A Model System for Application of Konjac ,Curdlan and Carrageenan in Meat Ball Processing

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ABSTRACT

"Kung-wan", an emulsified meatball, is a very popular meat product in Chinese communities. It is different from western style meatballs. "Tradition kung-wan"(control group) major material are pork leg muscle (75%) and pork back fat (25%). Generally speaking, kung-wanes are required to have higher hardness, brittleness and elasticity. A three-factor relatable central composite design was adopted for these study gum-hydrates on qualities of low-fat Kung-wan. The study use different level of gum contain (0%, 5% and 10%) , (konjac premixed with Ca(OH)2) gel,(curdlan) gel,(κ-carrageenan) gel,(curdlan and κ-carrageenan) gel,(κ-carrageenan and konjac with Ca(OH) 2)gel, (curdlan and konjac with Ca(OH)2)gel were chosen for further on texture, higher hardness, brittleness , elasticity and sensory qualities and fat substitutes of the low-fat kung-wan. The experimental result shows with the addition of different gum products provided are juicy; may be with WHC due to the addition of gum. "Kung-wan" adding of different gum product weightlessness and color there are not difference of showing to control group. Results indicated: The hardness, gel strength and hardness of TPA is also on was decreased after added to the(5%,10%) singular gum (konjac gel , curdlan gel , κ-carrageenan gel) .Addition(5%,10%) mixture of gum(curdlan , κ-carrageenan) gel,(κ-carrageenan ,konjac with Ca(OH)2)gel, (curdlan , konjac with Ca(OH)2)gel in contrary motion increase of TPA. Series reheating experiment indicated: The series reheating (70°C) process for either 1, 2, 3, or 4 hr gum-hydrates were insignificant except for gel strength and taste inferior to contrast group. As to frozen storage experiment (-18°C) process 15, 30, 45, or 60 day: The breading intension, gel strength and hardness of TPA are also on increasing with after frozen storage. Except for add 10% konjac gel with contrast group looks than have situation that reduce, have apparent difference. Overall sensory evaluation, adds 5% of curdlan gel has the best acceptance. In conclusion, the aims of this study were to find a better method of addition of three-factor gum-hydrates to "Kung-wan" comparing to control low-fat in sensory and shelf stability without causing adverse effects on texture. Furthermore, it provided juiciness and chewiness to Kung-wan and attained higher overall acceptability.

Keywords : WHC(water holding capacity), TPA(texture profile analyses)

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REFERENCES

1. 王進崑、柯文慶、洪端良、陳重文、盧榮錦、賴滋漢。2002食品、營養儀器分析。 p246 富林出版社，台中，台灣。 2. 邱健人、魏琬櫻。1978。膠在食品工業上之應用(一)。食品工業 10 (11) :36-42。 3. 邱建人、魏琬櫻。1978。膠在食品工業上之應用(二)。食品工業10(12):37-42。 4. 吳景陽。1994。蒟蒻。食品工業26(2):12-19。 5. 周學明、洪維新。1998。影響肉類蛋白質黏著特性的理化與加工因素。台糖畜產4(21):33-48。 6. 洪嘉祥。1999。豬肝之微生物營養強化劑之製備與豬肝渣在豬肝羅扶製造上應用。國立中興大學碩士論文，台中，台灣。 7. 姚念周。1994。食品組織的物理特性。食品工業26:22-29。 8. 張嘉銘。1996。多醣類對吳郭魚肉蛋白質乳化物膠體物性的影響。台灣海洋大學食品科學系碩士論文，台北，台灣。 9. 陳明造。1994。肉品加工理論與應用(修訂版)。藝軒圖書出版社，台北，台灣。 10.陳怡宏。1996。食品膠質配料簡介。食品市場資訊8403:2-1。 11.陳明造、劉登城。1999。低脂貢丸之試製及特性之研究。 12.陳明造。2003。蒟蒻的生產與利用。藝軒圖書出版社，台北，台灣。 13.陳明造、林敬堯、劉登城。1997。加壓及加熱處理對豬肉糊之硫氫基含量與凝膠特性之影響。中華農學會報182:72-8。 14.黃加成、蘇和平、林慶文。1998。蒟蒻在低脂中式香腸之利用。食品科學25(4): 437-445。 15.黃鎮富。2001。機能性軟糖之探討-蒟蒻軟糖。食品資訊184:52-3。 16.郭文怡。1997。一種廣泛運用於食品中的健康食品素材。烘焙工業14:59-61。 17.溫昭凱。1999。影響蒟蒻膠體及卡德蘭膠低溫貯藏中離水率因素與改進方法。台灣海洋大學碩士論文，台北，台灣。 18.彭翊瑋。2004。多醣類之混合膠與蛋白質之交互作用對膠體質感特性的影響。臺灣海洋大學碩士論文，台北，台灣。 19.楊季清、張政偉、羅麗珠。1997。蒟蒻素食火腿製作之最適化。食品科學 24(2):230-241 。 20.蔡明儒。2003。不同添加物在高溫滅菌後對類貢丸製品品質的影響。碩士論文。中國文化大學，台北，台灣。 21.羅正仁。1996。肌膠蛋白的熱凝膠反應機制。食品工業月刊31-38。 22.大倉裕二。1994。力-卜?????新??食品型態?開發。食品開發29:5-7。 23.中尾行宏，田口哲也，山口武信。1994。Preparadons of freezable processed tofu and freeze-dried tofu by using curdlan日本食品工業30:31-40。 24.永島利明。1988。????????，東京，民眾社，日本神山。1995。蒟蒻glucomannan 混合膠體之物性。New Food Industry。 25.奈良潔。1991。?????性質?食品??利用食品工業30:31-40。 26.原田篤也。1994。力-卜???????????物語?。New Food Industry 36:49-55。 27.Arnott, S., Scoit, W . E., Rees, D. A. and McNab,C.G.A.1974.i-Carrageenan: Moiec Lilar structure and packing of polysaecharide double helices in oriented fibres of divalent cation salts. J. Mol. Biol 90 253-67. 28.Acton, J . R., G.R. Ziegler, and D. L. Burge. 1983 . Functionality of muscle constituents in the processingof comminuted meat products. CRC Crit. Rev. Food Sci. Nutr., 18-99. 29.Barbut S., 1995 Importance of emulsification and protein matrix characteristics in meat batter stability. J. Food Sci. 53:1300-1304. 30.Bernal, V. M., Smajda, C. H., Smith, J. L. and Stanley, D. W 1987. Inteactions in Protein /polysaccharide/calcium gel. J. Food Sci. 52 : 12. 31.Borchert, L. L., M. L. Greaser, J. X. Bard, R. G. Cassens and E. J. Briskey. 1967, Electron microscopy of a meat emulsion. J. Food Sci. 32:419-421. 32.Borejio, J. 1983. Mapping of hydrophobic sites on the surface of myosin and its fragments. Biochemistry 22: 112-119. 33.Cairns P, Miles M J, Morris V J, BrownseyG J. 1987. X-ray fiber-diffraction studies of synergistic, binary polysaccharide gels. Carbohydr Res 160:411-23. 34.Chen , C. M . and G. R. Trout. 1991. Sensory, instrumental texture profile and cooking properties of restructured beef made with various binders. J. Food Sci. 56: 1457-1460. 35.Clark, A. H .1992. Gels and gelling .in H. G.., Schwartzberg, and R. W., Hartel, Physical Chemistry of Food p.263-305 .Marcel Dekker, Inc New , USD. 36.Claus, J. R., Hunt, M. C., Kastner, C. L. 1989. Effects of substituting added water for fat on the textural, sensory, and processing characteristics of bologna. J.Muscle Foods. 1(1):1-21. 37.Egbert, W. R., Huffman, D. L., Chen, C. M. and Dylewski, D. P.1991. Development of low fat ground beef. Food Technol. 45(6):64-73. 38.Eliasson, A. C. and Hegg, P. 0. 1980. Thermal stability of wheat gluten. Cereal Chem. 57 (6): 436. 39.Fennema, R. 0. 1985. Chapter 5 in "Food Chemistry," pp 245. Marcel Dekker Inc. New York, USA. 40.Glicksman, M. 1989. Red seaweed extracts (agar, carrageenan, furcellaran). In: Glicksman M, ed. Food hydrocolloids II. BocaRaton, FL, CRC Press, Inc. p 73-113. 41.Giese, J.1992. Developing low-fat meat products. Food Technol 46(4):100-108. 42.Galluzzo, S. J. and J. M. Regenstein. 1978. Role of chicken breast muscle proteins in meat emulsion formation: Myosin, actin and synthetic actomyosin. J. Food Sci. 43: 1761-1765. 43.Gordon, A. and S. Barbut. 1992. The effect of chloride salts on rotein extraction and interfacial protein film formation in meat batters. J. Sci. Food Agric. 58: 227-238. 44.Hansen, L. J. 1960. Emulsion formation in finely comminuted sausages. Food Technol. 14:565-569. 45.Harris . 1990 . Food Gels .Elsevier Applied Science .New York. 46.Harada, I., Masada, M., Fugimori, K. and Maeda, 1. 1966. Production of a firm, resilient gel-forming polysaccharide by a mutant of Alcaligenes faecalis var. myxogenes IOC3. J. Agric. Biol. Chem., 30:196-201. 47.Hemar, Y., Hall, C. E., Munro, P. A. and Singh, H. 2002. Small and large deformation rheology and microstructure carrageenan gels containing commercial milk protein products. Int Dairy Journal. 12 : 371-381. 48.Hermansson, A. M. O., Harbitz and M. Langton. 1986. Formation of two types of gels from bovine myosin. J. Sci. Food Argic . 37:69-84. 49.Jones, K. W. and R. W. Mandigo. 1982. Effect of chopping temperature on the microstructure of meat emulsions. J. Food Sci. 47:1930-1935. 50.Jimenez-Colmenero,F.and R. G. Cassens.1987.Influence of anextract of liver on colour and shelf stability of sliced bologna. Meat Science.21:219-230. 51.Keeton, J. T. 1994. Low-fat meat products- technological problems with processing. Meat Sci 36(1/2):261-276. 52.Konno. A., Okuyama, K., Koreeda, A., Harada, A., Kanazawa, Y. and Harada, T.1994.Molecular association and dissociation in formation of curdlan gels. In K. Nishinari and E. Doi eds , Food Hydrocolloids, Structure, Properties, and Functions, Plenum Press. New York. p. 113-118. 53.Langendorff, V., Cuvelier, G., Michon, C., Launay, B., Parker, A. and De Kruif, C. G. .2000. Effects of carrageenan type on the behaviour of carrageenan/milk mixtures. Food Hydro. 14 : 273-280. 54.Lee, 1. Y., Seo, W., Kirn, M. K., Park, C. and Park, Y H. 1997. Production of curdlan using sucrose or sugar one molasses by two-stepfed-batch cultivation of agrobaleriun species, Worls J. Micro. Bio. l80(4):255-322. 55.Maeda, M., Saito, 1., Masada, H., Misaki, M. and Harada, T. .1967. Properties of gels formed by heat treatment ofcurdlan, a bacterial β-1,3 glucan .Agric. Bio. Chem. 31:1184-1188. 56.Maekaji, K.1974. The mechanism of gelation of konjac mannan. Agric Biol Chem 38 (2):315-21. 57.Matsuhashi, T .1990. Chapter I Agar. In Food Gels. P. Hams,(eds.) Elsevier Applied Science. New York. p. 1-52. 58.Miwa, M., Nakao, Y. and Nara, K.1994. Food applications of Curdlan. In Food Hydrocolloids , Structures, Properties and Functions. K. Nishinari and E. Doi (eds.). Plenum Press, New York. p. 11-124. 59.Nakao, Y., Taguchi, T., Konno, A.,

Tawada, T., Kasai, H, Toda, J. and Terasaki, M .1991. Curdlan: Properties and application to foods. J. Food Sci. 56:769-776. 60.Niahinari ,K., Miyoshi, E., Takaya. T. and Williiams ,P A .1996. Rheological and DSC studies on the interaction between gellan gum and konjac glucomannan. Caitehydr Polym 30:193-207. 61.Nishinari, K., Hirashima, M., Miyoshi, E. and Takaya, T.1998. 'Rheological and DSC studies of aqueous dispersions and gels of cudlan : in gum and Stabilizer for the food industry. 9, Williams. P. A ., Philipps. G 0. EDS, pp. 26-23. 62.Peleg, M. and E. B.Bagley.1983. Physical properties of foods. Westport, Conn.: AVI Pub. Co. 63.Prine, J. F. and B, S. Schweigert.1987. The Science of 80 Meat and Meat Products. Food and Nutrition press, Westport. 64.Reagan, J. O., Liou, F.H., Reynolds, A .E., Carpenter, J .A .1983. Effect of processing variables on the microbial, physical and sensorycharacteristics of pork sausage. J Food Sci 48(1):146-149, 162. 65.Rizzotti, R., Tilly, G. and Patterson, R. A .1983. The use of hydrocolloids in the dairy industry. In Gums and Stabilisers for the Food Industry_.G. O. Phillips, D. J. Wedlock and P. A. Williams（eds.）. p.285-293, Pergamon Press, New York. 66.Sharma, S. C .1981. Gums and Hydrocolloids in oil-water emulsions Food Technol. 35(1):59 67.Stipanovic, A. J., Giammatto, R.J. and Vasconcellos, S.R .1987. Characterization and applications of viscoelastic solutions and water-soluble microbical polysaccharides. Poly. Mat. Sci, Eng.57:260-264. 68.Summerkamp, B. and Hesser, M, 1990.Fat substitute update. Food Technol44 (3) : 92,94,97. 69.Tada, T., Matsumoto, T. and Masuda, T .1999. Dynamic viscoelasticity and small-angle X-ray scattering studies on the gelation mechanism and network structure ofcurdlan gels, Carbohy. Polym. 39:53-59. 70.Takahiro, F., Yohei, K., Toshio, O., Yasunori, G., lwao, A., and Katsuyoshi, N .2005 .Effect of non-ionic polysaccharides on the gelatinization and retogradeation behavior of wheat starch. Food Hydrocolloids, 19,1-13. 71.Taki, G. H.1991. Functional ingredient blend produces low-fat meat products to meet consumer expectations. Food Techno l45 (11):70, 72, 74. 72.Takigami ,S . 2000. Konjac mannan. In: Phillips G O, and Wilhams P A, editors. Handbook of hydrocolloids. Boca Raton, FL.: Woodhead Publishing Limited and CRC Press . p 413-24. 73.Talcigami ,S., Takiguchi, T .and Phillips, G. O .1997. Microscopical studies of the tissue structure of konjac tubers; Food Hydrocoll. 11(4):479-8 4. 74.Tciboula, A. and Home, D. S .1999. Influence of whey protein denaturation on Carrageenan gelation. Colloids and Surfaces B: Biointerfaces. l2:299-308. 75.Thomas, WR. 1997. Konjac gum. In: Imeson A, editor. Thickening and gelling agents for food. London, UK: Blackie Academic and Professional , p169-79. 76.Tojo, E. and Prado, J .2003. A simple method for the quantification of carrageenans in blends. Carbohydrate Polymers. 53 : 325-3 76.Tye, R. J .1991. konjac flour: properties and applications. Food Technol. 45 (3) 86- 92. 77.Williams, P.A., Phillips, G. O. 2000. Introduction to food hydrocolloids. In: Phillips, G. O. and Williams, P. A., eds Handbook of hydrocolloids. Boca Raton, FL; Woodhead Publishing Limited and CRC Press LLC. p 1-19. 78.Yoahiroura, M. and Nishinari, K .1999. Dynamic viscoelasticity study on the gelation of konjac glucomaiman with different molecular weights. Food Hydrocoll . 13(3):227-33 79.Ziegler, G. R. and Acton ,J. C .1984. Mechanisms of gel formation by proteins of muscle tissue. Food Technol.:77.