EFFECT OF PYROPHOSPHATES ON HEAT-INDUCED GELATION PROPERTIES OF MYOSIN FROM RABBIT SKELETAL MUSCLES

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Introduction

Myosin is a large, fibrous protein with a molecular weight of about 500,000. It is the most abundant and important myofibrillar component (Xiong,1997). As the main protein extracted from meat when salt is added, myosin heat-induced gelation play a critical role in the texture, sensory properties, water holding capacity (WHC) in the processing of comminuted meat products. Pyrophosphates(PP) are used widely during the protein extraction as buffer(Xiong et al.,2000), however few literature has reported its effect on the heat-induced gelation properties of proteins, and the conclusions conflicted. The objective of this study was to explore the effect of pyrophosphates on the heat-induced gelation properties of myosin from rabbit skeletal muscles.

Materials and Methods

The myosin was prepared and purified according to Hermansson(Hermansson et al.,1986) with little modification from Pasoas major (PM) and Semimembranosus proprius (SMp) of male rabbit. Adjusted myosin suspensions 2 mL (15mg/mL protein in 0.6 M KCl, 20mM phosphate buffer solution, pH 6.0) with 0.25%,0.50%,0.75% or 1% pyrophosphates added in 7mL centrifuge tube were heated from 20 to 65℃ at a 1℃/min gradient and incubated the protein suspensions at 65℃for 20min, and held overnight at 4℃. Water holding capacity (WHC) was measured at 4℃, the above tubes centrifuged at 10000×g 5min. WHC was calculated as the weight of water released divided by gels weight multiplied by 100. Gel strength (Hardness in gram force) was measured using TA-XT2i (Stable Micro Systems Ltd, Surrey,UK) with a P5 5mm diameter cylinder stainless probe. The microstructure of heat-induced gels of myosin were observed with a SX-40 scanning electron microcopy (SEM, KASHI, Japan) at an accelerating voltage of 20 KV. To evaluate the differences between gels strength and WHC, data were analysed by analysis of variance (ANOVA) using the General Linear Model（GLM）of Statistics Analysis System(SAS 8.12）.

Results and Disscussion

Effect of pyrophosphates on the gel strength and WHC of heat-induced myosin gelation. With PP added, the gel strength decreased from 22.5g to 44.8g and 20.8g to 13.2g for SMp and PM myosin, respectively ($p<0.05$) (Fig 1). The reason may be PP destabilized myosin, interfered with myofibril gelation(Gang and Youling,1997). PP effected the WHC of muscle protein gels(Gang and Youling,1997). The WHC of PM myosin gels decreased ($p<0.05$) when PP added, however 0.75% and 1% PP has a similar WHC ($p>0.05$).And the lowest WHC of 45.1% was obtained with 0.50% PP added for SMp myoin gels.

Effect of PP on the myosin gels microstructure. Addition of ortho-, pyro-, tripoly- and hexametaphosphate up to1% increased SSP transition temp. and altered transition patterns(Robe and Xiong,1992); The PM gels containing 0.25% PP have pores size ≈0.5 μm and its shape and distribution were uniform. When the PP concentration increased, the gels showed a coarse rather a porous structure and the diameter increased to 2 μm with irregular shape. The SMp gels containing 0.25% PP showed fine three dimension structure with pores size

≈0.3 μ m and to spread homogenously over the network. When higher PP added, the gels showed a strand structure with small protein granular, and the gels coarseness increased. SMp and PM showed a different gels structure when PP is added(Fig 2), which may attributed to phosphates promoting protein extraction(Xiong et al.,2000), the different gel structure between SMp and PM myosin may result from myosin isoform(Xiong,1997).

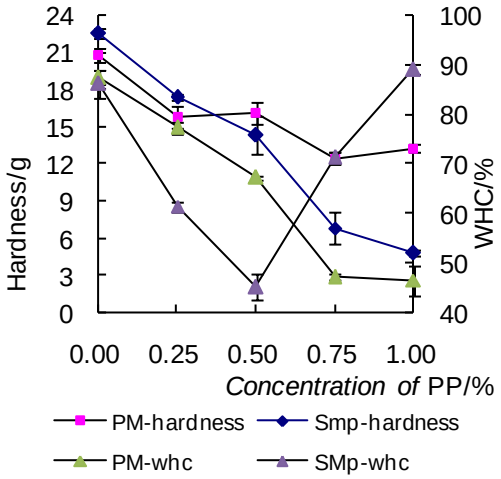

Fig 1 Effect of PP on the gel strength and WHC of myosin

Conclusion

PP has significant effect on the heat-induced gelation properties, and muscle type show different gel strength, WHC and gels strength.

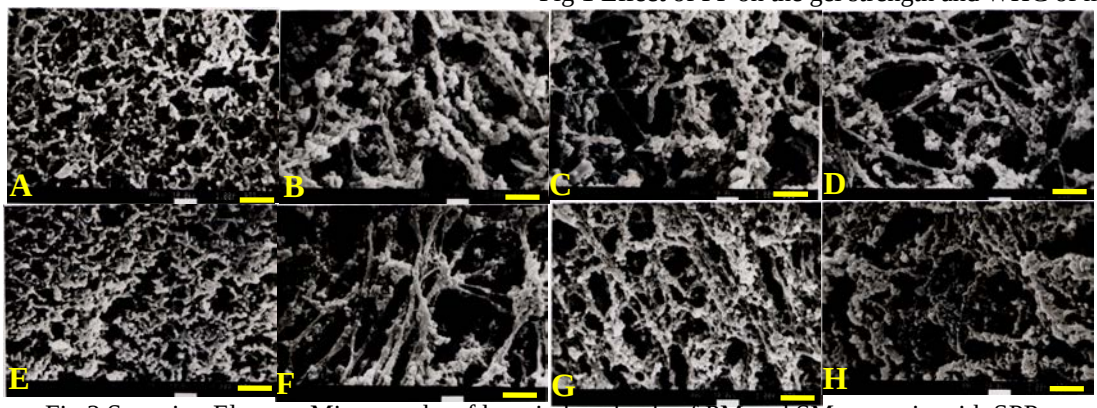

Fig 2 Scanning Electron Micrographs of heat-induced gels of PM and SMp myosin with SPP PM(A 0.25%,B 0.5%,C 0.75%,D 1.0%, SMp(E 0.25%,F 0.5%,G 0.75%,H 1.0%). Bar length is 1μm

These findings indicate SMp and PM muscle types should undergo different processing treatments for optimum quality of meat products.

Acknowledgments

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