

# EFFECTS OF THE RATIO OF FAT TO LEAN PORK ON THE PHYSICOCHEMICAL PROPERTIES OF CHINESE SAUSAGE DURING STORAGE

JX Cao, XL Xu\*, WQ Xu, MC Xu, X Zhang, C Xu, GH Zhou

*College of food science and technology, Nanjing Agricultural University, Nanjing, Jiangsu 210095, China*

**Keywords :** porcine back-fat, Chinese sausage, lipid oxidation

## Introduction

Chinese sausage is the favorite traditional processed meat item in the market due to its unique cured meat flavor and bright color. It is usually made from lean pork and a goodly amount of porcine back-fat. According to the traditional recipe, the proportions between porcine back-fat and lean pork are very high, among the ingredients of Chinese sausage raw material. However, consumers tend to favor products with lower fat levels based on health concerns currently. The result is that certain amount back-fat is replaced by lean pork, and the final quality of the products is changed. More lean pork component causes higher pigment content and darker color in the product. Compared with lipids in lean pork, lower is the proportion of polyunsaturated fatty acids (PUFA) in back-fat. Many sensory traits of products that depend on lipid traits of muscle and adipose tissues of fresh meat and on their degradation through a complex set of lipolytic and oxidative reactions during processing and storage is changed. The purpose of this study was to investigate effects of different proportions between porcine back-fat and lean pork on the color and lipid oxidation properties of Chinese sausages during storage period.

## Materials and Methods

Fresh pork forelegs, free fat and connective tissue were ground, and the lean tissue was through a 10 mm plate. Fresh pork back-fat was partially thawed through the same plate, mixed a certain of lean and back-fat with other ingredients according to the recipes as table 1, stuffed into sausages casing, then hanged in an oven for heating (64 h at 50°C). After drying, the products were stored at about 25°C for physicochemical properties determination. pH values were measured in a homogenate prepared with 10 g of sausages and 40 ml of distilled water, using a Crison 2001 pH-meter. Moisture was determined according to the AOAC method (AOAC 950.46, 2002). Instrumental color was measured with a Hunterlab colorimeter to determine lightness (L\*), redness (a\*) and yellowness (b\*). The TBARS values were determined according to Juncher et al. (2000). Data were analyzed with SAS (9.0) using a one-way analysis of variance. Mean comparisons were assessed by the Duncan test.

## Results and Discussion

*Color parameter, pH and moisture.* Higher pH values appeared in recipe 3 than recipe 2 and 1 during week 1,4,5,6, due to lower glycogen content with less lean proportion in recipe 3 (Table 2). As sugar and glycogen was decomposed by microorganism during storage, pH values decreased, but the phenomenon was not observed in recipe 1, no significant difference on pH values in recipe 1 during 6 weeks was obtained. The effects of the proportions between porcine back-fat and lean pork on the redness, showed higher a\* values in recipe 1 than recipe 2 and 3. The possible explanation is that recipe 1 had higher lean proportion, with more myoglobin pigment than other recipes. Very similar tendency were obtained in all of three recipes, the redness increased during 6 weeks. This was the result that compounds formed by reduction of nitrite or nitrate react with Mb forming the pink-coloured pigment, nitrosylmyoglobin (MbFe(II)NO) during storage (Christina et al, 2006). However, different proportions between porcine back-fat and lean pork had not caused different yellowness among three recipes. The significant increase on the yellowness was obtained in recipe 1 and 3 during 6 weeks, but not in recipe 2. The increase probably can be explained by the oxidation of fat, but the reason that why did the yellowness of sausages in recipe 2 not increase was not very clear. No significant difference on lightness in three recipes, or during 6 weeks storage period were observed. In addition, there was no significant difference ( $p > 0.05$ ) on moisture among three recipes, either no variation of moisture happened during 6 weeks storage period.

*Lipid oxidation.* TBARS values of sausages made in three different recipes, stored during 6 weeks are shown in Fig. 1 TBARS values increased significantly ( $P < 0.05$ ) during the 6 weeks storage period for each of the three recipes. As show in Fig. 1, the sausages with highest back-fat content, exhibited the greatest ( $P < 0.05$ ) degree of oxidative stability during retail storage, while sausages manufactured with moderate

back-fat content showed the highest TBARS values.

**Table 1.** The ingredients constitution of three Chinese sausage recipes

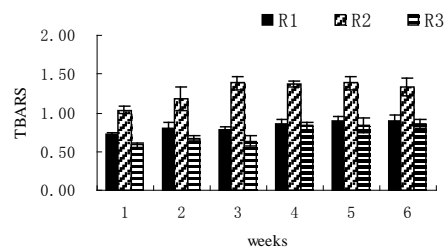
Recipes(%)	back-fat	lean pork	sugar	salt	wine	water	sodium nitrate
Recipe1	7.8	70	8	2	2	10	0.02
Recipe2	19.5	58.5	8	2	2	10	0.02
Recipe3	31.2	46.8	8	2	2	10	0.02

**Table 2.** Effects of the proportions between porcine back-fat and lean pork on the, instrumental color parameter, PH values during storage

Variation/ Storage period(weeks)	a*			b*			L*			PH		
	R1	R2	R3	R1	R2	R3	R1	R2	R3	R1	R2	R3
1	14.9Aab	12.6Bb	11.6Bcd	3.7Aabc	3.3Aa	3.0Ab	40.9Aab	40.5ABab	38.1Bb	5.5Ca	5.6Ba	5.8Aa
2	13.1Abc	11.9ABb	9.8Bd	4.0Bab	3.1Ba	3.2Bb	41.2Aab	39.7Aab	44.0Aa	5.4Aa	5.5Aab	5.6Ab
3	11.8Ac	11.7Ab	12.6Abc	2.7Abc	3.5Aa	3.1Ab	39.6Aab	38.5Abc	40.3Ab	5.4Aa	5.4Abc	5.5Ab
4	12.0 Abc	11.3Ab	11.1Acd	2.5Ac	3.2Aa	3.0Ab	38.9Ab	36.9Ac	39.3Bb	5.3Ba	5.3Bc	5.5Ab
5	14.8Aab	15.5Aa	14.5Aab	4.0Aab	3.6Aa	4.4Ab	38.3Ab	39.1Abc	39.9Ab	5.4Ba	5.3Cc	5.4Ab
6	16.4Aa	17.9ABa	15.2Ba	5.0Aa	4.5Aa	6.2Aa	42.6Aa	42.4Aa	44.0Aa	5.4ABa	5.3Bc	5.4Ab

<sup>a</sup> R1=recipe 1, R2=recipe 2, R3=recipe3.

<sup>b</sup> Means within the column for the same test having unlike letters (a - d) are significantly different, within the row for the same test having unlike letters (A - C) are significantly different (P<0.05).



**Fig 1.** Effects of the proportions between porcine back-fat and lean pork on the TBARS values during storage, R1=recipe 1, R2=recipe 2, R3=recipe3.

## Conclusions

With higher lean proportion, the sausages became redder, but no difference in yellowness and lightness. The significant increase on yellowness and redness was observed during 6 weeks storage. The sausages with highest back-fat content, exhibited the greatest degree of oxidative stability during storage period, while sausages manufactured with moderate back-fat proportion showed the highest TBARS values. Lipid oxidation increased significantly during the 6 weeks storage period for three kinds of sausages.

## References

1. AOAC. (1997). Official methods of analysis of AOAC international, 16 thed., 3rd revision, March.
2. Christina E. Adamsen, Jens K.S. Møller, Kristoffer Laursen, Karsten Olsen and Leif H. Skibsted. (2006). Zn-porphyrin formation in cured meat products: Effect of added salt and nitrite. Meat Science, 72:672-679
3. Dorte Juncher, Christian S. Vestergaard, Jakob Søltoft-Jensen, Claus J. Weber, Grete Bertelsen and Leif H. Skibsted (2000). Effects of chemical hurdles on microbiological and oxidative stability of a cooked cured emulsion type meat product. Meat Science, 55:483-491