

Advanced Processing Techniques for Probiotic Fermented Vegetable Juice: Exploring its Impact on Gut Microbiota of Human

Shubha Singh and Anshuman Roy*

Amity Institute of Biotechnology, Amity University Lucknow, India
Research And Development, Regional Food Research and Analysis Centre, India
shubhasingh51@gmail.com

Abstract: *In today's fast-paced society, many individuals neglect their health, particularly their digestive systems, due to hectic schedules and poor diets. Probiotics, beneficial bacteria known to enhance gut health, can support a healthy lifestyle and are increasingly being incorporated into functional foods. While dairy-based probiotic products have traditionally dominated the market, there is a growing interest in non-dairy alternatives such as fruit and vegetable juices. These juices are rich in bioactive components and are suitable for those who are lactose intolerant or prefer plant-based options. This study evaluates the development and analysis of a probiotic-enriched bitter melon (*Momordica charantia* Linn.) juice, focusing on sensory attributes, microbial viability, pH, total soluble solids (TSS), titratable acidity, protein, fat, ash, moisture, total solids, mineral content, carbohydrate, and energy content over a 3-day fermentation period and subsequent 21-day storage at 4°C. Sensory analysis indicated that while fresh juice scored higher in color and texture, probiotic juice developed a favourable flavour over time. The overall acceptability between fresh and probiotic juices was comparable. Microbiological analysis showed an increase in total viable counts from (105) CFU/ml on day 1 to (107) CFU/ml by day 3, maintaining stability during storage. The pH ranged from 4.3 to 5.5, indicating slight acidity, while TSS increased to 2 °Brix. Protein, fat, ash, moisture, and total solids content all showed an upward trend during fermentation, suggesting significant biochemical changes. Mineral analysis revealed consistent levels of iron, sodium, potassium, and calcium. Carbohydrates and energy content increased progressively, enhancing the nutritional profile of the juice. After 21 days of storage, the probiotic juice maintained acceptable pH, TSS, titratable acidity, and viable cell counts, with sensory evaluations indicating sustained or improved flavor, color, aroma, and texture. The findings support the potential of probiotic bitter melon juice as a functional beverage with health benefits and good consumer acceptability.*

The findings are anticipated to contribute to the development of healthy, non-dairy probiotic beverages, meeting consumer demand for dairy-free and vegan-friendly options, and promoting better digestive health through increased probiotic intake..

Keywords: Probiotics, pH, Fermentation, Temperature, Bitter melon, vegetable