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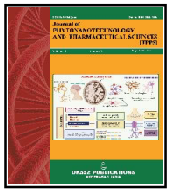

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Standardization of recipe for preparation of jaggery based persimmon fruit leather

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Abstract

Persimmon (*Diospyros kaki* Thunb.) belonging to the family Ebenaceae, is an important fruit tree mostly cultivated in sub-tropical and warm temperate regions. Persimmon fruits are a natural source of polyphenols, ascorbic acid, carotenoids, fiber, vitamins, and flavonols contributing to potential health benefits. Because of its short shelf-life and limited seasonal availability of only one to two months, it can be used to make value-added products like fruit leather. Fruit leather is a blend of fruit pulp with other additives like sugar, jaggery, acid, pectinetc. These leathers are consumed as snacks or desserts which are low in fat with high fibre and carbohydrate content. Hence, keeping in view the short seasonal availability and high nutritional composition of persimmon fruits, the current studies were carried out on the standardization of recipes for the preparation of jaggery-based persimmon fruit leather. For the preparation of leather, seven treatment combinations were tried by varying TSS levels (20, 24, 28, 32ºB) with citric acid concentrations as 0, 0.25, 0.50, 0.75, 1.00, 1.25 and 1.50 per cent, respectively, under each TSS level. Based on sensory evaluation, recipe C4 with 28 ºB TSS and 1 per cent citric acid addition was found as the best recipe for the development of persimmon fruit leather with sensory scores of 8.13, 8.16, 8.50 and 8.26 for colour, texture, taste and overall acceptability, respectively.

1. Introduction

Persimmon (*Diospyros kaki* Thunb.) is an important sub-tropical and warm temperate region deciduous fruit tree, which belongs genus *Diospyros* meaning 'The Fruit of God'. It is commonly known as '*Japani Phal'* or 'Japanese persimmon' and the word persimmon has been derived from the Algonquian language which means "Dry Fruit" (Pachisia, 2020). Presently, it is being cultivated on a very small scale in parts of Jammu and Kashmir, Himachal Pradesh, Uttrakhand, Northeastern states, hills of Uttar Pradesh and some parts of Nilgiri hills in South India (Chadha, 2019).The fruits are categorized as astringent and non-astringent or sweet persimmons based on their astringency. The sensation of astringency occurs due to the binding of tannins to salivary proteins, causing them to precipitate or aggregate, creating a dry or sandpapery feel in the mouth (Pachisia, 2020). However, in recent years, non-astringent cultivars like Fuyu, Hana Fuyu, Jiro, *etc.*,have gained greater popularity. It is generally recognized as an outstanding source of biologically active compounds including polyphenols, ascorbic acid, carotenoids, vitamins (A, B_6, B_{12}, D and E), proteins, tannins, flavonols and flavonoids (Pachisia, 2020). These compounds are known as effective antioxidants, protecting the body against oxidative stress and illnesses such as cancer, coronary heart diseases and hyper inflammation (Kashyap *et al*., 2017; Thakur *et al*., 2020; Hamid *et al*., 2022). The main therapeutic properties exhibited by persimmon are due to the antioxidant activity of ascorbic acid and tannins (George and Redpath, 2008).

One of the major constraints in fruits and vegetable consumption is their seasonal availability and high perishability so their use in the processing and development of high-value food products is a convenient and better alternative (Oreggo *et al.,* 2014). Now-a-days, the consumption of fruits and vegetables has increased due to their role in human health which is primarily due to the presence of phytochemicals with pharmacological potential (Sharma *et al*., 2019; Hamid *et al*., 2021). Different researchers and their findings cleared that fruits and vegetables have good health properties due to their different bioactive compounds which help in curing different diseases by improving the immune system (Kaushal *et al*., 2022). Although, persimmon is a rich source of bioactive compounds but its potential has not yet been completely exploited mainly because of its short seasonal availability and perishable nature. It deteriorates quickly, if stored at ambient temperature conditions (Zheng *et al.,* 2005). Although, fresh fruits can be stored for up to 2 months under cold storage conditions (Jung *et al.,* 2005) to increase their availability throughout the year; they can be processed into various value-added food products including fruit leather.

Fruit leather is also known as fruit slab or fruit bar and it is prepared by blending fruit puree or pulp, sugar or other nutritive sweeteners and additives desired for the product and then dehydrated to form a sheet of leather (Tiwari, 2019). Fresh fruits serve as a source of energy, vitamins, minerals and dietary fibre; however, fruit leathers are proclaimed to have far greater nutritional value than fresh fruits as all the nutrients are present in concentrated form. So, considering the short seasonal availability and good nutritional properties of persimmon fruits current studies were carried out on the development of jaggery-based persimmon fruit leathers.

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2. Materials and Methods

2.1 Persimmon fruit and other raw materials

The fully matured fruits of the Fuyu variety were procured from the District Kullu of Himachal Pradesh and brought to the research laboratory of the Department of Food Science and Technology for extraction of pulp and further development of fruit leather. Jaggery was procured from the local market of the Nauni campus. The packaging material and chemicals required during the study were procured from Loba International Scientifics and Surgicals, Solan.

2.2 Extraction of pulp

Persimmon fruits after sorting were washed properly and pulp was extracted as per the standardized method (Gautam *et al.,* 2020) which has been depicted in Figure 1.

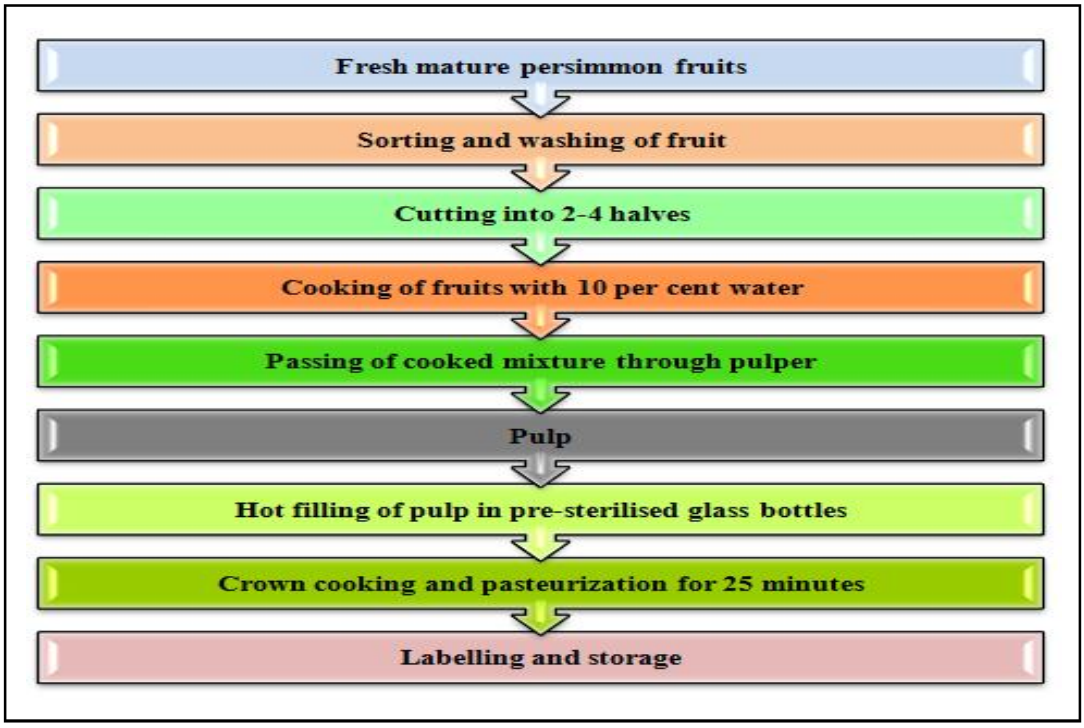

Figure 1: Unit operations for the preparation of persimmon pulp.

2.3 Standardization of recipe for the development of persimmon fruit leather

Persimmon fruit leathers were prepared by varying TSS levels of 20, 24, 28, and 32 ºB, and under each TSS level, the citric acid content was varied as 0, 0.25, 0.50, 0.75, 1.00, 1.25, and 1.5 per cent, respectively. The fruit leathers were prepared as per the methodology given in Figure 2. The best treatment combination was selected based on sensory characteristics and further evaluated for various physicochemical characteristics.

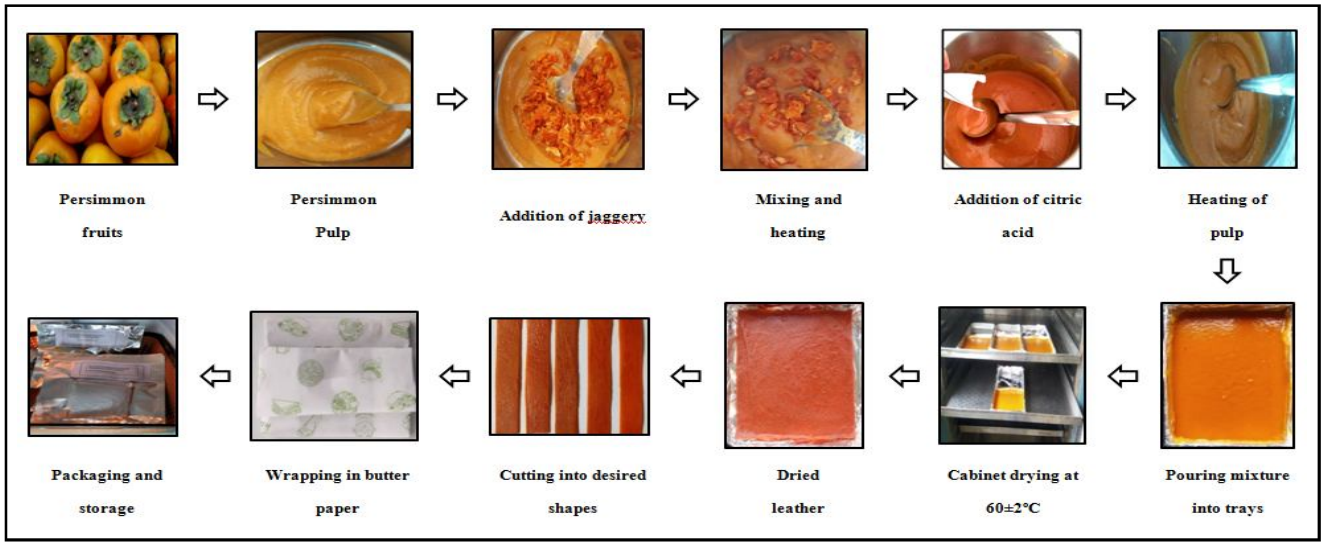

Figure 2: Unit operations for the preparation of jaggery-based persimmon fruit leather.

2.4 Physicochemical characteristics

For estimation of physical characteristics, 10 persimmon fruits were randomly selected. The size of fruits was analyzed by measuring their length and width using a vernier calliper and the average size was expressed in millimetres (mm). The fruit weight was measured by placing them on a digital weighing balance and the results were expressed in grams (g). The volume (cc) of persimmon fruits was measured using the water displacement method. Whereas, the density of fruits was obtained by dividing fruit weight (g) by their volume (cc) and was expressed as g/cc. The color of randomly selected fruit samples was assessed by visual comparison with color cards of the Royal Horticultural Society, London and pulp recovery was calculated on a per cent basis with respect to the weight of extracted pulp and initial weight. The moisture content, sugars, titratable acidity, ascorbic acid content, non-enzymatic browning (NEB) and carotenoids were estimated as per the standard methods by Ranganna (2009). Total solid content of pre-weighed samples was calculated on a per cent basis. The water activity of the sample was estimated by using the digital water activity meter (HW3 model, Rotronic International, Switzerland) at room temperature. The TSS of samples was measured by using hand refractometers of different ranges like 0-32°B, 28-62°B and 58-92°B (ERMA). The sugar-to-acid ratio was analyzed by dividing the TSS of the sample by titratable acidity. The total phenol content of the sample was determined by the Folin-Ciocalteu procedure given by Singleton and Rossi (1965).The antioxidant activity or the free radical scavenging activity of samples was measured according to the method of Brand-Williams *et al.* (1995). The ash content of the sample was determined by the gravimetric method according to the procedure of AOAC (2012).

2.5 Sensory characteristics

The nine-point Hedonic rating method was used for sensory evaluation of persimmon fruit leather. A panel of ten judges comprising 5 females and 5 males (faculty members and students) of the department of food science and technology, Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan (HP) were selected to evaluate fruit leathers for various sensory parameters such as color, texture, taste and overall acceptability.

2.6 Statistical analysis

All the analytical parameters were recorded in three replications and the mean values of each parameter was calculated. The data on physicochemical characteristics of different fruit leathers was analyzed by completely randomized design (CRD), whereas the data of sensory evaluation was analyzed using randomized block design (RBD).

3. Results

3.1 Physicochemical characteristics of persimmon fruit and pulp

3.1.1 Physical characteristics

The perusal of the data mentioned in Table 1 depicts that the colour of the persimmon fruit was observed as yellow-orange group 23 (A). The average length, width and weight of fruit were found to be as 47.10, 74.20 mm and 173.80 g, respectively. The fruit volume and density were found to be 177.00 cc and 0.98 g/cc, respectively. Nearly similar results of these parameters have been reported by Toplu *et al.* (2009); Altuntas *et al.* (2011); Unal *et al.* (2018); Gautam *et al.* (2020) and Bisht (2020).

Table 1: Physical characteristics of persimmon fruit

Parameters		Mean ± S.E.
*Visual colour		Yellow orange group 23 (A)
Size (mm)	Length	47.10 ± 1.24
	Width	74.20 ± 1.49
Weight (g)		173.80 ± 4.72
Volume (cc)		177.00 ± 1.30
Density (g/cc)		0.98 ± 0.11

*Colour and colour card number of Royal Horticulture Society, London

3.1.2 Chemical characteristics

The data on the chemical analysis of the persimmon fruit has been depicted in Table 2. The average moisture content and total solids of the fruit were found to be 80.90 and 19.10 per cent, respectively. The mean TSS content was found to be 15.30 ºB, whereas, reducing sugars and total sugars were found to be 7.37 and 11.20 per cent, respectively. The titratable acidity of this fruit was recorded as 0.15 per cent and further, the average ascorbic acid content of the fruit was found to be 20.80 mg/100 g. As per the results, total carotenoids and total phenols were found to be 3.32 mg/100 g and 580.80 mg GAE/100 g, respectively, whereas, the antioxidant activity was recorded as 79.44 per cent. The crude fibre and ash contents were observed as 0.80 and 0.38 per cent, respectively. Similar findings of these parameters have also been reported by Bubba *et al.* (2009); Toplu *et al.* (2009); Veberic *et al.* (2010); Chandel (2011); Altuntas *et al.* (2011); Baltacioglu and Artik (2013); Chen *et al.* (2016); Khokhlov and Plugatar (2016); Kim *et al.* (2016); Cho *et al.* (2018); Gautam *et al.* (2020) and Bisht (2020).

Table 2: Chemical characteristics of persimmon fruit

Parameters	Mean ± S.E.
Moisture (%)	80.90 ± 0.02
Total solids (%)	19.10 ± 0.02
TSS (º B)	15.30 ± 0.21
Reducing sugars (%)	7.37 ± 0.09
Total sugars (%)	11.20 ± 0.05
Titratable acidity (% malic acid)	0.15 ± 0.02
Ascorbic acid (mg/100 g)	20.80 ± 0.67
Total carotenoids (mg/100 g)	3.32 ± 0.02
Total phenols (mg GAE/100 g)	580.80 ± 0.85
Antioxidant activity (% DPPH free radical scavenging activity)	79.44 ± 0.16
Crude fibre (%)	0.80 ± 0.03
Ash (%)	0.38 ± 0.03

3.1.3 Physicochemical characteristics of pulp

The data presented in Table 3 highlights the physicochemical characteristics of persimmon pulp. The yield of persimmon pulp was found to be 64.96 per cent. The mean TSS content was found to be 14.9 ºB, whereas, reducing sugars and total sugars were found to

be 6.63 and 10.74 per cent, respectively. The titratable acidity of the pulp was recorded as 0.13 per cent and average ascorbic acid content was found as 14.20 mg/100 g. The total carotenoids and total phenols were found to be 3.15 mg/100 g and 514.36 mg GAE/100 g, respectively, whereas, the antioxidant activity of the persimmon pulp was recorded as 69.47 per cent. Similar findings of these parameters have also been reported by Gautam *et al.* (2020) and Sharma *et al.* (2020) in persimmon fruit pulp.

Table 3: Physico chemical characteristics of persimmon pulp

Parameters	Mean ± S.E.
Yield (%)	64.96 ± 0.02
TSS (ºB)	14.91 ± 0.03
Reducing sugars (%)	6.63 ± 0.05
Total sugars (%)	10.74 ± 0.03
Titratable acidity (% malic acid)	0.13 ± 0.02
Ascorbic acid (mg/100 g)	14.20 ± 0.06
Total carotenoids (mg/100 g)	3.15 ± 0.03
Total phenols (mg GAE/100 g)	514.36 ± 0.96
Antioxidant activity (% DPPH free radical scavenging activity)	69.47 ± 0.16

3.2 Development of persimmon fruit leather

3.2.1 Standardization of recipe for the development of persimmon fruit leather at different TSS levels (20, 24, 28 and 32 ºB)

The data presented in Figure 3 shows sensory scores of persimmon fruit leather at a TSS level of 20 ºB. The mean color scores ranged from 6.72 to 8.21 and the highest score was awarded to treatment A_4 (8.21), whereas, treatment A_0 (6.72) obtained the lowest scores. The average texture scores were found in the range of 7.82 to 8.11 and the maximum score was awarded to treatment A_3 (8.11) which was statistically at par with treatment A_4 (8.09), whereas, the minimum score was awarded to treatment A_0 (7.82). The mean scores for taste for different treatments ranged from 7.12 to 8.21 and the highest score was awarded to treatment A_4 (8.21) and the lowest scores to treatment A_0 (7.12). The average overall acceptability scores ranged from 7.22 to 8.17 and the maximum score was given to treatment A_4 (8.17), followed by A_3 (8.15) and A_2 (8.08), whereas, the minimum score to A_0 (7.22). Based on sensory evaluation treatment A_4 having 1 per cent citric acid was selected as the best recipe for the development of persimmon fruit leather at 20 ºB TSS.

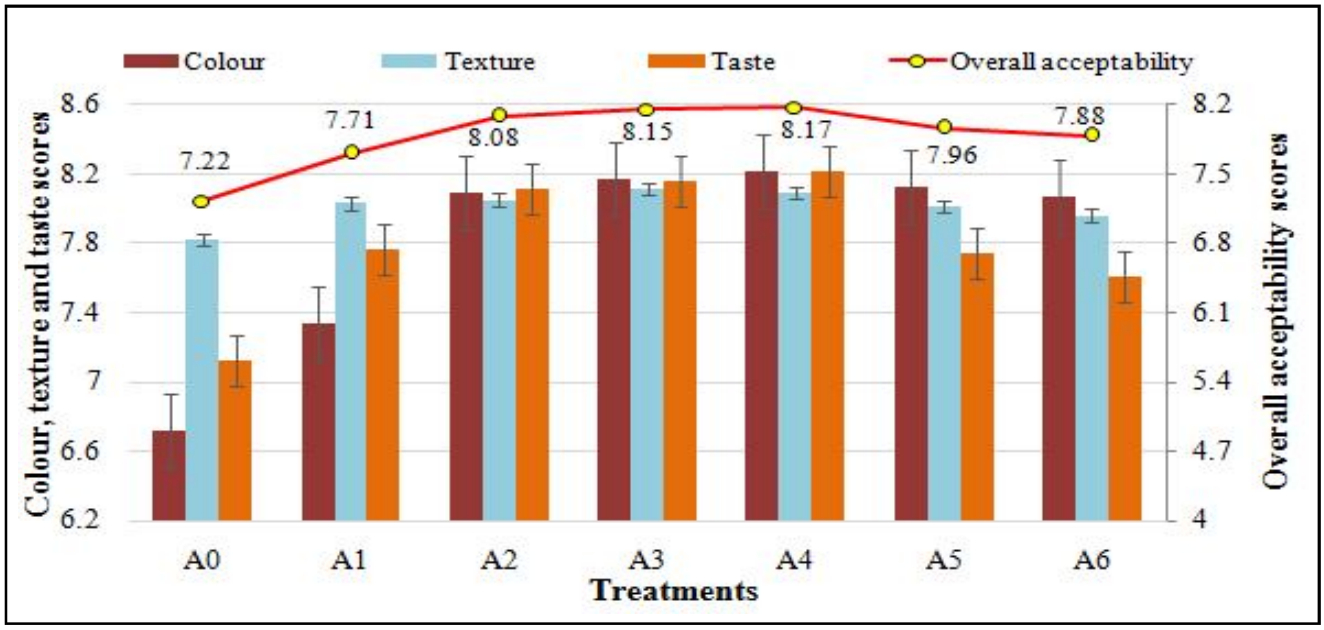

Figure 3: Sensory characteristics scores of persimmon fruit leather at 20 ºB TSS.

The data presented in Figure 4 shows sensory scores for persimmon fruit leather with TSS of 24 ºB. The mean color scores ranged from 6.69 to 8.18, with treatment B_4 receiving the highest score (8.18) and treatment B_0 receiving the lowest (6.69). The average texture scores varied from 7.78 to 8.12, with treatment B_3 (8.12) obtaining the highest score, which was statistically comparable to treatments B_2

(8.07) and B_4 (8.08), while treatment B_6 (7.78) obtained the lowest score. The mean taste scores ranged from 7.15 to 8.19, with treatment B_3 receiving the highest score (8.19) and Treatment B_0 receiving the lowest (7.15). The average overall acceptability scores ranged from 7.23 to 8.15, with treatment B_3 (8.15) receiving the highest score, which was statistically equivalent to treatment B_4 (8.13), and treatment B_0 (7.23) receiving the lowest scores among all treatments. As per the data from Figure 4 treatment B_3 with 0.75 per cent citric acid was selected as the best recipe for the development of persimmon fruit leather at 24 ºB TSS based on sensory evaluation.

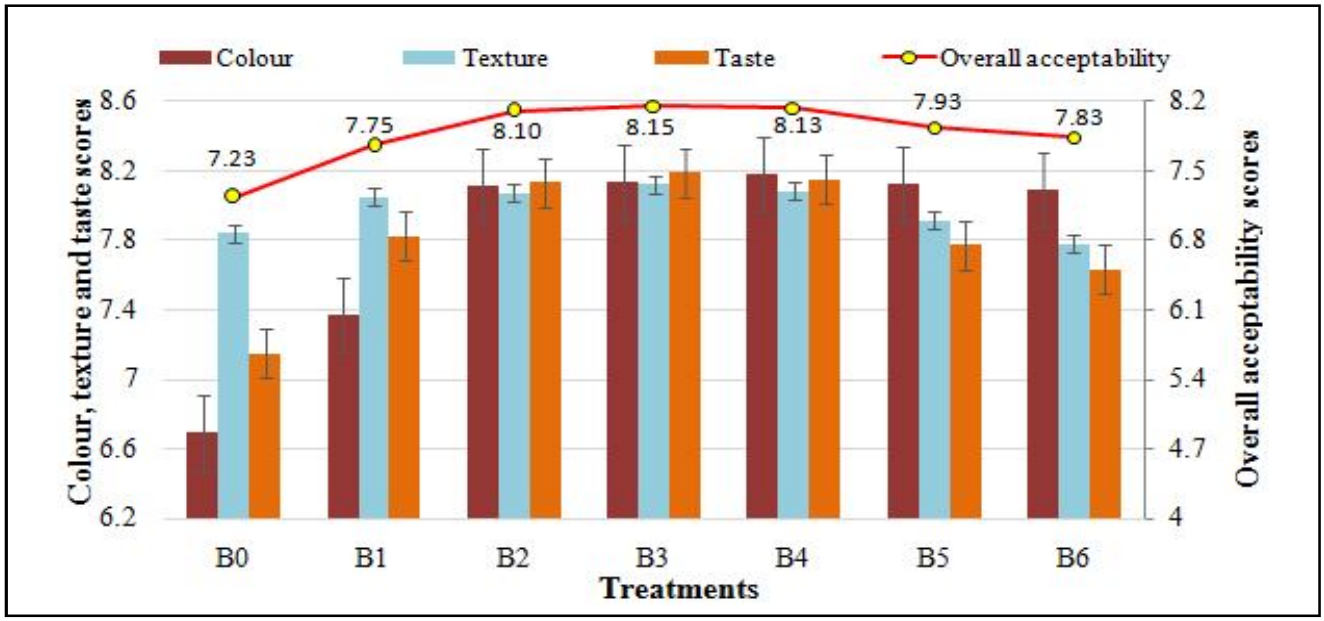

Figure 4: Sensory characteristics scores of persimmon fruit leather at 24 ºB TSS.

The data obtained as per the sensory evaluation of persimmon fruit leather at 28 ºB TSS is presented in Figure 5.The average scores for color ranged from 6.68 to 8.16 with treatment C_3 obtaining the highest score of 8.16 which was statistically at par with treatment C_4 (8.14) and the lowest with treatment C_0 with a score of 6.68. The mean texture scores were found in the range of 7.76 to 8.13 and the maximum score was given to treatment C_4 (8.13) which was statistically at par with treatment C_3 (8.12), whereas, the minimum score was obtained by treatment C_6 (7.76). The mean scores for taste ranged from 7.13 to 8.20 and the highest score was awarded to treatment C_4 (8.20) and the lowest scores to treatment C_0 (7.13). The average overall acceptability scores ranged from 7.21 to 8.16 and the highest score was given to treatment C_4 (8.16) and the lowest to treatment C_0 (7.21). It is evident from Figure 5 that based on sensory evaluation treatment C_4 having 1 per cent citric acid was selected as the best recipe for the development of persimmon fruit leather at 28 ºB TSS.

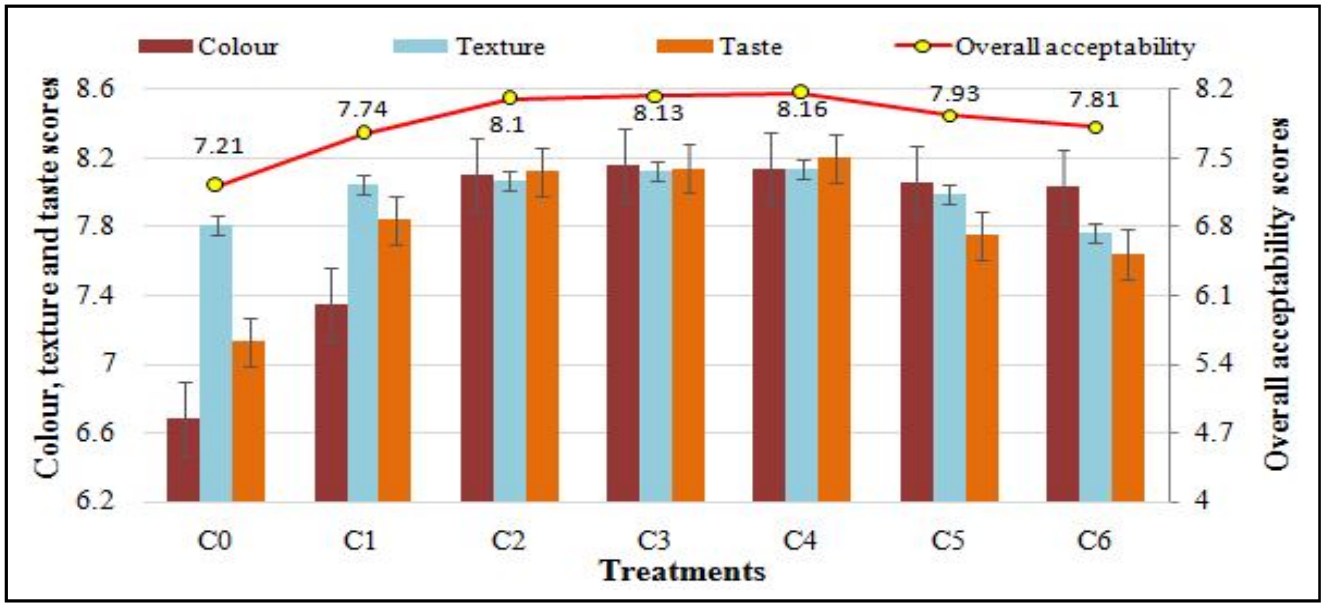

Figure 5: Sensory characteristics scores of persimmon fruit leather at 28 ºB TSS.

The data based on the sensory characteristics of persimmon fruit leather at 32 ºB TSS depicted in Figure 6 depicts that the mean colour scores ranged from 6.62 to 8.13 and the highest score was awarded to treatment D_4 (8.13) and the lowest to treatment D_0 (6.62). The average texture scores ranged from 7.55 to 8.06 with a maximum score given to treatment D_3 (8.06) and a minimum score awarded to treatment D_6 (7.55). The mean scores for taste ranged from 7.09 to 8.13 and the highest score was awarded to treatment D_3 (8.13) which was statistically at par with treatment D_2 (8.11) and the lowest score was obtained by treatment D_0 (7.09). The average overall acceptability scores ranged from 7.11 to 8.10 and the maximum score was given to treatment D_3 (8.10), whereas, the minimum score to treatment D_0 (7.11). From Figure 6 it was concluded that on the basis of sensory evaluation, treatment D_3 having 0.75 per cent citric acid was selected as the best recipe for the development of persimmon fruit leather at 32 ºB TSS.

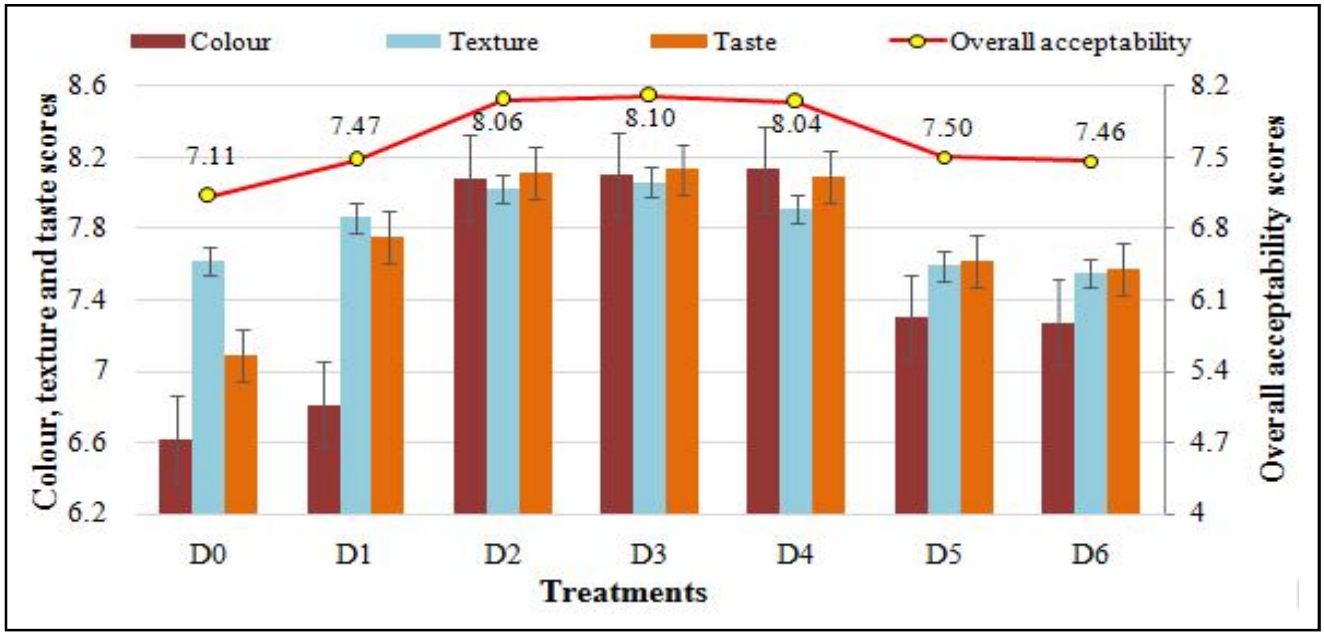

Figure 6: Sensory characteristics scores of persimmon fruit leather at 32 ºB TSS.

It is evident from Figures 3-6 that the color scores of persimmon fruit leather increased with the increase in citric acid concentration. However, at higher acid concentrations (above 0.75 and 1.00 %), the colour scores decreased due to the increased concentration of jaggery with high acid content resulted in a slightly darker color of the end product. The texture of the leather improved with the increasing concentration of citric acid; however, the higher concentrations negatively affected the texture of the leather. At the higher concentrations of citric acid, a stickier and softer product was obtained. This might have occurred due to syneresis or spontaneous exudation of fluid from gel in the presence of excess of acid (Srivastava and Kumar, 2015). The taste scores improved with the increasing concentrations of citric acid up to treatments with 0.75 and 1 per cent citric acid due to a better sugar-acid blend in the persimmon fruit leather. However, the higher levels of citric acid decreased the taste scores which may be attributed to the increased sour taste of the final product. The overall acceptability scores also increased with the increase in citric acid concentration but at higher concentrations, the overall acceptability of the product decreased due to a decrease in color, texture and taste of the product. Similar observations were reported by Prasad (2009) in protein-fortified mango and banana bars and by Suradkar *et al.* (2021) in jamun fruit leather.

3.2.2 Standardization of the best recipe for the preparation of persimmon fruit leather

The data obtained from the chemical and sensory characteristics of the selected persimmon fruit leather recipes at different TSS levels has been depicted in Table 4.

3.2.2.1 Chemical characteristics

As per the data illustrated in Table 4 based on the chemical characteristics of the selected recipes of persimmon fruit leather shows that there was a significant difference among the chemical characteristics of different recipes of persimmon fruit leather except for ascorbic acid, total carotenoids and crude fibre. The moisture content of different recipes was found in the range of 17.47 to 18.93 per cent and the highest moisture content was observed in treatment A_4 (18.93%), whereas, the lowest was in treatment D_3(17.47%). The total solids content was found in the range of 81.07 to 82.53 per cent and the maximum solids content was observed in treatment D_3 (82.53%), whereas, the minimum was in treatment A_4 (81.07%). The TSS, reducing sugars and total sugars content in different recipes of leather was in the range of 72.23 to 79.06 ºB, 30.47 to 38.87 per cent and 61.64 to 70.23 per cent, respectively. The highest content of these parameters was observed in treatment D_3, whereas, the lowest was in treatment A_4. The titratable acidity was found in the range of 1.33 to 1.47 per cent and the highest content of titratable acidity was found in treatment A_4 (1.47%) which was statistically at par with treatment C_4 (1.44%), whereas, the lowest in treatment D_3 (1.33%) followed by treatment B_3 (1.38%).

Table4: Chemical and sensory characteristics of different recipes of persimmon fruit leather

Parameter \ Treatment	A_4 (20 °B)	B_3 (24 °B)	C_4 (28 °B)	D_3 (32 °B)	$CD_{0.05}$
Chemical characteristics					
Moisture (%)	18.93	18.73	18.34	17.47	0.03
Total solids (%)	81.07	81.27	81.66	82.53	0.25
TSS (ºB)	72.23	75.36	77.01	79.06	0.40
Reducing sugars (%)	30.47	33.34	35.26	38.87	2.38
Total sugars (%)	61.64	63.83	66.82	70.23	1.40
Titratable acidity (% citric acid)	1.47	1.38	1.44	1.33	0.06
Sugar to acid ratio	49.14	52.33	55.80	59.44	0.65
Ascorbic acid (mg/100 g)	16.67	16.72	16.75	16.77	NS
Total carotenoids (mg/100 g)	8.99	8.96	8.94	8.91	NS
Total phenols (mg GAE/100 g)	949.27	965.53	994.14	1016.13	2.89
Antioxidant activity (% DPPH free radical scavenging activity)	85.30	86.17	88.79	91.38	2.31
Crude fibre (%)	1.32	1.30	1.27	1.26	NS
Ash (%)	1.68	1.72	1.75	1.77	0.01
Sensory characteristics					
Colour	8.11	8.14	**8.13**	8.12	NS
Texture	8.13	8.14	**8.16**	8.08	0.02
Taste	8.10	8.13	**8.50**	8.07	0.03
Overall acceptability	8.10	8.13	**8.26**	8.09	0.02

The sugar to acid ratio was found in the range of 49.14 to 59.44 and the highest in treatment D_3 (59.44), whereas, the lowest was observed in treatment A_4 (49.14). The total phenols were found in the range of 949.27 to 1016.13 mg GAE/100 g and the highest were found in treatment D_3 (1016.13 mg GAE/100 g) and the lowest in treatment A_4 (949.27 mg GAE/100 g). The antioxidant activity was found in the range of 85.30 to 91.38 per cent and the highest content was observed in treatment D_3 (91.38%), whereas, the lowest was in treatment A_4 (85.30%) which was statistically at par with treatment B_3 (86.17%). The ash content was found in the range of 1.68 to 1.77 per cent and the highest content was found in treatment D_3 (1.77%), whereas, the lowest in treatment A_4 (1.68%).

The evaluation of the data mentioned in Table 4 shows that the moisture content of the persimmon fruit leather decreased with an increase in TSS level from 20 to 32 ºB which might be due to the binding of free moisture by sugars. The total solids increased from treatment A_4 to D_3 as there was a decrease in moisture content. The TSS, total sugars and reducing sugars increased with an increase in TSS level. This increase might be attributed to the addition of higher quantities of jaggery to raise the TSS to the desired level. The higher titratable acidity content in treatments A_4 and C_4 might be due to higher (1%) citric acid content as compared to treatments B_3 and D_3 which contained lower (0.75%) citric acid content. The sugar-to-acid ratio increased from A_4 to D_3 due to an increase in TSS content. Also, there was an increase in the total phenols and antioxidant activity with an increase in the TSS level of leather, which might be contributed by the addition of higher quantities of jaggery at higher TSS levels. There was a significant increase in the ash content with the subsequent increase in TSS levels of the leather which might be due to the presence of a higher amount of minerals like calcium, phosphorous, iron, *etc.,* in jaggery.

3.2.2.2 Sensory characteristics

The perusal of the data mentioned in Table 4 shows that there was a significant difference among different treatments except for colour scores. The mean texture scores ranged from 8.08 to 8.16 and the maximum texture score was awarded to treatment C_4 (8.16), followed by B_3 (8.14) and the minimum was obtained by treatment D_3 (8.08). The mean scores for taste ranged from 8.07 to 8.50 and the maximum taste score was given to treatment C_4 (8.50) and the minimum to treatment D_3 (8.07), followed by A_4 (8.10). The average overall acceptability scores ranged from 8.09 to 8.26 and the maximum score was awarded to treatment C_4 (8.26) and the minimum to treatment D_3 (8.09), followed by A_4 (8.10).

Assessment sensory scores mentioned in Table 4 show that there was an increase in texture scores of different recipes of persimmon fruit leather however, at higher (above C_4: 28 ºB) TSS levels the leather became too soft and sticky due to the presence of higher jaggery content. There was an increase in taste scores with the increase in TSS levels due to a better sugar acid blend however, at higher (above C_4: 28 ºB) TSS levels the taste scores decreased as the leather became very sweet. The overall acceptability scores of leather

increased with increasing TSS levels which might be due to an increase in texture and taste scores. However, at higher concentrations (above C_4: 28 ºB) the overall acceptability scores decreased as there was a decrease in texture and taste scores of the developed products.

From the data presented in Table 4 it was concluded that recipe C_4 having 28 ºB TSS and 1 per cent citric acid was found as the best on the basis of sensory evaluation for the development of persimmon fruit leather as it had a better sugar-acid blend, texture, taste and higher overall acceptability.

4. Conclusion

From the above studies, it can be concluded that out of seven treatment combinations ofTSS (20,24, 28 and 32 ºB) and citric acid (0.25, 0.50, 0.75, 1.00, 1.25 and 1.50 %), 4 best combinations from each TSS level, *i.e.*, 20 (A_4), 24 (B_3), 28 (C_4) and 32 ºB (D_3) were evaluated on basis of sensory evaluation. Further, out of these best 4 combinations treatment, C_4 containing 1 per cent citric acid and 28 ºB TSS was standardized for the development of persimmon fruit leather as it was awarded the best sensory scores for texture, taste and overall acceptability which might be due to good sugar acid blend and flavour.

Conflict of interest

The authors declare no conflicts of interest relevant to this article.

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