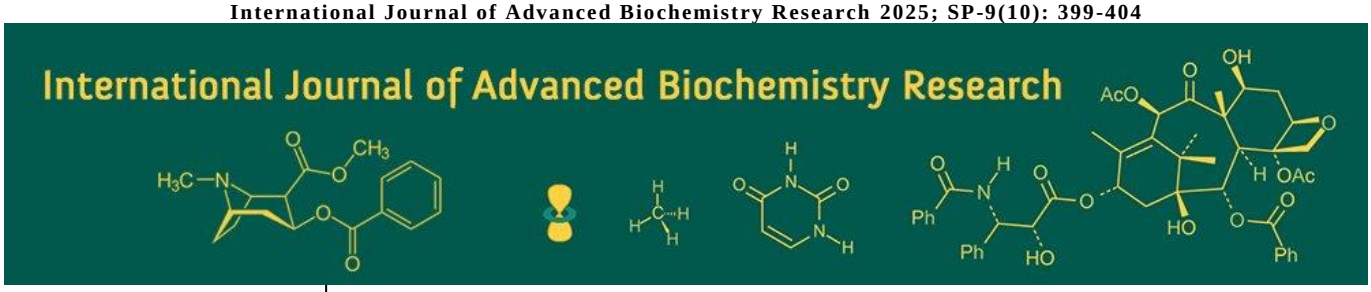

ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2025): 5.29
IJABR 2025; SP-9(10): 399-404
www.biochemjournal.com
Received: 26-08-2025
Accepted: 29-09-2025

PT Yalmar
M.Sc. Scholar, Department of PHM, Fruit, Vegetable and Flower Crops, PGI-PHTM, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, Maharashtra, India

Dr. GD Shirke
Professor and Head, Department of PHM, Medicinal, Aromatic, Plantation, Spices and Forest Crops, PGI-PHTM, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, Maharashtra, India

Dr. RC Ranveer
Professor, Department of PHM of Meat Poultry and Fish, PGI-PHTM, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, Maharashtra, India

Dr. RG Manjarekar
Subject Matter Specialist, Krishi Vigyan Kendra, Roha-Raigad, Maharashtra, India

SP Salvi
Assistant Professor, Department of PHM, Fruit, Vegetable and Flower Crops, PGI-PHTM, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, Maharashtra, India

Dr. PB Sanap
Professor and Head, Department of PHM, Fruit, Vegetable and Flower Crops, PGI-PHTM, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, Maharashtra, India

Corresponding Author:
PT Yalmar
M.Sc. Scholar, Department of PHM, Fruit, Vegetable and Flower Crops, PGI-PHTM, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, Maharashtra, India

Standardization of protocol for preservation of cashew apple (*Anacardium occidentale* L.) for juice

PT Yalmar, GD Shirke, RC Ranveer, RG Manjarekar, SP Salvi and PB Sanap

DOI: https://www.doi.org/10.33545/26174693.2025.v9.i10Se.5866

Abstract
It was aimed to preserve cashew apple juice by adding preservatives viz., Sodium Benzoate i.e. SB (T_1), Patassium Metabisulphate i.e. KMS (T_2) and Sorbic Acid i.e. SA (T_3) with different concentrations viz., 500 ppm (C_1), 1000 ppm (C_2), 1500 ppm (C_3) and 2000 ppm (C_4). The experiment was carried out in Factorial Completely Randomized Design (FCRD) with three treatment, four concentration and three replications. Cashew apple for juice was analyzed for physical, chemical and sensory quality parameters at 0, 6, 12, 18 and 24 hours of storage period at ambient conditions. From the present investigation, it was observed that the chemical parameters such as TSS, reducing sugar, total sugar and ascorbic acid exhibited a decreasing trend while titratable acidity shows increasing trend during storage period of 24 hours at ambient conditions when packed in plastic bottle containers. The treatment T_2 i.e. KMS 1000 ppm i.e C_2 was found to be the best as per as colour values and retention of ascorbic acid content during storage.

Keywords: Preservation, different concentration, storage, cashew apple, Sodium Benzoate (SB), Patassium Metabisulphate (KMS) and Sorbic Acid (SA)

Introduction
The cashew apple is a tropical fruit, but its true fruit is a nut. This is the main objective of the cashew apple culture, which is exported to many countries. The fruit is known as a faux fruit because 90% of it is edible. A pseudo-fruit, cashew apples are rich in vitamins, minerals, certain amino acids and reducing sugars (fructose and glucose) (Campos *et al*. 2002) [7]. The tropical cashew tree (*Anacardium occidentale* L.), native to Brazil, yields 90% of the cashew apples produced globally. The cashew nut, the most sought-after commodity with significant added value, grows atop the cashew apple, an enlarged peduncle filled with delectable pulp. As a result, 1.8 million tons of cashew fruits are processed each year for their nuts, with more than 80% of the peduncles ending up as industrial trash (Prommajak *et al*. 2014) [18].
The cashew apple, a pseudo fruit, accounts for 90% of the overall fruit weight, while the cashew nut, the cashew tree's true fruit, makes up 10%. The nut and apple fall to the ground together when they are ready to be processed and the nut is removed from the apple. Cashew apples are elongated, fibrous, spherical, or pear-shaped fruits. When fully developed, a cashew apple will be solid, juicy, colourless and easily separated from the plant. At this stage, there is a high concentration of flavour, aroma and sugar together with no acidity or astringency (Figueiredo *et al*. 2002) [2]. A non-climacteric fruit, cashew apples come in three different colours: yellow, orange and red and have the same pale-yellow flesh. They measure between 6 and 10 cm in length and weigh between 75 and 80 g (Maciel *et al*. 1986) [15]. Its pulp is acidic, astringent, juicy, fibrous and spongy. This type of false fruit is known as a cashew apple (Morton and Miami, 1987) [14]. One of the best sources of vitamin B complex, vitamin C (ascorbic acid) and other vitamins is cashew apples. Additionally, it is high in minerals and carbohydrates (Suganya and Dharshini, 2011) [21]. Cashew apple juice has therapeutic applications. Its strong tannin content makes it a good treatment for persistent diarrhoea and sore throats. It is said to possess antibacterial, antifungal, antitumor and antioxidant qualities (Ogunjobi and Ogunwolu, 2010) [16].
The presence of tannins and anacardic acid gives the cashew apple its astringent flavour, which creates a biting feeling on the tongue and throat when consumed raw.

The cashew apple's extremely high tannin content is the source of this. The fermented beverage known as fenny, made from cashew apple juice, is highly well-liked in Goa. The cashew apple is solely used in this commercial capacity. The use of cashew apples includes processed cashew apple products such as fresh juice, wine, jam, jelly, syrup and pectin; the process of turning apple juice into alcohol; non-alcoholic drinks; candied fruit; and sun-dried cashew apples, among others (Ogunjobi and Ogunwolu, 2010; Vaidehi *et al*. 1990) [16, 25]. One significant by-product of processing cashew apples is cashew apple pomace.

Approximately 2 lakh tons of cashew nuts are produced in Maharashtra each year. Five to six tons of cashew apples are produced for every ton of cashew nuts. Thus, around 10 lakh tons of cashew apples are produced annually in Maharashtra. of which only 9-10% of cashew apples are used. Cashew apples' limited shelf life and seasonal availability are the main problems with their use. One of the biggest obstacles facing the processing business is the cashew apple's seasonal output. Additionally, thousands of tons of cashew apples are lost annually as a result of people's ignorance of the nutritional value of cashew apples and appropriate technology. As a result, they must be stored for usage during off-season. Cashew apples can be stored for a longer period at a temperature of 0-5 °C and 85-90 relative humidity (Singh and Mathur, 1953) [22]. At these temperatures chilling injury and ripening are minimal. However, careful handling of cashew apples during their storage is essential to avoid bruises and injuries. Decay organisms enter through such breaks in the skin. Correct temperature management is also important for the consumer. Optimal storage conditions (temperature and relative humidity) can significantly extend the shelf life of cashew apples while maintaining their quality attributes (e.g., soluble solids, titratable acidity, weight loss, sensory characteristics) compared to ambient storage. The best storage settings for cashew apples to prolong their post-harvest life have not, however, been well studied. Given the wide range of applications for cashew apples, the ideal temperature may be required to prolong their shelf life. The efficiency of different preservatives alongwith different concentrations on cashew apples juice during ambient storage condition must be assessed in order to prolong the post-harvest life and preserve quality characteristics of juice such as soluble solids, titratable acidity and weight loss. The following particular objectives undertaken for the current study's implementation: To find out effective chemical preservative to enhance keeping quality of cashew apple juice and to study the physico-chemical changes during storage period.

Materials and Methods

The research was conducted at the Department of Post Harvest Technology of Fruit, Vegetable and Flower Crops, Post Graduate Institute of Post Harvest Technology Management, Killa-Roha, Dist. Raigad, (18°25'35.16312" N,73°10'45.77484" E) during the year 2024-2025.

Experimental material

The fresh and mature Cashew apple, brought to laboratory for conducting the research. The cashew apple was procured from Regional Fruit Research Centre, Vengurla. The experiment on the preservation of cashew apple juice was laid out with three main treatments, four sub treatments and three replications. The experimental details are as given below.

Experimental details

1. Crop	Cashew apple (*Anacardium occidentale* L.)
2. Variety	Local
3. Design	F.C.R.D.
4. Treatment Details	a) Chemical preservatives-3 b) Concentration-4
5. Number of Treatment Combination	12
6. Replication	3
7. Storage	24 hours, (0, 6, 12, 18 and 24 hrs)

Details of treatment

A) Chemical preservatives	
T_1	SB (Sodium Benzoate)
T_2	KMS (Potassium Metabisulphate)
T_3	SA (Sorbic Acid)
B) Concentration	
C_1	500 ppm
C_2	1000 ppm
C_3	1500 ppm
C_4	2000 ppm
Control (Without chemical treatment)	

The total soluble solids (TSS) were determined by using Hand Refractometer (A.O.A.C., 2020), the titratable acidity were determined by the method described by Ranganna (1986) [19]. The reducing sugars were determined by the method of Lane and Eynon (1923) as described by Ranganna (1986) [19] while the total sugars after acid hydrolysis of the same method. The ascorbic acid was determined by 2, 6-dichlorophenol indophenol dye method of Johnson (1948) as described by Ranganna (1986) [19]. For Microbial analysis the total plate count was determined as per APHA, 2001 and expressed as colony forming unit (cfu/g).

The data collected on chemical parameters of Cashew Apple Juice such as TSS, titratable acidity, total sugars, reducing sugars, ascorbic acid were represented as mean values. The data collected on the changes in physico-chemical and sensory quality parameters of cashew apple juice during storage were statistically analyzed by the standard procedure given by Panse and Sukhatme (1985) [17] using Factorial Completely Randomized Design and valid conclusions were drawn only on significant differences between treatment mean at 5 percent level of significance.

Results and Discussion

The observations on the changes in chemical and sensory quality parameters of preserved cashew apple juice during storage were recorded at 0, 6, 12, 18 and 24 hrs. The results obtained are presented and discussed in this chapter under the following headings.

Changes in chemical parameters of cashew apple juice during storage

TSS (B°)

It is clear from the Table 1 that the data collected for changes in TSS content in various treatments of preserved cashew apple juice were determined to be statistically non-significant. The treatment T_1 (Sodium benzoate) had the

numerically highest mean TSS concentration (10.611 °B), followed by T_3 (Sorbic acid). The treatment T_2 (Potassium metabisulphite) had the lowest mean value for TSS concentration (10.578°B). The data given in Table 4.1 shows that TSS levels in preserved cashew apple juice increased considerably during increase in concentration. The lowest (10.250 °B) mean value for TSS content was obtained at 500 ppm, while the maximum (10.933 °B) mean value was recorded at 2000 ppm. It is clear from the table 2 that the 0, 6, 12, 18, 24 hrs maximum TSS in T_2 (Potassium metabisulphite) in 2000 ppm.

The data collected for changes in TSS content in various treatments of preserved cashew apple juice were determined the treatment T_1 (Sodium benzoate) had the numerically highest mean TSS concentration while treatment T_2 (Potassium metabisulphite) had the lowest mean value for TSS concentration. This could be due to the fact that the higher level of KMS that reduced the bio chemical changes in the cashew apple juice during storage in accordance with Shimpi (2012) [20]. During the storage, TSS levels in preserved cashew apple juice increased considerably during increase in concentration. The conversion of polysaccharides into sugars during storage may be the cause of an increase in TSS of cashew apple juice, as also noted by Bharwal *et al*. (2009) [6] in hill lemon juice and Ayub (2010) [4] in strawberry juice. Regardless of preservatives and their combination, the TSS Cashew apple juice grew during storage, according to the data, until six hours later, at which point it slightly decreased. Kazemi *et al*. (2013) [12] also noted similar findings in pomegranates and Dhumal (2016) [9] in aonla juice during storage period. Also, Aluko *et al*. (2023) [3] noticed in cashew apple juice.

Titratable acidity (%)

It noticed from the Table 2 that the The numerically maximum (0.948%) mean value for the titratable acidity was observed in the treatment T_2 (potassium metabisulphate), followed by the same mean value for treatment T_1 & T_3 (0.947) of sodium benzoate and sorbic acid respectively. the titratable acidity in cashew apples increased during storage. The lowest (0.946) mean value for titratable acidity was found at 1000 ppm and highest (0.948) mean value for titratable acidity was recorded at both 500 and 2000 ppm. The table 2 that the 0 hrs maximum titratable acidity in T_2 (Potassium metabisulphite) in 2000 ppm and minimum 1000 ppm, and 6, 12, 18, 24 hrs maximum titratable acidity in T_2 (Potassium metabisulphite) in 500 ppm and minimum titratable acidity in T_2 (Potassium metabisulphite) in 1000 ppm.

All treatments showed an increasing trend in titratable acidity levels over the course of the 0-24 hour storage period. The rise in the concentration of weakly ionised acid and its salts during storage may be the cause of the increase in acidity. Shimpi (2012) [20] and Talasila *et al*. (2012) [24] also noted a similar pattern with cashew apple juice. Ayub (2010) [4] has observed a similar tendency in strawberry juice. More acid is produced in cashew apple juice as a result of increased metabolic activity made possible by the higher ambient temperatures noted by Aluko *et al*. (2023) [3]. Similar increases in titratable acidity over time were also noted by Chia *et al*. (2012) [8] in pineapple juice.

Reducing sugar (%)

The Table 1 clearly shows that the maximum (6.469%) mean value for the reducing sugar content was observed in the treatment T_2 (Potassium metabisulphite) followed by treatment T_1 (Sodium benzoate). The minimum (6.446%) mean value for reducing sugar content was observed in the treatment T_3 (Sorbic acid). It noticed table 2 that the 0 hrs maximum reducing sugar in T_2 (Potassium metabisulphite) in 2000 ppm and minimum titratable acidity in T_2 (Potassium metabisulphite) in 500 ppm. And 6, 12, 18, 24 hrs maximum reducing sugar in T_2 (Potassium metabisulphite) in 1000 ppm.

According to the results, reducing sugars were found to increase as the concentration of preservatives increased from 500 ppm to 2000 ppm and they were found to decrease from T_1 to T_3. Identical results also recorded by Dhumal (2016) [9] in aonla juice. In terms of storage time, the reducing sugars content of preserved cashew apples increased from 0 to 6 hours. The hydrolysis of complex polysaccharides into sugar may be the cause of this rise in reducing sugars. Similar findings were also observed by Bharwal (2009) [6] in hill lemon juice, Shimpi (2012) [20] in cashew apple juice. A decreasing trend in storage time was seen after 6 to 24 hours is due to the rate of hydrolysis exceeds the rate at which reducing sugar is used during the browning reaction, the amount of reducing sugar in the juice rises. However, Ma *et al*. (2022) [13] and Aluko *et al*. (2023) [3] have observed that the concentration of reducing sugar stabilises or even declines when the non-enzymatic browning event occurs.

Total sugar (%)

The table 1 clearly shows that the treatment T_1 (Sodium benzoate) at par T_3 (Sorbic acid) had the numerically highest mean total sugar concentration (10.199). The treatment T_2 (Potassium metabisulphite) had the lowest mean value for total sugar concentration (10.198). The data given in Table 4.16 shows that total sugar levels in preserved cashew apple juice increased considerably during increase in concentration. The lowest (10.197) mean value for total sugar content was obtained at 500 ppm, while the maximum (10.199) mean value was recorded at 2000 ppm. The table 2 that the 0, 6, 12 hrs maximum total sugar in T_2 (Potassium metabisulphite) is 2000 ppm, and 18, 24 hrs maximum total sugar in T_2 (Potassium metabisulphite) is 500 ppm.

The results showed that the overall sugar content varied statistically significantly among the different cashew apple juice preservation techniques. This can be due to cashew apple juice dilutes 104 the natural sugars. Dhumal (2016) [9] also noted the same outcomes in aonla juice and Aluko *et al*. (2023) [3] in cashew apple juice. From 0 to 6 hours of storage, the total sugar content of preserved cashew apples juice increased. The transformation of starch into soluble sugars and their derivatives may be the cause of the rise in total sugars during the preservation of preserved cashew apples. Similar findings were found by Shimpi (2012) [20] in cashew apple juice. After 6 hours to 24 hours of storage time declining trend was noticed it is due to the hydrolysis of nonreducing sugars, which produces carbohydrates like fructose and glucose, it may be the cause of the decline, according to similar results published by Ma *et al*. (2022) [13] and Talasila *et al*. (2012) [24] in cashew apple juice.

Ascorbic acid (%)

It is noticed that among the treatments, T_2 (Potassium metabisulphite) had the greatest average sugar concentration (234.958), followed by T_1 (Sodium benzoate), while T_3 (Sorbic acid) had the lowest mean value (232.795). Table 1 shows that ascorbic acid levels dramatically dropped as concentration dropped. The lowest average value (233.804) was found at 500 ppm, while the highest value (233.928) corresponded to the 2000 ppm level. The table 2 that the 0, 6, 12, 18, 24 hrs maximum ascorbic acid in T_2 (Potassium metabisulphite) is 1000 ppm.

The oxidation of ascorbic acid during storage may be the cause of the decrease in ascorbic acid content in cashew apple juice, regardless of the treatments being investigated. Shimpi. (2012) [20] observations of a declining trend in the ascorbic acid level of cashew apple juice treated with KMS (Potassium metabisulphite) corroborate these findings. Similar findings were noted by Dhumal (2016) [9], who noted that the ascorbic acid content of aonla syrup was trending downward. The organic acid and reactive chemical ascorbic acid reacts with the sugar in the soaking solution to cause chemical processes such caramelization and Maillard reactions, which may reduce the amount of vitamin C present reported by Vu *et al*. (2025) [26].

Table 1: Changes in chemical composition in various treatments of preserved cashew apple juice

		500	1000	1500	2000	Mean
TSS (B°)	SB (Sodium Benzoate)	10.252	10.524	10.737	10.931	10.611
	KMS (Potassium Metabisulphite)	10.228	10.446	10.718	10.920	10.578
	SA (Sorbic Acid)	10.271	10.460	10.719	10.947	10.599
Titratable acidity (%)	SB (Sodium Benzoate)	0.948	0.946	0.947	0.948	0.947
	KMS (Potassium Metabisulphite)	0.948	0.946	0.948	0.949	0.948
	SA (Sorbic Acid)	0.949	0.947	0.946	0.948	0.947
Reducing sugar (%)	SB (Sodium Benzoate)	6.440	6.450	6.450	6.470	6.450
	KMS (Potassium Metabisulphite)	6.450	6.460	6.470	6.480	6.460
	SA (Sorbic Acid)	6.430	6.440	6.450	6.460	6.440
Total sugar (%)	SB (Sodium Benzoate)	10.197	10.201	10.203	10.198	10.199
	KMS (Potassium Metabisulphite)	10.197	10.199	10.198	10.199	10.198
	SA (Sorbic Acid)	10.196	10.203	10.199	10.201	10.199
Ascorbic acid	SB (Sodium Benzoate)	233.66	234.393	233.077	233.94	233.768
	KMS (Potassium Metabisulphite)	234.987	235.84	234.267	234.737	234.958
	SA (Sorbic Acid)	232.767	233.057	232.25	233.107	232.795

Table 2: Changes in chemical composition in preserved cashew apple juice during storage

KMS					
Parameters Concentration	**TSS (°B)**	**Titratable Acidity (%)**	**Reducing Sugar (%)**	**Total Sugar (%)**	**Ascorbic Acid (mg/100)**
0 Hrs					
500	10.228	0.948	6.450	10.197	234.987
1000	10.446	0.946	6.460	10.199	235.840
1500	10.718	0.948	6.470	10.198	234.267
2000	10.920	0.949	6.480	10.199	234.737
Mean	10.578	0.948	6.460	10.198	234.958
6 Hrs					
500	10.316	0.939	8.440	12.177	222.840
1000	10.426	0.928	9.040	12.180	227.303
1500	10.640	0.935	8.820	12.186	220.617
2000	10.858	0.937	8.680	12.203	222.967
Mean	10.560	0.935	8.740	12.187	223.432
12 Hrs					
500	10.220	0.954	7.230	11.584	175.020
1000	10.347	0.943	8.220	11.538	203.767
1500	10.527	0.951	8.090	11.553	185.810
2000	10.710	0.952	7.840	11.591	190.867
Mean	10.451	0.950	7.840	11.567	188.866
18 Hrs					
500	10.055	0.974	6.330	10.624	151.337
1000	10.218	0.963	6.930	10.614	174.070
1500	10.337	0.971	6.710	10.623	162.107
2000	10.527	0.972	6.570	10.618	168.850
Mean	10.284	0.970	6.630	10.621	164.091
24 Hrs					
500	9.934	0.994	5.400	10.139	147.183
1000	10.117	0.983	5.760	10.126	164.383
1500	10.241	0.991	5.620	10.136	152.307
2000	10.356	0.992	5.540	10.135	156.163
Mean	10.162	0.990	5.580	10.134	155.009

Changes in microbial parameters of cashew apple juice during storage

Total Plate Count (cfu/g)

It could be observed that the total plate count was not detected in treatments T_2 (potassium metabisulphite), during 0, 6 hrs of storage at ambient conditions.

As concentration increased, total plate count levels sharply decreased, as 3 demonstrates. The 1000 ppm level had the lowest average value (41.333), while the 500 ppm level had the highest value (46.667) in 12 hrs.

The treatments, T_2 (potassium metabisulphite) had the lowest mean value 1000 ppm (67.333), while 1500 ppm (76.667) had the greatest average concentration of total plate count in 18 hrs. Among that the maximum (108 cfu/g) mean value for the total plate count content was observed at the concentration of 1500 ppm followed by concentration of 2000 ppm. The minimum (91.667 cfu/g mean value for the total plate count content was observed at the concentration of 1000 ppm followed by concentration of 500 ppm.

During the 0-6 hour storage period, no total plate count was observed. The total plate count was observed in treatments T_1 (sodium benzoate), T_2 (potassium metabisulfite), or T_3 (sorbic acid) after 12 hours of storage at room temperature. Talasila (2017) [23] reported similar results in preserved cashew apple juice using Aloe vera and hydroxychavicol and Jayeola *et al*. (2024) [11] in cashew apples.

Table 3: Changes in microbial parameters of cashew apple juice during storage

KMS	
Total Plate Count (cfu/g)	
0 Hrs	
500	ND
1000	ND
1500	ND
2000	ND
Mean	-
6 Hrs	
500	ND
1000	ND
1500	ND
2000	ND
Mean	-
12 Hrs	
500	46.667
1000	41.333
1500	44.667
2000	43.333
Mean	44.001
18 Hrs	
500	73.667
1000	67.333
1500	76.667
2000	70.000
Mean	71.917
24 Hrs	
500	103.00
1000	91.667
1500	108.00
2000	105.667
Mean	102.083

Conclusion

This study successfully addressed the major issues of shelf-life extension and quality retention by developing a standardized procedure for the preservation of cashew apple (*Anacardium occidentale* L.) juice. Our results unequivocally show that the ideal preservative dosage is 1000 ppm of potassium metabisulphate (KMS) (more precisely, the T_2 treatment).

By significantly reducing microbial counts, this T_2 treatment at 1000 ppm KMS ensured the cashew apple juice's microbiological safety and prolonged its shelf life. Furthermore, the preserved juice's high consumer acceptability was consistently demonstrated by sensory evaluation, suggesting that this concentration preserves desired organoleptic characteristics like colour, flavour and general appeal without including off-notes or unplanned changes.

References

1. A.P.H.A. In: Downes FP, Ito K, editors. Compendium of methods for microbiological examination of foods. Washington: American Public Health Association; 2001.
2. AOAC. Official method of analysis. Washington D.C., USA: Association of Official Analytical Chemists; 2020.
3. Aluko A, Kassim N, Makule E. Investigating the optimal treatment to improve cashew apple (*Anacardium occidentale*) juice quality and shelf life. J Food Process Preserv. 2023;2023(1):4155761.
4. Ayub. Evaluation of strawberry juice preserved with chemical preservatives at refrigeration temperature. Int J Nutr Metab. 2010;2(2):27-32.
5. Ayub M, Ullah J, Muhammad A, Zeb A. Evaluation of strawberry juice preserved with chemical preservatives at refrigeration temperature. Int J Nutr Metab. 2010;2(2):27-32.
6. Bharwal VS, Shrera SK. Standardization of extraction methods and preservation techniques of hill lemon juice. J Sci Ind Res. 2009;68(7):608-612.
7. Campos DCP, Santos AS, Wolkoff DB, Matta VM, Cabral LMC, Couri S, *et al*. Cashew apple juice stabilization by microfiltration. Desalination. 2002;148(1-3):61-65.
8. Chia SL, Rosnah S, Noranizan MA, Ramli WW. The effect of storage on the quality attributes of ultraviolet-irradiated and thermally pasteurized pineapple juices. Int Food Res J. 2012;19(3):1001-1008.
9. Dhumal MRD. Master of Science (Horticulture) [Doctoral dissertation]. Department of Horticulture, Faculty of Agriculture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth; 2016.
10. Figueiredo de RW, Lajolo FM, Alves RE, Filgueiras HAC. Physicochemical changes in early dwarf cashew pseudofruits during development and maturation. Food Chem. 2002;77(3):343-347.
11. Jayeola CO, Orimoloye PO, Olalekan AM, Olorundare BO, Akinola CO, Raji MO, *et al*. Salvaging cashew apples through processing into simulated cashew meat. Nutr Food Process. 2024;7:01-04.
12. Kazemi F, Jafararpoor M, Golparvar A. Effects of sodium and calcium treatments on the shelf life and quality of pomegranate. Int J Farming Allied Sci. 2013;2(S2):1375-1378.
13. Ma Y, Xu Y, Chen Y, Meng A, Liu P, Ye K, *et al*. Effect of different sterilization methods on the microbial and physicochemical changes in *Prunus*

mume juice during storage. Molecules. 2022;27(4):1197.
14. Morton JF, Julia F, Miami F. Cashew apple. In: Fruits of warm climates. Miami, FL: Echo Point Books and Media; 1987. p. 239-240.
15. Maciel ML, Hansen TJ, Aldinger SB, Labows JN. Flavor chemistry of cashew apple juice. J Agric Food Chem. 1986;34(5):923-927.
16. Ogunjobi MAK, Ogunwolu SO. Development and physicochemical evaluation of wine produced from cashew apple powder. J Food Technol. 2010;8(1):18-23.
17. Panse VG, Sukhatme PV. Statistical methods for agricultural workers. New Delhi: Indian Council of Agricultural Research; 1985. p. 70-72.
18. Prommajak T, Leksawasdi N, Rattanapanone N. Biotechnological valorization of cashew apple: A review. Chiang Mai Univ J Nat Sci. 2014;13(2):159-182.
19. Ranganna S. Handbook of analysis and quality control for fruits and vegetables. New Delhi: Tata McGraw Hill; 1986. p. 9-10.
20. Shimpi MAJ. Studies on preservation of cashew apple (*Anacardium occidentale*) juice [Doctoral dissertation]. Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth; 2012.
21. Suganya P, Dharshini R. Value added products from cashew apple-An alternate nutritional source. Int J Curr Res. 2011;3(7):177-180.
22. Singh KK, Mathur PB. Studies in the cold storage of cashew apples. Indian J Hortic. 1953;10(3):115-121.
23. Talasila U. Preservation of cashew apple juice using Aloe vera and hydroxychavicol. Int J Nutraceuticals Funct Foods Novel Foods. 2017;1:1-8.
24. Talasila U, Vechalapu RR, Shaik KB. Storage stability of cashew apple juice: Use of chemical preservatives. Am J Food Technol. 2012;10(4):117-123.
25. Vaidehi MP, Shivaleea HB, Pushpabharathi S, Thomas, Nagaraj AP, Khan MM, *et al*. Cashew apple for better utilization: A research study on cashew apple varieties for cashew apple products. AICRP Project Report. 1990;1-52.
26. Vu ND, Tran NY, Nguyen TX, Nguyen NH, Pham TT, Long HB, *et al*. Physicochemical and biological properties of cashew apples in the form of juice, concentrated juice and fresh under different storage conditions. J Food Qual. 2025;1:4458814.