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Development and quality evaluation of guava leather incorporated with aloe vera (*Aloe barbadenis miller*)

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Abstract
The present investigation was carried out to assess the quality of developed guava leather incorporated with different level of aloe vera (5%, 10%, 15% and 20%) and guava (95%, 90%, 85% and 80%) stored in LDPE and butter paper at ambient temperature for 30 days. Physiochemical, microbiological characteristics and sensory evaluation of packed guava aloe vera leather were done at 10 days intervals for 30 days. Physiochemical constituents in guava aloe vera leather were analyzed, results depict that there was slight increase in TSS, total sugar, reducing sugar, β-Carotene while decrease in moisture content, pH, ascorbic acid and no change in ash value for the study period of 30 days storage. Five different with variation in aloe Vera and guava pulp are conducted for experiment. Treatments were rated on 9 point hedonic scale by sensory panel member for study period of 30 days. The treatment T_1 secured the highest sensory score *viz*. colour (8.8), texture (8.8), taste (8.9), flavor (9.0), overall acceptability (9.0). However, it was found to be acceptable in good condition even after 30 days of storage.

Keywords: Guava, aloe vera, physiochemical constituents, 9 point, leather, LDPE

1. Introduction
Fruit leather is a form of dehydrated fruit-based product. They have slightly chewy nature. Fruit leathers are made by placing puree on a flat surface and left it for drying until the fruit puree undergoes with the additive changes. This dried puree is known as leather, which has shiny texture. Fruit leathers are rich in nutrients and often considered as a heath food.
Guava (*Psidium guajava* L.) is a tropical fruit which has sweet aroma, tangy flavour, and rich in vitamin C and dietary fibres. In 2019, India contributed 45% in the total production of guava in the world. In recent years guava cultivation has become popular due to international trade, nutritional value and value added products. Major guava producing states are Uttar Pradesh, Maharashtra, Bihar, Andhra Pradesh, Gujarat, Madhya Pradesh and Karnataka (Basha *et al.*, 2018) [5].
Aloe vera (*Aloe barbadenis miller*) is a plant species of genus aloe, family Liliaceae, and contains more than 300 species. Aloe vera has a long history of popular and traditional use. Aloe vera was originated in tropical Africa and it is now cultivated in warm climate areas of Asia, Europe and America. It is one of little herbal medicine in common uses. Aloe vera is being explored as a potential ingredient in a wide array of health foods. Aloe vera has been reported to be a source of active substances including vitamins, minerals, enzymes, sugars, Anthraquinones of phenolic compounds, lignin, saponins, sterols, amino acids and salicylic acid.
For making guava aloe vera leather guava pulps and aloe vera gel are mixed with adequate quantities of sugar, pectin, citric acid, and color and then dried into sheet shape and sometime rolled also. Sugar plays an important role it gives a sweeter taste to the product and increases the solid content; then pectin is added to thicken the pulp, which modifies the smooth glossy and flexible texture of the product and also ensures the retention of the shape of the leather. For drying of leather sun drying is generally used. Sun drying allows the final product to be translucent appearance and gummy texture.
Fruit leather consumption is very cost effective and better substitute of natural source of various nutritional elements (Diamante *et al.*, 2014) [13]. As we know that fresh fruits have very less shelf life, so it necessary to preserve the fruits by processing it and it also results in maintain the product price and availability in off season. Fruit leather is a form of dehydrated fruit based product. They have slightly chewy nature. Fruit leathers are made by placing puree on a flat surface and left it for drying until the fruit puree undergoes with the additive changes.

This dried puree is known as leather, which has shiny texture. Fruit leathers are rich in nutrients and often considered as a heath food. The prepared leather will be affordable for every class of people and it can also be stored for longer duration of time without adding preservatives to it. For the preparation of guava pulp with easier technology and its processing in the form of leather is very much acceptable.

2. Materials and Methods

2.1 Procurement of raw material

The fully ripened, freshly harvested guavas and aloe vera gel, sugar, citric acid was purchased from the local market in Prayagraj, India. Guava fruit was cut manually and the weight of peel, seeds and pulp were taken separately to determine the weight of pulp in the fruit.

2.2 Preparation of guava leathers: The guava fruit pulp will be used for the preparation of fruit leather. In the pulp sugar, salt as per the formula added, mixed well and then smeared on the aluminium or stainless-steel trays. Spread the pulp in thin layer (0.5 to 1.0 cm thick). Then the pulp will be dried in hot air oven at 50ºC for 8-10 hrs. After that dried pulp sheets cut into desired size and again dried for 8-10 hrs. After drying three layers of sheets were kept together and pressed properly to form one sheet. Then desired size (3 x 4 cm) cutting will be done and dried under fan for 2-3 hrs and then wrapped into a metalized polyester wrapper and then kept in plastic bag for storage study.

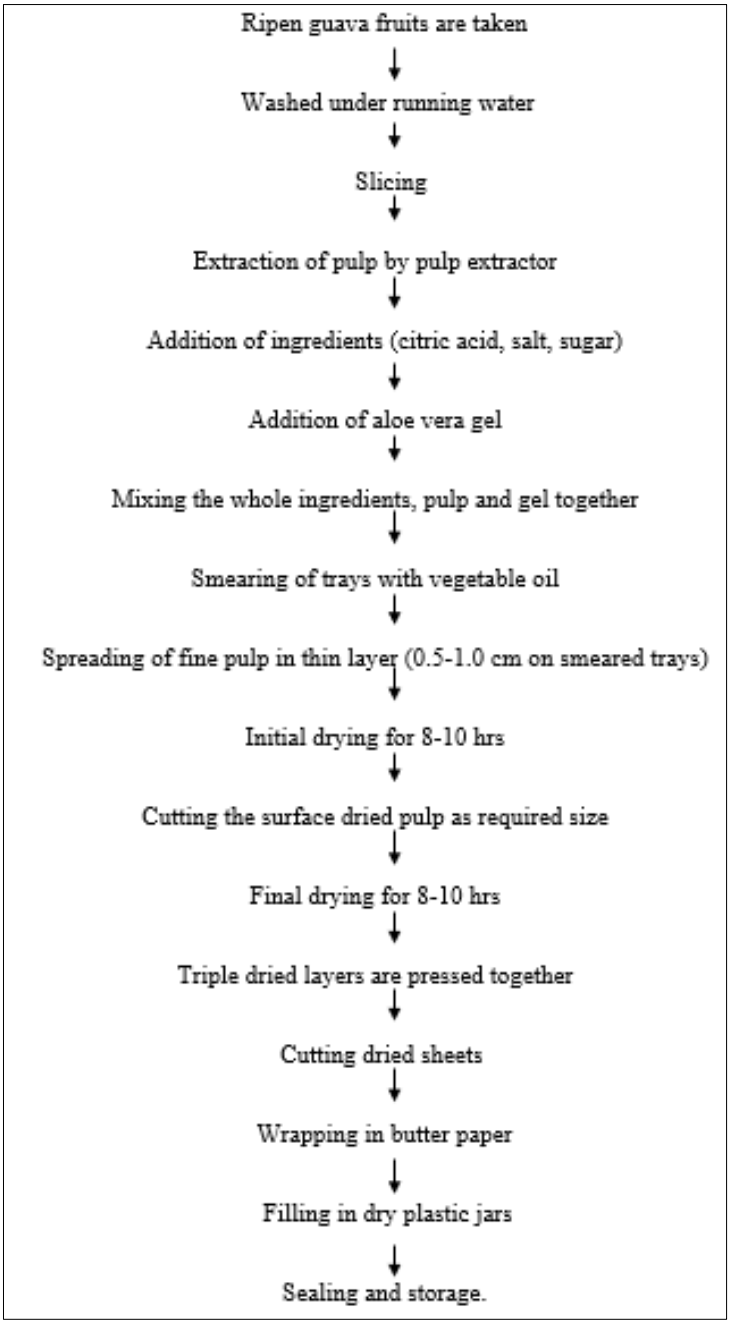

Fig 1: Process flow diagrams for preparation of guava Aloe vera leather

2.3 Physico-Chemical analysis

The moisture content, and fat of the Guava aloe vera leather were determined according to the standards of AOAC (2010) and Ranganna (1986). Bench model pH / mV meter (HANNA Instruments, model no: HI-122, Romania) will be used. Determination of ß-carotene was carried out by the method of (AOAC, 1980). Total soluble solid were measured with the standard method of (AOAC, 2000). Lane-Eynon method will

be used to determine the sugar content. Ascorbic acid was measured in triplicate according to standard methods as described by AOAC (2005).

2.4 Sensory Analysis
The samples were evaluated for colour and appearance, flavour, texture, taste and overall acceptability by a panel of 10 semi trained judges. The average scores of all the sensory parameters were recorded.

2.5 Microbial count of guava leather (Colony forming unit)
Microbial count was recorded as colony forming units (CFU). One colony was counted as microbe.

2.6 Statistical analysis
The experiment was conducted by adopting completely randomized design the data recorded during the course of investigation was statistically analyzed by the analysis of variance-Two way classification or single factor ANOVA. This technique gives an appropriate method capable of analyzing the variation of population variance. The significant effect of treatment was judged with the help of 'F' (variance ratio). Calculated F value was compared with the table value of F at 5% level of significance. If calculated value exceeds the table value the effect was considered to the significant.

3. Result and Discussion
The present investigation was carried out in Vaugh Institute of Agriculture Engineering and Technology, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, U.P. The fully ripened, freshly harvested guavas and aloe vera gel, sugar, citric acid was purchased from the local market in Prayagraj, India. Guava fruit was cut manually and the weight of peel, seeds and pulp were taken separately to determine the weight of pulp in the fruit. Lye peeling was done to peel the guava. To avoid browning small amount of citric acid was added. Guava was cut into small pieces and then pulped using mixture. The obtained pulp was passed though the fine sieve to get uniform and appropriate pulp.

The sugar was added in to the pulp and mixed properly. The prepared pulp and aloe vera gel were mixed in five different ratios of T_0 - 100:0, T_2 - 95:5, T_3 - 90:10, T_4 - 85:15 and T_5 – 80:20 respectively. Different treatments of pulp were spread on the aluminium foil in the form of sheet. The sheets were kept in the tray drier for drying. Drying was done at 55 ± 5°C till the moisture content of 15%. The dried sheets were weighed and wrapped in the butter paper and LDPE for storage study.

3.1 Effect on the Physico chemical properties

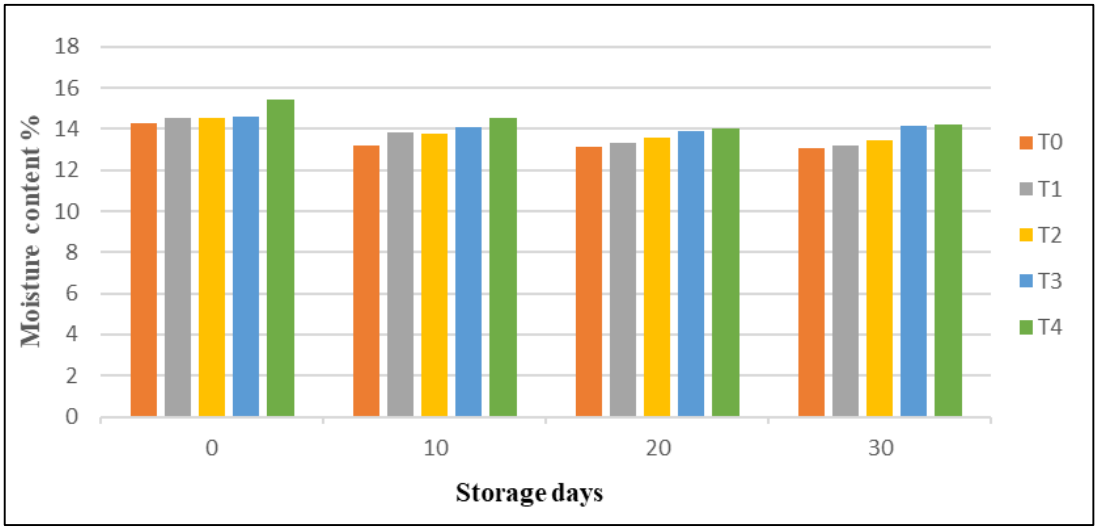

Fig 2: Moisture Content (%) of Guava Aloe vera Leather during storage

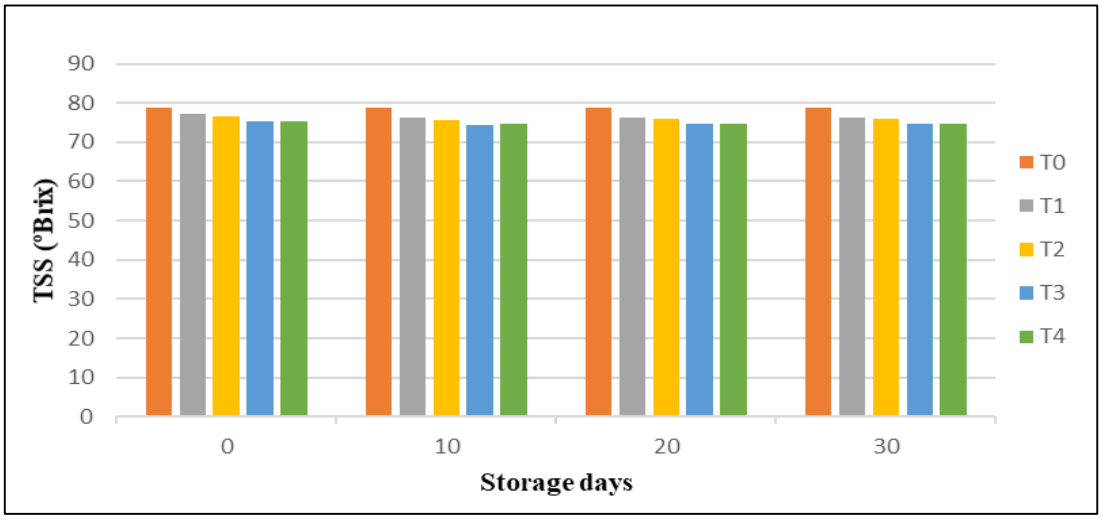

Fig 3: Total soluble solid (°Brix) of Guava Aloe vera Leather during storage

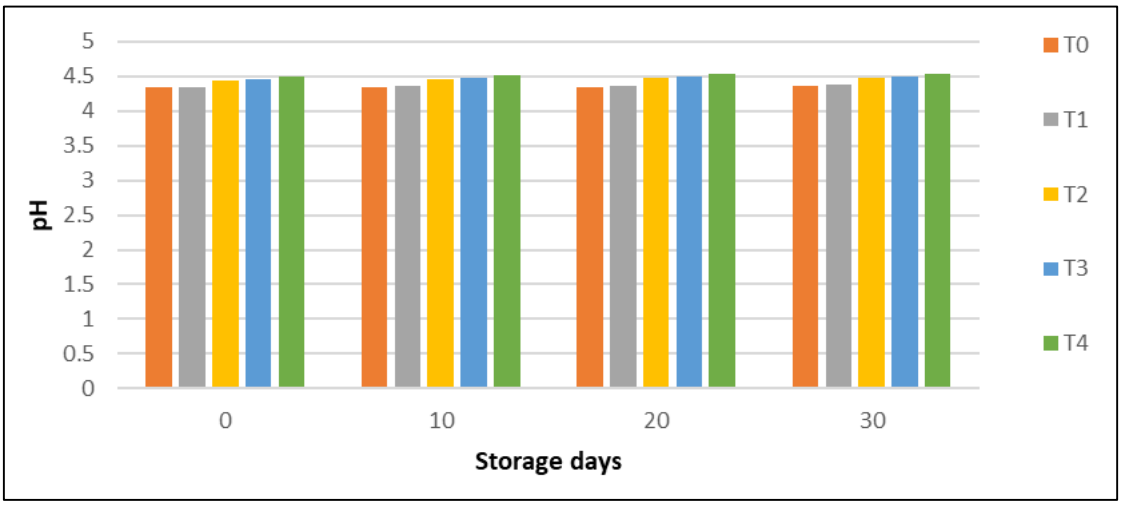

Fig 4: pH of Guava Aloe vera Leather during storage

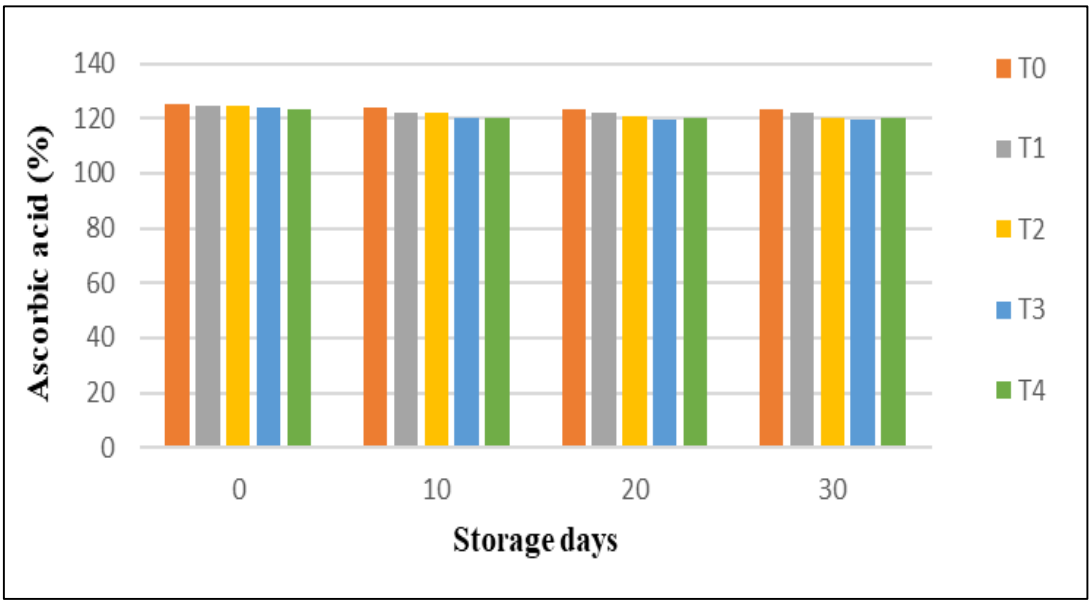

Fig 5: Ascorbic acid of guava aloe vera leather during storage

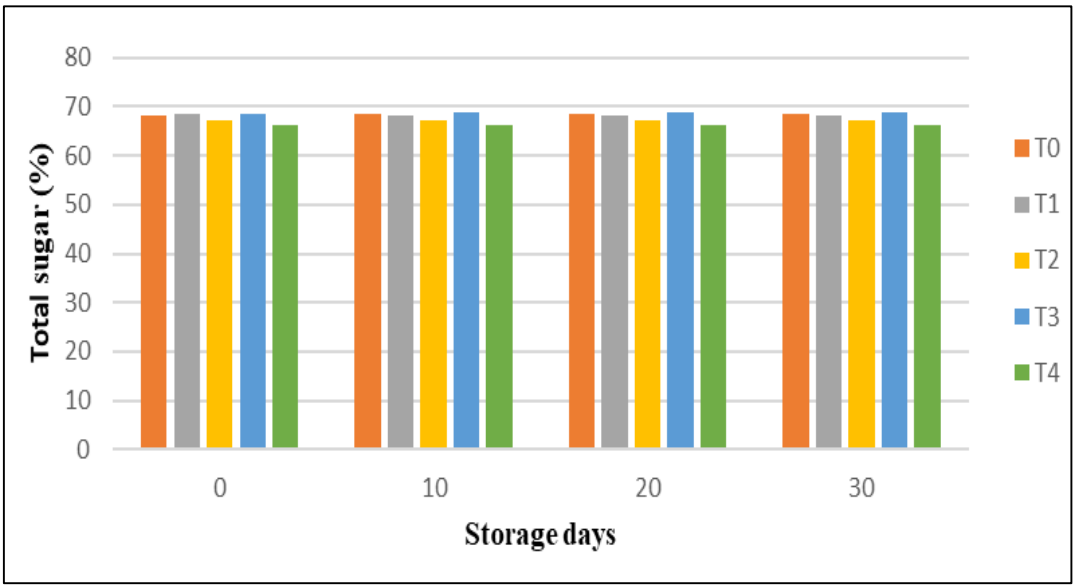

Fig 6: Total sugar of Guava Aloe vera Leather during storage

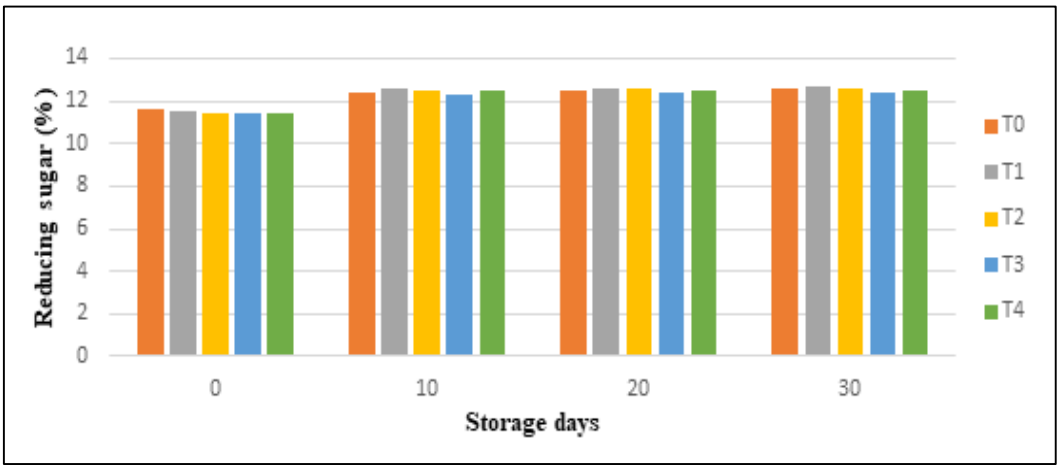

Fig 7: Reducing sugar content of Guava Aloe vera Leather during storage

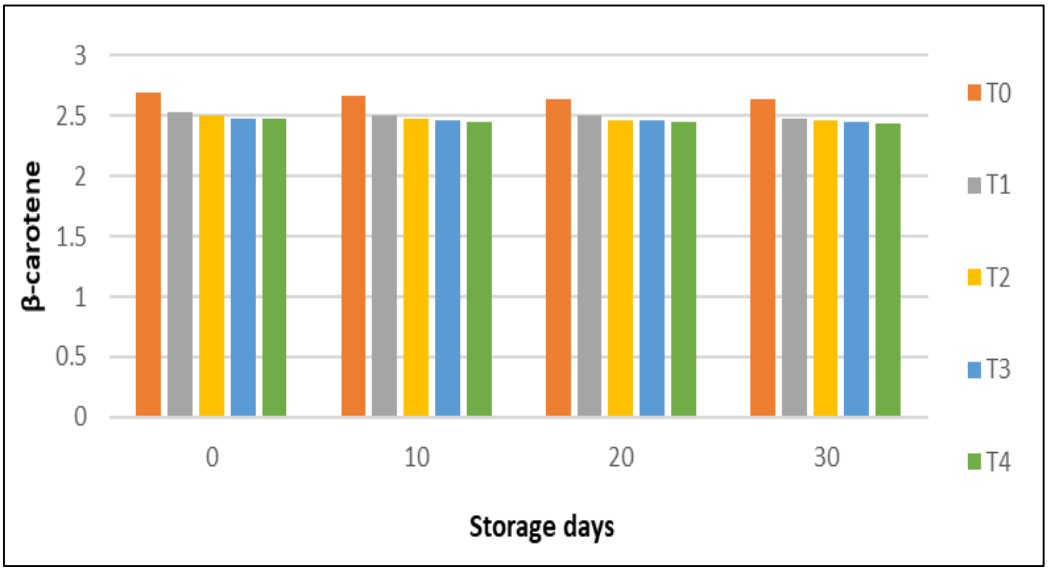

Fig 8: β-Carotene of Guava Aloe vera Leather during storage

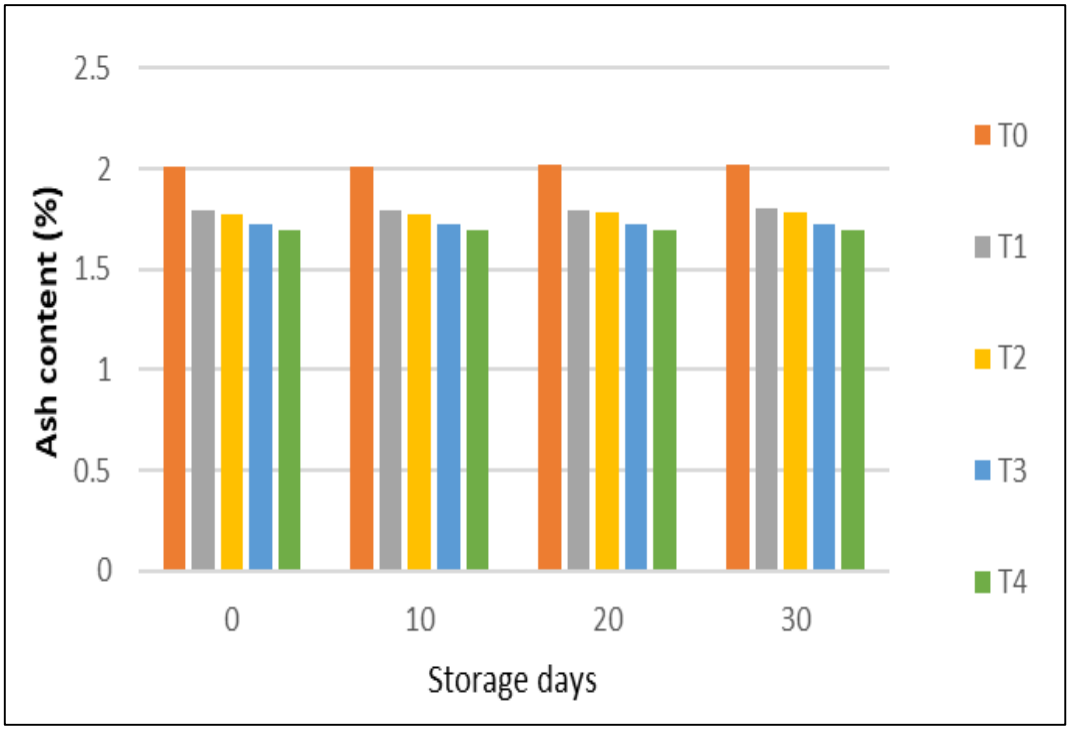

Fig 9: Ash content of guava aloe vera leather during storage

3.2 Sensory Analysis

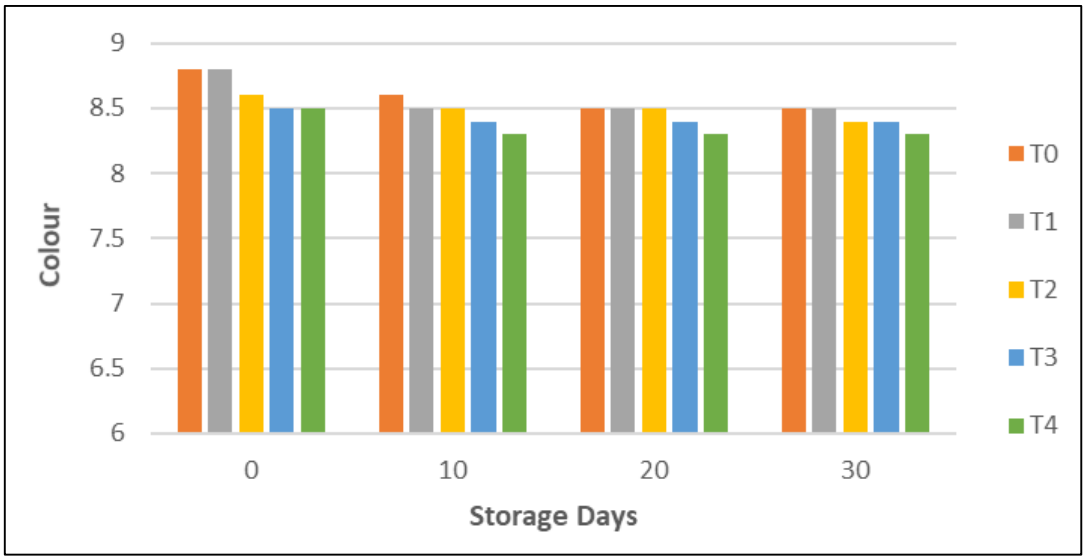

Fig 10: Colour analysis of guava aloe vera leather during storage

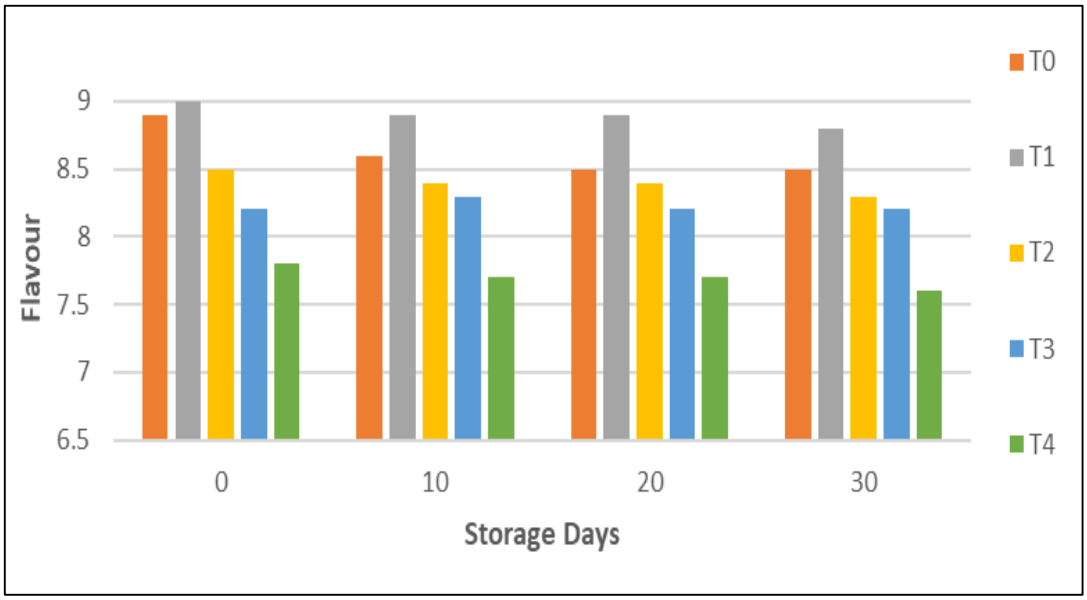

Fig 11: Flavor analysis of Guava Aloe vera Leather during storage

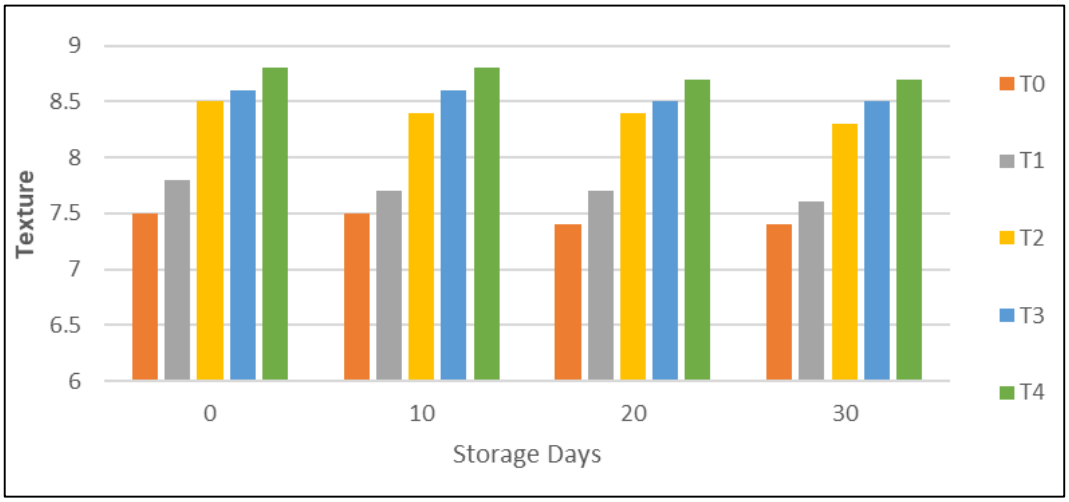

Fig 12: Texture analysis of Guava Aloe vera Leather during storage

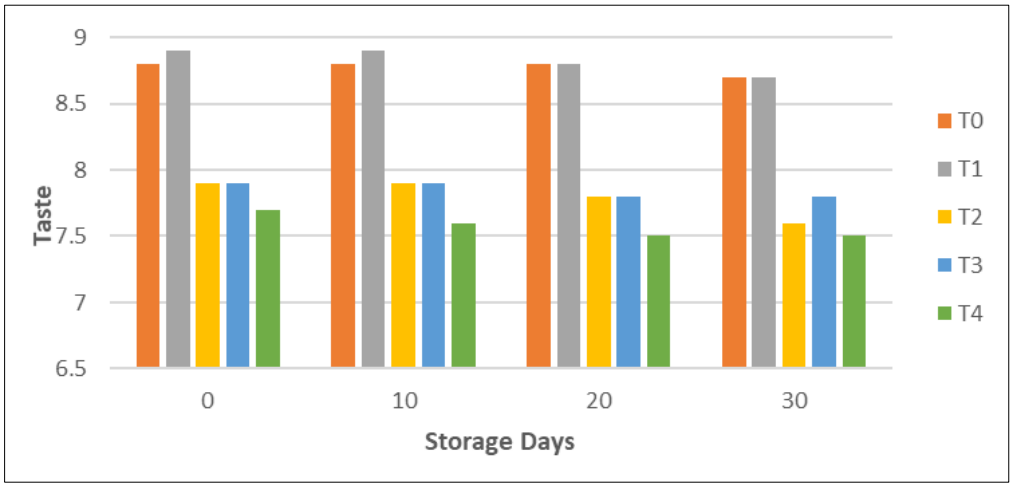

Fig 13: Taste analysis of Guava Aloe vera Leather during storage

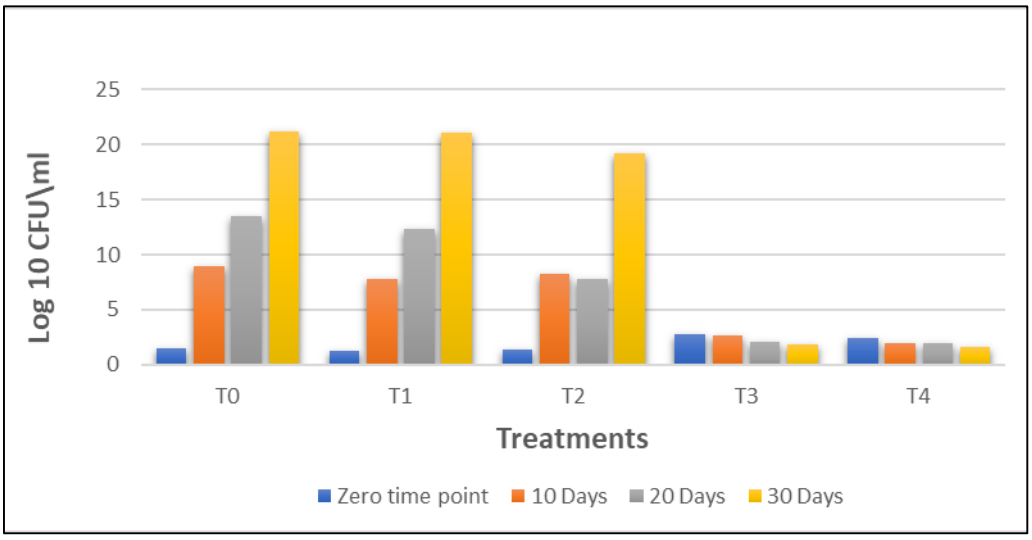

Fig 14: Overall acceptability of Guava Aloe vera Leather during storage

3.3 Microbial Analysis

4. Conclusion

From the present investigation, it has been concluded that different blending ratio and storage time had the significant effect on the blended guava aloe vera leather. Aloe vera not appears to affect guava leather quality and appearance. So, it seems to be promise to be safe, natural and environment friendly alternative solution to conventional synthetic preservatives. According to sensory quality attributes, blended leather prepared by 95% guava and 5% aloe vera was found best and also combines nutritional benefits of both the fruits. The growth of micro-organisms was also well within the safe limit for consumption till 30 days of storage period. It is anticipated that this technology or value addition would certainly improves the nutrient intake of consumers and also enabling small scale-employment in rural sector thus certain helps in income generation of the entrepreneurs.

Aloe Vera incorporated guava leather is very rich in vitamin C and various case studies reported from across the world demonstrate that vitamin C is known to avoid infections and improve immune responses. With specific reference to the critical phase of COVID-19, vitamin C plays a critical role. It has an essential role in tissue repair, and improves immune response against infection. The incorporated aloe vera in the leather also boosts up the immunity that is also very important during pandemic.

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