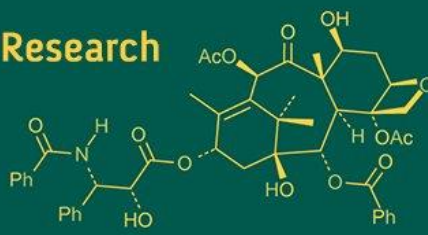


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Madhu D Nevase
Ph.D. Scholar, Department of
Fruit Science, College of
Horticulture, Dr. Balasaheb
Sawant Konkan Krishi
Vidyapeeth, Dapoli,
Maharashtra, India

CD Pawar
Ex-Professor, College of
Horticulture and Associate
Dean (L.A.E), Dr. Balasaheb
Sawant Konkan Krishi
Vidyapeeth, Dapoli,
Maharashtra, India

KV Malshe
Agronomist, Regional Coconut
Research Station, Bhatye,
Ratnagiri, Maharashtra, India

MC Kasture
Head, Department of Soil
science and Agril. Chemistry,
College of Agriculture,
Dr. Balasaheb Sawant Konkan
Krishi Vidyapeeth, Dapoli,
Maharashtra, India

JJ Kadam
Professor (CAS), Department
of Plant Pathology, College of
Agriculture, Dr. Balasaheb
Sawant Konkan Krishi
Vidyapeeth, Dapoli,
Maharashtra, India

MM Kulkarni
Associate Professor (CAS),
Department of Fruit Science,
College of Horticulture,
Dr. Balasaheb Sawant Konkan
Krishi Vidyapeeth, Dapoli,
Maharashtra, India

Corresponding Author:
Madhu D Nevase
Ph.D. Scholar, Department of
Fruit Science, College of
Horticulture, Dr. Balasaheb
Sawant Konkan Krishi
Vidyapeeth, Dapoli,
Maharashtra, India

Studies on chemical composition of natural juice and wine prepared from cashew apple (*Anacardium occidentale* L.) and lime (*Citrus aurantifolia*) blend

Madhu D Nevase, CD Pawar, KV Malshe, MC Kasture, JJ Kadam and MM Kulkarni

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Abstract

An investigation entitled “Studies on chemical composition of natural juice and wine prepared from cashew apple (*Anacardium occidentale* L.) and lime (*Citrus aurantifolia*) blend” was conducted during the year 2023-24 at the Pomology Laboratory, Fruit Processing Unit, College of Horticulture, Dapoli and Fruit Beverage Research Centre, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri. The study was undertaken to evaluate the effect of different blending ratios of cashew apple and lime juice along with varying T.S.S. levels on the chemical composition of wine during storage. The experiment comprised eighteen treatment combinations of juice blends and T.S.S. levels. Prior to wine preparation, the chemical composition of natural juices was analyzed. Cashew apple juice recorded higher T.S.S., reducing sugars, total sugars and ascorbic acid content, whereas lime juice exhibited higher titratable acidity and lower pH, indicating the suitability of blending for wine preparation. The prepared wines were analyzed for chemical parameters at ‘0’ and 6 months of storage. The results revealed that T.S.S., reducing sugars, total sugars, pH and ascorbic acid content decreased gradually during storage, whereas titratable acidity and alcohol content increased irrespective of juice blends and T.S.S. levels. Among the treatment combinations, interaction J₄T₁ recorded the lowest T.S.S. content, while the lowest reducing sugars were observed in J₂T₁. The lowest total sugars were recorded in J₃T₁ and J₅T₁. Interaction J₆T₁ recorded maximum titratable acidity and minimum pH. The highest ascorbic acid content was recorded in J₁T₁, whereas maximum alcohol content at six months of storage was observed in J₅T₃. The study concluded that blending ratios and T.S.S. levels significantly influenced the chemical composition and storage quality of wine.

Keywords: Cashew apple, lime, blended wine, T.S.S., fermentation

Introduction

Cashew is one of the important plantation crops cultivated extensively in tropical regions of India, particularly in the coastal belts of Maharashtra, Goa, Karnataka and Kerala. During 2024-25, India recorded about 11.9 lakh hectares area under cashew cultivation with production of nearly 8.0 lakh tonnes and productivity around 674-680 kg ha⁻¹ (Anon., 2025a) [4]. Similarly, lime and lemon are important citrus fruits cultivated widely in tropical and subtropical regions of India. During 2024-25, lime and lemon occupied approximately 3.4 lakh hectares area with production of about 37 lakh tonnes and productivity around 10.8 t ha⁻¹ in India (Anon., 2025b) [5]. In Konkan region, utilization of cashew apple for preparation of value-added products such as wine can help reduce post-harvest losses and enhance farmer's income. Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth has played a significant role in promoting cashew research, processing technologies and value addition of underutilized fruits in the Konkan region (Anon., 2021) [3].

Cashew apple is rich in vitamin C, sugars, minerals and antioxidant compounds, which makes it suitable for preparation of different value-added products such as juice, syrup, jam and wine. However, due to its highly perishable nature, about 80-90 percent of cashew apples are lost after harvesting because of poor storage facilities, rapid spoilage and lack of processing industries (Sivagurunathan *et al.*, 2017) [20].

Lime is another important citrus fruit widely used for its refreshing flavour, acidity and nutritional value. It is a good source of vitamin C and organic acids.

Lime fruits also face considerable post-harvest losses (20-30%) during handling, transportation and storage due to moisture loss, microbial spoilage and rind damage (Anonymous, 2002) [2]. Therefore, utilization of lime in processed products can help in reducing these losses and improving its market value.

Blending cashew apple juice with lime juice for wine preparation can improve the flavour, taste and overall acceptability of the beverage. Cashew apple provides natural sweetness and fruity flavour, while lime adds pleasant acidity and refreshing citrus aroma. The blended wine also contains important nutrients and antioxidants which may provide health benefits. Preparation of cashew apple and lime blended wine not only helps in utilization of underused fruits but also reduces post-harvest losses and creates opportunities for value addition and income generation for farmers.

Materials and Methods

The experiment entitled “Studies on wine from blended juice of cashew apple (*Anacardium occidentale* L.) and lime (*Citrus aurantifolia*)” was carried out in the year 2023-2024 at the Pomology Laboratory, Fruit Processing Unit of the College of Horticulture, Dapoli and the Fruit Beverage Research Centre of Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri. In this experiment, the must was prepared by blending cashew apple and lime natural juice as per treatments i.e., J₁ : 100 percent cashew apple juice, J₂ : 95 percent cashew apple juice + 5 percent lime juice, J₃ : 90 percent cashew apple juice + 10 percent lime juice, J₄ : 85 percent cashew apple juice + 15 percent lime juice, J₅ : 80 percent cashew apple juice + 20 percent lime juice, J₆ : 75 percent cashew apple juice + 25 percent lime juice and adjusting the T.S.S. to 16⁰Brix, 20⁰Brix and 24⁰Brix. The pH of the juice was kept natural.

Total soluble solids (⁰Brix) were determined with the help of Hand refractometer (Erma Japan, 0 to 32⁰Brix) and value was corrected at 20 °C with the help of temperature correction chart (A.O.A.C., 1975) [6]. The pH of the wine was determined with the help of pH meter. (Model Systronics μ pH system 361). The reducing sugars (%), total sugars (%), titratable acidity (%), ascorbic acid (mg/100ml) were estimated as per the methods suggested by Ranganna (1997) [17]. The alcohol (%) content in cashew apple and lime blended wine was determined by the method as reported by Natu *et al.*, (1986) [15].

Results and Discussion

1. Chemical composition of cashew apple and lime natural juice

The data regarding chemical composition of cashew apple and lime natural juice is presented in Table 1. The table clearly shows that the juice of cashew apple had a T.S.S., reducing sugar and total sugar content of 12.30⁰Brix, 8.76 percent and 10.29 percent, respectively. The titratable acidity was 0.21 percent and the pH was 3.90. Furthermore, 230.43 mg/100 ml of ascorbic acid were found in the cashew apple juice. In case of lime juice, the T.S.S., reducing sugar and total sugar content were 8.05 ⁰Brix, 1.32 percent and 1.91 percent, respectively. The titratable acidity was 6.22 percent and the pH was 1.71. In addition, the lime fruit juice recorded 44.33 mg/100 ml of ascorbic acid. Similar finding about chemical composition of cashew apple have been recorded by Kamble (2024) [12] while studying

cashew apple and aonla blended wine. In case of lime, similar finding was reported by Kurbett *et al.* (2023) [14] while studying quality attributes and nutrient composition of acid lime varieties.

2. Chemical composition of cashew apple and lime blended wine during storage

2.1 T.S.S. (⁰Brix)

The data regarding changes in T.S.S. of cashew apple and lime blended wine during storage is presented in Table 2. The T.S.S. content decreased from ‘0’ month (5.49⁰B) to 6 months (4.57 ⁰B) storage, irrespective of juice and T.S.S. levels. This decrease in T.S.S. during storage may be due to micro fermentation, which converts sugars into alcohol and sugars are major part of T.S.S. Similar finding was reported by Reddy *et al.* (2017) [18] in aonla and grape blended wine. In case of juice levels, T.S.S. content of wine was found to be decreased from J₁ (4.44 ⁰B) to J₄ (4.38⁰B) and further increased from J₄ (4.38 ⁰B) to J₆ (4.93 ⁰B), irrespective of T.S.S. levels at 6 months storage. The decrease in T.S.S. from J₁ to J₄ may be due to favourable conditions (pH around 3-3.5) available for fermentation decreased from J₁ to J₄ and increase in T.S.S. from J₄ to J₆ may be due to unfavourable conditions for fermentation (low pH and high acidity). Treatment J₄ recorded lowest T.S.S. due to better fermentation of must because of favourable pH (3.27) and acidity (0.92%) of must. The lowest T.S.S. recorded by J₃ (4.38⁰B) was significantly superior over others. Similar finding was reported by Balogun *et al.* (2021) [7] in pineapple and carrot blended wine.

In case of T.S.S. levels, T.S.S. content of wine increased with increase in T.S.S. levels from T₁ (3.53⁰B) to T₃ (5.76⁰B), irrespective of juice levels. This increase in T.S.S. may be the impact of T.S.S. levels where sugar was added in increasing trend to maintain T.S.S. to 16, 20 and 24⁰B as per treatments. The yeast utilise specific amount of sugar from different T.S.S. levels for conversion into alcohol and hence left over sugars showed increasing trend with increases in T.S.S. levels. Lowest T.S.S. recorded by treatment T₁ (3.53⁰B) was significantly superior over others. Similar finding was reported by Solanke (2024) [21] in mango wine. In case of interactions, at 6 months storage lowest T.S.S. was recorded by interaction J₄T₁ (3.07⁰B) and it was at par with J₂T₁ (3.40⁰B) and J₃T₁ (3.27⁰B) and significantly superior over others. The highest T.S.S. was recorded by J₅T₃ and J₆T₃ (5.80⁰B).

2.2 Reducing sugars (%)

The data regarding changes in reducing sugar of cashew apple and lime blended wine during storage is presented in Table 2. The reducing sugar content in wine decreased from ‘0’ month (0.25%) to 6 months (0.21%), irrespective of juice and T.S.S. levels. This decrease in reducing sugars during storage may be due to conversion of reducing sugars into alcohol by micro fermentation.

In case of juice levels, at 6 months of storage the reducing sugar content of wine was found to be increased from J₁ (0.18%) to J₃ (0.21%) and further decreased from J₃ (0.21%) to J₄ (0.20%). Again in treatment J₄ (0.20%) to J₆ (0.23%) reducing sugar increased during storage, irrespective of T.S.S. levels. The highest reducing sugar was recorded by treatment J₆ (0.23%) during 6 months storage. The lowest reducing sugar was recorded by treatment J₁ (0.21%) at ‘0’ month and during 6 months (0.18%) storage. Similar finding

was also reported by Galande (2023) ^[9] in jackfruit and kokum blended wine.

In case of T.S.S. levels, from data of 6 months of storage it is seen that, the reducing sugar content increased with increase in T.S.S. levels from T₁ (0.14%) to T₃ (0.31%) during storage. This increase in reducing sugars may be the impact of adjustment of T.S.S level in must by addition of sugar at 16, 20 and 24^oB. The yeast converts specific amount of reducing sugars from different T.S.S. levels into alcohol and hence the leftover reducing sugars showed increasing trend in wine as stated in T.S.S. The lowest reducing sugars was recorded by T₁ at '0' (0.16%) and at 6 months (0.14%) of storage and it was significantly superior over others. This may be the impact of low T.S.S level were must adjusted to 16^oB. Flory *et al.* (2022) ^[8] reported similar finding in blood fruit and aonla blended wine.

In case of interactions, at 6 months storage lowest reducing sugars were recorded by interaction J₂T₁ (0.11%) and it was at par with J₁T₁ (0.14%), J₃T₁ (0.14%), J₄T₁ (0.14%), J₅T₁ (0.13%), J₅T₂ (0.14%), J₆T₁ (0.15%) and significantly superior over others. The highest reducing sugars during storage was recorded by interaction J₅T₃ (0.39%).

2.3 Total sugars (%)

The data regarding changes in total sugar of cashew apple and lime blended wine during storage is presented in Table 2. The total sugar content in wine decreased from '0' month (0.34%) to 6 months (0.28%), irrespective of juice and T.S.S. levels. Total sugar content in wine decreased during storage primarily because of micro fermentation as explain under reducing sugar. Similar result have been reported by the Kadge *et al.* (2021) ^[11] in Nagpur mandarin wine.

In case of juice levels, at 6 months storage total sugar content of wine decrease from treatment J₁ (0.30%) to J₅ (0.26%), then increase in total sugars in treatment J₆ (0.31%), irrespective of T.S.S. levels. The lowest total sugars were recorded by treatment J₅ (0.26%) during 6 months of storage and it was at par with J₂ (0.27%), J₃ (0.27%) and J₄ (0.27%) and significantly superior over others. The lowest total sugars recorded by treatment J₅ due to congenial condition available for fermentation, which utilize sugar, and result into low total sugar content during storage. The highest total sugar content was recorded by treatment J₆ (0.31%) during 6 months of storage. Similar finding was reported by Galande (2023) ^[9] in jackfruit and kokum blended wine.

In case of T.S.S. levels, from data of 6 months storage it is seen that, total sugar content of wine increased with increase in T.S.S. levels from T₁ (0.16%) to T₃ (0.44%), irrespective of juice levels. This increase in total sugar may be the impact of T.S.S. levels where sugar was added in increasing trend to maintain T.S.S. to 16, 20 and 24^oB as per treatment. The total sugar content of wine showed same increasing trend as that of T.S.S. and reducing sugars. Reasons behind increase in total sugars are same as mentioned in T.S.S. and Reducing sugars. The lowest total sugars recorded by T₁ (0.16%) at 6 months storage and it was significantly superior over others. The results correspond with Pawar (2009) ^[16] who studied on sapota wine.

In case of interactions at 6 months storage, lowest total sugars were recorded by interaction J₃T₁ and J₅T₁ (0.14%) and it was at par with J₁T₁ (0.17%), J₂T₁ (0.18%), J₄T₁ (0.16%), J₅T₂ (0.19%) and J₆T₁ (0.17%) and significantly superior over others. The highest total sugars during storage

was recorded by interaction J₁T₃ (0.50%).

2.4 Titratable acidity (%)

The data regarding changes in titratable acidity of cashew apple and lime blended wine during storage is presented in Table 3. The titratable acidity increased from '0' month (0.81%) to 6 months (0.86%), irrespective of juice and T.S.S. levels. This increase in titratable acidity may be the impact of post-fermentation, certain microbes can metabolize various compounds in wine and turn it into acids. This leads to increase in acidity of wine during aging. Increases in titratable acidity during storage was reported by Adiyaman *et al.* (2019) ^[1] in star fruit wine

In case of juice levels, at 6 months storage titratable acidity was found to be increased from J₁ (0.27%) to J₆ (1.49%). This increase in titratable acidity may be the impact of lime juice percentage in blended juice which increased from J₁ (0.0%) to J₆ (25%). The highest titratable acidity recorded by treatment J₆ (1.49%) during storage, was significantly superior over others. Similar results were reported by Flory *et al.* (2022) ^[8] in blood fruit and aonla blended wine.

The titratable acidity of wine decreased with increase in T.S.S levels from T₁ (0.93%) to T₃ (0.81%). In general, decrease in acidity with increase in T.S.S. levels may be due to dilution of native acids with addition of sugars in increasing trend to maintain T.S.S levels. The highest titratable acidity recorded by T₁ (0.93%) at 6 months storage, was significantly superior over others. Similar finding was also reported by Kamble (2024) ^[12] in a study on cashew apple and aonla blended wine.

In case of interactions at 6 months storage, highest titratable acidity was recorded by interaction J₆T₁ (1.59%) and significantly superior over others. The lowest titratable acidity during storage was recorded by interaction J₁T₃ (0.25%).

2.5 pH

The data regarding changes in pH of cashew apple and lime blended wine during storage is presented in Table 3. The pH decreased from '0' month (2.44) to 6 months (2.40), irrespective of juice and T.S.S. levels. This decrease in pH during storage could be due to production of acids during fermentation and acids are inversely proportional to pH. Decrease in pH of wine during storage was reported by Kamble (2024) ^[12] in cashew apple and aonla blended wine..

In case of juice levels, at 6 months storage pH of wine was decreased from J₁ (3.21) to J₆ (1.88), irrespective of T.S.S. levels. This decrease in pH may be due to increase in lime juice percentage from J₁ (0.0%) to J₆ (25%). The lowest pH recorded by treatment J₆ (1.88) was significantly superior over others. The decrease in pH with increase in lime juice percentage may be due to increase in acidity of wine, as acids are inversely proportional to pH. Decrease in pH with increase in acidity was also reported by Kiribhaga *et al.* (2021) ^[13] in banana wine.

In case of T.S.S. levels, from pooled data of 6 months storage it is seen that, pH of wine increased from T₁ (2.37) to T₃ (2.46), irrespective of juice levels. The lowest pH recorded by T₁ (2.37) during 6 months storage was significantly superior over others. It was observed that the pH of cashew apple and lime blended wine increased with increase in T.S.S. levels. The highest pH was recorded by treatment T₃ (2.46) during 6 months of storage. Increase in pH with increase in T.S.S. levels may be due to dilution of

native acids in increasing trend with increase in T.S.S. levels. Lower the acids more will be the pH. Solanke (2024) ^[21] reported similar finding in mango wine.

In case of interactions at 6 months storage, lowest pH was recorded by interaction J₆T₁ and J₆T₂ (1.85) and significantly superior over others. The highest pH during storage was recorded by interaction J₁T₃ (3.23).

2.6 Ascorbic acid (mg/100ml)

The data regarding changes in ascorbic acid of cashew apple and lime blended wine during storage is presented in Table 3. The ascorbic acid decreased from '0' month (192.39 mg/100ml) to 6 months (185.78 mg/100ml). This decrease in ascorbic acid during storage may be due to oxidation of ascorbic acid by enzyme ascorbic acid oxidase as reported by Kadge *et al.* (2021) ^[11] while studying on effect of sugar sources and blended must on physico chemical and sensory evaluation of Nagpur mandarin wine

In case of juice levels, at 6 months storage ascorbic acid content of wine decreased from J₁ (203.56 mg/100ml) to J₆ (164.16 mg/100ml), irrespective of T.S.S levels. Decrease in ascorbic acid from J₁ to J₆ may be due to in decrease in cashew apple juice percentage from J₁ to J₆ with increase in lime juice percentage. In case of juice levels, significantly highest ascorbic acid was reported by treatment J₁ (203.56 mg/100g) during 6 months storage. Lowest ascorbic acid was reported by treatment J₆ (164.16 mg/100ml) during 6 months storage. The present findings are in conformity with the findings of Gnomou *et al.* (2022) ^[10] in cashew apple and papaya blended wine.

In case of T.S.S. levels, from data of 6 months storage it is seen that, the ascorbic acid was found to be decreased with increase in T.S.S. levels from T₁ (188.95 mg/100 ml) to T₃ (182.56 mg/100 ml), irrespective of juice levels. Decrease in ascorbic acid with increase in T.S.S. levels may be due to addition of sugar in juice in an increasing amount to maintain different T.S.S. levels, which diluted parental ascorbic acid content of wine. The highest ascorbic acid recorded by T₁ (188.95 mg/100g) at 6 months storage was significantly superior over others. Similar finding was also reported by Sapkal (2010) ^[19] in mango wine.

In case of interactions at 6 months storage highest ascorbic acid recorded by interaction J₁T₁ (209.00 mg/100ml) and it

was significantly superior over others. The lowest ascorbic acid during storage was recorded by J₆T₃ (156.33 mg/100 ml).

2.7 Alcohol (%)

The data regarding changes in alcohol content of cashew apple and lime blended wine during storage is presented in Table 4. The alcohol content increased from '0' month (10.51%) to 6 months (10.83%). This slightly increase in alcohol content of wine during storage may be due to micro fermentation, which leads to conversion sugars into alcohol. Similar finding was reported by Kamble (2024) ^[12] in cashew apple and aonla blended wine.

In case of juice levels, at 6 months storage alcohol content was found to be increased with increase in juice levels from J₁ (10.62%) to J₅ (11.11%) and slightly decreased in J₆ (10.46%), irrespective of T.S.S. levels. Maximum alcohol content was recorded by treatment J₅ (11.11%) at 6 months of storage. Lowest alcohol content was recorded by treatment J₆ (10.46%) at 6 months storage. This may be due to it contain high lime juice (25%) compare to other treatments, which increases acidity and inhibits yeast activity of converting sugars into alcohol. Similar finding was reported by Pawar (2009) ^[16] in sapota and mango blended wine.

In case of T.S.S. levels, from data of 6 months storage it is seen that, alcohol content was found to be increased with increase in T.S.S. levels from T₁ (10.51%) to T₃ (11.21%), irrespective of juice levels. This increase in alcohol content may be due to increase in T.S.S. levels of must by addition of sugars. Sugars are the main constituent of T.S.S, which were converted to alcohol by the action of yeast. Yeast produces pyruvic decarboxylase and alcohol dehydrogenase enzymes and these enzyme converts reducing sugars to ethanol. The highest alcohol content recorded by T₃ (11.21%) at 6 months storage was significantly superior over others. Increase in alcohol with increase in T.S.S. levels were also reported by Sapkal (2010) ^[19] in mango wine.

In case of interactions at 6 months storage highest alcohol content was recorded by interaction J₅T₃ (11.84%) and it was significantly superior over others. The lowest alcohol content during storage was recorded by J₁T₁ (10.25%).

Table 1: Chemical composition of cashew apple and lime natural juice

Sr. No.	Parameters	Cashew apple	Lime
1.	T.S.S. (°Brix)	12.30	8.05
2.	Reducing sugars (%)	8.76	1.32
3.	Total sugars (%)	10.29	1.91
4.	Titrateable acidity (%)	0.21	6.22
5.	pH	3.90	1.71
6	Ascorbic acid (mg/100 ml)	230.43	44.33

Table 2: Changes in T.S.S. (°Brix), reducing sugar (%) and total sugar (%) of cashew apple and lime blended wine during storage

Treatments/ Treatment combinations	T.S.S (°Brix)		Reducing sugar (%)		Total sugar (%)	
	‘0’ month	‘6’ months	‘0’ month	‘6’ months	‘0’ month	‘6’ months
J ₁	5.96	4.44	0.21	0.18	0.34	0.30
J ₂	5.62	4.42	0.26	0.21	0.35	0.27
J ₃	5.70	4.40	0.26	0.21	0.31	0.27
J ₄	5.40	4.38	0.26	0.20	0.36	0.27
J ₅	5.09	4.82	0.25	0.22	0.34	0.26
J ₆	5.16	4.93	0.27	0.23	0.36	0.31
Average	5.49	4.57	0.25	0.21	0.34	0.28
S.E.m±	0.08	0.06	0.008	0.006	0.010	0.007
C.D. at 1%	0.31	0.22	0.030	0.022	0.037	0.028
T ₁	4.54	3.53	0.16	0.14	0.19	0.16
T ₂	5.57	4.41	0.21	0.17	0.31	0.24
T ₃	6.34	5.76	0.39	0.31	0.53	0.44
Average	5.49	4.57	0.25	0.21	0.34	0.28
S.E.m±	0.06	0.04	0.005	0.004	0.007	0.005
C.D. at 1%	0.22	0.16	0.021	0.016	0.026	0.020
J ₁ T ₁	4.93	3.47	0.17	0.14	0.18	0.17
J ₁ T ₂	6.07	4.13	0.22	0.19	0.26	0.22
J ₁ T ₃	6.87	5.73	0.25	0.21	0.57	0.50
J ₂ T ₁	4.33	3.40	0.15	0.11	0.18	0.16
J ₂ T ₂	5.67	4.20	0.19	0.17	0.34	0.23
J ₂ T ₃	6.87	5.67	0.44	0.34	0.53	0.42
J ₃ T ₁	4.67	3.27	0.16	0.14	0.17	0.14
J ₃ T ₂	6.03	4.27	0.28	0.19	0.32	0.26
J ₃ T ₃	6.40	5.67	0.34	0.30	0.45	0.41
J ₄ T ₁	4.53	3.07	0.17	0.14	0.23	0.16
J ₄ T ₂	5.53	4.20	0.17	0.17	0.30	0.23
J ₄ T ₃	6.13	5.87	0.43	0.29	0.53	0.43
J ₅ T ₁	4.40	4.00	0.15	0.13	0.17	0.14
J ₅ T ₂	5.00	4.67	0.16	0.14	0.24	0.19
J ₅ T ₃	5.87	5.80	0.45	0.39	0.59	0.44
J ₆ T ₁	4.40	4.00	0.16	0.15	0.21	0.17
J ₆ T ₂	5.13	5.00	0.23	0.20	0.37	0.33
J ₆ T ₃	5.93	5.80	0.42	0.34	0.51	0.42
Average	5.49	4.57	0.25	0.21	0.34	0.28
S.E.m±	0.14	0.10	0.013	0.010	0.017	0.013
C.D. at 1%	0.54	0.38	0.052	0.039	0.064	0.049

Table 3: Changes in titratable acidity (%), pH and ascorbic acid (mg/100 ml) of cashew apple and lime blended wine during storage

Treatments/ Treatment combinations	Titratable acidity (%)		pH		Ascorbic acid (mg/100ml)	
	‘0’ month	‘6’ months	‘0’ month	‘6’ months	‘0’ month	‘6’ months
J ₁	0.25	0.27	3.25	3.21	211.04	203.56
J ₂	0.45	0.48	2.72	2.69	204.15	196.63
J ₃	0.65	0.71	2.42	2.38	197.14	189.59
J ₄	0.93	0.98	2.18	2.16	190.20	183.89
J ₅	1.19	1.24	2.13	2.10	180.82	176.85
J ₆	1.39	1.49	1.91	1.88	171.00	164.16
Average	0.81	0.86	2.44	2.40	192.39	185.78
S.E.m±	0.006	0.009	0.0005	0.001	0.23	0.78
C.D. at 1%	0.021	0.035	0.0017	0.004	0.90	2.99
T ₁	0.85	0.93	2.40	2.37	194.32	188.95
T ₂	0.81	0.86	2.41	2.39	192.71	185.83
T ₃	0.77	0.81	2.50	2.46	190.14	182.56
Average	0.81	0.86	2.44	2.40	192.39	185.78
S.E.m±	0.004	0.006	0.0003	0.001	0.17	0.55
C.D. at 1%	0.015	0.025	0.0012	0.003	0.64	2.11
J ₁ T ₁	0.27	0.31	3.24	3.20	212.19	209.00
J ₁ T ₂	0.26	0.27	3.25	3.21	211.00	201.67
J ₁ T ₃	0.23	0.25	3.26	3.23	209.93	200.00
J ₂ T ₁	0.48	0.53	2.71	2.65	206.45	198.59
J ₂ T ₂	0.45	0.47	2.72	2.70	204.90	196.45
J ₂ T ₃	0.42	0.43	2.73	2.71	201.09	194.85
J ₃ T ₁	0.70	0.76	2.40	2.37	198.96	192.41
J ₃ T ₂	0.65	0.69	2.40	2.38	197.90	189.17
J ₃ T ₃	0.60	0.67	2.46	2.40	194.56	187.19
J ₄ T ₁	0.97	1.07	2.10	2.07	191.89	185.33
J ₄ T ₂	0.93	0.96	2.10	2.08	190.10	184.00
J ₄ T ₃	0.89	0.93	2.35	2.32	188.60	182.34
J ₅ T ₁	1.25	1.31	2.08	2.05	182.78	179.56
J ₅ T ₂	1.18	1.22	2.13	2.10	180.78	176.34
J ₅ T ₃	1.13	1.20	2.19	2.15	178.89	174.65
J ₆ T ₁	1.45	1.59	1.87	1.85	173.67	168.78
J ₆ T ₂	1.39	1.54	1.86	1.85	171.56	167.37
J ₆ T ₃	1.34	1.35	2.00	1.95	167.78	156.33
Average	0.81	0.86	2.44	2.40	192.39	185.78
S.E.m±	0.010	0.016	0.001	0.002	0.41	1.35
C.D. at 1%	0.037	0.061	0.003	0.007	1.56	5.18

Table 4: Changes in alcohol (%) of cashew apple and lime blended wine during storage

Treatments/Treatment combinations	Alcohol (%)	
	'0' month	'6' months
J ₁	10.05	10.62
J ₂	10.44	10.79
J ₃	10.55	10.92
J ₄	10.85	11.07
J ₅	10.93	11.11
J ₆	10.25	10.46
Average	10.51	10.83
S.E.m±	0.03	0.05
C.D. at 1%	0.11	0.21
T ₁	10.33	10.51
T ₂	10.54	10.78
T ₃	10.66	11.21
Average	10.51	10.83
S.E.m±	0.02	0.04
C.D. at 1%	0.08	0.15
J ₁ T ₁	9.93	10.25
J ₁ T ₂	10.13	10.68
J ₁ T ₃	10.08	10.94
J ₂ T ₁	10.30	10.41
J ₂ T ₂	10.86	10.95
J ₂ T ₃	10.15	11.02
J ₃ T ₁	10.47	10.63
J ₃ T ₂	10.98	11.07
J ₃ T ₃	10.20	11.07
J ₄ T ₁	10.54	10.72
J ₄ T ₂	10.52	10.71
J ₄ T ₃	11.47	11.79
J ₅ T ₁	10.41	10.52
J ₅ T ₂	10.80	10.98
J ₅ T ₃	11.58	11.84
J ₆ T ₁	10.34	10.54
J ₆ T ₂	9.95	10.27
J ₆ T ₃	10.47	10.58
Average	10.51	10.83
S.E.m±	0.05	0.09
C.D. at 1%	0.19	0.36

Conclusion

From the experiment it can be concluded that interaction J₄T₁ (85% cashew apple juice + 15% lime juice and T.S.S of must adjusted to 16°Brix) recorded the lowest T.S.S. The lowest reducing was recorded by interaction J₂T₁ (95% cashew apple juice + 5% lime juice and T.S.S. of must adjusted to 16°Brix). Lowest total sugar was recorded by interactions J₃T₁ (90% cashew apple juice + 10% lime juice and T.S.S. of must adjusted to 16°Brix) and J₅T₁ (80% cashew apple juice + 20% lime juice and T.S.S. of must adjusted to 16°Brix) which was significantly superior over others. The highest titratable acidity and lowest pH was recorded by interaction J₆T₁ (75% cashew apple juice + 25 percent lime juice and T.S.S. of must adjusted to 16°Brix) which was significantly superior over all others interactions. Significantly highest ascorbic acid recorded by interaction J₁T₁ (100% cashew apple juice and T.S.S. of must adjusted to 16°Brix). Maximum alcohol content was recorded by interaction J₅T₃ (80% cashew apple juice + 20% lime juice and T.S.S. of must adjusted to 24°Brix) at 6 months of storage.

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