

Abstract

The growing demand for nutritious plant-based snack products has increased interest in utilizing alternative protein sources such as edamame. This study aimed to develop and optimize an edamame-based cereal bar by evaluating the effects of processing methods and formulation ratios on physicochemical properties and sensory acceptance. Preliminary sensory evaluation was conducted to compare baked and no-bake cereal bars using hedonic and Just-About-Right (JAR) tests. Formulation optimization was then carried out using Response Surface Methodology (RSM) through DesignExpert software by varying the proportions of bean and nut group, cereal group, and sweetener group ingredients. The optimized formulations were evaluated for color, texture profile, protein content, moisture content, and sensory acceptance using a 9-point hedonic scale. Results showed that the baked cereal bar had significantly higher scores for texture, sweetness, saltiness, umami, and overall liking. Therefore, the baked method was selected for further optimization. Significant differences ($p \leq 0.05$) were observed among formulations for several physicochemical and sensory attributes. Numerical optimization identified an optimum formulation consisting of 45% bean and nut group, 15% cereal group, and 20% sweetener group, which provided a desirable balance between nutritional quality, physicochemical characteristics, and consumer acceptance. Model validation showed percentage errors ranging from 0.10% to 29.05%, indicating that the optimization model was generally adequate for predicting the responses. Overall, the optimized edamame-based cereal bar showed high sensory acceptance and desirable physicochemical properties, supporting its potential as a nutritious plant-based snack product for health-conscious consumers.

Keywords: *Cereal Bar, Edamame, Product Optimization, Response Surface Methodology, Sensory Evaluation*