



Tropentag, September 9-11, 2020, virtual conference

“Food and nutrition security and its resilience
to global crises”

Response Surface Methodology Models for Optimisation of Traditional Fermentation of Cowpea Leaves

JOSHUA OWADE¹, GEORGE ABONG², MICHAEL OKOTH³, AGNES MWANG'OMBE⁴

¹*University of Nairobi, Dept. of Food Science, Nutrition and Technology, Kenya*

²*University of Nairobi, Dept. of Food Science, Nutrition and Technology, Kenya*

³*University of Nairobi, Dept. of Food Science, Nutrition and Technology, Kenya*

⁴*University of Nairobi, Dept. of Plant Science and Crop Protection, Kenya*

Abstract

Cowpea leaves is one of the African leafy vegetables that has been promoted to mitigate food and nutrition insecurity in arid and semi-arid lands of western and eastern Africa. Spontaneous fermentation of this vegetable is one of the traditional processing techniques that have been heavily utilised to improve the keeping quality and sensory attributes while inadvertently imparting health benefits. However, the vegetable has been shown to have minimal fermentable sugars for optimal action of the bacteria thus the process tends to be slow and the product quality less optimal. The current study utilised the central composite design of the response surface methodology (RSM) to optimise the spontaneous fermentation of cowpea leaves. The RSM model generated 20 runs with the independent variables being concentrations of sugar and salt and period of fermentation in days whereas the pH and titratable acidity of the fermented vegetable were the response variables. The models showed significant ($p < 0.01$) changes in the pH and titratable acidity with R^2 of 0.89 and 0.60, respectively. Change in the concentration of sugar and period of fermentation significantly ($p < 0.05$) affected the pH and titratable acidity of the fermented vegetables. Salt concentration and interaction of the independent variables did not significantly ($p > 0.05$) influence the changes in the response variables. The RSM model generated the optimal fermentation conditions as 2% salt and 5% sugar concentration and 16 days fermentation period; optimal response variables were 3.8 and 1.23% for pH and titratable acidity, respectively with a desirability of proportion of 85.9%. Optimal concentrations of sugar and salt and period of fermentation improved the action of the natural culture in fermented cowpea leaves. To avert the challenges of poor product quality and slow fermentation process among the traditional communities, the addition of sugar and salt to the vegetables and optimisation of fermentation period should be observed.

Keywords: Desirability proportion, fermentation, response variables, titratable acidity