

Production and optimisation of fermented pumpkin-based mature coconut water kefir beverage using response surface methodology

ABSTRACT

Fermentation of pumpkin puree and mature coconut water using water kefir grains is a potential method for producing a novel functional non-dairy-based probiotic drink. In the present study, response surface methodology based on Box–Behnken design (RSM-BBD) was used to optimise fermentation temperature and substrates' concentrations. The optimised fermentation temperature, pumpkin puree, and brown sugar concentrations of pumpkin-based mature coconut water kefir beverage (PWKC) were 27 °C, 20%, and 10% w/v, respectively. The optimised PWKC (PWKC_{opt}) obtained an overall acceptability (OA) score of 4.03, with a desirable *Lactobacillus* count (6.41 Log CFU/mL), 0.68% v/v lactic acid content, 31% of water kefir grains' biomass growth rate, and fermentation time (to reach pH 4.5) of 4.5 h. The optimized beverage, PWKC_{opt}, contained 3.26% proteins, 2.75% dietary fibre, 2186.33 mg/L of potassium, 180.67 mg/L phosphorus, and 137.33 mg/L calcium and had a total phenolic content of 89.93 mg GAE/100 mL, flavonoid content of 49.94 mg QE/100 mL, and carotenoid content of 33.24 mg/100 mL, with antioxidant activity (FRAP: 169.17 mM Fe(II)/100 mL, IC₅₀ value of DPPH free radicals scavenging activity: 27.17 mg/mL). Water kefir microorganisms in PWKC_{opt} remained stable for at least 56 days at 4 °C. Therefore, PWKC_{opt} might potentially serve as a value-added product, offering a basis for sustainable development within both the coconut and pumpkin industries.