World Academy of Science, Engineering and Technology
International Journal of Nutrition and Food Engineering
Vol:18, No:10, 2024

Effect of Wolffia globosa Incorporation on the Physical, Phytochemical and Antioxidant Properties of Breadsticks

Authors : May Phyo Wai, Tanyawan Suantawee

Abstract : The positive correlation between unhealthy diets (high in fats, sugars, carbohydrates, and low fibers) and the risk of non-communicable diseases (NCDs) like obesity, hypertension, diabetes, and heart diseases has led to a growing interest in healthier lifestyles and diets. Consequently, people are opting for foods rich in fiber and phytochemicals. Wolffia globosa, also known as duckweed or watermeal, is the smallest plant with high nutritional value, including protein, fiber, phytochemicals, and antioxidant properties. It offers numerous health benefits, such as improving gut health and lowering blood glucose levels, and it is widely available in Thailand. The purpose of this study was to develop nutritionally enhanced breadsticks utilizing vacuum heat-dried Wolffia globosa power (WP). Various concentrations of WP (0% as control, 5%, 10%, and 15 % w/w/) were added, and then the breadsticks' physical properties (hardness, fracturability, and color), phytochemicals (total phenolic compounds: TPC and total flavonoid contents: TFC), and antioxidant properties (DPPH radical scavenging activity (DPPH) and ferric reducing antioxidant power (FRAP) assay) were investigated. Experiments were done by triplicates and data was analyzed by one-way ANOVA. The results showed that the hardness, measured by a texture analyzer, increased significantly ($p<0.05$) with higher WP concentrations, reaching 2,897.01 ± 77.31 g at 15% WP from 1,314.41 ± 32.52 g of the control. In contrast, the lightness (L*), redness (a*), and yellowness (b*) of the breadsticks significantly decreased ($p < 0.05$) in a dose-dependent manner with added WP. Incorporating WP, rich in phytochemicals and antioxidants, into the flour significantly enhanced the TPC and TFC of the breadsticks ($p<0.05$), with TPC and TFC increasing dose-dependently rising to 1.8-fold and 3.5-fold at 15% WP, respectively. The antioxidant power, assessed by DPPH and FRAP assays, also showed a similar trend, with significantly higher values at 10% and 15% WP ($p<0.05$). These results indicate that adding WP significantly boosted the TPC, TFC, DPPH, and FRAP values of the developed breadsticks. Therefore, incorporating WP into breadsticks might be a promising strategy for creating food products enriched with phytochemicals and antioxidants, offering consumers healthier options in the market.

Keywords : antioxidant properties, breadsticks, phytochemicals, Wolffia globosa
Conference Title : ICFSN 2024 : International Conference on Food Science and Nutrition
Conference Location : Tokyo, Japan
Conference Dates : October 03-04, 2024