Utilising spent tea leaves powder as functional ingredient to enhance the quality of non-gluten shortbread cookies

ABSTRACT

The increasing prevalence of gluten-related disorders has led to higher consumer demand for convenient, gluten-free bakery products with health-promoting properties. In this study, nongluten shortbread cookies were incorporated with various kinds of spent (green, oolong, and black) tea leaves powder (STLP) at 8% w/w. Cookies with STLP had significantly higher ($p < 0.05$) moisture (2.18–2.35%), crude fibre (14.5–14.9%), total dietary fibre (22.38–22.59%), insoluble dietary fibre (15.32–15.83%), soluble dietary fibre (7.06–7.66%), and ash (1.9–2.0%) contents, but were significantly lower ($p < 0.05$) in carbohydrate (53.2–53.9%) and energy value (426.4–428.2 kcal) compared to control cookies (1.62%; 1.43%; 6.82%; 4.15%; 2.67%; 7.70%; 62.2%; and 457.8 kcal, respectively). The addition of STLP significantly enhanced ($p < 0.05$) the antioxidant properties of the cookies. Non-gluten shortbread cookies with spent green tea leaves powder (GTC) received the highest ($p < 0.05$) score for all sensory attributes, including overall acceptability. In addition, the shelf-life quality of the formulated cookie samples in terms of the moisture content, water activity, colour, texture, microbiology, and sensory properties was maintained ($p > 0.05$) for at least 22 days at 25 ◦C. STLP, which would have been previously thrown away, could be utilized as a potential functional ingredient to produce non-gluten shortbread cookies with enhanced nutritional, physicochemical, microbiological, sensory, and antioxidative properties.