



Optimization of Mixed Carrot and Beetroot Juice Using *Lactobacillus Brevis* and Its Effects on Colon Cancer Cell Line HCT116

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Abstract

Introduction: Formulation of new food supplements/food and beverages that contain probiotic ingredients and exhibit health-promoting properties has been one of the important focuses of the food scientists and the preference of the health-conscious consumers. The objective of the study was to develop a novel probiotic mixed carrot and beetroot juice with appropriate fermentation parameters using *Lactobacillus brevis*.

Methodology: The current study demonstrates a multivariate statistical optimization to determine the suitable conditions (proportion of starter culture, additional sugar, proportion of beetroot juice) for fermentation of probiotic carrot and beetroot juice. Artificial Neural Networking (ANN) was also used to validate the optimization. The optimized fermented juice was subjected to biochemical, infrared, and GC-MS (Gas chromatography-mass spectrophotometry) studies. MTT [3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide] assay and wound-healing cell migration assay were performed to study the anti-carcinogenic property of the optimized juice on the colon cancer cell line HCT116.

Results: The optimized parameters for the production of the juice were 2% inoculum (*L. brevis*), 0.67% additional sugar (dextrose), and 30.1% beetroot juice obtained from RSM. Both RSM and ANN models yielded good quality predictions, but ANN model results were accurate due to higher R^2 and lower AAD (absolute average deviation) values. GC-MS study revealed the generation of novel bioactive compounds and flavouring compounds during the fermentation such as piperidine, 2,2,6,6-tetramethyl-, 1,3,5-benzenetriol, γ -decalactone, 1,2:5,6-dianhydrogalactitol, and strychnine. The MTT assay after 72h treatment with juice samples showed that in a dose of 10 μ l and 15 μ l, the cell viability ratio was 25% and 13% in the fermented juice treated cells whereas it was 42% and 28% in the unfermented juice treated cells, respectively. The wound closure cell migration assay in different time intervals of 0h, 12h, 24h, 36h, and 48h, also exhibited a decrease in the cell migration (colon cancer) at a dose of 10 μ l and 15 μ l of fermented optimized juice as compared to unfermented juice.

Conclusion: The study illustrated the optimization and validation of a novel process for the preparation of probiotic carrot and beetroot juice with health-promoting properties.

Biography: Sachin Mahanta

Sachin Kumar Mahanta is a Doctoral student in KIIT School of biotechnology, Bhubaneswar, India. He is currently working on functional foods and fermentation technology in ARL at KIIT School of biotechnology. He had completed his post-graduation in Biotechnology and his dissertation work demonstrate the role of lactic acid bacteria in sour beer and statistical optimization to determine the appropriate fermentation conditions for enhancement of the nutritional attributes in sour beer practically.