香菇雞香氣成分形成之研究

蕭淑華、游銅錫 ; 張耀南

E-mail: 9808721@mail.dyu.edu.tw

摘 要

我國民間在傳統上常利用乾香菇、新鮮香菇與雞肉來烹煮香菇雞，在香菇雞肉之烹煮過程雞肉與香菇中之成分可能進行交互反應，使香菇雞具有獨特之香氣成分。就化學觀點而言，香菇之香氣成分主要為1-octen-3-ol、lenthionine 、dimethyl disulfide及dimethyl trisulfide；香菇特異香氣成分為含硫化合物其化學反應性很強，可能會於香菇雞烹煮過程與雞肉中的成分產生化學反應而賦予香菇雞特殊之香氣。 本論文實驗共分四部分進行，第一部分是以乾香菇、新鮮香菇、雞肉、乾香菇加雞肉及新鮮香菇加雞肉分別加熱迴流烹煮2小時，再進行香氣成分的抽提與鑑定。結果得知，在香氣成分的總含量上，新鮮香菇的香氣成分總量比乾香菇多，而乾香菇雞則比新鮮香菇雞的香氣成分總量比較多，這顯示出乾香菇與雞肉在加熱烹煮過程中，有比較多交互反應而產生較多的香氣成分。 第二部分將乾香菇雞及新鮮香菇雞中之香氣成分進行香氣成分的抽提在利用酸鹼區分法加以分析與鑑定，並由官能評品法以乾香菇雞有最佳整體喜好性。由酸鹼區分結果顯示在，雞肉之香味組成成分含量最多主要出現於第二（鹼性區分），其次出現在第三區分（微酸性），thiazoles類化合物具有烹煮肉之香味出現第一區分（微鹼性區分）。而乾香菇及新鮮香菇的含硫化合物主要出先於第二區分及第三區分，其次是第一區及第四區分。官能品評的結果其香菇雞肉味強度上，乾香菇加雞肉與新鮮香菇加雞肉無明顯差異。而在整體喜好性上則以乾香菇雞肉為佳。 第三部分是利用反應曲面法（RSM）設計實驗，以 不同比例之肉類前驅物質（Cysteine · HCl、Thiamine · HCl）及加強香菇香氣特徵產生之甲硫胺酸（Methionine）與乾香菇打碎液、雞肉酵素水解液混合之進行105℃，2小時密閉加熱模式反應，之後再將有反應液進行官能品評，找出肉味前驅物質與加強香菇香氣特徵之產生之甲硫胺酸之最佳添加量。再將有最佳香菇雞香味的反應液進行香氣成分的抽提與鑑定。結果得知，當雞肉水解液用量固定為60g 及香菇用量固定為15 g ，cysteine · HCl、Thiamine · HCl與Methionine之最佳值分別為0.09g、0.101及5.08g。另外在雞肉水解液、thiamine · HCl、cysteine · HCl與Methionine的混合反應液中鑑定到的主要香氣成分除了雞肉水解液的香氣成分aldehydes類及hydrocarbons類之化合物以外，還多alcohols、acids、梅納反應所得的產物，其中主要有furans類、thiophenes類、thiols類及sulfides類之化合物。 第四部份是以酸鹼區分法比較香菇雞熱反應液與香菇雞加Cysteine.HCl、Thiamine.HCl及Methionine之熱反應液中之香氣成分。結果得知，添加Cysteine.HCl、Thiamine.HCl及Methionine是可以促進肉味、香菇味及烘烤味之香氣成分的形成。

關鍵詞 : 乾香菇 ; 新鮮香菇 ; 香菇雞

目錄

參考文獻

1. 李益榮；楊正護；曾再富；黃慧櫻；林高塚 (1992) 雞肉蒸煮火腿製造改進之研究II-a.雞胸肉比例、食鹽、三聚磷酸鈉及冰水添加量對淘汰蛋雞肉蒸煮火腿官能品評及理化性狀之影響，中國畜牧學會會誌21 (2) : 213-228。 2. 李益榮；黃慧櫻；楊正護 (1992) 雞肉蒸煮火腿製造改進之研究II-b.淘汰蛋雞肉蒸煮火腿品評及理化性狀之潛在特性探討及品管方程式之建立，嘉義農專學報29:163-178。 3. 林高塚；曾再富；楊正護；李益榮 (1992) 雞肉蒸煮火腿製造改進之研究:IV機械嫩化及添加填充劑與黏著劑對經酸鹼處理之淘汰蛋雞腿肉製造蒸煮火腿品質之影響，食品科學19(2):149-160。 4. 林亮全 (1991) 淘汰蛋雞的利用-試製油炸脆雞片，食品科學18 (1):36-45。 5. 林高塚；周榮吉；曾再富；楊正護 (1993) 淘汰蛋雞與肉雞腿肉理化學性狀之比較，中國畜牧學會會誌22(4):423-432。 6. 林亮全；劉登城；郭秀蘭；賴娟娟；陳淑枋；陳明造 (1986) 淘汰雞的利用1.機械去骨後淘汰雞的屠體品質，中國畜牧學會會誌15(2):83-90。 7. 吳勇初；楊勝任 (1993) 淘汰種雞、蛋雞與肉雞製作雞肉餅品質之研究，中國畜牧學會會誌22(4):433-453。 8. 周榮吉；林高塚；曾再富 (1994) 淘汰蛋雞肉質之研究.酸鹼浸漬對腿肌之影響，中國畜牧學會會誌23(3):295-308。 9. 何其黨(1991) 食品加工過程所生成的香味，香料資訊3(3) :49-56. 10. 林欣榮 (1991) 簡介柑桔屬果汁之褐變. 食品工業23(7):10-27. 11. 許人平 (1992) 含硫化合物在肉類反應香料中所扮演的角色.食品工業24(8):40-48. 12. 范中寧 (2001)以淘汰蛋雞酵素水解液製備雞肉香料，大葉大學食品工程系碩士班，碩士論文，彰化縣，台灣。 13. 郭湘平 (1994) 酵素反應及梅納反應對香菇揮發性物質生成之影響，國立中興大學食品科學研究所，碩士論文，台中市，台灣。 14. 喬長誠，吳淳美 (1990) 香菇揮發性成分產生之研究，新竹食品工業研究所報告617-1號。 15. 彭秋妹、王家仁(1991)食品官能檢查手冊。食品工業發展研究所。新竹，p.10-33。 16. 程竹青(1987) 肉類香氣.食品香料化學與加工.115-131. 17. 程竹青、鄭靜桂(1988a) 以化學合成法及香料合成法製造中式食品香料(一).食品工業發展研究所研究報告505號. 18. 程竹青 (1987) 肉類香氣。食品香料化學與加工，吳淳美編。食品工業發展研究所，P115。 19. 陳秀蓮,馮筱慧,葉錦桐,蘇女淳,程竹青(1993) 中式調理食品用肉類調味料之研究與發展 (四) -以梅納反應製造肉類及仿肉類調味料. 食品工業發展研究所研究報告920號. 20. 陳明造；郭秀蘭；劉登城 (1994) 淘汰蛋雞的處理與應用，農林學報43(3):33-41。 21. 黃加成；紀學斌(1986)淘汰蛋雞之屠體性狀及其加工利用性，中國畜牧學會會誌15(2):71-81。 22. 黃加成 (1990) 蛋白分解?處理淘汰蛋雞肉對其機能性之影響，中國畜牧學會會誌19(1):65-71。 23. 黃淑琴 (1990) 香菇脂氧合酉每之純化及其特異性之探討，國立中興大學食品科學研究所，碩士論文，台中市，台灣。 24. 劉秀媛 (1997) 機械嫩化、包裝及儲藏時間對淘汰蛋雞胸肉品質之影響。東海大學食品科學研究所碩士論文。 25. 程竹青、鄭靜桂(1988b) 以化學合成法及香料合成法製造中式食品香料(二).食品工業發展研究所研究報告505號. 26. AOAC (1983) Official methods of analysis. Ed. By Horwitz,W.,A.O.A.C., Washington D. C., USA. 27. Buttery, R. G; Guadagni, D. G.; Ling, L. C. ; Steifert, R. M. ; Chen, C. C. and Wu, C. M.(1984) Volatile compontents of mushroom (Agaricus subrufecents). J. Food Sci. 49:1208. 28. Burton, H.S.；McWeeny. D.J.(1963) Non-enzymatic Burton, H.S.；McWeeny. D.J.(1963) Non-enzymatic browning reactions consideration of sugar stability. Nature. 197, 266-8. 29. Charpentier, B. A.; Sevenants, M. R. and Sander, R. A. (1986) In“ The Shelf Life of Foods and Beverages.“ G. Charalambous, (Ed). Elsevier Science, Amsterdam. pp. 143. 30. Chen, C. C.; Chen, S. D.; Chen, J. J. and Wu, C. M.(1984) Effects of pH value on the formation of volatiles of shiitake (Lentinus edodes), an edible mushroom. J. Agric. Food Chem. 32:999. 31. Chen, C. C.; and Ho, C. T.(1986) Identification of sulfurous compounds of shiitake mushroom (Lentinus edodes Sing.) J. Agric. Food Chem. 34:830-833. 32. Flament, I.(1989) Coffee, cocoa and tea. Food Review International 5(3):317-414. 33. Gasser, U. and Grosch, W. (1900) Primary odorants of chicken broth. A comparative study with meatbroths from cow and ox Lebensm Unters Forsch 190:3-8. 34. Gilbert I.I. and Arthur M. S. (1994) Unraveling the secret of meat flavor.Trends in Food Science & Technology October. Vol.5:314-321. 35. Guntert, M. Bertram H.-J., Hopp, R., Silberzahn, W., Sommer, H.；Werkhoff, P. (1992) Thermal generation of flavor compounds from thiamine and various amino acids. in:Recent developments in flavor and fragrance chemistry, p.215-239. 36. Heleer,S.R. and Milne,G.W.A.(1987) EPA/NIH mass spectral data base. Vol.1.,U.S. Government Printing Office, Washington, D.C.,USA. 37. Hodge, J.E.； Mills, F.D. ； Fisher, B.E. (1972) Compound of browned flavor derived from sugar-amine reactions. Cereal Sci. 38. Hofmann, T.；Schieberle, P. (1998) Quantitative model studies on the effectiveness of different precursor systems in the formation of the intense food odorants 2-furfurylthiol and 2-methyl-3- furanthiol Today 17(2) :393-408. 39. Kameoka, H., and Higuchi, M. (1976) The constituents of the steam volatile oil from Lentius edodes Sing.Nippon Nogei Kagaku Kaeshi 50(4) 185.(in Japanese) 40. Ito, Y. ; Toyoda, M. ; Suzuki, H. and Iwaida, M. (1978) Gas-liquid chromatographic determination of lenthionine in shiitake mushroom (Lentinus edodes) with special reference to the relation between carbon disulfide and lenthionine. J. Food Sci. 43:1287. 41. Iwami, K. ; Yasumoto, K. and Mitsuda, H. (1974). Mechanism of formaldehyde formation in Lentinus edodes. J. Jap. Soc. Food and Nitr. 27:393. 42. Iwami, K. ; Yasumoto, K.; Nakamura, K. and Mitsuda, H. (1975a) Properties of γ-glutamyltransferase from Lentinus edodes. Agr. Biol. Chem. 39:1933. 43. Iwami, K. ; Yasumoto, K.; Nakamura, K. and Mitsuda, H. (1975b) Reactivity of Lentinus γ-glutamyltransferase with lentinic acid as the principal endogenous substrate. Agr. Biol. Chem. 39:1941. 44. Iwami, K. and Yasumoto, K.(1982). Chaotropic ions in activation of γ-glutamyltransferase from fruiting bodies of Lentinus edodes. Agric. Biol. Chem. 46:761. 45. Iawami, K. ; Yasumoto, K. and Mizusawa, H. (1982) Enzymatic formation of thermostable“ antithiamine ” factor in fresh fruiting bodies of Lentinus edodes. Nippon Nogeikagaku Kaishi.56:905. 46. Joachim R. ； Werner B. (1994) Sulfur-containing furans in commercial meat flavorings. J. Agric. Food Chem. 42(10):2254-2259. 47. Kondaiah, N. ; Panda, B. (1989) Effect of phosphate and spent hen yolk on the quality of chicken sausages from spent hens.Poultry Sci. 68 (3):393-398. 48. Labuza, T.P. (1980). Effect of water activity on the reaction kinetics of food deterioration. Food Technol. 34(2):36-47. 49. Labuza, T.P.；Schmidl. M.K. (1986). Advances in the control of browing reactions in foods. In Role of Chemistry in the Quality of Processed Food. ed. Fennema,O.；Chang, W. ；Lii. C.-Y. Nutrition Press Westport. Connecticut, USA. p.80. 50. Leahy, M.M. (1985) The effects of pH, types of sugar and amino acid and water activity on the kinetics of the formation of alkyl pyrazines. Ph.D. Thesis, Feb., University of Minnesota, Department of Food Science and Nutrition,

St. Paul, Minnesota. 51. Liebich, H.M.； Douglas, D.R.； Zlatkis, A.； Muggler-Chavan, F.；Donzel, A.(1972) Volatile compoents in roast beef. J. Agric. Food Chem. 20:96-104. 52. Lwson, L. D. ; Hughes, B. G. (1992). Characterization of the formation of allicin and other thiosulfinates from garlic. Planta Med. 58:345. 53. Maga, J. A. (1981), “ Mushroom flavor ” review, J. Agric. Food Chem. 29,1 54. Maga J.A. (1982) Pyrazines in flavour. In food flavours part A: Introduction, Morton,I.D. MacLeod, A.J. eds. Devel. Food Sci.,Elsevier, Amsterdam. p.283. 55. MacLeod. G. (1986). The scientific and technological basis of meat flavors.In Developments in Food Flavours, ed. Brich,G. G.；Lindley, M.G, Elsevier, London. p191-223. 56. Min, B.S.； Ina, K.； Peterson, R. J.；Chang, S.S.(1977) The alkylbenzene in roast beef. J. Food Sci. 42:503 57. Morita, K. and Kobayashi, S. (1966) Isolation and synthesis of lenthionine, an odorous substance of shiitake, an edible mushroom. Tetrahedron letters No. 6, 573. 58. Mottram. D. S. (1991) Meat in volatile compounds in Foods and Beverages, ed. Maarse, H., Dekker, M. New York, 107-177. 59. Nakajima, N. ; Ichikawa, K. ; Kamada M. and E.Fujita, J.Agr.Chem. Soc. Japan 35,797,803(1961) 60. Noleau, I. and Toulemonde, B. (1986) Quantitative study of roasted chicken flavor. Lebensm. Wiss. U. Technol.,19,122- 125. 61. Noleau,I. and toulemonde,B.(1987) Volatile comp Onents of roasted chicken fat. Lebensm.Wiss.u.Technol., 20,37-41. 62. O ’ Brien, J. and Morrissey, P.A. (1989) Nutritional and Toxicological Aspents of the Maillard browning reaction in Food. Critical Reviews in Food Science and Nutrition. 28(3), p.221. 63. Odile H.； Jennifer M. A., Anton A. ；Elmore, J.S. (1992) The effectof xylose on the generation of volatiles from heated thiamine. FoodChemistry 44:381-389. 64. Ohloff, G and Flament, I. (1978) ” The role of hetero atomic substances in the aroma compounds of foodstuff ” Firmenich. Wien, Springer-Verlag, New York. 65. Rizzi, G.P. (1974) Formation of N-alkyl-2-acyl-pyrroles and aliphatic aldimines in model nonenzymatic browing reactions. J. Agric. Food Chem. 22:279-287. 66. Sasaki H.; Nakamura, N.; Aoyagi, Y.and Sugahara, T. (1988) The changes of free amino acids during rehydration of dried shiitake mushroom. Nippon Shokuhin Kogyo Gakkaishi. 35:90. 67. Sasaki, H. ; Saka, T.; Aoyagi, Y. and Sugahara, T. (1993) Changes in γ -glutamyltransferase activity and lenthionine content during rehydration and heating of dried shiitake mushroom. Nippon Shokuhin Kogyo Gakkaishi. 40:107. 68. Sullivan, J.E.；Kondtance, R.P.；Calhoun, M.J.；Talley, F.B.； Cording, J. J. ；Panasiuk, O. (1974) Flavor and storage stability of explosion-puffed potatoes: Nonenzymatic browning. J. Food Sci. 39:58-68. 69. Tandy; John S. and Nestec S. A. (1986) Chicken flavoratants and processes for preparing them Abstract. U. S. Patent 4,592,917. 70. Tang, J.; Jin, Q. Z.; Shen, G. H.; Ho, C. T and Chang, S. S. (1983) Isolation and indentfication of Volatile compounds from fried chicken, J. Agric. Food., Chem. 31,1287-1292. 71. TNO(1988) Compilation of mass spectra of volatile compounds in food, Central Institute for Nutrition and Food Research-TON.The Nethgerlands. 72. Tressl, R.D. ；Holzer, M.；Kossa, T. (1977) Formation of flavor components in asparaus. Ⅱ. Formation of flavor components in cooked asparagus. J. Agric. Food Chem. 25:459-467. 73. Tressl, R.；Helak, B.；Martin, N. (1985) Formation of flavor components from L-proline. In topic in flavour research. Berger, R.G.；Nitz S.；Schreier, P. eds. H. Eichhorn, Marzling-Hangenham. 74. Vernin, G.；Parkanyi, C. (1982) Mechanisms of formation of heterocyclic compounds in Maillard and pyrolyses reaction. In thechemistry if heterocylic flavouring and aroma compounds. Vermin, G. ed. Ellis Horwood, Chichester. p.151. 75. Wada, S. ; Nakatani, H., and Morita, K. (1967), “ A new aroma-bearing substance from shiitake, an edible mushroom. ” J. Food Sci. 32,559. 76. Yasumoto, K. ; Iwami, K. ; Baba, Y. and Mitsuda, H. (1971) Analysis of highly volatile compounds and determination of formaldehyde content in shiitake mushroom (Lentinus edodes). J. Jap. Soc. Food and Nutr. 24:463. 77. Yasumoto, K. ; Iwami, K. and Mitsuda, H. (1974) Enzymatic formation of shiitake aroma from non-volatile precursor(s)-lenthionine from lentinic acid. Mushroom Sci. 9（1）:371. 78. Yaylayan,V.;Forage,N.G.(1991)Determination of the Kinetics and mechanism of decomposition of tryptophan Amadori rearrengement product by RP-HPLC analysis. J. Agric. Food Chem. 39: 364-9. 79.Yu, T.H.；WU, C.M.；Ho, C.T. (1994a) Volatile compounds generated from thermal degradation of alliin and deoxyalliin in an aqueous sloution. J. Agric. Food Chem. 42(1):146-153. 80. Yu, T.H.；WU, C.M. ；Ho, C.T. (1994b) Meat-like flavor generated from thermal interactions of glucose and alliin or deoxyalliin. J. Agric. Food Chem. 42(4):1005-1009. 81. Yu, T.H.；WU, C.M. ；Ho, C.T. (1994c) Volatile compounds generated from thermal interactions of glucose and alliin or deoxyalliin in propylene glycol. Food Chem. 51:281-286. 82. Yaylayan,V.;Forage,N.G.(1991)Determination of the Kinetics and mechanism of decomposition of tryptophan Amadori rearrengement product by RP-HPLC analysis. J. Agric. Food Chem. 39: 364-9. 83. Yu, T.H.；WU, C.M. ；Ho, C.T. (1994a) Volatile compounds generated from thermal degradation of alliin and deoxyalliin in an aqueous sloution. J. Agric. Food Chem. 42(1):146-153. 84. Yu, T.H.；WU, C.M. ；Ho, C.T. (1994b) Meat-like flavor generated from thermal interactions of glucose and alliin or deoxyalliin. J. Agric. Food Chem. 42(4):1005-1009. 85. Yu, T.H.；WU, C.M. ；Ho, C.T. (1994c) Volatile compounds generated from thermal interactions of glucose and alliin or deoxyalliin in propylene glycol. Food Chem. 51:281-286.