PE4.09 Effects of pork color grades on muscle homogenate gel functionalities 29.00

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Abstract The study investigated data from 60 pig carcasses exhibiting a wide range of meat quality from extreme PSE (pale, soft and exudative) to extreme DFD (dark, firm and dry). 60 porcine samples of six color grades have been employed to prepare to muscle homogenate. The total protein solubility of muscle homogenate was observed and heat-induced gel was prepared and tested for its water holding capacity (WHC) and strength. The results indicated that pork color contributed the main effect on significant differences ($p<0.01$) of all the variables carried out in this study. pH also showed significant effect on differences ($p<0.01$) of the variables except effect on solubility($p<0.05$).

Key words: muscle homogenate, pork color grades, protein functionalities

I. INTRODUCTION

Pork color is one of the important attributes of the meat and a critical sensory trait of consumer¡¯s purchase. Norman et al. (2003) examined the edible qualities of different color grades of pork, andfound that the juiciness and tenderness of the darker pork were better than thaat of the lightet pork. Joo, S. T et al.(1999) reported that pork color was influenced by many physicochemical factors of muscle, and was closely related to pork qualities, such as water-holding potential. The pale pork had inferior processing qualities to that of normal color pork. C.C. Kuo and C.Y. Chu(2003) reported that in practical meat industry pork sausage with PSE pork had an lower yield, water-holding capacity and fat content, poor sensory scores, and the sausage¡¯s texture and flavor were not accepted by consumers. Unfortunately, the relationship of pork color and muscle homogenate functionalities has not been defined. The objective of this study was to elucidate the differences in myofibrillar protein functionalities between six color grades of pork M. Longissimus dorsi.

II. MATERIALS AND METHODS

60 pigs M.Longissimus dorsi samples were taken in the slaughter house at Jiangsu Province Food Co.Ltd., Huai¡¯an, Jiangsu, China. The pigs were 5-6 months old, and weighed 80-100kg each. All the operations were carried out under normal commercial slaughter. Samples were separated into 6 color grades according to American Pork Color Standard. Remove the Visible fat and connective tissue were removed and then the homogenates were prepared in pH6.5 and pH7.0 PBS buffer separately.

Total protein concentration were tested. Heat-induced gels were prepared by suspending 25 mg/mL myofibrillar proteins in 0.6 M NaCl and 50 mM KH2PO4/K2HPO4 (pH 6.5 and pH 7.0) in centrifuge tubes, and heating from 30 to 70 oC at 1.0 oC/min using a heating circulator (Julabo F25-ME, Germany) with subsequent cooling to 4oC. Water holding capacity was calculated as pellet weight after centrifugation(10000g¡Á10min) divided by the original weight of the gel before centrifugation.Gel strength was measured using TA-XT2i (Stable Micro Systems Ltd, UK). A cylinder probe with diameter of 5 mm was chosen and the probe speed was set up to 1 mm/s. The tests were performed by penetrating the sample until rupture. The rupture force, corresponding to the first major peak, was used to represent gel strength. The data were analyzed by SAS 8.2.

III. RESULTS AND DISCUSSION

Pork color grades significantly influenced ($p<0.05$) protein solubility, WHC and strength of homogenate gel. For the homogenates prepared with pH6.5 buffer, grade 1(PSE pork) had the lowest protein solubility (4.82 mg/mL). The protein solubility of the homogenate was increased ($p<0.05$) from grade 1 to grade 5, but decreased a little bit between grade 5 and 6. Both 5 and 6 grades had higher protein solubility (with 8.37-8.27 mg/mL respectively), and the difference was not significant ($p>0.05$).

There were similar trends of the protein solubility in homogenates prepared in pH7.0 buffer. On the other hand, the protein solubility of grade 1 to grade 3 was significantly influenced by pH ($p<0.05$), whereas not significant in grade 4 to grade 6 ($p>0.05$). Color grades significantly affected ($p<0.05$) water-hold capacity (Fig.2). At pH6.5, the water-hold capacity of

homogenate gel from grade 5 was 86.61%, significantly higher than that from grade 1 to grade 4($p<0.05$), but not significant higher than grade 6($p>0.05$). The worst water-hold capacity (36%) was seen in the homogenate gel from grade 1. At pH7.0, there were same trends of the water-hold capacity. Differences between grade 3 and grade 4 (64.2% vs. 72.68%) $p<0.05$), but not significant between grade 1 and grade 2, grade 5 and grade 6 ($p>0.05$). The water-hold capacity was improved by increasing pH from grade 1 to grade 4, rather than in grade 5 and grade 6.

Gel strength plays an important role in the texture of emulsion sausages. At pH6.5, Gel strength of muscle homogenate from Grade 6 was the largest highest (12.09g) in all of grades (Fig.3), significantly higher than that of grade 3 and grade 4($p<0.05$), but similar to grade 5. The gel strength of the homogenate from Grade 3 was 7.307g, not significant compared to grade 4($p>0.05$). No matter how pH is , homogenate from Grade 1 can not form network, so gel texture can not be measured. Same happens to Grade 2 at pH6.5. At pH7.0, the strength of homogenate gel from the 5th grade pork was 9.387g, significantly larger($p<0.05$) than that from the 4th(6.057g), 3rd(5.992g) and 2nd(5.048g), however, differences in gel strength between the 4th and 3rd, the 2nd and 3rd, the 5th and 6th grade pork were not significant($p>0.05$). The differences in gel strength between pH6.5 and pH7.0 were significant ($p<0.05$) at grade 5, but not significant($p>0.05$) at the color grade 3, 4 and 6.

IV. CONCLUSION

Both of grades 5 and 6 had higher WHC and gel strength than other grades under pH6.5 and pH7.0, indicating that darker pork had better functionalities of homogenate gel from M. longissimus dorsi.Protein solubility and gel WHC were increased from pH6.5 to pH7.0. The results showed that color and pH control are of great importance in meat processing. In commercial practice, pork color grades can be considered as a potential indicator of pork protein functionalities.

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