Effect of Koji Fermentation and Brewing on the Hydrolysis of Milkfish Meat Protein and the Quality Assessment of the ...

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ABSTRACT

Milkfish ordinary muscles were used as the raw materials for koji-making. The minced meat from the ordinary muscles was mixed with roasted and crushed wheat (30 mesh) at the meat/wheat ratio (w/w) of 1:1 (group A), 1:0.5 (group B), and 1:0.1 (group C). After inoculating with 0.2% spores of koji mold Aspergillus oryzae, koji was prepared in a koji fermenter by incubating at 35-40°C and over 95% RH for 36 hours. The koji obtained was then fermented under 20% NaCl for 6 months. Due to the action of exogenous microorganism, endogenous enzymes and koji mold, fish proteins were decomposed to amino acids. The final product was obtained by pressing and blending. The results were shown as follows: ○1Protease activities of the koji obtained via the 36 – hour incubation were 76.92, 31.82, and 19.84 units for group A, B, and C, respectively, while amylase activities were 79.89, 65.50, and 18.99 units. The VBN contents of the koji were at high values in all groups. ○2After fermentation for 6 months, total nitrogen were 1.12 g/100 mL for group A, while amino nitrogen were 0.68 g/100 mL, respectively. These contents have reached the level of second grade soy sauce in CNS. But total nitrogen and amino nitrogen contents, which were 0.98 and 0.44 g/100 mL for group B after fermentation for 6 months, reached the level of third grade in CNS. ○3The pH values of group B and C after fermentation for 6 months, which were 8.21 and 8.29, were higher than that of group A of 7.62 due to the higher basic nitrogen contents. According to the high level of VBN during koji-making, the procedures of incubation and fermentation were revised. Wheat mixed with 0.2% Aspergillus oryzae and incubated for 12 (group D) and 24 hours (group E), and then the minced fish meat was added to continuously incubate for 24 hours at the same condition described as above. The koji obtained were then fermented at 20% NaCl for 3 mouths. The changes of components in fish sauce were determined. The results were shown as follows: ○1VBN values of the koji obtained from group D and E were 37.73、39.34 mg/100 mL, respectively, which were significantly lower than that from group A. ○2The protease activity of the koji for group E was 98.77 units that was higher than that for group D (87.43 units), while amylase activities were 123.17 and 114.76 units for group D and E, respectively. The activities of both enzymes of group D and E were higher than group A. ○3Total nitrogen content of group E for 0 mouth was 0.29 g/100 mL, which was better than that of group D for 0.25 g/100 mL. Total nitrogen and amino nitrogen contents of group D were 0.88 and 0.57 g/100 mL after fermentation for 3 months, and group E were 0.88 and 0.53 g/100 mL after 2.5-month fermentation. These contents have reached the level of third grade soy sauce in CNS. ○4The sensory evaluation showed that the product of group A was the most acceptable in this study. Unacceptable fish odor and light color occurred in the product of group C, which is unacceptable for consumers It was confirmed we can replace the milkfish the soya bean, and to utilize the way to make koji. Succeed in making the fish sauce with good quality during half a year (A) to decrease the ferment time of traditional fish sauce (12~18 mouths). If want to take the products well, besides needing to consider the quantity of the fish with add in the opportunity of making koji, getting familiar time is also important factor.

Keywords : milkfish meat ; fish sauce ; Aspergillus oryzae ; koji making

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REFERENCES

1. 太田靜行。1991。水產物?鮮度保持。筑波書局。東京。日本。 2. 王義雄。1980。低鹽醬油。食品工業 12(11):26-33。 3. 田欽仁。1990。醬油過濾之研究。國立台灣大學食品科技研究所碩士論文。台北。 4. 吉田禮二、佐藤守、古望、池田靜德。1983。內臟酵素?利用??????魚醬油?試作。日水誌 49(3):463-469。 5. 沈世傑。2001。臺灣魚類誌。國立台灣大學動物學系印行。台北。台灣。 6. 李秀、賴滋漢、柯文慶。2000。食品分析與檢驗(二增定版)。富林出版社。台中。台灣。 7. 江伯源和柯文慶。1998。實用食品加工實習手冊。國立中興大學教務處。台中。台灣。 8. 邱健人。1980a。醬油製造技術之展望-原料處理。食品工業 12(7):24-28。 9. 邱健人。1980b。醬油製造技術之展望-製麴。食品工業 12(8):27-31。 10. 食品工業發展研究所。1996。醬油產業現況及發展趨勢分析。經濟部調查報告第 85-080 號。 11. 郭錦富。1986。醬油釀造過程中香味之變化及不同成品之比較。台灣大學農業化學研究所碩士論文。台北。 12. 郭錦富。1991。原料比例對醬油品質之影響。台灣大學農化所博士論文。台北。 13. 胡興華。2000。話漁台灣。行政院農業委員會漁業署。台北。台灣。 14. 張伊倫、李素菁和華傑。1996。我國醬油產業現況。生物產業期刊 4:251-257。 15. 凌美月和周正俊。1995。Aspergillus oryzae 在不同擠壓醬油發酵基質上之生長及酵素生產。中國農業化學會誌 33:521-532。 16. 陳茂松和鞠小倩。1978。南極蝦加工研究-南極蝦液化蛋白製造試驗。台灣省水產試驗所試驗報告 31:305-312。 17. 陳淑珍和黃堯。1981。魚醬油速釀法試驗-Ⅱ。台灣省水產試驗所試驗報告 33:441-452。 18. 陳勝和。1975。醬油。天然出版社。台北。台灣。 19. 陳聯桂。1996。利用鯉魚廢棄物製造魚醬油之研究。大葉大學食品工程研究所碩士論文。彰化。 20. 莊朝凱。2001。添加鮪魚蒸煮汁試製魚醬油可行性之評估。國立中興大學食品科學研究所碩士論文。台中。 21. 許鼎輝和陳欽明。1975。甲醛用量對醬油中 Formal nitrogen 檢出之影響。食品科學 2:39-42。 22. 梅田勇雄。1963。醬油。三共出版社。東京。 23. 彭秋妹和王家仁。1984。食品官能檢查手冊。食品工業發展研究所。新竹。 24. 彭瑞森。1992。低鹽醬油下缸釀造之微生物控制。食品工業25(1):43-53。 25. 經濟部。2007。經濟部統計資訊網路。調查報告醬油工業。台北。台灣。 26. 經濟部中央標準局。1994。中國國家標準(CNS 423 N5006)。台灣。 27. 經濟部中央標準局。1982。中國國家標準(CNS 1451 N6029)。經濟部中央標準局。台北。台灣。 28. 漁業年報。2006。行政院農業委員會漁業署。台北。台灣。 29. 齊藤恆行、內山均、梅本滋和河川俊治。1974。水產生物化學。食品學實驗書。pp.267-281。恆星社厚生閣。東京。日本。 30. 鄧世正。1994。淺談醬油添加物。醬類季刊(12):7-10 31. 橫塚保。1989a。醬油製造之原料蒸煮、製麴及醬醪發酵(上)。李政宏譯。食品工業 21(4):45-54。 32. 橫塚保。1989b。醬油製造之原料蒸煮、製麴及醬醪發酵(下)。李政宏譯。食品工業 21(5):23-40。 33. 賴慶隆。1994。醬油釀造微生物-麴菌。食品工業。26(12):31-38。 34. 闕文仁和鄧世正。1976。實用醬油釀造學。環宇出版社。台北。 35. 闕文仁和鄧世正。1979。醃漬物與醬油之製造技術。環宇出版社。台北 36. 闕文仁。1980。醬油釀造微生物-酵母。食品工業 12(9):24-28。 37. 藤井建夫、Basuki, S. B. 和戶?晴已。1980。?????產魚醬油?化學組成???微生物相。日水誌 46:1235-1240。 38. 饒家麟。1989。以豆麥麴及蝦頭、雞頸為材料釀造調味料之研究。國立中興大學食品科學系碩士論文。 39. A.O.A.C. 1984. Method Official of Analysis. 14th ed. Association of Official Analytical Chemists, Washington, D. C., U.S.A. Bergmeyer, H.V. 1984. In methods of enzymatic analysis. Vol. 2. New York, USA. p. 1018-1021. 40. A.O.A.C. 1995. Official Methods of Analysis of the Association of OfficialAnalytical Chemists. 14th edition. Ed. By Sidney, W. Washington D.C., USA. 41. Beddows, C. G. and Ardeshir, A. G. 1979a. The production of soluble fish protein solution for use in fish sauce manufacture Ⅱ. The use of added enzymes. J. Food Technol. 14:603-612. 42. Beddows, C. G. and Ardeshir, A. G. 1979b. The production of soluble fish protein solution for use in fish sauce manufacture Ⅱ. The use of acid at ambient temperature. J. Food Technol. 14:613-623. 43. BeMiller JN and Whistler RL. 1996. Carbohydrates. In Food C hemistry, 3rd. ed. Fennena, O.R.(ed.)Marcel Dekker, Inc., New York, U.S.A.Brain, J. B. W. 1985. In“ Microbiology of

Fermented Food ” , Vol. 2. Elsevier Applied Science Pubilishers Ltd., New York. pp.1-4. 44. Brain, J. B. W. 1985. In “ Microbiology of Fermented Food ” , Vol. 2. Elsevier Applied Science Pubilishers Ltd., New York. p.1-4. 45. Chae, S. K., Itoh, H. and Nikkuni, S. 1989a. Effects of soy sauce and commercial proteolytic enzyme on the acceleration of fish sauce production. Korean J. Food Sci. Technol. 21:639-648. 46. Chae, S. K., Itoh, H. and Nikkuni, S. 1989b. The color measurem- ent and sensory evaluation for the acceleration of fish sauce production. Korean J. Food Sci. Technol. 21:649-654 47. Chayovan, S., Rao, R.M., Liuzzo, J.A., Khan, M.A. 1983. Chemical characterization and sensory evaluation of a dietary sodium-potassium fish sauce. J. Agric. Food Chem. 31:859-863. 48. Ebine, H., Kimura, E., Fukuzaki, K., Furuta, T., Maeda, H., and Yokotsuka, T. 1976. Burean of Foods: Standard Production and Circulation of Shoyu. Tokyo, Japan. p. 97. 49. Fardiaz, D. and Markakis, P. 1979. Amines in fermented fish paste. J. Food Sci. 44:1562-1563. 50. Fukami, K., Funatsu, Y., Kawasaki, K. andWatabe, S. 2004. Improvement of fish-sauce odor by treatment with bacteria isolated from the fish-sauce mush (moromi) made from frigate mackerel. J. Food Sci. 69:45-49. 51. Fukami, K., Ishiyama, S., Yaguramaki, H., Masuzawa, T., Nabeta, Y., Endo, K., Shimoda, M. 2002. Identification of distinctive volatile compounds in fish sauce. J. Agric. Food Sci. 50:5412-5416. 52. Fukushima, D, 1981. Soy protein for foods entering around soy sauce and tofu, J. Am. Oil Chem. Sci. 58:346-351. 53. Funatsu, Y. 2002. The taste and flavor of fish sauce prepared by the use of soy sauce koji. Nippon Shokuhin Kogyo Gakkaishi. 49:1-11. 54. Gildberg, A. 2001. Utilization of male Arctic capelin and Atlantic cod intestines for fish sauce production-evaluation of fermentation conditions. Biores. Technol. 76:119-123. 55. Guillerm, J. 1928.Le nucmam et 1 ’ industrie saumuriere en Indochine. Arch. Inst. Pasteur Indochine. NO.7,21-60 56. Jeng, S. S. 1977. Salted, salt-fermented and medical products. In Fisheries Processing Industry in Taiwan. JCRR Fish. Ser. 25A:177-183. 57. Kasahara, K., Itaya, M. and Nishibori, K. 1990. Effect of soysauce flavoring on improvement of sardine odor in “ Mirin-boshi ” . Nippon Suisan Gakkaishi 56:619-623. 58. Kasahara, K. and Nishibori, K. 1991. Effect of fermented seasoning flavoring on improvement of sardine odor in “ Mirin- boshi ” . Nippon Suisan Gakkaishi 57:737-741. 59. Lafont, R. 1955. Valeur alimentaire des sauce de poisson. Proceeding of Indo-Pacific Fish Council, 15th Meeting, Bangkok, Thailand, Sections II and III, p. 163. 60. Lerke, P., Farber, L., and Adams, R. 1967. Bacteriology of spoilage of fish muscle. Appl. Microbiol. 15:776. 61. Lopetcharat, K. and Park, J.W. 2002. Characteristics of fish sauce made from pacific whiting and surimi by-products during fermentation stage. J. Food Sci. 67:511-516 62. Migauchi, K., Inamori, K., and Vchida, K. 1981a. Studies in environmental factor in fermentation of shyu mash (II). Effects of aeration on growth of shoyu yeast(2). J. Japan Soy sauce Res. Int. 7:54-58. 63. Migauchi, K., Inamori, K., and Vchida, K. 1981b. Studies in environmental factor in fermentation of shyu mash (II). Effects of aeration on growth of shoyu yeast(2). J. Japan Soy sauce Res. Int. 7:13-18. 64. Mukker, G. L. 1965. Use of dinitrosalicyclic acid regant for determination of reducing sugar. J. Food Sci. 2:39-44. 65. Nakadi, T., Nasuno, S., and Iguchi, N. 1972. The action of peptidase from Aspergillus oryzae in digestion of soybean protens. Agric. Biol. Chem. 36:261-268. 66. Narahara, H., Koyama, Y., Yoshida, T., Pichangkura, S., Ueda, R. and Taguch, H. 1982. Growth and enzyme production in a solid state culture of Aspergillus oryzae. J. Ferment. Technol. 60:311-319. 67. NEDA, 1992. National Economic Development Authority. National Statistics Office. Manila, Philippines. 68. Okuzumi, M., Okuda, S., and Awano, M. 1982. Occurrence of psychrophilic and halophilic histamine-forming bacteria (N-group bacteria) on/in red meat fish. Bull. Jap. Sco. Sci. Fish. 22:41-47. 69. Orejana, A.M. and Liston, J. 1982. Agents of proteolysis and its inhibition in patis (fish sauce) fermentation. J. Food Sci. 47:198-203, 209. 70. Peralta, R.R., Shimoda, M., Osajima, Y. 1996. Further identification of volatile compounds in fish sauce. J. Agric. Food Chem. 44:3606-3610. 71. Saisithi, P., Kasemsarn, J., Liston, D., Alexander, M. 1966. Microbiology and chemistry of fermented fish. J. Food Sci. 31:105-110. 72. Shimoda, M., Yamamoto, Y., Cocunubo-Castellanos, J., Yoshimura, T., Miyake, M., Ishikawa, H., Osajima, Y. 2000. Deodorization of fish sauce by contimuous-flow extraction with microbubbles of supercritical carbon dioxide. J. Food. Sci. 65:1349-1351. 73. Shimoda, M., Peralta, R.R., Osajima, Y. 1996. Headspace gas analysis of fish sauce. J. Agric. Food Chem. 44:3601-3605. 74. Sigholt, T., Erikson, U., Rustad, T., Johansen, S., Nordtvedt, T. S. and Seland, A. 1997. Handling stress and storage temperature affect meat quality of farmed-raised Atlantic salmon (Slmo salar) J. Food Sci. 62:898-905. 75. Sikorski, Z.E., Gildberg, A., Ruiter, A. 1995. Fish products. In: Ruiter, A., editor. Fish and fishery products. Wallingford, UK: Cab International. p. 315-346. 76. Taylor, S.L. 1986. Histamine food poisoning: toxicology and clinical aspects. Crit. Rev. Toxicol. 17:91-128. 77. Uchida, M. Ou, J., Chan, B. W., Yuan, C. H., Zhang, X. H., Chan, S. S., Funatsu., Kawasaki, K I., Satomi, M.,and Fukuda, Y. 2005. Effects of soy sauce koji and lactic acid bacteria on the fermentation of fish sauce from freshwater silver carp Hypophthalmichthys molitrix. Fisheriesscience. 71: 422-430 78. Uyenco, V., Lawas, I., Brioles, P.R., Taruc, R.S. 1953. Mechanics of bagoong (fish paste) and patis (fish sauce) processing. In: Robert, T.A., Skinner, F.A., editors. Food microbiology advances and prospects. London, UK: Academic Press. p. 152-168. 79. Uyenko, V. and Lawas, I., Briones, P.R., and Taruc, P.S. 1952. Mechanics of bagoong (fish paste) and patis (fish sauce) processing. Technical Report No. 20. p. 1 Proc. Symp. Indo-Pacific Fish. Counc., 4th Proc., Manila, Philippines. 80. Whistler, R.L., and Daniel, J.R. 1985. Carbohydrates. In Food Chemistry, 2 nd ed. Fennena, O.R.(ed.) Marcel Dekker, Inc., New York, U.S.A 81. Yokotsuka, T. 1986. Soy sauce biochemisty. Adv. Food Res. 30:195 - 329. 82. Yong, F.and Wood, B.J.B. 1976. Microbial succession in experimental soy sauce fermentation. J. Food Technol. 11:525-536. 83. Yongsawatdigul, Y.J., Choi Y.J. and Udomporn, S. 2004 Biogenic amines Formation in Fish Sauce Prepared from Fresh and Temperatureabused Indian Anchovy (Stolephorus indicus). J. Food Sci. 69:C312-319.