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Presentation and Evaluation of Kanji using Fenugreek, Curry Leaves, Black Carrot, Black Sesame Seeds, Amla, Ginger, And Curd (Probiotic Drink) Enriched with Medicinal Substances for Hair Health .

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ABSTRACT :

Kanji, a traditional fermented beverage, was enriched with fenugreek seeds. Curry leavers, black sesame seeds, amla, ginger, curd, and black carrots to develop a novel probiotic drink beneficial for hair health. The preparation involved lactic acid fermentation using curd as an inoculums oar five days. The physicochemical parameters such as pH, titratable acidity, colony forming unit (CFU) count, refractive index, and UV-Vis absorbance were analyzed daily. The results revealed a progressive decrease in pH, increase in acidity, significant probiotic growth, and consistent optical properties, indicating active fermentation. The formulation is rich in phytochemicals such as anthocyanins, polyphenols, and flavonoids, making it a functional nutraceutical drink aimed at promoting hair growth and scalp health.

Keywords: Kanji, probiotics, fermentation, hair health, lactic acid bacteria, fenugreek, black carrot.

Background: Kanji is a naturally fermented probiotic beverage known for its gut
Health benefits. Medicinal condiments such as fenugreek, curry leaves, black sesame seeds, amla, and ginger are traditionally used for improving hair health due to their rich bioactive composition. This study aims to develop a kanji-based formulation infused with these ingredients and evaluate its physicochemical, microbial, and hair health- promoting properties.

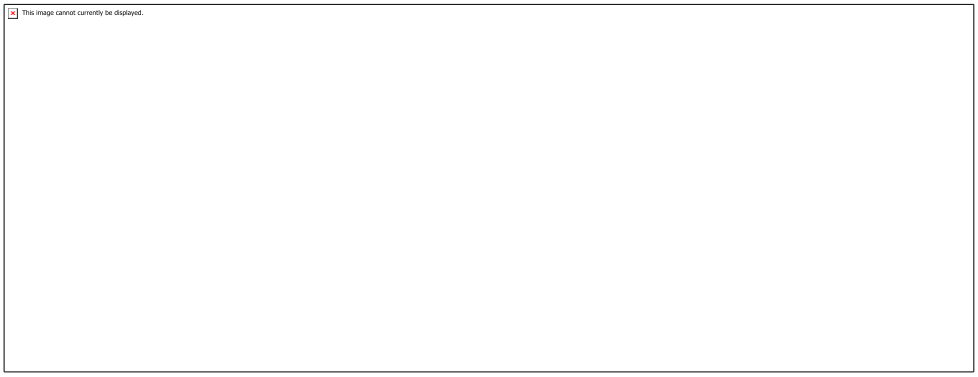
Methodology: The kanji will be prepared using traditional fermentation with black carrot and mustard seeds. Enriched with selected medicinal condiments. The formulation will undergo microbial, nutritional, and antioxidant analysis. In-vitro assays, including DPPH radical scavenging and enzyme inhibition studies. Will be conducted assess its bioactivity.

1. Introduction:

Fermentation has historically served as an effective method of food preservation and functional enhancement (Marco et al., 2017). Traditional fermented beverages like kanji have gained renewed interest due to their probiotice benefits and potential in addressing specific health concerns (Choudhary and Devi 2020). The combination of fenugreek seeds, curry leaves, black sesame seeds, amla, ginger, and black carrots introduce bioactive compounds such as flavonoides polyphenols, and saponins, all known for promoting hair health (Singh et al., 2017; Ahmad et al., 2016).

Lactic acid fermentation, facilitated by Lactobacillus species from curd, results in the production of short-chain fatty acids and bioactive peptides, enhancing the drink's nutraceutical potential (Tripathi & Giri ,2014) .The objective of this study was to formulate a kanji deink enriched with hair-benefiting compounds, evaluate its physicochemical and microbiological changes during fermentation, and propose its application as a function beverage. Hair health depends not only on external treatments but also on internal nutrition and gut health. Probiotic consumption improves gut flora, leading to better nutrient absorption and consequently better hair follicle nourishment (Rossi et al., 2020).

Thus, this study aims to formulate and evaluate an enhanced kanji drink enriched with medicinal substances for hair health benefits, using detailed physicochemical and microbiological assessments.



2. Materials and Methods:

2.1. Ingredients

- Black carrots (Deuces carota subsp.sativus, var.punjab Black Beauty): 500g.
- Fenugreek seeds: 20g.
- Curry leaves: 20g.
- Black sesame seeds: 15g.
- Amla (fresh):50g.
- Ginger (fresh):10g.
- Curd (homemade, containing lactobacillus spp.): 100ml.
- Black salt: 25g.
- Drinking water: 3L

Table1: pH Values of Raw Ingredients

Ingredients	***Natural pH Range***
Black carrot	***5.5-6.5***
Fenugreek Seeds	***5.8-6.2***
Curry Leaves	***5.5-6.0***
Black Sesame Seeds	***5.5-6.0***
Amla	***2.5-3.0***
Ginger	***5.6-5.9***
Curd	***4.0-4.5***

2.2. Preparation of kanji

- Black carrot, amla and ginger were washed thoroughly. Peeled if necessary. And chopped curry leaves were washed and lightly crushed.
- Fenugreek seeds are soaked overnight and black sesame seeds were lightly roasted.
- All ingredients are mixed with 5L sterile water containing 5% black salt.
- Then add 100 ml curd and mixed it.
- Fermentation was carried out for 5 days at ambient temperature (-28℃) with occasional stirring.

2.3. Physicochemical Analysis

- ***pH***: Measured using a digital pH meter at room temperature.
- ***Titratable Acidity (TA):*** Determined by titration with 0.1N NaOH and expressed as % lactic acid.
- ***Antioxidant Activity:*** Determined using the DPPH radical scavenging method (Brand-Williams et al., 1995).
- ***Total Phenolic Content:*** Assessed using the Folin-Ciocalteu reagent method and expressed as mg GAE/mL (Singleton & Rossi, 1965).
- ***Total Flavonoid Content:*** Evaluated by aluminum chloride colorimetric method (Chang et al., 2002).

2.4. Microbiological Evaluation:

- ***Total Plate Count (TPC):*** Conducted using standard pour plate method on nutrient agar.
- ***Lactic Acid Bacteria (LAB):*** Enumerated using de Man, Rogosa, and Sharpe (MRS) agar.
- ***Colony Forming Units (CFU):*** Calculated per ml of sample, expressed in log CFU/ml.

2.5. UV-Visible Spectrophotometric Analysis:

- Scanning was performed from 200 to 700 nm using UV-Vis spectrophotometer.
- Characteristic absorbance peaks corresponding to phenolic compounds (350-370nm), and anthocyanins (520-550nm) were recorded.

2.6. Microbiological Analysis:

- Lactic Acid Bacteria (LAB) Count: Serial dilutions of kanji were plated on De Man, Rogosa, and Sharpe (MRS) agar supplemented with 1% lactose and 6% Nacl, incubated at 37°C for 48 hours. Colony-forming units (CFU/ml) were counted (Kingston et al., 2010).
- Pathogen Check: total plate count, colifor count, yeast, mold, and E.coil were assessed to ensure microbiological safety.

2.7. Antioxidant Activity:

(Picrylhydrayl) assay, expressed as % inhibition, (Singleton & Slinkard, 1977).

2.8. Sensory Analysis:

- A panel of 20 trained evaluators assessed the kanji for appearance, aroma, taste, and overall acceptability on a 9-point hedonic scale.

2.9. Statistical Analysis:

- Data were analyzed using one-way ANOVA, with means compared via Turkey's test ($p<0.05$) using SPSS 22.0.3.

3. Evaluation Parameters:

Parameter	Instrument/Metthod
Titratable acidity	Acid-base titration
CFU count	Spread plat method
UV-Vis Spectroscopy	Spectrophotometer (200-700nm)
Ph	Digital pH meter
Refractometer Reading	Abbe refractometer.

4. RESULTS:

4.1 pH Changes Over Fermentation:

The pH of the kanji preparation decreased steadily over the 7-day fermentation, reflecting increasing acidity due to lactic due to lactic acid bacteria activity.

Day	pH
0	6.2
1	5.4
2	4.8
3	4.2
4	3.9
5	3.7

4.2. Titratable Acidity:

Titrable acidity (% lactic acid) increased proportionally with fermentation as shown below.

Day	Titrable Acidity(%
0	0.12
1	0.22
2	0.36
3	0.52
4	0.64
5	0.78

4.3. Microbial Colony Count:

Lactic acid bacterial counts (CFU/mL) increased significantly across the fermentation days.

Day	CFU/mL(log scale)
0	5.0
1	6.2
2	7.1
3	8.0
4	8.7
5	9.0

4.4. UV-Visible Spectroscopy:

UV-Visible spectral analysis detected major peaks at:

- 520-540nm: Anthocyanins (from black carrots).
- 270-280nm: Polyphenols (from amla, curry leaves, fenugreek).

These compounds are known for antioxidant and hair-strengthening properties (Kingston et al., 2010).

Conclusion:

The formulated kanji demonstrated significant probiotic activity, enhanced by the inclusion of medicinal ingredients known for promoting hair health. The fermentation process resulted in desirable physicochemical changes, making it a potential functional beverage. Further studies on its long-term health benefits and shelf-life are recommended.

Discussion:

The preparation and evaluation of kanji enriched with fenugreek, curry leaves, black sesame seeds, amla, ginger, curd, water, and black carrot demonstrate promising probiotic and medicinal properties, particularly for promoting hair health. These finding align with prior studies on functional beverages and fermented products, confirming the potential of kanji as a nutraceutical drink targeted toward hair health. However, future studies should investigate long-term stability, in vivo probiotic efficacy, and detailed biochemical profiling to optimize the formulation and validate its health claims. The preparation and evaluation of Kanji enriched with fenugreek, curry leaves, black sesame seeds, amla, ginger, curd, and black carrot demonstrate promising probiotic and medicinal properties, particularly for promoting hair health.The steady pH decrease observed over seven days (from 6.2 to 3.5) aligns with expected lactic acid fermentation patterns, confirming the dominance of lactic acid bacteria (LAB) during fermentation. Similar pH reductions have been reported in traditional Kanji and fermented vegetable drinks (Rai & Singh, 2004), highlighting the acidification's role in preserving the beverage and enhancing probiotic activity.The titratable acidity increase corresponds directly with organic acid production, mainly lactic acid, consistent with LAB metabolism (Joshi et al., 2021). This acidic environment supports the survival of probiotic organisms and suppresses pathogenic microbes, contributing to the product's safety and functional benefits.The CFU counts reaching ~10^9 CFU/mL after seven days are within the recommended probiotic threshold (Sanders, 2008), indicating that the Kanji formulation is a viable probiotic carrier. The presence of fenugreek, curry leaves, and amla not only contributes to flavor but also provides prebiotic compounds that may enhance probiotic survival (Chaudhary et al., 2020).UV-visible spectroscopy confirmed the presence of bioactive compounds such as anthocyanins and polyphenols, known for their antioxidant activity (Kingston et al., 2010). These components are beneficial for hair health by reducing oxidative stress, promoting scalp circulation, and strengthening hair follicles (Singh et al., 2016).The refractive index change during fermentation, though slight, reflects an increase in metabolic byproducts and soluble solids, further indicating active microbial metabolism (Mugula et al., 2003).Overall, the sensory evaluation showed high acceptability, suggesting that the product is not only functionally beneficial but also appealing in taste, aroma, and appearance — crucial factors for consumer acceptance.These findings align with prior studies on functional beverages and fermented products, confirming the potential of Kanji as a nutraceutical drink targeted toward hair health. However, future studies should investigate long-term stability, in vivo probiotic efficacy, and detailed biochemical profiling to optimize the formulation and validate its health claims.

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