



ROSE PETALS ELEVATE POMEGRANATE JAM: A SENSORY AND NUTRITIONAL EXPLORATION

Food Science

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ABSTRACT

The Indian Fragrant rose, known for its captivating aroma, is widely used in pujas, garlands, and ceremonies. Its petals are edible, used for garnishing, herbal tea, and making gulkand. Harvested commercially for rose oil, rose water, and rose concrete, this vibrant pink bloom adds beauty and fragrance to any setting. Pomegranate fruits, rich in anthocyanins that influence colour and consumer appeal, are consumed fresh and as processed products like juice, molasses, and jam. Pomegranate jam found optimal storage at 5°C without light and showed high-methoxyl pectin produced higher yields compared to low-methoxyl pectin. This study explores creating a rose petal-infused pomegranate jam, combining the health benefits of both botanicals. The blend enhances flavour with floral notes, improves antioxidant content, and offers a unique sensory experience. The nutritional assessments revealed an increase in antioxidant capacity, attributable to both pomegranate and rose petals, suggesting enhanced health benefits compared to traditional pomegranate jam. The results indicated that the incorporation of rose petals significantly enhanced the sensory profile of the jam, adding floral notes that complemented the tartness of pomegranate. Hence, it suggests strong commercialization potential, appealing to health-conscious consumers and inspiring innovation in gourmet food product development.

KEYWORDS

Fragrant rose, Pomegranate jam, Petal infused jam, Antioxidant capacity

INTRODUCTION

Product development is a key aspect of a brand's operations and marketing, involving the complex process of creating and introducing new or improved products to meet target audience needs. In the food industry, this includes addressing market gaps with innovative products. Formulation, the precise combination of components based on a formula, plays a crucial role in this process. It ensures product quality by combining raw materials in specific proportions, with research often conducted to optimize formulations and enhance product design. Understanding these processes is essential for successful product development and market appeal [1].

Rosa damascena Mill (Rosaceae) (Latin for damascene rose), more commonly known as the Damask rose or sometimes as the Bulgarian rose, Turkish rose, Taif rose, Arab rose, Ispahan rose and Castile rose, is a rose hybrid, derived from *Rosa gallica* and *Rosa moschata*. DNA analysis has shown that a third species, *Rosa fedtschenkoana* has made some genetic contributions to the damask rose [2].

The Indian Fragrant rose is a part of the rose family. These flowers are known to have very good fragrance and aroma. During auspicious pujas this flower is sought after. In the south of India there are also garlands made out of Indian Fragrant roses and used during engagements and ceremonies. The vibrant pink Indian Fragrant rose, which delights everyone with a sweet fragrance that cannot be ignored. The aroma of the Indian Fragrant rose, they are harvested commercially for rose oil. This is used in perfumes and used to make rose water and rose concrete. The petals are also edible and can be used as a flavouring and garnishing. It is also preserved in sugar as gulkand, and it is used as a herbal tea as well [3].

Health benefits of Indian Fragrant Rose

Rose petals contains polyphenols, antioxidants that work to protect you from cell damage. The polyphenols in rose tea have been shown to

reduce the risk of heart disease, diabetes, obesity and cognitive disease. Rose petals have been used for centuries as a digestive aid in the Middle East and have been shown to help improve digestion and smooth the stomach trouble. It can be help establish a good foundation for hair growth and help prevent hair loss. Rose petals are also high in vitamin A, B₃, C and E, which moistures the scalp and limutates hair follicles promoting hair growth [4].

The anti-inflammatory properties of rose helps acne, pimples and itchiness. The sugars in rose petals especially benefit those with sensitive skin. A rich source of vitamin C, rose petal paste makes for a beautiful, shiny glowing skin. Rose also help reduce redness on the skin especially for sun-damaged skin. Besides being filled with antioxidants, rose water and rose oils are also packed with vitamin A and C, which can help with aging skins. Most cancers are caused due to oxidative stress. Rose petal extract has been shown to possess antioxidant properties (polyphenols). These medicinal properties make it a good culinary component [5].

Rose petal powder is like an elixir. It can be used in various wonderful ways, giving innumerable benefits to the skin and hair. Due to its soothing fragrance, rose is said to balance 'vata dosha'. This dosha, according to Ayurveda, manifests mainly as anxiety, insomnia, and digestive issues. With its cooling and stabilizing effects, rose is also said to balance 'Pitta dosha' [6].

Research shows that rose petal powder has skin anti-inflammatory properties. It inhibits the inflammatory response produced by exposure to UV rays. Rose petal powder can reduce ageing effects. Regular use on the face and body can have significant anti-ageing effect [7].

Rose petal powder is known for its cooling and soothing properties, which help promote healthy nerves. For centuries, rose petals have been used to flavour foods, wines, and liqueurs. They can be incorporated into a variety of dishes, including desserts, salads, syrups,

and sweet spreads, or even frozen in ice cubes for added elegance [8].

Pomegranate fruits are rich in anthocyanins, pigments responsible for external and seed colour development of which the latter is a crucial quality attribute for consumer acceptance. The whole fruit has 52% aril, consisting of 78% juice and 22% seeds. Despite the fresh fruit consumption, pomegranate fruits are consumed as various processed products such as juice, molasses, jam, wine and dried kernels. Jam from pomegranate using high- and low-methoxyl pectin, and found that high-methoxyl pectin resulted in a higher yield. Different temperatures and light regimes were tested during storage. Optimal storage conditions were achieved at 5°C and no light exposure at all [9-11].

The present study was carried out to evaluate pomegranate jam anthocyanin content and colour development over time. Different temperatures and light regimes were tested during storage. Optimal storage conditions were achieved at 5°C and no light exposure at all.

MATERIALS AND METHODS

Selection of Ingredient and Product

The product selected was rose petals pomegranate jam. Rose petals and pomegranate create favourable combination when paired in sweets. Pomegranates are round, red fruits. They feature a white inner flesh that's densely packed with crunchy, juicy edible seeds called arils. They may be best known for the vibrantly coloured juice they're often used in, but these unique fruits have a lot more to offer.

Pomegranates are low in calories and fat but high in fiber, vitamins, and minerals. Benefits include antioxidants, heart health, urinary health, exercise endurance. Rose petals are also high in phytonutrients, plant compounds with antioxidant properties. So, rose petals was selected for incorporation in pomegranate jam. The methodology used for the study is presented as flow chart as shown in the Figure 1.



Fig 1. Methodology Flow chart

Formulation And Standardisation

The standard pomegranate jam recipe used in the study has been given in the Table 1.

Table 1. Formulation And Standardisation

Product	Pomegranate Jam (%)	Rose Petals (%)
Standard	100%	---
A	90	10
B	80	20
C	70	30
D	60	40

Sensory Evaluation

Sensory evaluation is a scientific discipline that applies principles of experimental design and statistical analysis to the use of human senses such as colour, flavour, texture, appearance and taste for the purpose evaluating consumer products. Sensory evaluation of different combination of beetroot in different variations was conducted in acceptability trials [12]. The products were evaluated by thirty members. A panel of thirty healthy members were selected from Foods and Nutrition department for the sensory evaluation.

Nutrient Benefits

Pomegranate arils are packed with nutrients and antioxidants, substances that can help prevent or delay damage within the cells. In fact, pomegranate juice has three times as many antioxidants as other antioxidant-rich beverages, such as green tea and red wine. The pomegranate arils have plenty of other nutrients, too, and are a great addition to your daily recommended serving of fruit the health benefits of pomegranates are innumerable apart from being healthy, they are delicious too. Pomegranates have anti-viral, and anti-tumour properties, and contain vitamins and minerals including calcium, potassium, zinc, vitamin K, niacin and folate as well as antioxidant vitamins A, C and E [13].

Cost Analysis

Cost Analysis was done to calculate the total expenditure based on the

price of all ingredients. The cost analysis was done for the standard and selected product. The costs related to making and acquiring goods and services that directly generates revenue of the firm. It comprises direct cost that are traceable to the creation of the product and includes the cost of a product [14]. Jam is so versatile because it is made from fruit and sugar, which are both ingredients that can be easily incorporated into a wide variety of dishes. The sweetness and fruity flavour of jam makes it a perfect addition to sweet and savoury dishes alike and it's readily acceptable.

Statistical Analysis

Statistical analysis is a component of data analytics. In the context of business intelligence (BI), statistical analysis involves collecting and scrutinizing every data sample in a set of items from which samples can be drawn. A sample, in statistics is a representative selection drawn from a total population. The data collected were tabulated and analysed using mean and standard deviation.

RESULTS AND DISCUSSION

The results obtained for mean sensory for standard and rose petals incorporated pomegranate jam has been discussed in details as follows.

1. Mean Sensory Score for Appearance

The factors comprising appearance can be divided into three board classes: The product's optical properties, its mode of presentation, all of which combine at different times and in different ways to form the three images of any products (Table 2 and Figure 2). Standard, Sample A-10%, Sample B-20%, Sample C-30%, and Sample D-40% of Rose petals.

Table 2. Mean Sensory Score for Appearance

S. No	Variations	Appearance (Mean± SD)
1.	Standard	4.83 ± 0.12
2.	Sample A	4.73 ± 0.19
3.	Sample B	4.56 ± 0.13
4.	Sample C	4.86 ± 0.09
5.	Sample D	4.9 ± 0.07

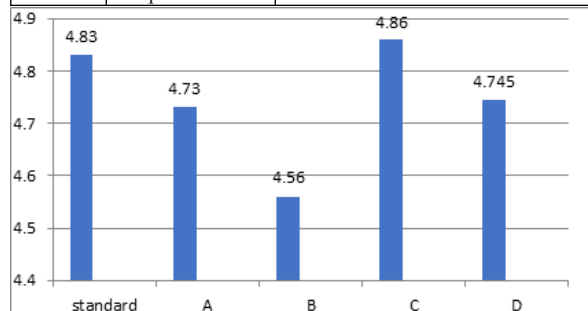


Fig 2. Mean Sensory Score for Appearance

Table 2 and Figure 2 illustrate the sensory attributes related to the appearance of products with varying proportions. The mean and standard deviation values differ across each product. For the standard product, the mean and standard deviation indicate that Sample D has an appearance comparable to the standard. Therefore, it can be concluded that the addition of rose petal extract does not significantly impact the appearance of the product.

2. Mean Sensory Score For Colour

In addition to giving pleasure, the colour of food is associated with other attributes, colour is used as an index to the quality of a number of foods as given in the Table 3 and Figure 3. Standard, Sample A-10%, Sample B-20%, Sample C-30%, and Sample D-40% of Rose petals.

Table 3. Mean Sensory Score for Colour

S. No	Variations	Colour (Mean± SD)
1.	Standard	4.9±0.21
2.	Sample A	4.7±0.21
3.	Sample B	4.83±0.12
4.	Sample C	4.9±0.07
5.	Sample D	4.93±0.04

The above Table 3 and Figure 3 depicts the mean sensory scores for colour obtained by the sensory evaluation of different proportions. The

mean and deviation is different for each product. It shows that, Sample D is good in colour as compared to that of the standard.

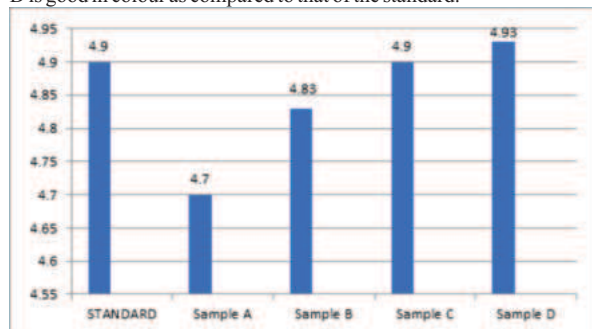


Fig 3. Mean Sensory Score for Colour

3. Mean Sensory Score for Texture

The brittleness of food is another aspect of texture. In this study, the brittleness is considered to be the best texture. The Table 4 and Figure 4 shows the sensory attributes of the texture of different proportions. It is seen that sample D obtained the maximum score of 5.0 as that of the standard. Addition of 40% rose petal extract also was acceptable with a mean score of 5.0 ± 0 . So, addition of rose petal extract did not affect the texture. Standard, A-5%, B-10%, C-15%, D-20% Rose petal.

Table 4. Mean Sensory Score For Texture

S. No	Variations	Texture (Mean± SD)
1.	Standard	4.93 ± 0.04
2.	Sample A	4.7 ± 0.19
3.	Sample B	4.6 ± 0.2
4.	Sample C	4.86 ± 0.09
5.	Sample D	5.0 ± 0.00

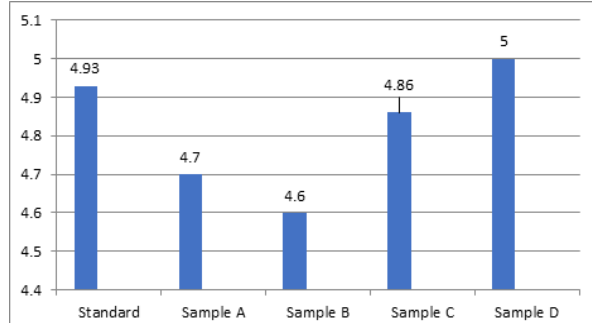


Fig 4. Mean Sensory Score for Texture

4. Mean Sensory Score for Flavour

The flavor of food has three components-odour, taste and a components of sensations known as mouth feel [15]. The Table 5 and Figure 5 shows the sensory attributes of the flavour of the different properties. The score is in various levels. The mean and standard deviation for standard is 4.9, Sample A is 4.7, Sample B is 4.7, Sample C is 4.83 and Sample D is 4.93. It shows that Sample D is good in flavour as that of standard product. Standard, A-5%, B-10%, C-15%, D-20% Rose petal.

Table 5. Mean Sensory Score For Flavour

S. No	Variations	Flavour (Mean± SD)
1.	Standard	4.9 ± 0.07
2.	Sample A	4.7 ± 0.21
3.	Sample B	4.7 ± 0.21
4.	Sample C	4.83 ± 0.12
5.	Sample D	4.93 ± 0.04

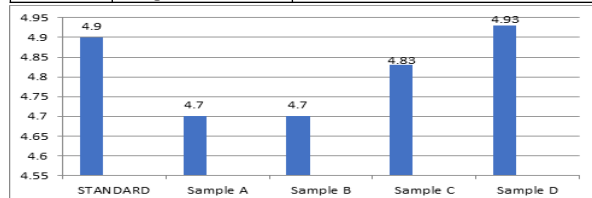


Fig 5. Mean Sensory Score for Flavour

5. Mean Sensory Score for Taste

Many individual factors contribute to the total perception of the taste of a food product. Food presentation describes the taste of food which describes the art of food which describes the art of modifying, processing, arranging or decorating food to enhance its aesthetic appeal [16]. The Table 6 and Figure 6 shows the sensory attributes of the taste of different properties. The score is in various levels. The mean value for standard is 4.96, sample A is 4.93, sample B is 4.93, sample C is 4.9 and sample D is 5.0. It shows that sample D is good in taste as that of standard product. Standard, A-5%, B-10%, C-15%, D-20% Rose petal.

Table 6. Mean Sensory Score For Taste

S. No	Variations	Taste (Mean± SD)
1.	Standard	4.96 ± 0.02
2.	Sample A	4.93 ± 0.04
3.	Sample B	4.93 ± 0.04
4.	Sample C	4.9 ± 0.07
5.	Sample D	5.0 ± 0.00

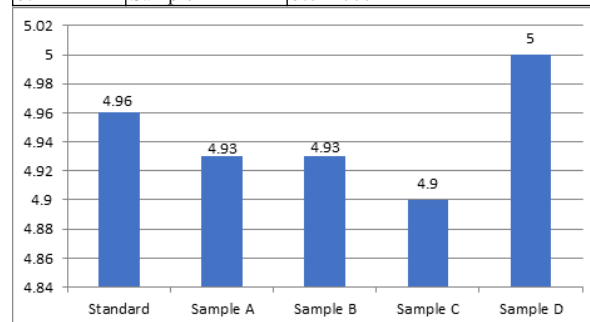


Fig 6. Mean Sensory Score for Taste

6. Comparison of Mean Sensory Scores of Standard and Selected Product

Consumer's reliability matching a variety of taste (bitterness, sweetness, sourness) oral somatic sensory attributes (carbonation, oral texture and mouth feel) and flavour to abstract shapes varying in their angularity. It is suggested that such shape symbolic association could be and in some cases already are being incorporated into labelling and/or packaging of food beverage products in order to subconsciously set up specific sensory expectations in the minds of consumers [17]. Given that consumers normally prefer those food and beverage product that meet their sensory expectations.

Table 7. Comparison Of Mean Sensory Scores Of Standard And Selected Product

S. No	Criteria	Standard (Mean ± SD)	Best Product (Mean ± SD)
1.	Appearance	4.83 ± 0.12	4.9 ± 0.07
2.	Colour	4.9 ± 0.21	4.93 ± 0.04
3.	Texture	4.93 ± 0.04	5.0 ± 0.00
4.	Taste	4.96 ± 0.02	5.0 ± 0.00
5.	Flavour	4.9 ± 0.07	4.93 ± 0.04

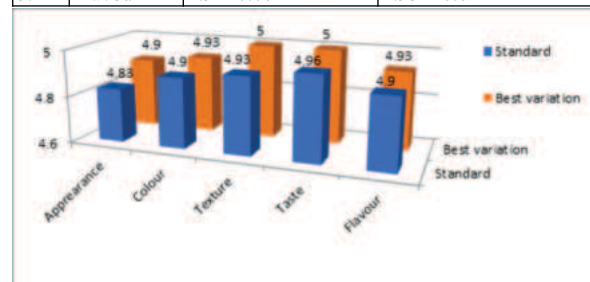


Fig 7. Comparison of Mean Sensory Scores of Standard and Selected Product

From the above Table 7 and Figure 7 depicts the mean sensory scores for the overall acceptability obtained by the sensory evaluation of standard and varying proportions of rose petal extract incorporated pomegranate jam with the help of the score card. It is seen that the product A and with 10% rose petal extract incorporated jam scored the highest among the variations and so it was selected as the best

variation. It is noted that the products were acceptable even up to 40% incorporated pomegranate jam from the mean scores.

7. Cost Analysis Of Standard And Selected Product

Table 8 shows the cost of standard and selected products. It is seen that the cost of 100 g of standard Pomegranate jam is Rs.21 and that of the rose petal extract incorporated jam is Rs.71. Hence, it can be concluded that the new product is prepared almost for the same cost.

Table 8. Cost Analysis Of Standard And Selected Product

Ingriient	Standard		Selected Product	
	Quantity	Cost	Quantity	Cost
Pomegranate	100g	15	60g	9
Sugar	100g	5	100g	5
Rose petals	--	--	40g	56
Citric acid	2g	1	2g	1
Total	--	21	--	71

8. Popularization Of Selected Product

The Table 9 and Figure 8 displays the mean score value of popularization activity. The mean score obtained in the popularization activity also shows that the rose petal extract incorporated pomegranate jam obtained similar scores as that of standard. Hence, the new product can be accepted by the customers.

Table 9. Mean Score of Analysis – Popularization Study

S. No	Criteria	Score	Standard Product	Mean $\pm$ SD	Best Product	Mean $\pm$ SD
1.	Appearance	3	3	3.0 $\pm$ 0	3	3.0 $\pm$ 0
2.	Colour	3	2.5	2.5 $\pm$ 0.35	2.5	2.5 $\pm$ 0.35
3.	Texture	3	3	3.0 $\pm$ 0	3	3.0 $\pm$ 0
4.	Taste	3	3	3.0 $\pm$ 0	3	3.0 $\pm$ 0
5.	Flavour	3	3	2.5 $\pm$ 0.35	2.5	2.5 $\pm$ 0.35

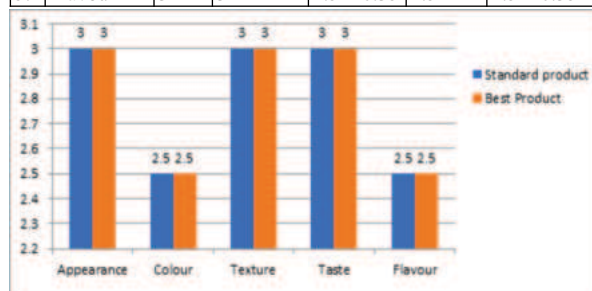


Fig 8. Mean Score of Analysis – Popularization Study

CONCLUSION

An innovative new food product has been formulated and designed to cater the consumers of all age groups, with a composition of food ingredients carefully selected to achieve the desired sensory and nutritional characteristics. A comprehensive understanding of the functions and properties of the various ingredients played a crucial role in developing a product that meets the desired attributes.

The findings suggest that the formulated food product, incorporating Indian fragrant rose petal extract in pomegranate jam is healthy one. Moreover, the addition of rose petal extract did not negatively affect the sensory attributes, maintaining the product's visual, taste and texture qualities comparable to the standard product. Additionally, the nutritive value of the formulated product remained on par with the standard, ensuring that the product provides the same health benefits while offering a unique sensory experience. Overall, the study demonstrates the feasibility of introducing innovative ingredients without compromising product quality and nutritional value.

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