ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR 2015; 1(12): 599-601
www.allresearchjournal.com
Received: 12-09-2015
Accepted: 15-10-2015

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Development of Tomato leather from Ingredients Level in Low Calorie-High Calcium

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Abstract
Low calorie high calcium Tomato fruit leather was developed using calcium carbonate powder for calcium enrichment, as source of geriatric nutrition. Randomized block design was used for selecting the levels of ingredients in the experimental run. The product was evaluated for sensory characteristics namely colour, taste, body and texture, flavour and overall acceptability. Results exhibited that the sensory scores ranged between 6.35-8.35, 6.5-8.1, 6.8-8.2, 7.98-8.35 and 6.3-8.2 for colour and appearance, taste, body and texture, flavour and overall acceptability, respectively. Calcium had significant effect on taste and body and texture. The optimum levels of ingredients for Low calorie-high calcium tomato leathers were 0.5, 1.5 and 1.5% of calcium carbonate powder for treatments T_1, T_2 & T_3 respectively.

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 & organoleptic ally 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].

The composition of final fruit product may vary depending on the processing conditions. Sun drying has traditionally being the process employed for preparing fruit leather from ripe fruit. However, sun dried products can become discoloured & the process can be unhygienic & lengthy [4].

The preservation of fruit leather depends on their low moisture content (15-20%), the natural acidity of the fruit & high sugar content. Major quality parameters associated with dried fruit products, in no particular order, are change of colour / visual appeal, flavour, shape, texture, shelf-life, microbial load, retention of nutrient, porosity or bulk density, rehydration properties, water activity and chemical stability [5].

Material & Methods

Procurement and purchasing of the raw materials Tomato (*Lycopersicum esculentum Mill.*) & Sugar was purchased from the local market of Allahabad city while Citric acid & Calcium carbonate ware purchased from Thermo Fisher Scientific India Pvt. Ltd.

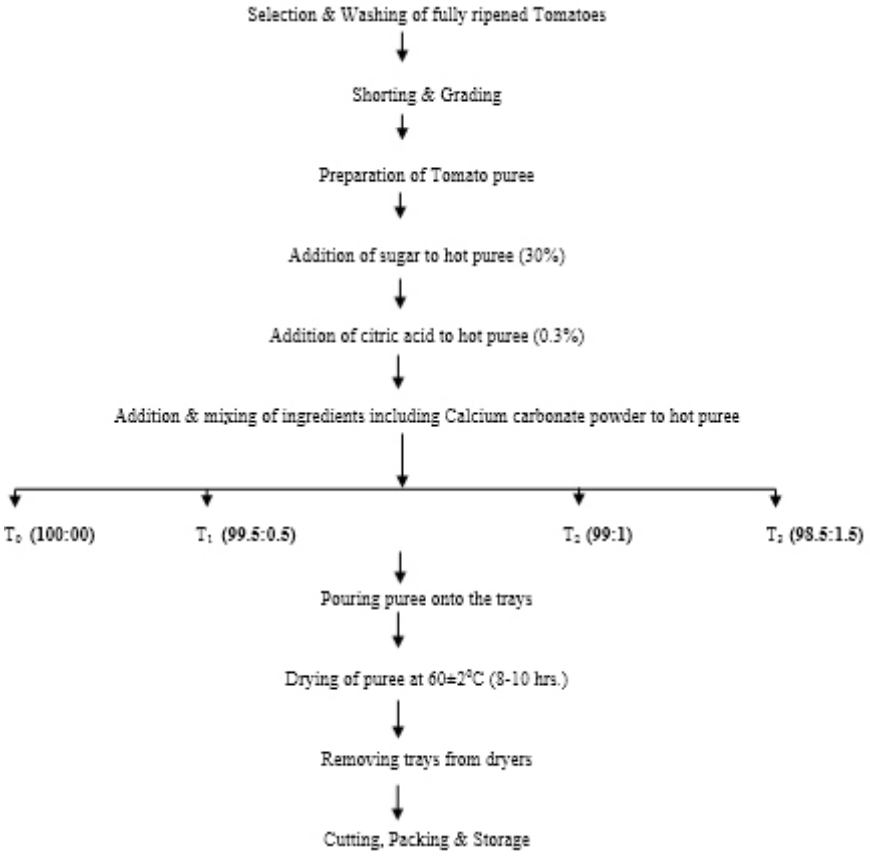

Fig 1: Schematic diagram of the preparing process of tomato Leather.

Results & Discussion

Table 1: Mean value, F-test, S. Ed. & C.D. value of all parameters.

Parameters	Scores / Values based on mean values of different parameters of treatment				F-Test	S. Ed.	C.D.
1. Sensory score (9- point Hedonic Score)							
	T_0	**T_1**	**T_2**	**T_3**			
(a) Colour & Appearance	8.12	8.29	7.54	7.05	*	**0.42**	**0.92**
(b) Flavour & Taste	7.64	8.55	7.24	7.43	*	**0.40**	**0.87**
(c) Body & Texture	7.72	8.08	7.59	7.21	*	**0.19**	**0.41**
(d) Overall acceptability	7.58	7.80	7.29	7.26	*	**0.15**	**0.32**
2. Physio-Chemical analyses (%)							
(a)Total Solides	80.28	80.18	79.92	78.84	*	**0.42**	**0.91**
(b) Total Mois ture	19.72	19.82	21.08	21.16	*	**0.42**	**0.91**
(c) Total Protéine	1.37	1.39	1.40	1.42	*	**0.01**	**0.03**
(d)Titratable Acidité	1.29	1.34	1.39	1.42	*	**0.01**	**0.02**
(e) Total Ash	0.70	0.66	0.54	0.48	*	**0.08**	**0.017**
(f) Crude Fat	0.59	0.62	0.64	0.65	*	**0.01**	**0.01**
(g) Total Calcium	0.10	0.60	0.80	0.90	*	**0.008**	**0.020**

* = Significant

The different parameters of experimental samples are as follows

Sensory parameters of experimental samples are as follows

(a) Colour & Appearance: The highest scores for colour & appearance was received in the experimental samples T_1 (6.74) followed by T_2 (6.49) & T_3 (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.

(b) Flavour & Taste: The highest scores for flavour & taste was received in the experimental samples T_1 (6.35) followed by T_2 (6.34) & T_3 (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.

(c) Body & Texture: The highest scores for body & texture was received in the experimental samples T_1 (5.94) followed by T_2 (5.86) & T_3 (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.

(d) Overall Acceptability: The highest scores for overall acceptability was received in the experimental samples T_1 (6.34) followed by T_2 (6.30) & T_3 (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

(a) Total Solids: The highest mean of total solid % was recorded in the experimental sample T_3 (85.33) in comparison to T_2 (83.83) & T_1 (82.55). The Increasing tread 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.

(b) Total Moisture: The highest mean of total moisture % was recorded in the experimental sample T_1 (17.45) in comparison to T_2 (16.17) & T_3 (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.

(c) Total Protein: The highest mean of total protein % was recorded in the experimental sample T_1 (2.46) in comparison to T_2 (2.41) & T_3 (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.

(d) Titratable Acidity: The highest mean of titratable acidity % was recorded in the experimental sample T_1 (1.18) in comparison to T_2 (1.16) & T_3 (1.12). The Decreasing trend of titratable 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.

(e) Total Ash: The highest mean of total ash % was recorded in the experimental sample T_3 (1.72) in comparison to T_2 (1.67) & T_1 (1.53). The Increase 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.

(f) Crude Fat: The highest mean of crude fat % was recorded in the experimental sample T_1 (0.32) in comparison to T_2 (0.29) & T_3 (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.

(g) Total Calcium: The highest mean of total calcium % was recorded in the experimental sample T_3 (0.92) in comparison to T_2 (0.81) & T_1 (0.64). The Increasing trends of total calcium content might be due to increasing concentration of Calcium carbonate powder in experimental samples.

Conclusion

In view of experimental results obtained during the present investigation, it may be concluded that the samples of treatment T_1 was found to be the best in every aspect of sensory quality i.e., colour & appearance (8.29), flavour & taste (8.55), body & texture (8.08) and overall acceptability (7.80).

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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