

Studies on Development of Tomato Leather Prepared for Geriatric Nutrition

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Abstract

Food Enrichment and Fortification are the most cost effective and sustainable strategy to address the problem of micronutrient. The study was conducted to standardize the protocol for preparation of Tomato fruit leather and to enhance the nutritional value by fortifying with Calcium carbonate powder. For preparation of fruit leather, Tomato and Calcium carbonate powder were blended in different proportions to standardize parameters like pulp combination and CaCO₃ concentration and the mixture was dried in mechanical dehydrator at 60 ± 2°C for 8-10 hrs. Best recipe was selected on the basis of sensory evaluation. The calcium content of Tomato bar was increased gradually from 0.64% to 0.92% with the increasing amount of Calcium carbonate powder whereas the calcium content of fruit leather without addition of Calcium carbonate powder was found to be 0.14%. Thus the study revealed that the developed fruit leather was found to be rich in calcium and it can be given as a supplement to old age people.

Keywords: Tomato; Calcium carbonate; Sugar; Citric acid

Introduction

Fruit leather or bar means the product prepared by blending pulp/puree from sound ripe fruit, fresh or previously preserved nutritive sweeteners, butter or other vegetable fat or milk solids & other ingredients appropriate to the product & dehydrated to form sheet which can be desired shape or size [1].

Fruit leather, also called a fruit bar or a fruit slab, is a dehydrated fruit-based confectionery dietary product which is often eaten as snack or dessert. Consuming fruit leather is an economic & convenient value-added substitution of natural fruit as a source of various nutritional elements. Furthermore, fruit leather has far fewer calories, less than 100 Kcal per serving, and then many other snacks. Fruit leathers are restructured fruit made from fresh fruit pulp or a mixture of fruit juice concentrates & other ingredients after a complex operation that involves a dehydration step. Fruit pulp-based fruit leathers are nutritious & organoleptically acceptable to customers. They contain substantial quantities of dietary fibers, carbohydrates, minerals, vitamins & antioxidants [2].

Fruit leather is one product that can be made using a drying process. Fruit leathers are dried sheets of fruit pulp that have a soft, rubbery texture & a sweet taste. Fruit leathers can be dried using various drying forces including sun drying, oven drying, cabinet drying & dehydrator drying. The edible portion of fruit (one or more types) is pureed, mixed with other ingredients to improve its physico-chemical & sensory characteristics [3].

Objectives

- To prepare fortified fruit leather using locally grown tomato.

- To assess the sensory & physico-chemical quality of prepared fruit leather.
- To evaluate the Microbiological quality of prepared of fruit leather.

Material and Methods

The experiment “Studies on development of Tomato leather prepared for geriatric nutrition” was carried out at the student research laboratory in Department, Warner School of Food & Dairy technology, SHIATS, Allahabad (UP). Details of experimental techniques to be employed during the course of investigation were as follows.

Procurement and purchasing of the raw materials

- Tomato-Tomato (*Lycopersicon esculentum* Mill.) was purchased from the local market of Allahabad city.
- Sugar-Sugar (Triveni Pvt. Ltd.) was purchased from the local shop of Allahabad city.
- Citric Acid-Citric acid (Thermo Fisher Scientific India Pvt. Ltd.) was purchased from the local shop of Allahabad city.
- Calcium Carbonate-Calcium Carbonate (Thermo Fisher Scientific India Pvt. Ltd.) was purchased from

Equipment required in the preparation of fruit leather

A laboratory scale tray dryer which consisted of a drying chamber, electric heater, a fan & temperature controller (up to 120°C) was used to dry fruit leathers. The drying air velocity was set to 1-1.5 m/s & the tray dryer was monitored regularly using a data logger.

Methodology

Preparation of tomato puree: Fresh tomato was washed, blanched (80°C), peeled & then cut into small pieces to remove seed. It was then concentrated by boiling for 10 minutes (up to 10°B). Then the puree

was blended with other ingredients viz. sugar, citric acid & calcium carbonate was mixed thoroughly.

Treatments	Tomato Puree	Calcium Carbonate Powder
T0	100	0
T1	99.5	0.5
T2	99	1
T3	98.5	1.5

Table 1: Treatment & combinations for tomato puree & calcium carbonate powder in fruit leather.

Dehydration: The Puree mixture was spread on a greased trays with a tray load & dried in preheated tray dryer at $60 \pm 2^\circ\text{C}$ for 8-10 hrs or to the moisture content of 15-20 %. The dried leather was removed from the tray & cut into desired size or rolled. The final product is then packed in wrappers & stored in air tight container at ambient temperature for further analysis (Figure 1).

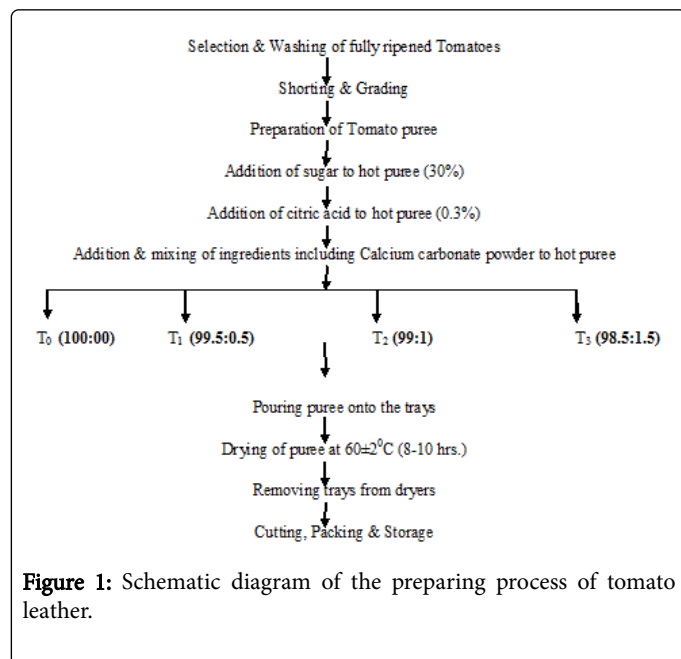


Figure 1: Schematic diagram of the preparing process of tomato leather.

Sensory evaluations: This was evaluated using 9 point Hedonic table given by Gujral & Khanna. Five experienced panelist of the Warner school of food & dairy technology department served as a judging panel & evaluated the samples of fruit leather. Numerical scores were allocated for colour, appearance, flavour, taste, body, texture and overall acceptability of the fruit leather samples. The numerical score was used as an indication of sensory quality of the samples [4].

Analytical method: Various methods employed for the sensory, physico-chemical, and microbiological analyses during the investigation are given here under:

- **Total solids:** The Total solids content of samples were determined as per AOAC.
- **Total moisture:** The Total moisture content of samples was determined as per ISI Handbook of food analysis (Part VIII).
- **Total protein:** The Total protein content of samples was determined as per AOAC.
- **Titrateable acidity:** The Titrateable acidity content of samples was determined as per IS 13844.
- **Total ash:** The Total ash content of samples was determined as per IS 3500.
- **Crude fat:** The Crude fat content of samples was determined as per AOAC.
- **Total calcium:** The Total calcium content of samples was determined as per AOAC.

Results and Discussion

The present investigation “Studies on development of Tomato leather prepared for geriatric nutrition” was planned and carried out in Warner School of Food and Dairy technology, SHIATS, Allahabad (UP). Average values of Sensory, Physico-chemical and Microbiological parameter of different treatments of experimental samples are as follows (Table 1).

Sensory parameters of experimental samples are as follows

Colour & appearance: The highest scores for colour & appearance was received in the experimental samples T₁ (6.74) followed by T₂ (6.49) & T₃ (6.43). There was non-significant difference between all the treatments which may be ascribed by the different level of calcium carbonate powder in experimental samples.

Parameters	Scores / Values based on mean values of different parameters of treatment				F-Test	S.Ed.	CD
	T ₀	T ₁	T ₂	T ₃			
Sensory score (9- point Hedonic Score)							
(a) Colour & Appearance	7.8	6.74	6.49	6.43	NS	0.43	
(b) Flavour & Taste	7.31	6.35	6.34	6.31	NS	0.48	
(c) Body & Texture	7.2	5.94	5.86	5.75	*	0.3	0.74
(d) Overall acceptability	7.43	6.34	6.3	6.16	*	0.31	0.76
Physio-chemical analysis (%)							

(a) Total Solids	81.4	82.6	83.8	85.3	*	0.62	1.51
(b) Total Moisture	18.6	17.5	16.2	14.7	*	0.62	1.51
(c) Total Protein	2.5	2.46	2.41	2.38	*	0.02	0.04
(d) Titratable Acidity	1.28	1.18	1.16	1.12	*	0.02	0.04
(e) Total Ash	1.18	1.53	1.62	1.72	*	0.12	0.3
(f) Crude Fat	0.35	0.32	0.29	0.27	*	0.02	0.04
(g) Total Calcium	0.14	0.64	0.81	0.92	*	0.01	0.02
Microbiological analysis (cfu/g)							
	T ₀	T ₁	T ₂	T ₃			
(a) TPC ($\times 10^3$ cfu/g.)	16.3	15	14	10.7	*	1.22	2.98
(b) Coliform	Nil	Nil	Nil	Nil			
(c) Yeast & Mould	Nil	Nil	Nil	Nil			

Table 2: Mean value, F-test, S.Ed & CD value of all parameters. *=Significant, NS=Non-Significant.

Flavour & taste: The highest scores for flavour & taste was received in the experimental samples T₁ (6.35) followed by T₂ (6.34) & T₃ (6.31). There was non-significant difference between all the treatments which may be ascribed by the different level of calcium carbonate powder in experimental samples.

Body & texture: The highest scores for body & texture was received in the experimental samples T₁ (5.94) followed by T₂ (5.86) & T₃ (5.75). There was significant difference between all the treatments which may be ascribed by the different level of calcium carbonate powder in experimental samples.

Overall acceptability: The highest scores for overall acceptability was received in the experimental samples T₁ (6.34) followed by T₂ (6.30) & T₃ (6.16). There was significant difference between all the treatments which may be ascribed by the different level of calcium carbonate powder in experimental samples.

Physico-chemical parameters of experimental samples are as follows

Total solids: The highest mean of total solid % was recorded in the experimental sample T₃ (85.33) in comparison to T₂ (83.83) & T₁ (82.55). The increasing trend of total solids content might be due to increasing level of calcium carbonate powder in the final product & Calcium carbonate powder contains 99% total solids. So, total solids content increases with increase in level of calcium carbonate. There was significant difference between all the treatments which may be ascribed by the different levels of samples.

Total moisture: The highest mean of total moisture % was recorded in the experimental sample T₁ (17.45) in comparison to T₂ (16.17) & T₃ (14.67). The decreasing trend of moisture content might be due to increasing concentration of total solids content with increasing level of calcium carbonate powder in the final product. There was significant difference between all the treatments which may be ascribed by the different levels of samples.

Total Protein: The highest mean of total protein % was recorded in the experimental sample T₁ (2.46) in comparison to T₂ (2.41) & T₃

(2.38). The decreasing trend of total protein content might be due to decreasing concentration of tomato pulp in the final product & pulp contains protein & there is zero protein in calcium carbonate powder. There was significant difference between all the treatments which may be ascribed by the different levels of samples.

Titrateable acidity: The highest mean of titrateable acidity % was recorded in the experimental sample T₁ (1.18) in comparison to T₂ (1.16) & T₃ (1.12). The decreasing trend of titrateable acidity % might be due to increasing concentration of calcium carbonate in the final product & Calcium carbonate is basic in nature & acts as acidity regulator in the product. There was significant difference between all the treatments which may be ascribed by the different levels of samples.

Total ash: The highest mean of total ash % was recorded in the experimental sample T₃ (1.72) in comparison to T₂ (1.67) & T₁ (1.53). The increasing trends of total ash % might be due to increasing level of calcium carbonate in the final products & Calcium carbonate contains salts of Calcium which increased total ash content in the final product. There was significant difference between all the treatments which may be ascribed by the different levels of sample.

Crude fat: The highest mean of crude fat % was recorded in the experimental sample T₁ (0.32) in comparison to T₂ (0.29) & T₃ (0.27). The decreasing trends of total fat % might be due to decreasing concentration of tomato pulp & increasing concentration of calcium carbonate in final product also pulp contains total fat & there is no fat content in calcium carbonate powder. There was significant difference between all the treatments which may be ascribed by the different levels of sample.

Total calcium: The highest mean of total calcium % was recorded in the experimental sample T₃ (0.92) in comparison to T₂ (0.81) & T₁ (0.64). The increasing trends of total calcium content might be due to increasing concentration of Calcium carbonate powder in experimental samples & Calcium carbonate contains about 60% calcium so, with increase in concentration of Calcium carbonate powder, Calcium percentage also increases in final product. There was

significant difference between all the treatments which may be ascribed by the different levels of samples.

Microbiological parameters of experimental samples are as follows

Total plate count ($\times 10^3$ cfu/gm): The lowest mean count of total plate count (cfu/gm) was recorded in the experimental sample T₃ (10.66) in comparison to T₂ (14) & T₁ (15). There was significant difference between all the treatments which may be ascribed by the different levels of samples.

Coliform count ($\times 10^2$ cfu/gm): It is evident from the evaluation that the Coliform count in all experimental samples were 100% negative.

Yeast & mould count ($\times 10$ cfu/gm): It is evident from the evaluation that the Yeast & Mould count in all experimental samples were 100% negative.

Conclusion

In view of experimental results obtained during the present investigation, it may be concluded that the samples of treatment T₁

was found to be the best in every aspect of sensory quality i.e., colour & appearance, flavour & taste, body & texture and overall acceptability.

Therefore, it may be concluded that, there is a great scope of manufacturing fruit lather using tomato pulp fortified with calcium carbonate as it is proved to have nutritional properties as well as health benefits and it is good for old age group people.

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