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Evaluation of various varieties for processing and storability of ready-to-serve unripe mango beverage (Pana)

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Abstract
The present investigation was undertaken to evaluate ten cultivars of mango for preparation of ready to serve unripe mango beverage *pana.* The cultivars differed significantly in terms of fruit weight and content of pulp, peels and stone. Variations in pH content of TSS, acidity, ascorbic acid, reducing, non-reducing and total sugars among treatment was found. A critical analysis of physical composition of mango fruits revealed that maximum fruit weight and pulp weight was recorded 380g and 266.76g, respectively, from Kakna (local) which was 70.2 per cent of the total fruit weight. The parameters seed weight and non-edible waste in mango fruit were recorded 74.17g and 155.52g respectively. The calculated value of these two parameters are 19.51 per cent and 40.92 per cent, respectively of total fruit weight, whereas pulp: seed ratio was calculated 4.38g maximum for Dashehari. Among the chemical composition the maximum value of total soluble solids (TSS) was recorded 22 ^{0}Brix from Mallika. The maximum value of total sugar and non-reducing sugar content was recorded 17.81 per cent, 13.81 per cent respectively from Mallika The maximum value of ascorbic acid content was recorded 56.34 mg/100ml from Langra. Total titrable acidity was recorded 0.35 per cent from totapari whereas, pH value was also recorded 3.75 in the fruit sample. Among various treatment tried in this investigation, *Pana* prepared from treatment T_{10} (Totapari) recorded highest organoleptic score with respect to aroma, taste and overall acceptability.

Keywords: mango, beverage, *Pana*, organoleptic score, dashehari, mallika, langra, kakna (local), totapari

Introduction
Mango (*Mangifera indica* L.) is known as the king of fruits and belongs to the Anacardiaceae family. The mango is native to South Asia, from where it has been distributed worldwide to become one of the most cultivated fruits in the tropics. Mango is commercially grown in all over India except very high northern altitudes. It is well known for its taste, excellent flavour and healthful food values. It is considered as one of the best fruits in the world market because of its great utility, excellent flavour, attractive fragrance, and beautiful shades of colour, delicious taste and healthful value. Nutritionally, mango is highly important, because it has medium calorific value and high nutritional values. Mango helps to prevent many deficiency diseases because it is a rich source of vitamins, minerals, acid, total soluble solids. It is one of the most important tropical fruit worldwide in terms of production and consumer acceptance (Anon, 2005) [2]. This fruit is considered as a source of antioxidant including ascorbic acid (provides about 50% of the recommended daily intake of vitamin C) and carotenoids. Carotenoids, which are lipophilic radical scavengers found in many fruits and vegetables are also responsible of the bright yellow colour of mango (Shieber *et al*., 2000) [22]. The fresh fruits of mango have limited shelf life. Therefore, It is necessary to utilize the fruit for making different products to increase its availability over an extended period and to stabilize the price during the glut season. Mango can be consumed fresh or can be processed into juice, nectar, pulp, jam, jelly, slices, syrup, fruit bar or dehydrated products, as well as being used as an additive to other fruit juices or pulps. These products have good potential for internal as well as external trade. The utilization of mango for preparation of beverages and intermediates moisture products has not been explored much and mango pulp can be used as base for the preparation of these products. In the food industry, knowledge of the physical properties of food is fundamental in analysing the unit operations. They influence the treatment received during the processing and are good indicators of other properties as well as

The qualities of food. These are beneficial the producer, industry and the consumer.

Raw mango beverage (Pana) is a very popular traditional product prepared and consumed in most households in India as a preventive and curative remedy for sunstroke, bilious, gastrointestinal and blood disorders. The beverage is a convenient alternative for utilization of unripe mango fruits as value added fruit drink of high quality in respect of sensory and nutritional aspects as well as medicinal and therapeutic values. The pana is appetizing, thirst quenching, highly refreshing, easily digestible and nutritionally far superior to many synthetic and aerated drinks.

India is a country were soft drinks are in good demand practically throughout the year. During hot summer days these become all the more important because of their thirst quenching property. Traditionally our country has been well known for offering syrup or sherbet. Among all, fruit juice and beverage have an important place. It is rich in essential minerals, vitamins and other nutritive factors, also it is liked and appreciated by people of all ages and acceptable on all occasion. They are delicious and have universal appeal unlike other beverages. The nutritive value of fruit beverage are far better than that of synthetic products which at present is being bottled & sold in large quantites throughout country. If fruit juices will be sustained for synthetic products it will be beneficial to consumers as well as to the fruit growers. Looking at the demand there is a great scope in the country for production of fruit juices and other fruit based beverages.

Materials and Methods

The present investigation was conducted in the Horticulture Processing Laboratory Department of Fruit Science, College of Agriculture, Indira Gandhi Agricultural University, Raipur (C.G.) during the year 2017-18.For the preparation of pana Freshly harvested mango fruits were procured and the diseased and damaged mango fruits were sorted out from the bulk lot of each variety. Washing of mangoes was carried out with warm water to remove dirt and dust particles. The fruits were then cooked in boiling water for 15min.The cooked fruits were peeled manually and carefully to minimize pulp loss with the peels. The pulping was done using the domestic mixer grinder and the stone was collected separately. After extraction of pulp, 10 per cent pulp for mango beverage (*pana*) was taken. The volume of the final product was maintained by adding water to each recipe combination in each replication. A calculated amount of sugar was added in the pulp to adjust the total soluble solids as 15 per cent for *pana*. The acidity was maintained to 0.3 per cent in the final product by the addition of required amount of citric acid. The prepared pana was filtered by sieving through a muslin cloth to obtain a product of uniform consistency. The product was poured into hot, sterilized crown bottles of 200 ml capacity and corked air-tight. The filled bottles were pasteurized in boiling water till the temperature of product reaches 100ºC. It took about 15 minutes to attain required temperature. The bottles of pana beverages were kept at ambient condition for further studies up to 90 days.

The experiment consists of 10 treatment combination each for pana namely, Amrapali, Amin, Chausa, Dashehari, Kakna, Krishn bhog, Langra, Mallika, Sundri and Totapari. The treatment was replicated three times in completely Randomized Design. Ten pana beverage bottles were taken for each treatment in each replication. The effect on chemical composition and organoleptic values of pana were observed on same day and after 30, 60 and 90 days of storage at ambient conditions. The acidity, ascorbic acid (mg/100ml), total sugar, reducing and non reducing sugar were determined as per the method of AOAC (2002). The TSS of fruit was measured with the help of Hand-Refractometer of 0-32º Brix range. The taste, flavour and colour of each sample were evaluated by panel of 10 judges following the nine point hedonic rating test as described by Rangana (1997).

Results and Discussion

Total soluble solids (%)

Data pertaining to effect of different recipe treatments on the total soluble solids of pana stored under ambient condition are presented in Table 1. It is clear from the data that total soluble solids content in pana showed an increasing trend with increasing period of storage (0 to 90 days). A non significant difference in TSS was observed during 0 days of storage. Thereafter, TSS of pana was found to be significant at 30 to 90 days of storage.

At 30 days of storage, the total soluble solids content was found to be maximum (15.24°Brix) under the treatment T8 (Mallika) followed by T4 (Dashehari). While, minimum TSS content was observed (15.02°Brix) with the treatment T10 (Totapari). The treatments T4 and T8, T2 and T3 were found statistically at par.

At 60 days of storage, maximum TSS was recorded (15.41°Brix) with the treatment T8 (Mallika) followed by T4 (Dashehari). While, minimum TSS content was observed (15.19°Brix) with the treatment T10 (Totapari). The treatments T4 and T8, T2 and T3 were found statistically at par.

At 90 days of storage, similar trend was observed in TSS. The increased TSS in nectar and pana during storage was probably due to conversion of left over polysaccharides into soluble sugars. In conformity of this, similar results were reported in jamun RTS (Kanan and Thirumaran, 2002; Das, 2009; Gehlot *et al*., 2010) [9, 6, 7], papaya RTS (Saravanan *et al*., 2004) [20], guava beverages (Pandey, 2004) [14] and banana RTS (Yadav *et al*., 2013) [25].

Acidity (%)

It is evident from the data in Table 1 that acidity of pana showed an increasing trend with increasing period of storage (0 to 90 days). A non- significant difference in acidity was observed during 0 to 30 days of storage. Thereafter, acidity of pana was found to be significant at 60 to 90 days of storage.

At 60 days of storage, higher acidity was found (0.53%) with the treatment T10 (Totapari) followed by T2 (Amin).While, minimum acidity was observed (0.42%) with T5 (Kakna). The treatments T6 and T7, T1, T3, T8 and T9 were showed statistically similar differences.

After 90 days of storage, the titrable acidity was found to be higher (0.65%) with the treatment T10 (Totapari) followed by T2 (Amin).While, minimum acidity was observed (0.50%) with the treatment with T5 (Kakna). The treatments T3, T4 and T6, T1 and T9 were statistically at par.

The increase in acidity in RTS during 90 days of storage may be due to formation of organic acids by ascorbic acid degradation as well as progressive decrease in the pectin content. Similar findings were also reported in beverages of sweet orange (Byanna and Gowda, 2012) [4], banana (Yadav *et al*., 2013) [25], and jamun (Khurdiya and Roy, 1985 and Das, 2009) [10, 6]. Ravani and joshi (2011) [19] reported that there was significant increase in acidity on prolonging storage of *pana.*

Ascorbic acid (mg/100ml)

It is apparent from the data that ascorbic acid content in mango pana of all the treatments showed a decreasing trend with increasing period of storage 0 to 90 days. (Table 1)

At the time of preparation (0 day), the maximum ascorbic acid was observed (25.97 mg/100ml) with the treatment T7 (Langra) followed by T10 (Totapari). The minimum ascorbic acid content was recorded (7.08 mg/100 ml) with the treatment T6 (Krishn bhog).

After 30 days of storage, maximum ascorbic acid was observed (25.88 mg/100ml) with the treatment T7 (Langra) followed by T10 (Totapari). The minimum ascorbic acid content was recorded (7.00 mg/100 ml) with the treatment T6 (Krishn bhog).

After 60 days of storage, maximum ascorbic acid was observed (25.69 mg/100ml) with the treatment T7 (Langra) followed by T10 (Totapari). The minimum ascorbic acid content was recorded (6.81 mg/100 ml) with the treatment T6 (Krishn bhog).

After 90 days of storage, maximum ascorbic acid was recorded (25.57 mg/100ml) with the treatment T7 (Langra) followed by T10 (Totapari). The minimum ascorbic acid was recorded (6.69 mg/100 ml) with the treatment T6 (Krishn bhog).

The decrease in ascorbic acid in RTS during storage might 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.

Similar reduction in ascorbic acid content have also been reported by Baramanray *et al.* (1995) [3] in guava nectar, Saravanan *et al*. (2004) [20] in papaya RTS, Das (2009) [6] in jamun products, and by Sharma *et al*. (2009) [21] in guava-jamun RTS. Ravani and joshi (2011) [19] reported that there was significant decrease in ascorbic acid on prolonging storage of *pana*.

Reducing sugar (%)

The different recipes influenced the reducing sugar content of *pana* and showed an increasing trend with increasing period of storage (0-90 days). The reducing sugar was recorded to be significant from 0 to 90 days of storage.

At the time of preparation, the maximum (4.36%) reducing sugar was observed with the treatment T8 (Mallika) followed by T3 (Chausa). The minimum reducing sugar was recorded (3.28%) with the treatment T10 (Totapari). The treatments T1 and T6 were found statistically at par (Table 2)

At the time of 30 days storage, maximum reducing sugar was observed (4.55%) with the treatment T8 (Mallika) followed by T3 (Chausa). The minimum reducing sugar was recorded (3.47%) with the treatment T10 (Totapari). The treatments T1 and T6, T4 and T5 were found statistically at par.

After 60 days of storage, maximum reducing sugar was recorded (4.88%) with the treatment T8 (Mallika) followed by T3 (Chausa). The minimum reducing sugar was recorded (3.80%) with the treatment T10 (Totapari). The treatments T1 and T6, T4 and T5 were found statistically at par.

After 90 days of storage, maximum reducing sugar was recorded (5.48%) with the treatment T8 (Mallika) followed by T3 (Chausa).The minimum reducing sugar was recorded (4.40%) with the treatment T10 (Totapari). The treatments T1 and T6, T4 and T5 were found statistically at par.

These results are in close conformity with the report of Patil (2001) [15], who revealed that there was a significant increase in reducing sugars in jamun juice throughout the storage period. The increase in sugars during storage may be due to gradual inversion of non-reducing sugars to the reducing sugars by the hydrolysis process. Kalra and Tandon (1985) [8] found that the reducing sugar in mango beverage was increased four times during storage.

Non-reducing sugar (%)

The non-reducing sugar in pana showed decreasing trend with increasing period of storage (0-90 days). The non reducing sugar was found to be significant from 0 to 90 days of storage.

At the time of preparation, maximum non-reducing sugar was recorded (10.88%) with the treatment T4 (Dashehari) followed by T8 (Mallika). Whereas, the minimum (9.75%) non reducing sugar was observed with the treatment T1 (Amrapali). The treatments T7and T10 were at par.

After 30 days of storage, maximum non-reducing sugar was observed (10.79%) with the treatment T4 (Dashehari) followed by T8 (Mallika). While, the minimum content was observed (9.66%) with the treatment T1 (Amrapali). The treatments T7and T10 were at par.

After 60 days of storage, maximum non reducing-sugar was recorded (10.58%) with the treatment T4 (Dashehari) followed by T8 (Mallika) whereas, the minimum content was observed (9.45%) with the treatment T1 (Amrapali). The treatments T7and T10 were at par.

After 90 day of storage, maximum non-reducing sugar was recorded (10.09%) with the treatment T4 (Dashehari) followed by T8 (Mallika) Whereas, the minimum content was observed (8.96%) with the treatment T1 (Amrapali). The treatments T7and T10 were at par (Table 2).

The increase in reducing sugar as well as total sugar corresponded to the increase in total soluble solids (TSS) and ultimate decrease in non-reducing sugar in both the beverages during storage period. The variation in different fractions of sugar might be due to hydrolysis of polysaccharides like starch, pectin and inversion of non-reducing sugar into reducing sugar, as increase in reducing sugar was correlated with the decrease in nonreducing sugar. The increased level of total sugar was probably due to conversion of starch and pectin into simple sugars. Similar findings were reported by Saravanan *et al*. (2004) [20] in papaya RTS, Phalke (2009) [17] in sapota and lime blended RTS and Byanna and Gowda (2012) [4] in sweet orange RTS beverages.

Total sugar (%)

Data pertaining to effect of different recipe treatments on the total sugar of *pana* under ambient condition storage are presented in Table 2. It is evident from the data that the total sugar content in pana showed an increasing trend with increasing period of storage. The total sugar was recorded to be significant from 0 to 90 days of storage the maximum total sugar content was observed (14.98%) with the treatment T8 (Mallika) followed by T3 (Chausa).The minimum total sugar content was recorded (13.10%) with the treatment T10 (Totapari). The treatments T3 and T4, T1 and T7 were found statistically at par.

After 30 days of storage, the maximum total sugar content was observed (15.09%) with the treatment T8 (Mallika) followed by T3 (Chausa). The minimum total sugar content was recorded (13.20%) with the treatment T10 (Totapari). The treatments T1 and T7 were found statistically at par.

After 60 days of storage, the maximum total sugar content was observed (15.21%) with the treatment T8 (Mallika) followed by T3 (Chausa). The minimum total sugar content

was recorded (13.32%) with the treatment T10 (Totapari). The treatments T1 and T7 were found statistically at par.

At the end (90 days) of storage, the maximum total sugar content was observed (15.32%) with the treatment T8 (Mallika) followed by T3 (Chausa). The minimum total sugar content was recorded (13.43%) with the treatment T10 (Totapari). The treatments T1 and T7 were found statistically at par.

Similar findings were reported in jamun juice and beverages (Patil, 2001; Kannan and Thirumaran, 2002; Gehlot *et al*., 2010) [15, 9, 7], Bael beverages (Verma and Gehlot, 2006) [23], rose apple jamun blended RTS (Patil *et al*., 2014) [16] and canned mango slice (Vijayanand *et al*, 2013) [24].

Organoleptic evaluation of *pana* during storage

The mean score for colour and appearance, aroma, taste and overall acceptability of different treatments were recorded at 0, 30, 60 and 90 days and observed that organoleptic score for colour and appearance, aroma, taste and overall acceptability continuously decreased with all the treatments upto 90 days of storage (Table 3).

At the time of preparation, significantally maximum value for colour and appearance was recorded (8.26) with the treatment T8 (Mallika) followed by T6 (Krishn bhog).The minimum mean score was recorded (7.07) with the treatment T3 (Chausa). The treatments T2 and T10 were found statistically at par. In the same way, the maximum value for aroma score was recorded (8.37) with the treatment T10 (Totapari) followed by T2 (Amin). The minimum mean score was recorded (6.86) with the treatment T3 (Chausa). The treatments T1, T4, and T6 were statistically similar.

Maximum value for taste score was recorded (8.62) with the treatment T10 (Totapari) followed by T8. The minimum mean score was observed (5.28) with the treatment T4 (Dashehari).Similar to above characters, the maximum value for overall acceptability score was recorded (8.55) with the treatment T10 (Totapari) followed by T8 (Mallika). The minimum mean score was recorded (6.02) with the treatment T4 (Dashehari). After 30 days of storage, significantaly maximum mean score for colour and appearance was recorded (8.18) with the treatment T8 (Mallika) followed by T6 (Krishn bhog).The minimum mean score was recorded (6.89) with the treatment T3 (Chausa).Similarly, the maximaum mean score for aroma was recorded (8.05) with the treatment T10 (Totapari) followed by T2 (Amin). The minimum mean score was recorded (6.54) with the treatment T3 (Chausa). The treatments T1 and T4 were showed significantly at par differences. The maximaum mean score for taste was recorded (8.36) with the treatment T10 (Totapari) followed by T8 (Mallika). The significantaly minimum mean score was recorded (5.02) with the treatment T4 (Dashehari). In the same way, maximaum mean score for overall acceptability was recorded (8.25) with the treatment T10 (Totapari) followed by T8 (Mallika). The significantaly minimum mean score was recorded (5.72) with the treatment T4 (Dashehari).

After 60 days of storage, maximum mean score for colour and appearance was recorded (8.12) with the treatment T8 (Mallika) followed by T6 (Krishn bhog).The significantaly minimum mean score was recorded (6.52) with the treatment T3 (Chausa). The maximum mean score for aroma was recorded (7.45) with the treatment T10 (Totapari) followed by T2 (Amin).The minimum mean score was recorded (6.24) with the treatment T3 (Chausa). The treatments T1and T4, and T6, were showed statistically similar differences. Similarly, maximum mean score for taste was recorded (7.79) with the treatment T10 (Totapari) followed by T8 (Mallika). Minimum.

Mean score was recorded (4.45) with the treatment T4 (Dashehari). The maximum mean score for overall acceptability was recorded (7.68) with the treatment T10 (Totapari) followed by T8 (Mallika).The significantaly minimum mean score was recorded (6.05) with the treatment T4 (Dashehari). After 90 days of storage, similar trend was observed.

There was a considerable decrease in sensory mean score for colour and appearance, taste, flavour and overall acceptability during storage. The sensory mean score for each attribute was highest on the day of preparation, which decreased with increasing period of storage. There are many extrinsic factors which determines the storage stability of products and temperature plays an important role among them.

There are certain biochemical changes which occurs under low pH and high temperature that leads to formation of brown pigment and produces off flavour in the beverages.

The other possible reasons could be the loss of volatile aromatic substances responsible for flavour and taste which decreased acceptability in storage at ambient condition. The present findings are in accordance with the view of Das (2009) [6] in jamun beverages, Mehmood *et al*. (2008) [13] in apple juice, Byanna and Gowda (2012) [4] in sweet orange RTS beverage and Lather *et al*. (2009) [11] in aonla juice.

Table 1: Effect on total soluble solids, acidity and ascorbic acid of mango *pana*

		TSS (%)				Acidity (%)				Ascorbic acid(mg/100ml)			
S.N.	**Treatments**	**0 DAT**	**30 DAT**	**60 DAT**	**90 DAT**	**0 DAT**	**30 DAT**	**60 DAT**	**90 DAT**	**0 DAT**	**30 DAT**	**60 DAT**	**90 DAT**
1	Amrapali	15.06	15.09	15.21	15.28	0.32	0.34	0.45	0.53	9.1	9.01	8.82	8.7
2	Amen	15.15	15.18	15.35	15.42	0.33	0.34	0.48	0.54	8.7	8.61	8.42	8.3
3	Chausa	15.17	15.17	15.34	15.42	0.34	0.36	0.46	0.51	12.61	12.52	12.33	12.21
4	Dashehari	15.2	15.23	15.4	15.47	0.34	0.35	0.38	0.53	13.03	13	12.83	12.31
5	Kakna	15.07	15.08	15.25	15.33	0.31	0.32	0.42	0.5	8.55	8.46	8.27	8.15
6	krishn bhog	15.19	15.19	15.36	15.44	0.33	0.34	0.4	0.52	7.08	7	6.81	6.69
7	Langra	15.03	15.06	15.23	15.31	0.35	0.36	0.4	0.55	25.97	25.88	25.69	25.57
8	Mallika	15.21	15.24	15.41	15.48	0.34	0.36	0.45	0.46	13.45	13.36	13.17	13.05
9	Sundri	15.1	15.12	15.29	15.37	0.32	0.34	0.44	0.53	8.36	8.27	8.08	7.96
10	Totapari	15	15.02	15.19	15.27	0.36	0.37	0.53	0.65	14.8	14.71	14.52	14.4
	SEm±	0.131	0.004	0.004	0.003	0.026	0.026	0.003	0.004	0.005	0.004	0.003	0.003
	CD at 5%	N/A	0.01	0.01	0.01	N/A	N/A	0.01	0.012	0.01	0.01	0.01	0.01

Table 2: Effect on reducing sugar, non-reducing sugar and Total sugar of *Pana*

			Total sugar (%)				Reducing sugar (%)				Non reducing sugar (%)		
S.N.	**Treatments**	**0 DAT**	**30 DAT**	**60DAT**	**90 DAT**	**0 DAT**	**30 DAT**	**60 DAT**	**90 DAT**	**0 DAT**	**30 DAT**	**60 DAT**	**90 DAT**
1	Amrapali	13.61	13.71	13.83	13.94	3.86	4.05	4.38	4.98	9.75	9.66	9.45	8.96
2	Amen	13.92	14.02	14.14	14.25	3.82	4.01	4.34	4.94	10.1	10.01	9.8	9.31
3	Chausa	14.83	14.94	15.06	15.17	4.23	4.42	4.75	5.35	10.61	10.45	10.31	9.82
4	Dashehari	14.82	14.52	14.64	14.75	3.94	3.73	4.06	4.66	10.88	10.79	10.58	10.09
5	Kakna	13.41	13.51	13.63	13.74	3.49	3.68	4.01	4.61	9.92	9.83	9.62	9.13
6	krishn bhog	14.2	14.3	14.42	14.53	3.95	4.14	4.47	5.07	10.25	10.16	9.95	9.46
7	Langra	13.62	13.72	13.84	13.95	3.79	3.98	4.31	4.91	9.83	9.74	9.53	9.04
8	Mallika	14.98	15.09	15.21	15.32	4.36	4.55	4.88	5.48	10.63	10.54	10.33	9.84
9	Sundri	13.82	13.92	14.04	14.15	3.84	4.03	4.36	4.96	9.98	9.89	9.68	9.19
10	Totapari	13.1	13.2	13.32	13.43	3.28	3.47	3.8	4.4	9.82	9.73	9.52	9.03
	SEm±	0.003	0.004	0.004	0.005	0.005	0.003	0.004	0.004	0.003	0.021	0.004	0.004
	CD at 5%	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.06	0.01	0.01

DAT=Days After treatments

Table 3: Effect on organoleptic parameters of *pana*

		Colour and appereance				Aroma				Taste				Overall acceptability			
S.N.	**Treatments**	**0 DAT**	**30 DAT**	**60 DAT**	**90 DAT**	**0 DAT**	**30 DAT**	**60 DAT**	**90 DAT**	**0 DAT**	**30 DAT**	**60 DAT**	**90 DAT**	**0 DAT**	**30 DAT**	**60 DAT**	**90 DAT**
1	Amrapali	7.92	7.84	7.78	7.69	8.04	7.72	7.12	6.52	7.96	7.7	7.13	6.03	8.16	7.86	7.29	6.44
2	Amen	7.41	7.32	7.26	7.11	8.12	7.81	7.2	6.6	8.36	8.1	7.54	6.43	8.41	8.11	7.54	6.69
3	Chausa	7.07	6.89	6.52	6	6.86	6.54	6.24	6.14	6.35	6.09	5.52	5	6.93	6.63	5.86	4.82
4	Dashehari	7.56	7.48	7.42	7.33	8.04	7.72	7.12	6.52	5.28	5.02	4.45	4.32	6.02	5.72	6.05	4.53
5	Kakna	7.61	7.53	7.47	7.38	7.86	7.54	6.94	6.34	7.58	7.32	6.75	5.65	7.87	7.57	7	6.15
6	krishn bhog	8.15	8.07	8.01	7.92	8.02	7.7	7.1	6.5	8.24	7.98	7.41	6.31	8.28	7.98	7.41	6.56
7	Langra	7.52	7.44	7.38	7.29	7.81	7.49	6.89	6.29	7.45	7.19	6.62	5.52	7.78	7.48	6.91	6.1
8	Mallika	8.26	8.18	8.12	8.03	8.1	7.78	7.18	6.58	8.4	8.14	7.57	6.47	8.46	8.16	7.59	6.74
9	Sundri	8	7.92	7.86	7.77	7.97	7.65	7.05	6.45	8.12	7.86	7.29	6.19	8.24	7.94	7.37	6.52
10	Totapari	7.38	7.3	7.24	7.15	8.37	8.05	7.45	6.85	8.62	8.36	7.79	6.69	8.55	8.25	7.68	6.83
	SEm±	0.012	0.005	0.006	0.005	0.012	0.005	0.016	0.005	0.006	0.005	0.005	0.005	0.006	0.006	0.012	0.005
	CD at 5%	0.04	0.02	0.02	0.02	0.04	0.02	0.05	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02

Conclusion

The pana prepared from the treatment T10 (Totapari) with recipe 10 per cent juice, 15 per cent TSS and 0.3 per cent acidity was found to be suitable for commercial scale. The taste, colour and appearance, aroma and overall acceptability were found decreased continuously during storage with the advancement of storage period.

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