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Value addition of guava candy (*Psidium guajava*. L) cv. Allahabad Safeda

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Abstract
In the academic year 2023-2024, a study was conducted at the Post Harvest Laboratory, Department of Horticulture, NAI, SHUATS, Prayagraj (U.P.). In a Completely Randomised Design, nine treatments were used to test the effects of different levels of mint syrup, tulsi syrup, and lemongrass syrup on value added guava candy. These treatments were replicated three times to ensure accurate results. The experiment's primary objective was to determine the effect of different concentrations of mint syrup, tulsi syrup, and lemongrass syrup on the physico-chemical and sensory traits of value- added guava candy. According to the findings of this study, Treatment T_2 [Mint syrup (1.0%)] was found best with physico-chemical attributes of value added guava like [70.45 (0 DAS), 71.30 (15 DAS), 73.46 (30 DAS), 74.89 (45 DAS), 75.27 (60 DAS) and 73.08 (MEAN] ºBrix T.S.S (ºBrix), [18.85 (0 DAS), 16.37 (15 DAS), 15.36 (30 DAS), 14.41 (45 DAS), 14.10 (60 DAS) and 15.82 (MEAN] % moisture (%), [0.25 (0 DAS), 0.24 (15 DAS), 0.23 (30 DAS), 0.22 (45 DAS), 0.18 (60 DAS) and 0.23 (MEAN] % acidity (%), [77.76 (0 DAS), 75.65 (15 DAS), 74.23 (30 DAS), 72.83 (45 DAS), 71.46 (60 DAS) and 74.39 (MEAN] mg/100 g of pulp ascorbic acid, [75.45 (0 DAS), 79.89 (15 DAS), 80.55 (30 DAS), 82.01 (45 DAS), 85.85 (60 DAS) and 80.75 (MEAN] % total sugar, [36.92 (0 DAS), 39.09 (15 DAS), 39.41 (30 DAS), 40.13 (45 DAS), 42.01 (60 DAS) and 39.51 (MEAN] % reducing sugar, [36.61 (0 DAS), 38.76 (15 DAS), 39.08 (30 DAS), 39.79 (45 DAS), 41.65 (60 DAS) and 39.18 (MEAN] % non-reducing sugar and sensory attributes like [8.97 (0 DAS), 8.91 (15 DAS), 8.72 (30 DAS), 8.53 (45 DAS), 8.34 (60 DAS) and 8.69 (MEAN] hedonic value of Color, [8.54 (0 DAS), 8.49 (15 DAS), 8.13 (30 DAS), 8.04 (45 DAS), 7.62 (60 DAS) and 8.16 (MEAN] hedonic value of Flavor, [8.63 (0 DAS), 8.58 (15 DAS), 8.22 (30 DAS), 8.12 (45 DAS), 7.70 (60 DAS) and 8.25 (MEAN] hedonic value of Taste, [8.97 (0 DAS), 8.69 (15 DAS), 8.50 (30 DAS), 8.44 (45 DAS), 8.05 (60 DAS) and 8.53 (MEAN] hedonic value of Texture and [8.42 (0 DAS), 8.38 (15 DAS), 8.33 (30 DAS), 8.27 (45 DAS), 8.21 (60 DAS) and 8.32 (MEAN] hedonic value of Overall acceptability.

Keywords: Candy, guava, lemongrass syrup, mint syrup, physico-chemical, sensory and Tulsi syrup

Introduction
As per the NHB (2013) [2] report, the estimated fruit production in India is around 76.4 million tonnes, with an area coverage of approximately 6.7 million hectares. As highlighted by Negi and Anand (2016) [3], a considerable portion of the produce, around 30-40%, is lost due to insufficient post- harvest management practices, such as inadequate storage, packing, and processing methods. Hence, it is essential to implement efficient post-harvest management techniques and value addition methods to minimise quality deterioration, control the growth of microorganisms, and guarantee the safety and convenience of the product (Gajanana *et al.*, 2002) [4].

India's diverse agro-climatic conditions facilitate the cultivation of a vast variety of fruits, ranging from tropical and subtropical to temperate and arid zone fruits (Sankaran and Dinesh, 2020) [5]. Amongst all these crops, guava stands out as particularly noteworthy. Guava, also known as Psidium guajava L., is a fruit crop that is extensively grown in subtropical and tropical regions worldwide (Arévalo-Marín *et al.*, 2021) [1]. This fruit is widely known as the "apple of the tropics" and is highly regarded in India's agricultural industry. It is considered one of the most popular and widely cultivated fruits in the country, second only to mango, banana, and citrus fruits (Hada *et al.*, 2014) [6].

The nutritional composition of guava fruits include protein (0.1 – 0.5 g), fat (0.43 – 0.7 g), carbohydrate (9.1 – 17 g), crude fibre (0.9 – 1 g), and calories (77 – 86 g) (Rawan *et al.* (2017) [8]. In a study conducted by Omayio *et al.* (2019) [7], it was found that the guava fruit had a total sugar content of 8.92 g including Thiamin (0.067 mg), Riboflavin (0.04 mg), Niacin (1.084 mg), and vitamin B6 (0.11 mg). The minerals found in guava include iron (0.26 mg), magnesium (22 mg), manganese (0.15 mg), phosphorous (40 mg), potassium (417 mg), sodium (2 mg), zinc (0.23 mg), and lycopene (5204 µg).

Guava, despite being highly popular, faces challenges in terms of post-harvest losses due to its perishable nature and limited shelf life (Omayio *et al.*, 2019) [7]. According to a study conducted by Rawan *et al.* (2017) [8], the guava fruit is recognised for its climacteric nature and its susceptibility to rapid spoilage. It is crucial to acknowledge that guavas, like other fruits, undergo both quantitative and qualitative post-harvest losses during different stages, such as harvesting, handling, packaging, transportation, post- harvest storage, and marketing (Paltrinieri, 2014) [9]. Based on a study conducted by Kanwal *et al.* (2016) [10], a considerable percentage of guava fruits, around 20-25%, are regrettably damaged and unsuitable for consumption when they reach the consumer.

Normally, fresh guavas can last for approximately 3 to 10 days. By effectively managing specific factors, such as variety and preservation methods, it is feasible to increase their lifespan by an additional 2 -

11 days (Pareek *et al.*, 2009) [11]. Various processing techniques are employed in order to maintain the quality and longevity of guava and its derived products. These techniques encompass pulping, juice extraction, drying, canning, and jam- making, as outlined by Kanwal *et al.* (2016) [10]. As per the findings of Omayio *et al.* (2019) [7], processed guava products offer numerous advantages. They provide convenience and accessibility to consumers throughout the year, while also presenting opportunities for farmers and food processors to enhance value and generate income.

The guava fruit is considered climacteric, meaning it undergoes rapid ripening after it is harvested, leading to a relatively short period of time in which it can be stored. It is crucial to use the fruit to make different preserved products in order to ensure its availability for a longer period of time (Yousaf *et al.*, 2024) [12]. Guava offers a diverse array of options for transforming into a variety of high-quality products, such as jam, jelly, juice, nectar, puree, fruit bar and dehydrated goods. Candy is a delectable indulgence created through the process of infusing fruits or vegetables with a sweet syrup, eliminating any surplus syrup, and subsequently drying the product to enhance its shelf life (Girdhari, 1986) [13]. An advantage of processing fruit into candy is its ability to be stored for a long time at room temperature. The reason for this is its intermediate moisture content and high solids content, as mentioned by Bhatia *et al.* (1964) [14]. By adding mint syrup, tulsi syrup, and lemongrass syrup to the mixture, the sweet fruit-based products made from raw guava may have enhanced physico-chemical properties and increased nutritional value.

Keeping in view the above facts this experiment titled "Value addition of guava candy (*Psidium guajava*. L) cv. Allahabad Safeda" was designed and carried out.

Materials and Methods

In the year 2023-2024, fruits of Guava cv. Allahabd Safeda were harvested from each tree in a consistent size and stage of maturity. These fruits were then stored in the laboratory for further study. In order to address the issue of field heat, minimise the presence of microbes, and eliminate soil particles from the surface of the fruits, a thorough cleansing was conducted using tap water. The experiment took place in the post-harvest laboratory of the Department of Horticulture at the Sam Higginbottom University of Agriculture, Technology, and Sciences in Allahabad. The experimental site is located on the left side of the Allahabad-Rewa Road, near the Yamuna River, approximately 8 kilometres from the city of Allahabad. The coordinates of its location are 25.57°N latitude and 81.51°E longitude. The fruits were treated with different combinations of mint syrup, tulsi syrup, and lemongrass syrup, i.e., T_0: Control, T_1: Mint syrup (0.5%), T_2: Mint syrup (1.0%), T_3: Tulsi syrup (0.5%), T_4: Tulsi syrup (1.0%), T_5: Lemongrass syrup (0.5%), T_6: Lemongrass syrup (1.0%), T_7: Cinnamon syrup (1.0%), T_8: Mint syrup (0.5%) + Tulsi syrup (0.5%) + Lemongrass syrup (0.5%).

During this procedure, the fruits underwent a thorough washing with tap water, followed by peeling and slicing into 1cm thick pieces. The slices were subsequently blanched in a solution containing 0.3% citric acid until they reached a soft texture. Next, the chemicals were drained and the slices were then boiled in boiling water for a duration of 4 minutes. At first, the fruits were stored in a sugar syrup with a low concentration. The concentration was gradually increased by 10 ºB every other day until it reached a final concentration of 70 ºB. When it comes to creating various types of candy, it's important to use specific ingredients in precise amounts. For example, you'll need mint, tulsi, and lemongrass, each measured at either 50 g (0.5%) or 100 g (1%) per 100 g of candy. Additionally, sugar syrup was enriched with the inclusion of cinnamon (100 g, 1%) in each treatment. The precise amounts of these ingredients were carefully added in accordance with the specific treatment combinations. The mixture was heated gently until it reached a boiling point, using medium heat. After the water reached its boiling point, the heat was lowered to a gentle simmer. The ingredients were then allowed to steep in the water for approximately 10-15 minutes, allowing the flavours to meld together. Once the simmering process was complete, the saucepan was taken off the heat and the water infused with flavour was allowed to cool down to room temperature. The ingredients were strained using a fine mesh strainer or cheesecloth, with pressure applied to extract maximum flavour. The concentration was then measured using Abbe's Refractometer. The fruit slices were placed in a container and a sugar syrup was added at a ratio of 1.5 litres per kilogramme of fruit. A slight amount of pressure was exerted to ensure that the fruit slices remained submerged in the syrup. The following day, the syrup was drained and then poured again, this time with an increased strength of 50 ºB achieved by adding 300 g of sugar. This step was repeated on the 4th and 6th day. Consequently, the fruits were left in the syrup for an additional day. After a series of steps, the sugar concentration was carefully adjusted to 70 ºB and then carefully maintained for a duration of 7 days.

The experiment employed a Completely Randomised Design (Fisher and Yates, 1953) with three replications for each of the nine treatment combinations. Physico-chemical attributes like Total Soluble Solids (T.S.S) (ºBrix), Acidity (%), Ascorbic acid (mg/100 g of pulp), Total sugar (%), Reducing sugar (%), non- Reducing sugar (%) and Moisture (%) & Sensory attributes like Color, Flavor, Taste, Texture and Overall acceptability were successfully recorded at 0, 15, 30, 45 and 60 days after storage.

Results and Discussion

A statistical analysis was conducted to study the physico-chemical and sensory characteristics of guava candy with added value. Based on the findings, the inclusion of different treatments led to a significant improvement in all the characteristics. Based on the data, it can be concluded that the variances were statistically significant as the calculated F value was greater than the tabulated F value.

Physico-Chemical Attributes

Total Soluble Solids (T.S.S) (ºBrix): According to data (Table 1; Fig 1), it was observed that the treatment T_2 [Mint syrup (1.0%)] was found best and effective. It was observed significantly the maximum T.S.S (ºBrix) i.e., [70.45 (0 DAS), 71.30 (15 DAS), 73.46 (30 DAS), 74.89 (45 DAS), 75.27 (60 DAS) and 73.08 (MEAN] ºBrix whereas effect of treatment T_4 [Tulsi syrup (1.0%)] was found significantly the least effective with lowest T.S.S (ºBrix) i.e., [69.46 (0 DAS), 70.30 (15 DAS), 70.86 (30 DAS), 72.24 (45 DAS), 72.61 (60 DAS) and 71.09 (MEAN] ºBrix.

Moisture (%): The result regarding moisture (%) is shown in Table 1; Fig 1, where it was found that treatment T_2 [Mint syrup (1.0%)] recorded the minimum moisture (%) i.e., [18.85 (0 DAS), 16.37 (15 DAS), 15.36 (30 DAS), 14.41 (45 DAS), 14.10 (60 DAS) and 15.82 (MEAN] % whereas effect of treatment T_4 [Tulsi syrup (1.0%)] was found significantly the least effective with maximum moisture (%) i.e., [20.34 (0 DAS), 19.91 (15 DAS), 18.68 (30 DAS), 17.53 (45 DAS), 17.14 (60 DAS) and 18.72 (MEAN] %.

Acidity (%): The perusal of result (Table 2; Fig 2) shows that the differences were significant where effect of Treatment T_2 [Mint syrup (1.0%)] was found best effective with significantly the minimum acidity (%) i.e., [0.25 (0 DAS), 0.24 (15 DAS), 0.23 (30 DAS), 0.22 (45 DAS), 0.18 (60 DAS) and 0.23 (MEAN] % whereas effect of treatment T_4 [Tulsi syrup (1.0%)] was found significantly the least effective with maximum acidity (%) i.e., [0.32 (0 DAS), 0.31 (15 DAS), 0.30 (30 DAS), 0.28 (45 DAS), 0.24 (60 DAS) and 0.29 (MEAN] %.

Ascorbic acid (mg/100 g of pulp): The differences in effect of different treatment combinations on Ascorbic acid (mg/100 g of pulp) was found to be significant with maximum Ascorbic acid (mg/100 g of pulp) (Table 3; Fig 3) [77.76 (0 DAS), 75.65 (15 DAS), 74.23 (30 DAS), 72.83 (45 DAS), 71.46 (60 DAS) and 74.39 (MEAN] mg/100 g of pulp whereas effect of treatment T_4 [Tulsi syrup (1.0%)] was found significantly the least effective with minimum Ascorbic acid (mg/100 g of pulp) i.e., [69.70 (0 DAS), 68.55 (15 DAS), 67.26 (30 DAS), 66.00 (45 DAS), 64.76 (60 DAS) and 67.25 (MEAN] mg/100 g of pulp.

Total sugar (%): According to data (Table 3; Fig 3), it was observed that the treatment T_2 [Mint syrup (1.0%)] was found best and effective. It was observed significantly the maximum Total sugar (%) i.e., [75.45 (0 DAS), 79.89 (15 DAS), 80.55 (30 DAS), 82.01 (45 DAS), 85.85 (60 DAS) and 80.75 (MEAN] % whereas effect of treatment T_4 [Tulsi syrup (1.0%)] was found significantly the least effective with lowest Total sugar (%) i.e., [72.71 (0 DAS), 73.27 (15 DAS), 73.87 (30 DAS), 75.22 (45 DAS), 78.83 (60 DAS) and 74.78 (MEAN] %.

Reducing sugar (%): The result regarding Reducing sugar (%) is shown in Table 4; Fig 4, where it was found that treatment T_2 [Mint syrup (1.0%)] recorded the maximum Reducing sugar (%) i.e., [36.92 (0 DAS), 39.09 (15 DAS), 39.41 (30 DAS), 40.13 (45 DAS), 42.01 (60 DAS) and 39.51 (MEAN] % whereas effect of treatment T_4 [Tulsi syrup (1.0%)] was found significantly the least effective with Reducing sugar (%) i.e., [34.95 (0 DAS), 35.22 (15 DAS), 35.51 (30 DAS), 36.16 (45 DAS), 37.89 (60 DAS) and 35.95 (MEAN] %.

Non-Reducing sugar (%): The perusal of result (Table 4; Fig 4) shows that the differences were significant where effect of Treatment T_2 [Mint syrup (1.0%)] was found best effective with significantly the maximum non-Reducing sugar (%) i.e., [36.61 (0 DAS), 38.76 (15 DAS), 39.08 (30 DAS), 39.79 (45 DAS), 41.65 (60 DAS) and 39.18 (MEAN] % whereas effect of treatment T_4 [Tulsi syrup (1.0%)] was found significantly the least effective with minimum non-Reducing sugar (%) i.e., [35.87 (0 DAS), 36.15 (15 DAS), 36.44 (30 DAS), 37.11 (45 DAS), 38.89 (60 DAS) and 36.89 (MEAN] %.

Sensory Attributes

Color: According to data (Table 5; Fig 5), it was observed that the treatment T_2 [Mint syrup (1.0%)] was found best and effective. It was observed significantly the maximum hedonic value of Color i.e., [8.97 (0 DAS), 8.91 (15 DAS), 8.72 (30 DAS), 8.53 (45 DAS), 8.34 (60 DAS) and 8.69 (MEAN] whereas effect of treatment T_4 [Tulsi syrup (1.0%)] was found significantly the least effective with lowest hedonic value of Color i.e., [8.66 (0 DAS), 8.52 (15 DAS), 8.33 (30 DAS), 8.15 (45 DAS), 7.97 (60 DAS) and 8.33 (MEAN].

Flavor: The result regarding Flavor of value added guava candy is shown in Table 5; Fig 5, where it was found that treatment T_2 [Mint syrup (1.0%)] recorded the minimum hedonic value of Flavor i.e., [8.54 (0 DAS), 8.49 (15 DAS), 8.13 (30 DAS), 8.04 (45 DAS), 7.62 (60 DAS) and 8.16 (MEAN] whereas effect of treatment T_4 [Tulsi syrup (1.0%)] was found significantly the least effective with lowest hedonic value of Flavor i.e., [8.47 (0 DAS), 8.42 (15 DAS), 8.06 (30 DAS), 7.97 (45 DAS), 7.56 (60 DAS) and 8.10 (MEAN].

Taste: The perusal of result (Table 6; Fig 6) shows that the differences were significant where effect of Treatment T_2 [Mint syrup (1.0%)] was found best effective with significantly the maximum hedonic value of Taste i.e., [8.63 (0 DAS), 8.58 (15 DAS), 8.22 (30 DAS), 8.12 (45 DAS), 7.70 (60 DAS) and 8.25 (MEAN] whereas effect of treatment T_4 [Tulsi syrup (1.0%)] was found significantly

the least effective with lowest hedonic value of Taste i.e., [8.56 (0 DAS), 8.51 (15 DAS), 8.15 (30 DAS), 8.05 (45 DAS), 7.64 (60 DAS) and 8.18 (MEAN].

Texture: The differences in effect of different treatment combinations on Texture of value added guava candy (Table 7; Fig 7) was found to be significant with maximum hedonic value of Texture i.e., [8.97 (0 DAS), 8.69 (15 DAS), 8.50 (30 DAS), 8.44 (45 DAS), 8.05 (60 DAS) and 8.53 (MEAN] whereas effect of treatment T_4 [Tulsi syrup (1.0%)] was found significantly the least effective with lowest hedonic value of Texture i.e., [8.66 (0 DAS), 8.46 (15 DAS), 8.27 (30 DAS), 8.22 (45 DAS), 7.84 (60 DAS) and 8.29 (MEAN].

Overall acceptability: According to data (Table 7; Fig 7), it was observed that the treatment T_2 [Mint syrup (1.0%)] was found best and effective. It was observed significantly the maximum hedonic value of Overall acceptability i.e., [8.42 (0 DAS), 8.38 (15 DAS), 8.33 (30 DAS), 8.27 (45 DAS), 8.21 (60 DAS) and 8.32 (MEAN] whereas effect of treatment T_4 [Tulsi syrup (1.0%)] was found significantly the least effective with lowest hedonic value of Overall acceptability i.e., [7.89 (0 DAS), 7.86 (15 DAS), 7.81 (30 DAS), 7.75 (45 DAS), 7.70 (60 DAS) and 7.80 (MEAN].

Discussion: The physico-chemical and sensory attributes of value-added guava candy was significantly affected by the application of different treatments. The effect of treatment T_2 [Mint syrup (1.0%)] was found best on each of the physico- chemical and sensory attributes of value- added guava candy.

Guava contains polysaccharides such as starch and pectin, which are complex carbohydrates (Naseer *et al.,* 2018) [15]. Over time, especially during storage, these polysaccharides can undergo hydrolysis, a process in which they are broken down into simpler sugar through the action of enzymes or acids present in the candy or naturally occurring in the fruit (Becker *et al*., 2021). Resulting in increased TSS during storage time period. Patel *et al.* (2022) [16], Singh *et al.* (2022) [17] and Kadam *et al.* (2012) [18] while preparing guava candies also found similar results.

During storage period, the acidity (%) and ascorbic acid (mg/100 g of pulp) decreased. Guava contains organic acids such as citric acid and ascorbic acid, which contribute to its characteristic tartness and acidity (Chan *et al.,* 2006) [19]. During storage, especially if the candy is exposed to air or oxygen, these acids can undergo oxidation reactions. Oxygen reacts with the acids, leading to the formation of oxidation products and ultimately reducing the concentration of free acids in the candy (Yin *et al.,* 2022) [22]. Kuchi *et al.* (2014) [20] while preparing guava jelly bar and Khatun (2011) [21] while preparing guava juice and jelly also found similar results.

There was a gradual increase in total sugar (%), reducing sugar (%) and non- reducing sugar (%) content in guava candy with storage time. Guava contains complex carbohydrates such as starch and pectin (Ninga *et al.,* 2021) [23]. During storage, these polysaccharides can undergo hydrolysis, a process where they are broken down into simpler sugar (glucose, fructose, etc.) by enzymes naturally present in the fruit or introduced during processing. This enzymatic breakdown of complex carbohydrates into sugar contributes to the gradual increase in total sugar content in the candy (Lovegrove *et al.,* 2017) [24]. Similar observations were reported by Mondal *et al.* (2017) [25] while preparing aonla candy and Mir *et al.* (2015) [26] while preparing quince candies.

Decrease in moisture content (%) of value added guava candy during storage can also be attributed to the fact that Evaporation occur as water molecules at the surface of the candy gain sufficient energy from the surrounding environment to transition from a liquid to a gaseous state, leading to a gradual reduction in moisture content. This could be the reason behind gradual decrease in moisture content during storage period. Similar observations were reported by Kuchi *et al.* (2014) [20] while preparing guava jelly bar and Khatun (2011) [21] while preparing guava juice and jelly.

The hedonic values of color and texture also decreased during the course of storage period. This might have occurred due to Maillard reaction. The Maillard reaction is a complex chemical reaction between reducing sugar and amino acids that occur during heating or cooking. Over time, the Maillard reaction can progress further, leading to the formation of brown pigments and compounds known as melanoidins (Tamanna and Mahmood, 2015) [27], leading to decreased color and texture of the candy. Bankar *et al.* (2013) [29] and Pathak and Goswami (2016) [28] also reported similar results while working on pineapple burfi.

The taste and flavor compounds might also have oxidized due to exposure to oxygen during storage. Oxygen reacts with unsaturated fats and other sensitive molecules, altering their chemical structure and leading to the development of off- flavor or loss of taste notes during the storage period as shown by our experimental data (Shahidi and Hossain, 2022) [31]. Similar reports were reported by Golande *et al.,* (2007) [30], Shelke and Basawade (2007) [32] and Bankar *et al.,* (2013) [29].

The overall acceptability scale of guava candy might have decreased over time due to various factor such as changes in taste, texture, color, and aroma. Moisture loss can lead to dryness and hardness, while sugar crystallization can result in a gritty or grainy texture, both of which detract from the candy's initial appeal. Kuchi *et al.* (2014) [20] while preparing guava jelly bar and Khatun (2011) [21] while preparing guava juice and jelly found similar results.

Table 1: Effect of various treatments on TSS (°Brix) & Moisture (%) of value-added guava candy during storage

S. No.	Treatments	TSS (°Brix)						Moisture (%)					
		0 DAS	15 DAS	30 DAS	45 DAS	60 DAS	MEAN	0 DAS	15 DAS	30 DAS	45 DAS	60 DAS	MEAN
1	T_1	69.92	70.77	72	73.4	73.78	71.97	19.67	18.19	17.07	16.01	15.66	17.32
2	T_2	70.21	71.06	72.88	74.3	74.68	72.63	19.19	17.03	15.98	14.99	14.66	16.37
3	T_3	70.45	71.3	73.46	74.89	75.27	73.08	18.85	16.37	15.36	14.41	14.1	15.82
4	T_4	69.51	70.35	71	72.38	72.75	71.2	20.24	19.63	18.42	17.28	16.9	18.49
5	T_5	69.46	70.3	70.86	72.24	72.61	71.09	20.34	19.91	18.68	17.53	17.14	18.72
6	T_6	70.11	70.96	72.44	73.85	74.23	72.32	19.43	17.61	16.52	15.5	15.16	16.85
7	T_7	70.4	71.25	73.32	74.75	75.13	72.97	18.95	16.85	15.81	14.83	14.51	16.19
8	T_8	69.7	70.54	71.42	72.81	73.18	71.53	20	19.05	17.87	16.77	16.4	18.02
9	T_9	69.73	70.57	71.56	72.96	73.33	71.63	19.91	18.77	17.61	16.52	16.16	17.79
F-Test		S	S	S	S	S	S	S	S	S	S	S	S
S.E. (m) (±)		0.03	0.03	0.08	0.09	0.1	0.07	0.05	0.14	0.16	0.16	0.14	0.13
CD (5%)		0.09	0.09	0.24	0.27	0.29	0.2	0.14	0.41	0.48	0.46	0.43	0.38

T_0: Control, T_1: Mint syrup (0.5%), T_2: Mint syrup (1.0%), T_3: Tulsi syrup (0.5%), T_4: Tulsi syrup (1.0%), T_5: Lemongrass syrup (0.5%), T_6: Lemongrass syrup (1.0%), T_7: Cinnamon syrup (1.0%), T_8: Mint syrup (0.5%) + Tulsi syrup (0.5%) + Lemongrass syrup (0.5%).

Table 2: Effect of various treatments on Acidity (%) of value-added guava candy during storage

S. No.	Treatments	Acidity (%)					
		0 DAS	15 DAS	30 DAS	45 DAS	60 DAS	MEAN
1	T_1	0.29	0.29	0.28	0.27	0.22	0.27
2	T_2	0.27	0.26	0.25	0.23	0.20	0.24
3	T_3	0.25	0.24	0.23	0.22	0.18	0.23
4	T_4	0.31	0.30	0.29	0.27	0.23	0.28
5	T_5	0.32	0.31	0.30	0.28	0.24	0.29
6	T_6	0.28	0.27	0.26	0.24	0.21	0.25
7	T_7	0.26	0.25	0.24	0.23	0.19	0.23
8	T_8	0.30	0.30	0.29	0.27	0.23	0.28
9	T_9	0.30	0.29	0.28	0.26	0.22	0.27
F-Test		S	S	S	S	S	S
S.E. (m) (±)		0.03	0.03	0.08	0.09	0.1	0.07
CD (5%)		0.09	0.09	0.24	0.27	0.29	0.2

T_0: Control, T_1: Mint syrup (0.5%), T_2: Mint syrup (1.0%), T_3: Tulsi syrup (0.5%), T_4: Tulsi syrup (1.0%), T_5: Lemongrass syrup (0.5%), T_6: Lemongrass syrup (1.0%), T_7: Cinnamon syrup (1.0%), T_8: Mint syrup (0.5%) + Tulsi syrup (0.5%) + Lemongrass syrup (0.5%).

Table 3: Effect of various treatments on Ascorbic acid (mg/100 g of pulp) & Total sugar (%) of value-added guava candy during storage

S. No.	Treatments	Ascorbic acid (mg/100 g of pulp)						Total sugar (%)					
		0 DAS	15 DAS	30 DAS	45 DAS	60 DAS	MEAN	0 DAS	15 DAS	30 DAS	45 DAS	60 DAS	MEAN
1	T_1	73.58	71.95	70.60	69.27	67.97	70.67	74.45	76.43	77.06	78.46	82.19	77.72
2	T_2	75.82	73.95	72.56	71.20	69.86	72.68	74.43	78.31	78.95	80.39	84.17	79.25
3	T_3	77.76	75.65	74.23	72.83	71.46	74.39	75.45	79.89	80.55	82.01	85.85	80.75
4	T_4	70.52	69.25	67.95	66.67	65.42	67.96	73.07	73.91	74.52	75.87	79.52	75.38
5	T_5	69.70	68.55	67.26	66.00	64.76	67.25	72.71	73.27	73.87	75.22	78.83	74.78
6	T_6	74.70	72.95	71.58	70.23	68.91	71.67	73.77	77.37	78.00	79.42	83.18	78.35
7	T_7	76.94	74.95	73.54	72.16	70.80	73.68	75.09	79.25	79.90	81.35	85.16	80.15
8	T_8	71.64	70.25	68.93	67.63	66.36	68.96	73.43	74.85	75.46	76.84	80.51	76.22
9	T_9	72.46	70.95	69.62	68.31	67.02	69.67	73.79	75.49	76.11	77.49	81.20	76.82
F-Test		S	S	S	S	S	S	S	S	S	S	S	S
S.E. (m) (±)		0.3	0.26	0.28	0.25	0.27	0.27	0.16	0.24	0.27	0.25	0.26	0.24
CD (5%)		0.89	0.77	0.84	0.75	0.81	0.82	0.46	0.72	0.79	0.75	0.77	0.7

T_0: Control, T_1: Mint syrup (0.5%), T_2: Mint syrup (1.0%), T_3: Tulsi syrup (0.5%), T_4: Tulsi syrup (1.0%), T_5: Lemongrass syrup (0.5%), T_6: Lemongrass syrup (1.0%), T_7: Cinnamon syrup (1.0%), T_8: Mint syrup (0.5%) + Tulsi syrup (0.5%) + Lemongrass syrup (0.5%).

Table 4: Effect of various treatments on Reducing sugars (%) & non-Reducing sugars (%) of value-added guava candy during storage

S. No.	Treatments	Reducing sugars (%)						Non-Reducing sugars (%)					
		0 DAS	15 DAS	30 DAS	45 DAS	60 DAS	MEAN	0 DAS	15 DAS	30 DAS	45 DAS	60 DAS	MEAN
1	T_1	36.09	37.05	37.35	38.03	39.84	37.67	36.45	37.42	37.72	38.41	40.23	38.05
2	T_2	36.27	38.16	38.47	39.17	41.02	38.62	36.25	38.14	38.45	39.15	41.00	38.60
3	T_3	36.92	39.09	39.41	40.13	42.01	39.51	36.61	38.76	39.08	39.79	41.65	39.18
4	T_4	35.18	35.58	35.87	36.53	38.28	36.29	36.00	36.41	36.71	37.38	39.18	37.14
5	T_5	34.95	35.22	35.51	36.16	37.89	35.95	35.87	36.15	36.44	37.11	38.89	36.89
6	T_6	35.85	37.60	37.91	38.60	40.43	38.08	36.02	37.78	38.09	38.78	40.62	38.26
7	T_7	36.69	38.72	39.04	39.75	41.61	39.16	36.48	38.50	38.82	39.52	41.37	38.94
8	T_8	35.44	36.13	36.43	37.09	38.86	36.79	36.09	36.78	37.09	37.76	39.57	37.46
9	T_9	35.67	36.49	36.79	37.46	39.25	37.13	36.21	37.05	37.35	38.03	39.85	37.70
F-Test		S	S	S	S	S	S	S	S	S	S	S	S
S.E. (m) (±)		0.1	0.14	0.15	0.15	0.15	0.14	0.06	0.1	0.11	0.1	0.1	0.09
CD (5%)		0.29	0.42	0.45	0.43	0.44	0.41	0.17	0.29	0.32	0.31	0.31	0.28

T_0: Control, T_1: Mint syrup (0.5%), T_2: Mint syrup (1.0%), T_3: Tulsi syrup (0.5%), T_4: Tulsi syrup (1.0%), T_5: Lemongrass syrup (0.5%), T_6: Lemongrass syrup (1.0%), T_7: Cinnamon syrup (1.0%), T_8: Mint syrup (0.5%) + Tulsi syrup (0.5%) + Lemongrass syrup (0.5%).

Table 5: Effect of various treatments on Color & Flavor of value-added guava candy during storage

S. No.	Treatments	Color						Flavor					
		0 DAS	15 DAS	30 DAS	45 DAS	60 DAS	MEAN	0 DAS	15 DAS	30 DAS	45 DAS	60 DAS	MEAN
1	T_1	8.80	8.70	8.68	8.67	8.65	8.70	8.50	8.45	8.09	8.00	7.59	8.13
2	T_2	8.90	8.82	8.63	8.44	8.26	8.61	8.52	8.47	8.11	8.02	7.60	8.15
3	T_3	8.97	8.91	8.72	8.53	8.34	8.69	8.54	8.49	8.13	8.04	7.62	8.16
4	T_4	8.68	8.55	8.36	8.18	8.00	8.35	8.48	8.43	8.07	7.98	7.57	8.11
5	T_5	8.66	8.52	8.33	8.15	7.97	8.33	8.47	8.42	8.06	7.97	7.56	8.10
6	T_6	8.85	8.76	8.57	8.38	8.20	8.55	8.51	8.46	8.10	8.01	7.60	8.14
7	T_7	8.95	8.88	8.69	8.50	8.31	8.66	8.53	8.48	8.12	8.03	7.61	8.15
8	T_8	8.73	8.61	8.42	8.24	8.06	8.41	8.49	8.44	8.08	7.99	7.58	8.12
9	T_9	8.75	8.64	8.45	8.27	8.08	8.44	8.50	8.45	8.09	8.00	7.59	8.13
F-Test		S	S	S	S	S	S	S	S	S	S	S	S
S.E. (m) (±)		0.01	0.01	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01
CD (5%)		0.03	0.04	0.05	0.03	0.05	0.04	0.02	0.02	0.03	0.02	0.02	0.02

T_0: Control, T_1: Mint syrup (0.5%), T_2: Mint syrup (1.0%), T_3: Tulsi syrup (0.5%), T_4: Tulsi syrup (1.0%), T_5: Lemongrass syrup (0.5%), T_6: Lemongrass syrup (1.0%), T_7: Cinnamon syrup (1.0%), T_8: Mint syrup (0.5%) + Tulsi syrup (0.5%) + Lemongrass syrup (0.5%).

Table 6: Effect of various treatments on Taste & Texture of value-added guava candy during storage

S. No.	Treatments	Taste						Texture					
		0 DAS	15 DAS	30 DAS	45 DAS	60 DAS	MEAN	0 DAS	15 DAS	30 DAS	45 DAS	60 DAS	MEAN
1	T_1	8.59	8.54	8.18	8.08	7.67	8.21	8.80	8.56	8.37	8.32	7.93	8.40
2	T_2	8.61	8.56	8.20	8.10	7.68	8.23	8.90	8.64	8.45	8.39	8.00	8.48
3	T_3	8.63	8.58	8.22	8.12	7.70	8.25	8.97	8.69	8.50	8.44	8.05	8.53
4	T_4	8.57	8.52	8.16	8.07	7.65	8.19	8.68	8.47	8.28	8.23	7.85	8.30
5	T_5	8.56	8.51	8.15	8.05	7.64	8.18	8.66	8.46	8.27	8.22	7.84	8.29
6	T_6	8.60	8.55	8.19	8.09	7.68	8.22	8.85	8.60	8.41	8.36	7.97	8.44
7	T_7	8.62	8.57	8.21	8.11	7.69	8.24	8.95	8.68	8.49	8.43	8.04	8.52
8	T_8	8.58	8.53	8.17	8.08	7.66	8.20	8.73	8.51	8.32	8.27	7.88	8.34
9	T_9	8.59	8.54	8.18	8.08	7.67	8.21	8.75	8.52	8.33	8.28	7.89	8.35
F-Test		S	S	S	S	S	S	S	S	S	S	S	S
S.E. (m) (±)		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
CD (5%)		0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.03	0.03	0.03

T_0: Control, T_1: Mint syrup (0.5%), T_2: Mint syrup (1.0%), T_3: Tulsi syrup (0.5%), T_4: Tulsi syrup (1.0%), T_5: Lemongrass syrup (0.5%), T_6: Lemongrass syrup (1.0%), T_7: Cinnamon syrup (1.0%), T_8: Mint syrup (0.5%) + Tulsi syrup (0.5%) + Lemongrass syrup (0.5%).

Table 7: Effect of various treatments on Overall acceptability of value-added guava candy during storage

S. No.	Treatments	Overall acceptability					
		0 DAS	15 DAS	30 DAS	45 DAS	60 DAS	MEAN
1	T_1	8.14	8.11	8.05	8.00	7.94	8.05
2	T_2	8.30	8.27	8.21	8.15	8.10	8.20
3	T_3	8.42	8.38	8.33	8.27	8.21	8.32
4	T_4	7.93	7.90	7.84	7.79	7.74	7.84
5	T_5	7.89	7.86	7.81	7.75	7.70	7.80
6	T_6	8.22	8.19	8.13	8.07	8.02	8.13
7	T_7	8.38	8.34	8.29	8.24	8.18	8.29
8	T_8	8.01	7.98	7.92	7.87	7.81	7.92
9	T_9	8.06	8.03	7.97	7.92	7.86	7.97
F-Test		S	S	S	S	S	S
S.E. (m) (±)		0.02	0.02	0.02	0.02	0.02	0.02
CD (5%)		0.05	0.06	0.06	0.06	0.06	0.06

T_0: Control, T_1: Mint syrup (0.5%), T_2: Mint syrup (1.0%), T_3: Tulsi syrup (0.5%), T_4: Tulsi syrup (1.0%), T_5: Lemongrass syrup (0.5%), T_6: Lemongrass syrup (1.0%), T_7: Cinnamon syrup (1.0%), T_8: Mint syrup (0.5%) + Tulsi syrup (0.5%) + Lemongrass syrup (0.5%)

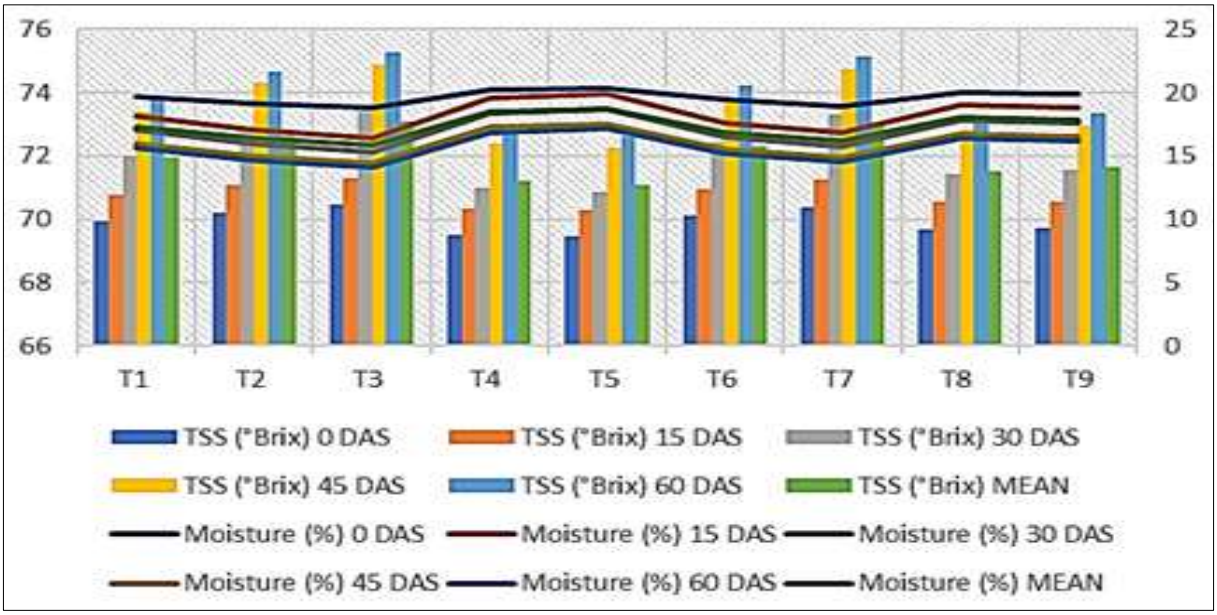

Fig 1: Effect of various treatments on TSS (°Brix) & Moisture (%) of value- added guava candy during storage

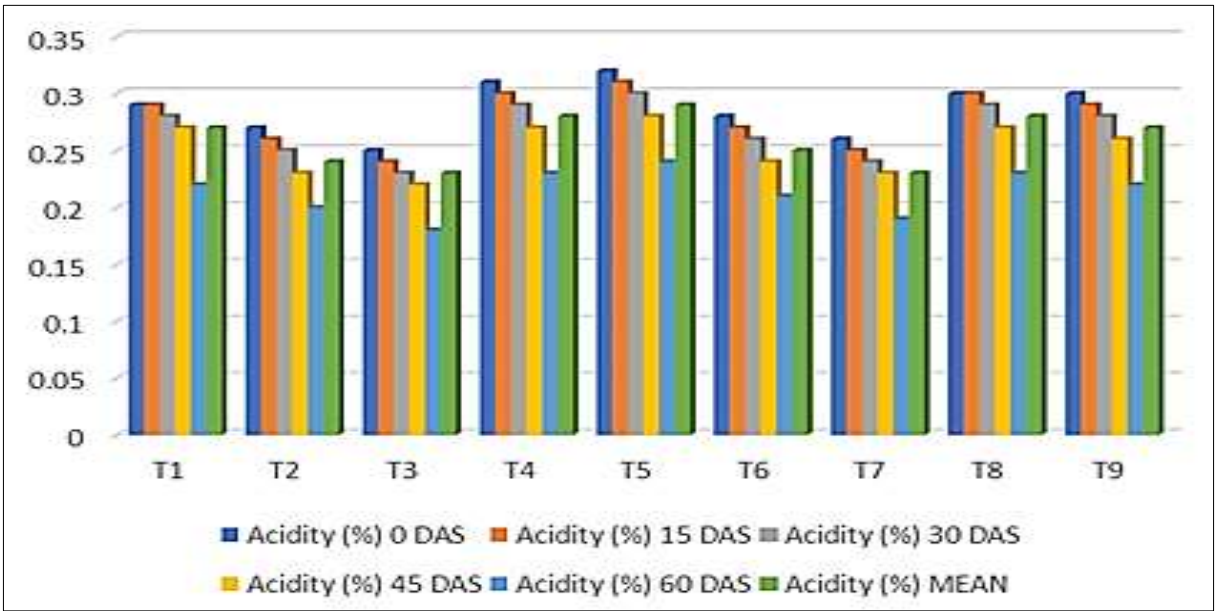

Fig 2: Effect of various treatments on Acidity (%) of value-added guava candy during storage

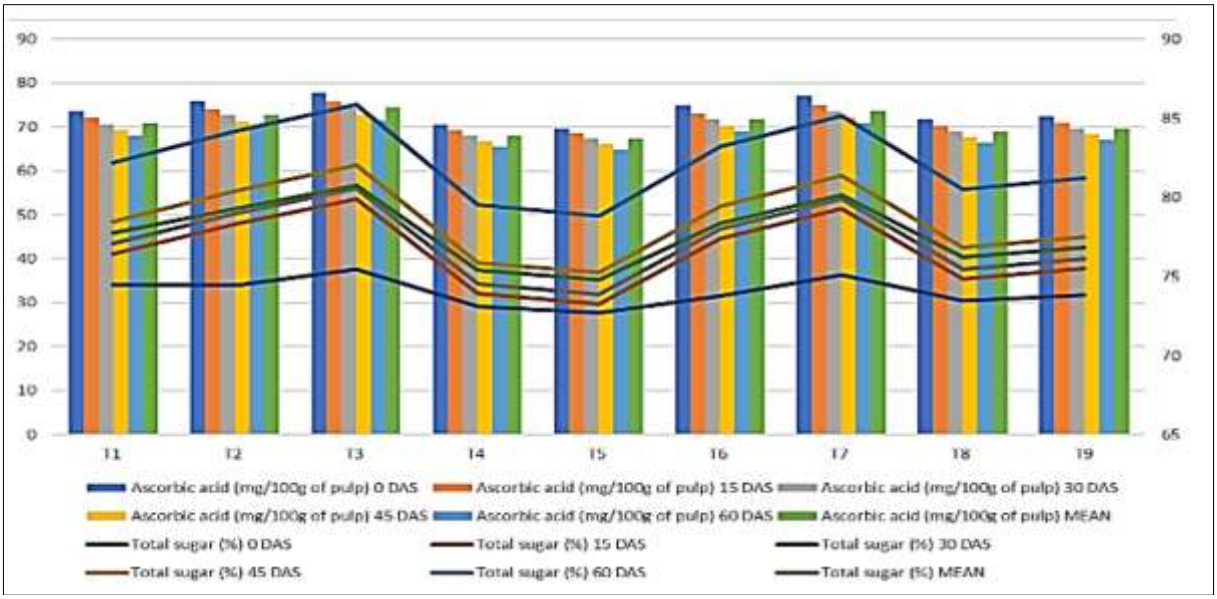

Fig 3: Effect of various treatments on Ascorbic acid (mg/100 g of pulp) & Total sugar (%) of value-added guava candy during storage

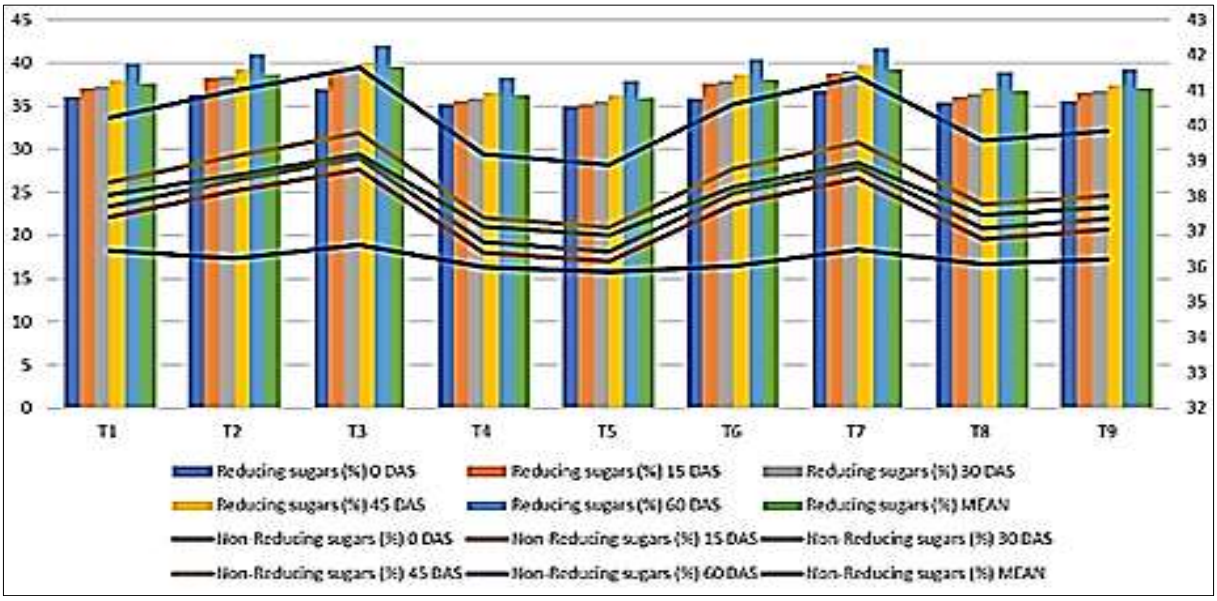

Fig 4: Impact of edible coating on pH and Titrable Acidity % of Amrapali Mango (*Mangifera indica* L.)

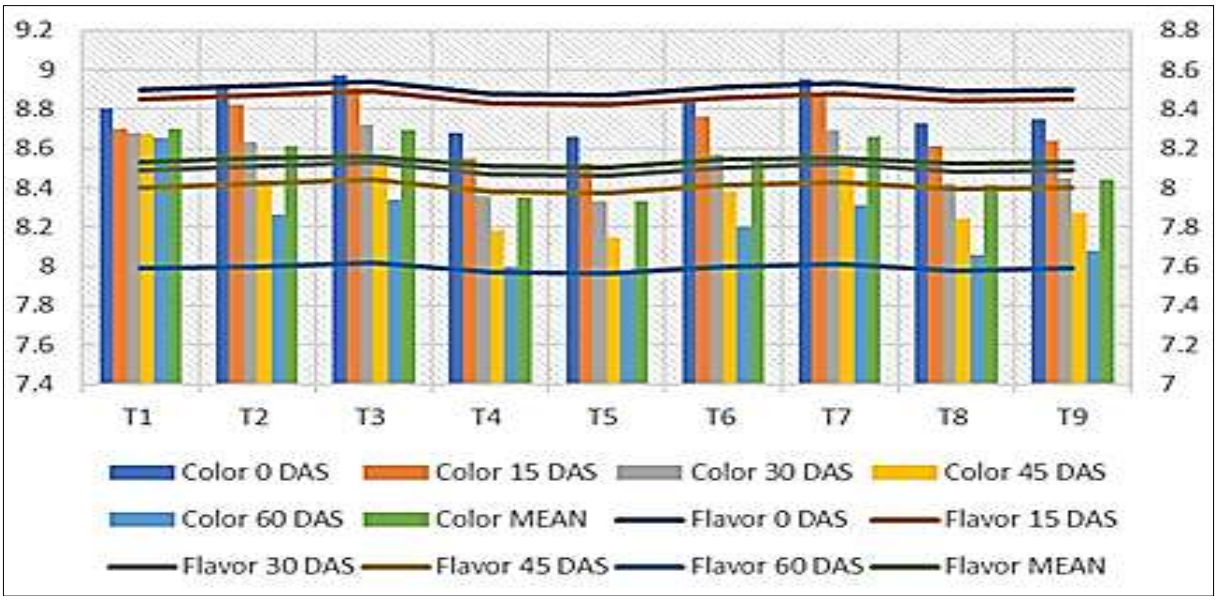

Fig 5: Effect of various treatments on Color & Flavor of value-added guava candy during storage

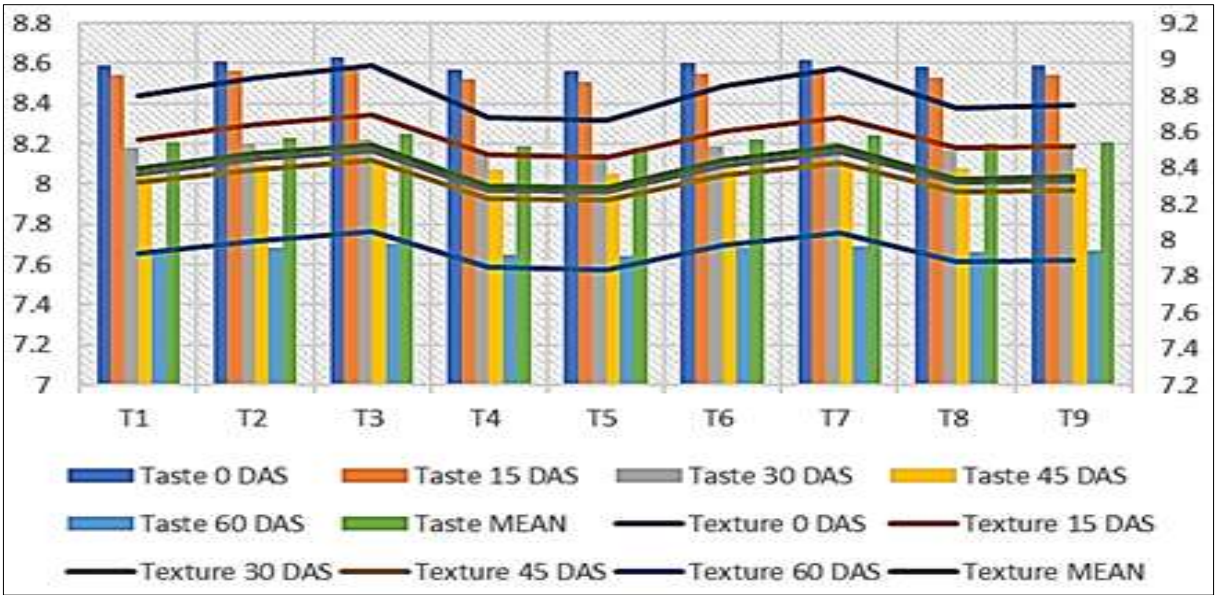

Fig 6: Effect of various treatments on Taste & Texture of value-added guava candy during storage

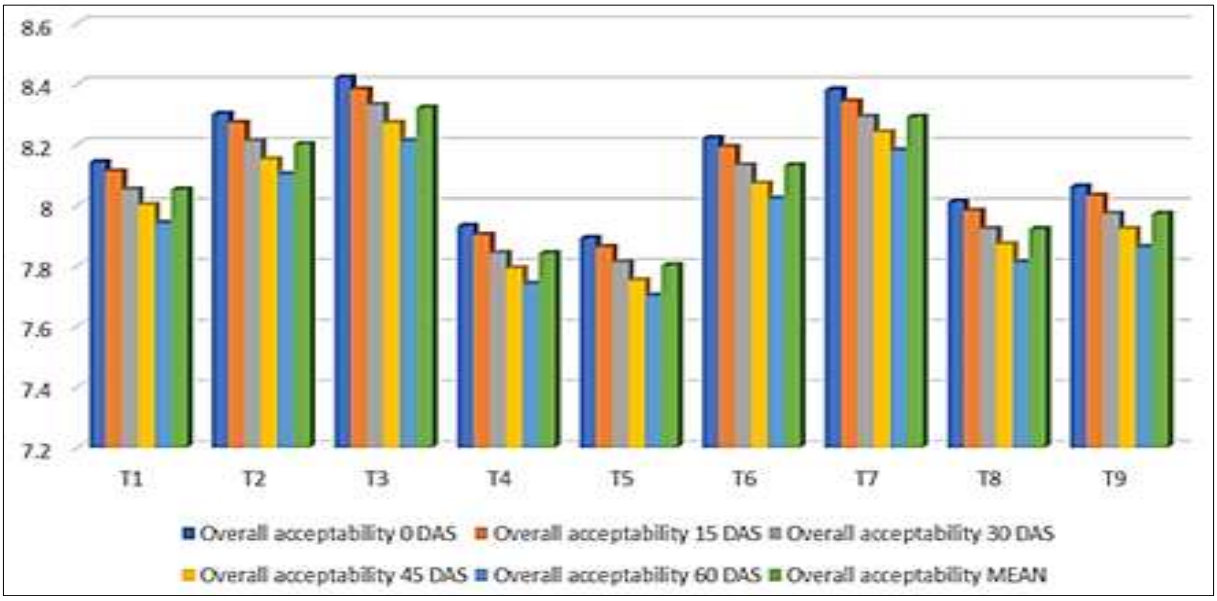

Fig 7: Effect of various treatments on Overall acceptability of value-added guava candy during storage

Conclusion

On the basis of results obtained during the present investigation it is concluded that T_2 [Mint syrup (1.0%)] was found best in terms of physico-chemical attributes of guava candy like TSS (°Brix), Acidity (%), Ascorbic acid (mg/100 g of pulp), Total sugar (%), Reducing sugar (%), non-Reducing sugar (%) and moisture (%).

Also, it recorded significantly the highest in terms of sensory attributes of value-added guava candy *viz*., Color, flavor, taste, texture and overall acceptability.

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