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EFFECT OF ALOE VERA JUICE INCORPORATION ON TEXTURAL AND SENSORY CHARACTERISTICS OF THE PEDA DURING STORAGE AT 37 ± 1 °C

Keerthi Srikanth^{1*} and S Kartikeyan²

*Corresponding Author: Keerthi Srikanth, ✉ keerthisrikanth017@gmail.com

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The present research was intended to study the feasibility of incorporation of *Aloe vera* juice in different ratio for preparation of *Aloe vera* incorporated *peda* and assess their textural and sensory characteristics during storage at 37 ± 1 °C. The quality analysis was carried out on 0th, 3rd, 5th and 7th days of storage. The textural analysis of stored samples, i.e., Hardness, Springiness, Cohesiveness, Gumminess and Chewiness values were increased from 2138.21 to 2633.49 g, 0.179 to 0.270mm, 0.181 to 0.242, 398.80 to 696.10 g and 58.08 to 115.49 g.mm. Adhesiveness values decreased from -33.03 g.sec to -43.60 g.sec. The sensory analysis of stored *peda* samples, i.e., colour and appearance, body and texture, flavor, sweetness, overall acceptability scores were decreased from 7.87 to 7.31, 8.16 to 7.44, 8.17 to 7.44, 8.40 to 7.99, 8.15 to 7.54 during storage at 37 ± 1 °C for 7 days. The control had the better textural and sensory scores among the experimental samples, after control T₁ had the better textural score and T₂ had better sensory scores. *Peda* prepared with *aloe vera* juice incorporation levels of upto 10% gave satisfactory results. The produced *Peda* with the incorporation of *aloe vera* juices would benefit the consumer to reduce the cardiovascular diseases.

Keywords: Khoa, peda, Aloe vera juice, Textural characteristics, Sensory characteristics

INTRODUCTION

India ranks first in milk production in the world and accounting to 19% of world's total milk production. The milk production in India is estimated to be 155.20 MT (FAO, 2016). India is also the largest Dairy products consumer in the world and Traditional dairy products have played a significant role in the economic, social, religious and nutritional well-being of our people. These products need to be enhanced in terms of quality and functionality to attract overseas market and health orientated consumers. *Khoa* is the major TDP produced by heat desiccation of milk. It is made of either Dried or Whole milk thickened by heating it in an open iron pan. *Khoa* is used as a base material for production of *peda*, *burfi* and *gulabjamun* (Londhe and Pal., 2007).

Peda is highly nutritious product as it contains almost all milk solids plus sugar and other additives. It is heat desiccated indigenous milk sweet prepared by heating a mixture of *Khoa* and sugar until the desired granular and firm texture and flavor develops. The quantity of *peda* produced in India exceeds any other indigenous milk based sweet and it has also special importance in various celebrations (wedding, inaugural functions, etc.), throughout the year (Ghule *et al.*, 2013).

Increasing awareness among consumers to ensure good health coupled with changing lifestyle has led to the concept of functional foods. The development of functional food is thus unique to contribute opportunities for the improvement of the quality of food and consumer health and well-being.

¹ Department of Dairy Technology, College of Dairy Science and Food Technology, CGKV, Raipur 492001.

² Department of Dairy Technology, College of Dairy Science and Food Technology, CGKV, Raipur 492001.

Nowadays, more and more people are adopting herbal way of life for their health benefits (Neall, 2004).

Aloe vera has been used as a functional and therapeutic ingredient especially in the beverage and dairy sectors (Ramachandra and Srinivasa Rao, 2008). *Aloe vera* is one of the oldest known medicinal plants gifted by nature; and is often called “miracle” plant. The most widely used variety of *Aloe vera* is *Barbadensis millar*. It is perennial, succulent plant with stiff fleshy leaves (Manoharan and Ramasamy, 2013). *Aloe vera* gel is a clear thin gelatinous material that comes from inside the *Aloe vera* leaves. *Aloe Vera* juice improves blood circulation due to its ability to detoxify and its leaves have vital ingredients such as vitamins, minerals, amino acids, polysaccharides, enzymes, plant steroids, saponins, lignin, anthraquinones, salicylic acid, which are necessary for the human body. *Aloe vera* also works as anti-septic, antibacterial, antiviral, antidiabetic, anti-carcinogenic, anti-inflammatory and also natural healer (Manoharan *et al.*, 2012).

Aloe vera juice is more suitable for incorporation in various food formulations. Hence our present investigation was aimed to develop good quality *peda* by incorporating *Aloe vera* juice.

MATERIAL AND METHODS

The work was carried out in the Department of Dairy Technology of College of Dairy Science & Food Technology, C.G.K.V., Raipur (C.G.). Fresh Buffalo milk was procured from Naseeb Dairy, Raipur (C.G) and it was standardized to 6.0% fat and 9.0% SNF before product manufacture. Good quality commercial grade cane sugar was purchased from the local market of Raipur and used as sweetening agent. Fully matured *Aloe vera* leaves were procured from Department of Medicinal and Aromatic plants, Indira Gandhi Krishi Viswavidyalaya, Raipur (C.G), juice was extracted and used in the study.

Aloe Vera Juice Extraction

In order to avoid contaminating the internal fillet with the yellow sap, traditional hand filleting method was used for *Aloe vera* juice extraction (Ramachandra and Srinivasa Rao, 2008). In this method lower one inch of the leaf base, the tapering point (2-4 in.) of the leaf top, the short sharp spines located along the leaf margin are removed. The knife is then introduced into the mucilage layer below the green rind avoiding the vascular bundles, and the top rind is removed. The bottom rind is similarly removed and the rind parts with

significant amount of mucilage remained attached are discarded. Thus, most of the “yellow sap” is discarded with the rind portions. The fillet was then washed with water to remove a majority of the deeper layer mucilage attached to the outer surface of the integral fillet. The fillet was chopped into cube and was grinded in a mixer, it was then filtered 3-4 times using muslin cloth. The filtrate was then left for 24 h to decant at refrigeration condition. It was finally pasteurized and used.

Preparation of Khoa and Peda

Buffalo milk preheated (40 °C), standardized to 6% fat and 9% SNF, boiling of milk in open karahi, continuous stirring and scraping with *khunti*, after *khoa* formation, *khoa* leaving the sides of pan and stop heating. Addition of sugar (30% by weight of *khoa* basis) and *Aloe vera* juice was incorporated at different levels (0%, 5%, 10%, 15% and 20%) during *khoa* pat formation stage. Based on the sensory evaluation of *peda*, the level of *Aloe vera* incorporation was restricted to a maximum of 20% for final study. The treatment details are given below.

- T₀ - Buffalo milk *peda* (control)
- T₁ - *khoa* + *Aloe vera* juice@ 5 % on *khoa* weight basis.
- T₂ - *khoa* + *Aloe vera* juice@ 10 % on *khoa* weight basis.
- T₃ - *khoa* + *Aloe vera* juice@ 15 % on *khoa* weight basis.
- T₄ - *khoa* + *Aloe vera* juice@ 20% on *khoa* weight basis.

Storage Study

The control and *Aloe vera* juice incorporated *peda* samples were packed in HDPE (Thickness is 98.5 µm) and stored in incubator maintained at 37 ± 1 °C. The samples were subjected to texture and sensory analysis on 0th, 3rd, 5th and 7th day.

Experimental Design and Analysis

The present investigation attempted to develop *peda* with 4 levels of *Aloe vera* juice incorporation resulting in five treatments including control (T₀, T₁, T₂, T₃ and T₄). The samples were stored and subjected to texture and sensory analysis. The experiment was replicated 4 times and the data were subjected to statistical analysis using Factorial Randomized Block Design with 5 treatments (1 control +4 mixed ratios) and 4 storage days. Texture Profile Analysis

(TPA) on *peda* samples was performed in Texture Analyzer (TA.XT Plus), using the procedure (Jha *et al.*, 2013). The Sensory evaluation of control and experimental *peda* were carried out by a panel of five judges selected from the faculty of college of Dairy Science and Food Technology by using “9 point Hedonic scale” developed by Gupta (1976).

RESULTS AND DISCUSSION

Effect of Aloe Vera Juice Incorporation on Textural Quality of the *peda* Samples During Storage at 37 ± 1 °C

The effect of *Aloe vera* juice incorporation on textural quality with respect to hardness, adhesiveness, springiness, cohesiveness, gumminess and chewiness of *peda* were studied during storage at 37 ± 1 °C, it was carried out at 0th, 3rd, 5th and 7th and the results are displayed in respective Tables.

Hardness

The effect of *Aloe vera* juice incorporation on hardness of the *peda* samples during storage at room temperature (37 ± 1 °C) is shown in Table 1. Comparing treatment means, it can be observed that T₃ had the highest hardness values 2610.02 g, while, control had the lowest hardness value 1938.49 g,

however, it was found that T₁, T₂, T₃, and T₄ were at par with each other.

During storage, the *peda* samples showed significant ($P \leq 0.05$) increase in hardness values from 2138.21 to 2633.49g during storage at 37 ± 1 °C for 7 days. This could be attributed to the continuous reduction in moisture content and consequent increase in total solids mainly contributed by sucrose. In one of the recent study conducted by Londhe *et al.* (2012) the initial hardness value of laboratory made brown *peda* was 86.14 N (87897 g). During storage at 30 °C for 20 days *peda* packed in card board box lined with butter paper hardness decreased to 203.67 N (207824 g). While hardness value of same *peda* samples packed in multilayer pouches increase to 95.66 N after 30 days of storage and 110 N after 40 days in vacuum packed samples. Jha *et al.* (2012) observed that the hardness values were significantly higher ($p < 0.01$) in *lal peda* throughout the storage period.

Adhesiveness

The effect of *Aloe vera* juice incorporation on adhesiveness of the *peda* samples during storage at 37 ± 1 °C is shown in Table 2. Comparing treatment means, it can be seen that control (T₀) had the lowest adhesiveness value -20.90 g.s as

Table 1: Effect of Aloe Vera Juice Incorporation on Hardness (g) of the Peda Samples During Storage at 37 ± 1 °C

Treatments	Hardness (g)					
	Storage Period in Days (S)					
	0 th Day	3 rd Day	5 th Day	7 th Day	Mean of Treatments (T)	
T ₀	1639.64	1835.46	2136.48	2347.36	1938.49 ^A	
T ₁	2129.85	2350.89	2529.33	2774.61	2446.17 ^B	
T ₂	2167.27	2373.92	2611.36	2859.52	2503.02 ^B	
T ₃	2520.3	2691.98	2925.18	2302.63	2610.02 ^B	
T ₄	2239.01	2420.13	2661.34	2883.33	2550.95 ^B	
Mean of period (S)	2138.21 ^A	2334.48 ^{AB}	2572.74 ^B	2633.49 ^B		
ANOVA						
SV	DF	MSS	F-Value	SE(m)	CD (5%)	CV (%)
Treatment (T)	4	1503945.458	15.348**	78.26	221.57	12.7
Storage period (S)	3	1726648.172	17.621**	70	198.18	
TxS	12	2547.4917	0.026	156.52	NS	
Error	57	97989.702	–	–	–	

Table 2: Effect of Aloe Vera Juice Incorporation on Adhesiveness (g.s) of the Peda Samples During Storage at 37 ± 1 °C

Treatments	Adhesiveness (g.s)					
	Storage Period in Days (S)					
	0 th Day	3 rd Day	5 th Day	7 th Day	Mean of Treatments (T)	
T ₀	-16.86	-18.91	-22.31	-25.54	-20.90 ^A	
T ₁	-27.97	-31.32	-34.35	-37.72	-32.84 ^B	
T ₂	-29.66	-33.54	-37.22	-41.49	-35.47 ^{BC}	
T ₃	-46.23	-49.85	-53.2	-56.71	-51.49 ^C	
T ₄	-44.43	-48.24	-52.34	-56.54	-50.38 ^C	
Mean of period (S)	-33.03 ^A	-36.37 ^A	-39.88 ^{AB}	-43.60 ^B		
ANOVA						
SV	DF	MSS	F-Value	SE(m)	CD (5%)	CV (%)
Treatment (T)	4	2642.554	44.200**	1.93	5.47	-20.23
Storage period (S)	3	413.873	6.923**	1.73	4.9	
TxS	12	1.5604	0.026	3.87	NS	
Error	57	59.786	—	—	—	

compared to experimental samples while, T₄ had the highest adhesiveness value -50.38 g.s.

The adhesiveness values increased from -33.03 g.s on 0th day to -43.60 g.s on 7th day. During storage the adhesiveness value increased significantly at every stage of storage period. The increase in the adhesion could be due to the more in the moisture content in experimental samples. In one of recent study conducted by Londhe *et al.* (2012), initial adhesiveness value of laboratory made brown *peda* was observed to be 52.43 N.mm (5350 g.s). During storage at 30 °C *peda* packed in card board box lined with butter paper, the adhesiveness decreased to 39.46 N.mm (4026.5 g.s). Jha *et al.* (2012) reported that adhesiveness reduced significantly ($P < 0.01$) with the progress of storage period and it ranged between 107.53-76.24 g.s of during storage at 37 °C of 9 days.

Springiness

It is observed (Table 3) that treatment mean was not affected on springiness by the incorporation of *Aloe vera* juice. The springiness was found to be significant ($P \leq 0.05$) at every storage period. The *peda* samples showed significant ($P \leq 0.05$) increase in springiness from 0.179 to 0.270 during storage at 37 ± 1 °C for 7 days.

In one of recent study conducted by Londhe *et al.* (2012) the initial springiness value of laboratory made brown *peda* was 0.162 mm. During storage at 30 °C *peda* packed in (P₁) cardboard box lined with butter paper springiness increased to 0.233 mm in 20 days. While springiness value of same *peda* samples packed in (P₂) multilayer pouches increase to 0.178 mm after 30 days of storage and 0.198 mm after 40 days in (P₃) vacuum packed samples. Rapid increase in springiness value was observed in P₁ sample followed by P₃. Sample P₂ show the slower rate compare to P₁ and P₂. Springiness was the only textural attribute which had no correlation with any of the compositional parameters of the *khoa* (Gupta *et al.*, 1990; and Adhikari *et al.*, 1994).

Cohesiveness

The effect of *Aloe vera* juice incorporation on cohesiveness of the *peda* samples during storage at 37 ± 1 °C is shown in Table 4. Comparing treatment means, it can be noticed that T₄ had the highest cohesiveness value 0.233 and T₁ had the lowest cohesiveness value 0.193, while, it was found that the effect of *Aloe vera* juice incorporation on cohesiveness value was found to significant ($P < 0.05$) differed.

The cohesiveness value increased from 0.181 on 0th day to 0.242 on 7th day. During storage the cohesiveness values

Table 3: Effect of Aloe Vera Juice Incorporation on Springiness (mm) of the Peda Samples During Storage at 37 ± 1 °C

Treatments	Springiness (mm)					
	Storage Period in Days (S)					
	0 th Day	3 rd Day	5 th Day	7 th Day	Mean of Treatments (T)	
T ₀	0.178	0.201	0.232	0.265	0.219	
T ₁	0.172	0.194	0.231	0.259	0.214	
T ₂	0.184	0.215	0.248	0.272	0.229	
T ₃	0.171	0.202	0.236	0.27	0.219	
T ₄	0.191	0.216	0.249	0.284	0.235	
Mean of period (S)	0.179 ^A	0.205 ^B	0.239 ^C	0.270 ^D		
ANOVA						
SV	DF	MSS	F-Value	SE(m)	CD (5%)	CV (%)
Treatment (T)	4	0.0011	0.652	0.01	NS	19.11
Storage period (S)	3	0.0315	17.275**	0.01	0.03	
TxS	12	0.000036	0.02	0.02	NS	
Error	57	0.00182	–	–	–	

Table 4: Effect of Aloe Vera Juice Incorporation on Cohesiveness of the Peda Samples During Storage at 37 ± 1 °C

Treatments	Cohesiveness					
	Storage Period in days (S)					
	0 th Day	3 rd Day	5 th Day	7 th Day	Mean of Treatments (T)	
T ₀	0.177	0.183	0.201	0.219	0.195 ^B	
T ₁	0.168	0.181	0.201	0.223	0.193 ^A	
T ₂	0.168	0.221	0.238	0.257	0.221 ^D	
T ₃	0.185	0.208	0.23	0.251	0.218 ^C	
T ₄	0.2103	0.222	0.243	0.26	0.233 ^E	
Mean of period (S)	0.181 ^A	0.203 ^B	0.222 ^C	0.242 ^D		
ANOVA						
SV	DF	MSS	F-Value	SE(m)	CD (5%)	CV (%)
Treatment (T)	4	0.00497	4.955**	0.01	0.02	14.9
Storage period (S)	3	0.01349	13.449**	0.01	0.02	
TxS	12	0.00034	0.346	0.02	NS	
Error	57	0.001	–	–	–	

increased significantly at every storage period. Londhe *et al.* (2012) reported that cohesiveness value of laboratory

made brown *peda* was 0.153. During storage at 30 °C *peda* packed in cardboard box lined with butter paper

cohesiveness increased to 0.256 in 20 days. While the cohesiveness value of same samples packed in multilayer pouches increased to 0.155 after storage of 30 days and 0.185 after 40 days in vacuumed packed samples. Jha *et al.* (2012) observed that cohesiveness of *lal peda* ranged between 0.30-0.37 during storage at 37 °C for 9 days.

Gumminess

The effect of *Aloe vera* juice incorporation on gumminess of the *peda* samples during storage at 37±1 °C is shown in Table 5. Comparing treatment means, it can be noticed that T₃ had the highest gumminess value 641.76 g and T₀ had the lowest cohesiveness value 395.42 g, while, it was found that T₃ and T₄ were at par with each other However, T₀, T₁ and T₂ significantly different impact on gumminess.

The gumminess was found to significant (P≤0.05) at every stage of storage period. The *peda* samples showed significant (P≤0.05) increase in gumminess from 398.80 to 696.10 during storage at 37±1 °C for 7 days. Londhe *et al.* (2012) resulted that initial gumminess value of laboratory made brown *peda* was 13.17 N (1343.8 g). During storage at 30 °C *peda* packed in cardboard box lined with butter paper gumminess increased to 52.29 N (5335.71) in 20 days. While the gumminess value of same *peda* samples packed in

multilayer pouches increase to 14.92 N (1522.4 g) after 30 days of storage and 20.51 N (2056.1 g) after 40 days in vacuum packed samples. All samples showed an increasing trend during storage but the rate increase varied in all packaging techniques.

Chewiness

The effect of *Aloe vera* juice incorporation on chewiness of the *peda* samples during storage at 37±1 °C is shown in Table 6. Comparing treatment means, it can be observed that T₄ had the highest cohesiveness value 97.19 g.mm while, control T₀ had the lowest cohesiveness value 77.68 g.mm, it can be seen that T₀ and T₁ were at par with each other however T₂, T₃ and T₄ significant different on chewiness. The chewiness was found to significant (P≤0.05) at every stage of storage period. The *peda* samples showed significant (P≤0.05) increase in chewiness from 58.08 to 115.49 during storage at 37±1 °C for 7 days. It might be due to gradual increase hardness, cohesiveness and springiness value.

Effect of Storage at 37 ± 1 °C on Sensory Quality of the Control and Aloe Vera Juice Incorporated Peda Samples

Effect of *Aloe vera* juice incorporation on sensory quality

Table 5: Effect of Aloe Vera Juice Incorporation on Gumminess (g) of the Peda Samples During Storage at 37±1 °C

Treatments	Gumminess (g)					
	Storage Period in Days (S)					
	0 th Day	3 rd Day	5 th Day	7 th Day	Mean of Treatments (T)	
T ₀	289.07	338.28	434.76	519.58	395.42 ^A	
T ₁	362.75	432.29	516.05	625.05	484.03 ^B	
T ₂	371.7	550.61	645.55	753.73	580.39 ^C	
T ₃	480.73	578.59	688.86	818.88	641.76 ^D	
T ₄	489.78	562.08	666.32	763.28	620.36 ^D	
Mean of period (S)	398.80 ^A	492.37 ^B	590.31 ^C	696.10 ^D		
ANOVA						
SV	DF	MSS	F-Value	SE(m)	CD (5%)	CV (%)
Treatment (T)	4	169540.47	13.248**	28.28	80.07	20.78
Storage period (S)	3	326838.24	25.539**	25.3	71.62	
TxS	12	3311.054	0.259	56.56	NS	
Error	57	12797.696	–	–	–	

Table 6: Effect of Aloe Vera Juice Incorporation on Chewiness (g.mm) of the Peda Samples During Storage at 37 ± 1 °C

Treatments	Chewiness (g.mm)				
	Storage Period in days (S)				
	0 th Day	3 rd Day	5 th Day	7 th Day	Mean of Treatments (T)
T ₀	51.87	66.55	85.82	106.5	77.68 ^A
T ₁	52.34	68.46	84.9	106.17	77.96 ^A
T ₂	55.71	73.54	94.41	113.74	84.35 ^B
T ₃	63.03	78.05	101.62	122.63	91.33 ^C
T ₄	67.45	86.09	106.81	128.44	97.19 ^D
Mean of period (S)	58.08 ^A	74.54 ^B	94.71 ^C	115.49 ^D	

ANOVA						
SV	DF	MSS	F-Value	SE(m)	CD (5%)	CV (%)
Treatment (T)	4	1158.7657	30.524**	1.54	4.36	7.19
Storage period (S)	3	12376.7652	326.031**	1.38	3.9	
TxS	12	12.2491	0.323	3.08	NS	
Error	57	37.9619	—	—	—	

with respect to colour and appearance, body and texture, flavour, sweetness and overall acceptability of *peda* were studied during storage at 37 ± 1 °C, it was carried out at 0th, 3rd, 5th and 7th and the results are displayed in respective Tables.

Colour and appearance

The effect of *Aloe vera* juice incorporation on colour and appearance of the *peda* samples during storage at 37 ± 1 °C is shown in Table 7. Comparing treatment means, it was found that control (T₀) had the highest colour and appearance score of 8.15, while, T₄ had the lowest colour and appearance score 6.15. It was found that T₀, T₁ and T₂ were at par with each other; however T₃ and T₄ significantly different on colour and appearance score.

The colour and appearance score decreased from 7.87 on 0th day to 7.31 on 7th day. During storage the colour and appearance scores decreased significantly with at storage period. During storage after control (8.15), T₂ (8.10) was better colour and appearance scores. The decrease in colour and appearance of *peda* samples was due to loss of moisture from the surface indicating dull and dry surface, change in acidity and development of hydroxyl methyl furfural during storage. Jha *et al.* (2012) observed that *lal peda* samples

showed significant ($P \leq 0.05$) decrease in colour and appearance scores from 7.7 to 4.4 during storage at 37 °C for 9 days.

Body and texture

The effect of *Aloe vera* juice incorporation on body and texture of the *peda* samples during storage at 37 ± 1 °C is shown Table 8. Comparing treatment means, it can be seen that T₂ had the highest body and texture score of 8.28 while, T₄ had the lowest body and texture score of 6.72. It was found that T₀ and T₁ and also T₁ and T₂ were at par with each other. However T₂, T₃ and T₄ significantly different on body and texture score.

The body and texture score decreased from 8.16 on 0th day to 7.44 on 7th day. During storage the body and texture score decreased significantly at every stage of storage period. However during storage T₂ (8.28) had better body and texture scores than rest of the samples. The decrease in body and texture scores might be due to loss of moisture during storage, crystallization of sugar and lactose. Jha *et al.* (2012) reported that the body and texture score of *lal peda* decreased during storage, however it was found acceptable up to 9 days at 37 °C.

Flavour

The effect of *Aloe vera* juice incorporation on flavour of the

Table 7: Effect of Aloe Vera Juice Incorporation on Colour and Appearance of the Peda Samples During Storage at 37 ± 1 °C

Treatments	Colour and Appearance					
	Storage Period in Days (S)					
	0 th Day	3 rd Day	5 th Day	7 th Day	Mean of Treatments (T)	
T ₀	8.34	8.24	8.1	7.92	8.15 ^{CD}	
T ₁	8.5	8.33	7.89	7.56	8.07 ^C	
T ₂	8.39	8.12	7.98	7.91	8.10 ^C	
T ₃	7.41	7.26	7.07	6.84	7.14 ^B	
T ₄	6.7	6.6	6.46	6.31	6.51 ^A	
Mean of period (S)	7.87 ^D	7.71 ^C	7.50 ^B	7.31 ^A		
ANOVA						
SV	DF	MSS	F-Value	SE(m)	CD (5%)	CV (%)
Treatment (T)	4	8.6063	128.716**	0.06	0.18	3.4
Storage period (S)	3	1.193	17.850**	0.06	0.16	
TxS	12	0.0511	0.764	0.13	NS	
Error	57	0.0668	-	-	-	

Table 8: Effect of Aloe Vera Juice Incorporation on Body and Fexture of the Peda Samples During Storage at 37 ± 1 °C

Treatments	Body and Texture					
	Storage Period in Days (S)					
	0 th Day	3 rd Day	5 th Day	7 th Day	Mean of Treatments (T)	
T ₀	8.5	8.39	7.85	7.51	8.06 ^C	
T ₁	8.42	8.31	8.04	8.11	8.22 ^{CD}	
T ₂	8.42	8.32	8.25	8.16	8.28 ^D	
T ₃	7.91	7.71	7.72	7.03	7.59 ^B	
T ₄	7.54	7.14	6.82	6.4	6.72 ^A	
Mean of period (S)	8.16 ^D	7.97 ^C	7.73 ^B	7.44 ^A		
ANOVA						
SV	DF	MSS	F-Value	SE(m)	CD (5%)	CV (%)
Treatment (T)	4	4.8246	50.166**	0.08	0.22	3.96
Storage period (S)	3	1.9214	19.978**	0.07	0.2	
TxS	12	0.1602	1.667	0.16	NS	
Error	57	0.0961	-	-	-	

Table 9: Effect of Aloe Vera Juice Incorporation on Flavour of the Peda Samples During Storage at 37 ± 1 °C

Treatments	Flavour					
	Storage Period in Days (S)					
	0 th Day	3 rd Day	5 th Day	7 th Day	Mean of Treatments (T)	
T ₀	8.34	8.32	8.1	8.02	8.19 ^C	
T ₁	8.31	8	7.86	7.62	7.94 ^B	
T ₂	8.37	7.99	8.31	7.93	8.15 ^{BC}	
T ₃	7.99	7.84	7.81	7.26	7.72 ^B	
T ₄	7.84	7.07	7.24	6.37	7.13 ^A	
Mean of period (S)	8.17 ^C	7.84 ^B	7.86 ^B	7.44 ^A		
ANOVA						
SV	DF	MSS	F-Value	SE(m)	CD (5%)	CV (%)
Treatment (T)	4	3.0058	25.358**	0.09	0.24	4.4
Storage period (S)	3	1.785	15.059**	0.08	0.22	
TxS	12	0.1754	1.48	0.17	NS	
Error	57	0.1185	-	-	-	

peda samples during storage at 37 ± 1 °C is shown in Table 9. Comparing treatment means, it was observed that control (T₀) had the highest flavour score 8.19 as compared to experimental samples while, T₄ had the lowest flavour score 7.13. It was found that T₁ and T₂ were at par with each other. After control (T₀), T₂ had better flavour score 8.15.

The flavour score decreased from 8.17 on 0th day to 7.44 on 7th day. During storage the flavour score decreased significantly with at every stage of storage period. The flavour score was found to significant ($P\leq 0.05$) at every stage of storage interval but 3rd and 5th days of storage were at par with each other. After control (T₀), T₂ had the better flavour scores than rest of the experimental samples. It could be due to loss of freshness and development of off flavours. Sharma *et al.* (2003) observed that malai *peda* was stored at 32 ± 3 °C and relative humidity of 90% was acceptable up to the sixth day of storage on flavour basis. Londhe *et al.* (2012) reported that laboratory made brown *peda* stored in cardboard box lined with butter paper at 30 °C was acceptable up to 20 days on flavour basis. Flavour score of *lal peda* was found to be acceptable up to 9 days at 37 °C (Jha *et al.*, 2012).

Sweetness

The effect of *Aloe vera* juice incorporation on sweetness of

the *peda* samples during storage at 37 ± 1 °C is shown in Table 10. Comparing treatment means, it can be noticed that control (T₀) had the highest sweetness score 8.46 when compared to experimental samples while, T₄ had the lowest flavour score 7.96.

The sweetness score decreased from 8.40 on 0th day to 7.99 on 7th day. During storage the sweetness score decreased significantly with at every stage of increasing storage period. The sweetness score was found to significant ($P\leq 0.05$) at every stage of storage interval but 0th and 3rd and 5th and 7th days of storage were at par with each other. The decrease in sweetness might be due to hydrolysis of sugars by acids and also increasing total plate and yeast and mould counts during storage.

Overall Acceptability

The effect of *Aloe vera* juice incorporation on overall acceptability of the *peda* samples during storage at 37 ± 1 °C is shown in Table 11. Comparing treatment means, it was found that control (T₀) had the highest overall acceptability score 8.21 as compared to experimental samples while, T₄ had the lowest overall acceptability score 7.14. Overall acceptability score of T₂ was better after control.

The overall acceptability score decreased from 8.15 on

Table 10: Effect of Aloe Vera Juice Incorporation on Sweetness of the Peda Samples During Storage at 37 ± 1 °C

Treatments	Sweetness					
	Storage Period in Days (S)					
	0 th Day	3 rd Day	5 th Day	7 th Day	Mean of Treatments (T)	
T ₀	8.58	8.57	8.34	8.35	8.46 ^C	
T ₁	8.43	8.44	8.32	8.17	8.34 ^{BC}	
T ₂	8.53	8.42	7.95	8.11	8.25 ^B	
T ₃	8.22	8.3	7.85	7.6	7.99 ^A	
T ₄	8.25	8.03	7.84	7.72	7.96 ^A	
Mean of period (S)	8.40 ^B	8.35 ^B	8.06 ^{AB}	7.99 ^A		
ANOVA						
SV	DF	MSS	F-Value	SE(m)	CD (5%)	CV (%)
Treatment (T)	4	0.7589	8.833**	0.07	0.21	3.57
Storage period (S)	3	0.8512	9.908**	0.07	0.19	
TxS	12	0.0535	0.623	0.15	NS	
Error	57	0.0859	-	-	-	

Table 11: Effect of Aloe Vera Juice Incorporation on Overall Acceptability of the Peda Samples During Storage at 37 ± 1 °C

Treatments	Overall Acceptability					
	Storage Period in Days (S)					
	0 th Day	3 rd Day	5 th Day	7 th Day	Mean of Treatments (T)	
T ₀	8.44	8.38	8.1	7.95	8.21 ^C	
T ₁	8.42	8.27	8.03	7.87	8.14 ^C	
T ₂	8.43	8.21	8.12	8.03	8.19 ^C	
T ₃	7.88	7.78	7.61	7.18	7.61 ^B	
T ₄	7.58	7.21	7.09	6.7	7.14 ^A	
Mean of period (S)	8.15 ^D	7.97 ^C	7.79 ^B	7.54 ^A		
ANOVA						
SV	DF	MSS	F-Value	SE(m)	CD (5%)	CV (%)
Treatment (T)	4	3.5706	176.749**	0.04	0.1	1.81
Storage period (S)	3	1.3346	66.067**	0.03	0.09	
TxS	12	0.0373	1.847	0.07	NS	
Error	57	0.0202	-	-	-	

0th day to 7.54 on 7th day. During storage the overall acceptability score decreased significant ($P \leq 0.05$) at every storage period. The sensory scores decreased rapidly because of the continuous loss of moisture and resultant textural characteristics and oxidation of fat with the progression of storage period. In similar study on brown *peda* changes in sensory scores were attributed to the differences in the method of preparation and chemical composition, particularly fat and sugar levels in the final product (Londhe and Pal, 2008). Jha *et al.* (2012) resulted that overall acceptability was significant ($P < 0.01$) effect on storage temperature and it was decreased period of storage at 37 °C.

The interaction between treatment and storage was found to be non-significant for all the textural and sensory characters.

CONCLUSION

The level of *aloe vera* juice incorporation shows highly significant differences in textural and sensory characteristics of control and experimental *peda* samples. It might be due to grain formation, increased stickiness and more desiccation time with *aloe vera* juice added experimental *peda* samples. Similar changes in the experimental samples compared with laboratory sample during storage period i.e increase the textural values and reduce the sensory scores. The control had the better textural and sensory scores among the experimental samples, after control T₁ had the better textural score and T₂ had better sensory scores. *Peda* prepared with *aloe vera* juice incorporation levels of upto 10% gave satisfactory results. The produced *Peda* with the incorporation of *aloe vera* juices would benefit the consumer to reduce the cardiovascular diseases.

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