

## Processing Technology For Tomato Powder



### Home Science

**KEYWORDS :** processing, technology, tomato powder, Sundrying

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### ABSTRACT

*Tomato is one of the most popular and widely grown vegetable crops in Sri Lanka. A wide variety of tomato products are prepared by concentrated juice or pulp, which needs high cost technology for good quality products. Healthy tomatoes were washed thoroughly with cold tap water to remove adhering extraneous matter. An investigation was undertaken to develop suitable technology for preparation of tomato powder using dehydration method and to incorporate powder in popular recipes.*

### Introduction:

Tomato (*Solanum lycopersicum* L.) is widely used in Indian kitchens and is rich in Vitamin C, Potassium and antioxidant-lycopene. Tomato is being grown in all the blocks of in diguld-istrict of Tamilnadu and it is quite unfortunate that most of the farmers getting lower prices especially during the months between February to June, due to higher production with the low price range of Rs.2 to Rs.5 per kg. Among several processing methods spray drying is the efficient mode of preservation of tomato powder. Tomato powder is readily marketable due to ease in packaging, transportation and utilization in different ready to eat food preparations with extended storage life. Tomato and tomato products are the major sources of lycopene and are considered to be important contributors of carotenoids in human diet (Tapiero et al. 2004; Goula and Adamopoulos 2005). Though very few tomato processing units are available in India, tomato powders are widely used in soups, Instant sauce premixes, ketchups, Sambar and Rasam mix, Puddings, Bakery Products, Health Foods, Sweets, Biscuits, Baby foods, Confectioneries, Snacks etc

An investigation was undertaken to develop suitable technology for preparation of tomato powder using dehydration method and to incorporate powder in popular recipes. Tomatoes were dehydrated by two methods viz., Oven and Sun drying pretreatments given before drying were Blanching, blanching plus potassium metabisulphite, 0.25% Blanching plus potassium metabisulphite 0.5% and Blanching plus potassium metabisulphite 0.75%. Pretreated tomato powder was evaluated for sensory attributes by panel of ten judges. Among the drying methods, oven drying had a significantly higher mean score for all organoleptic parameters at one per cent level. The pretreatment significantly influenced all the sensory parameters. Blanching plus potassium metabisulphite 0.5% plus 1% salt treated powder produced better quality product. From the sensory evaluation of recipes prepared by using powder and fresh tomatoes viz., chutney, dosa, soup, burfi, rice, etc., it was evident that there was no significant difference between the two. The dehydrated powder was packed in polythene bags and kept in glass bottles at room temperature. The peroxide value increased with storage period, indicating deterioration. Even though, there was decrease in mean score of recipes for sensory characteristics; the product was acceptable by the judges.

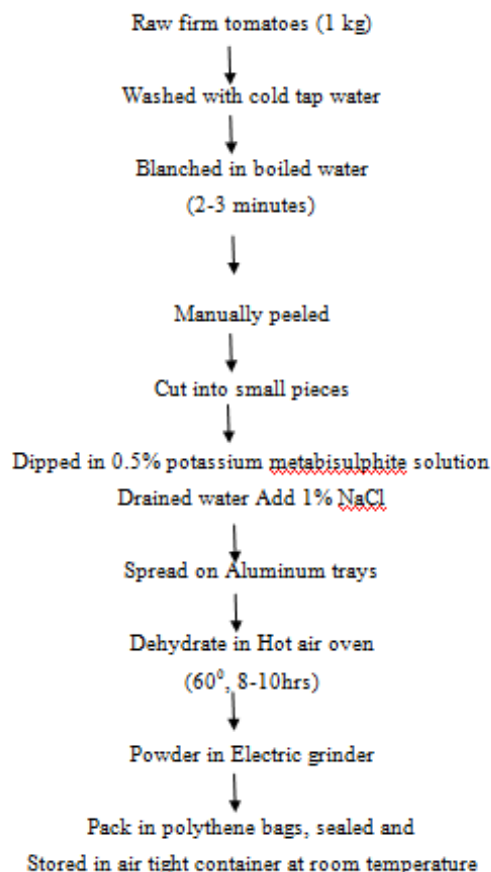
Healthy tomatoes were washed thoroughly with cold tap water to remove adhering extraneous matter. Tomatoes were balanced in boiling water for two to three minutes (Giridharlal et al., 1960). After that tomatoes were peeled manually after blanching and were cut into pieces with stainless steel knife. Prior to drying, for pretreatments the separate batches of tomato pieces were dipped in 0.25, 0.5 and 0.75 per cent of potassium metabisulphite solution for 15 minutes. The tomato pieces without sulphitation were kept as control. Control as well as pretreated tomato pieces was subjected to dehydration experiment.

The pretreatments selected were as follows:

- T1 - Blanched alone - control
- T2 - Blanched plus potassium metabisulphite 0.25%

- T3 - Blanched plus potassium metabisulphite 0.5%
- T4 - Blanched plus potassium metabisulphite 0.75%

**Fig.1: Flow chart for the preparation of Tomato Powder**



**Sundrying:** Control as well as pretreated tomato pieces were spread in aluminium trays under sunlight between 9.00 A.M to 5.00 P.M till the product obtained constant weight. It took 30-32 hours for drying (Gupta and Nirankar, 1984). Soon after drying was over, dried pieces were ground into powder in an electric grinder at medium speed. Ground powder was packed in polythene bags, sealed and stored in air tight container at ambient temperature.

**Hot air oven drying:** Control as well as pretreated tomato pieces were spread on Aluminium trays and were dried in hot air oven at 60°C to a constant weight (Gupta and Nirankar, 1984). Tomatoes which were given different treatments were dried separately and ground into powder. All the powder samples were evaluated for sensory attributes by panel of ten judges.

**Dehydration with salt:** Among them sundried and hot air oven dried samples, the treatment which has got higher mean score was considered for dehydration with salt, to improve the quality and storage life of the product and to determine the level of salt acceptable it was incorporated at 0.25, 0.5 and 1 per cent and sulphitation at 0.5 per cent was selected as follows.

- T1 - Blanched alone - control
- T2 - Blanched pieces with salt 0.5%
- T3 - Blanched plus sulphitation (0.5%) with salt 0.25%
- T4 - Blanched plus sulphitation (0.5%) with salt 1%

Sensory evaluation of powders conducted for all treatments on the basis of score card. The quality parameters such as appearance, colour, texture, picture, flavour, taste and over all acceptability and was carried out by panel of judges on a five point scale. The quality parameters were quantified and mean score was calculated.

**Preparation of tomato products and tomato powder and fresh tomatoes:** To know the acceptability of the powder, the recipes prepared with powder was compared with fresh recipes and kept for sensory evaluation. Tomato rice, tomato dosa, tomato chutney, tomato soup and burfi were evaluated immediately after preparation by scoring method (Swaminadhan, 1979) and coding. The mean score obtained was statistically analysed.

**Results and Discussion:** Mean score of sensory qualities of tomato powder as influenced by drying methods are presented in table 1. Appearance of the tomato powder prepared by oven and sundrying method had a mean score of 3.20 and 2.72, respectively. Appearance of dried tomato powders had a significantly higher mean score and attractive appearance than sundried powders. Conversely, the interaction between drying methods for appearance was found to be significant at one per cent level. Tomato powder prepared by drying in hot air oven had a significantly higher mean score for colour, taste, highly acceptable flavour than compared to sundried powders.

Appearance of all the powders was acceptable. It is evident from Table 2 that oven dried control (Blanched alone) had a significantly higher mean score of 3.4 followed by the tomatoes treated with T3 (Blanched + KMS 0.5%), T<sub>4</sub> (Blanched + KMS 0.75%) and T2 (Blanched + KMS 0.25%). Among all the treatments control (T1) retained an attractive appearance both in oven and sundried powders. Critical difference revealed that there was significant difference between T<sub>1</sub> (Blanched) and T2 (Blanched + KMS 0.25%). However, no such significant difference was observed in other treatments. Colour retention of tomato powders treated with different treatments varied significantly. The colour retention was significantly better in oven dried powder over sundried sample. However, the interaction between drying methods and treatments was found to be not significant.

All the powders had acceptable sour taste. However, the powders differed in taste depending on the treatments given. It was observed that oven dried powders had a highly acceptable quality parameters as compared to sundried powders. Mean score of overall acceptability of oven dried samples were higher (3.27) than sundried powder samples (2.90). It is noticeable that oven dried control had a higher mean score for taste of 3.7 followed T3 (Blanched + KMS 0.5%). The taste of both T1 and T3 treated powders were highly acceptable by the judges. No significant difference was observed between the two treatments. It was noticed from the Table 2 that control (T1) had a significantly better aroma than the other treatments. The texture of oven dried T3 (Blanched + KMS 0.5%) had a higher mean score of 3.8 followed by T2 (blanched + KMS 0.25%), T4 (Blanched + KMS 0.75%) and control (Ti). Among all the treatments, T3 had recorded better sensory attributes. Hence, this has been taken for further dehydration with salt.

To improve the sensory qualities and storage life of powders, salt was incorporated before dehydration and evaluated for sensory attributes. The results pertaining to this experiment are presented in Table No.3. From the table, it is clear that salt treated samples had a higher mean score for appearance over control. Among the treatments, salt at 1% was found to give better texture and had higher mean score for all sensory parameters (Table 3). Analysis of variance showed a significant difference between treatments for appearance at 1% level. The (Blanched + KNIS 0.5% + salt 1%

had an attractive colour over control (Ti). However, the colour of powder turned slightly dark with the addition of salt. After trying different methods and treatments the best method for the preparation of tomato powder was presented in the flow chart.

The tomato powder was incorporated at 5% level and used in the preparation of recipes viz., tomato dosa, soup, rice and burfi and compared with fresh tomato recipes. As the powder is in the concentrated form, it gave attractive appearance, colour and taste to the recipes. All the recipes were highly acceptable by the judges were not significant difference between tomato powder and fresh tomato recipes. Thus, powder can be used for the preparation of tomato recipes just like fresh tomato since it could impart all quality parameters similar to fresh tomato.

As powder is in concentrated form, one spoon of powder (5g) found to give acceptable colour, taste and flavour to the recipes. The yield of tomato powder ranged from 10 to 11 per cent on dry weight basis. As tomatoes are cheaper (Rs.2/- per kg) during the season and are early available, they can be

Processed in the form of powder. One kilogram powder costs around RS.20/-excluding labour and chemical charges. Where as in the off season tomatoes are costly, the prices may raise upto a Rs.20/- per kg and the cost of one kilo gram powder will be Rs.200/- Hence, the powder processing method at household level on small scale basis is cheap and can be prepared during the season and recommended for use both during season and off season. The powder can be used in the preparation of curries, soup and as an additive such as colouring and flavouring agent in bakery and confectionery and alike products.

#### Tomato Processing Plant:

- **Tomato processing plant** gives variety of tomato based dishes which you can enjoy any time.
- Tomato Puree from **tomato processing plant**
- Tomato Paste from **tomato paste processing plant**
- Tomato Ketchup/Sauces from **tomato ketchup puree plant**
- Tomato Juices from **tomato juice processing plant**

Packing lines can be offered depending upon the requirement like Product in glass bottles, Cans, Drums, etc. Manufacturing process involves most modern technology of vacuum evaporation using forced circulation evaporators/scrapped surface evaporators. Evaporation plants are versatile in nature and can concentrate other juices also.

#### SALIENT FEATURES ARE:

- High yield upto 90% of juice
- Low energy cost.
- Low temperature evaporation resulting improved quality of products.
- User friendly.
- Semi automatic as well as fully automatic system available.
- Both hot break and cold break systems available.

**Table 1 : Mean Value of sensory parameters of pretreated tomato powder obtained from oven and sundrying methods.**

| Sensory Qualities      |   | Method of Drying      |                |                |                |                     |                |                |                |                |      | Overall Mean |
|------------------------|---|-----------------------|----------------|----------------|----------------|---------------------|----------------|----------------|----------------|----------------|------|--------------|
|                        |   | Oven drying           |                |                |                |                     | Sundrying      |                |                |                |      |              |
|                        |   | T <sub>1</sub>        | T <sub>2</sub> | T <sub>3</sub> | T <sub>4</sub> | Mean                | T <sub>1</sub> | T <sub>2</sub> | T <sub>3</sub> | T <sub>4</sub> | Mean |              |
| Appearance             |   | 3.4                   | 3.0            | 3.3            | 3.1            | 3.2                 | 3.2            | 2.5            | 2.6            | 2.6            | 2.7  | 2.9          |
| Colour                 |   | 3.7                   | 3.0            | 3.6            | 3.3            | 3.4                 | 3.3            | 2.6            | 2.7            | 2.8            | 2.8  | 3.1          |
| Taste                  |   | 3.7                   | 2.9            | 3.3            | 2.9            | 3.2                 | 2.8            | 2.5            | 2.8            | 2.6            | 2.6  | 2.9          |
| Flavor                 |   | 3.8                   | 2.9            | 3.6            | 3.1            | 3.3                 | 3.1            | 2.8            | 2.8            | 2.8            | 2.8  | 3.1          |
| Texture                |   | 2.8                   | 3.7            | 3.8            | 3.4            | 3.4                 | 2.7            | 3.2            | 3.3            | 3.2            | 3.1  | 3.2          |
| Over all acceptability |   | 3.4                   | 3.1            | 3.5            | 3.1            | 3.2                 | 3.0            | 2.7            | 3.1            | 2.87           | 2.9  | 3.0          |
| Mean                   |   | 3.4                   | 3.1            | 3.5            | 3.1            | 3.2                 | 3.0            | 2.7            | 2.8            | 2.8            | 2.8  | 3.0          |
| T <sub>1</sub>         | - | Blanched ( Control)   |                | **             | -              | Drying              |                |                |                |                |      |              |
| T <sub>2</sub>         | - | Blanched+Kms (0.25%)  |                | **             | -              | Treatments          |                |                |                |                |      |              |
| T <sub>3</sub>         | - | Blanched+ Kms (0.5%)  |                | NS             | -              | Drying x treatments |                |                |                |                |      |              |
| T <sub>4</sub>         | - | Blanched+ Kms (0.75%) |                | *              | -              | 5 points scale      |                |                |                |                |      |              |

**Table 2: Mean score of sensory parameters for pretreated dehydrated powder.**

| Sensory Characters    | Pretreatments |      |      |      |      | C.D ± S.Em   |
|-----------------------|---------------|------|------|------|------|--------------|
|                       | T1            | T2   | T3   | T4   | Mean |              |
| Appearance            | 3.30          | 2.75 | 3.00 | 2.85 | 2.95 | 0.47 ± 0.181 |
| Colour                | 3.50          | 2.80 | 3.25 | 3.05 | 3.15 | 0.37 ± 0.141 |
| Taste                 | 3.25          | 2.70 | 3.05 | 2.75 | 2.93 | 0.41 ± 0.213 |
| Flavour               | 3.45          | 2.85 | 3.20 | 2.95 | 2.11 | 0.34 ± 0.137 |
| Texture               | 2.75          | 3.45 | 3.75 | 3.30 | 3.31 | 0.37 ± 0.143 |
| Overall Acceptability | 3.20          | 2.90 | 3.30 | 2.95 | 3.08 | 0.32 ± 0.124 |
| Mean                  | 3.24          | 2.90 | 3.25 | 2.97 | 3.10 |              |

T<sub>1</sub>- Blanched (Control)T<sub>2</sub>- Blanched + Kms (0.25%)T<sub>3</sub>- Blanched + Kms (0.5%)T<sub>4</sub>- Blanched + Kms(0.75%)**Table 3: Mean Score of sensory parameters for pretreated (with salt) tomato powder from over drying.**

| Sensory Qualities     | T1  | T2  | T3  | T4  |
|-----------------------|-----|-----|-----|-----|
| Appearance            | 3.0 | 3.3 | 2.9 | 3.5 |
| Colour                | 3.2 | 3.4 | 3.0 | 3.4 |
| Taste                 | 2.9 | 3.0 | 3.2 | 3.5 |
| Flavour               | 3.0 | 3.1 | 3.1 | 3.2 |
| Overall Acceptability | 3.2 | 3.3 | 3.2 | 3.6 |
| Mean                  | 3.0 | 3.2 | 3.1 | 3.4 |

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T<sub>1</sub>- Blanched (Control)T<sub>2</sub>- Blanched + Salt 0.5%T<sub>3</sub>- Blanched + Kms 0.5% +0.25 % SaltT<sub>4</sub>- Blanched + Kms0.5% + Salt 1%

\*- 5 points Scale

**Table 4: Mean scores of sensory parameters of Tomato rice, Dosa and Chutney with fresh and powder tomato.**

| Sensory qualities     | Recipes of Tamaros |      |        |      |        |         |        |      |        |       |
|-----------------------|--------------------|------|--------|------|--------|---------|--------|------|--------|-------|
|                       | Tomato             | Rice | Tomato | Dosa | Tomato | Chutney | Tomato | Soup | Tomato | Burfi |
|                       | 1                  | 2    | 1      | 2    | 1      | 2       | 1      | 2    | 1      | 2     |
| Appearance            | 3.4                | 3.3  | 3.3    | 3.2  | 3.1    | 3.0     | 3.3    | 3.2  | 3.6    | 3.4   |
| Colour                | 3.6                | 3.5  | 3.5    | 3.4  | 3.2    | 3.1     | 3.2    | 3.1  | 3.4    | 3.3   |
| Taste                 | 3.5                | 3.5  | 3.2    | 3.3  | 3.3    | 3.4     | 3.1    | 3.2  | 3.4    | 3.4   |
| Flavor                | 3.5                | 3.6  | 3.1    | 3.3  | 3.1    | 3.1     | 3.1    | 3.2  | 3.4    | 3.5   |
| Overall acceptability | 3.4                | 3.4  | 3.1    | 3.1  | 3.3    | 3.3     | 3.1    | 3.1  | 3.4    | 3.4   |

**Tomato Powder****Fresh Tomato**

NS - Non-Significant difference between recipes at 0.05% level.

\*- 5 points scale

## REFERENCE

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