



Effect of *Aloe vera* incorporation on chemical and microbial characteristics of fresh *Peda*

KEERTHI SRIKANTH, S. KARTIKEYAN AND ADARSH M. KALLA

ABSTRACT : The present investigation was intended to study the effect of incorporation of *Aloe vera* juice on chemical and microbial characteristics of *Peda*. The *Peda* was prepared from standardised buffalo milk and experiment was laid out in Completely Randomized Design with five treatments: 0 per cent control sample (T_0), 5 per cent (T_1), 10 per cent (T_2), 15 per cent (T_3) and 20 per cent (T_4) incorporation of *Aloe vera* juice to *Peda*, by weight of *Khoa* after patting stage. The fresh *Peda* samples were analysed for chemical (moisture, fat, protein, ash and acidity) and microbial (total plate, yeast and moulds and coliform counts) qualities. The control had lowest moisture (15.42%), ash (2.66%) and acidity (0.55% of LA) as compared to experimental samples, while T_4 had the highest moisture (16.98%), ash (2.89%) and acidity (0.60% LA). However, carbohydrate content decreased and there was no significant difference in fat, protein and ash with incorporation of *Aloe vera* juice as compared to control. Though the moisture, acidity and total carbohydrate were influenced by the level of *Aloe vera* juice incorporation, it remained within the FSSAI standards. The total plate count and yeast and mould count of T_0 sample was significantly higher than the other samples.

KEY WORDS : *Peda*, *Khoa*, *Aloe vera*, Chemical, Microbial qualities

HOW TO CITE THIS PAPER : Srikanth, Keerthi, Kartikeyan, S. and Kalla, Adarsh M.(2017). Effect of *Aloe vera* incorporation on chemical and microbial characteristics of fresh *Peda*. *Res. J. Animal Hus. & Dairy Sci.*, 8(1) : 20-25 : DOI: 10.15740/HAS/RJAHDS/8.1/20-25.

INTRODUCTION

The food industry is growing at a rapid rate and consumers have changed their view towards processed foods. The consumers have a negative attitude toward processed foods and they are moving towards local and organic alternatives (Shafie and Rennie, 2012). This shift is attributed, to the growing concern towards health and nutrition, which has lead to the de-selection of many foods

and beverages. A large number of food industries and research institutes have experimented and developed new products with functional properties to meet the present consumer demand. The dairy industry is one among them, which produces large variety of milk based sweets and beverages. India is one of the largest dairy product consumer in the world. India's traditional dairy product (TDP) sector poised for rapid expansion with modern process technologies. The consumption of TDP is likely to grow at an annual growth rate of more than 20 per cent (Gavhane *et al.*, 2014).

The development of functional food is thus, unique to contribute opportunities for the improvement of the quality of food, consumer health and well-being (Frewer *et al.*, 2003). Now-a-days, more and more people are adopting herbal way of life for their health benefits. There are many plants and herbs that have unique functional

MEMBERS OF RESEARCH FORUM

Address for correspondence :

Adarsh M. Kalla, Southern Regional Station, ICAR-National Dairy Research Institute, Adugodi, BENGALURU (KARNATAKA) INDIA
Email : Adarshkalla002@gmail.com

Associated Authors' :

Keerthi Srikanth, Department of Dairy Technology, College of Dairy Science and Food Technology, CGKV, RAIPUR (C.G.) INDIA
Email : keerthisrikanth017@gmail.com

S. Kartikeyan, Department of Dairy Technology, College of Dairy Science and Food Technology, CGKV, RAIPUR (C.G.) INDIA

properties, these functional ingredients can be used for formulation of many functional dairy products and enhance their functional characteristics. *Aloe vera* is one of them and is 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 (Manhoran and Ramaswamy, 2013). *Aloe vera* gel is a clear thin gelatinous material that is present inside the *Aloe vera* leaves. *Aloe vera* juice has many health benefits. 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, anti-bacterial, anti-viral, anti-diabetic, anti-carcinogenic, anti-inflammatory and also natural healer (Manoharan *et al.*, 2012). *Aloe vera* has been used as a functional and therapeutic ingredient in many foods and dairy products (Boghani *et al.*, 2012).

The bio molecules present in *Aloe vera* extract has encouraged researchers to use these as functional ingredients for formulation of functional foods (Sasikumar, 2013). Looking at its functional, therapeutic and bland flavour in nature, *Aloe vera* is more suitable for incorporation in various food formulations. So far no study with respect to incorporation of *Aloe vera* juice in the manufacture of *Peda* has been reported. Therefore, the present investigation is aimed to develop good quality *Peda* by incorporating *Aloe vera* juice and to evaluate the chemical and microbial characteristics of developed *Peda*.

MATERIAL AND METHODS

The work was carried out in the Department of Dairy Technology of College of Dairy Science and 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 per cent fat and 9.0 per cent SNF before product manufacture. The average chemical composition of buffalo milk is given in the Table A. 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/gel was extracted and used in the study.

Table A : Average chemical composition of buffalo milk

Constituents	Per cent*
Fat	6.2
SNF	9.45
Protein	3.75
Lactose (by weight difference)	5.0
Ash	0.7
Titrateable acidity (% LA)	0.15
Total solids	15.65

*Average of four replications

Preparation of *Aloe vera* juice :

Aloe vera juice/gel was extracted as per the procedure outlined by (Ramachandra and Srinivasa, 2008). Firstly the fresh *Aloe vera* leaves were washed for 3-4 times. The lower leaf base was cut by 1 inch, the tapering point at the leaf top was cut by 2-4 inches and finally the short spines located along the margins were removed. They leaves were cut into small pieces and pulp was removed from the cuticle and blended so as to get homogenous *Aloe vera* juice/gel. The average chemical composition of *Aloe vera* juice is depicted in the Table B.

Table B : Average chemical composition of *Aloe vera* juice

Constituent	Per cent*
Moisture	98.5
Total solids	1.5
Acidity (%)	0.35
pH (Not in %)	4.30

*Average of four replications

Preparation of *Khoa* and *Peda* :

Khoa and *Peda* were prepared as per the methodology given by Gavhane *et al.* (2014) with slight modification; where in *Aloe vera* juice/gel was incorporated at different levels (0%, 5%, 10%, 15% and 20%) during *Khoa* pat formation stage (Fig. A). The sugar was incorporated at constant level @ 30% by weight of *Khoa* basis. Based on the sensory evaluation of *Peda*, the level of *Aloe vera* incorporation was restricted to a maximum of 20 per cent 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

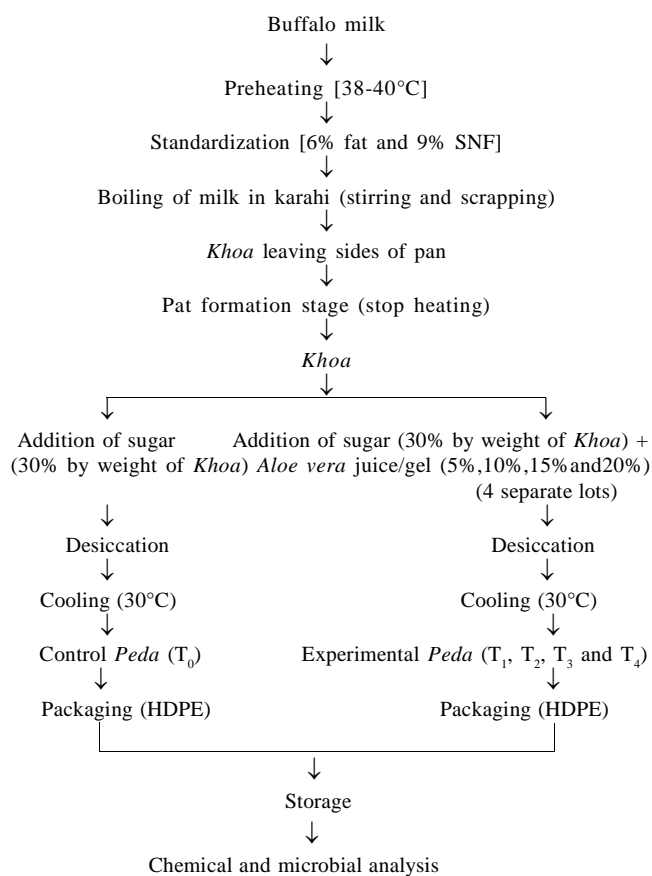


Fig. A: Preparation of *Aloe vera* incorporated *peda*

–T₃ - *Khoa* + *Aloe vera* juice @15% on *Khoa* weight basis

–T₄ - *Khoa* + *Aloe vera* juice @20% on *Khoa* weight basis.

Treatment 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 experiment was replicated 4 times. The control and *Aloe vera* incorporated *Peda* samples were packed in HDPE (Thickness is 98.5µm) and samples were subjected to chemical and microbial analysis.

The *Peda* samples were chemically analyzed for moisture (IS: 2785, 1964), fat (IS: 1224, Part II, 1977), acidity (IS, 18 Part (XI) (1981), protein (Meneffee and Overman, 1940) and ash (A.O.A.C., 1975). Total plate count, yeast and mould counts were enumerated using standard procedure (ISI: 5402, 5403, 1969) and Coliform

count by (Chalmers, 1955) by MecConkey's broth medium. The experiment was replicated 4 times and the data were subjected to statistical analysis using Randomized Block Design with 5 treatments (1 control +4 mixed ratios).

RESULTS AND DISCUSSION

The results of the present study as well as relevant discussions have been presented under following sub heads:

Effect of *Aloe vera* juice incorporation on the chemical composition of fresh *Peda* :

For chemical analysis of *Aloe vera* incorporated *Peda* moisture content, fat, protein, ash and acidity were considered. The Table 1 depicts the results obtained for various chemical analysis of *Aloe vera* incorporated *Peda*.

Moisture :

The effect of *Aloe vera* juice incorporation on moisture content of *Peda* is depicted in Table 1. This shows an increasing trend in moisture content with increase in level of incorporation of *Aloe vera* juice. The control sample (T₀) had minimum moisture content of 15.42 per cent and highest moisture content of 16.98 per cent was obtained at 20 per cent level of incorporation in T₄ sample. The effect of *Aloe vera* juice incorporation on moisture content of *Peda* samples reflected that it differed significantly (P≤0.05) and were at par with each other. The increasing trend might be ascribed to more moisture content in *Aloe vera* juice (higher incorporation) and also difference in desiccation temperature and duration. The recorded value on moisture content of control *Peda* sample is in proximate with the values reported for control *Peda* by Jha *et al.* (2012). In view of the fact that there is no evident study available on *Aloe vera* incorporated *Peda* hence, the present values of experimental samples could not be compared. However, Ghule *et al.* (2013) reported that increasing the level of incorporation of bottle gourd pulp increased the moisture content (18.32-23.04%) of the *Peda* samples.

Acidity :

The results pertaining to the effect of *Aloe vera* juice incorporation on the acidity of *Peda* samples presented in Table 1 reflected that it differed significantly

($P \leq 0.05$) by level of *Aloe vera* juice incorporation. The increasing trend in acidity was observed with increase in level of *Aloe vera* juice addition. The control sample (T_0) had the lowest acidity of 0.50 per cent LA, while T_4 sample (20% *Aloe vera* juice) had the highest acidity of 0.60 per cent LA. The increasing trend in the acidity may be attributed to the acidic compounds that are initially present in *Aloe vera* juice which might have increased the acidity of *Peda* samples. These findings are supported by Manhoran and Ramaswamy (2013) who reported that *Aloe vera* contained uronic acid, salicylic acid and phenolic compounds which were responsible for the increase in acidity (0.22 to 0.31 % LA) of the ice cream. These results were further supported by Singh *et al.* (2012) who prepared *Aloe vera Lassi* and reported that there was an increase in titratable acidity with increasing the level of *Aloe vera* juice in milk (0 to 15%).

Fat, protein and ash :

It is observed (Table 1) that fat, protein and ash contents were not affected by the incorporation of *Aloe vera* juice as evident by non-significant difference existed among fresh *Peda* samples.

Effect of *Aloe vera* juice incorporation on microbiological quality of fresh *Peda* :

The total plate count, yeast and mould count and coliform count were considered for microbial analysis of *Peda* samples. The Table 2 depicts the results obtained various microbial analysis of *Aloe vera* incorporated *Peda*.

The statistical results regarding the effect of incorporation of *Aloe vera* juice on total plate count and yeast and mould count reveals that the incorporation of *Aloe vera* juice showed significant ($P \leq 0.05$) influence on the total plate count and yeast and mould count. The total plate count decreased with increase in *Aloe vera* juice incorporation, the highest total plate count was observed in control sample T_0 of 3.85 \log_{10} cfu/g and lowest in T_4 sample of 3.48 \log_{10} cfu/g. Similar decreasing trend was observed in yeast mould count with increase in incorporation of *Aloe vera* juice. The highest yeast and mould count was observed in control sample T_0 of 3.60 \log_{10} cfu/g and lowest in T_4 sample of 3.28 \log_{10} cfu/g.

The decreasing trend in total plate count and yeast and mould count may be attributed to the fact that, the anti-microbial and anti-fungal agents namely saponins,

Table 1 : Effect of *Aloe vera* juice incorporation on the chemical composition of fresh *Peda*

Treatments	Moisture	Fat	Protein	Ash	Acidity
T_0	15.42 ^A	16.55	16.40	2.66	0.50 ^A
T_1	16.00 ^B	16.61	16.33	2.70	0.54 ^{AB}
T_2	16.20 ^{BC}	16.60	15.77	2.79	0.59 ^C
T_3	15.95 ^B	16.58	16.17	2.80	0.59 ^C
T_4	16.98 ^C	16.70	16.17	2.89	0.60 ^C
F-values	13.886**	0.073	1.136	2.354	6.056**
S.E.±	0.1519	0.2044	0.2256	0.0774	0.0167
C.D. (P=0.05)	0.47	NS	NS	NS	0.05

* and ** indicate significance of value at P=0.05 and 0.01, respectively

NS= Non-significant

Table 2 : Effect of *Aloe vera* juice incorporation on the microbial quality of fresh *Peda*

Treatments	Total plate count (\log_{10} cfu/g)	Yeast and mould count (\log_{10} cfu/g)
T_0	3.85	3.60
T_1	3.71	3.54
T_2	3.68	3.49
T_3	3.57	3.41
T_4	3.48	3.28
F-values	34.410**	15.165**
S.E.±	0.0244	0.0323
C.D. (P=0.05)	0.08	0.10

*and ** indicate significance of value at P=0.05 and 0.01, respectively

fatty acids, glucomannan and acemannan present in *Aloe vera* juice might have reduced their growth and hence, decreased their count. The present study was supported by Habeeb *et al.* (2007) demonstrated that *Aloe vera* inner gel possessed anti-microbial properties against both Gram-positive and Gram-negative bacteria. These findings were further supported by Manhoran and Ramaswamy (2013) who prepared *Aloe vera* (pulp) ice cream with natural colour and different level of artificial sweeteners and concluded that increasing the level of *Aloe vera* pulp incorporation resulted in decreased standard plate count.

Coliforms were absent in all *Peda* samples, which is an indicative of hygienic practices during manufacturing process.

Conclusion :

The control had lowest moisture (15.42 %), ash (2.66 %) and acidity (0.55% of LA) as compared to experimental samples, while T₄ had the highest moisture (16.98%) and ash (2.89%), acidity (0.60 % LA). The incorporation of *Aloe vera* juice on *Peda* samples with respect to fat, protein and ash have not shown any statistical difference as compared to control. The control had highest overall acceptability score than experimental samples. However, among experimental samples the Fresh *Peda* with 10 per cent *Aloe vera* juice incorporation gave better sensory scores. *Aloe vera* juice at 10 per cent level could be incorporated to produce good quality *Peda* (sensory and microbial) without adversely affecting the chemical composition and sensory qualities finished product. The increased level of *Aloe vera* juice incorporation decreased the total plate count and yeast and mould count.

Acknowledgement:

It is my profound privilege to acknowledge gratitude and indebtedness to major advisor Dr. S. Kartikeyan, Professor, Department of Dairy Technology for valuable guidance and my advisory committee me, Dr. B. K. Goel, Professor, Department of Dairy Technology, Dr. .K. Agrawal, Professor, Department of Dairy Engineering, Dr. S. D. Pophaly, Asst. Professor, Department of Dairy Microbiology for their constructive suggestions. I greatly acknowledge that Department of Medicinal and Aromatic plants, IGKV, Raipur (C.G) for providing fresh *Aloe vera* leaves for my research work.

LITERATURE CITED

- A.O.A.C. (1975). *Official methods of analysis of the association of official analytical chemists*. Pub.Association of Official Analytical Chemists, Washington, U.S.A.
- Boghani, A.H., Raheem, A. and Hashmi, S.I. (2012). Development and storage studies of blended papaya-*Aloe vera* ready to serve (RTS) Beverage. *J. Food Process. Technol.*, **3**(10):1-4.
- Chalmers, C.H. (1955). *Bacteria in relation to milk supply*. Edward Arnold, Publisher Ltd. London 4th Ed.
- Frewer, L., Scholderer, J. and Lambert, N. (2003). Consumer acceptance of functional foods: issues for the future, *British Food J.*, **105** (10) : 714-731.
- Gavhane, M.S., Kamble, N.S., Desale, R.J., Ghule, B.K. and Mule, P.R. (2014). Studies on preparation of *Peda* with ginger powder. *Internat. J. Food Agric. Vet. Sci.*, **4** (2): 64-68.
- Ghule, B. K., Desale, R. J. and Awaz, B. H. (2013). Studies on preparation of bottle gourd *Peda*: A Review. *Asian J. Dairy & Food Res.*, **32**(4) : 328-331.
- Habeeb, F., Shakir, E., Bradbury, F., Cameron, P., Taravati, M.R., Drummond, A.J., Gray, A.I. and Ferro, V.A. (2007). Screening methods used to determine the anti-microbial properties of *Aloe vera* inner gel. *Methods*, **42**(4): 315-320.
- ISI: 2785 (1964). *Specification for ice-cream* (Indian Standard Institution, Manak Bhavan, NEW DELHI, INDIA.
- ISI (1969). *IS: 5402, Indian standard method for plate count of bacteria in food stuffs*. Manak Bhavan, NEW DELHI, INDIA.
- ISI (1969). *IS: 5403, Indian standard method for yeast and mould count in food stuffs*. Manak Bhavan, NEW DELHI, INDIA.
- ISI: 1224 (Part II) (1977). *Determination of fat by gerbers method* (Part II) Indian Standard Institution (Manak Bhavan, NEW DELHI, INDIA.
- IS, 18 Part (XI) (1981). *Hand book of food analysis*. Analysis of Dairy products. Bureau of Indian Standards, NEW DELHI, INDIA.
- Jha, A., Kumar, A., Jain, P., Om, H., Singh, R. and Bunkar, D.S. (2012). Physical-chemical and sensory changes during storage of *Lal Peda*. *J. Food Sci. Technol.*, **63**(5): 17-19.
- Manoharan, A.D., Ramasamy, C., Kumar, Naresh, Dhanalashmi, B. and Balakrishnan, V. (2012). Organoleptic evaluation of herbal ice creams prepared with different inclusion levels of *Aloe vera* pulp. *Indian J. Med. & Healthcare*, **1**(2): 25-28.
- Manhoran, A.D. and Ramaswamy, C. (2013). Physico-chemical, microbial and sensory analysis of *Aloe vera* (pulp) ice cream with natural colour in different artificial sweeteners, *Indian J. Fund & Appl. Life Sci.*, **3** (2) : 114-121.

- Meneffee, S.G and Overman, O.R. (1940). A semi-micro kjeldhal method for determination of total nitrogen in milk. *J. Dairy Sci.*, **23**(A) 143-147.
- Ramachandra, C.T. and Srinivasa, R.P. (2008) Processing of *Aloe vera* Leaf Gel: A Review. *Am. J. Agril. & Biol.Sci.*, **3** (2): 502-510
- Sasikumar, R. (2013). Effect of processing on physio-chemical and sensory parameters of low calorie therapeutic RTS beverage blend of *Aloe vera* and *Aonla* fruit using artificial sweeteners. *As. J. Food Ag-Indian*, **6**(6): 337-346.
- Shafie, A.F. and Rennie, D. (2012). Consumer perceptions towards organic food. *Procedia - Social & Behavior. Sci.*, **49**: 360-367.
- Singh, T.P., Kumari, S. and Sethi, S. (2012). Development of *Lassi* containing *Aloe vera* juice and its quality characteristics. *J. Dairy. Foods & HS*, **31**(1): 1-4.

Received : 08.02.2017; **Revised:** 06.05.2017; **Accepted :** 20.05.2017