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PHYSICO-CHEMICAL CHARACTERIZATION OF FRUIT-BASED CHUTNEYS USING MULTIVARIATE ANALYSIS

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Abstract: This study aimed to characterize three chutney formulations with different fruit compositions, based on mango (*Mangifera indica L.*), a combination of mango and aronia (*Aronia melanocarpa*), and kiwi (*Actinidia deliciosa*), respectively, using selected physicochemical parameters and multivariate statistical analysis.

• Introduction

Fruits, vegetables, herbs, and spices are the main ingredients of chutneys, which are liquid or semi-solid condiments. They are usually pounded or ground into a paste, which produces a variety of textures, from smooth to chunky. Chutneys are renowned for their complex flavor profiles, which frequently combine notes of sweetness, sourness, spice, and salt.

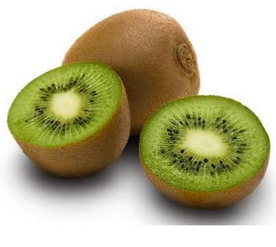
• Material and method

• Materials

To achieve the proposed objective, 3 chutney formulas were prepared: mango chutney, mango and aronia chutney and kiwi chutney.







• Methods:

Standardized analytical methods recommended by AOAC (2000) were applied to determine physico-chemical and nutritional parameters (moisture, dry matter, ash, vitamin C content, as well as titratable acidity) for chutney samples.

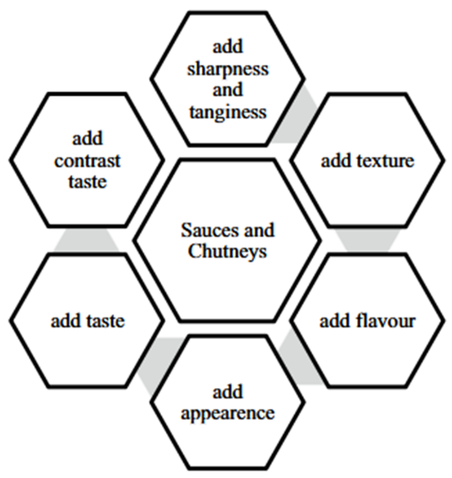


Fig. 1 Significance of sauces and chutneys in food (Pandey, N., et al., 2025)

• Results and discussions

Principal Component Analysis (PCA) and Hierarchical Cluster Analysis (HCA) were used to assess the relationships among the analyzed variables, identify the main sources of variation, and highlight differences among the chutney samples based on their physicochemical profiles.

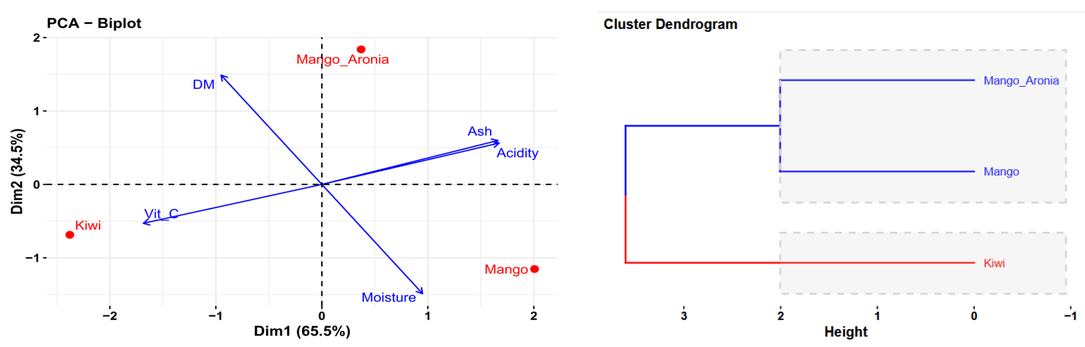


Fig. 2. Multivariate analysis of the chutney formulations: (a) PCA biplot of the chutney formulations and physicochemical parameters; (b) HCA cluster dendrogram of the chutney samples

• Conclusions

- The PCA results showed that the first two principal components accounted for 100% of the total variance (the first dimension explaining 65.5% and the second dimension explaining 34.5%), providing a clear multivariate perspective on the compositional characteristics of the products.
- Both the PCA biplot and the HCA dendrogram grouped the mango and mango–aronia formulations in a common cluster, while the kiwi chutney was clearly separated from the rest of the formulations due to its physicochemical profile.
- The physicochemical characterization, together with PCA, is a comprehensive method to evaluate fruit-based chutneys.
- This approach may be useful for identifying the parameters strongly related to product differentiation and for supporting further studies on development and quality assessment of new fruit-based condiments.