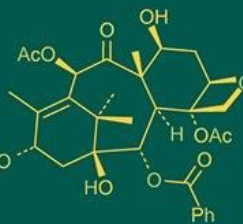
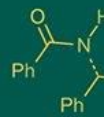


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A study on infusing orange essence into paneer

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Abstract

Paneer is a product obtained from cow or buffalo milk by precipitation with sour milk, lactic acid or citric acid. It should contain maximum 70% moisture and minimum 50% fat on dry matter basis". Paneer is a valuable source of animal protein, fat, vitamins and minerals available at a comparatively lower cost and the biological value of protein in paneer. The exploration of innovative flavors and ingredients in food products has become increasingly important in contemporary culinary practices. One such endeavour is the development of orange flavoured paneer bites, which merges the rich, creamy texture of paneer with the vibrant and zesty essence of oranges. This unique combination aims to create a delightful snack that not only caters to the palate but also offers nutritional benefits by infusing paneer with orange flavour, we can enhance its existing profile, introducing freshness and a hint of sweetness that appeals to a broader audience, including health-conscious consumers and adventurous eaters. The use of natural fruit flavors allows for an innovative approach to snack food, aligning with current trends that favor artisanal and health oriented offerings. In present study orange flavoured paneer bites are prepared and shelf life study was done for 45 days and sensory evaluation was done by using 9 point hedonic scale, the sensory score were acceptable upto 45 day.

Keywords: Paneer, orange flavour

Introduction

Paneer, a popular Indian dairy product, has a relatively short shelf life. Extending its freshness while infusing it with orange flavour presents an exciting challenge. This study aims to develop orange-flavoured paneer bites and investigate their shelf life under refrigerated conditions. Citrus sinensis, or the sweet orange, is the type people typically enjoy fresh and in juice form. Oranges are a treasure trove of nutrients and protective plant compounds, including vitamins, minerals, and antioxidants. Studies show that consuming oranges regularly may benefit your health in several ways. Oranges are high in this important nutrient, which keeps your bones, organs, and muscles strong. Oranges are a great way to get a big dose of folate naturally. Your body uses it to divide cells and make DNA. Because it helps prevent birth defects, it's an especially important B vitamin for pregnant women. The 12 grams of sugar in an orange are all natural. That's different from the kind of sugar you'd get in a candy bar. Plus, all the fibre, vitamins, and antioxidants that come with an orange make it a much better choice for your body. Choose raw oranges, which have less sugar than the dried kind. This nutrient lowers your blood pressure, and oranges have a bunch of it. Paneer is a popular South-Asian variety of non-fermentative, non-renneted, non melting and un-ripened type cottage cheese, prepared by acid coagulation of hot milk. According to the FSSAI (2006), "Paneer is a product obtained from cow or buffalo milk by precipitation with sour milk, lactic acid or citric acid. It should contain maximum 70% moisture and minimum 50% fat on dry matter basis". Paneer is a valuable source of animal protein, fat, vitamins and minerals available at a comparatively lower cost and the biological value of protein in paneer is in the range of 80 to 86 (Shrivastava and Goyal, 2007). Paneer is consumed either in raw form or in preparation of varieties of culinary dishes like palak paneer, shahi paneer, matter paneer and snacks as paneer pakora or fried paneer chunks. To date, no comprehensive study was conducted regarding development of protein rich cranberry infused caramel paneer bites for school going children. Further, shelf life of the cranberry infused caramel paneer bites was analysed at refrigeration temperature (4±1 °C) up to spoilage. The exploration of innovative flavors and ingredients in food products has become increasingly important in contemporary culinary practices.

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One such endeavour is the development of orange flavoured paneer bites, which merges the rich, creamy texture of paneer with the vibrant and zesty essence of oranges. This unique combination aims to create a delightful snack that not only caters to the palate but also offers nutritional benefits. Paneer, a fresh cheese common in Indian cuisine, is celebrated for its high protein content and versatility in various dishes. By infusing paneer with orange flavour, we can enhance its existing profile, introducing freshness and a hint of sweetness that appeals to a broader audience, including health-conscious consumers and adventurous eaters. The use of natural fruit flavors allows for an innovative approach to snack food, aligning with current trends that favor artisanal and health oriented offerings. Furthermore, the technologic aspect of developing these orange flavored paneer bites involves careful consideration of the balance between flavor, texture, and nutrition. The creation process will necessitate experimentation with various proportions of orange zest, juice, and tissue integrity of paneer, ensuring an optimum blend that holds its shape during cooking while still effectively showcasing this refreshing flavor. This component of food innovation not only contributes to the culinary world but also underlines the importance of creativity and research in developing exciting new products in the ever-evolving landscape of gastronomy. As such, orange flavored paneer bites stand to redefine snack options for diverse demographics, providing them with a unique culinary experience that is deeply rooted in both tradition and innovation. Therefore, research in this direction aims to further explore the synthesis of flavors and the potential of integrating unconventional ingredients into traditional food items, ultimately pioneering gourmet snacks that satisfy modern tastes without compromising on quality or health aspects. In conclusion, the development of orange flavored paneer bites showcases an emerging trend that marries diverse culinary traditions with innovative flavor profiles, celebrating the endless possibilities within the realm of food science and gastronomy.

Materials and Methods

Procurement of sample

The milk sample was procured from Nandini parlour (DAMUL), Dharwad. The milk sample of 4.5% fat and 8.5% SNF was taken into the consideration for well suitable quality for the preparation of bites. The orange juice was extracted from fresh valencia oranges procured from a local fruit vendor. The purpose of choosing this particular variety of orange is due to its balanced sweet to tart flavor ratio that carries over to their juice. Valencia oranges are believed to be a hybrid cross of pomelos and mandarins which explains both sweetness and juiciness.

Physical characteristics of orange flavored paneer bites

Physical characteristics of orange flavored paneer bites include a vibrant orange hue that enhances visual appeal, a slightly tangy taste due to the presence of orange flavoring, and a soft yet firm texture that is characteristic of well prepared paneer. The infusion of orange not only contributes to its aesthetic quality but also ensures a unique flavor profile that can enhance the overall taste experience of the dish. The paneer bites may also exhibit a moist consistency, making them more palatable and enjoyable for consumers. Ultimately, these physical traits can play a vital role in determining the acceptance and popularity of orange

flavored paneer bites among different demographics. Additionally, the physical characteristics of orange flavored paneer bites highlight their appealing color and texture. The infusion of orange flavor not only adds a vibrant hue, making the paneer bites visually enticing, but also enhances the overall sensory experience with a refreshing aroma and taste. The final product typically presents a firm yet tender texture, complemented by a slight gloss from the flavored coating, which together contribute to an appetizing presentation that is likely to attract consumers.

Product developed (orange flavored paneer bites)

Orange flavored paneer bites involves incorporating 15% orange juice into the 60% paneer, & 15% sugar. This mixture is cooked for about 15-20 mins simultaneously stirring continuously. Then the hot mixture is taken out, demoulded in a square container, cooled and cut into small squares. Meanwhile and orange zest layer is prepared by adding 2% of sugar in 8% of orange zest and stirred continuously, cooled and coated on top of the layer of orange flavored paneer squares.

Sensory Evaluation of (orange flavored paneer bites)

The sensory evaluation of orange flavored paneer bites is conducted using 9 point hedonic scale by semi trained judges. These judges, typically familiar with the product, assess attributes like appearance, texture, taste, aroma, & acceptability. Orange flavored paneer bites incorporation 60% paneer, is prepared and presented consistently. Judges rate each attribute from 1 ("dislike extremely") to 9 ("like extremely"). The collected data is then analyzed to determine the product's sensory acceptance, following guidelines similar to those outlined by Meilgaard, Civille, & Carr in their 1999 work, Sensory Evaluation Techniques.

Nutritional composition of orange flavored paneer bites

The nutrient composition of orange flavored paneer bites includes a balance of macronutrients and micronutrients that contribute to their overall health benefits, were conducted by standard AOAC method.

Estimation of acidity: The titratable acidity of milk powder is defined as the number of milliliters of a 0.1N NaOH solution required to titrate a quantity of the reconstituted sample corresponding to 5g of SMP/WMP milk powder to color change point of phenolphthalein according to the procedure.

$$\text{Lactic acid \%} = \frac{\text{Titratable volume in ml} \times 2}{\text{SNF}}$$

Estimation of moisture: The sample is dried to constant weight at 97 °C-100 °C for 3 hours in hot air oven and loss in weight reported as moisture. From the moisture percentage, the total solids content in milk powder is determined.

$$\text{Moisture \%} = \frac{\text{Difference weight in gm} \times 100}{\text{Sample taken in gm}}$$

$$\text{Difference weight (gm)} = \text{total weight (gm)} - \text{final weight (gm)}$$

Estimation of protein: The protein in paneer are estimated by using either component amino acids or by their chemical reactions or by their physical forms. We determined by chemical method i.e., formol titration. This method involves titration of a sample to the end point of an indicator such as phenolphthalein, or adding a solution of formaldehyde, and titrating the acid liberated to the same end point. The amount of alkali used in the second titration is a measure of the amino groups that were originally present and combined with the formaldehyde. As per Bureau of Indian Standards, for estimation of total milk protein a factor of 1.7 is used and while for casein the factor 1.38 is used.

Difference = Final burette reading-Initial burette reading

Protein % = Difference x 1.7 x 1

Estimation of fat: Gerber method is primary and historic chemical test to determine the fat content. Milk powder fat is separated from proteins by adding Sulphuric acid. Separation is facilitated by using amyl alcohol and centrifugation. The fat content is read directly via a special calibrated butyrometer. Gerber developed specialized

butyrometer (tubes), pipettes and centrifuges. Water baths were built specially for Gerber tubes are often used.

Fat % = Butyrometer reading × 6.66

Statistical Analysis

Data Analysis: The collected data will be analyzed statistically to summarize taste profiles, microbial growth, and any changes in physical properties over time, allowing for a comprehensive understanding of the stability of the orange-flavored paneer bites. By thoroughly investigating this innovative product, we aim to determine its feasibility for market introduction and suitable shelf life without compromising taste or safety. This methodology will provide a comprehensive framework for not only developing orange-flavored paneer bites with enhanced organoleptic properties but also for understanding fundamental preservation science, ultimately ensuring consumer satisfaction and product innovation in dairy offerings.

Methods of processing

Methods of processing-flow chart

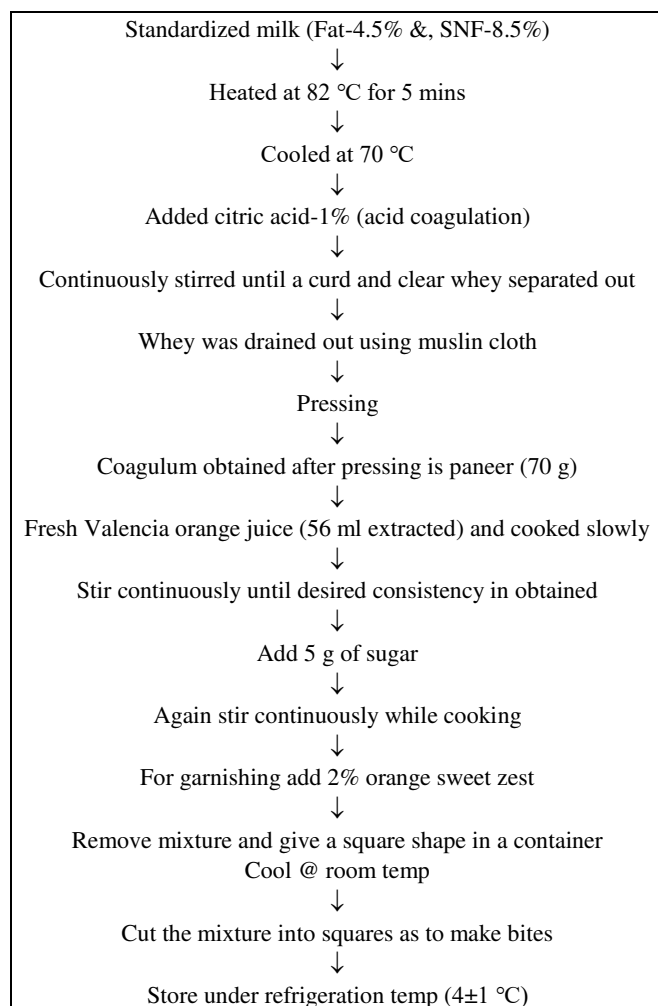


Fig 1: Process flow chart of orange flavored paneer bites

Shelf-life study of (orange flavored paneer bites): A shelf-life study of orange flavored paneer bites was conducted at refrigeration temperature (4 ± 1 °C) for 30 days, using different packaging materials. The shelf life of the paneer bites will be assessed at regular intervals (e.g.0,

10, 15 days) through sensory evaluation (taste, texture, and aroma), microbiological tests, and chemical analysis (pH and moisture content). Observations will be recorded daily to determine spoilage indicators and assess overall product quality throughout the storage period.

Results and Discussion

Table 1: Nutritional composition of orange flavored paneer bites

Nutrient	Quantity
Fat (g)	22.75
Protein (g)	18.93
Carbohydrate (g)	17.32
Energy (kcal)	350.97

Table 1 indicates the composition of orange flavored paneer bite. The fat content is about 22.75g, protein is 18.9g carbohydrate is 17.32 and calories is 350.97 kcal. This composition highlights the nutritional benefits while also considering the potential appeal to younger consumers through the fruit flavoring. According to Gandhi and Muthukumarappan (2007) Paneer is an acid-heat coagulated milk product, which is similar in nature to the non-melting types of mozzarella cheese. It is relatively wet containing between 52% and 56% of water, between 26% and 30% of

fats, between 17% and 23% of protein and 2% ash. Paneer depends on the quality of the milk, the coagulating acid used, coagulating temperature and the method of production as stated by Rajmohan *et al.*, 2012.

Table 2: Chemical analysis of orange flavored paneer bites

Time (days)	Acidity (% lactic acid)	Moisture content (%)	Sucrose content (%)
0	0.50	54.0	5.0
15	0.65	56.5	4.8
30	0.80	58.0	4.5
45	1.0	65.0	4.6

With increase in time period of the product the acidity increases because microbial activity as lactose gets converted into lactic acid which eventually increases the acidic level. The increased percentage of acidity and moisture is due to the increased Ph content as days increased. The study is supported by (Singh *et al.*, 2018).

Table 3: Sensory evaluation of orange flavored paneer bites

Variation in storage time of orange flavored paneer bites	appearance	Aroma	Colour	Texture	Taste	Overall acceptability
0th day	7.90	8.00	7.70	8.5	7.80	8.70
15th day	7.85	7.90	7.0	7.6	8.0	8.50
30th day	8.0	7.40	8.60	8.20	7.0	7.90
45th day	7.1	7.90	7.0	7.20	7.80	7.10

Table 3 indicates the sensory evaluation of orange flavoured paneer for 45th day time duration on 0th day the overall acceptability was 8.70 with (appearance 7.9, aroma, 8.0, colour 7.7, texture 8.5, and taste was 7.80) and on 45th day the overall acceptability of orange flavoured paneer was 7.10. The sensory scores are decreased in orange flavoured paneer over a period of time may be because of change in physicochemical composition of paneer.

Conclusion

In conclusion, the integration of fruit flavoring into paneer bites presents a promising opportunity to enhance their appeal, particularly among younger consumers who favor flavored products over traditional options. However, while this innovation may increase marketability, the orange flavored paneer bites present a promising innovative product with a unique flavor profile that could appeal to health-conscious consumers.

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