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AT THE HEART OF NOSE-TO-TAIL EATING - EXPLORING THE SENSORY CHARACTERISTICS OF OFFAL

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I. INTRODUCTION

Offal consumption in Sweden has declined over the past four decades. In 1980 the average intake was 2.6 kg per person, compared to 1.3 kg per person in 2024 [1]. This trend is unfortunate since offal could provide an affordable, value-added product improving resource effectiveness by increasing the sustainable use of animal proteins. Historically, nose-to-tail eating was a part of Swedish food culture but has largely disappeared from households and today only one fifth off the edible offal is consumed domestically [2]. Offal represents rather distinct culinary characteristics, appreciated by many consumers but perceived as repellent by others [3]. Domestic cooking practices like soaking liver in milk have been used to milden the pungent taste. However, the sensory characteristics of offal and the effect of animal age and various pre-treatments has not been extensively described in modern literature. Therefore, the objective was to establish an organoleptic profile and investigate the effects of animal age and various pre-treatments on the sensory characteristics of bovine liver and kidney. Further, the organoleptic profile of bovine heart was compared to beef.

II. MATERIALS AND METHODS

Animals, Slaughter, and Meat Handling

In a parallel study, focusing on finishing-feeding of culled dairy cows, 62 Swedish Holstein dairy cows were slaughtered at a commercial Swedish abattoir. Post-slaughter, the liver, kidneys, and heart, were examined for abnormalities by a veterinarian according to standard practices. For the present study, liver and kidneys were sampled from three older (40 ± 5 months) and three younger (78 ± 7.5 months) cows to assess the effect of age on sensory characteristics, and heart from six randomly selected cows of various ages (61 ± 20.1 months). All samples were frozen at -20°C until analysis. Additionally, one sample of tenderloin (M. *longissimus lumborum, LL*) was randomly taken from one of the six cows. The heart and *LL* were aged for 7 days before freezing.

Liver and Kidneys

After thawing for 24 hours at +4°C, liver and kidney samples underwent one of three treatments: 1) soaked in water for 24 hours, 2) soaked in 0.5% spirit vinegar for 24 hours, or 3) untreated. After treatment, the samples were minced and steam-cooked in a tin lined with plastic foil for 35 minutes at 100°C. To mask any differences in appearance, the samples were fragmented and placed in three-digit coded plastic cups with lids. Prior to sensory analysis, the samples were reheated to 55°C. Descriptive analysis was conducted using a trained panel of nine panellists, with samples served in random order in triplicates. Panellists cleansed their palates with crackers and water. The results were documented using the software EyeQuestion (version 5.12.12).

Heart

One-kilo heart samples were thawed for 48 hours at 4°C, heat-treated in circulating water at 63°C for five hours until an internal temperature of 61.3°C ± 0.4°C was reached, and left to rest for 90 minutes. As a reference, one LL sample was thawed for 24 hours and heat-treated in circulating water to an internal temperature of 62°C. The heart and LL were sliced into 7mm thick pieces using a commercial meat slicer and trimmed into rectangular pieces measuring 20 × 30 × 7 mm. These samples were reheated and served at 55°C in three-digit coded disposable plastic dishes. A sensory analysis using Rate-all-that-apply (RATA) was performed with eight trained panellists, who rated the intensity of attributes on a scale of 0 to 5. The samples were served in random order, in triplicates.

III. RESULTS AND DISCUSSION

The results describe an organoleptic profile for aroma (A), appearance (App), taste (T), flavour (F), and mouthfeel (MF) for the liver, kidney, and heart, thus providing a vocabulary for describing sensory characteristics of offal. Neither the age of the animal nor the pre-treatments affected the intensity of sensory attributes related to aroma, taste, or flavour in the liver and kidney samples. However, the appearance and mouthfeel were, to some extent, influenced by pre-treatments but were generally not affected by the age of the animal (Fig. 1 and 2).

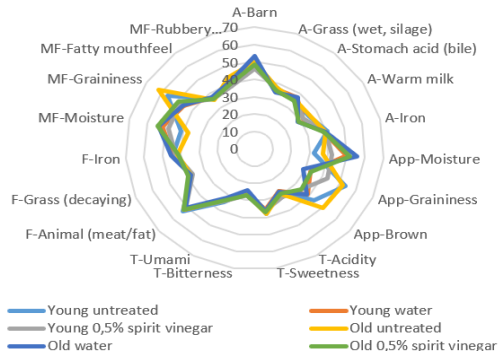


Figure 1. Sensory characteristics of liver from young and old cows treated with spirit vinegar, water or left untreated.

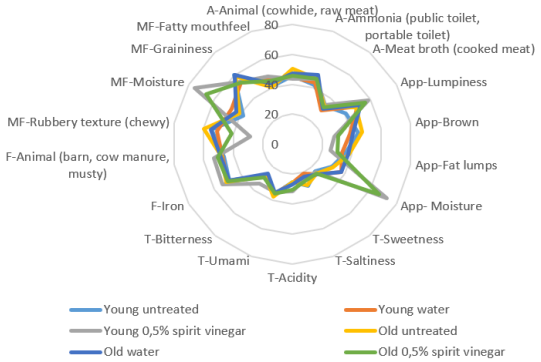


Figure 2. Sensory characteristics of kidney from young and old cows treated with spirit vinegar, water or left untreated.

The RATA analysis revealed the intensity of 25 attributes describing the cooked heart and *LL*. ANOVA revealed that the heart was perceived as having a significantly more intense iron flavour, as well as a more bitter and less acidic taste, compared to *LL*. The heart appeared more pink and brown in colour and exhibited less connective tissue than *LL*. There was a tendency for the heart to be rated as more tender and less crumbly in texture compared to *LL*. Current literature offers limited information regarding the sensory properties of offal in general, and heart in particular. When reported, potential applications and sensory evalations are often in relation to the use of offal in mixted products like patties, sausages or jerkey [3,4].

IV. CONCLUSION

This study established an organoleptic profile and sensory vocabulary for bovine liver, kidney, and heart. Neither animal age nor the applied pre-treatments significantly affected aroma, taste, or flavour of liver and kidney, although appearance and mouthfeel were influenced by soaking in spirit vinegar. Bovine heart differed from beef in terms of iron flavour, bitterness, and acidity, as well as in texture characteristics. These findings contribute to a better understanding of the sensory properties of offal, which may support future product development pointing at the potential of using offal as distinct ingredients in various culinary applications. However, the study was based on a limited number of samples which should be considered when interpreting the results. Further research is warranted to investigate sensory variation across different animal types, processing methods, and the relationship between sensory attributes and consumer acceptance.

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