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# Utilization of custard apple pulp for preparation of blended nectar

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## ABSTRACT

**Present study was intended to study the feasibility of utilizing custard apple pulp for preparing blended nectar beverage by blending custard apple pulp with lime juice, Kinnow mandarin juice, Nagpur mandarin juice and strawberry pulp in ratios of 100:0, 75:25 and 50:50, keeping 20 per cent pulp/ juice, 17°B TSS and 0.3 per cent acidity. The homogenized blended nectars were filled into pre- sterilized glass bottles of 200 ml capacity, pasteurized at 85° C for 30 min, cooled and stored at ambient temperature for three months. The nectar was subjected to physico- chemical, microbial and sensory analysis at monthly interval. The results indicated that the TSS, acidity, total and reducing sugar contents increased, while ascorbic acid and phenol content of the nectar decreased during the storage. The prepared nectars had negligible microbial count initially, which slightly increased during the storage. Custard apple blended with strawberry pulp in 50:50 ratio had the highest sensory scores of 7.87, 8.02 and 7.88 for colour, aroma and overall acceptability, respectively, and second highest score of 7.83 for taste.**

**Key words:** *Annona squamosa* L., blended nectar, Kinnow, lemon, Nagpur mandarin, strawberry

## INTRODUCTION

Custard apple also known as sugar apple is regarded as the 'New Super Fruit of the 21st Century' owing to its nutritional and medicinal properties. In India, these fruits are generally found growing in forests, rocky terrains, waste lands and community land on the bunds of the field or besides water channels.

In India, it covers an area of 46,000 hectares with a production of 0 0.401 million tonnes. (Anonymous, 2). The leading custard apple growing states are Assam, Bihar, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Uttar Pradesh, Andhra Pradesh, Telangana and Tamil Nadu. Custard apple is considered as one of the most delicious and nutritionally valuable fruit, relished by many for table purpose. Its edible portion is soft, creamy and granular pulp having good blend of sweetness and acidity. The nutritive value of custard apple per 100 g of pulp is presented in table 1. The fruit has high calorific value (300-450 kJ per 100 g) which is almost double than that of peach, orange and apple. Custard apple is full of vitamin C, which improves the immune system. It is rich in dietary fibre, Vitamin A, potassium, magnesium and also contains calcium, Vitamin B6, Copper and excellent source of Iron. Anti-oxidants like Vitamin C, present in the fruit helps to fight free radicals in our body. Owing to its nutritive value the fruit has dietary importance in preventing cardiac diseases and blood

**Table 1.** Nutrient value of custard apple per 100 g of pulp

| Nutrient | Amount |
|---|---|
| Water | 70-80% |
| Protein | 5.2g |
| Calories total | 235 |
| Total carbohydrate | 59 g |
| Dietary fibre | 11 g |
| Total fat | 725 mg |
| Vitamin A | 15 I.V. |
| Vitamin C | 91 mg |
| Thiamine | 275 mcg |
| Riboflavin | 283 mcg |
| Niacin | 2.2 mg |
| Vitamin B6 | 500 mcg |
| Folate | 35 mcg |
| Pantothenic acid | 565 mcg |
| Calcium | 60 mg |
| Iron | 105 mg |
| Magnesium | 53 mg |
| Phosphorus | 80 mg |
| Potassium | 618mg |
| Copper | 215 mcg |

(Source: Nair and Agrawal, 12)

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pressure, fight muscle weakness, keeps eyes, skin and hair healthy and cures indigestion. As the fruit is rich in magnesium, it maintains the water balance in our body, which helps in removing acids from the joints and reduces the symptoms of rheumatism and arthritis (Nair and Agrawal, 12). Besides, nutritional value, custard apple has medicinal / therapeutic value, and used as remedy for ulcer of alimentary canal, abscesses and boils.

However, custard apple fruit is climacteric and highly perishable in nature having limited shelf life (2-4 days) after ripening at ambient condition. The short shelf life and seasonal availability calls for value addition for managing surplus produce, seasonal glut and price regulation. Further, custard apple is a difficult to eat fruit unlike orange, banana, grapes etc. Bearing in mind, the fast increasing area under custard apple cultivation, methods of its preservation and processing technology needs to be established to regulate the prices of produce during glut period. Presently, processing of custard apple pulp is quite limited viz. ice cream industry, confectionary and some milk products. Custard apple fruit, having pulpy texture can be a good candidate for making acceptable nectar. Presently, nectar is prepared from the tropical fruits such as mango, litchi, guava, papaya, citrus fruits, pineapple etc. by adding sugar, acid and other ingredients. It is a general assumption that juices/ pulp of different fruits can be blended to complement certain quality attributes such as colour, aroma, taste and nutritional attributes. Hence, in order to deliver nutritionally and therapeutically valuable but difficult to eat fruit, an attempt was made on development and evaluation of blended nectar using custard apple pulp.

## MATERIALS AND METHOD

The study was conducted at Post-harvest Technology laboratory, College of Horticulture & Forestry, Jhalawar (Rajasthan) during the year 2018-19. Uniformly matured custard apple fruits of cv. Balanagar, and strawberry fruits var. Winter Dawn were procured from instructional farm of the College while Nagpur mandarin, Kinnow and lime fruits were procured from local market. The custard apple fruits were stored at room temperature for 3 days for ripening before extraction of pulp. The pulp from custard apple fruits was extracted by halving the fruits, scooping the pulp and passing it through the pulper machine to get fine and homogenized pulp free from seeds. The pulp was treated with sulphur dioxide by adding 700 ppm of potassium metabisulphite and stored in deep freezer at a temperature of -18 °C until use. Pulp of strawberry fruits was prepared by grinding the fruits in a domestic grinder after removing stalk and sepals from the fruits. The pulp was preserved by treating with sodium benzoate @ 600 ppm and storing in deep freezer at a temperature of -18 °C**.** The fruits of Nagpur and Kinnow mandarins were peeled manually and the juice was extracted using screw type juice extractor while lime juice was extracted from fruits by using lime juice squeezer. These juices were used fresh to prepare blended nectar.

For preparation of blended nectar, the pulp/ juice of strawberry, Nagpur mandarin, Kinnow mandarin and lime was mixed with custard apple pulp in different ratios (Table 2).

After evaluating the blends for TSS and acidity, the nectar was prepared to maintain 20 per cent juice/ pulp, 17° Brix TSS and 0.3 per cent acidity in the final product using standard process. The calculated amount of sugar and citric acid were added in water and slightly heated so as to dissolve the sugar and citric acid. The syrup was cooled and strained through muslin cloth. Then, the measured quantity of blended pulp/ juice was mixed with syrup and the mixture was homogenized properly. The prepared nectar was filled in cleaned and sterilized glass bottles of 200 ml capacity. The filled bottles were crown corked and pasteurized at about 85˚C for 25-30 minutes in an open water bath. The bottles of nectars were kept at cool and dry place for 3 months storage period to study the qualitative changes with respect to physico- chemical, nutritional and microbial attributes. The product was evaluated immediately after preparation, and then at monthly interval. The sensory quality of the nectar was judged orgenoleptically by a panel of 7 semi- trained judges on 9 point hedonic scale (Ranganna, 15). The overall sensory score was calculated by averaging the scores. A product having score above 5.5 was

**Table 2.** Treatment details.

| Treatment code | Treatment details |
|---|---|
| $T_0$ | Custard apple pulp 100 % |
| $T_1$ | Custard apple 75%+ strawberry 25% |
| $T_2$ | Custard apple 50%+ strawberry 50% |
| $T_3$ | Custard apple 75%+ Nagpur mandarin 25% |
| $T_4$ | Custard apple 50%+ Nagpur mandarin 50% |
| $T_5$ | Custard apple 75%+ Kinnow mandarin 25% |
| $T_6$ | Custard apple 50%+ Kinnow mandarin 50% |
| $T_7$ | Custard apple 75%+ lime 25% |
| $T_8$ | Custard apple 50%+ lime 50% |

considered as acceptable. The TSS, acidity, ascorbic acid, total sugars, reducing sugars and total phenols were determined by standard methods as suggested by Ranganna (15). The microbial count (cfu/ ml) was conducted according the method of Cruickshank *et al*. (5). Data recorded on above mentioned properties were subjected to statistical analysis of variance technique as given by Panse and Sukhatme (13) for Complete Randomized Design with three replications for each treatment.

## RESULTS AND DISCUSSION

The data pertaining to sensory score for colour as influenced significantly by different treatments are presented in Table 3. It is evident from the data that initially, the maximum colour value (8.20) was found in $T_2$ followed by 7.73 in $T_7$ while, minimum colour value (7.07) was recorded in $T_0$. Fresh blended nectar beverages had high colour values initially but with the advancement of storage period, a decrease in colour value was observed in all the treatments during storage period. This decrease in colour value may be due to browning reactions in the nectar. After 3 months of storage, the maximum colour rating (7.67) was again observed in $T_2$ followed by in $T_7$ (7.0), while minimum (6.17) was observed in $T_0$. Similar finding have also been reported by Mandal and Pathak (10) in blended nectar of pine apple and phalsa.

The changes in sensory score for aroma of blended nectar are presented in Table 3. Initially, the maximum score for aroma (8.61) was found in $T_2$ which was found at par with 8.42 in $T_8$, while minimum score (7.03) was recorded in $T_0$. Higher sensory for aroma in custard apple: strawberry blended (50:50) nectar may be due to positive combined effect of volatiles of the two fruits. During storage, a decreasing trend in organoleptic score for aroma was observed irrespective of the treatments. After 3 months of storage, the maximum aroma rating (7.53) was observed in $T_8$, which was, however found at par with $T_7$ and $T_2$, while minimum score (6.16) was observed in $T_3$. The decrease in score for aroma during storage may be attributed to increase of temperature in ambient condition (Thakre, 17). Apart from this, certain enzymatic or biochemical changes might have resulted in production of slight off-flavour.

The sensory score for taste (Table 4) was found maximum (8.52) in $T_7$ which was however at par with 8.20 in $T_2$, while minimum taste value (6.81) was recorded in $T_0$, at the start of the storage. Higher score for taste in $T_7$ might be due to excellent flavour of the lime juice and resultant appropriate TSS: acid ratio of the blend. Similar findings have also been reported by Pilaniya *et al*. (14). A decrease in sensory score for taste was observed in all the treatments as the storage period advanced. At the end of storage period, the maximum taste value (7.43) was recorded both in $T_2$ and $T_7$ followed by 7.21 in $T_8$ while, minimum taste value (6.03) was found in $T_3$. The results are analogous to the findings of Bisht *et al*., (4) in seabuckthorn RTS beverage and Akhtar *et al*. (1) in pomegranate drink.

Similar to other sensory attributes, the overall acceptability of blended custard apple nectar was also significantly affected by different proportions of fruits (Table 4). In freshly prepared blended nectar highest

**Table 3.** Colour and aroma (score out of 9) of the blended nectar as affected by ratio of blending different fruit juice/ pulp with custard apple pulp.

| Treatment | Colour | | | | Aroma | | | |
|---|---|---|---|---|---|---|---|---|
| | Storage period (Months) | | | | Storage period (Months) | | | |
| | 0 | 1 | 2 | 3 | 0 | 1 | 2 | 3 |
| $T_0$ | 7.07 | 6.50 | 6.22 | 6.17 | 7.27 | 6.71 | 6.50 | 6.36 |
| $T_1$ | 7.60 | 7.20 | 6.32 | 6.23 | 7.62 | 7.40 | 6.90 | 6.62 |
| $T_2$ | 8.20 | 7.90 | 7.72 | 7.67 | 8.61 | 8.2 | 7.72 | 7.53 |
| $T_3$ | 7.50 | 7.20 | 6.90 | 6.50 | 7.35 | 6.72 | 6.53 | 6.35 |
| $T_4$ | 7.20 | 6.40 | 6.32 | 6.23 | 7.03 | 6.80 | 6.50 | 6.16 |
| $T_5$ | 7.33 | 6.70 | 6.57 | 6.5 | 7.35 | 7.17 | 6.72 | 6.38 |
| $T_6$ | 7.40 | 6.80 | 6.73 | 6.40 | 7.60 | 7.47 | 7.17 | 6.80 |
| $T_7$ | 7.73 | 7.50 | 7.25 | 7.00 | 8.20 | 8.00 | 7.80 | 7.51 |
| $T_8$ | 7.50 | 7.40 | 6.62 | 6.50 | 8.42 | 8.17 | 7.79 | 7.47 |
| SEm (±) | 0.13 | 0.19 | 0.09 | 0.11 | 0.09 | 0.09 | 0.12 | 0.15 |
| $CD_{(5\%)}$ | 0.27 | 0.41 | 0.19 | 0.23 | 0.20 | 0.20 | 0.25 | 0.31 |

**Table 4.** Taste and overall acceptability (score out of 9) of the blended nectar as affected by ratio of blending different fruit juice/ pulp with custard apple pulp.

| Treatment | Taste | | | | Overall acceptability | | | |
|---|---|---|---|---|---|---|---|---|
| | Storage period (Months) | | | | Storage period (Months) | | | |
| | 0 | 1 | 2 | 3 | 0 | 1 | 2 | 3 |
| $T_0$ | 6.81 | 6.76 | 6.27 | 6.13 | 6.97 | 6.64 | 6.32 | 6.21 |
| $T_1$ | 7.33 | 7.25 | 6.67 | 6.4 | 7.35 | 7.15 | 6.83 | 6.36 |
| $T_2$ | 8.20 | 8.13 | 7.55 | 7.43 | 8.29 | 8.01 | 7.65 | 7.58 |
| $T_3$ | 7.22 | 6.83 | 6.5 | 6.03 | 7.36 | 6.95 | 6.63 | 6.32 |
| $T_4$ | 6.93 | 6.5 | 6.26 | 5.22 | 6.85 | 6.44 | 6.22 | 6.08 |
| $T_5$ | 7.03 | 6.62 | 6.58 | 6.33 | 7.19 | 6.85 | 6.59 | 6.37 |
| $T_6$ | 7.13 | 6.77 | 6.52 | 6.23 | 7.23 | 6.94 | 6.72 | 6.40 |
| $T_7$ | 8.52 | 7.93 | 7.67 | 7.43 | 8.06 | 7.79 | 7.58 | 7.36 |
| $T_8$ | 7.93 | 7.73 | 7.57 | 7.21 | 7.87 | 7.72 | 7.37 | 7.10 |
| SEm (±) | 0.10 | 0.10 | 0.13 | 0.10 | 0.27 | 0.08 | 0. 07 | 0. 28 |
| $CD_{(5\%)}$ | 0.22 | 0.21 | 0.27 | 0.20 | 0.56 | 0.16 | 0.14 | 0.58 |

score (8.29) for overall acceptability was observed in $T_2$ which was followed by 8.06 in $T_7$ while minimum score (6.85) was found in $T_4$. The overall acceptability of the blended custard apple nectar decreased with the advancement of storage period. At the end of the storage period, the highest overall acceptance value (7.58) was obtained in $T_2$, closely followed by 7.36 in $T_7$ whereas, minimum (6.08) was obtained in $T_4$. The present findings are in conformity with the view of Baramanray *et al.* (3) in guava nectar.

An increase in TSS content during storage of blended nectars was observed (Table 5). Different treatments had significant effect on the TSS content of the blended nectar after storage for 1,2 and 3 months at ambient condition. After 3 months of storage maximum (19.34°B) TSS was found in $T_0$ which was found at par with in $T_5$ (19. 17°B), while minimum (17.68°B) was found in $T_8$. The increase in TSS content in nectar might be due to solubilisation of pulp constituents and degradation of starch, pectin and other polysaccharides in to soluble sugars. The results are in conformity to those of Sarvanan *et al*. (16).

Titratable acidity of blended nectars differ significantly with treatments (Table 5). Initially, the

**Table 5.** Total soluble solids and acidity of the blended nectar as affected by ratio of blending different fruit juice/ pulp with custard apple pulp.

| Treatment | TSS (°Brix) | | | | Acidity (%) | | | |
|---|---|---|---|---|---|---|---|---|
| | Storage period (Months) | | | | Storage period (Months) | | | |
| | 0 | 1 | 2 | 3 | 0 | 1 | 2 | 3 |
| $T_0$ | 17.00 | 17.67 | 18.60 | 19.34 | 0.30 | 0.31 | 0.33 | 0.35 |
| $T_1$ | 17.00 | 17.63 | 18.53 | 18.83 | 0.30 | 0.38 | 0.40 | 0.42 |
| $T_2$ | 17.00 | 17.50 | 18.23 | 18.67 | 0.30 | 0.34 | 0.40 | 0.43 |
| $T_3$ | 17.00 | 17.33 | 17.97 | 18.63 | 0.30 | 0.47 | 0.49 | 0.53 |
| $T_4$ | 17.00 | 17.03 | 17.63 | 17.80 | 0.30 | 0.53 | 0.54 | 0.56 |
| $T_5$ | 17.00 | 17.80 | 18.47 | 19.17 | 0.30 | 0.31 | 0.33 | 0.36 |
| $T_6$ | 17.00 | 17.50 | 18.23 | 18.90 | 0.30 | 0.32 | 0.38 | 0.39 |
| $T_7$ | 17.00 | 17.17 | 17.97 | 18.20 | 0.68 | 0.71 | 0.75 | 0.88 |
| $T_8$ | 17.00 | 17.37 | 17.53 | 17.60 | 0.73 | 0.78 | 0.83 | 0.98 |
| SEm (±) | 0.03 | 0.11 | 0.13 | 0.12 | 0.014 | 0.011 | 0.012 | 0.012 |
| $CD_{(5\%)}$ | NS | 0.23 | 0.28 | 0.25 | 0.02 | 0.02 | 0.02 | 0.02 |

acidity of blended custard apple and lime nectar (50:50 ratio) i.e. $T_8$ was significantly higher (0.73%). The acidity in all the treatments increased gradually up to 3 months of storage. The increase in acidity during storage may be due to formation of organic acids by the degradation of pectic substances and ascorbic acids. Similar findings have been reported in stored aonla beverages (Jain *et al.,* 6). After 90 days of storage also, maximum acidity (0.98 %) was found in $T_8$ (i.e. custard apple: lime at 50:50) followed by 0.88 per cent in $T_7$ i.e. custard apple: lime at 75:25, while minimum (0.35%) was observed in $T_0$.

Total sugars content of blended nectar exhibited significant variation due to different treatments (Table 6). Initially, the maximum total sugars content (16.42 %) was observed in $T_0$ whereas minimum (11.51 %) was observed in $T_8$. The total sugars content of blended nectar got increased as the storage period progressed. After 3 months of storage, maximum total sugars (16.74 %) was found in $T_0$ and minimum in $T_8$. This increase in total sugar might be attributed to the hydrolysis of polysaccharides like pectin, starch etc., into simple sugars as also reported by Thakre (17) in papaya banana blended nectar.

Various treatments had a significant effect on the reducing sugar content of blended nectars (Table 6). The reducing sugar content in blended nectar increased gradually with increasing period of storage. Initially, the maximum reducing sugar content (9.92 %) was observed in $T_0$, whereas minimum (7.00 %) was observed in $T_8$. Similarly, after 90 days of storage maximum reducing sugars (11.54 %) was found in $T_0$ and minimum value (9.17 %) was found in $T_8$.The increase in reducing sugar during storage may be attributed to gradual inversion of non-reducing sugars to reducing sugar by the hydrolysis process. Similar results were also obtained by Jain *et al.* (7) in mango nectar.

The ascorbic acid content of blended custard apple nectar was also significantly affected by different proportions of fruits (Table 7). Initially, the highest ascorbic acid content (8.71 mg/ 100 ml) was observed in $T_7$, whereas minimum (3.31 mg/ 100 ml) was observed in $T_0$. The ascorbic acid content in nectar got decreased with the advancement of storage period. After 90 days of storage again maximum (6.72 mg/ 100 ml) ascorbic acid was found in $T_7$and minimum (1.63) was observed in $T_0$. The decrease in ascorbic acid content in nectar may be due to oxidation or irreversible conversion of L-ascorbic acid into dehydro ascorbic acid in the presence of enzyme ascorbic acid oxidase (ascorbinase) caused by trapped or residual oxygen in the glass bottles. ( Kalra and Tondon, 8).

The proportion of various fruits in blended nectar had a significant effect on total phenol content of freshly prepared custard apple blended beverage Table 7). In fresh nectar, maximum total phenol (8.50 mg GAE/ 100 ml) was found in $T_4$ while minimum (2.97mg GAE/ 100 ml) was found in $T_0$. The phenol content of nectars decreased linearly with the advancement of the storage period. After 3 months of storage also the maximum total phenol content (7.57mg GAE/ 100 ml) was observed in $T_4$and minimum (1.47mg GAE/ 100 ml) was observed in $T_0$. The decrease in phenolic compounds during storage

**Table 6.** Total sugars and reducing sugars of the blended nectar as affected by ratio of blending different fruit juice/ pulp with custard apple pulp.

| Treatment | Total sugars (%) | | | | Reducing sugars (%) | | | |
|---|---|---|---|---|---|---|---|---|
| | Storage period (Months) | | | | Storage period (Months) | | | |
| | 0 | 1 | 2 | 3 | 0 | 1 | 2 | 3 |
| $T_0$ | 16.42 | 16.50 | 16.61 | 16.74 | 9.92 | 10.10 | 10.40 | 11.54 |
| $T_1$ | 14.63 | 15.17 | 15.91 | 16.04 | 9.00 | 9.80 | 11.00 | 11.17 |
| $T_2$ | 13.53 | 14.31 | 14.82 | 15.51 | 8.20 | 9.07 | 10.12 | 11.40 |
| $T_3$ | 13.10 | 13.50 | 13.96 | 14.17 | 8.76 | 10.07 | 10.86 | 11.26 |
| $T_4$ | 12.21 | 12.83 | 13.56 | 13.72 | 8.67 | 9.27 | 10.33 | 10.87 |
| $T_5$ | 14.80 | 15.07 | 15.40 | 15.80 | 9.50 | 9.32 | 10.08 | 11.51 |
| $T_6$ | 14.33 | 14.70 | 15.07 | 15.31 | 8.24 | 8.43 | 9.44 | 10.10 |
| $T_7$ | 12.04 | 12.47 | 12.71 | 12.80 | 7.83 | 8.67 | 8.90 | 9.47 |
| $T_8$ | 11.51 | 12.21 | 12.52 | 12.71 | 7.00 | 7.63 | 8.42 | 9.17 |
| SEm (±) | 0.11 | 0.092 | 0.088 | 0.095 | 0.14 | 0.14 | 0.10 | 0.14 |
| $CD_{(5\%)}$ | 0.23 | 0.19 | 0.19 | 0.20 | 0.30 | 0.29 | 0.21 | 0.30 |

**Table 7.** Ascorbic acid and total phenol content of the blended nectar as affected by ratio of blending different fruit juice/ pulp with custard apple pulp.

| Treatment | Ascorbic acid (mg/ 100ml) | | | | Phenol (mg GAE /100 ml) | | | |
|---|---|---|---|---|---|---|---|---|
| | Storage period (Months) | | | | Storage period (Months) | | | |
| | 0 | 1 | 2 | 3 | 0 | 1 | 2 | 3 |
| $T_0$ | 3.31 | 2.84 | 2.42 | 1.63 | 2.97 | 2.50 | 1.77 | 1.47 |
| $T_1$ | 4.50 | 4.29 | 4.19 | 3.93 | 6.37 | 5.47 | 4.70 | 4.33 |
| $T_2$ | 4.61 | 4.55 | 4.33 | 4.11 | 6.53 | 5.57 | 5.33 | 4.73 |
| $T_3$ | 5.24 | 5.17 | 4.90 | 4.86 | 8.47 | 8.27 | 7.67 | 7.10 |
| $T_4$ | 5.60 | 5.49 | 5.35 | 5.26 | 8.50 | 8.43 | 7.77 | 7.57 |
| $T_5$ | 6.32 | 6.28 | 6.19 | 5.91 | 7.43 | 7.33 | 6.77 | 6.33 |
| $T_6$ | 6.40 | 6.39 | 6.27 | 6.12 | 7.50 | 7.07 | 6.35 | 6.33 |
| $T_7$ | 8.71 | 8.44 | 6.88 | 6.72 | 3.67 | 3.57 | 3.47 | 2.87 |
| $T_8$ | 7.51 | 7.36 | 6.90 | 6.43 | 4.50 | 3.63 | 3.57 | 3.33 |
| SEm (±) | 0.08 | 0.05 | 0.04 | 0.06 | 0.13 | 0.14 | 0.13 | 0.14 |
| $CD_{(5\%)}$ | 0.17 | 0.10 | 0.08 | 0.13 | 0.28 | 0.29 | 0.28 | 0.30 |

**Table 8.** Total plate count of the blended nectar as affected by ratio of blending different fruit juice/ pulp with custard apple pulp.

| Treatment | Total plate count (x $10^3$ cfu/ml) | | | |
|---|---|---|---|---|
| | Storage period (Months) | | | |
| | 0 | 1 | 2 | 3 |
| $T_0$ | 3.31 | 2.84 | 2.42 | 1.63 |
| $T_1$ | 4.50 | 4.29 | 4.19 | 3.93 |
| $T_2$ | 4.61 | 4.55 | 4.33 | 4.11 |
| $T_3$ | 5.24 | 5.17 | 4.90 | 4.86 |
| $T_4$ | 5.60 | 5.49 | 5.35 | 5.26 |
| $T_5$ | 6.32 | 6.28 | 6.19 | 5.91 |
| $T_6$ | 6.40 | 6.39 | 6.27 | 6.12 |
| $T_7$ | 8.71 | 8.44 | 6.88 | 6.72 |
| $T_8$ | 7.51 | 7.36 | 6.90 | 6.43 |
| SEm (±) | 0.08 | 0.05 | 0.04 | 0.06 |
| CD (5%) | 0.17 | 0.10 | 0.08 | 0.13 |

of blended nectars at ambient temperature may be attributed to oxidation of these bioactive components (Moldovan *et al*., 11).

The microbial count in terms of CFU/ ml was significantly affected by blending proportions (Table 8). Initially, the total plate count ranged between $1.04\times10^3$ to $1.09\times10^3$ Cfu/ ml among different treatments. During storage, a negligible increase in total plate count was observed in all the treatments including control, as also reported by Ladaniya *et al*. (9).

## AUTHORS' CONTRIBUTION

Conceptualization of research (SKJ); Designing of the experiments (SKJ, PB, NM, HC, DG); Contribution of experimental materials (SKJ, NM); Execution of field/lab experiments and data collection (DG, SKJ, HC); Analysis of data and interpretation (DG, SKJ, PB); Preparation of the manuscript (DG, SKJ).

## DECLARATION

The authors declare no conflict of interest.

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