

Study on Preparation and Evaluation of Characteristics of Tomato Puree

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Abstract

Tomato (*Solanum Lycopersicum*) is a very cultivated solanaceous crop for its edible fruit. After postharvest, about 40% of tomatoes are lost due to lack of appropriate storage facilities. Therefore, these tomatoes were prepared into value added products such as tomatoes puree. The tomatoes were collected from Inlay District, Shan State. For the preparation of tomato puree, tomatoes were firstly washed, blanched, peeled and crushed followed by extraction of the juice and finally concentrated by evaporation. Furthermore, the problem of micro-organisms formation during processing of these products was eliminated by sterilization. The physico-chemical characteristics of prepared tomato puree such as pH, acidity, soluble solid content and salt content were determined. Effect of concentration time and amount of preservatives on the quality of prepared tomato puree were also studied.

Key words: Tomato, Blanching, Concentration time, Preservatives

Introduction

Tomato (*Solanum Lycopersicum*) is one of the most important vegetable crops of Myanmar and it constitutes part of our daily diets, as cooked or salads. Tomatoes are abundantly cultivated in Shan State especially in Inlay lake, where it is grown almost throughout the year on floating islands and also in Magway, Sagaing and Mandalay Regions. In addition, tomatoes are mostly cultivated in winter season at Pyinmana, Takkone and Leway Townships. In Myanmar, tomatoes are abundantly available and large quantities of tomatoes are used to produce juice, puree, ketchup and sauce (<http://www.Home>>projects >> Tomato Products>).

Tomato is an extremely valuable raw material for a very wide range of processed foods. Fresh tomatoes are very refreshing. They are good source of vitamins particularly of vitamin C (Daulty E, Mircea, 1995). The fruits are eaten raw or cooked. Large quantities of tomatoes are used to produce soup, juice, sauce, ketchup, puree, paste, powder and also in preparing traditional curries.

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They are extensively used in canning industry. Tomato can be cultivated on almost any type of the soil. Tomatoes are grown both in summer and winter but those grown in winter are superior, because they contain more solids. Tomatoes contain usually from 7 to 8.5% of total solids of which about 1% is skin and seeds. Sugar in tomatoes is almost entirely reducing sugar. The sugars constitute 1.5- 4.5% of the fresh weight equivalent to some 65% of the total soluble solid. White immature tomatoes contain considerable amount of starch, it is only a minor constituent of ripe fruit. The tomato is a valuable source of vitamin C. The ripe tomatoes contain citric, malic, formic and acetic acid. Both citric and malic acid are increased steadily throughout maturation and ripening. The tomato changes in colour during different stages of its maturity and ripening i.e., from green to pale yellow and finally red (Neslon, P,1989).

The term 'Fruit Juice' unfermented liquid which can be separated from sound ripe fruit on pressing. Fruit and vegetable juices are manufactured for two main purposes, (a) for preparing pleasant -tasting 'soft drink' and (b) as a contribution of vitamin C to the diet. Puree is any food (usually a fruit or vegetables) that is finely mashed to a smooth, thick consistency. This can be accomplished by one of several methods including using a food processor or blender or by forcing the fruits through a sieve. Tomato products are judged by their colour depending on the degree of redness of tomatoes.

Tomato puree is prepared from tomato juice or pulp and vinegar with sugar, salt and spices and sometimes flavorings such as onion and garlic contain not less than 12% of tomato solid and 28% total solid. To prepare puree, at first select deep red colour tomato, wash them and remove all green and yellow portions because it affects the colour and quality of product. To prepare puree, the tomato solids must be derived from clean, wholesome tomatoes which have been strained to exclude seeds (or) other cores (or) hard substances. No vegetables other than tomatoes may be included in the puree except onions, garlic and spices added for flavoring purposes. If tomatoes could be prepared and preserved as puree, could be used the whole year round (J.K Paul, 1975).

The objectives of this study were to determine the different concentration time on the prepared tomato puree and the effect of chemical preservatives on the quality of tomato puree.

Materials and Methods

Materials

Fresh, sound ripe tomatoes of deep red colour were collected from Inlay District, Shan State. All ingredients such as sugar, salt, ginger, garlic, chili and vinegar were purchased from local markets. Sodium Carboxymethyl cellulose and Potassium Sorbate were also purchased from Able Chemical store, 76 Street, between 28 and 29 Street, Mandalay, Mandalay Region.

Methods

Preparation of Tomato Pulp

About (1) kg of sound ripe tomatoes of deep red colour was washed thoroughly with water to remove unwanted entities like dust, dirt, pesticides and residues. After washing, the tomatoes were drained on the rack. And then, tomatoes were blanched at 95°C for 5 min and peeled the tomato and separated out the seeds. After that seed removal tomato, it was ground with blender. The resulting pulp was weighed and the yield of tomato pulp was calculated as follows.

$$\% \text{ yield of pulp} = \frac{\text{weight of pulp} \times 100}{\text{Weight of fruit}}$$

Seasoning of Spices with Vinegar to Prepared Tomato Pulp

About (6) g of onion, (9) g of garlic, (2) g of ginger were sliced into small pieces and then (2) g of clove and (2)g of pepper powder were mixed. Then they were crushed and placed inside a cotton bag. The cotton bag the above mixtures was leached with 30mL of vinegar containing in the steel tank and then heated to 70°C for (5) minutes and cooled at room temperature for an hour and the species bag were taken out. The resulting mixture was prepared for the tomato puree.

Preparation of Tomato Puree

(600) g of extracted tomato pulp was put in a separate stainless steel sauce pan and boiled for about (15) min at 70°C and stirred frequently. (2) g of sugar and (1) g of salt were added to the concentrated pulp and further boiled for (25) min until a relatively thickened tomato pulp was obtained. Then, the seasoning spices were added to the concentrated pulp and followed by the addition of (0.01) g of potassium sorbate as preservative and (0.4) g of thickener as sodium carboxymethyl cellulose and thoroughly mixed to obtain tomato puree. It was then poured carefully into sterilized bottles and sealed with sterilized caps.

For the suitable condition, tomato pulp was concentrated with different time intervals (20min, 30min, 40min, 50min and 60min) and the respective parameters were determined. The shelf-life of tomato puree with different amounts of preservatives was also investigated.

Effect of Concentration Time on the Characteristics of Tomato Puree

(600) g extracted tomato pulp was put in a stainless steel sauce pan. After that, it was boiled for 20 minutes at 70°C and measured the total solid, acidity and pH. The variation of concentration times such as 30min, 40 min, 50 min and 60min for tomato pulp was also conducted and the respective characteristics were determined. The results are shown in Table (2).

Effect of Amount of Preservative on Shelf-life of Tomato Puree

The effect of amount of preservative on the shelf-life of prepared tomato puree was investigated by varying potassium sorbate (0g, 0.005g, 0.01g, 0.02g and 0.03g) respectively. The results are shown in Table (3).

Physico- chemical Characteristics of Tomato Puree

Determination of Soluble Solid Content

The soluble solids content of tomato puree was measured with a refractometer (WYT – 0 – 60 °Brix) at room temperature. The apparatus was firstly calibrated with distilled water at the soluble solids content of zero.

After calibration, one drop of the sample was placed on the fixed prism of the refractometer. Then, prism was closed and the instrument was directed towards a light source. A circular field of view was observed in the eye. The soluble solid content (°Brix) was read at the line which divides the light and dark parts of the surface on the vertical scale. All measurements were repeated twice for each sample. The results are shown in Table (4).

Determination of Acidity

About (5) ml of tomato puree was added in the conical flask and mixed with (50) ml of distilled water. Then, titrated with 0.1 M standard sodium hydroxide solution from the burette and phenolphthalein indicators was used using the method A4a in Food Analysis: Analytical and Quality Control Methods for Food Manufactures and Buyer, Lees, 1975. The titrant volume was noted as soon as it turned pink (end point) and its total acidity was calculated using tartaric acid present in the following equation:

$$\text{Acidity} = \frac{\text{volume of NaOH} \times (\text{molarity of base}) \times (\text{M.eqwt acid})}{\text{volume of sample}} \times 100$$

Acid factor, for 0.1 M solution, citric acid = 0.064 gms

The result is shown in Table (4).

Determination of pH

The tomato puree solution was tested with a glass electrode of pH, which was standard standardized with buffer solution at pH 6.99. pH of the solution was obtained by reading from pH meter (KL-009(1), CE, made in China). Then, the pH value of sample was determined using the method P4 in Food Analysis; Analytical and Quality Control Methods for Food Manufacture and Buyer, Lees, 1975. The determination of pH was carried out at Industrial Chemistry Department, Yadanabon University. The data of different samples are shown in Table (4).

Determination of Salt (Sodium Chloride) Content

Approximately (1)g of each of tomato puree was taken in a conical flask and diluted with 100 ml of distilled water and potassium chromate indicator was added into it. And then it was titrated with 0.1 N standard silver nitrate solution from burette. The titrant volume was noted as soon as it turned brick red and salt content was determined as shown below. The result is shown in Table (4).

$$\% \text{ Salt} = V \times N \times 0.585 \times 100/W$$

Where, V = milliliters silver nitrate solution

N = normality silver nitrate solution

W = weight puree in gram



Figure: Tomato Puree

Results and Discussion

Concentrated tomato products, including tomato puree, were one of the most important products groups in fruit and vegetable product industries. In conventional puree

production, tomatoes were cleaned, sorted, and chopped. Then, the chopped tomatoes were pulped. The pulp was concentrated at 70°C and stored. The result in Table (1) presented the characteristics of tomato pulp. From the result the total yield of tomato pulp was 60%. Table (2) pointed out the effect of concentrating time on total soluble solid, pH and acidity. It was found that total soluble solid and acidity increased with increasing concentrating time whereas pH decreased. Thus, the optimum concentrating time was chosen for 40 min, concentrating time longer than 40 min resulted in extra heavy puree and also the colour changed from red to reddish brown which is undesirable colour.

The preservative concentration conditions being employed and their reflection on the shelf-life of prepared tomato puree was shown in Table (3). Without preservatives, there was significant changes in colour, flavour and consistency of prepared tomato puree within 30 days. The most suitable amount of potassium sorbate for tomato puree was found to be 0.01g as shown by the results in Table (3). At those suitable conditions the shelf- life of tomato puree was well above (180) days period and thus clearly met the normal (180) days shelf-life earmarked for the most food products. It should be noted that cleanliness in handling and preparation played a significant role, as lesser amount of preservative for extended shelf-life periods could be achieved which would be interpreted as economical and higher profits in marketing.

The results in Table (4) show the comparison of the characteristics of prepared tomato puree and tomato puree (Chito) from local market. It was found that the parameters were nearly the same with that of the commercial tomato puree (Chito) except that the total soluble solid content is higher than that of the commercial tomato puree (Chito).

Table (1) Characteristics of Tomato Pulp

Sr. No.	Characteristics	Tomato Pulp
1	Total soluble solids	5.0
2	Acidity	1.2
3	pH	4.5
4	Yield %(w/w)	60

Table (2) Effect of Concentrating Time with respect to prepared Tomato Puree

Tomato Pulp = 600 g

Concentration Temperature = 70°C

Sr. No.	Time (min)	Soluble Solid	Acidity (%w/w)	pH	Colour	Consistency
1.	20	7.2	1.20	4.5	Red	Thin
2	30	9.3	1.30	4.4	Red	Thin
3	40*	12	1.38	4.4	Red	Thick
4	50	13.2	1.42	4.3	Deep red	Thick
5	60	15.1	1.50	4.3	Reddish brown	Very Thick

* The most suitable condition

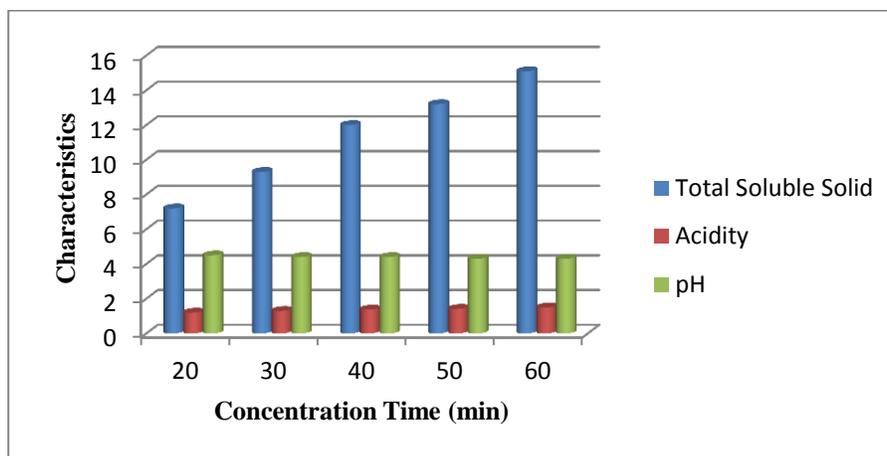


Figure (4) Effect of Concentrating Time on Preparation of Tomato Puree

Table (3) Effect of Amount of Preservatives on Shelf-Life of Prepared Tomato Puree

Concentration Temperature = 70°C

Concentration Time = 40 min

Sr. No.	Amounts of Preservative (g)	Colour	Flavour	Consistency	Shelf-life	Remarks
1	0	Red	Off-Flavour	Layer Separation	1 month	Moldy
2	0.005	Red	Good Flavour	Thin	4 months	Fresh
3	0.01*	Red	Good Flavour	Thick	6 months	Fresh
4	0.02	Red	Good Flavour	Thick	6 months	Fresh
5	0.03	Red	Good Flavour	Thick	6 months	Fresh
6	0.04	Red	Good Flavour	Thick	6 months	Fresh

* The most suitable condition

Table (4) Physico-chemical Characteristics of Tomato Puree

Amount of Tomato pulp = 600 g

Amount of Potassium Sorbate = 0.01g

Amount of Spices = 21 g

Amount of Vinegar = 30 ml

Concentration Temperature = 70°C

Concentration Time = 40 min

Sr. No.	Characteristics	Prepared Sample	Local Market (Chito)
1	Total soluble solids	12	9.6
2	Acidity (% w/w)	1.38	0.45
3	pH	4.4	4.4
4	Colour	Red	Red
5	Consistency	Thick	Thick
6	Salt (% w/w)	0.7	0.5

Conclusion

As Myanmar is a country where fruits, vegetable and crops are seasonally cultivated and harvested once a year and it would be scarce at off reason periods that proper extraction and preservation should be given some thought as they would be cost effective and give an edge in competitive marketing. Production of tomato puree constitutes a genuine alternative for utilizing the loss of surplus tomato. Tomato processed into puree of 12% TSS can be stored for at least six months without alteration. Concentration time of tomato pulp 40 min and 0.01g of potassium sorbate can give the tomato puree acceptable in flavour, colour, texture and shelf-life.

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