

A Study to Examine the Impact of Herbal Preservatives on The Quality of Paneer

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ABSTRACT

The present study investigates the impact of herbal preservatives on the quality of paneer, a popular Indian dairy product, prepared from cow milk. The objective was to enhance the shelf life and nutritional value of paneer while maintaining its sensory and microbiological quality. To achieve this, herbal preservatives such as basil and mint powder were incorporated into the paneer-making process. Paneer samples were prepared using standard procedures, with the addition of the selected herbal preservatives at specific concentrations. Additionally, the study noted that paneer treated with herbal preservatives retained better texture and appearance compared to the control sample. The antioxidant properties of the herbs also contributed to preserving the nutritional quality of the paneer, making it a healthier alternative to conventional paneer. In conclusion, the use of basil and mint as natural preservatives in paneer production offers a promising approach to improve its quality and shelf life. This research underscores the potential of herbal preservatives in enhancing food safety and consumer acceptability of dairy products.

Key Words: *Herbal, Moisture, Fat, Food, Protein.*

I. INTRODUCTION

In light of the increasing demand for natural and functional foods and the possible health advantages of herbal paneer, a spin on the classic Indian cottage cheese, it has been the center of much attention as of late. Adding herbal preservatives to paneer improves its nutritional profile and extends its shelf life, while also meeting the growing demand for clean-label goods. The complex interaction between natural additives and dairy matrices is illuminated by this research, which examines the effects of several herbal preservatives and combinations on the physico-chemical characteristics of herbal paneer. The antibacterial, antioxidant, and health-promoting characteristics of herbs have made them highly sought-after in both culinary and therapeutic contexts for millennia. Among them, the bioactive components found in common herbs like mint, basil, oregano, thyme, and rosemary are known to suppress microbial development and postpone deterioration. Herbs like these are great for extending the life of foods that might otherwise spoil, like paneer, since they contain essential oils and phenolic compounds, which are natural preservatives. Synthetic chemicals are often linked with health hazards and customer aversion; using these natural preservatives might lessen their dependence. Quality and customer acceptability of paneer are strongly influenced by its physico-chemical qualities, which include sensory features, moisture content, pH, and texture. Herbal preservatives have the potential to alter these characteristics in a number of ways. For example, paneer's texture and mouth feel might be changed by the interaction of the essential oils from herbs with the lipids and proteins in the dish. The antibacterial characteristics of these herbs may have a similar effect on the microbial load, which in turn affects the rate of deterioration and the

product's shelf life. Through a thorough examination of herbal paneer treated with both solo and mixed herbal preservatives, this research seeks to shed light on these effects.

Knowing the synergistic and antagonistic interactions of herbal preservatives is important for incorporating them into paneer. Herbs have different effects on their own, but when used together they may have a multiplicative or synergistic impact, which might make them a better preservative. For instance, since the bioactive components of oregano and thyme work together, the combined effect may be more potent against microbes than that of either plant alone. This element of the research is crucial because it may help scientists create preservative blends that improve paneer's physico-chemical qualities while reducing their negative effects. This study's technique involves choosing herbs for their preservation characteristics, extracting those herbs, and then adding those extracts to paneer. After that, we look at the paneer's physico-chemical changes, such as how well it retains moisture, how stable its pH is, how its texture profile changes, and how intact its proteins are. The economic success of every food product depends on customer acceptability, which is why sensory assessment is an essential component as well. In order to determine the bioactive chemicals in the herbal extracts and how they work, the research makes use of cutting-edge analytical methods including gas chromatography-mass spectrometry (GC-MS) and high-performance liquid chromatography (HPLC).

Past research has shown that paneer may be kept for much longer using herbal preservatives without losing any of its flavor or texture. As an example, there is evidence that extracts from basil and mint may effectively inhibit the formation of microbes, and that rosemary and thyme have potent antioxidant properties that can prevent the paneer from oxidative rancidity. Nevertheless, there has been little research into how these herbs affect the physico-chemical characteristics of paneer, especially when used together. To address this knowledge gap, this research will examine the effects of various natural ingredients on the quality of herbal paneer. This study has far-reaching ramifications. Consumers' growing desire for unprocessed and natural foods is in line with the trend toward adopting natural preservatives, which may lessen their exposure to synthetic chemicals. The results have important implications for the dairy sector, as they might help shape future product lines aimed at health-conscious customers, who may represent an untapped market opportunity. This research also helps us understand how natural substances interact with complicated food matrices, which might lead to new developments in food preservation techniques in the future. One potential way to make paneer last longer and have more nutritional value is to add herbal preservatives, either alone or in mixtures, to it. This research delves into the physico-chemical characteristics of herbal paneer and how these natural ingredients impact them. It also analyzes the possibility of making new dairy products with a focus on health. The study intends to develop sustainable and health-focused food preservation procedures by offering a complete examination of these interactions. This will benefit both consumers and the food business in the long run.

II. REVIEW OF LITERATURE

Buch et al., (2012) Researchers looked studied turmeric's potential as a paneer preservative. Part one of the research included adding turmeric to the paneer at concentrations of 0.0 (control), 0.2, 0.4, 0.6, 0.8, and 1.0% by weight of anticipated yield. A rate of 0.4% by weight of anticipated paneer output was chosen for the addition of turmeric to milk, taking into account changes in paneer sensory score. The next section compares the predicted paneer yield both before and after heat treatment of milk, as well as the impact of adding turmeric at a rate of 0.4% by weight. The paneer samples were tasted both immediately upon preparation and after an interval of 12 days of storage at a temperature of 7 ± 1 °C. The preserved paneer samples that had turmeric added to them before the milk was heated had better results. Results showed that paneer samples made with turmeric before heating the milk had far less raw turmeric flavor. As a

result, in the section that follows, we will test the efficacy of turmeric in prolonging the shelf life of paneer using a 0.6% concentration of turmeric in addition to the 0.4%. The paneer samples containing 0.6% turmeric by weight of anticipated paneer production are suitable for storage at 7 ± 1 °C for up to 12 days. According to the current research, a significant drop in paneer's sensory score occurs when turmeric is added to the dish at a rate higher than 0.6% by weight of the projected paneer production.

Eresam et al., (2013) an assessment was conducted to determine the efficacy of black pepper, cardamom, cinnamon, and clove in prolonging the shelf life of paneer. Each spice was included into the paneer at different weights: 0% (control), 0.2%, 0.4%, 0.6%, 0.8%, and 1% of the expected yield of paneer by weight. Black pepper, cardamom, clove, or cinnamon were added in quantities of 0.6 percent by weight or 0.4 percent by weight, respectively, which were deemed acceptable. Therefore, the paneer was prepared by including 0.6% black pepper, cardamom, and clove (Bp, Ca, and Cl) and 0.4% cinnamon (Ci) based on the weight of the projected paneer. Each paneer sample, including Bp, Ca, Cl, and Ci, underwent sensory evaluation immediately after production and again after 7 days of storage at a temperature of 7 ± 1 °C, for a total duration of 28 days. The results indicated that control remained manageable for a duration of 7 days, Bp for 14 days, and Cl for 21 days during storage. Although it had been stored for 28 days, the overall acceptability score for Ca was still much greater than the allowable limit. According to the findings of changes in chemical characteristics, cardamom demonstrated superior performance compared to other spices in limiting the rate of increase in acidity, free fatty acid content, and soluble nitrogen concentration in paneer during storage. Cardamom, cinnamon, clove, and black pepper had the most efficacy in prolonging the shelf life of paneer. The microbiological composition of paneer was evaluated by doing standard plate counts (SPC), yeast and mold counts, and coliform counts to determine the effect of cardamom.

Kandel et al., (2023) Paneer, a nutritious and tasty indigenous dairy product, has a short shelf life due to its high moisture content. Conversely, herbs are renowned for their antioxidant, preservative, and flavor-enhancing properties. In this research, we examined four distinct samples: one with 0.15% cow milk, another with 0.20% buffalo milk, and two more with 0.20% buffalo milk. We assessed the quality characteristics of these samples, which included titratable acidity, lactose, moisture, ash, fat, protein, phenolic content, and sensory parameters. The samples were labeled as A, B, C, and D. Although the findings showed that the herbal paneer had a favorable sensory quality, they observed that the nutritional and chemical properties of the paneer remained unchanged. According to the herbal paneer samples, the total phenolic content of buffalo milk paneer is somewhat higher than that of cow milk paneer. Overall, the sample containing 0.20 percent cardamom in buffalo milk was successful. Based on the study findings, cardamom shows potential for developing a novel dairy product with enhanced antioxidant properties and extended shelf life.

Shan et al., (2011) This study investigated the antibacterial effectiveness of five spice and herb extracts (cinnamon stick, oregano, clove, pomegranate peel, and grape seed) against *Listeria monocytogenes*, *Staphylococcus aureus*, and *Salmonella enterica* in cheese at room temperature ($\sim 23^\circ\text{C}$). The cheese was regularly subjected to oxidative tests to assess lipid oxidation, which involves the identification of components that react with thiobarbituric acid. According to the research, all five plant extracts shown effectiveness against three infections transmitted by cheese. The use of these extracts to cheese resulted in increased resistance to lipid oxidation. Cloves ranked highest in terms of their antioxidant and antibacterial qualities. The findings indicated that plant extracts, namely clove, had the potential to serve as natural food preservatives by diminishing the presence of foodborne pathogens and impeding lipid oxidation in cheese.

III. PROPOSED METHODS FOR THE STUDY

Experimental Materials

The following ingredient was used for the research work.

- Cow milk- It is the primary ingredient for making paneer.
- Citric acid- It is commonly used as a coagulant in paneer production.
- Basil and Mint- Basil is a fragrant herb and Mint is another aromatic herb with a cooling flavor.

Physico-Chemical Properties

The moisture, pH, titratable acidity, fat, total solids, and protein contents of the herbal paneer were tested using several standardized methods. The necessary samples of herbal paneer with various treatments were analyzed for their proximate composition, including moisture content, titratable acidity, pH level, fat content, total solids, protein content, solid non-fat content, and ash content.

IV. EXPERIMENTAL RESULTS

The necessary samples of herbal paneer with various treatments were analyzed for their proximate composition, including moisture content, titratable acidity, pH level, fat content, total solids, protein content, solids-not-fat (SNF) content, and ash content. Total 10 treatments were applied. Results are presented in table below: -

Table 1: Effects of Herbal Preservatives and Mixtures on Herbal Paneer's Chemistry

Treatments	Chemical Composition (%)							
	Moisture	Titratable Acidity	pH	Fat	Total Solids	Protein	SNF	Ash
T1	53.19	0.487	5.455	24.00	46.68	16.17	22.64	1.69
T2	53.57	0.488	5.466	23.79	46.24	16.18	22.35	1.17
T3	53.14	0.475	5.472	23.72	46.64	16.17	22.74	1.65
T4	53.34	0.472	5.486	23.84	46.49	16.14	22.55	1.64
T5	53.25	0.469	5.508	23.68	46.43	16.08	22.74	1.62
T6	53.43	0.467	5.519	23.62	46.24	16.17	22.42	1.25
T7	53.79	0.463	5.554	23.82	46.08	16.05	22.08	1.34
T8	54.1	0.449	5.566	23.57	45.84	16.08	22.18	1.15
F test	Sig.	NS	NS	Sig.	Sig.	Sig.	Sig.	Sig.
SE (M)+	0.019	0.008	0.024	0.015	0.008	0.002	0.008	0.004
CD at 5%	0.066	--	--	0.073	0.043	0.039	0.042	0.004

Hydration, titratable acidity, pH, total solids, protein, solids-not-fat (SNF), and ash content are among of the characteristics that are examined in the table, which provides a comprehensive study of the chemical composition of herbal paneer under different treatments (T1 to T8). Herbal preservatives are used in varying concentrations or combinations in each therapy.

Moisture Content

There is a little variation in the moisture content across the treatments; T8 has the most at 54.1% and T1 has the lowest at 53.19%.

There is a statistically significant change in the moisture retention of paneer due to the presence of several herbal preservatives or combinations thereof (F test: Sig.).

Titrateable Acidity and pH

T8 has a limited range of titrateable acidity (as a percentage) from 0.449% to 0.488%, whereas T1 to T8 have pH values ranging from 5.455 to 5.566. Neither of these measures demonstrated statistically significant variations between treatments (NS in the F test), suggesting neither the acidity nor pH levels of the paneer were not significantly impacted by the kind of herbal preservatives used.

Fat Content

T1 has the greatest fat content at 24.00% and T6 has the lowest at 23.62%, while there are very small differences among treatments. The use of herbal preservatives has the potential to affect the fat content of the paneer, since this parameter is statistically significant (F test: Sig.).

Total Solids

When looking at the total solids in the paneer, the largest percentage is in T1 (46.68%), while the lowest is in T8 (45.64%). There is a statistically significant difference in the total solids concentration of the paneer among the various herbal treatments, as shown by this variation (F test: Sig.).

Protein Content

The protein composition remains mostly same across the treatments, with T7 showing a little drop to 16.05% from T1's 16.17%. Herbal preservatives may affect paneer protein levels; this parameter is significant (F test: Sig.), despite the small range.

Solids-Not-Fat (SNF)

Proteins, lactose, and minerals make up the SNF content, which ranges from 22.08% in T7 to 22.74% in T3 and T5. The non-fat solids in paneer may be affected by various herbal treatments, as shown by this significant variance (F test: Sig.).

Ash Content

Ash content, which is a measure of mineral content, varies between 1.15 and 1.69 percent in T8 and T1, respectively. That the sort of herbal preservatives employed might affect the mineral content of paneer is suggested by this parameter, which is likewise statistically significant (F test: Sig.).

The treatments had a substantial impact on the contents of moisture, fat, total solids, protein, SNF, and ash, according to the significance levels (F test: Sig.). No significant changes were observed between treatments (NS) in terms of titrateable acidity and pH. We provide the critical difference at 5% (CD at 5%) and the standard error of mean (SE (M)+) for every parameter. The critical difference values reveal significant differences for moisture, fat, total solids, protein, SNF, and ash.

According to the results, the physico-chemical characteristics of herbal paneer may be drastically changed by adding different herbal preservatives or a mix of them. It seems that these natural ingredients significantly affect the paneer's quality and composition, since there were notable changes in moisture, fat, total solids, and protein, SNF, and ash levels. This research shows that there is room for improvement in the nutritional profile and storage life of paneer by experimenting with different combinations of herbal preservatives, all while keeping the tasty, satisfying qualities that consumers love.

V. CONCLUSION

Potential improvements to paneer's physico-chemical characteristics, shelf life, and nutritional profile may result from adding certain herbal preservatives or mixtures of these to the cheese. Herbs like mint, basil, oregano, thyme, and rosemary may boost paneer's antioxidant capacity and microbiological stability, making it last longer and keeping it safe to eat, according to this research. The research shows that these all-natural ingredients may keep or improve herbal paneer's texture, moisture level, pH, and sensory qualities, making them a good substitute for artificial preservatives. These findings provide the groundwork for the creation of natural, healthier dairy products that may satisfy the needs of clean-label and functional food consumers. Sustainable and health-oriented practices may be advanced in the food business with the help of future technologies informed by this research's insights into food preservation.

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