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Preparation of Petha by Using Pomegranate Flavour

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Abstract: The present study was carried out at the Department of Food Science and Technology, School of Agriculture, Lovely Professional University. The increasing demand for healthier snack alternatives has led to the exploration of natural ingredients in confectionery products. This research focuses on the development and evaluation of petha by using pomegranate flavour. The primary objective is to create a nutritious petha that provides essential nutrients while satisfying sweet cravings. Six different treatments were developed, varying the proportions of pomegranate flavour, with comprehensive analysis conducted to evaluate their sensory and nutritional properties. Sensory evaluation identified the optimal formulation as Treatment 6, which received the highest scores for taste (8.80), flavour (8.70), colour (8.70), texture (8.90), mouthfeel (8.70) and overall acceptability (8.75) on a 9-point hedonic scale. Nutritional analysis of the best-performing treatment revealed a moisture content of 31.08% (T1), ash content of 3.00% (T5), total acidity of 0.030% (T6) and ascorbic acid of 5.25Mg/100g (T6). Physio-chemical analysis showed highest values in treatment T6 viz., tannin (1.07mg/100g), total phenolic content (8.66mg GAE/g) and total flavonoid content (2.66mg QE/g). The research employed advanced techniques such as solvent extraction, steam distillation and supercritical fluid extraction to integrate pomegranate essence effectively without compromising the traditional texture and integrity of petha. Results from the sensory evaluations indicated a positive reception, with participants appreciating the innovative flavour profile and expressing a high likelihood of consumption, suggesting strong market potential, especially among health-conscious consumers. The chemical analysis confirmed significant increase in Vitamin C content, reinforcing the product's positioning as a healthier alternative within the confectionery market. The study underscores the feasibility of blending traditional confectionery practices with modern nutritional enhancements, highlighting a viable pathway for the evolution of traditional sweets into functional foods.

Keywords: Petha;Pomegranate flavour; Lime powder; Sensory Evaluation; Proximate analysis, Physio chemical properties.

Aim:

To develop and evaluate the sensory and nutritional parameters of petha made by using pomegranate flavour

Introduction

Petha, a quintessential Indian sweet delicacy, embodies a rich tapestry of cultural heritage deeply rooted in the traditions and customs of the Indian subcontinent. Originating in the historic city of Agra, Uttar Pradesh, petha holds a cherished place in the culinary landscape of India, transcending mere gastronomic delight to become a symbol of communal celebrations and cultural identity (Srivastava et al., 2015). It's historical significance can be traced back to the Mughal era, where it is believed to have been relished by the Mughal emperors, particularly Emperor Shah Jahan, who ruled during the 17thcentury (Dutta and Zisserman, 2019). Petha was introduced to the royal court by the Persian confectioners who accompanied the Mughal rulers and its exquisite taste and delicate texture captivated the royal palate. Over time, petha became synonymous with the city of Agra, earning the moniker "Agra Petha" and establishing itself as a culinary emblem of the region. Today, the tradition of making and consuming petha continues to thrive in Agra, with numerous iconic sweet shops and confectioneries specializing in its production. Beyond it's geographical origins, petha has transcended regional boundaries to become a beloved sweet across India, enjoyed during festivals, weddings and other auspicious occasions (Sharma and Bhatt, 2016). Its translucent appearance, subtle sweetness and melt-in-your-mouth texture evoke nostalgia and evoke fond memories of festive gatherings and familial bonds. Moreover, petha's association with cultural festivities such as Diwali, Eid and weddings underscores its role as a harbinger of joy and prosperity. The preparation of petha has been passed down through generations, with each family and community adding its own unique touch to the traditional recipe, thus enriching its cultural legacy. The enduring popularity of petha reflects not only its culinary appeal but also its ability to transcend time and space, serving as a timeless reminder of India's rich cultural heritage and culinary diversity (Gottardi et al., 2019).

The preparation of pomegranate-flavoured petha not only relies on traditional techniques but also benefits from modern advancements in flavour extraction and processing. With the advent of advanced extraction methods, such as solvent extraction, steam distillation and supercritical fluid extraction, it is now possible to capture the authentic essence of pomegranate with precision and efficiency (Santos et al., 2017). These technological innovations enable manufacturers to produce high-quality flavouring agents that enhance the taste and aroma of confectionery products like petha. By leveraging cutting-edge flavour extraction techniques, the pomegranate flavour can be incorporated seamlessly into the traditional petha recipe, offering consumers a harmonious blend of tradition and innovation. The preparation of pomegranate-flavoured

petha benefits from the application of modern advancements in flavour extraction and processing.

Ash gourd, Benincasa hispidabelongs to the family Cucurbitaceae, is a well-liked vegetable crop with numerous nutritional and therapeutic uses. The well-known ash gourd is grown on hillsides up to 1200 meters in elevation as well as across India's plains. With slabby, fast-growing stems, it's a huge climbing plant, round, with a waxy layer covering it. According to a phytochemical investigation, the main components of Benincasa hispida fruits are proteins, carotenes, flavonoids, glycosides, saccharides, volatile oils, vitamins, minerals, ß-sitosterol, and uronic acid. Typically, the locals referred to it as a vegetable fruit. The fruit's entire body can be utilized medicinally.Fruits used for fever, dyspepsia, epilepsy, cardiotonic illness, aphrodisiac and other conditions (Doharey et al., 2021).

Pomegranate flavour is a well-known and iconic flavour characteristic in the realm of petha and Indian sweets. The pomegranateflavour is inspired by the fruit's juicy arils, which are high in antioxidants and have a sweet-tart flavour.The pomegranate flavour in petha is sweet and slightly acidic, with fruity undertones and a faint acidity.Pomegranate flavour in petha is often obtained by combining natural and artificial flavourings such as pomegranate juice, extract and other fruit flavours.Some petha recipes may include other pomegranate flavourings, such as pomegranate molasses or pomegranate syrup, to create a richer and more robust flavour profileNatalello et al., (2023). Pomegranate taste is a common and recognizable flavour characteristic in petha and Indian sweets. The pomegranateflavour in petha is sweet and somewhat acidic. The pomegranate taste in petha is frequently combined with additional spices such as cardamom, saffron and nuts to create a distinct and balanced flavour experience. The flavour is popular among petha fans, particularly during festivals and special occasions. The pomegranate flavour in petha is not only delicious, but it also has potential health advantages because pomegranates are high in antioxidants and anti-inflammatory qualities (Dhuma et al., 2014).

Material and methods

Ash gourd **(**Benincasa hispida**),** Pomegranate flavour**(**Brand**:** Natural and Herbal products**)**andLime powder **(**Brand**:** INDVIK**),** were purchased from markets of Jalandhar, Punjab. The majority of the chemicals and additives utilized in this research study were of analytical gradequality and available from the university laboratory.

Preparation and Standardization of Petha

The control petha formulation consisted of 250g ash gourd, 5g lime powderand 500g sugar. Six different formulations were prepared by changing the ratio forpomegranate flavour were 0(control); 2; 4; 6; 7 and 9 w/w. Across all

formulations, the amount of ash gourd, lime powder and sugar matched the control.

Table 1: Quantity of ingredients used for standardization of petha

Treatment Number	Ash gourd (g)	Lime powder (g)	Sugar (g)	Pomegranate Flavour (g)	Water (ml)
T1	250	5	500	0	100
T2	250	5	500	2	100
T3	250	5	500	4	100
T4	250	5	500	6	100
T5	250	5	500	7	100
T6	250	5	500	9	100

Preparation of Petha

The petha-making process begins with the preparation of petha by using ash gourd pomegranate flavour. Select a fresh winter melon (also known as ash gourd). Cut it into cubes after peeling and seeding it. Soak these cubes in a lime solution at overnight (calcium hydroxide) to harden their texture. After soaking, give it a thorough wash to remove any remaining lime residue. To make sugar syrup, that has a Brix concentration of 65-80°C, dissolve the sugar in water and bring the liquid to a boil. The cubes of ash gourd have absorbed the syrup and then add the pomegranate flavour to the boiling sugar syrup. Slowly the ash gourd was absorbing the flavour and sugar syrup. Heat the mixture until it thickens and all of the flavour is blended. Once the petha is taken out of the syrup, allow it to cool on parchment paper. Keep it a side at overnight room temperature and store it in laminated pouches to maintain the freshness for prolonged enjoyment (Hasan et al., 2022).

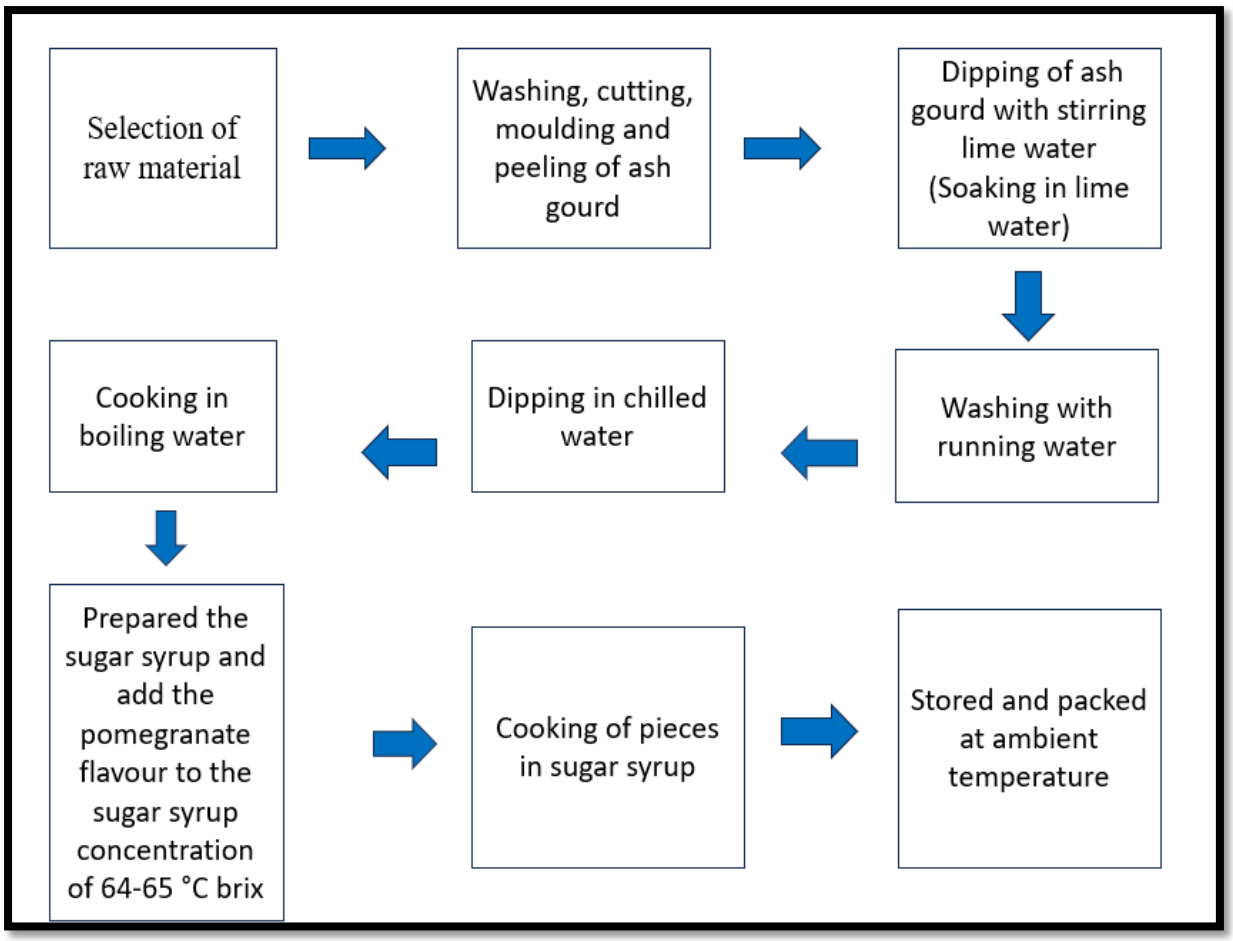

Figure1: Process flow chart for the preparation of petha by using pomegranate flavour

Sensory evaluation

The scientific field of sensory evaluation measures, analyzes and interprets responses to items as they are experienced by the senses of sight, smell, touch and hearing. The sensory examination of the samples included assessments of their taste, flavour, colour, texture, mouthfeel and overall acceptability. The panelists employed a 9-point hedonic scale ranging from 1 to 9 to complete the sensory evaluation (Patil et al., 2020).

Nutritional and qualitative analysis

Proximate Analysis

Moisture, ash, titrable acidity and ascorbic acid ofpetha was determined as per method mentioned by the AOAC (2016)

Physio-chemical analysis

Tannin

The tannin content of plant extracts was investigated using the Folin-Ciocalteu's reagent and the results were represented in terms of gallic acid equivalent in the standard curve equation
(Noypitak et al., 2015).

Total phenolic content and total flavonoid content

TPC and TFC in the candy were determined by spectrophotometrically according to the Folin–Ciocalteu and quercetin standard method respectively, as described by Mir et al., (2015). The results obtained were expressed as mg GAE/g for TPC and (QE)/g for TFC.

Ascorbic acid

Vitamin C in the sample was assessed by method explained by (Dahanayake and Ekanayake, 2020).

Results and discussion

Sensory evaluation

Table 2: Sensory evaluation chart of preparation of petha by using pomegranate flavour

Treatment	Taste	Flavour	Colour	Texture	Mouth feel	Overall acceptability
T1	8.00	8.00	8.00	7.95	8.15	8.00
T2	8.05	8.00	7.35	8.25	8.15	7.97
T3	8.05	8.00	7.85	8.15	7.95	8.07
T4	8.30	8.20	8.15	8.50	8.20	8.23
T5	8.40	8.50	8.25	8.70	8.60	8.66
T6	8.80	8.70	8.70	8.90	8.70	8.75

The sensory evaluation identified T6 was the best treatment in terms of sensory attributes viz., taste (8.80), flavour (8.70), colour (8.70), texture (8.90), mouth feel (8.70) and overall acceptability (8.75) followed by T5. (8.40, 8.50, 8.25, 8.70, 8.60 and 8.66 for taste, flavour, colour, texture, mouth feel and overall acceptability, respectively). After that, T4 was the most preferred treatment. Overall, the sensory evaluation suggested that treatments T6, T5 and T4 are the

most promising treatments for petha due to their high acceptability and favourable sensory profiles. T6 was the most preferred treatment overall, excelling in multiple sensory attributes like taste, flavour, colour, texture and mouth feel while T5 and T4 also consistently scored high, making them highly competitive with T6.

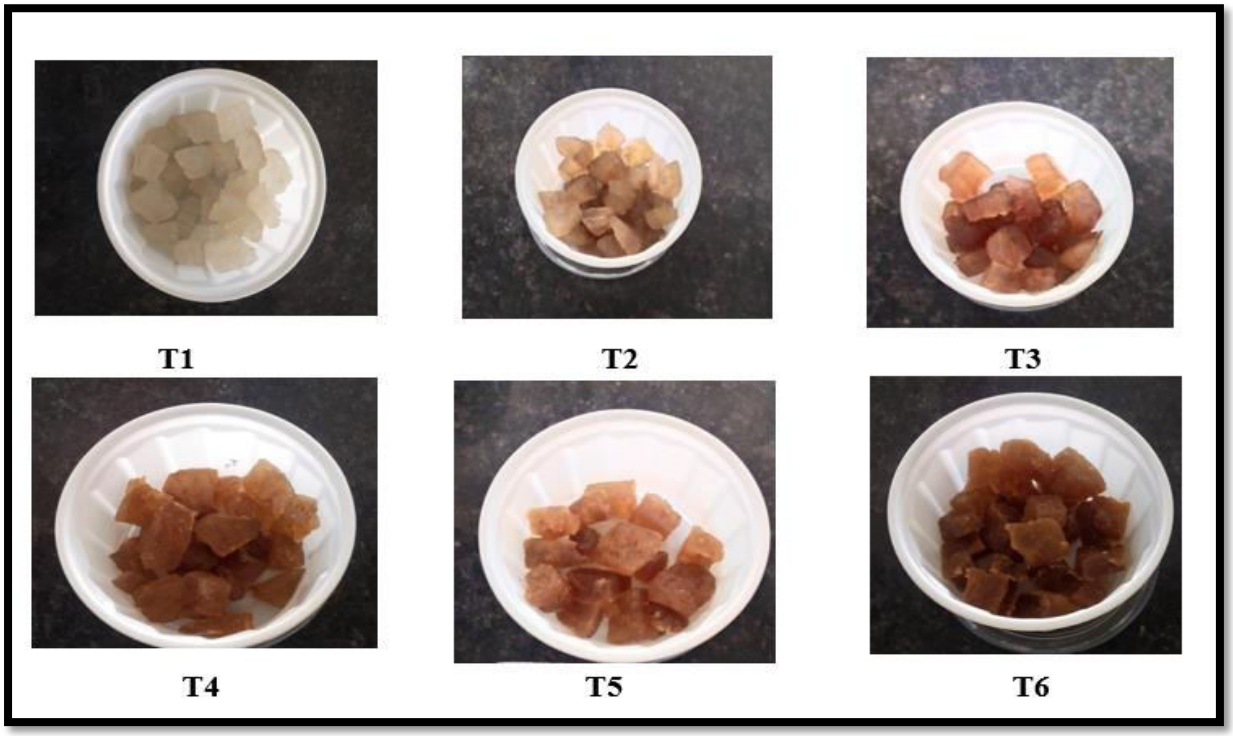

Figure 2: Preparation of petha by using pomegranate flavour in different Concentrations

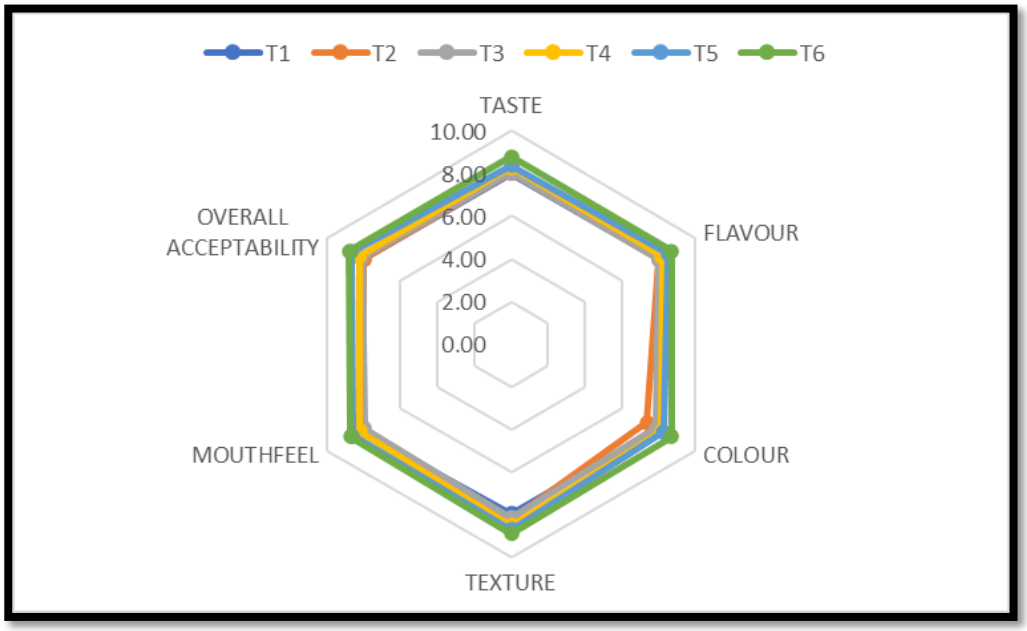

Figure 3: Graphical representation for sensory evaluation ofpetha

Nutritional and qualitative analysis

Proximate analysis

Table 3 Proximate analysis of petha at different treatments

Treatment	Moisture (%)	Ash (%)	Titrable acidity (%)	Ascorbic acid (mg/100g)
T1	31.08	2.70	0.023	4.97
T2	29.40	2.80	0.025	4.78
T3	28.83	2.60	0.026	4.68
T4	27.74	2.90	0.027	4.63
T5	27.45	3.00	0.028	5.03
T6	26.45	2.90	0.030	5.25
C.D	**0.62**	**0.18**	**0.002**	**0.26**

Food moisture content is important for several aspects of food preservation and quality. It describes how much water is in a food item, which affects its texture and flavor. It is essential to keep the moisture level of food under adequate management in order to preserve its ideal qualities and avoid spoiling or deterioration. Choosing the right analysis method requires an understanding of the expected moisture content. The results showed that T1 had the highest moisture content (31.08%) followed by T2 (29.40%). Treatment T6 had the lowest moisture content (26.45%). T3, T4 and T5 had average moisture contents of 28.83%, 27.74% and 27.45%, respectively. These results are in agreement with Pandey et al., (2014).While there were some minor differences in moisture content amongst the remaining treatments, this could be due to changes that happened during cooking, which could be influenced by the physiochemical properties of the raw materials, etc. Because of the high pomegranate flavour,the moisture content began to decline gradually as a result of the efficient drying or dehydration procedures that removed the excess moisture content in a significant amount of flavour Goutam et al.,(2022) provides further support for the validity and consistency of the obtained results.Determining the nutritional value and quality of the petha is mostly dependent on its ash content. When the petha is completely burned, the inorganic residue left behind is referred to as the ash content. Calcium, sodium, magnesium and phosphorus are the main minerals found in this residue Sharma, (2021). With (3.00%), petha T5 had the highest content, compared to (2.90%).Ash percentage rises marginally from (2.70%) to (2.80%) in the remaining treatments (T1 to T2). T4 and T6 were found at par with T5. The lowest ash content was found in T3 (2.60%). The results were found in the range reported by Pandey et al., (2012).Consequently, it was discovered that

petha had a significantly higher ash concentration, might be due to the fact that the length of storage time significantly decreased the ash content of petha, most likely as a result of the moisture content rising over time (Hasan et al., 2022). The investigation of titrable acidity is a measure of the total acid content in a food product. Treatment T6 (0.030%) showed an increasing trend in titrable acidity. T5 (0.028%)was found at par with T6. In treatment T1, which was the control group, the titrable acidity was found to bethe lowest (0.023%). The average mean scores were for T2 (0.025%), T3 (0.027%) and T4 (0.027%).Titrable acidity of petha was increasing because of pomegranates contain acidic substances such as ascorbic acid, citric acid and malic acid. Titrable acidity may rise as a result of increased ash gourd's acidic chemical extraction facilitated by the addition of pomegranate flavor, as suggested by Koppel et al., (2015). Conversely, the reduction in pH caused by the organic acids produced during the fermentation of petha's polysaccharides was directly connected with the increase in titratable acidity upon storage. The results are in broad confirming with Panday et al., (2012). T6 contains the highest ascorbic acid (5.25 mg/100 g). T5 (5.03mg/ 100g) was found at par with T6 (5.25 mg/100g). Lower ascorbic acid was found in T4 (4.63mg/100g). Control treatment T1 was recorded with ascorbic acid content (4.97 mg/100g).The results are in agreement with Pandey et al. (2012). This might be due to variations in the acidity or pH of the treatments may have an impact on the stability of ascorbic acid (Singh et al., 2014). Overall, the results revealed that adding pomegranate flavour to petha affect its ascorbic acid concentration, with T6 exhibiting the highest potential levels. The need to formulate the product to achieve consistent and desired nutritional effects is highlighted by the variation in ascorbic acid levels among treatments.

Table 4: Physio-chemical analysis of petha

Treatment	Tannin (mg/100g)	TPC (mg GAE/g)	TFC (mg QE/g)
T1	0.58	5.72	0.92
T2	0.65	6.13	0.95
T3	0.77	7.24	1.48
T4	0.87	7.33	1.75
T5	0.98	8.46	2.28
T6	1.07	8.66	2.66
C.D	**0.06**	**0.35**	**0.13**

The tannin content is a type of polyphenol that is present in plants and is distinguished by its bitter, astringent taste as well as its capacity to bind to other molecules and proteins. The tannin content ranged from0.58 mg/100g to 1.07 mg/100g. The highest tannin content was found in T6 (1.07 mg/100g) followed by T5 (0.98 mg/100g). The average tannin content was (0.65 mg/100g) in T2, (0.77 mg/100g) in T3 and (0.87 mg/100g).T1 had the lowest tannin content, measuring

(0.58 mg/100g). The results are in agreement with Gade et al., (2022). These variants show how the addition of pomegranate flavor affects the amount of tannin in the prepared petha, which may have an impact on the end product's flavor and health benefits. This may be because pomegranate's tannin concentration can be increased by utilizing solvents and extraction techniques that remove tannins from the fruit only. The pH level of pomegranate flavor may have an impact on tannin extraction, which would raise the tannin content Chawla et al., (2019).

Total phenolic content (TPC) ranges from 5.72 mg GAE/g to 8.66mg GAE/g. TPC is a major indicator of antioxidant capacityand potential health benefits in foods and beverages. High TPC has been linked to potential health benefits like improved cardiovascular health, decreased inflammation and anticancer properties of petha. T6 has the greatest TPC of (8.66 mg GAE/g) and the largest amount of phenolic chemicals, which are known for their antioxidant properties. The high proportion of phenolic-rich pomegranate flavouris shown by the high TPC in T6.T5 (8.46 mg GAE/g) was found at par with T6 (8.66 mg GAE/g). In contrast, T1 had the lowest TPC (5.72 mg GAE/g), indicating a lower concentration of phenolic compounds in T1. Treatments T1 (5.72 mg GAE/g) to T6 (8.66 mg GAE/g) showed an overall increase in TPC, while intermediate treatments T2 (6.13 mg GAE/G), T3 (7.24 mgGAE/g)and T4 (7.33 mg GAE/g) show progressive increase in TPC values. T5 had a further increase to 8.46 mg GAE/g. The results are in agreement with Madhura et al., (2021). This pattern indicates that the TPC-rises enzymes found in flavour can catalyze the reactions that raise the production of phenolic compounds, resulting in a greater TPCHiga et al., (2017).

The content of flavonoids includes different subclasses of flavonoids, such as anthocyanins, flavanols, flavonols and flavones. Treatment T6 had the maximum total flavonoid content of (2.66 mg QE/g), followed by T5 (2.28 mg QE/g).The fact that T1 has the lowest TFC content (0.92 mg QE/g) indicated that it is flavourless and contains fewer flavonoids.T1 and T2 have comparatively modest TFC values when compared to the other treatments, with 0.92 mg QE/g and (0.95 mg QE/g), respectively. The results are in broad confirming with Madhura et al., (2021). This may occur from the deliberate inclusion of flavonoid-rich components, such as citrus extracts or other minerals high in polyphenols, which can raise the flavonoid concentration following the findings cited by Fawole et al.,(2013).

Conclusions

The present study successfully developed a nutritious and delicious petha formulation by incorporating ash gourd and pomegranate flavour as the primary ingredients. Through a systematic approach, various combinations of these ingredients were explored, and Treatment T6, containing 9% pomegranate flavour, emerged as the most promising formulation based on its superior sensory attributes, including taste, flavour, colour, texture, mouthfeel, and overall

acceptability followed by T5 having 7% dates pulp. The incorporation of pomegranate flavour into the petha formulation significantly enhanced the nutritional profile by increasing the levels of beneficial physio chemicals, such as tannin, phenolic compounds and flavonoids of the product. Overall, this research approach successfully developed a nutritious and indulgent homemade candy that caters to the growing consumer demand for healthier snack options. The unique combination of banana, dates, and skim milk powder offers a guilt-free indulgence with a desirable taste and texture, while also providing valuable nutrients and bioactive compounds. The findings of this study pave the way for further exploration and commercial development of functional and innovative candy products that align with current health trends.Overall, this study highlights the potential of using pomegranate flavour to create a nutritious petha, contributing to the advancement of healthier and more sustainable pasta products.In conclusion, the successful integration of pomegranate flavour into petha not only offers a template for revitalizing traditional sweets but also serves as a model for other culinary innovations that seek to merge tradition with modern dietary trends. As the food industry continues to evolve, such studies will be pivotal in guiding the development of products that honor culinary heritage while embracing health, sustainability and the diverse palates of global consumers. Moving forward, the confectionery industry, particularly in regions with rich culinary histories, can leverage this model to explore similar innovations, thereby driving growth and sustainability in a competitive market environment.

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