ISSN Print: 2664-844X
ISSN Online: 2664-8458
NAAS Rating: 4.97
IJAFS 2025; 7(7): 314-318
www.agriculturaljournals.com
Received: 23-05-2025
Accepted: 25-06-2025

Yogesh Kumar
Research Scholar, Department of Agriculture (Horticulture), Faculty of Agriculture and Veterinary Sciences, Mewar University, Chittorgarh, Rajasthan, India

Champa Lal Regar
Assistant Professor, Department of Agriculture (Horticulture), Faculty of Agriculture and Veterinary Sciences, Mewar University, Chittorgarh, Rajasthan, India

Bhagwan Suman
Assistant Professor, Department of Agriculture (Horticulture), Faculty of Agriculture and Veterinary Sciences, Mewar University, Chittorgarh, Rajasthan, India

Proloy Sankar Dev Roy
Assistant Professor, Department of Agriculture (Horticulture), Faculty of Agriculture and Veterinary Sciences, Mewar University, Chittorgarh, Rajasthan, India

Pradeep Singh
Assistant Professor, Department of Agriculture (Horticulture), Faculty of Agriculture and Veterinary Sciences, Mewar University, Chittorgarh, Rajasthan, India

Om Prakash Regar
Assistant Professor, Department of Agriculture (Horticulture), Faculty of Agriculture and Veterinary Sciences, Mewar University, Chittorgarh, Rajasthan, India

Corresponding Author:
Yogesh Kumar
Research Scholar, Department of Agriculture (Horticulture), Faculty of Agriculture and Veterinary Sciences, Mewar University, Chittorgarh, Rajasthan, India

Studies on preparation and storage of papaya (*Carica papaya* L.) fruit jam

Yogesh Kumar, Champa Lal Regar, Bhagwan Suman, Proloy Sankar Dev Roy, Pradeep Singh and Om Prakash Regar

DOI: https://www.doi.org/10.33545/2664844X.2025.v7.i7d.523

Abstract
An experiment was conducted at central laboratory, Mewar University, Chittorgarh (Rajasthan) in 2025, which consisted nine treatments *viz*., control T_1: Pulp 45% + sugar 55% + acid 0.2%, T_2: Pulp 50% + sugar 50% + acid 0.2%, T_3: Pulp 55% + sugar 45% + acid 0.2%, T_4: Pulp 45% + sugar 55% + acid 0.3%, T_5: Pulp 50% + sugar 50% + acid 0.3%, T_6: Pulp 55% + sugar 45% + acid 0.3%, T_7: Pulp 45% + sugar 55% + acid 0.4%, T_8: Pulp 50% + sugar 50% + acid 0.4% and T_9: Pulp 55% + sugar 45% + acid 0.4% in completely randomized design (CRD). The papaya variety "Taiwan Red Laddy" was used for experiment.
Results clearly showed that biochemical analysis *viz*., total soluble solids (TSS) highest recorded under treatments T_6 (Pulp 55% + Sugar 45% + Citric Acid 0.3%) at 70.91, 71.41 and 71.61 at 0, 30 and 60 DAS, conversely, T_1 (Pulp 45% + Sugar 55% + Acid 0.2%) showed the highest pH value of papaya jam (3.72, 3.52 and 3.42 at 0, 30 and 60 DAS, respectiely). In case of sensory observation *viz*., flavor (7.87, 7.77 and 7.47out of scale of nine) and overall acceptability (8.28, 8.08 and 7.88 out of scale of nine) of papaya jam at 0, 30 and 60 DAS, respectively were recorded under T_6 (Pulp 55% + Sugar 45% + Citric Acid 0.3%).

Keywords: Papaya, days after storage (DAS), jam, fruit preservation

Introduction
Fruit processing is a critical aspect of the food industry, aiming to extend shelf life, enhance safety, and add value to fresh produce. The process begins with cleaning, sorting, and grading to remove contaminants and ensure uniformity, which are essential steps for maintaining quality and safety standards. Cleaning typically involves water baths or sprays to eliminate dirt and microorganisms, while sorting and grading are based on size, color, and ripeness to meet consumer expectations and regulatory requirements.
Papaya *(Carica papaya* L.) is an important fruit of tropical and subtropical regions of the world. It belongs to the family *Caricaceae* (Badillo, 1971) [1] and grows well in tropical climate. It requires warm and humid climate and can be cultivated upto an elevation of about 1000 meters.
Papaya is mainly dioecious fruit crop with male and female flowers born on separate plants. The fruit is large, fleshy and hallow. It may be round typical hermaphrodite plant. Fruits are harvested when they are full size, mature green, with a tinge of yellow at the apical end. A mature stage is characterised by skin colour break and oozing of watery liquid when scratched at the fruit surface. In India, Washington, Honey Dew, Coorg Honey Dew, Co-1, Co-2, Co-4, Co-5, Co-6, Pusa Delicious, Sioux (Disco), Pusa Majesty and Pusa Nanha are grown extensively.
The papaya is a rich source of pectin and alkoloids like carpaine. The fruit pulp contains sucrose, invert sugars, a various substances, papain, malic acid and salt of tartaric and citric acid. The ripe papaya fruit contain water 88.33%, reducing sugars 6.25%, total sugars *1.5%,* protein 0.5%, lipids 0.17%, crude fiber 1.05%, ash 0.56%, acid 0.7%, and energy value 34.38 cal/lOOg. Papaya is the second largest source of vitamin 'A' next to mango. The vitamin content of papaya is, vit. A 2000-5000 IU, thiamin 15.63 mg, riboflavin 23-83 mg, niacin 0.15-0.76 mg and ascorbic acid 33-136 mg/100 g of the fruit pulp.

Fruit jam processing is a key segment of the fruit preservation industry, aimed at extending shelf life while retaining the fruit's nutritional and sensory parameters. Jam is a semi-solid product made by boiling fruit pulp with sugar and pectin to achieve a gel-like consistency. The preparation process includes washing, peeling, pulping, and cooking the fruit with sugar, followed by the addition of acid (usually citric acid) to adjust pH and pectin to aid gel formation (Rathore *et al*., 2011) [10]. The total soluble solids (TSS) content of finished jam is generally maintained at 65-68°Brix, which helps in microbial stability by creating osmotic pressure that inhibits spoilage organisms (Manay & Shadaksharaswamy, 2001) [6].

Fruit jam production also plays a vital role in reducing post-harvest losses by utilizing surplus or substandard fruits that may not meet fresh market standards. This contributes to food security and economic returns for small-scale processors and farmers alike (FAO, 2010) [2].

Materials and Methods

An experiment was conducted at central laboratory, Mewar University, Chittorgarh (Rajasthan) in 2025 to study the "Studies on Preparation and Storage of Papaya (*Carica papaya* L.) Fruit Jam" in completely randomized design with consisted nine treatments *viz*., control T_1: Pulp 45% + sugar 55% + acid 0.2%, T_2: Pulp50% + sugar 50% + acid 0.2%, T_3: Pulp 55% + sugar 45% + acid 0.2%, T_4: Pulp 45% + sugar 55% + acid 0.3%, T_5: Pulp 50% + sugar 50% + acid 0.3%, T_6: Pulp 55% + sugar 45% + acid 0.3%, T_7: Pulp 45% + sugar 55% + acid 0.4%, T_8: Pulp 50% + sugar 50% + acid 0.4% and T_9: Pulp 55% + sugar 45% + acid 0.4% at centeral laboratory, Mewar University, Chittorgarh (Rajasthan). The experimental area is geographically located at 74º635929 E longitude and 25.032514º N latitude and this region falls under agro-climatic zone IV A of Rajasthan. Papaya fruits of Taiwan Red Iady cultivar were obtained from the Progressive Farmer's field from Nimach. The fully matured, healthy and uniform sized sound fruits were carefully harvested and brought to the laboratory for further experimentation. Most of chemicals used in the present investigation were of analytical grade. They were purchased from Jam Chemicals, Udaipur. The observation were recorded at harvest was analysed by statistical methods (Fisher, R.A. 1950) [3].

Result and Discussion

It is clear from the result of present study that, T_6 (Pulp 55% + Sugar 45% + Citric Acid 0.3%) had significantly affected the total soluble solids (TSS) of 70.91, 71.41 and 71.61 at 0, 30 and 60 DAS, respectively and being statistically at par with T_5 and T_2. Whereas lowest TSS of 68.09, 68.59 and 68.79 °Bx at 0, 30 and 60 DAS, respectively was observed in T_7: Pulp 45% + sugar 55% + acid 0.4%. Conversely, T_1 (Pulp 45% + Sugar 55% + Acid 0.2%) recorded maximum pH value of 3.72, 3.52 and 3.42 at 0, 30 and 60 DAS, respectively which was remained at par with T_2 and T_3. Whereas lowest pH value of 3.35, 3.15 and 3.05 at 0, 30 and 60 DAS, respectively were recorded under T_9: Pulp 55% + sugar 45% + acid 0.4% (Table-1). he superior TSS content in T6 can be attributed to its higher pulp proportion, which contributed more natural sugars and solids, enhancing the concentration of soluble substances. These results were statistically at par with treatments T_5 and T_2, suggesting that a slightly increased acid or altered sugar level within this range did not significantly alter the TSS. These findings are in alignment with earlier work by Singh *et al*. (2019) [12]. Treatment T_9 (Pulp 55% + Sugar 45% + Citric Acid 0.4%) showed the lowest pH values (3.35, 3.15, and 3.05 at 0, 30, and 60 DAS, respectively), which can be directly correlated with its higher citric acid content. The higher acid concentration not only enhances preservation but also contributes to a sharper decrease in pH, making the product more acidic. This is in accordance with the observations of Sharma *et al*. (2021) [11].

Further sensory evaluation revealed that T_6 was significantly superior in terms of flavor (7.87, 7.77 and 7.47out of scale of nine) and overall acceptability (8.28, 8.08 and 7.88 out of scale of nine) of papaya jam at 0, 30 and 60 DAS, respectively followed closely by T_5 and T_2. T_7, with low pulp and high acid content, scored the lowest across sensory parameters. Similarly, inferior in terms of flavor (7.30, 7.20 and 6.90 out of scale of nine) and overall acceptability (7.69, 7.49 and 7.29 out of scale of nine) registered under T_7: Pulp 45% + sugar 55% + acid 0.4%. The significantly higher sensory scores under treatment T6 may be attributed to an optimal balance of pulp, sugar, and acid, which enhanced both flavor and overall acceptability. Adequate pulp content contributes to improved texture, natural color, and fruitiness, all of which are critical in consumer perception (Kumar *et al*., 2013) [4]. A moderate sugar level complements the fruit's natural sweetness without overpowering its flavor, while appropriate citric acid addition sharpens taste and preserves freshness (Ranganna, 1986) [8].

Conversely, the lowest sensory scores under T_7 can be ascribed to the low pulp and high acid concentration, which likely caused an overly sour taste and inferior mouthfeel. Excessive acid negatively affects palatability and can lead to poor consumer acceptability (Thompson *et al*., 1998) [13]. The decline in scores over storage might also relate to acid-induced degradation of flavor compounds and changes in consistency (Patil *et al*., 2021) [7].

Table 1: Studies on pulp, sugar and acid levels on total soluble solids (°Brix) of papaya jam

Treatment	TSS (°Brix)		
	0 DAS	30 DAS	60 DAS
T_1: Pulp 45% + sugar 55% + acid 0.2%	68.82	69.32	69.52
T_2: Pulp50% + sugar 50% + acid 0.2%	70.66	71.16	71.36
T_3: Pulp 55% + sugar 45% + acid 0.2%	69.93	70.43	70.63
T_4: Pulp 45% + sugar 55% + acid 0.3%	68.75	69.25	69.45
T_5: Pulp 50% + sugar 50% + acid 0.3%	70.84	71.34	71.54
T_6: Pulp 55% + sugar 45% + acid 0.3%	70.91	71.41	71.61
T_7: Pulp 45% + sugar 55% + acid 0.4%	68.09	68.59	68.79
T_8: Pulp 50% + sugar 50% + acid 0.4%	69.85	70.55	70.68
T_9: Pulp 55% + sugar 45% + acid 0.4%	69.48	69.98	70.18
SEm+	0.49	0.62	0.94
CD (P=0.05)	1.48	1.86	2.82

Table 2: Studies on pulp, sugar and acid levels on pH of papaya Jam at 0, 30 and 60 days after storage (DAS)

Treatment	pH		
	0 DAS	30 DAS	60 DAS
T_1: Pulp 45% + sugar 55% + acid 0.2%	3.72	3.52	3.42
T_2: Pulp50% + sugar 50% + acid 0.2%	3.69	3.49	3.39
T_3: Pulp 55% + sugar 45% + acid 0.2%	3.68	3.48	3.38
T_4: Pulp 45% + sugar 55% + acid 0.3%	3.56	3.36	3.26
T_5: Pulp 50% + sugar 50% + acid 0.3%	3.51	3.31	3.21
T_6: Pulp 55% + sugar 45% + acid 0.3%	3.5	3.30	3.20
T_7: Pulp 45% + sugar 55% + acid 0.4%	3.39	3.19	3.09
T_8: Pulp 50% + sugar 50% + acid 0.4%	3.36	3.16	3.06
T_9: Pulp 55% + sugar 45% + acid 0.4%	3.35	3.15	3.05
SEm±	0.31	0.28	0.24
CD (P=0.05)	0.92	0.84	0.71

Table 3: Studies on pulp, sugar and acid levels on flavor (9 point scale) papaya jam at 0, 30 and 60 days after storage (DAS)

Treatment	Flavor (9 point scale)		
	0 DAS	30 DAS	60 DAS
T_1: Pulp 45% + sugar 55% + acid 0.2%	7.30	7.20	6.90
T_2: Pulp50% + sugar 50% + acid 0.2%	7.72	7.62	7.32
T_3: Pulp 55% + sugar 45% + acid 0.2%	7.51	7.41	7.11
T_4: Pulp 45% + sugar 55% + acid 0.3%	7.26	7.16	6.86
T_5: Pulp 50% + sugar 50% + acid 0.3%	7.75	7.65	7.35
T_6: Pulp 55% + sugar 45% + acid 0.3%	7.87	7.77	7.47
T_7: Pulp 45% + sugar 55% + acid 0.4%	7.22	7.12	6.82
T_8: Pulp 50% + sugar 50% + acid 0.4%	7.51	7.41	7.11
T_9: Pulp 55% + sugar 45% + acid 0.4%	7.39	7.29	6.99
SEm±	0.06	0.06	0.05
CD (P=0.05)	0.19	0.18	0.15

Table 4: Studies on pulp, sugar and acid levels on overall acceptability (9 point scale) papaya jam at 0, 30 and 60 days after storage

Treatment	Overall acceptability (9 point scale)		
	0 DAS	30 DAS	60 DAS
T_1: Pulp 45% + sugar 55% + acid 0.2%	7.69	7.49	7.29
T_2: Pulp50% + sugar 50% + acid 0.2%	8.16	7.96	7.76
T_3: Pulp 55% + sugar 45% + acid 0.2%	7.95	7.75	7.55
T_4: Pulp 45% + sugar 55% + acid 0.3%	7.61	7.41	7.21
T_5: Pulp 50% + sugar 50% + acid 0.3%	8.24	8.04	7.84
T_6: Pulp 55% + sugar 45% + acid 0.3%	8.28	8.08	7.88
T_7: Pulp 45% + sugar 55% + acid 0.4%	7.58	7.38	7.18
T_8: Pulp 50% + sugar 50% + acid 0.4%	7.88	7.68	7.48
T_9: Pulp 55% + sugar 45% + acid 0.4%	7.85	7.65	7.45
SEm±	0.049	0.047	0.045
CD (P=0.05)	0.14	0.13	0.12

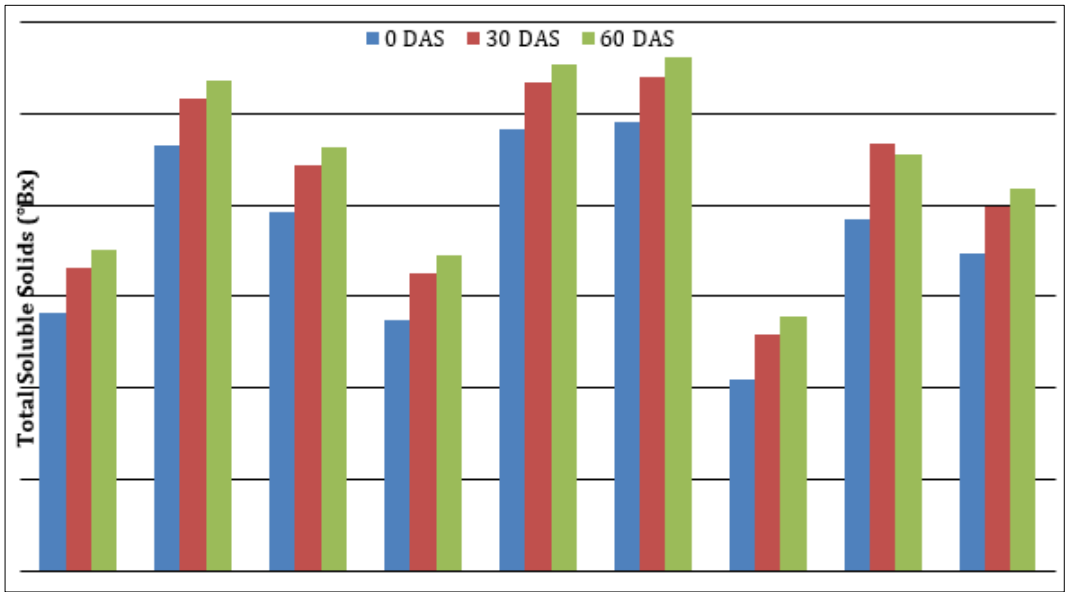

Fig 1: Studies on pulp, sugar and acid levels on total soluble solids (°Brix) of papaya jam

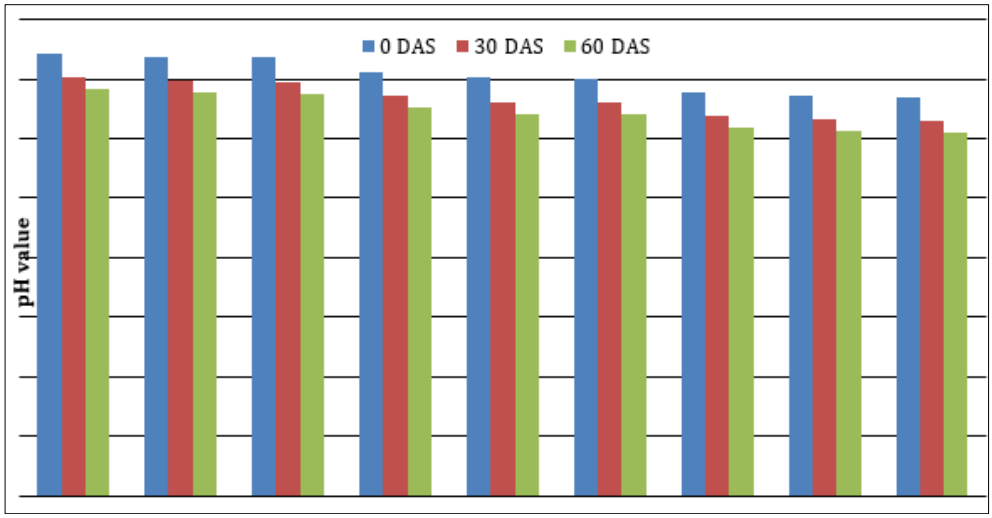

Fig 2: Studies on pulp, sugar and acid levels on pH value of papaya jam

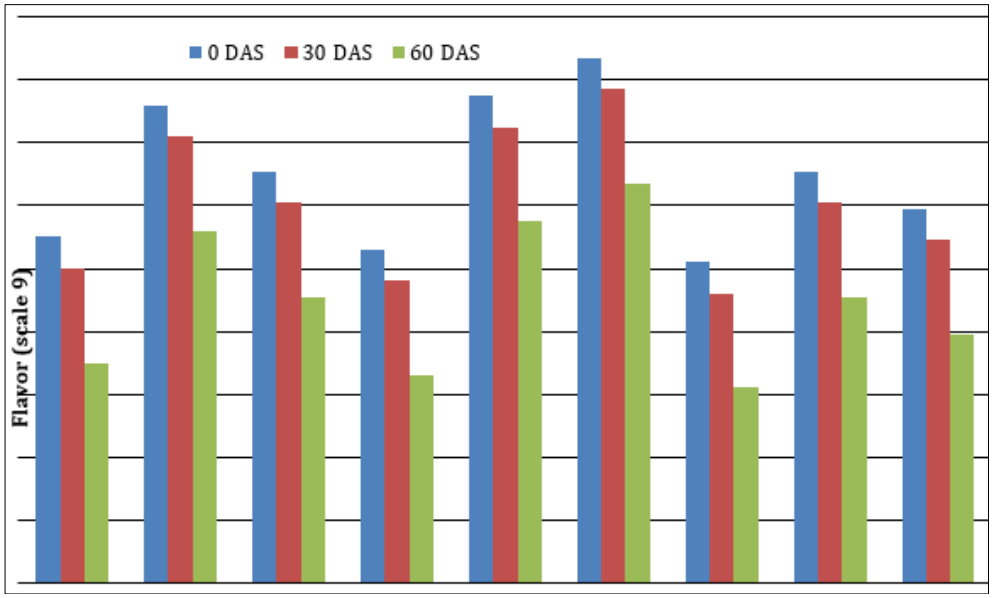

Fig 3: Studies on pulp, sugar and acid levels on flavor of papaya jam

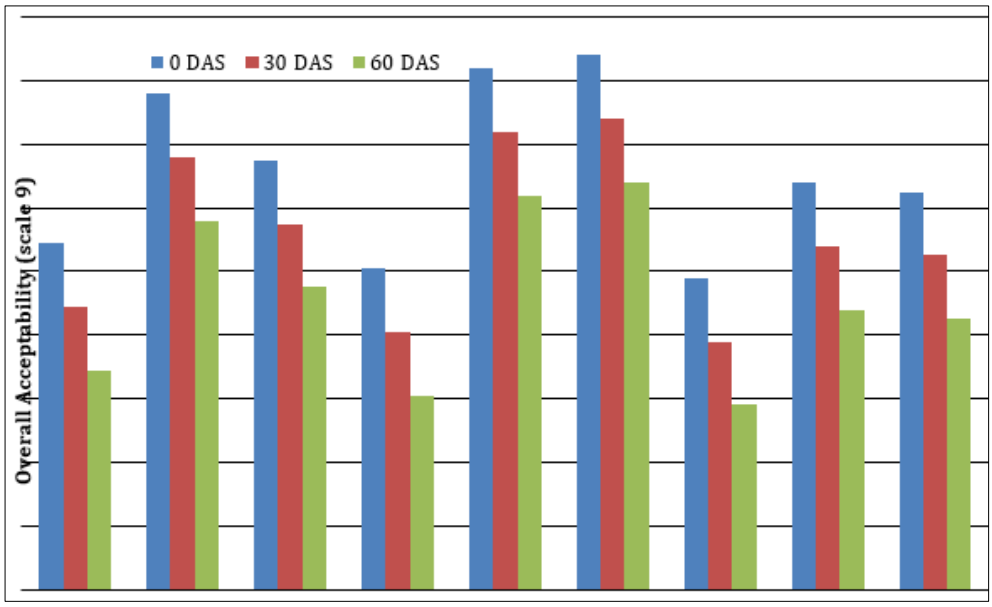

Fig 4: Studies on pulp, sugar and acid levels on overall acceptability of papaya jam

Conclusion

Based on the results of the experimentation, it may be concluded that the Application of T_6 (Pulp 55% + Sugar 45% + Citric Acid 0.3%) found suitable to papaya jam and their storage.

Acknowledgments

A feeling of sincere and heartfelt gratitude envelops me as I draft this acknowledgement. I acknowledge my esteemed Major Advisor, advisory committee, Head, Department of Agriculture (Horticulture), faculty members and non-teaching staff of Department of Agriculture (Horticulture), Mewar University, Chittorgarh for providing me the necessary help and suggestions during the course of the study.

References

1. Badillo VM. El género *Carica* L. Acta Cient Venez. 1971;22:47-76.
2. FAO. Reducing post-harvest losses in horticultural crops. Food and Agriculture Organization of the United Nations; 2010.
3. Fisher RA. Statistical Methods for Research Workers. 11th ed. Edinburgh: Oliver and Boyd; 1950.
4. Kumar A, Sharma R, Singh J. Effect of pulp and sugar concentration on quality of fruit jam. J Food Sci Technol. 2013;50(2):292-297.
5. Kumar S, Bhatnagar P, Saini R. Impact of sugar and acid concentration on storage behavior of fruit jams. Int J Process Postharvest Technol. 2018;9(1):23-29.
6. Manay SN, Shadaksharaswamy M. Foods: Facts and Principles. 2nd ed. New Delhi: New Age International Publishers; 2001.
7. Patil S, Gaikwad SA, Jadhav BS. Influence of storage on sensory and chemical quality of fruit jams. J Food Process Preserv. 2021;45(4):e15334.
8. Ranganna S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. Tata McGraw-Hill; 1986.
9. Rao SR, Reddy BV. Influence of acid concentration on physicochemical stability of fruit preserves during storage. J Food Process Preserv. 2020;44(10):e14776.
10. Rathore SS, Masud T, Sammi S. Effect of storage on physicochemical composition and sensory properties of mango (*Mangifera indica* L.) variety Dosehari jam. Pak J Nutr. 2011;10(5):410-415.
11. Sharma P, Choudhary M, Thakur N. Effect of citric acid concentration on the quality and shelf life of fruit-based products. Indian J Hortic Sci. 2021;78(2):219-225.
12. Singh R, Gupta RK, Verma N. Effect of fruit pulp concentration on quality characteristics of jam during storage. J Food Sci Technol. 2019;56(8):3773-3779.
13. Thompson AK, Barrett DM, Timm EJ. Quality and shelf-life of fruit preserves and spreads. Food Res Int. 1998;31(6):401-409.