

# Aloe Vera Gel as a Natural Preservative on the Shelf life of Flavored Pasteurized Milk

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**Abstract** - All over the world liquid milk is the largest consumed liquid dairy product due to its palatability, nutritious value and easy availability. The demand for functional foods with prolonged shelf life and without chemical preservatives has increased around the world. Recently, processing of Aloe vera gel converted to a big industry owing to its applications in the food industry. In this scenery, the present study was carried out to check the effect of Aloe vera as a preservative agent on the sensory attributes of flavored pasteurized milk. The natural Aloe Vera is *barbadensismillar* extract used as the functional ingredient and preservative agent. The product was developed by incorporating 5% of Aloe vera pulp. The organoleptic properties of the product such as appearance, flavor, aroma, texture/ mouth-feel, overall-taste, overall-acceptability and consumer acceptance were observed in every 7 days. Microbial parameters such as aerobic plate count and coliform count and physicochemical parameters such as pH, total solids, total soluble solids, and discoloration were examined every 5 days interval to evaluate the safety and keeping quality of the product. The data obtained were analyzed statistically. Aloe vera incorporated flavored pasteurized milk was accepted by the sensory panelists. All sensorial attributes tested in the formulated product during the storage period scored above 7 in nine-point hedonic scale which revealed that the product was towards the "extremely-like" category. Although the shelf life of pasteurized liquid milk product is 14 days, but here, until the storage period of 21 days there was no significant difference in all analyzed parameters and matched with the Sri Lankan standard for flavored pasteurized milk. So the study led to the conclusion that the Aloe vera has a preservative effect in the pasteurized milk.

**Key Words:** Aloe vera, Consumer, Functional, Preservative

## 1. INTRODUCTION

Milk is the normal secretion of the mammary glands of all mammals, which is commonly used to nourish the young ones of the species (Potter and Hotchkiss, 1995). It supplies essential nutrients and is an important source of dietary energy, high-quality proteins and fats. It is considered as an important part of daily nutrition and especially important food among all age groups because of its unique nutritional properties. As it is a unique substance, it can be consumed as fluid milk with minimal processing.

People all over the world are becoming more health conscious and moving towards herbal products (Kumar, 2017) due to the increasing knowledge and awareness about the advantages of herbal components. Nowadays, general public demand to reduce the use of chemical preservatives or additives in food or feed (Brul and Coote, 1999). Instead, consumers require high quality, preservative free, safe, but mildly processed food with extended shelf life. In addition, present legislation restricted the use of some currently accepted preservatives in different foods (Brul and Coote, 1999). The demand for functional foods with prolonged shelf life and without chemical preservatives has been increased around the world. Although a number of artificial preservatives have been used to preserve food freshness, the natural preservatives are believed to be the first to use.

Recently, processing of Aloe vera gel converted to a big industry owing to its applications in the food industry. Aloe vera is one of the oldest known medicinal plants gifted by nature which is often called as miracle plant, and known by many names. Over 200 types of Aloe vera varieties are available and of these only 4 or 5 are commonly used in medicine and food (Wijesundara and Adikari, 2017). The most widely used variety of Aloe vera for food and medicine is *Aloe vera barbadensismillar* (More et al., 2017). Aloe vera incorporation is considered as a dietary supplementation and functional ingredient in many food products including beverages, yoghurt, milk, ice creams, confectionary etc.

The inclusion of physiologically active natural components with beneficial effects on health strengthens the nutritional value of milk beverages along with the preservative action. Therefore, the addition of Aloe vera gel makes it possible to produce functional foods from milk by keeping their chemical, physical and sensorial characteristics and fortifying their nutritional value by introducing biologically active components, in a controlled way by allowing fast compositional changes. Moreover, Food and Drug Administration (FDA), in the United States has approved the internal use of gel as a "dietary supplement" and also in the European Commission (EC) according to Annex I of Regulation No 1831/2003 (Elbandy, Abed and Gad, 2014).

The previous researches proved that Aloe vera worked through combination of mechanisms and it composed of most of the polysaccharides which acts as a natural barrier to moisture and oxygen which speed food deterioration. Also it enhances food safety because it contains antibiotic and

antifungal compounds that potentially delay or inhibit the microorganisms that are responsible for food spoilage. So, this study was conducted to check the effect of *Aloe vera* gel as a natural preservative on the shelf life of flavored pasteurized milk.

## 2. MATERIALS AND METHODS

### 2.1 Preparation of Aloe (*Aloe vera barbadensis*) incorporated pasteurized milk and its evaluation

Extraction and preservation of pure *Aloe vera* juice were prepared by using freshly harvested leaves. Aloe vera incorporated pasteurized flavored milk beverage was prepared with 5% of *Aloe vera* pulp according to standard procedures (Vithushana *et al.*, 2020). The organoleptic, physicochemical and microbiological qualities were considered during the study.

The freshly prepared *Aloe vera* incorporated milk was analyzed every five days for pH, total soluble solids, total solids during storage to find the effect of storage on its chemical composition. pH was determined with the help of the pH meter. The total soluble solids were determined by using a hand refractometer at room temperature and total solids were analyzed by using moisture analyzer.

Microbiological studies were conducted at every five days of storage. Aerobic plate count, and E.Coli were undertaken. Standard procedure according to AS 1766:1991; Section 2.1 used for Aerobic plate count and Standard procedure according to IDF Standard 73 A: 1985 (Method A) used for coliform detection.

Once in every seven days, sensory evaluation was done with 30 semi-trained panelists along with ballot paper prepared as nine-point hedonic scale. Sensory qualities such as appearance, overall taste, aroma, flavor, texture/ mouth-feel, and overall acceptability were evaluated. The samples were given three digit random numbers and placed in plastic cartons and served in random order to panelists.

### 2.2 Data analysis

Gathered data through ballot paper prepared as nine-point hedonic scale was analyzed by using Microsoft application package MS Excel 2010 and the data analyzed were interpreted through the Radar chart.

Sensory evaluation data which obtained every seven days of storage period were analyzed by Kruskal–Wallis test by ranks non-parametric test in SPSS software package with 95% confidence interval. Statistical significance was declared at  $P < 0.05$ .

## 3. RESULTS AND DISCUSSION

### 3.1 Physico- chemical evaluation

**Table-3.1:** Physicochemical evaluation of the product during the storage period

Parameters	Day 1	Day 5	Day 10	Day 15	Day 21
pH	04.55 ± 0.01	04.58 ± 0.01	04.59 ± 0.01	04.58 ± 0.01	04.53 ± 0.01
Total solids (%)	13.79 ± 0.00	13.80 ± 0.00	13.83 ± 0.00	13.52 ± 0.00	13.40 ± 0.00
Total soluble solids (%)	13.50 ± 0.00	13.10 ± 0.00	13.20 ± 0.00	13.02 ± 0.00	13.08 ± 0.00
Discoloration	No	No	No	No	No

During the storage period, pH of flavored pasteurized milk was in the range of 4.53- 4.59 and total solids (%) of flavored pasteurized milk was in the range of 13.40 – 13.83. Amount of total solids present in *Aloe vera* was 3.69% (Elbandy, et al. 2014). According to SLS 917. 1991, the total solids should be around 14% for milk added pasteurized drinks. The average total solids of this product were matched between the SLS specifications up to 21 days of storage. Total soluble solids (%) of this product were ranged between 13.02 – 13.50. Amount of total soluble solids present in *Aloe vera* was 3.00% (Elbandy, et al. 2014). Aloe vera pulp may undergoes discoloration with storage (Mudgil, et al. 2016) but in this flavored pasteurized milk, there was no any color change observed up to 21 days of storage period.

### 3.2 Microbial evaluation

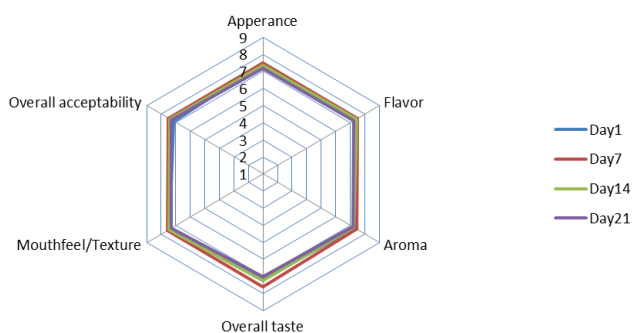
**Table-3.2:** Microbial evaluation of the product during the storage period

Parameters	Day 1	Day 5	Day 10	Day 15	Day 21
Aerobic plate count (cfu/ml)	18	106	230	116	119
Coliform count (cfu/ml)	0	0	0	0	0

Microbial evaluation of this product was analyzed by calculating aerobic plate count and coliform count. As in table 3.2, highest aerobic plate count was observed in 10<sup>th</sup> day with the count of 230. The coliform count was zero throughout the storage period. According to SLS 181. 1983 the APC should be less than 30000 cfu/ml and coliform

count should be less than 1. This product consisted with the APC ranged from 18 – 230 cfu/ml. The counts were much lesser than the standard levels and it was matched with the microbial specification for milk added pasteurized drinks. The incorporation of *Aloe vera* not only contributed towards safety of foods but also prevented them from microbial spoilage (Aslam *et al.*, 2018). Because of the variety of antimicrobial compounds present in *Aloe vera* gel, antimicrobial activity is exhibited due to their synergistic effect (Lawrence *et al.*, 2009 cited in Aslam *et al.*, 2018). Thus, it was coincided with the concept that *Aloe vera* gel could be utilized for bio-fortification of various foods as a source of antioxidant rich ingredient, nutraceuticals or as a natural preservative (Elbandy, Abed and Gad, 2014).

### 3.3 Sensory evaluation



**Figure-3.1:** Radar graph for sensory mean scores of the product during the storage period

When quality of a food product is assessed by means of human sensory organs, the evaluation is said to be sensory or subjective. Sensory evaluation is the only method for getting correct opinion of the target population and consumer acceptance of the product and there are different rating scales used for testing the product acceptance, out of these the hedonic scale is mostly used (Elbandy *et al.*, 2014). Sensory evaluation of the product was conducted initially and weekly which includes appearance, aroma, mouth feel/texture, flavor, overall taste as well as the overall acceptability. In 9 point hedonic scale sensory evaluation, the rank seven is considered as the mid-point between neither like nor dislike and like extremely (Vithushana *et al.*, 2020). According to the sensory evaluation results, this product was in the like extremely category and there was no significant difference between the considered attributes up to 21 days. Therefore all the sensory attributes are in consumer preferred range until 21 days.

Shelf life of the flavored pasteurized milk was 14 days and it was the recommended shelf life for pasteurized liquid milk products under the storage condition of 4 °C (Goff and Griffiths, 2006), but here the product was acceptable for consumption until 21 days in terms of physicochemical, microbial and sensory attributes.

## 4. CONCLUSION

In this present investigation, efforts were made to investigate the effect of *Aloe vera* as a natural preservative in pasteurized flavored milk. The product possessed good overall acceptability, physicochemical, and microbial properties up to 21 days. So the shelf life of the product was 21 days and it can be proved that *Aloe vera* acted as natural preservative in pasteurized flavored milk.

## 5. SCOPE OF FUTURE WORK

In future, studies on the effectiveness of *Aloe vera* to extend the shelf life of UHT treated flavored milk can be possible.

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