



Ethnomicrobiological Practices and Probiotic Potential of Fermented Foods Consumed by Tribal Communities of Marathwada Region, India

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Abstract:

Traditional knowledge of tribal communities includes unique practices of natural fermentation, food preservation, and indigenous microbial applications that contribute to gut health and disease resistance. The present study explores the **ethnomicrobiology of fermented foods** consumed by tribal groups in the **Marathwada region of Maharashtra** with special focus on isolation of beneficial probiotic bacteria, antimicrobial activity, and microbial diversity profiling. Samples of 7 traditionally fermented foods and beverages were collected from **Gond, Bhil, Pardhi and Kolam tribes**. Microbial isolation was performed using selective media followed by biochemical characterization and antimicrobial assay against human pathogens (*E. coli*, *S. aureus*, *Salmonella typhi*, and *P. aeruginosa*). Results confirmed presence of dominant probiotic strains including *Lactobacillus plantarum*, *L. fermentum*, *Leuconostoc mesenteroides*, and *Saccharomyces cerevisiae*. Several isolates exhibited strong inhibitory effects against test pathogens. The study validates that tribal fermented foods act as natural bio-preservatives, immunomodulators, and probiotic reservoirs. Hence, these foods hold potential for development of community-based nutraceuticals, promoting both tribal health and microbial conservation.

Keywords: *Ethnomicrobiology, Tribal Fermented Foods, Probiotics, Marathwada Tribes, Antimicrobial Activity, Indigenous Microbiota*

Introduction:

Indigenous tribal communities possess deep knowledge of bio-resources, traditional fermentation, disease treatment, and natural food preservation. Many of these practices are guided by **microorganisms unknowingly used for centuries**, representing an unexplored area termed **Ethnomicrobiology**. Tribal populations consume spontaneously fermented foods rich in beneficial microorganisms crucial for gut health, immunity, and nutrition.

The Marathwada region houses multiple tribal groups such as **Gond, Bhil,**

Kolam, and Pardhi, who prepare fermented food items using natural inoculation without starter cultures. However, scientific documentation of their microbial diversity remains limited. Exploring these food systems may yield novel probiotic strains, bio-preservatives, and antimicrobial metabolites useful for pharmaceutical, nutritional, and industrial purposes.

Review of Literature:

1. Tamang et al. reported that fermented food microbiota contributes to

gastrointestinal balance and immune enhancement.

2. Sah et al. showed antimicrobial metabolites of *Lactobacillus plantarum* inhibit enteric pathogens.
3. Indian tribal fermentation studies highlight presence of LAB (Lactic Acid Bacteria) with probiotic characteristics.
4. Yet, **Marathwada tribal microbiological resources remain under-documented**, showing a significant research gap.

Research Gap:

Although India hosts rich tribal fermented food culture, **scientific microbiological profiling, probiotic screening, and antimicrobial validation of tribal foods from Marathwada region is largely unexplored.**

Objectives:

1. To document fermented foods consumed by selected tribal communities of Marathwada.
2. To isolate and identify dominant microorganisms from these fermented products.
3. To evaluate probiotic properties and antimicrobial potential of isolates against pathogens.
4. To analyze the role of indigenous microbiota in community health and disease prevention.

Hypothesis:

Tribal fermented foods of Marathwada contain unexplored probiotic

microbial strains with strong antimicrobial activity that contribute positively to community health.

Methodology:

1. Study Area & Sample Collection:

- Locations: Tribal pockets of **Beed, Nanded, Parbhani, and Hingoli districts**
- Tribes covered: **Gond, Bhil, Kolam, Pardhi**
- Samples collected (7 types):
 1. Handi-Dahi (fermented curd)
 2. Ambil (millet based fermented drink)
 3. Fermented bamboo shoots
 4. Mahua flower brew
 5. Fermented rice water (Kanji type)
 6. Local herbal fermented chutney
 7. Fermented grain paste

2. Microbial Isolation & Identification:

- Media used: MRS Agar, Nutrient Agar, MacConkey agar, Sabouraud Dextrose Agar
- Identification: Gram staining, biochemical tests (Catalase, Oxidase, IMViC, Sugar fermentation)

3. Probiotic Screening Parameters:

- Acid tolerance (pH 2.0–3.5 survival)
- Bile salt tolerance (0.3–1%)
- Auto-aggregation ability
- Hemolysis test (safety assessment)

4. Antimicrobial Assay:

- Agar well diffusion against:
 - *Escherichia coli*
 - *Staphylococcus aureus*
 - *Salmonella typhi*
 - *Pseudomonas aeruginosa*

Results:

Isolated Microorganisms	Frequency of Occurrence	Probiotic Traits	Antimicrobial Activity
<i>Lactobacillus plantarum</i>	High	Strong acid & bile tolerance	Highly inhibitory
<i>L. fermentum</i>	High	Safe, non-hemolytic	Moderate-High
<i>Leuconostoc mesenteroides</i>	Medium	Good aggregation	Moderate
<i>Saccharomyces cerevisiae</i>	Medium	Supports gut microbiota	Low-Moderate
<i>Bacillus subtilis</i>	Low	Spore forming probiotic	Moderate

L. plantarum showed maximum zone of inhibition against *S. aureus* and *E. coli*.

Discussion:

The presence of robust LAB strains confirms that tribal fermentation promotes gut-friendly microorganisms supporting immunity without artificial inoculants. The antimicrobial activity indicates natural biopreservation and therapeutic roles. The absence of hemolysis validates safety for probiotic application. Regular consumption of these foods may explain lower gastrointestinal disorder prevalence in tribal diets.

Conclusion:

The study establishes that **tribal fermented foods act as a natural reservoir of beneficial microbes** exhibiting probiotic and antimicrobial properties. These findings emphasize the need for preserving tribal microbial knowledge and developing **tribal probiotic nutraceutical formulations**, which could enhance rural health and generate economic opportunities.

Recommendations:

1. Establish a **Tribal Fermented Food Microbial Repository** in Marathwada.

2. Develop community-based probiotic product pipelines (e.g., probiotic drinks, starter cultures).
3. Train tribal groups in microbial safety, hygiene, and fermentation standardization.
4. Further molecular characterization via 16S rRNA sequencing is recommended.

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