NSAP 47th Annual Conference (JOS 2022) CONFERENCE PROCEEDINGS
THEME: SECURING ANIMAL AGRICULTURE AMIDST GLOBAL CHALLENGES

SENSORY QUALITY AND CONSUMER ACCEPTABILITY OF BEEF SAUSAGE FORTIFIED WITH EDIBLE MEAT WASTE AS FAT REPLACER

Alao, B. O and Falowo A. B*
Department of Livestock and Pasture Science, University of Fort Hare, Alice, South Africa
*Department of Animal Science, Adekunle Ajasin University, Akungba Akoko falowoba@gmail.com

ABSTRACT

This study assessed the sensory quality of sausage fortified with edible meat waste as fat replacer. Lean beef and edible meat waste samples were obtained from commercial abattoir and combined in ratio 50:50 and 30:70 and designated as T1 and T2 respectively, while the control contained 90% lean meat and 10% fat as CT. The fresh T1, T2 and CT sausages were thermal processed using microwave (MW) and oven-grilling (OV) cooking methods. A total of 60 untrained panellists evaluated the sausages on a 9-point hedonic scale (with 1 being "disliked extremely" and 9 being "liked extremely) on six sensory parameters (appearance, flavour, taste, texture, juiciness and overall acceptability). Data generated were analysed using descriptive statistics of SPSS version 20. The results showed that beef sausage fortified with edible meat wastes were all acceptable to the consumers, irrespective of the cooking methods used. After however, the distribution of consumers who liked the appearance, colour, texture and flavour of the sausage meat containing edible meat waster was higher than those who dislike the products. With regards to all the attributes, the sensory evaluation showed that microwaved sausages formulated with 50% beef and 50% edible meat wastes were most acceptable compared to others. This indicates that edible meat wastes can be successfully used in the meat industry to replace fat in sausage production

Keywords: Sausage, edible meat waste, attributes, acceptability, fat replacer, sensory

INTRODUCTION

Edible by- products possess the inherent capability to be used on a large scale in the meat processing industry for value-addition without any threat to consumers' acceptability (Alao *et al.,* 2017). An example is the recovery of edible meat waste for sausage production. The processing of sausage involves the addition of different food components that could enhance digestibility and human well-being. The addition of these components also provides functional properties that improve the structure, nutritional and health qualities of the finished products (Fernández- Ginés *et al.,* 2005). In the processing of edible animal products, any edible parts can be used and blended with lean meat to make good sausages. The blending of lean meat with offals (liver, kidney, heart) and other meat products (edible meat waste) can also provide a cheaper animal protein with a better flavour. In this regard, the act of using edible meat by products in meat processing has been very effective in producing a sustainable meat production system (Jayathilakan *et al.,* 2012; Lobato *et al.,* 2014). However, the amount of the edible meat by-products that have been utilized is to a greater degree smaller as compared to the amount produced at the abattoir. After production, different culinary methods such as grilling, microwave cooking, oven grilling, and frying have been employed for cooking sausages (Singh *et al.,* 2015; Adam and Abugroun. 2015). The type of cooking methods used usually contribute to the adhesion properties, tenderness and sensory properties of the sausage batter (Obuz *et al.,* 2003). Although the consumers' decision and overall judgement are influenced by the tenderness of meat and other factors such as flavour, juiciness, appearance, price, colour and food safety (Troy and Kerry. 2010). Therefore, the objective of this study was to determine the acceptability of edible meat wastes as replacements for fat in sausages.

MATERIALS AND METHODS

The study was carried out in the Meat Science laboratory, Department of Livestock and Pasture Science, University of Fort Hare, South Africa. The lean beef meat and edible meat waste (EMW) were collected separately from slaughtered cattle at the abattoir to produce a novel beef sausage. In the production of

sausage, the lean beef and edible meat waste samples were combined in ratio 50:50 and 30:70and designated as T1 and T2 respectively, while the control contained 90% lean meat and 10% fat as Treatment 3 (CT). Fresh sausages were thermal processed using microwave and oven-grilling cooking methods. In microwave method, fresh sausage samples (T1-MW, T2-MW and CT-MW) were cooked at 80^{o}C for 4min. During oven-grilling (T1-OV, T2-OV and CT-OV), doneness was determined by inserting a probe thermometer (Thermo-pro TP-food thermometer) into the geometrical centre of the sausage to measure its internal temperature. The samples were considered done when the digital thermometer gave an alarm and flashed green light. For sensory evaluation, a total of 60 untrained panellists (staff and students) were recruited and asked to rate their attributes on a 9-point hedonic scale, with 1 being "disliked extremely" and 9 being "liked extremely" in the middle "neither like nor dislike". The six most widely used sausage sensory characteristics were selected and panellists were asked to score each sample for overall likeness as well as the acceptability of appearance, flavour, taste, texture, and juiciness using a 9 hedonic scale. Data generated were entered in Microsoft excel program and were summarized as frequencies of respondent profiles on consumers acceptability. Descriptive statistics were used to determine the relationship between sausage attributes and the response of the respondents using SPSS version 20 for the analysis.

RESULTS AND DISCUSSION

Sausage meat is one of the most widely utilized meat products among all processed meats because they can easily be produced from different meat types and varieties of meat products including edible meat waste and edible offal. Figures 1-6 shows the results obtained from the sensory analysis and indicates the differences between the appearance, colour, texture, flavour, and overall acceptance attributes of the sausage meats containing edible meat waste and control treatment. The results revealed that sausages containing edible meat waste were all acceptable to the consumers, irrespective of the cooking methods used, when compared to control treatment. This result is in accordance with the findings of Magoro et al (2020) who reported no significant difference in sensory quality of sausage meat formulated with edible offal compared to control group. However, the distribution of those who liked the appearance, colour, texture and flavour of the sausage meat were higher than those who dislike the products. This indicates that edible meat wastes can be successfully used in meat industry to replace fat in sausage production. Also, report has shown that edible meat waste consists of carbohydrates, proteins and fat based constituents that are needed for fat substitutes in sausage production (Weiss 2010, Alao, 2019). Furthermore, the percentage of consumers who liked T1-MW (84.7%) was higher than those of T2-MW (65.5%) but comparable to those on T1-MW (83.1)(Table 1). The decrease in acceptability of T2-MW may be as a result of excess fat which may affect the sensory attributes and thus, reduce the acceptability of the sausage (Alao et al., 2021). Similarly, the percentage of consumers that liked T1-OV (56.1%) was the same as that of T2-OV (56.9) (Table1) but lowered than those of CT-OV. This suggests the consumers preferred microwaved meat sausage more than oven-grilled sausages.

CONCLUSION

Findings from this study have shown that the replacements of fat with edible meat waste in sausage production has overall acceptance in most of the attributes scored (colour, appearance, taste, texture and flavour) and these were above the desirable average. Thus, the utilization of edible meat waste in the production of sausages has the potential to increase profitability in the meat industry and minimise meat waste in the industry

. **Table 1:** Percentage of panellists that liked cooked beef sausage

Cooking method (C)	Treatments (T)	%
	CT-MW 90/10	83.1
Microwave	T1-MW 50/50	84.7
	T2-MW 30/70	65.5
	CT-OV 90/10	73.6
Oven-grilling	T1-OV 50/50	56.1
	T2-OV 30/70	56.9

CT 90/10 (Control, 90% lean beef +10%Fat), T1 50/50 (50% lean beef+50% edible meat waste), T2 30/70 (30% lean beef+70% edible meat waste)

References

Adam, Y.S.I. and Abugroun, H.A., 2015. Evaluation of Traditional Cooking Methods on Eating Meat Characteristics and Chemical composition. *J. Agri. Vet. Sci*, 8: 12-17.

Alao, B.O., Falowo, A.B. and Aladejana, E. B. 2021. Effect of Cooking Oil on the Fatty Acid Profile of Beef Sausage Fortified with Edible Deboned Meat Waste. International Journal of Food Science, 2021:8, Article ID 5592554

Alao, B.O. 2019. Nutritional quality of sausage made with edible meat waste and the perception of consumers on offal product in eastern cape province, south Africa. Ph.D Thesis

Alao, B.O., Falowo, A.B., Chulayo, A. and Muchenje, V., 2017. The Potential of Animal By-Products in Food Systems: Production, Prospects and Challenges. *Sustainability*, **9:** 1089

Fernández- Ginés, J.M., Fernández- López, J., Sayas- Barberá, E. and Pérez- Alvarez, J., 2005. Meat products as functional foods: A review. *Journal of food science*, 70.

Jayathilakan, K., Sultana, K., Radhakrishna, K. and Bawa, A.S., 2012. Utilization of by-products and waste materials from meat, poultry and fish processing industries: a review. *Journal of food science and technology*, 49**:** 278-293.

.**Lobato, J.F.P., Freitas, A., Devincenzi, T., Cardoso, L.L., Tarouco, J.U., Vieira, R.M., Dillenburg, D.R. and Castro, I., 2014.** Brazilian beef produced on pastures: sustainable and healthy. *Meat science*, 98: 336-345.

Maurice G. O'Sullivan., 2017. NutritionallLPy Optimised Low Fat Foods. In Handbook for Sensory and Consumer-Driven New Product Development. https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/fat-substitute

Magoro, M. M., Zondagh, B. I., Jooste, P. J. and Morey L. 2012. Sensory analysis of cooked fresh meat Sausages containing beef offal. Journal of Family Ecology and Consumer Sciences, 40: 201**2**

Obuz, E., Dikeman, M.E. and Loughin, T.M., 2003. Effects of cooking method, reheating, holding time, and holding temperature on beef longissimus lumborum and biceps femoris tenderness☆. *Meat science*, 65: 841-851.

Singh, T., Chatli, M.K., Kumar, P., Mehta, N. and Malav, O.P., 2015. Effect of different cooking methods on the quality attributes of chicken meat cutlets. *Journal of Animal Research*, 5: 547.

Troy, D.J. and Kerry, J.P., 2010. Consumer perception and the role of science in the meat industry. *Meat science*, 86: 214-226.

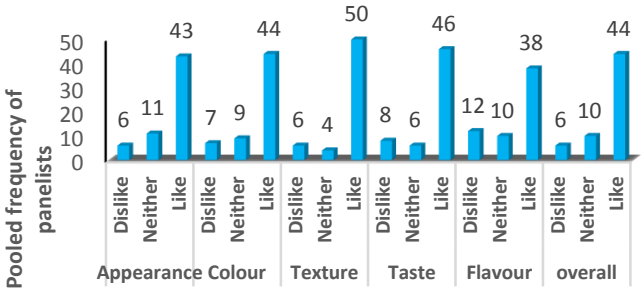


Fig. 1: Distribution of panellists who liked 10% fat CT-MW sausage

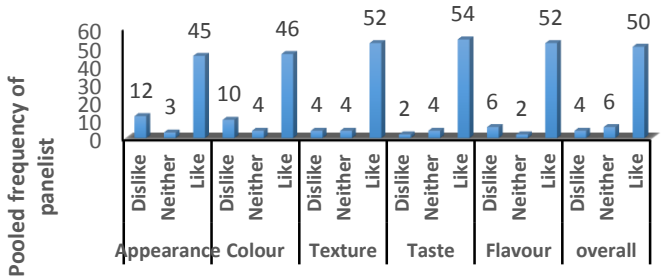
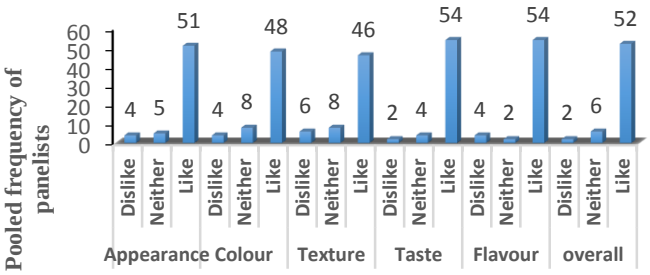


Fig 4: Distribution of panellists



who liked 10% fat CT-OV sausage

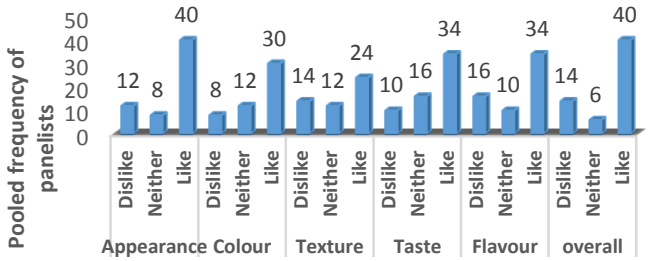


Fig. 2: Distribution of panellists who liked 50% T1-MW sausage

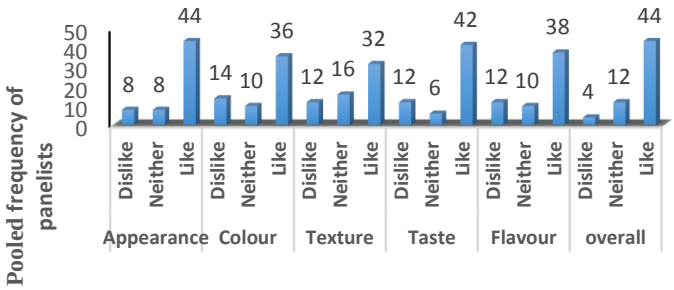


Fig. 5: Distribution of panellists who liked 50% T1-OV sausage

Fig. 3: Distribution of panellist who liked 70% T2-MW sausage

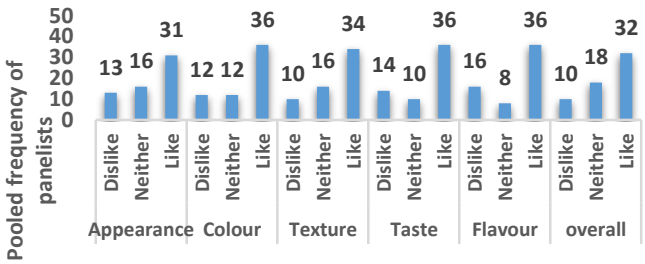


Fig. 6: Distribution of panellists who liked 70% T2-OV sausage

10% fat CT (90% lean beef +10%Fat), 50% T1 (50% lean beef+50% edible meat waste), 70% T2 (30% lean beef+70% edible meat waste), MW: Microwave, OV: Oven grilled