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Processing and Cereal Products - Poster

Production Optimization of Golden Rice Analogs Using a Pasta Extruder and Response Surface Methodology

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The applications of corn and rice flour subjected to the extrusion and optimization process were observed to create the golden rice analog (GRA). A central composite design (CCD) with 2 factors (cornflour and feed moisture) was applied to obtain the optimum conditions for physical and cooking characteristics. The predicted optimum conditions were cornflour (70%) and feed moisture (33.56%), resulting in GRA with conditions 2.62 (g/g), 1.86%, 81.38, 4.32, 28.12, 4.95%, 6.58% and 4 min for water absorption index, water solubility index, lightness, redness, yellowness, water absorption ratio, cooking loss, and cooking time, respectively. Scanning electron microscope (SEM) analysis indicated that as the cornflour concentration was increased from 60-80%, the rice and corn flour bonded well and had a smaller pore size. Moreover, crude protein, crude fat, β-carotene content, and antioxidant activity in the GRA were higher than in Japonica rice.

Keywords: Golden rice analog, Response surface methodology, Pasta extruder, β-carotene, SEM

References:

1. Budi, F. S., P. Hariyadi, S. Budijanto and D. Syah. (2015). Effect of dough moisture content and extrusion temperature on degree of gelatinization and crystallinity of rice analogous. Journal of Developments in Sustainable Agriculture; 10: 91-100.
2. Bordoloi, R. and S. Ganguli. (2014). Extrusion technique in food processing and a review on its various technological parameters. Review Article; 1-3.
3. Dalbhagat, C. G. and Mishra, H. N. (2019). Effect of extrusion process conditions on system parameters: physicochemical properties and cooking characteristics of extruded fortified rice kernels. Journal of Cereal Science, 89, 1-9.
4. Dalbaghat, C. G., D. K. Mahato, and H. N. Mishra. (2019). Effect of extrusion processing on physicochemical, functional and nutritional characteristics of rice and rice-based products: A review; Trends in Food Science and technology;85; 226-240.
5. Fabbri, A., A. Angioloni, A. D Stevano, E. Fava, A. Guarnieri, and G Lorenzini. (2007). Preliminary investigation of pasta extrusion process: Rheological characterization of semolina dough. Journal of Agriculture Engineering; (2): 21-24.

B. Suet-Yine Woo (胡雪盈)

Profiling analysis of functional components in rice

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Abstract

In addition to essential nutrients, phytochemicals in cereals have attracted consumers' attention by increasing health awareness. This study explores the phytochemical profiles in six rice varieties using ultra-performance liquid chromatography-electrospray tandem mass spectrometry (UHPLC-DAD-HRMS) to compare brown with polished rice samples. Bran and germ are richer in phospholipids, sphingolipids, phytosterols, tocols, and polyphenols than endosperm. The content of phospholipids was in the range of 0.67 ~ 4.54 mg/g, and phosphatidylcholine was the major component in brown rice. Lignocerate (24:0) sphingosine was the major ceramide component accounting for 16 ~ 32% of sphingolipids (0.41 ~ 1.33 mg/g) in brown rice. Cycloartenyl ferulate, known as γ-oryzanol, was the major steryl ferulate phytosterol (135.83 ~ 262.02 μg/g). The brown rice samples also contained a similar amount of β-sitosterol in their free form (205.21 ~ 262.66 μg/g). The contents of α-tocomonoenol (10.34 ~ 27.86 μg/g) and γ-tocotrienol (11.41 ~ 18.06 μg/g) were higher than the content of α-tocopherol (8.45 ~ 12.61 μg/g) in brown rice samples. Brown rice contained a minuscule amount of phenolic acids (trace ~ 3.23 μg/g), and the p-coumaric acid was the major component. The sugar composition profile of soluble dietary fiber was also conducted to understand the properties of the major prebiotics of rice. The contents of mentioned phytochemicals in polished rice samples were significantly lower than the brown rice. This study provides information for brown rice quality control of functional components and supports promoting whole-grain consumption for health.

Keywords: brown rice, functional components, profiling analysis

C. Li-Yu Chen (陳立於)

Effects of buckwheat sourdough on the bread-making performances and nutrition properties of bread

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ABSTRACT

In this study, the bread-making performances and nutritional qualities of buckwheat sourdough bread were investigated. The sourdough fermentation was initiated by the spontaneous biota of the buckwheat flours and propagated by continuous back-slopping until the stability was reached. *Lactobacillus plantarum*, *Lactobacillus brevis,* and *Pediococcus pentosaceus* were identified in the stable sourdoughs by using culture-dependent techniques. An addition of 10 % buckwheat sourdough did not influence the baking characteristics of wheat bread, which led to similar specific volume (control, 4.8 ± 0.2 ml/g; bread with 10 % sourdough, 4.8 ± 0.2 ml/g) and hardness (control, 288.2 ± 25.9 g; bread with 10 % sourdough, 300.9 ± 28.7 g). However, addition of 20 % buckwheat sourdough decreased the bread volume (control, 4.8 ± 0.2 ml/g; bread with 20 % sourdough, 3.8 ± 0.2 ml/g) and significantly hardened the bread (control, 288.2 ± 25.9 g; bread with 20 % sourdough, 487.4 ± 54. g). Buckwheat sourdough positively influenced the nutritional properties of buckwheat flour and wheat bread, in terms of polyphenols (control bread, 18.6 mg GAE/100 g; bread with 10 and 20 % sourdough, 73.6 and 107.6 mg GAE/100 g, respectively) and phytic acid contents. Overall, the results of this study suggest that buckwheat sourdough could be a suitable formula for enhancing the nutritional properties of wheat bread without influencing the overall quality.

Keywords: Buckwheat, Sourdough, Baking, Bread

D. Su-Der Chem (陳淑德教授)

Using brown rice as a medium for *Hericium erinaceus* solid-state fermentation

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Abstract

Hericium erinaceus is a popular medicinal and edible mushroom. The objective of this study was to analyze GABA and erinacine A in *Hericium erinaceus* solid-state fermented mycelial products using germinated brown rice or brown rice as the medium. The results were showed that the GABA content reached to 169.8 mg/100g, when brown rice was soaked 6 hours and set 36 hours for continuous germination. The 3 kg germinated brown rice took only 17 minutes by 3 kW microwave drying to reach 13% moisture content; however, cold air drying took 4 hours. *Hericium erinaceus* solid-state 3-week fermented brown rice product had GABA 496.06 mg/100g and erinacine A 14.9 mg/100g. As a result, brown rice served as an excellent medium for *Hericium erinaceus* solid-state fermentation in order to improve the functional compounds.

Keywords: brown rice, germination, GABA, *Hericium erinaceus*, fermentation

E. Ting-Hsuan Sung (宋庭瑄)

Development and Analysis of Functional Pastry - Fermented Black Garlic Pineapple cake

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Pineapple cake is a sweet traditional pastry and dessert containing butter, flour, egg, sugar, and pineapple jam or slices widely eaten in Taiwan. However, pineapple cakes are high in calories, each serving (50 grams) contains about 250 calories. The oil-to-calorie ratio and sugar-to-calorie ratio are both higher than 20%, which increase the risk of cardiovascular disease. Black garlic (Allium sativum L.) is an emerging processed food obtained by fresh garlic under high temperature of fermentation. It is rich in bioactive components such as polyphenols, polysaccharides and organic sulfur compounds and also shows several biological activities such as antioxidant, anticancer, promoting gastrointestinal motility and liver protection. Therefore, the main purpose of this study is to partially replace the filling of traditional pineapple cake with local black garlic, and to develop and produce a sugar-reduced pastry. First, the production process of pineapple cake is established, and then the filling of traditional pineapple cake is replaced with black garlic in different proportions, and the sensory evaluation of consumers' preference is conducted. Among them, the change of S-allycysteine (SAC) content of black garlic in unroasted and roasted garlic are also quantified by HPLC-UV. The results show that the content of the unbaked (120.33±12.01 μg/g extract) and baked (107.33±18.00 μg/g extract) groups only cause a slight decrease, and the baking process can still retain more than 90 % of the SAC content in black garlic. The results of the sensory evaluation show that apart from the flavor test, there was no significant difference between the control group and the 10% black garlic group in other tests, indicating that the black garlic pineapple cake with 10% replacement has a high acceptance. According to the result, the black garlic pineapple cake has high consumer acceptance, and can retain more than 90% of the SAC content in black garlic after the baking process. In conclusion, this study suggests that the black garlic pineapple cake may be a novel functional pastry containing the functional components SAC.

Keyword: Pineapple cake, Black garlic, SAC, Functional pastry