麵粉之化學組成與水餃皮品質之相關性

闕壯勳、張基郁,陳齊聖

E-mail: 9018801@mail.dyu.edu.tw

摘 要

本研究探討五種不同麵粉之化學成分(水分、粗蛋白質、灰分及蛋白質組成)及其製成水餃皮後之蒸煮特性(吸水率、最大吸水量、增重率、增容率及耗損率)與品質(感官品評分數、抗張強度及色澤)，以分 析麵粉化學組成與水餃皮品質間之相關性。本研究所使用之麥種為AHRS (AMERICAN HARD RED SPRING) 、AHRW (AMERICAN HARD RED WINTER) 、ASW (AMERICAN SOFT WHITE) 、APW (AUSTRALIAN PRIME HARD) 與CWRS (CANADIAN WESTERN RED SPRING)；五種麵粉製做成水餃皮後，經由色澤測定、物性分析及感官品評比較其品質之差異，進而找出五種麵粉其最適之加工條件(攪拌加水量及攪拌時間) 。結果顯示五種麵粉製成水餃皮之最適加水量均為45%、攪拌時間均為10分鐘。 將五種麵粉基本組成與其水餃皮蒸煮特性進行相關性分析，結果顯示五種麵粉粗蛋白含量與蒸煮增重率、耗損率呈現顯著負相關；在麵粉水分含量方面也有相同的結果。麵粉基本組成與水餃皮品質之相關性分析方面，麵粉之粗蛋白含量與水餃皮之抗張強度及HUNTER B值呈顯著正相關；在麵粉水分含量方面也有相同的結果。 本研究依電泳分析之結果將麵粉蛋白質組成分成六個區分，其分子量分別為第I區分：116.0 ~ 97.4 KDA、第II區分：66.2 KDA、第III區分：45.0 KDA、第IV區分：36.0 ~ 24.0 KDA、 第V區分：24.0 ~ 19.7 KDA及第VI區分：19.7 ~ 6.5KDA。在麵粉之各蛋白質區分含量與水餃皮蒸煮特性相關性方面，第I、III、V及VI區分含量與水餃皮蒸煮增重率呈顯著負相關；第I區分含量與增容率呈顯著負 相關；第I、III、V及VI區分含量與耗損率呈顯著負相關。在麵粉之各蛋白質區分含量與水餃皮品質相關性方面，第 I、II、III、IV及V區分含量與生水餃皮抗張強度呈顯著正相關，第II、III及IV區分含量與熟水餃皮抗張強度呈顯著正相關；第I 與V區分含量與水餃皮之HUNTER B值呈顯著正相關，第VI區分含量與水餃皮白色度 (WHITE INDEX) 呈顯著負相關。

關鍵詞 : 水餃、水餃皮、化學組成、蛋白質、麵粉

目錄

參考文獻

1.工業局，1990，麵製品業現況調查計畫成果報告。經濟部工業局及中華麵麥食品工業技術研究所。 2.中國國家標準，1979，經濟部中央標準局印行。總號 551，類號N6002。 3.吳元欽，1992A，酵素在烘焙產品的應用。麵粉技術及品管研習(A)班資料彙編。中華麵麥食品工業 技術研究所編印。 4.吳宗沛，1992B，FARINOGRAPH與EXTENSOGRAPH的分析原理與二次加工利用。麵粉技術及品管研習(A) 班資料彙編。中華麵麥食品工業技術研究所編印。 5.林苾芬，1999，麵粉蛋白質組成與其麵糰物性之相關性。大葉工學院食品工程研究所碩士論文。 6.徐華強、黃登訓、謝健一、顧德材，1974。實用麵包製作技術P．139-140，142-143。中華麵麥食品 工業技術研究所編印。台北。 7.郭文怡，1991，麵粉的分級及成分特性。烘焙工業35 : 45-51。 8.陳勉之，1975，小麥蛋白質之組成及發酵麵食的製作功能。食品工業7（8）:15-18。 9.黃登訓，1988，硬質白麥。烘焙工業22:35-45。 10.黃宏隆，郭文怡，徐華強，1995麵條加工技術。中華穀類食品工業技術研究所，台北縣。 11.賴滋漢、金安兒，1991，食品加工學（製品篇），P.14-18。精華出版社，台中。 12.盧訓，林子清，1988，影響麵條品質質地之探究，食品科學， 18: 99-110。 13.盧訓，郭封谷，乳化劑和澱粉對東方式麵條品質之影響。食品科學，18(1): 315-323。 14.盧榮錦，1992，麵粉的品質與分析方法。美國小麥協會發行。 15.AACC. AMERICAN ASSOCIATION OF CEREAL CHEMIST. 1983. APPROVED METHODS. AACC. ST. PAUL, MN. 16.BAIK, B. K., Z. CZUCHAJOWSKA AND Y. POMERANZ, 1994. ROLE AND CONTRIBUTION OF STARCH AND PROTEIN CONTENTS AND QUALITY TO TEXTURE PROFILE ANALYSIS OF ORIENTAL NOODLES.CEREAL CH -EM. 71(4): 315-320. 17.BATEY, I. L., R. B. GUPTA AND F. MACRITCHIE, 1991. USE OF SIZE-EXCLUSION HIGH-PERFORMAN -CE LIQUID CHROMATOGRAPHY IN THE STUDY OF WHEAT FLOUR PROTEINS: AN IMPROVED CHROMATOGRA -PHIC PROCEDURE. CEREAL CHEM. 68(2): 207-209. 18.BEAN, M. M., P. M. KEAGY, J. G. FULLINGTON, F. T. JONES AND D. K. MECHAM, 1974A. DRY JA -PANESE NOODLES. II. EFFECT OF AMYLASE, PROTEASE, SALTS AND PH ON NOODLE DOUGHS. CEREAL CHEM. 51: 427-434. 19.BEAN, M. M., P. M. KEAGY, J. G.

FULLINGTON, F. T. JONESAND D. K. MECHAM, 1974B. DRY JAP -ANESE NOODLES. I. PROPERTIES OF LABORATORY PREPARED NOODLE DOUGHS FROM SOUND AND DAMA -GED WHEAT FLOURS. CEREAL CHEM. 51: 416-427. 20.BECKWITH ,A. C. AND J. S. WALL, 1996. REDUCTION AND REOXIDATION OF WHEAT GLUTENIN. BIOC -HEM. BIOPHYS. ACTA 130: 155-159. 21.BELITZ, H. D. AND W. GROSCH, 1987.CEREAL AND CEREAL PRODUCTS. FOOD CHEMISTRY., CHAPTER 15, SPRING-VERLAG. 22.BIETZ, J. A. AND F. R. HUEBNER, 1980. STRUCTURE OF GLUTEN :ACHIEVEMENTS AT THE NORTHERN REGIONAL RESEARCH CENTER. ANN. TECHNOL. AGRIC. 29: 249-253. 23.BIETZ, J. A. AND T. S. WALL, 1980. IDENTITY OF HIGH MOLECULAR WEIGHT GLIADIN AND ETHANO -L-SOLUBLE GLUTENIN SUBUNITS OF WHEAT: RELATION TO GLUTEN STRUCTURE. CERCEL CHEM. 57(6) : 415-421. 24.BILIADERIS, C. G., T. J. MAURIC AND J. R. VOSE, 1980. STARCH GELATINIZATION PHENOMENA STUDIED BY DIFFERENTIAL SCANNING CALORIMETRY. J. FOOD SCI. 45: 1669-1674, 1680. 25.BOHLIN, L. AND T. L. GARLSON, 1980. DYNAMIC VISCOELASTIC PROPERTIES OF WHEAT FLOUR DOUG -H:DEPENDENCE ON MIXING TIME. CEREAL CHEM. 57(3): 174-177. 26.BUSHUK, W. AND C. W. WRIGLEY, 1971.GLUTENIN IN DEVELOPING WHEAT GRAIN. CEREAL CHEM. 48: 448-455. 27.CAMPOS DT?STEFFE JS, NG PKW. 1996. MIXING WHEAT FLOUR AND ICE TO FORM UNDEVELOPED DOUGH . CEREAL CHEM. 73(1): 105-107. 28.CAMPOS DT?STEFFE JS, NG PKW.1997.RHEOLOGICAL BEHAVIOR OF UNDEVELOPED AND DEVELOPED WHEA -T DOUGH. CEREAL CHEM. 74 (4): 489-494. 29.CHANG, C. Y., P. R. SHYONG AND C. H. CHANG, 1997. THE EFFECT OF SOLVENT ON THE AXTRACTA -BILITY AND THE MOLECULAR SIZE DISTRIBUTION OF THE PROTEINS FROM WHEAT FLOUR.PROCEEDIN -GS OF THE NATIONAL SCIENCE COUNCIL, ROC, PART B: LIFE SCIENCES 21(1): 26-30. 30.CROSBIE, G. B. 1991. THE RELATIONSHIP BETWEEN STARCH SWELLING PROPERTIES, PASTE VISCOSI -TY AND BOILED NOODLE QUALITY IN WHEAT FLOURS. J. CEREAL SCI. 13: 145-150. 31.CROSBIE, G. B., W. J. LAMBE, H. TSUTSUI AND R. F.GILMOUR 1992. FURTHER EVALUATION OF THE FLOUR SWELLING VOLUME TEST FOR IDENTIFYING WHEAT POTENTIALLY SUITABLE FOR JAPANESE NOODLES. J. CEREAL SCI. 15: 271-280. 32.DANNO, G. 1981. EXTRACTION OF UNREDUCED GLUTENIN FROM WHEAT FLOUR WITH SODIUM DODECYL SULFATE. CEREAL CHEM. 58(4): 311 -313. 33.DEXTER, J. E. AND R. R. MATSUO 1978. THE EFFECT OF GLUTEN PROTEIN FRACTIONS ON PASTA DOUGH RHEOLOGY AND SPAGHETTI -MAKING QUALITY. CEREAL CHEM. 55: 44-57. 34.DEXTER, J. E., R. R. MATSUO AND B. C. MORGAN 1981. HIGH TEMPERATURE DRYING: EFFECT ON SPAGHETTI PROPERTIES. J. FOOD SCI. 46: 1741-1746. 35.DEXTER, J. E., PRESTON, K. R., TWEED, A. R., KILBORN, R. H. AND TIPPLES, K. H. 1985. RELATIONSHIP OF FLOUR STARCH DAMAGE AND FLOUR PROTEIN TO THE QUALITY OF BRAZILIAN-STYLE HEARTH BREAD AND REMIX PAN BREAD PRODUCED FROM HARD RED SPRING WHEAT. CEREAL FOODS WOR -LD 30(8): 511-514. 36.DOEKES, G. J. AND L. M. J. WENNEKES 1982. EFFECT OF NITROGEN FERTILIZATION ON QUANTITY AND COMPOSITION OF FLOUR PROTEIN. CEREAL CHEM. 59(4): 276-278. 37.DONG, H., R. G. SEARES, T. S. COX, R. C. HOSENEY, G. L. LOOKHART AND M. D. SHOGREN 1992 . RELATIONSHIPS BETWEEN PROTEIN, COMPOSITION AND MIXOGRAPH AND LOAF CHARACTERISTICS IN WHEAT. CEREAL CHEM. 69(2): 132-136. 38.GUPTA, R. B., BATEY, I. L. AND MACRITCHIE, F. 1992. RELATIONSHIPS BETWEEN PROTEIN COMP -OSITION AND FUNCTIONAL PROPERTIES OF WHEAT FLOURS. CEREAL CHEM. 69(2): 125-131. 39.HOSENEY, R. C. 1986. PRINCIPLE OF CEREAL SCIENCE AND TECHNOLOGY. 1ST ED. ST. PAUL, MN: AM. ASSOC. CEREAL CHEM. PP.3、327. 40.HOSENEY, R. C. AND J. M. FAUBION 1989. THE VISCOELASTIC PROPERTIES OF WHEAT FLOUR DOUG -HS. IN DOUGH RHEOLOGY & BAKED PRODUCT TEXTURE, ED. H. FARIDI & J. M. FAUBION PP. 29-66 . VAN NOSTRAND REINHOLD, NEW YORK. 41.HOSENEY, R. C. 1990.PRINCIPLES OF CEREAL SCIENCE AND TECHNOLOGY. PP. 136-137. AMERICAN ASSOCIATION OF CEREAL CHEMISTS, INC. ST. PAUL, MN, USA. 42.HUEBNER, F. R. 1977. WHEAT FLOUR PROTEINS AND THEIR FUNCTIONALITY IN BAKING. BAKER'S DIG. 51(5): 25, 154. 43.INOUE, Y. AND BUSHUK, W. 1992. STUDIES ON FROZEN DOUGHS. II. FLOUR QUALITY REQUIREMENT -S FOR BREAD PRODUCTION FROM FROZEN DOUGHS. CEREAL CHEM. 69(4): 423-428. 44.INOUE, Y., SAPIRSTEIN, H. D., TAKAYANAGI, S. AND BUSHUK, W. 1994. STUDIES ON DOUGHS. III. SOME FACTORS INVOLVED IN DOUGH WEAKENING DURING FROZEN STORAGE AND THAW-FREEZE CYC -LES. CEREAL CHEM. 71(2): 118-121. 45.KASARDA, D. D., J. E. BERNARDUN AND C. C. NIMMOM, 1976. WHEAT PROTEINS. ADV. CEREAL SCI . & TECHNOL. 1: 158-236. 46.KASARDA, D. D., C. C. NIMMO AND G. O. KOHLER 1971. PROTEINS AND THE AMINO ACID COMPOSI -TION OF WHEAT FRACTIONS. PP. 227-299. IN〃WHEAT: CHEMISTRY AND TECHNOLOGY〃, 2ND ED.Y . POMERANZ. ED. AM. ASSOC. CEREAL CHEM. ST. PAUL, MN. 47.KASARDA, D. D., WOODARD, K. M. AND ADALSTEINS, A. E. 1998. RESOLUTION OF HIGH MOLECULAR WEIGHT GLUTENIN SUBUNITS BY A NEW SDS-PAGE SYSTEM INCORPORATING A NEUTRAL PH BUFFER. CEREAL CHEM. 75(1): 70-71. 48.KOINK, C. M., D. M. MISKELLY AND P. W. GRAS, 1992. CONTRIBUTION OF STARCH AND NONSTARCH PARAMETERS TO THE EATING QUALITY OF JAPANESE WHITE SALTED NOODLES. J. SCI. FOOD AGRIC. 58: 403-406. 49.LAGOUDAKI, M., P. G. DEMERTZIS AND M. G. KONTOMINAS 1993. MOISTURE ADSORPTION BEHAVIOUR OF PASTA PRODUCTS. LEBENSM. WISS. U. TECHNOL. 26: 512-516. 50.L'ASZTITY, R., NEDELKOVITS, J. AND VARGA, J. 1970. THE STRUCTURE OF THE HIGH MOLECULAR WEIGHT PROTEIN COMPONENT OF GLUTEN. PAPER PRESENTED AT THE IUPAC SYMPOSIUM, RIGA. 51.L'ASZTITY, R. 1972. RECENT RESULTS IN CEREAL PROTEIN RESEARCH. PERIOD. POLYTECH. (TECH. UNIV. BUDAPEST) 16: 331. 52.MATSUO, R. R., J. W. BRADLEY AND G. N.

IRVINE 1972. EFFECT OF PROTEIN CONTENT ON THE COOKING QUALITY OF SPAGHETTI. CEREAL CHEM. 49: 707-711. 53.MEREDITH, O. B. AND J. J. WREN 1966.DETERMINATION OF MOLECULAR-WEIGHT DISTRIBUTION IN WHEAT FLOUR PROTEINS BY EXTRACTION AND GEL FILTRATION IN A DISTRIBUTION MEDIUM. CEREAL CHEM. 43: 169-186. 54.MIMOUNI, B., ROBIN, J. M., AZANZA, J. -L. AND RAYMOND, J. 1998. WHEAT FLOUR PROTEINS: ISOLATION AND FUNCTIONALITY OF GLIADIN AND HMW-GLUTENIN ENRICHED FRACTIONS. J. SCI. FO -OD AGRIC. 78: 423-428. 55.MISSKELY, D. M. 1984. FLOUR COMPONENTS AFFECTING PASTE AND NOODLE COLOR. J. SCI FOOD AGRIC. 35: 463-471. 56.MISSKELY, D. M. AND H. J. MOSS, 1985. FLOUR QUALITY REQUIREMENT FOR CHINESE NOODLE MAN -UFACTURE. J. CEREAL SCI. 3: 379-387. 57.MOSS, H. J. 1971. THE QUALITY OF NOODLES PREPARED FROM THE FLOURS OF SOME AUSTRALIAN WHEAT. AUST. J. EXP. AGRIC. ANIM. HUSB. 11: 243-247. 58.NAGAO, S., S. IMAI, S. SATO, Y. KANEKO, AND S. OTSUB,1976. QUALITY CHARACTERISTICS OF SOFT WHEATS AND THEIR USE IN JAPAN. I. METHODS OF ASSESSING WHEAT SUITABILITY FOR JAPA -NESE PRODUCTS. CEREAL CHEM. 53: 988-997. 59.NAGAO, S., S. ISHIBASHI, S. IMAI, T. SATO, T. KENBE, Y. KANEKO AND H. OTSUBO 1977. QUAL -ITY CHARACTERISTICS OF SOFT WHEATS AND THEIR UTILIZATION IN JAPAN. III. EFFECTS OF CRO -P YEAR AND PROTEIN CONTENT ON PRODUCT QUALITY. CEREAL CHEM. 54(2): 300-306. 60.NAGAO, S. 1981. SOFT WHEAT USES IN THE ORITEN. IN "SOFT WHEAT PRODUCTION, BREEDING, MIL -LING, AND USES" (W. T. YAMAZAKI AND C. T. GREENWOOD, EDS.), PP. 267, AACC, ST. PAUL, MINNESOTA. 61.NOVARO, P., M.G.D'EGIDIO, B.M. MARIANI AND S.NARIDI 1993. COMBINED EFFECT OF PROTEIN CONTENT AND HIGH -TEMPERATURE DRYING SYSTEMS ON PASTA COOKING QUALITY. CEREAL CHEM. 70 (6): 716-719. 62.ODA, M., Y. YASUDA, S. OKAZAK, Y. YAMAUCHI AND Y. YOKOYAMA 1980. A METHOD OF FLOUR QUAL -ITY ASSESSMENT FOR JAPANESE NOODLES. CEREAL CHEM. 57(4): 253-254. 63.OH, N. H., P. A. SEIB, C. W. DEYOE AND A. B. WORD, 1983.NOODLE. I. MEASURING THE TEXTU -RAL CHARACTERISTICS OF COOKED NOODLES. CEREAL CHEM. 60: 433-438. 64.OH, N. H., P. A. SEIB, C. W. DEYOE AND A. B. WARD, 1985A. NOODLES. II. THE SURFACE FIRM -NESS OF COOKED NOODLES FROM SOFT AND HARD WHEAT FLOURS. CEREAL CHEM. 62(6): 431-436. 65.OH, N. H., P. A. SEIB AND D. S. CHUNG 1985B. NOODLES. III. EFFECT OF PROCESSING VARIAB -LES ON QUALITY CHARACTERISTICS OF DRY NOODLES. CEREAL CHEM.62(6): 437-440. 66.OSBORNE, T. B. 1907. THE PROTEINS OF THE WHEAT KERNEL. PUBL. 84. CARNEGIE INSTITUTE OF WASHINGTON: WASHINGTON, D. C. 67.PASARIBU, S. J., TOMLINSON, J. D. AND MCMASTER, G. J. 1992. FRACTIONATION OF WHEAT FL -OUR BY SIZE EXCLUSION-HPLC ON AN AGAROSE-BASED MATRIX. J. CEREAL SCI. 15: 121-136. 68.PELTONEN, J. AND A. VIRTANEN 1994. EFFECT OF NITROGEN FERTILIZERS DIFFERING IN RELEASE CHARACTERISTICS ON THE QUANTITY OF STORAGE PROTEIN IN WHEAT. CEREAL CHEM. 71(L): 1 -5. 69.PENCE, J. W. AND H. S. OLCOTT 1952. EFFECT OF REDUCING AGENTS ON GLUTEN PROTEIN. CERE -AL CHEM. 29: 292-296. 70.POMERANZ, Y. 1987. MODERN CEREAL SCIENCE AND TECHNOLOGY, VCH PUBLISHERS, INC, U.S.A., 26-29. 71.POMERANZ, Y. 1988. WHEAT: CHEMISTRY AND TECHNOLOGY VOLUME II . PP. LL, AMERICAN ASSOCIAT -ION OF CEREAL CHEMISTS, LNC. ST, PAUL, MN, U.S.A. 72.RHO, K. L., D. K. CHUNG AND C. W. DEYOE, 1988. NOODLES. VII. INVESTIGATING THE SURFACE FIRMNESS OF COOKED ORIENTAL DRY NOODLES MADE FROM HARD WHEAT FLOURS. CEREAL CHEM. 65(4) : 320-326. 73.SAS INSTITUTE, INC. 1985. SAS USER'S GUIDE: STATISTICS VERSION 5TH ED. SAS INST. CARY, NC., U.S.A. 74.SCHOCH, T. J. AND D. FRENCH, 1947. STUDIES ON BREAD STALING. THE ROLE OF STARCH. CEREAL CHEM. 24: 231-249. 75.SHEWRY, P. R., A. R. TATHAM, J. FORDE, M. KREIS AND, B. J. MIIFLIN 1986. THE CLASSIFI -CATION AND NOMENCLATURE OF WHEAT GLUTEN PROTEIN: A REASSESSMENT. J. CEREAL SCI. 4: 97- 106. 76.SINGH, N. K., G. R. DONOVAN, I. L. BATEY AND F. MACRITCHIE 199OA.USE OF SONICATION AND SIZE-EXCLUSION HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY IN THE STUDY OF WHEAT FLOUR PROT -EINS. I. DISSOLUTION OF TOTAL PROTEINS IN THE ABSENCE OF REDUCING AGENTS. CEREAL CHEM. 67(2): 150-161. 77.SINGH, N. K., G. R. DONOVAN AND F. MACRITCHIE 199OB. USE OF SONICATION AND SIZE-EXCLUS -ION HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY IN THE STUDY OF WHEAT FLOUR PROTEINS RELAT -IVE QUANTITY OF GLUTENIN AS A MEASURE OF BREADMAKING QUALITY. CEREAL CHEM. 67(2): 161 -170. 78.SINGH, N. K., K. W. SHEPHERD AND G. B. CORNISH, 1991.A SIMPLIFIED SDS-PAGE PROCEDURE FOR SEPERATING LMW SUBUNITS OF GLUTENIN. J. CEREAL SCI. 14: 203-208. 79.STEVENS, H. H. 1992. CONTROL OF PRODUCT QUALITY IN THE MILL.麵粉場之良好作業規範研討會 專輯。中華麵麥食品工業技術研究所編印, 台北。 80.TATHAM, A. S. AND P. R. SHEWRY 1985.THE CONFORMATION OF WHEAT GLUTEN PROTEINS. THE SEC -OND STRUCTURE AND THERMAL STABILITIES OF A-, B-, AND Γ -GLIADINS. J. CEREAL SCI. 3: 103-113. 81.TOYOKAWA, H., G. L. RUBENTHALER, J. R. POWERS AND E. G. SHANUS 1989A. JAPANESE NOODLE QUALITIES I. FLOUR COMPONENTS. CEREAL CHEM. 66: 382-386. 82.TOYOKAWA, H., G. L. RUBENTHALER, J. R. POWERS AND E. G. SHANUS, 1989B. JAPANESE NOODLE QUALITIES II. STARCH COMPONENTS. CEREAL CHEM. 66: 387-391. 83.WALL, J. S. 1979. THE ROLE OF WHEAT PROTEINS IN DETERMINING BAKING QUALITY.IN RECENT ADVANCES IN THE BIOCHEMISTRY OF CEREALS, ED, D.L.LAIDMAN AND R. G. W. JONSE, ACADEMIC PRESS, NEW YORK