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Prof. Dr. József Sárosi
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Réka Dobozi

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ANN MODELING OF NON-ESSENTIAL AMINO ACIDS CONTENT IN EXTRUDED MAIZE-BASED PRODUCT

Biljana Lončar¹, Vladimir Filipović¹, Milica Nićetin¹, Miloš Radosavljević¹, Ivica Đalović², Milenko Košutić³, Jelena Filipović³

¹Faculty of Technology Novi Sad, University of Novi Sad

²Field and Vegetable Crops Institute

³Institute of Food Technology, University of Novi Sad

e-mail: biljanacurcicc@gmail.com

ABSTRACT

Artificial Neural Network (ANN) modeling is widely applied in extruded product development to predict and optimize the effects of formulation and processing parameters on physicochemical, nutritional, and sensory properties of the final product. Extruded snacks are convenient ready-to-eat products that, when properly formulated, can provide improved nutritional quality and digestibility compared with traditional cereal-based snacks. *Chenopodium quinoa* (quinoa) is a nutritionally rich gluten-free pseudocereal, valued for its high-quality protein, essential amino acids, bioactive compounds, and adaptability to diverse environments, including successful cultivation under Serbian agroclimatic conditions with higher protein and essential amino acid content than wheat. In this study ANN modeling was utilized to predict the non-essential amino acids content of quinoa-enriched maize-based extruded products. A multilayer perceptron model was created to estimate alanine, arginine, aspartic acid, glutamic acid, glycine, histidine, proline, serine, and total non-essential amino acids content as functions of screw speed (350, 500, and 650 rpm) and quinoa addition (0%, 10%, 20%, and 30%). To ensure robust validation, the dataset was divided into training (60%), testing (20%), and validation (20%) subsets, and 100,000 models were generated to identify the optimal model configuration. The developed model revealed excellent predictive performance $R^2 > 0.97$ and demonstrated a good fit to the data. The ANN modeling was confirmed to be reliable for the proposed application.

Keywords: extrusion, corn, quinoa, amino acids, artificial neural network

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