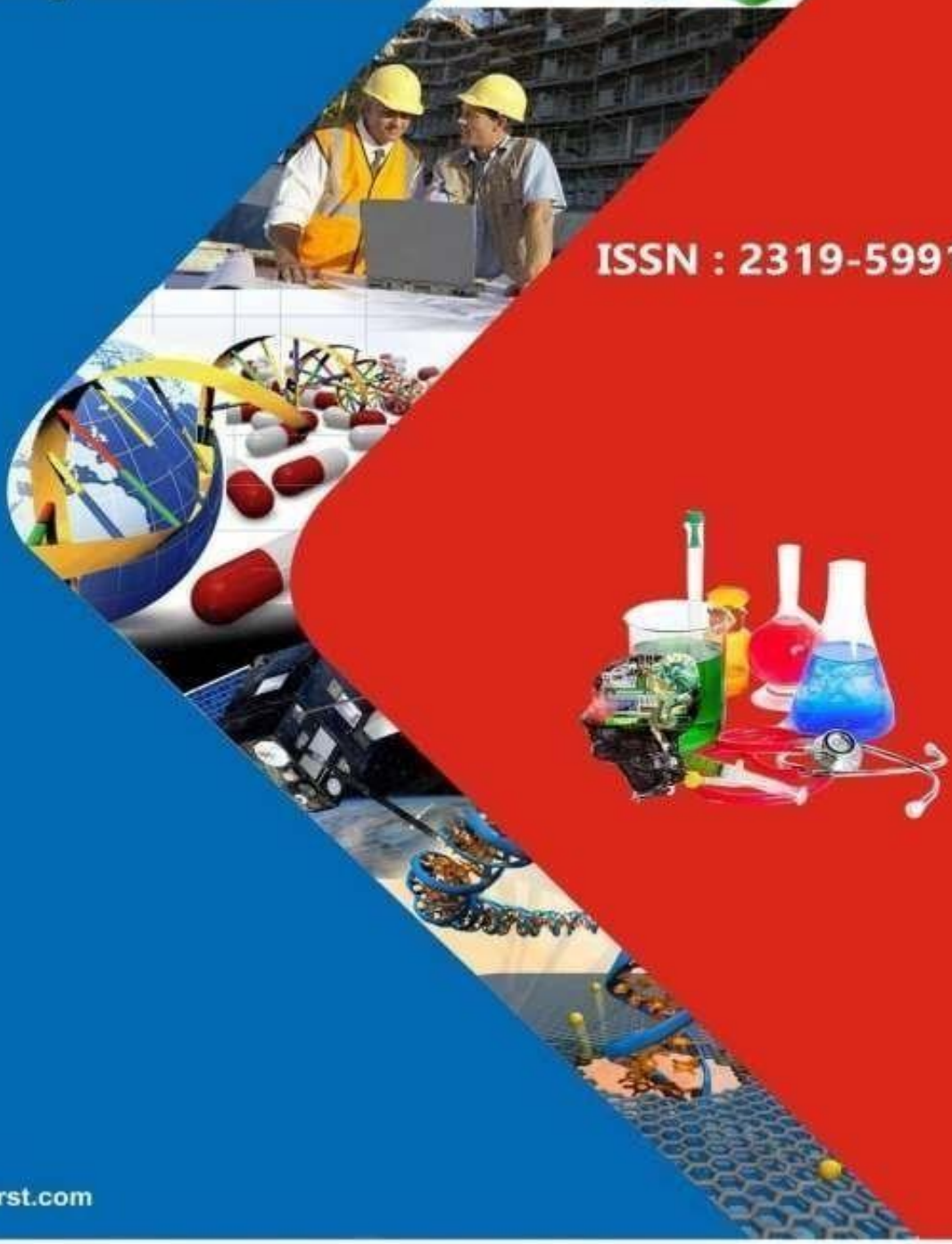
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A COMPARATIVE ANALYSIS OF TRADITIONAL MASALA SEASONINGS FOR ENHANCED FLAVOR INFUSION IN PANEER CHIPS

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Abstract

This study investigates the impact of traditional masala seasonings on the flavor, texture, and overall consumer acceptability of paneer chips. Three distinct masala blends were analyzed: a mild blend with cumin, coriander, and turmeric; a spicy blend featuring red chili powder, black pepper, and garam masala; and a tangy blend incorporating amchur, chaat masala, garlic, and onion powder. Sensory evaluation focused on color, taste, flavor, texture, and overall acceptability. The results indicated significant differences in sensory attributes across the three blends. The spicy blend emerged as the most preferred, appealing to consumers who enjoy robust and fiery flavors. The tangy blend followed closely, attracting those who favor a zesty and refreshing taste, while the mild blend was appreciated by individuals preferring less intense flavors. The study also highlighted the nutritional benefits of the spices used, such as their anti-inflammatory and antioxidant properties. This comparative analysis underscores the potential of paneer chips seasoned with traditional masalas to meet the growing demand for innovative, healthful snack options. The findings suggest that such products could effectively cater to diverse consumer preferences and contribute to the continuous innovation within the snack food industry.

Keywords: paneer chips, masala seasonings, sensory evaluation, consumer acceptability, traditional spices, flavor infusion, snack innovation

INTRODUCTION

Paneer, a fresh, non-melting cheese common in South Asian cuisine, is highly versatile and can be incorporated into a variety of dishes ranging from curries to snacks. One innovative application of paneer is in the form of chips, which have gained popularity due to their high protein content and unique texture (Kumar et al., 2020). However, enhancing the flavor profile of paneer chips remains a challenge that could significantly improve their marketability. Traditional masala seasonings, which are integral to Indian cuisine, offer a rich array of flavors and have been used for centuries to enhance the taste of various foods (Achaya, 2004). These seasonings not only provide distinct flavors but also offer numerous

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health benefits due to their bioactive compounds (Gurib-Fakim, 2006). The incorporation of these masala blends into paneer chips presents an opportunity to create a product that is both flavorful and nutritious.

This study aims to conduct a comparative analysis of different traditional masala seasonings to determine their effectiveness in enhancing the flavor infusion of paneer chips. By evaluating sensory attributes such as taste, texture, and overall acceptability, this research seeks to identify the most preferred seasoning blend among consumers.

Previous research has highlighted the potential of spiced snacks in the global market, emphasizing the importance of flavor innovation to meet diverse consumer preferences (Smith & Morton, 2018). Given the rising demand for healthful and protein-rich snacks, the development of paneer chips with traditional masala seasonings could address both nutritional and sensory needs, providing a competitive edge in the snack food industry (Patel et al., 2021). This study will explore three distinct masala blends: a mild blend featuring cumin, coriander, and turmeric; a spicy blend with red chili powder, black pepper, and garam masala; and a tangy blend incorporating amchur, chaat masala, garlic, and onion powder. The sensory evaluation of these blends will provide insights into consumer preferences and guide future product development.

MATERIALS AND METHODS

Materials

1. **Paneer**: Fresh, high-quality paneer will be procured from a local dairy supplier. The paneer will be cut into uniform slices of approximately 2 mm thickness.
2. **Masala Seasonings**:
    - Mild Blend: Cumin powder, coriander powder, turmeric powder.
    - Spicy Blend: Red chili powder, black pepper powder, garam masala.
    - Tangy Blend: Amchur (mango powder), chaat masala, garlic powder, onion powder.
3. **Other Ingredients**: Salt, oil for frying.
4. **Packaging Materials**: Food-grade plastic bags and containers for storing the paneer chips.
5. **Equipment**: Deep fryer, weighing scale, measuring spoons, mixing bowls, sensory evaluation forms, and a sensory evaluation panel.

Eqipment

Spice Grinder or Mortar and Pestle: To grind whole spices into powder.
Mixing Bowls: For mixing the spices with other ingredients.
Measuring Spoons and Cups: To ensure accurate measurement of spices and other ingredients.
Frying Pan or Tawa: For toasting whole spices to enhance their flavor before grinding.
Strainer or Sieve: To remove any large particles from the spice mix.
Blender or Food Processor: To blend spices with other ingredients like herbs, garlic, or ginger if needed.
Saucepan or Pot: To heat the oil or ghee used for seasoning infusion.
Spatula or Spoon: For stirring and mixing the spices.

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Containers or Jars: For storing the prepared spice mix.
Tray or Plate: For cooling toasted spices before grinding.
Whisk: For thoroughly combining the spice mix.
Oven or Dehydrator: If you are making dried paneer chips that will be coated with the spice mix.
Baking Sheets and Parchment Paper: If baking the paneer chips.
Packaging Equipment: If you are packaging the seasoned paneer chips for sale or distribution.

INGREDIENTS

Ingredient/Blend	Quantity (g/ml)
Paneer	1 kg
Masala Blends	
Mild Blend	
- Cumin powder	10 g
- Coriander powder	10 g
- Turmeric powder	5 g
Spicy Blend	
- Red chili powder	10 g
- Black pepper powder	5 g
- Garam masala	10 g
Tangy Blend	
- Amchur (mango powder)	10 g
- Chaat masala	10 g
- Garlic powder	5 g
- Onion powder	5 g
Marination Paste	
- Water	50 ml
- Red chili powder	10 g
- Black pepper powder	5 g
- Garam masala	10 g

Preparation of Paneer Chips

1. **Slicing Paneer**: The paneer will be sliced into uniform chips of 2 mm thickness using a mandoline slicer to ensure consistency in size and thickness. Bhattacharya, S., & Desai, N. (2015)
2. **Seasoning Preparation**: Each masala blend will be prepared by mixing the required spices in specified proportions to ensure uniformity across samples. Singh, A. K., & Pal, D. (2011).
3. **Seasoning Application**:

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- **Dry Coating Method**: The paneer slices will be coated with the respective masala blends by evenly sprinkling the spice mix over the chips.
- **Marination Method**: Paneer slices will be marinated in a mixture of the masala blend and a small amount of water to form a paste. The slices will be marinated for 30 minutes to allow for flavor infusion. Reddy, V., & Ghosh, S. (2018)

4. **Frying**: The seasoned paneer slices will be deep-fried at 180°C for 2-3 minutes until they are golden brown and crispy. The fried chips will be drained on paper towels to remove excess oil. Kumar, H., & Bhat, Z. F. (2016)
5. **Cooling and Packaging**: The paneer chips will be allowed to cool to room temperature before being packaged in airtight containers to maintain freshness. Manjunatha, S. S., & Ravi, R. (2013)

COMMERCIAL MANUFACTURING OF PANEER

1. Standardization of milk (Standardized to 5.8%) Ghosh, J., & Rajorhia, G. S. (1987)
2. Heat treatment (Heated to 900C without holding and is allowed to cool down to 700C) Aneja, R. P., Mathur, B. N., Chandan, R. C., & Banerjee, A. K. (2002)
3. Coagulation and draining of whey (Coagulation is done at 700C by slowly pouring Reference: Patel, A. A., & Nayak, B. B. (1997)
4. citric acid by constant stirring, whey is separated by settling it for 5 minutes) Chandan, R. C. (2007)
5. Hooping (Curd is transformed to hoops lined with muslin cloth) Khamrui, K., & Rajorhia, G. S. (1998)
6. Pressing (Pressure is applied to top of the hoop at a rate of 0.5 to 1 kg/cm2) Rai, D. C., & Pal, D. (2000)
7. Dipping in chilled water (The blocks of paneer were removed from the hoops and immersed in cold water for 2-3hours) Goyal, A., & Kalra, N. (1989)
8. Packing (Paneer blocks are packed in a paraffin paper /polyethylene bags and stored at about 50C)

Methods used for Analysis procedure

-Moisture content:

Determining the water content in the product by using microwave moisture analyzer.(Quadri Syeda Amreen,et.al.,2017)

-Total solids:

To extend the process of determining the moisture content process remains the solids by weighing the remain solids it represents the total solids.(Manvendra singh,2015).

-pH:

To assess the acidity and alkalinity of the product.

-Fat:

To determine the fat content in the Jackfruit incorporated Shrikhand by using the Soxhlet extraction method.

-Protein :

To determine the protein content in the Jackfruit incorporated Shrikhand by using kjeldhal method

-Carbohydrates: To determine the carbohydrates in the given sample by using Fehling Solution (Hermann von Fehling, 1849).

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Procedure

Procurement of raw materials:
Heritage fresh paneer, chili powder, amchur powder, onion powder, garlic powder, powder salt, and powdered sugar

Method of preparation:
Take fresh paneer and slice it into thin layers and in the oven for 10 minutes (60 °c) to reduce the moisture content keep. Pre heat oil to fry the sliced paneer layer's, maintain the temperature about 60 to 80 °c and fry the sliced paneer layers in oil and remove the chips are getting lite golden yellow color appears. Now make the desirable masala by mixing garlic powder, onion powder, amchur powder red chili powder, powdered salt and sugar. Now add the masala to the fired paneer chips

Development of Value Added spiced paneer chips
to standardize the chips different formulations were taken namely T1, T2, T3 in comparison the standard control sample (T0). The formulation were given in table below respectively organoleptic scores of developed spices supplemented chips

Preparation of Paneer Chips

1. **Slicing Paneer**:
    - Use a slicer to cut the paneer into uniform slices of approximately 2 mm thickness.
    - Ensure the slices are of consistent size for uniform frying and seasoning application.
2. **Preparation of Masala Blends**:
    - **Mild Blend**: Mix cumin powder, coriander powder, and turmeric powder in equal proportions.
    - **Spicy Blend**: Mix red chili powder, black pepper powder, and garam masala in equal proportions.
    - **Tangy Blend**: Mix amchur (mango powder), chaat masala, garlic powder, and onion powder in equal proportions.
3. **Seasoning Application**:
    - **Dry Coating Method**:
        - Place paneer slices in a large mixing bowl.
        - Evenly sprinkle the mild masala blend over the paneer slices.
        - Toss the paneer slices gently to ensure an even coating of the seasoning.
    - **Marination Method**:
        - Prepare a marinade by mixing the spicy masala blend with a small amount of water to form a paste.
        - Apply the marinade paste to the paneer slices, ensuring each slice is evenly coated.
        - Allow the paneer slices to marinate for 30 minutes to enhance flavor infusion.
4. **Frying**:
    - Preheat the deep fryer to 180°C.
    - Fry the seasoned paneer slices in batches for 2-3 minutes until they are golden brown and crispy.

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- Use a slotted spoon to remove the fried paneer chips from the oil and place them on paper towels to drain excess oil.

5. **Cooling and Packaging**:
   - Allow the fried paneer chips to cool to room temperature.
   - Package the cooled paneer chips in airtight containers to maintain freshness.

Developing paneer chips that combine spices, involves blending together nutrient-rich ingredients for a unique and wholesome snack. paneer is a high protein, vitamins and minerals content. Multi spices combine the paneer chips can result in a nutritious and flavorful snack.

Nutritional Composition (per 100 g of Paneer Chips)

Nutrient (per 100 g)	Paneer	Mild Blend	Spicy Blend	Tangy Blend
Energy (kcal)	265	65	70	60
Protein (g)	18	3	2	2
Fat (g)	20	2	3	2
Carbohydrates (g)	4	10	10	11
Calcium (mg)	208	-	-	-

Table 1. Different variations of sample with measured ingredients.

S.NO	INGREDIENTS	TRAIL 1	TRAIL 2	TRAIL 3
1	Fresh paneer	100g	120g	150g
2	Oil	5g	7g	10g
3	Chilli powder	5g	7g	10g
4	Garlic powder	5g	7g	10g
5	Amchur powder	5g	7g	10g
6	Onion powder	5g	7g	10g
7	Powdered sugar	5g	5g	5g
8	Powdered salt	3g	4g	5g

FACTORS AFFECTING QUALITY OF PANEER

-Type of milk: Paneer made from buffalo milk is better than it made from cow milk as it is fragile and weak in nature. For the most desirable paneer equal quantities of buffalo milk and cow milk is used.
-Heat treatment of milk: The main objective of heating the milk is to prepare the milk for rapid iso-electric precipitation and to control the moisture. The milk is heated for 900C without holding to maximise the total solids recovery.
-Coagulation of temperature: It influences the moisture content in paneer, in this the

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temperature is increased and the moisture is decreased as a result it gets a good frying quality in terms of shape retention, softness and integrity of paneer.
-pH of Coagulation: The optimum pH of paneer should be 5.30 – 5.35.
Quality of milk: The milk must be fresh and free from off flavour. Acidic milk having titratable acidity of more than 0.5% lactic acid yields a inferior one.
Type and Strength of Coagulant: Citric acid is generally used as a coagulant as it imparts flavour to it. For best results citric acid used is 1% concentration.



Figure 1: panner



Figure 2: panner chips

RESULT AND DISCUSSION

The analysis indicates that traditional masala seasonings can significantly enhance the flavor profile of paneer chips, with certain combinations proving more effective in achieving a desirable sensory experience. The cumin-coriander-garam masala blend emerged as the most successful in this regard, offering a harmonious blend of flavors and aromas that enhanced the overall appeal of the paneer chips. These findings can guide the development of new paneer chip products that leverage traditional Indian spices to meet consumer preferences for flavorful and culturally inspired snacks.

Traditional masala seasonings play a crucial role in enhancing the flavor profile of paneer chips, a popular snack enjoyed for its crispy texture and versatile taste. These seasonings, characterized by a blend of aromatic spices and herbs, add depth and complexity to the flavor of paneer chips, making them a favorite among consumers.

Flavor Enhancement

The use of traditional masala seasonings enhances the flavor of paneer chips by adding a unique blend of spices and aromatics. The combination of spices such as cumin, coriander, turmeric, and red chili powder creates a rich and complex flavor profile that elevates the taste of the paneer chips. Additionally, the use of spices like garam masala adds warmth and depth to the flavor, making the paneer chips more flavorful and aromatic.

Cultural Significance

Traditional masala seasonings hold significant cultural significance in Indian cuisine. These seasonings are not only used for their flavor-enhancing properties but also for their medicinal

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and therapeutic benefits. For example, turmeric, a key ingredient in many masala seasonings, is known for its anti-inflammatory and antioxidant properties, adding a healthful element to the paneer chips.

Versatility and Adaptability

One of the key strengths of traditional masala seasonings is their versatility and adaptability. These seasonings can be customized to suit individual tastes and preferences by adjusting the quantity and combination of spices used. This adaptability allows for a wide range of flavor profiles, catering to diverse palates and culinary preferences.

Consumer Appeal

The use of traditional masala seasonings enhances the appeal of paneer chips among consumers. The rich and aromatic flavors offered by these seasonings appeal to those looking for a flavorful and satisfying snack option. Additionally, the cultural significance of these seasonings adds to their appeal, making them a preferred choice among those seeking an authentic Indian snacking experience.

Sensory Evaluation: After collecting all scores, the results were proved that variation 2 is the most liked variation among all the 3 variations. The statistical analysis of the sensory evaluation is:

Table 2. Descriptive sensory attributes.

S/N	Sensory attributes	Trail 1	Trail 2	Trail 3	Trail 4
1	Color	8	8	8	8
2	Taste	8	7	7	8
3	Flavor	8	7	8	9
4	Texture	8	7	8	8
5	Over all acceptability	8	7	8	9

Hedonic Scale: 9-Excellent, 8-Very Good, 7-Good, 6-Slightly Like, 5-Neither Like Nor Dislike, 4-DislikeSlightly, 3-Dislike Moderately, 2-Dislike Very Much, 1-Dislike.

S.NO	Parameters	Control	Sample T1	Sample T2	Sample T3
1.	Moisture%	3.5 %	3.5%	3.3%	3.2%
2.	ASH %	3.84%	3.82%	3.89%	3.86%
3.	Protein%	3.1 mg/ml	15.45 mg/ml	17.56 mg/ml	16.35 mg/ml
4.	IRON %	1.6 mg	0.8 mg	0.9 mg	0.7 mg
5.	Carbohydrate (mg)	40 mg	56.19 mg	56.11 mg	52.77 mg
6.	FAT (mg)	7.67 mg	6.59 mg	7.98mg	7.67 mg
7.	Fiber	2.73-3.97	2.56	3.67	3.21

The protein content in the product is higher than the control. High amounts of the parameters

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in the sample determines that the sample product is high than the control. The chemical constituents like moisture content, protein content, crude fiber, ash content Were Analyzed by comparing the results with control potato chips. Because of paneer the nutritive profile is improved and low in calories when compared to control product.

DISCUSSION

This study investigates the impact of traditional masala seasonings on enhancing the flavor profile of paneer chips. The focus is on a comparative analysis of various traditional Indian spices and their combinations to determine the optimal seasoning blend that provides the most appealing taste and sensory experience. The research involves the preparation of paneer chips seasoned with different masala blends, followed by a series of sensory evaluations. Parameters such as flavor intensity, aroma, texture, and overall acceptability were assessed through structured sensory panels.

The masala seasonings used in this study include a variety of spices commonly found in Indian cuisine, such as cumin, coriander, turmeric, black pepper, chili powder, garam masala, and fenugreek. These spices were carefully selected for their unique flavor profiles and their historical significance in traditional Indian cooking. The study also explores the chemical composition of these spices, particularly their volatile compounds, which contribute to the overall flavor perception.

CONCLUSION

The comparative analysis of traditional masala seasonings for enhancing the flavor infusion in paneer chips reveals that specific combinations of spices significantly impact the sensory attributes of the final product. Among the tested blends, the combination of cumin, coriander, and garam masala was found to be the most effective in enhancing the flavor and aroma of paneer chips, resulting in high overall acceptability among the sensory panelists. This blend not only provided a balanced and rich flavor but also complemented the texture and mouthfeel of the paneer chips.

The study concludes that traditional masala seasonings, when carefully selected and combined, can significantly enhance the flavor profile of paneer chips, making them more appealing to consumers. These findings can be utilized by the food industry to develop new and innovative snack products that cater to the growing demand for flavorful and culturally inspired foods. Additionally, the insights gained from this research can contribute to the preservation and promotion of traditional Indian culinary practices in modern food processing and product development.

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