EVALUATION OF ORGANOLEPTIC PROPERTIES OF PROCESSED GREEN OFFAL FROM DIFFERENT RED MEAT ANIMALS

[1]*Amos, M., [2]Zahraddeen, D.T., [2]Abdu, S.B. and [1]Mailili, T.Y.
[1]Federal College of Agriculture, Ishaku, Ebonyi State
[2]Department of Animal Science, Ahmadu Bello University, Zaria
*Corresponding author: gwaryshaels@gmail.com; +234 806 441 7578

ABSTRACT
Animal protein consumption has increased globally, leading to a higher production of edible meat co-products. This study evaluates the organoleptic properties of processed green offal from cattle, sheep, goat, and camel. Green offal samples were sourced from Zango Abattoir, Zaria, and processed by boiling before sensory evaluation by 30 semi-trained panelists using a 5-point Hedonic scale. Key attributes assessed included colour, texture, aroma, juiciness, tenderness, and overall acceptability. Data were analyzed using the general linear model procedures of statistical Analysis Software while significantly different means were separated using Duncan's Multiple Range Test. Results indicated significant differences ($P<0.05$) in colour, texture, aroma, juiciness, and acceptability among species, while tenderness remained non-significant ($P>0.05$). Goat offal exhibited the highest scores in aroma (4.01), texture (3.87), and juiciness (3.72), contributing to its overall highest acceptability (3.97). Cattle and camel offal scored higher in colour and general acceptability, whereas sheep offal was least preferred. It was therefore concluded that green offal from goat was preferred while camel and cattle were the less preferred and sheep offal was the least.
Keywords: Green offal, sensory evaluation, organoleptic properties, consumer preference, meat by-products

DESCRIPTION OF PROBLEM

Animal protein consumption increased worldwide from approximately 61 g per person per day in 1961, to 80 g per person per day in 2011. The predicted increased meat production will bring a concomitant increase in the amounts of generated edible meat co-products or offal which are also underused as protein sources for human consumption, even though they are also excellent sources of minerals and vitamins (Latoch *et al*., 2024). Green offal, encompassing the stomach and intestines of red meat animals, is a significant component of traditional diets in various cultures.

The consumption of green offal is prevalent in many regions; however, variability in its organoleptic properties often leads to inconsistent consumer experiences. This inconsistency can be attributed to differences in animal species, processing methods, and the intrinsic chemical composition of the offal. Currently, there is limited empirical data comparing the sensory attributes of processed green offal across different red meat animals. This gap in knowledge hinders the development of standardized processing protocols aimed at enhancing the quality and consumer acceptance of offal products (Ali *et al*., 2024).

Edible offal is a valuable source of nutrients, often surpassing skeletal muscle in nutrient concentration (Florek *et al*., 2023). By improving the organoleptic properties of green offal, its consumption can be promoted, contributing to better nutrition and offering economic benefits to meat processors and retailers. Understanding the factors that influence the sensory attributes of green offal will enable the development of processing methods that consistently meet consumer preferences, thereby increasing satisfaction and demand. Enhancing the appeal of green offal can lead to increased utilization of these by-products, contributing to waste reduction in the meat industry and promoting sustainable practices (Daszkiewicz *et al*., 2020). This study aims to evaluate the organoleptic properties of processed green offal from different red meat animals.

MATERIAL AND METHODS

Experimental site

The study was conducted at the Animal Products and Processing Laboratory of the Department of Animal Science, Ahmadu Bello University, Zaria, Kaduna State. Zaria is located in the Northern Guinea Savannah zone, located on longitude 11˚09' 01.78'' N and 7˚39'14.79'' E at an altitude of 671m above sea level (Ovimap, 2024). The climate is characterized by well-defined dry and wet seasons.

Source, processing and evaluation of green offal

Samples (I kg each) of green offal (stomach and intestine) from cattle, sheep and goat were obtained from Zango Abattoir, Zaria. The collected samples were transported to the Animal Products and Processing Laboratory, Department of Animal Science, Ahmadu Bello University, Zaria for processing. The offal parts were trimmed,

rinsed and washed thoroughly with clean water. The stomach and intestine were separated, cut into pieces, thoroughly rinsed and cooked by boiling.

The sensory attributes of processed green offal from cattle, sheep, goat and camel was assessed for colour, aroma, juiciness, tenderness and general acceptability using a structured questionnaire on a 5-point Hedonic scale; 5-like extremely, 4-like moderately, 3-neither like nor dislike, 2-dislike moderately, 1-dislike extremely; which involve a total of 30 semi-trained panelists from the Faculty of Agriculture, Ahmadu Bello University, Zaria. All needed accessories were provided to the panelists such as clean water, toothpicks, detergent, biscuit and serviette before the evaluation. Each sample was blind coded to reduce bias.

Data analysis

All data obtained from the study were statistically analysed using the General Linear Model Procedure of Statistical Analysis Systems software package (SAS, 2002) while significant differences between treatment means will be separated using Duncan Multiple Range Test (DMRT).

RESULTS AND DISCUSSION

Table 1 shows the organoleptic properties (colour, texture, aroma, tenderness, juiciness, and acceptability) of processed green offal from camel, cattle, goat, and sheep. The results showed that there were significant ($P<0.05$) differences in colour, texture, aroma, juiciness and overall acceptability while no significant ($P>0.05$) difference was observed for tenderness. Cattle offal had the highest colour score (3.97), followed by camel (3.93), while goat (3.75) and sheep (3.69) had significantly lower scores. This suggests that cattle and camel offal had a more visually appealing appearance, which is a crucial factor influencing consumer preference (Ali *et al*., 2024). The differences in colour could be attributed to variations in pigmentation, fat content, and processing techniques (Daszkiewicz *et al*., 2020).

Goat (3.87) and sheep (3.81) offal were rated significantly better in texture compared to camel (3.60) and cattle (3.63). The superior texture in goat and sheep offal may be due to their lower connective tissue content and finer muscle fibres, making them more tender and palatable (Florek *et al*., 2023). Texture is a critical parameter in consumer acceptance, as tougher offal is less preferred in culinary applications (Adeyemi and Sazili, 2019). Goat offal (4.01) had the highest aroma score, significantly differing from cattle (3.73) and camel (3.65), while sheep (3.87) was intermediate. The stronger aroma in goat offal may be attributed to higher lipid oxidation levels or the presence of characteristic fatty acids influencing its odour profile (Olusanya *et al*., 2022).

Goat offal (3.72) was rated the highest in juiciness, while sheep (3.56), camel (3.57), and cattle (3.59) had lower ratings. Juiciness is often linked to fat and water retention capacity, suggesting that goat offal may have a more favourable composition for moisture retention during cooking (Kim *et al*., 2021). The overall acceptability of processed green offal differed significantly ($P<0.05$), with goat offal (3.97) being the most preferred, followed by cattle (3.87) and camel (3.83b), while sheep (3.70) offal had lower acceptability. The higher acceptability of goat offal is likely due to its favourable aroma, texture, and juiciness, making it more appealing to consumers (Muhammed *et al*., 2023). Sheep offal had the lowest score, possibly due to its less desirable texture and aroma profile.

Table 1: Organoleptic properties of processed green offal from different red meat animals

Animal species	Colour	Texture	Aroma	Tenderness	Juiciness	Acceptability
Camel	3.93^{a}	3.60^{b}	3.65^{c}	3.68	3.57^{b}	3.83^{b}
Cattle	3.97^{a}	3.63^{b}	3.73^{c}	3.65	3.59^{b}	3.87^{b}
Goat	3.75^{b}	3.87^{a}	4.01^{a}	3.60	3.72^{a}	3.97^{a}
Sheep	3.69^{b}	3.81^{a}	3.87^{b}	3.61	3.56^{b}	3.70^{c}
SEM	0.22	0.08	0.06	0.10	0.06	0.04

^{abc}Means with different superscripts along the same column are significantly ($P<0.05$) different, SEM: standard error of means, *: Significant, NS: Not significant.

CONCLUSION AND APPLICATION

The findings revealed that goat offal exhibits the best sensory attributes overall, particularly in terms of aroma, texture, juiciness, and acceptability. Cattle and camel offal also performed well in terms of colour and overall acceptability, whereas sheep offal ranked the lowest in most parameters. Targeted processing techniques was therefore suggested to enhance the eating quality of the green offal and the less favourable attributes of sheep green offal.

REFERENCES

Adeyemi, K. D., and Sazili, A. Q. (2019). Efficacy of processing methods in improving meat quality traits. *Food Science and Nutrition*, 7(6), 2561-2576.

Adeyemo, O. A., Oguntona, T., and Ajiboye, B. (2021). Influence of processing techniques on the sensory attributes of edible offal. *African Journal of Food Science*, 15(3), 67-74.

Ali, A., Hussain, M. A., and Shah, Q. A. (2024). Evaluation of Physico-Chemical Characteristics of Meat and Edible Offals of Cattle. *Pak Euro Journal of Medical and Life Sciences*, 4(4), 177-183.

Daszkiewicz, T., Kubiak, D., and Janiszewski, P. (2020). Analysis of Technological and Consumption Quality of Offal from Pulawska and Zlotnicka White Pigs. *Animals*, 10(6), 964.

Florek, M., Litwińczuk, Z., Skałecki, P., Kędzior, W., and Grodzicki, T. (2023). Edible Offal as a Valuable Source of Nutrients in the Diet—A Review. *Nutrients*, 16(11), 1609.

Kim, H. J., Park, S. J., and Kim, S. H. (2021). Effect of moisture retention on meat juiciness and consumer acceptance. *Journal of Meat Science and Technology*, 12(3), 89-102.

Latoch, A., Stasiak, D. M., & Siczek, P. (2024). Edible Offal as a Valuable Source of Nutrients in the Diet—A Review. *Nutrients*, *16*(11), 1609. https://doi.org/10.3390/nu16111609.

Muhammed, A. M., Yusuf, T. A., and Bello, R. O. (2023). Organoleptic properties and consumer preferences for offal-based meat products. *Journal of Food Quality and Preferences*, 25(1), 45-59.

Olusanya, B. O., Adejumo, A. A., and Ogundele, F. A. (2022). Fatty acid profile and oxidative stability of offal from different livestock species. *Meat Science Research Journal*, 14(2), 102-114.

Ovimap (2024). Ovimap location: ovi earth imagery date 23th January, 2024.

Statistical Analysis System. (2002). SAS Institute Inc. SAS/STATTM Users Guide, Release 6.0 Ed, Cary, NC, SAS Institute Inc.