

6th International Symposium on Gluten-Free Abstract

(A)宋文杰

Oral

Product development of gluten-free rice chiffon cake with yam and okra powder addition

Wen-Chieh Sung

Department of Food Science, National Taiwan Ocean University, Taiwan

Abstract

The present study aimed to create gluten-free chiffon cakes by replacing wheat flour with rice flour and adding yam and okra powder. The effect of yam's and okra water-soluble fiber on cake physicochemical properties was studied, including batter density, cake specific volume, color, texture, moisture content, water activity, total phenolic content, antioxidant, sensory scores and volatile compounds. Results revealed that yam and okra addition decreased crumb lightness value, and batter density. In contrast, batter viscosity increased with yam and okra powder levels, with the optimal amount being 10% for yam and 5% for okra powder. To identify the aroma compounds, headspace solid phase microextraction with gas chromatography-mass spectrometer (GC-MS) was used, and 24 compounds were identified in gluten-free chiffon cake with 10% yam addition. 1-octen-3-ol was the primary contributor, accounting for 89.9% odor activity value (OAV) of the aroma with a fruity, buttery, and mushroom odor. The remaining 9% of compounds (hexanal, 3-methylbutanal, 2-methylbutanal, pentanal, 2-methylpropanal, nonanal, octanal, and heptanal) had high perception thresholds. Thus, 1-octen-3-ol was identified as the key aroma compound in gluten-free chiffon cake with 10% yam addition, attributed to its low threshold. Gluten-free chiffon cake containing 5% okra powder showed significantly ($p < 0.05$) higher protein and ash contents as compared to their control and chiffon cake made with wheat flour. Although the overall acceptability of gluten-free chiffon cake supplemented with 10% okra powder had a lower ($p < 0.05$) overall acceptability than all cake samples, it was still shown acceptable to consumers. Gluten-free rice chiffon cakes with high nutrient contents and antioxidant activities can be processed by the incorporation of okra powder of less than 10% to increase the diversification of gluten-free foods. Gluten-free cakes with high amounts of okra powder addition would produce cake having high water content, total phenol content, DPPH radical scavenging activity, reducing power, hardness, chewiness, cohesiveness, batter viscosity, ash and crude protein content through

principal component analysis.

Keywords

Chiffon cake, gluten-free, yam, okra, rice flour

(B)賴喜美

● Oral

Slowering digestibility of rice starch by cooking with mung bean skin water extract

Hsi-Mei Lai and Kang Lu

Department of Agricultural Chemistry, National Taiwan University, Taipei 106,

TAIWAN

Abstract

Mung bean (*Vigna radiata*) is one common pulse widely used food ingredient in Asia. It has been reported that mung bean (MB) skin water extract (MBWE) is rich in phytochemicals, including phenolic acids and flavanols. Recently, modifying the digestibility of starch by interacting with phenolics has been studied. Therefore, a proposed concept, i.e. the dietary quality of starch-based foods could be improved by introducing MBWE during cooking, was delivered and the effect of MBWE on the pasting properties during cooking and digestibility of the cooked rice starch was investigated. The MBWE was obtained by soaking the cleaned MB in boiling water in a smoldering pot overnight. Then, the desirable amount of MBWE was used to cook the rice starch. A slightly higher pasting temperature and significantly lower peak viscosity (PV) and breakdown, and higher final viscosity when using MBWE cooked low amylose (AM) rice (TT30, AM=13.6%) and high AM rice (TNS14, AM=27.4%) starches than those cooked with distilled water were investigated. While, the MBWE did not change the pasting behavior of the waxy rice (TKW3, AM=1.4%) starch. A decreased content of rapidly digestible starch and the increased contents of slowly digestible starch and resistant starch of TT30 and TNS14 were found when cooked with MBWE at four tested water contents (55, 70, 85, and 90%) based on the results of *in vitro* starch digestibility measurements. These changes are more obvious in TT30 cooked with MBWE at 85% water content during storage for up to 14 days. Using the same amounts of vitexin (5.64 mg/g ds) and isovitexin (50.4 mg/g ds) in MBWE to cook rice starch and found that the mixture of pure phenolics decreased the PV only. According to the results of iodine affinity, FTIR, and x-ray diffractometry, the effects of MBWE on cooked rice starch digestibility were concluded due to the interaction of phenolics in MBWE with amylose, which was mainly through hydrogen bonding and hydrophobic interaction, maintained the starch granular integrity during cooking and resulted in the strong tendency of starch molecular reassociation during storage. This study provides an easy, safe, and effective way to improve the dietary quality of starch-based foods by simply cooking with MBWE.

Keywords: rice starch, mung bean, phenolics, *in vitro* digestibility.

● **Poster**

Development of gluten-free whole corn pasta by using a twin-screw extruder

Hsi-Mei Lai¹, Sung-yen Wu¹ and Shih-Tong Jeng²

¹Department of Agricultural Chemistry, National Taiwan University, Taipei 106, TAIWAN

²Institute of Plant Biology, National Taiwan University, Taipei 106, TAIWAN

Abstract

Two domestically bred and grown maize varieties, quality protein maize (QPM) and high amylose maize (HM), were the only ingredients used to make gluten-free whole corn pasta products. Three whole corn pasta products, QPM=100, QPM:HM=90:10, and QPM:HM=80:20, were produced by using a twin-screw extruder. Since whole grain flour was used, the freshly milled and storage at a low temperature before tempering should be kept in mind. Even tempering, which depends on particle size and its distribution, and tempering conditions, is the critical factor for getting good quality whole corn pasta. Three pasta products developed in this study contain high dietary fiber (11.94-16.71%, db), high bioactive compounds, including lutein (2.57-4.48 µg/g, db), zeaxanthin (4.73-7.72 µg/g, db), and total phenolics (6.43-9.53 mg ferulic acid equiv/g, db). Since QPM is the major ingredient, the superior composition of amino acids, containing tryptophan (0.44-0.68% protein, db) and lysine (1.42-2.09% protein, db), is obtained. As blended with HM, the cooked whole corn pasta own a good quality of dietary carbohydrates, which contain 70.89-73.95% of slowly digestible starch and resistant starch in total starch and result in a lower estimated glycemic index (eGI=68) than commercial corn pasta (eGI=76). The commercial corn pasta purchased from local market contains low contents of total dietary fiber (4.16%, db), lutein (0.28 µg/g), zeaxanthin (3.42 µg/g, db), total phenolics (1.97 mg ferulic acid equiv/g), tryptophan (0.31% in protein) and lysine (0.41% in protein) than the whole corn pasta products developed in this study. Using domestic non-genetic modified corn varieties cultivated according to good agricultural practice for corn pasta products production not only provides gluten-free products but also whole grain foods for people looking for health benefits.

Keywords: gluten-free, whole grain food, quality protein maize, high amylose maize.

(C)陳淑德

Study on enriching GABA and calcium in germinated brown rice

Su-Der Chen* Shao-Fu Tsou Pei-Jun Liao Hsin-Yun Hsu

Department of Food Science, National Ilan University, Taiwan 26041, ROC

*sdchen@niu.edu.tw

Abstract

Brown rice contains endosperm germ, and rice bran, thus it has more nutritional value than white rice, but it is also more difficult to eat because it contains rice bran. The germinated brown rice (GBR) can be induced the nutritional value and bioactive components such as γ -aminobutyric acid (GABA) beneficial to the human body useful to the human body by immersion soaking solution and high pressure processing (HPP) treatment, as well as improve the taste. Therefore, the objective of the study was to investigate on the effects of different calcium chloride soaking solutions or high-pressure processing (HPP) on the GABA and calcium contents of germinated brown rice. The results showed that after japonica brown rice soaking 6 h and germinating until 42 h at 25°C, and it was dried by 35°C cold air drying for 8 h to reduce moisture content to about 14%. The protein contents of germinated brown rice increased protein and decreased fatty acid. The calcium content of brown rice was 0.327 ppm, and germinated brown rice after 6 h soaking in RO water, 0.1% and 0.2% calcium chloride solution contained 0.404, 0.889 and 1.922 ppm calcium, respectively; and their calcium contents were 0.798 and 1.784 ppm in germinated brown rice by 100 MPa HPP treatment. GABA content of japonica brown rice was 10.55 mg/100g, and the GABA content of germinated brown rice was significantly increased to 27.71 mg/100 g, and the GABA contents of germinated brown rice soaked in 0.1% and 0.2% calcium chloride solution were 36.74 and 22.24 mg/100 g, respectively, which increased to 83.10 and 62.58 mg/100 g by 100 MPa HPP. Therefore, the treatment of germinated brown rice by soaking 0.1% calcium chloride solution and 100 MPa HPP can greatly increase the GABA and calcium contents.

Keywords: brown rice, germination, γ -aminobutyric acid (GABA), soaking liquid, calcium-enriched, high pressure processing (HPP)

(D)胡雪盈

Arabinogalactans in the dietary fiber of adlay (*Coix lacryma-jobi*)

Ting-Jang Lu^{1*}, Suet-Yine Woo¹, Po-Xuan Chen¹, Pei-Sheng Lee¹, Min-Hsiung Pan¹,

Wen-Chang Chiang¹

¹ Graduate Institute of Food Science and Technology, National Taiwan University, Taipei, Taiwan, R.O.C.

Abstract

Adlay (*Coix lacryma-jobi*) is a minor gluten-free crop containing proteins, lipids, and minerals similar to wheat and higher than rice. This grain is also known for being rich in phytochemicals and bioactive dietary fibers. Our data indicated that the dietary fiber content was 6.8% of whole grain and distributed in bran, embryo, and endosperm, in the ratio of 7.6% (soluble and insoluble ratio = 2 : 3), 10.3% (3 : 5), and 82.1% (4 : 7). The major sugar composition of soluble dietary fiber included mannose, arabinose, galactose and glucose in the molar ratio of 38.4%, 14.7%, 13.7% and 14.4%. Arabinogalactans in soluble dietary fiber showed activity to mitigate the inflammatory response of lipopolysaccharide, known as endotoxin, stimulation on RAW264.7, a murine macrophage cell line. The arabinogalactans comprise (1,3)-linked galactan backbone with high branching of arabinose side chains revealed through methylation linkage analysis and selective binding of β -galactosyl Yariv reagent. The arabinogalactan distributed in bran, embryo, and endosperm, in the ratio of 48.7%, 43.7%, and 7.6% through a quantitative Yariv reagent reaction. This study indicated that adlay is a good choice as gluten-free raw material with bioactive arabinogalactans.

Keywords: *Coix lacryma-jobi*, arabinogalactan, dietary fiber, Yariv reagent