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Effect of cooking times on fatty acid composition and textural properties of pork backfat (#373)

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Introduction

Adipose tissue, as an important component of meat, can involve in a series of metabolism and provide energy in body, and is a flavor reservoir during cooking process. Many meat products rich in fat are popular in China, such as hongshaorou and traditional Chinese sausage. It can be attributed to that fat could provide unique texture, flavor and taste. Thermal process is an essential method to make fresh meat edible and promotes a series of physical and chemical reactions within fat tissues that can affect eating quality attributes and fatty acid composition. It has been reported that cooking increases percentages of n-6 polyunsaturated fatty acids (PUFA) and monounsaturated fatty acids (MUFA), but decreased the SFA percentage in lamb meat, compared to roasting and grilling. Although studies on processing characteristics of fat in meat have been performed, few have been conducted on the adipose tissue during cooking. This work aimed to evaluate the effect of long-term cooking on the processing characteristics of pork backfat.

Methods

Eight pig carcasses (about 6 months of age, 80 ± 10 kg of carcass weight) were slaughtered and cleaned by a commercial pork-processing company (Sushi, Jiangsu, China). After 24 h postmortem, each chilled backfat samples were removed and cut into strips (5 cm width, 5 cm length and 2 thickness). Then, the strips were placed in 4-L stainless steel pots (ST22J1, Supor, Hubei, China) with purified water (Yibao, Shenzheng, China) in a weight ten times the mass of the backfat, and cooked at 95-99 for 0, 50, 100, 150 or 200 min. Finally, the backfat was removed from the pots after cooking, and cooled down to room temperature for analysis. The fat content of the backfat was determined using the Soxhlet extraction method (AOAC 1990). Fatty acids of backfat were analyzed by gas chromatography after lipid extract and methyl esterification. The relative content of each fatty acid constituent was calculated based on the region normalization. Each strip was cut into the 1.0 cm (height)×2.5 cm (diameter) cylinder for TPA analysis. TPA was carried out with a texture analyzer TA-XT2i (Stable Micro Systems, Godalming, U.K.). Hardness (kg), chewiness, cohesiveness (J) and resilience were calculated from the compression curves provide by the texture analyzer.

Results

The fat contents of porcine back fat obtained at different cooking times are shown in Fig. 1a. The fat content was 58.34 % in raw backfat, which was lower than that of previous reports. The discrepancies maybe attributed to differences in the breeds and pork parts. As cooking time increased, fat content significantly increased to 84.88 %. Cooking destroyed the integrity of fat cells, and resulted in fat melting and migration of other components from backfat into liquid and water phases. Fat content increased when component migration dominated, and vice versa. Fig. 2 shows the change of fatty acid profile of backfat during cooking. Palmitic acid (C16:0), stearic acid (C18:0), oleic acid (C18:1) and linoleic acid (C18:2) were the main fatty acids in porcine backfat, and C18:1 had the greatest content. Meanwhile, UFA was the major component, followed by MUFA and SFA from the angle of saturation level of Fatty acid. The significant changes in SFA and UFA contents haven't been observed even after cooking for 200 min. MUFA content increased significantly during cooking. It could be attributed to high levels of natural antioxidants present in cooked samples such as Maillard reaction products (MRPs). MRPs, especially of melanoidins, have the ability of scavenging hydroxyl radicals, superoxide and hydrogen peroxide as well as metal chelation, resulting in the inhibition of unsaturated fatty acids oxidation. The textural properties of backfat were remarkably affected by the cooking time (Fig. 1b). Hardness, gumminess, resilience and chewiness of cooked porcine backfat decreased with increasing cooking time, but springiness and cohesiveness increased firstly, then decreased significantly. This suggested that the tenderness and elasticity of cooked backfat increased after long-term cooking, which could account for the unique texture of cooked fat that was different from the short-term cooking for porcine backfat. The adipocyte integrity largely depended on the connective tissue and reticular fiber, and long-term cooking could lead to the solubilization of connective tissue and the destruction of adipocytes, which could cause the decrease in hardness, gumminess, resilience and chewiness of cooked backfat. The increase in springiness and cohesiveness at 50 min of cooking could result from the solubilization and gelation of collagen in connective tissue, and then the decreases could contributed to the loss of collagen in backfat.

Conclusion

Prolonged cooking time increased the percentages of fat and MUFA in porcine backfat after cooking, and had tenderizing effects. Long-term cooking may be recommended as an appropriate cooking protocol for the preparation of a tasty and healthier pork product.

Notes

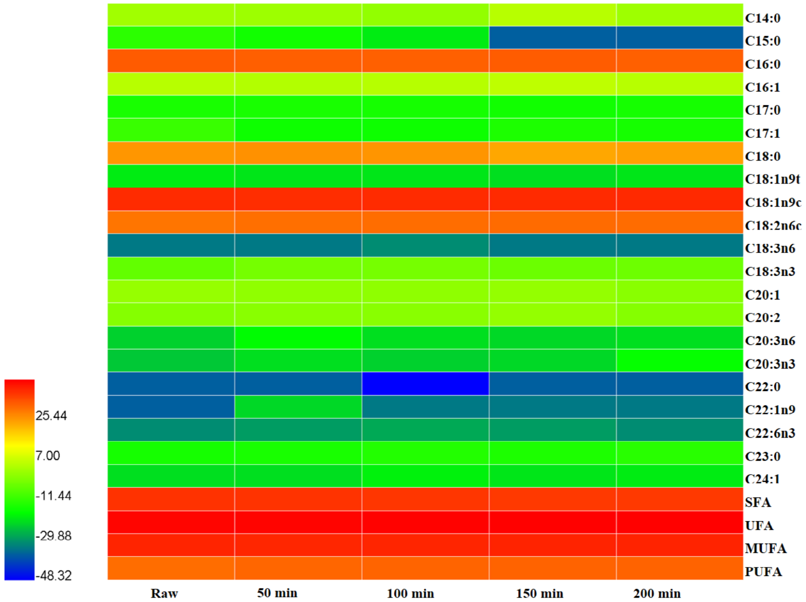

Figure 2 Heat-map of fatty acids of porcine backfat at different cooking times obtained after differ

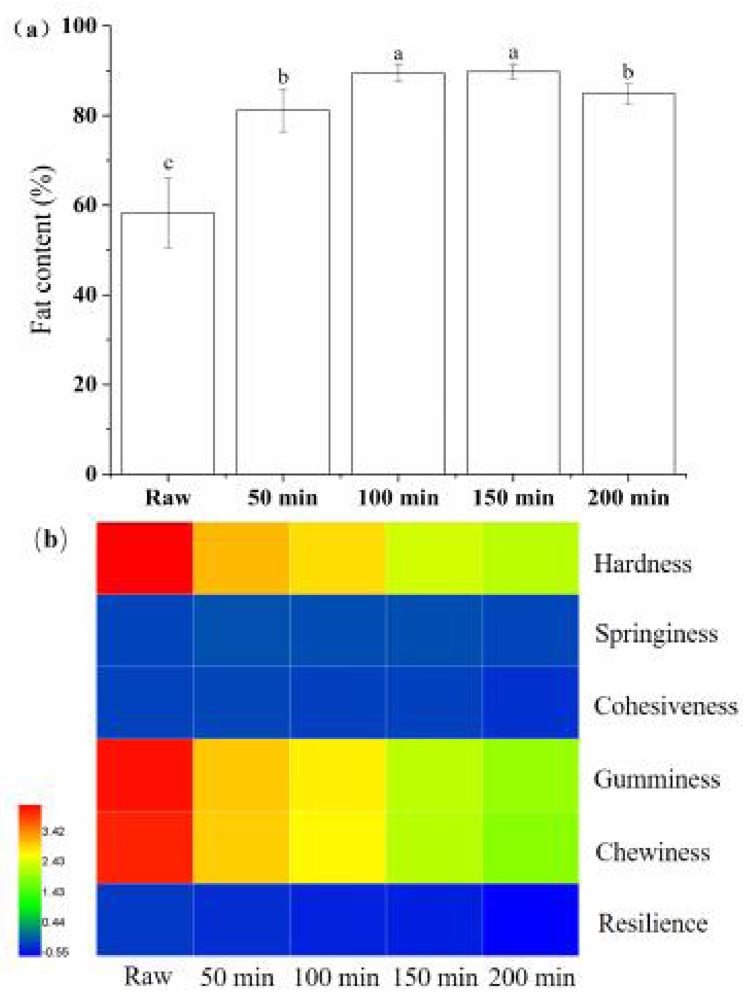

Figure 1 Heatmap analysis showed the changes of fat content (a) and texture parameters (b) of porcin

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