INFLUENCES OF XYLOOLIGOSACCHARIDES ON THE PHYSICOCHEMICAL AND SENSORY PROPERTIES OF FROZEN CHINESE-STYLE MEATBALL (KUNG-WAN)

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Abstract*- Oligosaccharides are linear or branched sacchardies consisting primarily of 2 to 10 sugar units and possess unique functional characteristics including promoting growth of intestinal probiotics, increasing bowel movement, and lowering serum cholesterol and triglycerides. Sugars and polyols had been reported to be cryoprotective against protein denaturation and retain protein functionality in frozen food products. In light of xylooligosaccharide's multi-functionality, the present study was conducted to investigate the possible cryoprotective effect of xylooligosaccharides comparing with sorbitol and sucrose on the physicochemical and sensory traits of frozen Chinese meatball (20% fat) processed from various combinations of xylooligosaccharides and sucrose. No significant differences in WHC were noted for treatments following cooking and frozen storage. XSO1 (1% xylooligosaccharides + 3% sucrose) had the highest sensory juiciness score and XSO4 (4% xylooligosaccharides) being the lowest. Springiness, hardness and overall acceptability of all treatments were found not significantly different. Extractable SSP and WSP concentrations followed similar patterns to those of raw meat batters. No significant differences in relative protein hydrophobicity among all meatball treatments. In conclusion, addition of xylooligosaccharides or sucrose singly or in combination at current levels resulted in comparable Chinese meatballs in quality parameters evaluated in this experiment. Partial replacement of sucrose with xylooligosaccharides created a health-oriented, valued-added processed meat product.

***Index Terms*- xylooligosaccharides, Chinese meatball, protein surface hydrophobicity, water-holding capacity**

I. INTRODUCTION

Xylooligosaccharides (XOS) are usually produced from xylan by limited hydrolysis by endo-1,4-β-xylanase and can not be digested by gastric and intestinal enzymes and are regarded as prebiotics. XOS contribute to the growth of *Bifidobacterium* in the large intestine and to lower serum cholesterol and triacylglycerol (Delzenne & Roberfroid 1994; Howard, Gordon, Garleb & Kerley, 1995). Okazaki, Fujikawa and Matsumoto (1990) pointed out superior effect of XOS on promoting the growth of *Bifidobacterium* to other oligosaccharides. Chung, Hsu, Ko and Chan (2007) concluded a better promoting effect of XOS on the growth of *Bifidobacterium* in the intestine of elderly than fructooligosaccharide and inulin. In light of xylooligosaccharide's multi-functionality, the present study was conducted to investigate the possible cryoprotective effect of xylooligosaccharides comparing with sorbitol and sucrose on the physicochemical and sensory traits of frozen Chinese meatball (20% fat) processed from various combinations of xylooligosaccharides and sucrose.

II. MATERIALS AND METHODS

Lean pork and fat were emulsified with appropriate amounts of additives and saccharides, and shaped into ~20 g meatballs. Sacchardies used were coded as follows. Suc4＝sucrose 4%; XSO1＝xylooligosaccharides 1% + sucrose 3%; XSO2＝xylooligosaccharides 2% + sucrose 2%; and XSO4＝xylooligosaccharides 4%. Meatballs were cooked in 85 ℃ hot water until internal temperature reached 80 ℃. Cooked meatballs were chilled in ice-water, drained, vacuumed packaged, and stored under -20 ℃. Packages of frozen meatball were randomly sampled for analyses at 4-week interval for total of 12 weeks, including water-holding capacity, myofibrillar protein content, protein surface hydrophobicity, and sensory evaluation. Data collected were statistically analyzed as a completely randomized design, and a one-way analysis of variance of GLM was applied to compare the means for treatments at the same storage periods or the same treatment at different storage periods. Duncan's Multiple Range Test method for significant main effects at $P< 0.05$ was used.

III. RESULTS AND DISCUSSION

Significantly lower cooking loss was noted for treatments XSO4 (4% xylooligosaccharides) and Suc4 (4% sucrose). No significant differences in WHC were found for all treatments following cooking and frozen storage. XSO1 (1% xylooligosaccharides + 3% sucrose) had the highest sensory juiciness score and XSO4 being the lowest. Springiness, hardness and overall acceptability of all treatments were found not significantly different. Extractable SSP and WSP concentrations followed similar patterns to those of raw meat batters. No significant differences in relative protein hydrophobicity among all meatball treatments.

IV. CONCLUSION

Addition of xylooligosaccharides or sucrose singly or in combination at current levels resulted in comparable Chinese meatballs in quality parameters evaluated in this experiment. Partial replacement of sucrose with xylooligosaccharides created a health-oriented, valued-added processed meat product.

V. ACKNOWLEDGEMENT

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VI. REFERENCES

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Table 1-The changes in protein relative surface hydrophobicity of cooked meatball containing xylooligosaccharides at different levels during frozen storage at -20 ℃

Treatment*	Storage time (week)			
	0	4	8	12
Suc4	102.87^{Aa}±22.72	128.19^{Aa}±53.28	109.65^{Aa}±13.43	109.28^{Aa}±35.05
XSO1	83.80^{Aa}±21.13	106.85^{Aa}±39.42	107.89^{Aa}±4.05	110.28^{Aa}±24.32
XSO2	81.57^{Aa}±9.46	96.91^{Aa}±15.57	99.75^{Aa}±25.28	100.57^{Aa}±6.16
XSO4	86.43^{Aa}±28.04	102.39^{Aa}±12.81	110.29^{Aa}±12.68	100.00^{Aa}±16.58

[a] Means (± SD) within the same column at the same storage period bearing unlike letters are significantly different (P<0.05).

[A] Means (± SD) within the same row bearing unlike letters are significantly different (P<0.05).