 ^b	12.53 ^a	12.32 ^a	0.42	0.033

Sed: Standard error of difference, means on the same row with different superscript are significantly different

of T4 was significantly lower ($p < 0.05$) than that of T1, T2 and T3. The crude protein of T1, T3 and T4 were significantly higher ($p < 0.05$) than T4.

DISCUSSION

Sensory characteristics of pork sausages: The taste, colour, Prekese, aroma and overall-liking of the pork sausages prepared with and without prekese were insignificantly different ($p > 0.05$). Colour is the visual appraisal of meat products and it is one of the important criteria to attract consumers (Feiner, 2006). Pre-slaughter and post-slaughter handling of animals and meats also have effect on meat colour (Adzitey, 2011a; Adzitey and Nurul, 2011; Adzitey *et al.*, 2011; Adzitey and Huda, 2012). The blue black colour of the Prekese seed powder did not affect the colour of the pork sausages. The insignificant differences ($p > 0.05$) indicate that the sausages prepared with Prekese Seed Powder (PSP) at the inclusion level of 5 g have similar colour as the control product and could be patronized equally as the control product. Prekese pod and its seed are commonly used as a flavour enhancer of local dishes especially by the 'Akans' in Ghana. It was expected that the taste, flavour and aroma of the products would be altered as a result of the natural flavour and aroma of the Prekese. The study revealed that there were insignificant differences ($p > 0.05$) in the taste, Prekese flavour and aroma of the pork sausages. Perhaps the level of inclusion was not high enough to significantly affect the taste, flavour and aroma. The use of Prekese seed powder in sausages had no significant ($p > 0.05$) effects on the overall-liking of the pork sausages indicating that prekese has prospects as an additive in meat products if the inclusion rates are not increased beyond 5 g kg⁻¹ of meat. Comparable to this work, Boateng (2013) and Adu-Adjei *et al.* (2014) also found insignificant differences in colour, aroma, Prekese flavor and acceptability of pork sausages prepared using boiled or soaked Prekese. However, this study disagrees with that of Lartey (2012), who indicated that there were significant differences ($p < 0.05$) in the colour and Prekese flavour of pork sausages prepared with Prekese Pod Powder (PPP) at the inclusion level of 4 g.

Proximate composition of pork sausages: There were significant differences ($p < 0.05$) in the moisture, pH and crude protein of the pork sausages. The crude fat content of the pork sausages did not differ from each other. Crude protein of T1, T3 and T4 were significantly higher ($p < 0.05$) than T2. The moisture content of T2 product was the highest followed by T4, T1 and T3. The current result disagrees with that of Lartey (2012), who indicated that there were no significant differences ($p > 0.05$) in the moisture content sausage prepared with Prekese Pod Powder (PPP) at the inclusion level of 4 g. It however, agrees with that of Adu-Adjei *et al.* (2014) who recorded significant difference in moisture content of smoked pork sausages prepared using ground Prekese pod soaked in 10 mL water for 24 h to be significantly higher ($p < 0.05$) than the control (no Prekese). The moisture content in meat is a good indicator of its relative components of energy, protein and lipids (Aberoumad and Pourshafi, 2010). There was no significant difference ($p > 0.05$) in the fat content of the pork sausages. Fat contributes to flavour, juiciness and texture. Adu-Adjei *et al.* (2014) and found significant differences in pork sausages prepared using Prekese. There were significant differences ($p < 0.05$) in the crude protein content of the products (Table 2). It can be observed from the results that T1 was significantly higher than T2 but not T3 and T4. Contrarily, Boateng (2013) and Adu-Adjei *et al.* (2014) reported no significant differences in pork sausages prepared using Prekese. The composition of protein in *Tetrapleura tetraptera* ranges from 7.44-17.50%. Protein from meat and meat products are important to humans because they play

a role in the growth and development of our bodies (Warriss, 2000; Adzitey, 2011b). There were significant differences ($p < 0.05$) in the pH of the sausages as shown in Table 2. The pH of the products T1, T2 and T3 were significantly higher ($p < 0.05$) than T4. According to Heinz (2007), a typical pH value for pork and its product ranges from 5.50-6.20. The pH of meat products is important for their storage. The lower the pH, the lesser favourable condition for microbial growth and therefore storability is enhanced for longer time. It can be suggested from the results that T1, T2 and T3 may deteriorate faster than T4 due to their comparatively high pH level, creating a favourable environment for bacterial growth.

CONCLUSION

The inclusion of Prekese seed powder at 5 g kg^{-1} in pork sausages had no adverse effect ($p > 0.05$) on the product acceptability and thus, such products would be acceptable as the products on the market. The study also revealed that, the use of Prekese seed powder had no effect ($p > 0.05$) on the nutritional qualities in terms of crude fat, however, there were effect ($p < 0.05$) on moisture, pH and crude protein although the trends were not consistent. It is recommended that further studies should be conducted on the effect of Prekese seed powder on the sensory characteristics and nutritional qualities of pork products with inclusion level higher than 5 g .

REFERENCES

- AOAC., 1999. Official Method of Analysis. 17th Edn., Association of Analytical Chemists, Washington, DC., USA., pp: 56-132.
- Aberoumad, A. and K. Pourshafi, 2010. Chemical and proximate composition properties of different fish species obtained from Iran. *World J. Fish Mar. Sci.*, 2: 237-239.
- Abugri, D.A. and G. Pritchett, 2013. Determination of chlorophylls, carotenoids and fatty acid profiles of *Tetrapleura tetraptera* seeds and their health implication. *J. Herbs Spices Med. Plants*, 19: 391-400.
- Adu-Adjei, S., F. Adzitey and G.A. Teye, 2014. The effect of prekese (*Tetrapleura tetraptera*) pod extract on the sensory and nutritional qualities of pork sausage. *Global J. Anim. Sci. Res.*, 2: 52-57.
- Adzitey, F., 2011a. MiniReview: Effect of pre-slaughter animal handling on carcass and meat quality. *Int. Food Res. J.*, 18: 485-491.
- Adzitey, F., 2011b. Production potentials and the physicochemical composition of selected duck strains: A mini review. *Online J. Anim. Feed Res.*, 2: 89-94.
- Adzitey, F. and H. Nurul, 2011. Pale Soft Exudative (PSE) and Dark Firm Dry (DFD) meats: Causes and measures to reduce these incidences-a mini review. *Int. Food Res. J.*, 18: 11-20.
- Adzitey, F., G.A. Teye and M.M. Dinko, 2011. Pre and post-slaughter animal handling by butchers in the bawku municipality of the upper east region of Ghana. *Livestock Res. Rural Dev.*, Vol. 23.
- Adzitey, F. and N. Huda, 2012. Effects of post-slaughter carcass handling on meat quality. *Pak. Vet. J.*, 32: 161-164.
- Adzitey, F., G.A. Teye and F.E. Boateng, 2014. Whole egg of chicken as a binder in beef burger. *Ghana J. Sci. Technol. Dev.*, 1: 1-9.
- Akin-Idowu, P.E., D.O. Ibitoye, O.T. Ademoyegun and O.T. Adeniyi, 2011. Chemical composition of the dry fruit of *Tetrapleura tetraptera* and its potential impact on human health. *J. Herbs Spices Med. Plants*, 17: 52-61.

- Al-Bahouh, M.E., S.F. Al-Zenki, H. Alomirah, B. Al-Failee, T. Al-Mutairi and A.R. Khan, 2012. Conformity of Labeling into Real Composition of Local and Imported Chicken Burgers Sold in the State of Kuwait Int. J. Poult. Sci., 11: 529-535.
- Amanfo, D.O., F. Adzitey and G.A. Teye, 2015. The effect of prekese (*Tetrapleura tetraptera*) pod extract processed at different time intervals on the sensory qualities of pork sausage. Ghana J. Sci. Technol. Dev., 2: 54-58.
- BSI., 1993. Assessors for sensory analysis. Guide to Selection, Training and Monitoring of Selected Assessors, BS 17667, British Standard Institute, London, UK.
- Boateng, B., 2013. Sensory characteristics and nutritional qualities of pork sausage treated with boiled prekese (*Tetrapleura tetraptera*) pod extract. B.Sc. Thesis, University for Development Studies, Tamale.
- Bulambaeva, A.A., D.B. Vlahova-Vangelova, S.G. Dragoev, D.K. Balev and Y.M. Uzakov, 2014. Development of new functional cooked sausages by addition of goji berry and pumpkin powder. Am. J. Food Technol., 9: 180-189.
- Cangao, C., 2011. African indigenous fruits with potential health benefits. <http://www.itfnet.org/v1/2011/12/african-indigenous-fruits-with-potential-health-benefits/>.
- Feiner, G., 2006. Meat Products Handbook: Practical Science and Technology. CRC Press, Boca Raton, FL., ISBN-13: 9781845690502, Pages: 648.
- Haslia, F., F. Adzitey, N. Huda and G.R.R. Ali, 2015a. Effect of steaming and storage time on the microbial quality of duck and quail sausages. Global Anim. Sci. J., 2: 1209-1214.
- Haslia, F., F. Adzitey, N. Huda and G.R.R. Ali, 2015b. Effect of temperature on the growth and survival of pathogens in duck and quail meatballs. J. Life Sci. Biomed., 5: 48-52.
- Heinz, G., 2007. Meat Processing Technology for Small- to Medium-Scale Producers. Food and Agriculture Organizations, Rome, Italy, ISBN-13: 9789747946994, Pages: 455.
- Ismail, I., N. Huda and F. Ariffin, 2014. Quality characteristics of spent duck sausages containing surimi like material substitution during refrigerated storage. Int. J. Poult. Sci., 13: 228-239.
- Lartey, G.S., 2012. Effect of prekese pod powder on the sensory characteristics and nutritional qualities of pork products. B.Sc. Thesis, University for Development Studies, Tamale, Ghana.
- Mohammed, R.A., M.A. Sulieman and E.A. Elgasim, 2013. Effect of bee honey in safety and storability of beef sausage. Pak. J. Nutr., 12: 560-566.
- Muktar, A., F. Adzitey, G.A. Teye, M. Alhassan and H.K. Dei, 2015. Effects of *Albizia julibrissin* leaf meal-based diet on carcass and sensory characteristics of broiler chickens. Global J. Anim. Sci. Res., 3: 388-392.
- Teye, G.A., J. Bawah, F. Adzitey and N.N. Lartey, 2014. Effect of sweet basil (*Ocimum basilicum*) leaf extract as a spice in hamburger. Global J. Anim. Sci. Res., 2: 92-96.
- Teye, G.A., F. Adzitey, J. Bawah and F. Takyi, 2015. Dawadawa (*Parkia biglobosa*) pulp as an extender in beef sausage. UDS Int. J. Dev., 1: 30-35.
- Warriss, P.D., 2000. Meat Science-An Introductory Text. CAB International, Wallingford, England, pp: 297.