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Standardization and shelf life of tomato toffee with local variety tomato

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Abstract
Tomato toffee with local variety was prepared using different levels of sugar, liquid glucose, butter, citric acid, pectin and was standardized. The addition of 750gm of sugar, 50gm of liquid glucose, 300gm of guava pulp, 15 gm of butter and 2.5gm of citric acid per kg tomato pulp resulted in good quality toffee with local variety tomato. The shelf life of toffee at ambient temperature was found to be for 3 months without any change in sensory characteristics and with no microbial growth.

Keywords: Local variety tomato, toffee, shelf life, sensory evaluation, microbial growth

Introduction
Tomato is the most abundantly grown vegetable crop in the world, both for fresh use as well as processing purpose, such as canned tomato, sauce, juice, ketchup, stews and soup (Lenucci *et al*., 2006) [6]. There are known different varieties of tomato, round, oval, "cherry", but all have the same nutritional characteristics, being an important source of potassium, phosphorus and magnesium. (Debjit Bhowmik *et al*., 2012) [3]. Tomato is a major source of antioxidants contributing to the daily intake of a significant amount of these molecules. The short shelf life of tomatoes and bulky production of tomatoes lead to an excess of wastage during peak season. Development of value added products helps in maximum utilization of tomatoes. However, the purpose of post harvest technology is to prevent wastage by production into various foodstuffs without compromising the nutritive value. Now a day's fruit toffees are very popular and acceptable product by almost all age groups of the population. Toffee retains vitamins and mineral present in the original fruit and is nutritionally superior to toffee synthesized from sugar or syrups. In this view, an effort was made to standardize and develop a toffee from local variety tomato with the objective of to study the consumer acceptability, effect of storage on organoleptic qualities and microbial evaluation in the developed toffee.

Materials and Methodology
Toffee preparation
The procedure, which is commonly followed for making the toffee, was taken as a standard for refinement of toffee with local variety tomato. The ingredients like sugar, liquid glucose, guava pulp, butter and citric acid were used at different levels for preparation of tomato toffee. The local variety tomato was procured from local markets for the prepare of tomato toffee. Tomatoes were washed and cut into pieces. Then the pieces were cooked till soft to extract the pulp. The extracted pulp was strained using stainless steel sieves to remove seeds and skin. The pulp was cooked for about 15 minutes. Then sugar and liquid glucose were added to the cooked pulp. The cooking was continued with constant stirring till the mix attained the T.S.S. of 83°Brix. During cooking the foam formed was removed frequently. Spec test was also carried out to know the desired consistency. In this test, a spec of the mix was put in water at normal temperature. Specs forming a solid mass indicate the optimal degree of consistency of toffee firm. At this stage citric acid dissolved in water and butter was added to the pulp mix. Cooking was continued till the T.S.S. content reaches the 85°Brix. Then the mix was spread in a greased tray into equal thickness. The spread was cooled to room temperature and cut into desired shapes. The addition of groundnuts, cashew nuts, and spice (cardamom, cinnamon, and ginger) powders to the pulp was also done before spreading the mix in the tray to bring variations in tomato toffee. The toffees were packed using wrappers and stored in disposable plastic containers for shelf life studies. The flow chart for preparation of tomato toffee is presented in Figure 1.

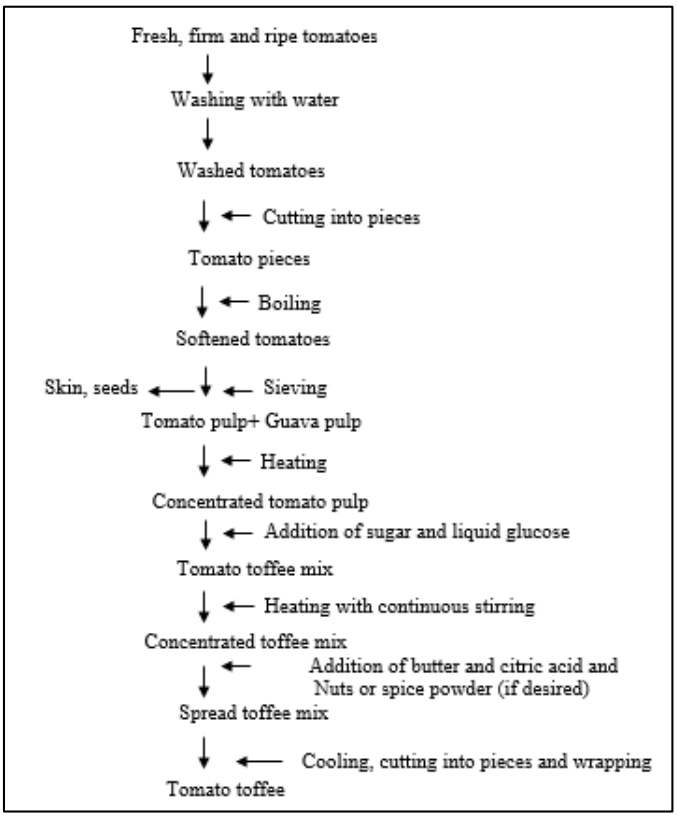

Fig 1: Flow chart for the preparation of tomato toffee

Sensory evaluation

Panel of ten judges from College of Home Science, Professor Jayashankar Telangana State Agricultural University was involved in sensory evaluation of tomato toffee every fortnight for three months of storage period. Five point Hedonic scale (ISI, 1971 and Swaminaathan, 1987) [5, 7] was followed for ranking the sensory attributes viz. appearance, colour, chewiness, taste and overall acceptability of tomato toffee.

Microbial growth evaluation

The presence of microbial growth in tomato toffees was tested every fortnightly in three months of storage period. The procedure by Cruikshank *et.al*. 1975 was used to determine microbial growth in the tomato toffees.

Table 1: Proportion of the ingredients used in standardization of toffee from local variety tomato pulp

Ingredients	Levels (gm/kg pulp)			Optimum level (gm/per kg pulp)
Sugar,	1000	750	550	750
Liquid glucose	100	50	25	50
Pectin	50	25	10	Nil
Guava pulp	300	200	100	300
Butter	20	15	10	15
Milk powder	20	15	10	Nil
Citric acid	5	2.5	1	2.5
Ground nuts/cashew nuts	300	200	100	100
Pepper powder	2.0	1.5	1	½ tsp
Cardamom powder	2.0	1.5	1	½ tsp
Ginger powder	2.0	1.5	1	1 tsp
Cinnamon powder	2.0	1.5	1	1 tsp
Cloves powder	2.0	1.5	1	½ tsp

Results and Discussion

Parameters standardized for preparation of tomato toffee

Fresh, firm, ripe tomatoes were better suitable for preparation of toffees with local variety tomato. Over ripe tomatoes were found to give dark colour to the toffee. Addition of water was not required to soften tomatoes. Cooking at medium temperature for $2^{1/2}$ hours was required for obtaining good quality toffee with local variety tomato. The colour and flavor of toffee were adversely affected if the tomato pulp was cooked at high temperature. Toffee prepared with local variety tomato pulp alone did not get the best texture and chewiness. Hence, the addition of commercial pectin was tried to the pulp and that resulted in good shape but not in chewiness. Instead of commercial pectin, guava pulp was tried, wherein the texture and chewiness of toffee were improved. For making guava pulp, guavas were cut into pieces and boiled in an equal quantity of water. The pulp was extracted using steel strainers to remove the seeds. The addition of 300 gm of guava pulp per 1kg tomato pulp was found to be optimum for obtaining toffee with good quality texture and chewiness.

Cleaning

Cutting into pieces

Extarcting pulp

Weighing

Addition of guava pulp

Cooking

Checking the endpoint

Spreading in tray and cooling

Wrapping toffees

Plate 1: Totoma toffee processing

This was supported by a study results by Beena Cherian *et al.*, 2003 [1] that papaya leather blended with mango pulp scored highest for all sensory attributes compared to leather with papaya pulp alone. The study also reported that the texture of leather would be improved considerably when it was prepared with a combination of pulps. The addition of one kilogram of sugar and 100 grams of liquid glucose per kilogram of tomato pulp resulted stickiness and dark colour and too much sweetens in the toffee. The custard apple toffee prepared by Dhumal *et.al.* (1996) [4] using 100% sugar was sticky and scored a minimum for texture. They also reported that 75% of sugar as optimum and the addition of skim milk powder at the same level too decrease the score for colour and appearance of toffee. Tomato toffee prepared with 750 gm of sugar and 50 gm of liquid glucose per kg of tomato pulp had good taste and improved texture compared to 1000 gm of sugar and 550 gm of sugar alone. 550 gm of sugar and 25 gm of liquid glucose per kilogram tomato pulp resulted in less sweetness in toffee and required longer periods of heating for reaching the endpoint of toffee. Addition of skim milk powder did not produce good colour and appearance in tomato toffee. Citric acid at the level of 5 gm resulted in sour taste in the tomato toffee whereas e 2.5 gm was found to be optimum. Addition of 15gm of butter helped in giving sufficient glazed surface and smooth cutting effect. It also prevents toffee sticking from the sheet while wrapping. Among the variations triad, groundnuts, cashew nuts, cardamom, cinnamon and clove powder added toffees were more acceptable than pepper and ginger powder added tomato toffees. Addition of pepper ($^{1/2}$ tsp), cardamom ($^{1/2}$ tsp), ginger (1 tsp), cinnamon (1 tsp) and cloves ($^{1/2}$ tsp) powders respectively was blended well in the pulp to give sufficient flavour and taste to the toffee.

Table 2: Sensory scores of tomato toffee obtained during storage

Storage (Days)	Appearance	Colour	Texture	Chewiness	Taste	Flavor	Overall acceptability
Initial	5. 0 ± 0.43	4.6 ± 0.25	4.4 ± 0.65	4.4 ± 0.73	4.8 ± 0.45	4.6 ± 0.57	5.0 ± 0.10
15	4.6 ± 0.51	4.6 ± 0.65	4.4 ± 0.38	4.2 ± 0.20	4.8 ± 0.41	4.4 ± 0.47	4.6 ± 0.55
30	4.4 ± 0.32	4.6 ± 0.29	4.2 ± 0.45	4.0 ± 0.50	4.6 ± 0.39	4.6 ± 0.51	4.6 ± 0.49
45	4.4 ± 0.35	4.6 ± 0.15	4.2 ± 0.25	4.0 ± 0.30	4.4 ± 0.32	4.4 ± 0.51	4.6 ± 0.45
60	4.2 ± 0.33	4.4 ± 0.17	4.2 ± 0.35	4.0 ± 0.26	4.4 ± 0.22	4.4 ± 0.21	4.4 ± 0.22
75	4.2 ± 0.17	4.4 ± 0.55	4.0 ± 0.34	4.0 ± 0.33	4.2 ± 0.28	4.2 ± 0.31	4.4 ± 0.25
90	4.2 ± 0.37	4.2 ± 0.18	4.0 ± 0.22	3.8 ± 0.31	4.2 ± 0.25	4.2 ± 0.51	4.4 ± 0.19

5- Excellent, 4-Very good, 3- Good 2- Fair and 1- Not acceptable

Shelf life of toffee

The mean sensory scores of tomato toffee on the storage period revealed that the toffees could be stored for 3 months at ambient temperature. There was no significant change observed in the organoleptic characteristics in the toffees during storage of the 3 months period (Table 2). However, the chewiness of tomato toffee was ranked lesser (3.8) after 3 months of storage compared to other sensory attributes; it was at an acceptable level. There was no presence of bacterial growth was found in the toffees till the 3 months of storage period.

Conclusion

The present study was carried out to develop toffee with local variety tomato. A good quality tomato toffee was prepared by blending 1 kg tomato pulp with 300 gm of guava pulp, 750 gm of sugar, 50 gm of liquid glucose, 15 gm of butter and 2.5 gm of citric acid. It can be stored without any deterioration in the sensory and microbial count and at consumer acceptable level up to 3 months. Hence it can be concluded that local variety tomato has a scope in the manufacture tomato toffee. Tomato Value-added products with minimizes the post-harvest losses during peak season.

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