探討不同添加物部分取代小麥麵粉對義大利麵營養價值與烹煮品質之影響

邱恩亭(5129)

1/11/2017

大綱

一、前言

二、不同添加物和麵食-烹飪水的比例對義大利麵烹煮品質之影響

三、添加小麥胚芽和麩皮對義大利麵感官、烹煮品質和結構性質之影響

四、添加豌豆粉和關華豆膠對義大利麵化學成分、感官和烹煮品質之影響

五、結論

摘要

為了創造烹飪的多樣性，並有效利用當地作物和提高麵食的營養價質，各種非傳統 (nontraditional, NT) 配方被放入麵食中，然而添加非傳統成分往往會影響麵食製品的品質，進而影響消費者對這些產品的可接受度，因此本篇將探討不同添加物對義大利麵營養價值與烹煮品質 (cooking quality) 之影響。分別將玉米粉 (corn flour)、亞麻籽粉 (flaxseed flour)、扁豆粉 (lentil flour)、燕麥粉 (oat flour)、斑豆粉 (pinto bean flour)、黃豆粉 (soybean flour) 部分取代小麥麵粉，發現他們分別提升了義大利麵的蛋白質或脂質含量，且其最佳烹調時間 (optimum cooking time, OCT) 皆有縮短的現象，而烹煮損失 (cooking loss) 皆有增加的情形，添加豆科植物粉則使麵食硬度上升，另外，麵食-烹飪水的比例越小，所需的 OCT 越短。其次，分別將胚芽 (pollard) 和麩皮 (bran) 取代小麥麵粉，發現它們製成的義大利麵 OCT 也都縮短，且顯著提升其膳食纖維含量及抗氧化能力，但隨著添加量的增加，其顏色變得越深，烹煮損失有增加的情形，此外，隨著胚芽的添加量增加，澱粉消化率也跟著提升。而以豌豆粉 (pea flour) 部分取代小麥麵粉製成的義大利麵，隨著添加量的提升，其彈性越差，並且有較深的顏色和較大的硬度，最後發現，添加 15% 豌豆粉的義大利麵最接近感官可接受閾值 (sensory threshold value)，因此將 15% 豌豆粉的義大利麵另外添加關華豆膠 (guar gum) 以改善其品質，與未添加之組別相比，其呈現較佳的顏色，並有較低的澱粉消化率和較高的纖維含量。由上述結果可得知，不同添加物部分取代小麥麵粉製成義大利麵，提高了義大利麵的蛋白質、脂質、膳食纖維或抗氧化能力，但隨著添加量的提升，對麵食的顏色、質地與感官品評有些負面影響，因此未來仍須探討如何改善營養強化義大利麵的品質，以達到營養價值與品質皆有提升的效果。

參考文獻

Abdel-Aal, E.S.M., & Hucl, P. (2002). Amino acid composition and in vitro protein digestibility of selected ancient wheats and their end products. Journal of Food Composition and Analysis, 15, 737–747.

AbuHammad, W.A., Elias, E.M., Manthey, F.A., Alamri, M.S., & Mergoum, M. (2012). A comparison of methods for assessing dough and gluten strength of durum wheat and their relationship to pasta cooking quality. International Journal of Food Science and Technology, 47, 2561–2573.

Aravind, N., Sissons, M., & Fellows, C. (2011). Can variation in durum wheat pasta protein and starch composition affect in vitro starch hydrolysis? Food Chemistry, 124, 816–821.

Aravind. N., Sissons M., Egan N., & Fellows C. (2012). Effect of insoluble dietary fibre addition on technological, sensory, and structural properties of durum wheat spaghetti. Food Chemistry, 130, 299–309.

Borrelli, G. M., De Leonardis, A., Fares, C., Platani, C., & Di Fonzo, N. (2003). Effects of modified processing conditions on oxidative properties of semolina dough and pasta. Cereal Chemistry, 80, 225–231.

Brennan, C.S., Blake, D.E., Ellis, P.R., & Schofield, J.D. (1996). Effects of guar galactomannan on wheat bread microstructure and on the in vitro and in vivo digestibility of starch in bread. Journal of Cereal Science, 24, 151–160.

Brennan, C.S., & Tudoricã, C.M. (2008). Evaluation of potential mechanisms by which dietary fibre additions reduce the predicted glycaemic index of fresh pastas. International Journal of Food Science and Technology, 43, 2151–2162.

Chillo, S., Laverse, J., Falcone, P.M., Protopapa, A., & Del Nobile, M.A. (2008). Influence of the addition of buckwheat flour and durum wheat bran on spaghetti quality. Journal of Cereal Science, 47, 144–152.

Cleary, L., & Brennan, C. (2006). The influence of a (1–3)(1–4)-b-D glucan rich fraction from barley on the physico-chemical properties and in vitro reducing sugars release of durum wheat pasta. International Journal of Food Science and Technology, 41, 910–918.

Cubadda, R., Carcea, M., & Pasqui, L.A. (1992). Suitability of the gluten index method for assessing gluten strength in durum wheat and semolina. Cereal Foods World, 37, 866–869.

Daun, J.K., Barthet, J.V., Chornick, T.L., & Duguid, S. (2003). Structure, composition, and variety development of flaxseed. Thompson. In: Flaxseed in Human Nutrition, 2nd edn (edited by S.C. Cunnane & L.U. Thompson). Pp. 1–40. Champaign, IL: AOCS Press.

De La Peña, E., & Manthey, F.A. (2014). Ingredient composition and pasta : water cooking ratio affect cooking properties of nontraditional spaghetti. International Journal of Food Science and Technology, 49, 2323–2330.

Del Nobile, M.A., Baiano, A., Conte, A., & Mocci, G. (2005). Influence of protein content on spaghetti cooking quality. Journal of Cereal Science, 41, 347–356.

Dexter, J.E., & Matsuo, R.R. (1977). Influence of protein content on some durum wheat quality parameters. Canadian Journal of Plant Science, 57, 717–727.

Edwards, N. M., Biliaderis, C. G., & Dexter, J. E. (1995). Textural characteristics of whole-wheat pasta and pasta containing non-starch polysaccharides. Journal of Food Science, 60, 1321–1324.

Esposito, F., Arlotti, G., Maria Bonifati, A., Napolitano, A., Vitale, D., & Fogliano, V. (2005). Antioxidant activity and dietary fibre in durum wheat bran by-products. Food Research International, 38, 1167–1173.

Fares, P., Codianni, F., Nigro, C., Platani, F., Scazzina, & Pellegrini, N. (2008). Processing and cooking effects on chemical nutritional and functional properties of pasta obtained from selected emmer genotypes. Journal of the Science of Food and Agriculture, 88, 2435–2444.

Fares, C., Platani, C., Baiano, A., & Menga, V. (2010). Effect of processing and cooking on phenolic acid profile and antioxidant capacity of durum wheat pasta enriched with debranning fractions of wheat. Food Chemistry, 119, 1023–1029.

Grant, L. A., Dick, J. W., & Shelton, D. R. (1993). Effects of drying temperature, starch damage sprouting, and additives on spaghetti quality characteristics. Cereal Chemistry, 70, 676–684.

Gueguen, J., & Barbot, J. (1988). Quantitative and qualitative variability of pea (Pisum sativum L.) protein composition. Journal of the Science of Food and Agriculture, 42, 209–224.

Hoover, R., & Ratnayake, W.S. (2002). Starch characteristics of black bean, chick pea, lentil, navy bean and pinto bean cultivars grown in Canada. Food Chemistry, 78, 489–498.

Jenkins, D. J. A., Kendall, C. W. C., Augustin, L. S. A., Martini, M. C., Axelsen, M., & Faulkner, D. (2002). Effect of wheat bran on glycemic control and risk factors for cardiovascular disease in type 2 diabetes. Diabetes Care, 25, 1522–1528.

Kaur, G., Sharma, S., Nagi, H.P.S., & Basharat, N.D. (2012). Functional properties of pasta enriched with variable cereal brans. Journal of Food Science and Technology, 49, 467–474.

Kim, H.J., & White, P.J. (2012). In vitro digestion rate and estimated glycemic index of oat flours from typical and high b-glucan oat lines. Journal of Agricultural and Food Chemistry, 60, 5237–5242.

Lintas, C. (1988). Carbohydrates of durum wheat. In: Durum Wheat: Chemistry and Technology (edited by G. Fabriani & C. Lintas). Pp. 121–123. St. Paul, MN: American Association of Cereal Chemists.

Manthey, F.A., & Schorno, A.L. (2002). Physical and cooking quality of spaghetti made from whole wheat durum. Cereal Chemistry, 79, 504–510.

Manthey, F.A., Yalla, S.R., Dick, T.J., & Badaruddin, M. (2004). Extrusion properties and cooking quality of spaghetti containing buckwheat bran flour. Cereal Chemistry, 81, 232–236.

Matsuo, R. R., Dexter, J. E., Boudreau, A., & Daun, J. K. (1986). The role of lipids in determining spaghetti cooking quality. Cereal Chemistry, 63, 484–489.

Mongeau, R. (2003). Dietary fibre. In R. Macrae, R. K. Robinson, & M. J. Sadler (Eds.), Encyclopaedia of food science and nutrition (pp. 1362–1387). New York: Academic Press.

Nasehi, B., Mortazavi, S.A., Razavi, S.M.A., Nasiri Mahallati, M., & Karim, R. (2009). Optimization of the extrusion conditions and formulation of spaghetti enriched with full-fat

soy flour based on the cooking and color quality. International Journal of Food Science and Nutrition, 60, 205–214.

Padalino L., Mastromatteo M., Lecce L., Spinelli S., Contò F., & Del Nobile M. A. (2014). Chemical composition, sensory and cooking quality evaluation of durum wheat spaghetti enriched with pea flour. International Journal of Food Science and Technology, 49, 1544–1556.

Pascoe, D. A., & Fulcher, G. (2007). Biochemistry and compartmentalization of cereal grain components and their functional relationship to mammalian health. In L. Marquart, Jr. Jacobs, G. H. McIntosh, K. Poutanen, & M. Reicks (Eds.), Whole grains health (pp. 89–113). Oxford, UK: Blackwell Publishing.

Peña, E. de la, & Manthey, F. A. (2014). Ingredient composition and pasta:water cooking ratio affect cooking properties of nontraditional spaghetti. International Journal of Food Science and Technology, 49, 2323–2330.

Pereira, M.A., Kartashov, A.I., Ebbeling, C.B., & Van Horn, L. (2005). Fast food habits, weight gain, and insulin resistance the CARDIA study: 15 years prospective analysis. Lancet, 365, 36–42.

Petitot, M., Boyer, L., Minier, C., & Micard, V. (2010 a). Fortification of pasta with split pea and faba bean flours: pasta processing and quality evaluation. Food Research International, 43, 634–641.

Petitot, M., Barron, C., Marie Morel, H., & Micard, V. (2010 b). Impact of legume flour addition on pasta structure: consequences on its in vitro starch digestibility. Food Biophysics, 5, 284–299.

Pinarli, I., Ibanoglu, S., & Öner, M. D. (2004). Effect of storage on the selected properties of macaroni enriched with wheat germ. Journal of Food Engineering, 64, 249–256.

Rayas-Duarte, P., Mock, C.M., & Satterlee, L.D. (1996). Quality of spaghetti containing buckwheat, amaranth, and lupin flours. Cereal Chemistry, 73, 381–387.

Sabanis, D., Makri, E., & Doxastakis, G. (2006). Effect of durum flour enrichment with chickpea flour on the characteristics of dough and lasagne. Journal of the Science of Food and Agriculture, 86, 1938–1944.

Sandhu, K.S., Singh, N., & Kaur, M. (2004). Characteristics of the different corn types and their grain fractions: physicochemical, thermal, morphological, and rheological properties of starches. Journal of Food Engineering, 64, 119–127.

Stevenson, D.G., Doorebos, R.K., Jane, J., & Inglett, G.E. (2006). Structures and functional properties of starch from seeds of three soybean (*Glycine max (L.) Merr.*), varieties. Starch/Stärke, 58, 509–519.

Tahir, M., Lindeboom, N., Baga, M., Vandenberg, A., & Chibbar, R.N. (2011). Composition and correlation between major seed constituents in selected lentil (Lens culinaris Medik) genotypes. Canadian Journal of Plant Science, 91, 825–835.

Trowel, H., & Burkitt, D. (1986). Physiological role of dietary fiber: a ten years review. Journal of Dentistry for Children, 53, 444–447.

Tudoricã, C. M., Kuri, V., & Brennan, C. S. (2002). Nutritional and physicochemical characteristics of dietary fibre enriched pasta. Journal of Agriculture and Food Chemistry, 50, 347–356.

Vansteelandt, J., & Delcour, J.A. (1999). Characterisation of starch from durum wheat (Triticum durum). Starch/Stärke, 51, 73–80.

Wood, P.J. (2010). Oat and rye b-glucan: properties and function. Cereal Chemistry, 87, 315–330.

Watson, S.A., & Ramstad, P.E. (1991). Structure and composition. In: Corn Chemistry and Technology (edited by S.A. Watson & P.E. Ramstad). Pp. 53–82. St. Paul, MN: American Association of Cereal Chemists.

Yun-hui, C., Zhang, W., & Shi-ying, X. (2006). Antioxidant properties of wheat germ protein hydrolysates evaluated in vitro. Journal of Central South University of Technology, 13, 160–165.

Zhao, Y.H., Manthey, F.A., Chang, S.K.C., Hou, H.J., & Yuan, S.H. (2005). Quality characteristics of spaghetti as affected by green and yellow pea, lentil, and chickpea flours. Journal of Food Science, 70, 371–376.

Zhou, M., Robards, K., Glennie-Holmes, M., & Helliwell, S. (1998). Structure and pasting properties of oat starch. Cereal Chemistry, 75, 273–281.