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Research Article

Quality Evaluation of Pomegranate-Fortified Pumpkin Jam

Karka Gayathri, Karri Jagannadham*, Narender Vaishnavi, Patteti Jessy Jyothsna, Dhagnapoor Prasanna Kumari

Department of Clinical Nutrition and Dietetics, School of Allied and Healthcare Sciences, Malla Reddy University, Hyderabad, Telangana, INDIA.

ABSTRACT

Background: Pumpkin (*Cucurbita* spp.) is a nutritious vegetable with significant nutritional, medicinal, and economic value. This study aimed to develop pumpkin jam fortified with pomegranate and evaluate its quality. **Materials and Methods:** A control (T0) and three fortified jam formulations (T1, T2, and T3) were prepared and evaluated for sensory, nutritional, physicochemical, antioxidant, and color characteristics. **Results:** T3 recorded the highest overall acceptability (8.20±0.69), with superior scores for appearance (8.20±0.95), color (8.35±0.81), flavor (8.20±0.89), taste (8.25±0.78), and texture (8.40±0.59). Protein content ranged from 0.86±0.10% to 2.25±0.10%, carbohydrate from 40.76±2.37% to 65.75±2.02%, fat from 0.65±0.06% to 1.05±0.06%, and energy from 177.97±11.40 to 297.90±33.00 kcal/100 g. Moisture content decreased from 55.70±3.34% (T0) to 29.23±2.78% (T2), while total soluble solids increased to 14.57±0.13% (T3). Antioxidant activity reached 62.86±0.34% in T3. Color values changed from L 37.86±0.28 to 24.99±10.15*, a 14.06±0.89 to 22.16±0.09*, and b 26.50±0.30 to 16.09±0.38*, indicating a darker and redder jam. **Conclusion:** Pomegranate fortification improved the overall quality of pumpkin jam. Among the formulations, T3 demonstrated the best sensory, nutritional, physicochemical, antioxidant, and color characteristics, making it the most acceptable formulation.

Keywords: Antioxidant activity, Pumpkin, Pomegranate, Physicochemical Properties.

Correspondence:
Dr. Karri Jagannadham
Department of Clinical Nutrition and Dietetics, School of Allied and Healthcare Sciences, Malla Reddy University, Hyderabad-500043, Telangana, INDIA.
Email: karrijagannadham@gmail.com

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INTRODUCTION

Pumpkin (*Cucurbita* spp.) is a member of the Cucurbitaceae family and is one of the most widely consumed vegetables, valued for its significant nutritional, medicinal, and economic importance (AlJahani and Cheikhousman, 2017). Various parts of the pumpkin plant-including its leaves, immature and mature fruits, male flowers, tender vine tips, and seeds-are all consumed as food. Pumpkin is widely consumed both as a vegetable and for medicinal purposes in countries such as China, Argentina, Bangladesh, India, Mexico, Brazil, the United States, and South Korea, particularly for the prevention of diabetes and the elimination of intestinal parasites (Caili *et al*., 2006). It has also been traditionally used in the management of various health conditions, including diabetes, hypertension, cancer, hepatitis, macular dystrophy, abdominal cramps and distension caused by intestinal worms, inflammation, and obesity, among others (Yadav *et al*., 2010; Adams *et al*., 2011; Marcus *et al*., 2002).

The *Punica granatum* tree, belonging to the Punicaceae family, produces a fruit that has been traditionally consumed and valued for its therapeutic properties. The pomegranate is an irregularly shaped fruit with a thick outer rind that ranges from reddish-brown to yellow and contains numerous seeds within (Alsubhi *et al*., 2022).

In Sri Lanka, pumpkin cultivation is primarily concentrated in the dry and intermediate zones, with greater on the Maha season compared to the Yala season due to more favorable climatic conditions. The annual production of pumpkin is estimated to range between 20,000 and 40,000 metric emphasis tons, of which over 20% is lost as a result of imbalances between production and consumption, as well as inadequate post-harvest handling practices. Major pumpkin-growing regions include Monaragala, Anuradhapura, Ratnapura, Hambantota, the Mahaweli System H, and Matale, which are recognized as key areas of cultivation (Ruwanthika *et al*., 2023).

MATERIALS AND METHODS

Materials

Pumpkin, Pomegranate, sugar, pectin and citric acid. These were purchased from the local supermarket in Hyderabad, Telangana, India.

Preparation of pumpkin pulp

Peel the pumpkin and remove the seeds and fibrous portion. Cut into small cubes and steam/blanch until soft. Mash or blend to obtain smooth pumpkin pulp.

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Preparation of pomegranate juice

Extract juice by blending pomegranate arils and straining to remove seeds and coarse particles. Filter through muslin cloth to obtain clear juice.

Preparation of jam

Jam was prepared by the method of (Makki *et al.*, 2024). Mix pumpkin pulp with pomegranate juice in desired ratio. Transfer the fruit mixture to a stainless - steel pan. Heat slowly with constant stirring and add stevia equivalent to sweetness. Incorporate citric acid to maintain acidity which enhances flavor and gel formation. Add pectin to the mixture and continue heating until the total solids reaches 65^0 Brix. Check for gel test and fill the hot jam into sterilized glass jars. Seal immediately to create vacuum. Invert jars for a few minutes to ensure sterilization of lid. Allow jars to cool at room temperature.

Nutrient analysis of the jam

The Kjedahl technique was used to assess the jam samples crude protein content (AOAC, 2000). The procedure was used using the Automated Soxhlet equipment to determine the fat content of the jam samples. The technique was used to assess the jam ash content. The difference approach will be used to determine the total carbohydrate content (Southgate, 1991). Jam energy content will be determined using the factorial approach of (AOAC, 1995).

Antioxidant activity

The DPPH radical scavenging effect was determined according to the (Milardović *et al.*, 2006). The radical scavenging activity was expressed as % of inhibition according to the formula

$$\text{Inhibition (\%)} = \frac{A\ Control - A\ sample}{A\ control} X\ 100$$

Where,

$A_{\text{Control and}}$ A_{sample} are the absorbances of the control and sample respectively.

PH determination

The pH of the different jam formulations was determined using pre-calibrated pH meter. The pH meter was prior calibrated using buffers at pH 4, pH 7, and pH 10. Approximately, 10 g of sample was suspended in 90 mL of deionized water (Mamede *et al.*, 2013). The electrode of pH meter was immersed in the suspended solution and the result was recorded according to the (Milardović *et al.*, 2006).

Total titratable acidity

The total titratable acidity of the different jam formulation was determined using the method proposed by (Mamede *et al.*, 2013). Approximately, 3 g of sample was weighed and suspended in 15 mL of distilled water. The suspended solution was filtered and the filtrate was added with two drops of phenolphthalein indicator. The mixture was titrated with 0.1 N of sodium hydroxide solution until the faint pink endpoint achieved. The obtained results were multiplied with the conversion factor of 63 g oxalic acid.

Total soluble solids

Total Soluble Solids (TSS) of jam were determined using a digital refractometer according to (Martínez *et al.*, 2013). The results were expressed as Brix.

Colour

Parameters (L*, a*, b*) were determined using a Hunter Lab Colorimeter. The L* value indicates lightness, a* indicates the red/green axis, and b* the yellow/blue axis. Colour analysis is important for evaluating visual appeal and consumer perception (Pathare *et al.*, 2013).

Sensory analysis of Jam

Twenty semi-trained panel members was rate the Jam colour, texture, flavour, taste, and overall acceptability using a nine-point hedonic scale.

Storage Studies

Jam made using Pumpkin pulp and pomegranate fruit was be kept in an airtight container. Jam will be stored for 0 day, 7^{th} day, and 15^{th} day in order to evaluate the impact of storage time on their sensory qualities (Table 1).

Statistical analysis

The samples will be subjected to three analyses. Microsoft Excel 2007 was used to determine the mean score and standard deviation of the three replicates for each test (for all samples). The Statistical Package for Social Sciences (SPSS) was used to perform a One-Way Analysis of Variance (ANOVA) on all of the collected data. Means were compared using LSD, with a *p*-value of less than 0.05.

RESULTS

Sensory analysis of control and experimental jam

Sensory analysis of control and experimental jam was described in Table 2. The appearance scores of controls and experimental jam samples were 7.5±0.51, 7.8±0.41, 8.1±0.71 and 8.2±0.95 respectively. Highest appearance score was observed in T3 (8.2±0.95) while lowest appearance score was recorded in T0 (7.5±0.51) (Alqahtani, 2020). Found similar results where the highest appearance score was for the 50% replacement sample (9.2±0.26) and the lowest appearance score was for the 0% replacement sample (8.8±0.26). The colour scores of the control and experimental jam samples were 7.4±0.94, 7.85±0.67, 8.1±0.78, and 8.35±0.81, respectively. The Flavor of the control and experimental jam was 7.55±0.68, 7.95±0.94, 8±0.52, 8.2±0.89 respectively. The taste scores of the control and experimental jam

samples were 7.45±0.99, 7.7±0.92, 8.05±0.94, and 8.25±0.78, respectively. The texture scores of the control and experimental jam samples were 7.35±1.30, 7.75±1.11, 8.2±0.52, and 8.4±0.59, respectively. The overall acceptability scores of the control and experimental jam samples were 7.5±0.76, 7.8±0.69, 7.95±0.94, and 8.2±0.69, respectively. The highest overall acceptability was observed in T3 (8.2±0.69), while the lowest was recorded in T0 (7.5±0.76). Similar findings were reported by (Ukozor *et al.*, 2025) who observed the highest overall acceptability in sample PPJ (7.50±0.70) and the lowest in sample CFJ (7.40±0.80).

Nutritional properties of control and experimental jam

Nutritional properties of control and experimental jam were reported in Table 3. The protein content of the control and experimental jam samples was found to be 1.90±0.10, 2.25±0.10, 0.86±0.10, and 1.38±0.09%, respectively. The fat content of the control and experimental jam samples was recorded as 0.51±0.05, 0.81±0.05, 0.85±0.14, and 1.05±0.06%, respectively. The fiber content of the control and experimental jam samples was found to be 1.74±0.15, 2.06±0.10, 1.21±0.05, and 1.57±0.09%, respectively. The carbohydrate content of the control and Experimental jam samples to be 38.81±3.270, 50.99±0.601,65.75±2.016, 57.20±0.521 respectively. The Energy content of the control and Experimental jam was 167.3±12.98, 220.3±1.717, 297.9±33.00, 243.8±1.395 respectively. The moisture content of the control and experimental jam samples was found to be 55.7±3.34, 42.7±0.51, 29.23±2.78, and 37.63±0.38%, respectively. Among the treatments, the highest moisture content was observed in T0 (55.7±3.34%), while the lowest was recorded in T2 (29.23±2.78%). These findings are in line with the study (Ponnan and Eli, 2025) who reported comparatively higher moisture content in one sample than the other. The ash content of the control and experimental jam samples was found to be 1.94±0.08, 1.22±0.05, 2.07±0.50, and 1.15±0.06%, respectively.

Physicochemical properties of Control and Experimental jam

Physicochemical properties of Control and Experimental jam was reported in Table 4. The DPPH radical scavenging activity of the control and experimental jam samples was recorded as 49.56±0.33, 52.56±0.45, 58.75±0.66, and 62.86±0.34%, respectively. The Total Soluble Solids (TSS) content of the control and experimental jam samples was recorded as 13.55±0.32, 13.98±0.10, 14.40±0.17, and 14.57±0.13%, respectively. The titratable acidity of the control and experimental jam samples was recorded as 0.26±0.01, 0.30±0.01, 0.21±0.005, and 0.23±0.005%, respectively. The pH of the control and experimental jam samples was recorded as 5.30±0.02, 5.47±0.08, 5.44±0.05, and 5.49±0.02, respectively.

Color characteristics of control and experimental jam

The color parameter L* (lightness) of the control and experimental jam Table 5. Samples were found to be 37.86±0.28, 36.29±0.38, 31.71±0.41, and 24.99±10.15, respectively. The color parameter a* (redness/greenness) of the control and experimental jam samples was recorded as 14.06±0.89, 15.26±0.12, 21.56±0.26, and 22.16±0.09, respectively. The color parameter b* (yellowness/blueness) of the control and experimental jam samples was recorded as 25.75±0.29, 26.50±0.30, 16.39±0.37, and 16.09±0.38, respectively.

Effect of Storage period on sensory analysis of selected jam

Effect of Storage period on sensory analysis of selected jam was presented in Table 6. All the sensory attributes showed a significant decline in the hedonic scores during storage period. The appearance scores of the selected jam on 0^{th}, 7^{th} and 15^{th} days of storage were 8.2±0.95, 7.9±0.55 and 7.75±0.78 respectively. The hedonic scores for all sensory attributes showed a significant decrease during the storage period. The highest score of appearance was on the 0^{th} day and the lowest was on the 15^{th} day. The colour scores of the selected jam on the 0^{th}, 7^{th}, and 15^{th} days of storage were 8.35±0.81, 8.0±0.72, and 7.85±0.81, respectively. The hedonic scores for all sensory attributes showed a significant decline during the storage period. The flavour scores of the selected jam on the 0^{th}, 7^{th}, and 15^{th} days of storage were 8.2±0.89, 8.0±0.91, and 7.4±0.75, respectively. The hedonic scores for all sensory attributes showed a significant decrease during the storage period. The taste scores of the selected jam on the 0^{th}, 7^{th}, and 15^{th} days of storage were 8.25±0.78, 7.9±0.78, and 7.45±0.99, respectively.The hedonic scores for all sensory attributes showed a significant decrease during the storage period. The texture scores of the selected jam

Table 1: Formulation of control and experimental Jam.

Ingredients (g)	T0	T1	T2	T3
Pumpkin pulp	100	75	50	25
Pomegranate pulp	00	25	50	75
Sugar	40	40	40	40
Pectin	0.5	0.5	0.5	0.5
Citric acid	0.3	0.3	0.3	0.3

T0 - 100:0 (pumpkin pulp: pomegranate pulp), T1- 75:25 0(pumpkin pulp: pomegranate pulp), T2- 50:50 (Pumpkin pulp: pomegranate juice) T3- 25:75(pumpkin pulp: pomegranate pulp).

Table 2: Sensory analysis of control and experimental jam.

Sensory attributes	T0	T1	T2	T3
Appearance	7.5±0.51a	7.8±0.41ad	8.1±0.71bd	8.2±0.95cd
Colour	7.4±0.94a	7.85±0.67ad	8.1±0.78bd	8.35±0.81cd
Flavour	7.55±0.68a	7.95±0.94ac	8±0.52ac	8.2±0.89bc
Taste	7.45±0.99a	7.7±0.92ad	8.05±0.94bd	8.25±0.78cd
Texture	7.35±1.30a	7.75±1.11ad	8.2±0.52bd	8.4±0.59c
Overall acceptability	7.5±0.76a	7.8±0.69ac	7.95±0.94ac	8.2±0.69bc

Mean values followed by the different letters with subscript within the row are significantly different ($p<0.05$).

Table 3: Nutritional properties of control and experimental jams.

Nutritional properties (%)	T0	T1	T2	T3
Protein	1.90±0.10a	2.25±0.10b	0.86±0.10c	1.38±0.09d
Fat	0.51±0.05a	0.81±0.05be	0.85±0.14ce	1.05±0.06d
Fiber	1.74 0.15a	2.06±0.10b	1.21±0.05c	1.57±0.09a
Carbohydrate	38.81±3.27a	50.99±0.60b	65.75±2.01c	57.20±0.52d
Energy	167.3±12.98a	220.3±1.71ba	297.9±33.00c	243.8±1.39da
Ash	1.94±0.08a	1.22±0.05bd	2.07±0.50a	1.15±0.06cd
Moisture	55.7±3.34a	42.7±0.51b	29.23±2.78c	37.63±0.38d

Mean values followed by the different letters with subscript within the row are significantly different ($p<0.05$).

on the 0th, 7th, and 15th days of storage were 8.4±0.59, 7.9±0.78, and 7.35±1.03, respectively. The hedonic scores for all sensory attributes showed a significant decrease during the storage period. The overall acceptability scores of the selected jam on the 0th, 7th, and 15th days of storage were 8.2±0.69, 7.75±0.96, and 7.3±1.03, respectively.

DISCUSSION

The appearance scores of controls and experimental jam samples were 7.5±0.51, 7.8±0.41, 8.1±0.71 and 8.2±0.95 respectively. Highest appearance score was observed in T3 (8.2±0.95). Alqahtani (2020) who found similar results where the highest appearance score was for the 50% replacement sample (9.2±0.26) and the lowest appearance score was for the 0% replacement sample (8.8±0.26). The highest colour score was observed in T3 (8.35±0.81), while the lowest was recorded in the T0 sample (7.4±0.94). Similar findings were reported by Rahman *et al.* (2018) who stated that the highest colour score was found in T6 (6.94), whereas the lowest was observed in T0 (4.15). Among the samples, T3 showed the highest texture score (8.4±0.59), whereas T0 recorded the lowest texture score (7.35±1.30). These findings are in agreement with the study conducted by Ihediohanma, Okafor and Adeboye (2014) who reported the highest texture score in orange jam (C) (7.2±1.03) and the lowest texture score in jackfruit jam (A) (6.1±1.37). The highest overall acceptability was observed in T3 (8.2±0.69), while the lowest was recorded in T0 (7.5±0.76). Similar findings were reported by Ukozor *et al.* (2025) who observed the highest overall acceptability in sample PPJ (7.50±0.70) and the lowest in sample CFJ (7.40±0.80).

Among the formulations, the highest protein content was observed in T1 (2.25±0.10%), while the lowest was recorded in T2 (0.86±0.10%). These findings are in agreement with the study by Sourav Garg *et al.* (2019) who reported that sample 2 exhibited a higher protein content (2.84±0.02%) compared to sample 1 (1.55±0.01%). Among the treatments, the highest fat content was observed in T3 (1.05%), while the lowest was found in the control sample T0 (0.51%).

These findings are consistent with the study by Adetoro *et al.* (2022) who reported that the fat content of FF jam (0.40±0.03) was higher compared to the control sample (0.20±0.01). Among the treatments, the highest fiber content was observed in T1 (2.06±0.10%), while the lowest was recorded in T2 (1.21±0.05%). These results are in agreement with the findings of Aruna *et al.* (2017) who reported that DSPJ had a higher fiber content (4.80%) compared to NAJ (0.44%). The highest Carbohydrate content was reported in T2 sample, while the lowest was observed in T0 sample.

Similar findings with Naeem *et al.* (2017) who stated that Jam sample 112 has the highest carbohydrate content compared with Control. The highest Energy content was observed in T2 sample, while the lowest Energy content was reported in to sample. Similar findings with Birajdar *et al.* (2023) who stated that the treatments, the highest moisture content was observed in T0 (55.7±3.34%), while the lowest was recorded in T2 (29.23±2.78%). These findings are in line with the study Ponnan and Eli (2025) who reported comparatively higher moisture content in one sample than the other. Among the treatments, the highest ash content

was observed in T2 (2.07±0.50%), while the lowest was recorded in T1 (1.22±0.05%). These findings are in agreement with the study by Anwar *et al.* (2023), who reported that sample B had a higher ash content (3.30%) compared to sample A (3.10%).

Among the treatments, the highest DPPH activity was observed in T3 (62.86±0.34%), while the lowest was found in the control sample T0 (49.56±0.33%). Among the treatments, the highest TSS was observed in T3 (14.57%), while the lowest was found in the control sample T0 (13.55%). These findings are in agreement with the study by Benmeziane-Derradji *et al.* (2022) who reported that the TSS content of T3 jam (67.25%) was higher compared to the control sample (66.12%). Among the treatments, the highest titratable acidity was observed in T1 (0.30±0.01%), while the lowest was recorded in T2 (0.21±0.005%). These findings are consistent with the study by Abd El-Hady *et al.* (2025) who reported that the titratable acidity of the T0 sample (0.85%) was higher compared to the T6 sample (0.82%). Among the treatments, the highest pH was observed in T3 (5.49±0.02), while the lowest was recorded in the control sample T0 (5.30±0.02).

Among the treatments, the highest L* value was observed in T0 (37.86±0.28), indicating greater lightness, while the lowest was recorded in T3 (24.99±10.15), indicating a darker appearance. These results are consistent with the findings of Khan *et al.* (2012) who reported that pineapple pulp exhibited a higher L* value (64.7±0.59) compared to the F3 sample (29.7±0.78). Among the treatments, the highest a* value was observed in T3 (22.16±0.09), indicating greater redness, while the lowest was found in the control sample T0 (14.06±0.89). These findings are consistent with the study by Bukya and Madane (2018) who reported that the a* value of jam containing 80% date paste (39.31±0.02) was higher compared to the control sample (7.88±0.01). Among the treatments, the highest b* value was observed in T1 (26.50±0.30), indicating greater yellowness, while the lowest was recorded in T3 (16.09±0.38). These findings are consistent with the study by ul Haq and Darakshan (2014) who reported that fresh fruit jam exhibited a higher b* value (17.8±0.2) compared to conventional jam (10.3±0.7).

The highest score of appearance was on the 0th day and the lowest was on the 15th day. Abolila *et al.* (2015) reported a similar decreasing trend of sensory quality during storage in a study of strawberry jam. The highest colour score was observed on the 0th day, while the lowest score was recorded on the 15th day. A similar declining trend in sensory quality during storage was reported by Bukya and Madane (2018) in their study on Jamun jam. The highest taste score was observed on the 0th day, while the lowest score was recorded on the 15th day. A similar declining trend in sensory quality during storage was reported by ul Haq and Darakshan (2014) in their study on dried-apricot date jam. The highest texture score was observed on the 0th day, while the

Table 4: Physicochemical properties of Control and Experimental jam.

Physicochemical properties	T0	T1	T2	T3
DPPH (%)	49.56±0.33a	52.56±0.45b	58.75±0.66c	62.86±0.34d
TSS (%)	13.55±0.32a	13.98±0.10b	14.4±0.166ce	14.57±0.13de
Titrable acidity (%)	0.26±0.01a	0.30±0.01b	0.21±0.005ce	0.23±0.005de
PH	5.3±0.02a	5.47±0.08be	5.44±0.05ce	5.49±0.02de

Mean values followed by the different letters with subscript within the row are significantly different (p<0.05).

Table 5: Color characteristics of control and experimental Jam.

Color Characteristics	T0	T1	T2	T3
L*	37.86±0.28^{a}	36.29±0.38^{b}	31.71±0.41^{c}	24.99±10.15^{d}
a*	14.06±0.89^{a}	15.26±0.12^{b}	21.56±0.26^{ce}	22.16±0.09^{de}
B*	25.75±0.29^{a}	26.5±0.30^{b}	16.39±0.37^{ce}	16.09±0.38^{de}

Mean values followed by the different letters with subscript within the row are significantly different (p<0.05).

Table 6: Effect of Storage period on sensory analysis of selected jam.

Sensory attributes	0th day	7th day	15th day
Appearance	8.2±0.95^{a}	7.9±0.55^{a}	7.75±0.78^{a}
Colour	8.35±0.81^{a}	8±0.72^{ac}	7.85±0.81^{bc}
Flavour	8.2±0.89^{a}	8±0.91^{a}	7.4±0.75^{b}
Taste	8.25±0.78^{a}	7.9±0.78^{ac}	7.45±0.99^{bc}
Texture	8.4±0.59^{a}	7.9±0.78^{a}	7.35±1.03^{b}
Overall Acceptability	8.2±0.69^{a}	7.75±0.96^{ac}	7.3±1.03^{bc}

Mean values followed by the different letters with subscript within the row are significantly different (p<0.05).

lowest score was recorded on the 15th day. A similar declining trend in sensory quality during storage was reported by Abolila *et al.* (2015) in their study on low-calorie orange jam. The highest overall acceptability score was observed on the 0th day, while the lowest score was recorded on the 15th day. A similar declining trend in sensory quality during storage was reported by Patel, Naik and Senapati (2015) on banana-pineapple blended jam.

CONCLUSION

The results of the present study demonstrated that the incorporation of the experimental ingredient significantly influenced the sensory, nutritional, physicochemical, antioxidant, and colour properties of jam. Overall, although T1 exhibited the highest protein and fibre contents and T2 showed the highest carbohydrate and energy values, T3 provided the best combination of sensory quality, antioxidant activity, physicochemical characteristics, and consumer acceptability. Therefore, T3 can be considered the optimum jam formulation and is recommended for the development of a nutritionally enriched and highly acceptable value-added jam product.

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ETHICAL STATEMENT

The sensory evaluation was conducted according to institutional guidelines and that participants provided informed consent.

ABBREVIATIONS

FRAP: Ferric Reducing Antioxidant Power; **TSS:** Total Soluble Solids; **RSM:** Response Surface Methodology; **TPC:** Total phenolic content; **TAC:** Total antioxidant capacity; **HMF:**5-hydroxymethylfurfural; **PH:** Potential of hydrogen; **SPSS:** Statistical Package for social science; **LSD:** Least Significant Difference; **TA:** Titratable Acidity; **DPPH:** 2,2-diphenyl-1-picrylhydrazyl.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORS' CONTRIBUTION

Conceptualization: KJ and DPK; Experiments: KG; Data analysis: KJ, KG, DPK, NV and PJJ; Supervision: KJ; Funding: KG, PJJ and NV; Manuscript writing: KG, KJ and DPK.

SUMMARY

Pomegranate fortification enhanced the nutritional value, increasing protein (2.25%), carbohydrates (65.75%), fat (1.05%), and energy (297.90 kcal/100 g). Pumpkin jam fortified with pomegranate was developed to improve its nutritional, medicinal, and sensory quality, with one control (T0) and three fortified formulations (T1-T3). T3 was the most preferred formulation, achieving the highest overall sensory acceptability (8.20±0.69) with superior appearance, colour, flavour, taste, and texture scores. Physicochemical and antioxidant properties improved, with reduced moisture content, increased total soluble solids (14.57% in T3), and the highest antioxidant activity (62.86%) observed in T3. Pomegranate fortification produced a darker, redder jam with better overall quality, making T3 the optimal formulation for sensory, nutritional, physicochemical, antioxidant, and colour characteristics.

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