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Optimal Drying Conditions for Production of Nutritious and Safe Cassava Leaves

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Abstract

The current study was conducted to optimise oven drying conditions of cassava leaves to maximise total antioxidant activity, beta carotene and minimise total cyanide content using Response Surface Methodology (RSM). I-optimal design with two independent variables: temperature (50–80) °C and time (3–8) hours was employed. Processed cassava leaves were analysed for total antioxidant activity (2,2-diphenyl-1 picrylhydrazyl (DPPH) radical scavenging assay), beta carotene and total hydrogen cyanide. Shelf life of the optimised cassava leaves was determined by evaluating the microbial count for 12 weeks. Analysis of variance showed that a linear model was significant for total hydrogen cyanide ($R^2 = 0.90$, $p < 0.05$) and beta carotene ($R^2 = 0.89$, $p < 0.05$) while quadratic model was significant for total antioxidant activity ($R^2 = 0.89$, $p < 0.05$). Response surface plots showed that an increase in temperature significantly increased total antioxidant activity and total cyanide content while total beta carotene reduced. The optimal drying conditions based on combination of all responses using desirability approach were: temperature (60°C) and time (3 hours). Under the above-mentioned optimal conditions the dried cassava leaves yielded total cyanide content 55.01 mg kg⁻¹, total antioxidant activity 54.06 mg VCE g⁻¹ and beta carotene 5,967.11 µg/100 g. There was a close agreement between experimental and predicted values. Total plate count and yeasts and molds of the optimised dried cassava leaves increased during storage for 12 weeks but did not exceed maximum acceptable safety values. This processing method can be applied in the production of a safe, shelf stable, nutritious, high antioxidant product in the nutraceutical and food industries.

Keywords: Cassava leaves, drying, nutritious, optimisation