IOCFE 2025 Conference
The 1st International Online Conference on Fermentation
12–13 November 2025 | Online
MDPI

Metabolomic Diversity and PCA-Based Nutraceutical Insight of Fermented Bamboo Shoots from Manipur, India

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INTRODUCTION & AIM

- **Traditional Relevance:**

Fermented bamboo shoots (FBSs) are a vital part of Manipur's indigenous cuisine, cherished for their unique flavor and health-promoting qualities.

FS1 (New Soibum), FS2 (Aged Soibum), and FS3 (Soidon)

- **Research Gap:**

Despite their popularity, the biochemical diversity and nutraceutical potential of FBSs remain largely unexplored.

- **Objective:**

To profile metabolites of three FBS samples- FS1 (New Soibum), FS2 (Aged Soibum), and FS3 (Soidon) using LC–QTOF–MS and PCA to assess biochemical diversity.

METHOD

Sample Collection and Sample Preparation

- **Sample Preparation**

Samples were freeze-dried, ground, and methanol-extracted (3 g each).
Extracts were filtered, concentrated, and stored at –20 °C for analysis.

- **LC–QTOF–MS Analysis** Metabolites analyzed by Liquid Chromatography–Quadrupole Time-of-Flight Mass Spectrometry (LC–QTOF–MS). Both positive and negative ionization modes used for broad profiling.

Yoshida et al.,2016

- **Multivariate Data Analysis**

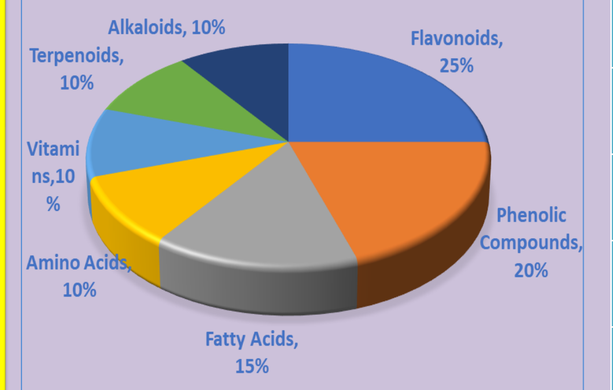
LC–QTOF–MS data were normalized and processed using MetaboAnalyst.
Principal Component Analysis (PCA) was performed to visualize metabolite diversity and clustering.

ACKNOWLEGEMENT: The authors gratefully acknowledge the Department of Science and Technology (DST), Government of Manipur (***File No. 23/05/2023 R&D-Biotech/DST/375)*** Special thanks to HOD, Department of Zoology for guidance and support.

RESULTS & DISCUSSION

- The results showed that LC–QTOF–MS identified 371 unique metabolites across the three samples.
- Major classes included flavonoids, phenolic acids, amino acids, fatty acids, vitamins, and alkaloids.

Fig.1. METABOLITE PROFILE IN FERMENTED FOODS

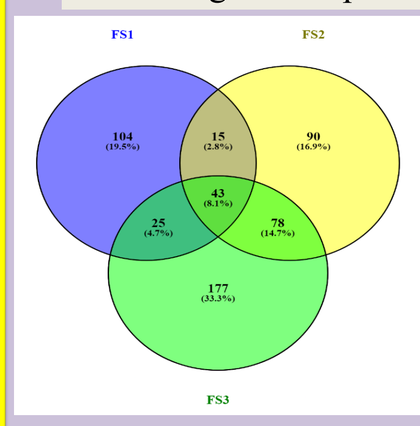


Key Metabolites Identified (Table 1)

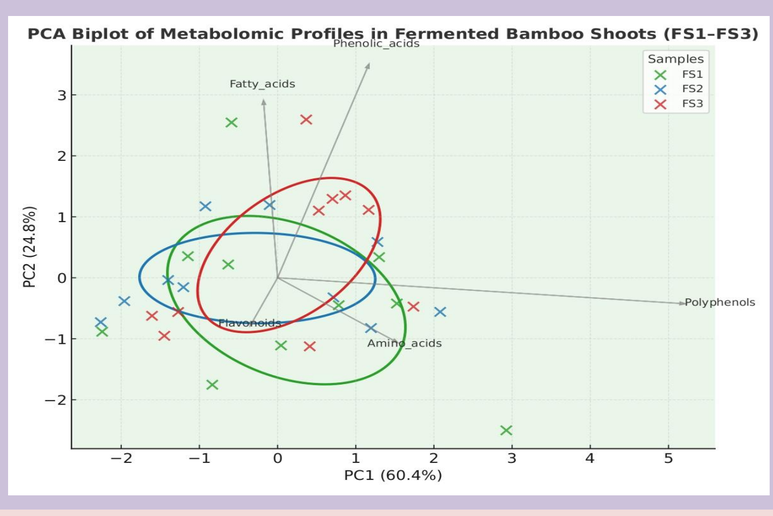
Sample	Notable Compounds	Nutraceutical Function
FS1	(3β,5α,9α,14α,22E,24R)-Tetrahydroxyergosta-7,22-dien-6-one	Antioxidant, anti-cancer
FS2	(E,E)-2,4-Decadienoic isobutylamide	Immunomodulatory
FS3	(+)-12-Methyl myristic acid	Anti-inflammatory
FS1	S-cis-N-methylstylopine	Anti-microbial
FS3	(-)-menthyl β-D-glucoside	Gut health enhancer

Thokchom et al.,2020, Fermentation

Fig.2. Comparative Metabolite Profile of FS1, FS2, and FS3



➢ Results showed that FS3 was metabolically distinct, rich in bioactive compounds



➢ Results showed FS3 (Soidon) exhibited the showed highest metabolite diversity, while FS1 (New Soibum) and FS2 (Aged Soibum) overlapping profiles influenced by fermentation age.
➢ The results showed that fermentation age influenced metabolite composition among samples.

CONCLUSION

Fermentation → Metabolite Production → Nutraceutical Pathways → Health Benefits

- PCA and Metabolite profiles revealed clear biochemical variation among samples, highlighting their nutraceutical potential and the unique bioactive compounds of Manipur's traditional foods.

FUTURE WORK / REFERENCES

Future studies will expand metabolomic profiling, integrate metagenomics, and validate bioactives through *in vitro* and *in silico* models. Future work will also expand to other fermented foods of Manipur as the findings highlight the **Market Potential.**

Reference:

- **Singhal P, Satya S, Naik SN.** Fermented bamboo shoots: A complete nutritional, anti-nutritional and antioxidant profile of the sustainable and functional food to food security. Food Chem (Oxf). 2021 Sep 15;3:100041. **Thokchom, R.; Joshi, S.R.** Traditional Fermented Foods of Northeast India: Their Nutritional and Nutraceutical Potential. *Fermentation* **2020**, *6*(3), 64.

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