TEXTURAL PROPERTIES OF BEEF MEATBALLS ENRICHED WITH SUGARCANE FIBRE FOR ELDERLY CONSUMERS

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I. INTRODUCTION

Texture is a determinant trait for a better eating experience of older consumers, i.e, soft, easy and safe to chew/swallow. Moisture retention is important in comminuted meat products for modifying texture [1]. Meat, as a rich source of proteins, may help mitigate age-related sarcopenia (muscle loss), improve bone health and thereby enhance quality of life among elderly people [2]. Sugarcane flour contains 87% dietary fibre (DF). Contributions of DF to improve digestion and overall health are well known. Meat products are low in DF; it is therefore interesting to investigate the possibility of increasing DF content in these products by adding sugarcane fibre while obtaining an acceptable texture. Meatballs enriched with sugarcane flour, various fat levels and different water-binding additives were developed. The aim was to investigate the effect of different formulations and cooking methods on textural characteristics of beef meatballs.

II. MATERIALS AND METHODS

Boneless beef topside, pork back-fat (from female pigs), sodium bicarbonate (SB) and salt were sourced from local markets and shops. Tetrasodium pyrophosphate (TSPP) was from Hela® Spice Australia Pty (132 Woodlands Drive, Braeside, Melbourne VIC 3195, Australia) and sugarcane flour from KFSU Ltd (Ayr, QLD 4807, Australia). Meatballs were prepared by mixing minced beef with 5, 10, 15 or 20% minced fat, 0.2% additive (either SB or TSPP), 0.5% salt (sodium chloride), 3% sugarcane flour, and 10% water. Meatballs with 20% fat were prepared only with SB as additive. Batter was refrigerated at 4°C for 30 min, meatballs were hand-formed (15 ± 2g each), vacuum packed, and frozen at -20°C until further analysis. Meatballs were thawed at 4°C for 12 hours, cooked (either pan-fried or in boiling water, to internal temperature of 75°C), cooled to room temperature and analysed. In order to measure texture contrast, cooked meatballs were cut in half with a sharp knife, and the outer surface was penetrated for crust hardness whereas the inner surface was penetrated for inside hardness. Hardness was measured using a texture analyser (Lloyd Materials Testing, METEK®, LS5) fitted with a 6 mm diameter cylindrical probe set to 20% depth. A load cell of 50 kg and a speed of 200 mm/min with 0.1 s delay descent was used. Total moisture content was determined by weight difference before and after placing in a hot oven at 100 °C until a constant weight was obtained (AOAC 950.46, 2005). Data was statistically analysed by an Unbalanced Analysis of Variance (ANOVA) and Fisher´s LSD using GenStat® (18th Edition, UK).

III. RESULTS AND DISCUSSION

The hardness results for fat*additive*cooking interaction are shown in Fig. 1. Results show that meatballs with 20% fat had lower crust and inside hardness (softer) than meatballs with 5-15% fat (Crust; fat-20%, 4.9N vs fat-5-15%, 6.7N; SED = 1.04, P<0.001) (Inside; 3.8N vs 5.6N respectively; SED = 0.85, P<0.001). Several studies found that low-fat comminuted products tend to be harder than higher-fat ones [3, 4, 5]. Cooking method influenced only crust hardness, i.e., boiled samples were softer than pan-fried (6.4N vs 7.1N respectively; SED = 0.36, P<0.001). When considering at crust vs inside hardness, it is evident that texture contrast was achieved with both cooking methods (Fig. 1). Total moisture content in pan-fried meatballs was lower than boiled (57.1% vs 60.4% respectively; SED = 0.38, P<.001). Lower moisture content was associated with harder texture. As expected, moisture content was lower with increased fat content (63.0% vs 60.0% vs 57.3% vs 57.2% for 5, 10, 15 and 20% fat respectively; SED = 0.47, P<.001).

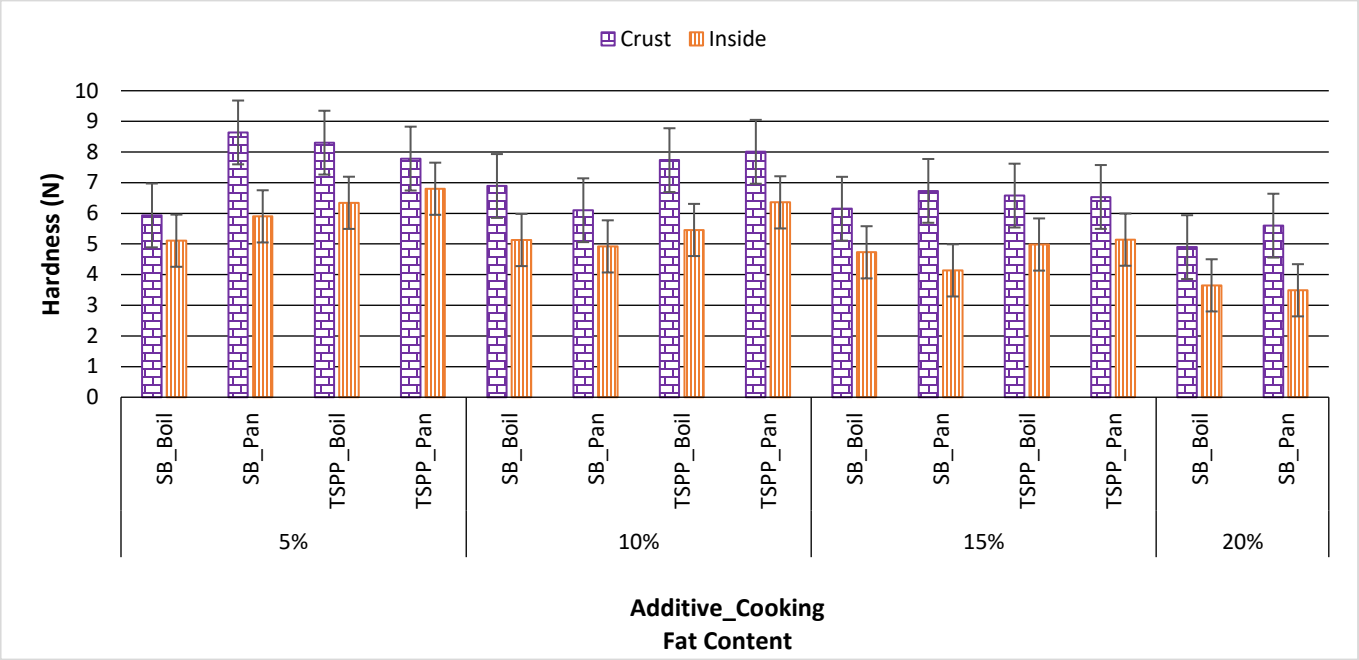

Figure 1. Influence of fat content (Fat; 5, 10, 15, 20%), additive (SB, sodium bicarbonate; TSPP, tetrasodium pyrophosphate) and cooking method (Cook; boiled vs pan-fried to 75°C) on the texture, i.e., hardness of the crust and inside of the meatballs. Values are least squares means ± Standard Error of the Difference.

IV. CONCLUSION

To obtain a soft and moist crust on meatballs, boiling was a better cooking method than pan-frying. Results of this study indicated that texture contrast was achieved with both cooking techniques. Furthermore, a greater contrast, between inside and crust, was observed in pan-fried samples in most cases. In addition, moisture content was shown to be an important trait for texture. Sugarcane flour addition seems to be a good approach to increase fibre content in meatballs. However, sensory research with older adults needs to be conducted to measure sensory textural properties of formulations to determine overall palatability.

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