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POST HARVEST MANAGEMENT AND TECHNOLOGY OF FRUITS AND VEGETABLES



POST HARVEST MANAGEMENT & TECHNOLOGY OF FRUITS & VEGETABLES

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2023
EDITION

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Published by

Royal Book Publishing
21/11, K M Nagar,
Ayodhiyapatinam, Salem.
Tamil Nadu-636103
Cell:+91 7598141199



Email: contact@royalbookpublishing.com

Website: www.royalbookpublishing.com

Published in India.

International Standard Book Number (ISBN) : 9788119821631

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Chapter – 13

TOMATO PROCESSING

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ABSTRACT:

Nearly 80% of fresh tomatoes are processed in developed nations. Despite rising tomato output in India, the industry's expansion is sluggish, mostly because the processing centre does not get a steady supply of affordable, high-quality raw materials. As a valuable and very perishable agricultural crop, tomatoes are extensively dried to increase shelf life. Both dried tomatoes and dried tomato manufacturing byproducts can provide useful commodities. It is used to make a range of processed foods such tomato juice, ketchup, sauce, canned goods,

puree and paste in addition to fresh veggies. It is also consumed directly all around the world. However, it is extremely difficult to produce dried forms of food that have qualities comparable to those of fresh tomatoes, such as nutrient content, appearance, flavour, texture and features that allow for reconstitution.

KEY WORDS:

Processing, Tomato, Value addition, Vegetables.

INTRODUCTION:

Due to India's varied climate, various types of fresh vegetables are always available. In terms of global vegetable output, it comes in second place to China. One of the most significant commercial vegetable crops, the tomato is crucial to the Indian economy. It is a member of the Solanaceae family and is thought to be indigenous to tropical America (Vavilov, 1951). The second-most important vegetable crop worldwide after potatoes is the tomato. The tomato is referred regarded as "The Poor man's Apple"(Rick, 1978). From a nutritional standpoint and is cultivated both indoors and outdoors for processing and fresh consumption. With 4.8 million hectares of land under cultivation, tomatoes are the second-most widely grown vegetable (following potatoes), producing 182 million tonnes of fresh produce annually (FAO, 2018).

The tomato is a perennial plant that is grown all over the world. Due to its many health advantages and the variety of products on the market, it is one of the most well-liked vegetables. Tomato consumption is linked to a lower risk of cancer, cardiovascular disease and chronic illnesses. Recent studies have also shown a link between tomato consumption and tomato-related products and better skin, bone and

brain health. We cultivate a lot of tomatoes (*Solanum lycopersicum*), both in the summer and the winter, but the winter-grown tomatoes are better since they have greater total solids. They provide a healthy amount of vitamin C (Burton and Reimers, 2011).

Fresh tomatoes are delicious and incredibly refreshing, but they cannot be kept for a long time. A loss of roughly 25 % of the yield is thought to occur in India as a result of the absence of post-harvest processing processes. In this case, producing, storing and transporting an intermediate product would assist to reduce the significant post-harvest losses and would be very advantageous for the growth of the processing business. However, due to the greater costs involved, advanced technology for bulk storage of tomato pulp finds limited applicability in India. The intermediary goods that would enable the farmer to maximise agricultural profits. During the busiest harvest season, they are frequently sold at distressing rates and a significant portion of the crop spoils from improper treatment. Making delightful goods from tomatoes helps prevent such losses (Bhatkar *et al.*, 2021).

❖ IMPORTANCE OF TOMATO PROCESSING:

One of the key crops, tomatoes are used to make a range of processed foods, including tomato juice, ketchup, sauce, canned goods, puree and paste. Nearly 80 % of freshly harvested tomatoes are processed in industrialised nations. Although tomato output is rising in India, the expansion of the tomato processing business is sluggish, mostly because the processing centre does not get a steady supply of affordable, high-quality raw materials.

Tomato sauce and ketchup are widely used in India and are produced there on a big scale, mostly in modest quantities. There is

potential for putting up massive processing facilities because tomatoes are basically accessible all year. The colour of a tomato product, which depends on how red the tomatoes used were, serves as a gauge of its quality. Lycopene, a red pigment, may really be used as a measure of how much tomato is truly present in a product. High quality tomato products can be prepared only by:

- 1) Using evenly coloured, plant-ripened tomatoes is best since the yellow and greenish parts oxidise and brown the tomatoes' crimson colour.
 - 2) Avoiding lengthy heating and fast chilling the prepared product
 - 3) Avoiding employing iron and copper in any industrial equipment.
- When lycopene, a self-oxidizing isomer of carotene, comes into contact with iron, it turns brown. Together with the tannin in the tomatoes and the utilised spices, iron also creates dark compounds. Stainless steel or glass-lined equipment should be utilised.

(FME-Training Manual on Processing of Tomato Products,
2020).

❖ **THINGS TO KEEP IN MIND WHEN PROCESSING TOMATOES:**

- 1) Use red ripen tomatoes. In addition to covering over the red colour of the fully ripe tomatoes, the yellow and greenish regions also oxidise and turn brown.
- 2) When processing, stay away of using iron equipment. When lycopenes come into touch with iron, it become brown. Together with the tannin in the tomatoes or the spices, iron also creates dark compounds.

- 3) After preparing tomato-based processed items such ketchup, sauce, chutney and soups, avoid overheating the product and immediately cool it.
- 4) Because the mould filaments and other microorganisms present in the cracks, folds, folds and stem cavities cannot be easily eliminated by mild washing alone, simply rinsing tomatoes in water is insufficient.
- 5) It is best to pasteurise tomato products after filling bottles in order to prevent fermentation.
- 6) One of the main issues with tomato ketchup and sauce-like products is the production of black necks. It has an impact on the product's quality. To avoid black neck formation:
 - a) Filling hot sauce at a temperature of no less than 85°C can help avoid black neck.
 - b) Leaving bottles with little to no headspace
 - c) Lowering iron pollution; salt and metal objects are sources of iron
 - d) Partial substitution of sugar for glucose or corn syrup, both of which contain sulphur and avoid blackening.
 - e) Addition of 100 mg of ascorbic acid or 100 ppm of sulphur dioxide
- 7) Bottles should be stored horizontally or upside down to disperse trapped air (O₂) throughout the container and lower the concentration in the neck just enough to prevent blackening.

(Nasir *et al.*, 2015)

❖ CHALLENGES LIMITING THE FRUIT AND VEGETABLE PROCESSING INDUSTRY'S DEVELOPMENT INCLUDE:

- 1) Less number of varieties are available appropriate for processing

- 2) Nature of the product is very perishable
- 3) Legislation governs the processed food business in India
- 4) Production is mostly concentrated in small, unorganised industries
- 5) Only a few significant firms have access to modern technologies
- 6) Ineffective connections between small farmers and the sector that processes fruits and vegetables
- 7) The high cost of raw materials, equipment and packaging materials, inadequate and expensive air freight and transportation and poor technology in processing, packaging and distribution

(Eipeson and Bhowmik, 1992)

❖ **POTENTIAL FOR FRUIT AND VEGETABLE PROCESSING:**

- 1) There is a chance to harvest underutilised minor fruits. While many foods are healthy, they are not always safe for ingestion while they are raw, nonetheless, they may be processed to produce top-notch goods. The processing business might utilise its capacity more effectively.
- 2) Food needs are changing and the demand for processed fruit and vegetables is only going to rise as a result of higher living standards and more women contributing to the family income. Fast food, prepared foods and convenience foods have risen to the status of societal necessities. Working women could substantially benefit from the availability of accessible fruit and vegetable products that provide wholesome foods at affordable costs throughout the off-season. This will assist them to conserve their important and creative time. Additionally, because to the influence of electronic media, rural residents now consume processed fruits and vegetables.

- 3) Processing of fruits and vegetables produces significant solid waste. Processing trash and byproducts may boost overall profits or cut processing costs per unit. Fruit and vegetables worth over Rs. 3000 crore are thought to be lost annually owing to a lack of post-harvest processing. If this loss is prevented or minimised, it will not only boost producers' incomes but also contribute to the nation's food supply.
- 4) With around 10 % and 13 % of the world's total production of fruits and vegetables, respectively, India is the world's greatest producer of these foods. India's modest percentage of world trade, however, suggests that it has room to grow its exports.
- 5) Processing of fruits and vegetables has strong and direct links to rural areas around the nation. This promotes job growth in the growing, harvesting, shipping, storage, processing and distribution sectors for both skilled and unskilled workers.
- 6) Grants in aid are being provided by the Indian Ministry of Food Processing Industry for the establishment of new processing units as well as the renovation and upgrading of current plants. The industry of processing fruits and vegetables would benefit greatly from this.

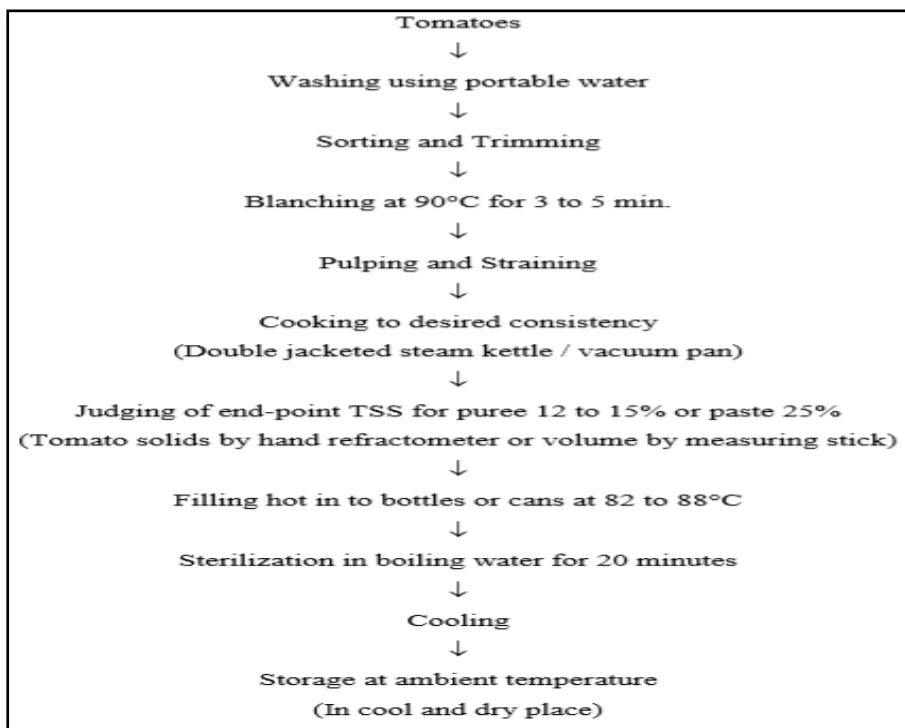
❖ **HYGIENIC CONDITIONS OF THE PROCESSING UNIT:**

- 1) Cleanliness of the ceiling, flooring and walls
- 2) Proper lighting and ventilation
- 3) Separate storage area for cleaning materials, utensils and equipments
- 4) Regular and adequate cleaning facility
- 5) Adequate hand washing facilities

- 6) Dressing rooms and toilet facilities
- 7) Sanitary Garbage disposal
- 8) Control of rodents and insects

❖ **VARIOUS PROCESSED PRODUCTS OF TOMATO:**

1) PASTE:



De-seeding, de-skinning and cooking/concentrating the tomatoes for many hours results in tomato paste. It can occasionally be sweetened for taste. It is a substantial, deep-red concentration. To prepare 1 kg of tomato paste, approximately 6 kg of fresh tomatoes is used. Whole processing tomatoes with a tomato solids content of typically 4.5 to 6.0 percent are used to make tomato paste (Maity *et al.*, 2014).

2) PUREE:

In terms of texture and taste intensity, tomato puree is different from tomato paste. Compared to tomato puree, which has a diluted flavour and a thinner consistency, tomato paste is more concentrated and has a much stronger flavour. Tomato puree varies from paste solely in that it has a lower percentage of TSS, which ranges from 11 to 14 % (Singh *et al.*, 2021).

- **FPO specification for tomato puree and paste:**

- a) The tomato paste must be made using healthy, fresh and completely ripe tomatoes that are essentially free from insect or fungal assault or any other flaw impacting the fruit's quality
- b) Tomatoes that have been properly cooked and strained must be free of skin and seeds
- c) Common salt, citric acid, ascorbic acid, spices, authorised colours and preservatives are the only ingredients that may be added
- d) The end product must have a decent tomato flavour and be devoid of any other unsavoury flavours
- e) After seven days at 370°C, it must be of high keeping quality and not exhibit any signs of fermentation
- f) A maximum of 60 % of the field studied may include mould in the completed product
- g) Tomato paste and puree both need to include a minimum of 25 % and 9 % soluble solids (w/w) free of salt, respectively

- **Quality problems in paste and puree preparation:**

- 1) Overcooking has occurred if the tomato paste becomes too black

- 2) The hot break's temperature is too low if it is excessively liquid
- 3) The presence of lactic acid bacteria, which arises from the raw tomato remaining too long before being processed, is indicated by a yoghurt-like flavour

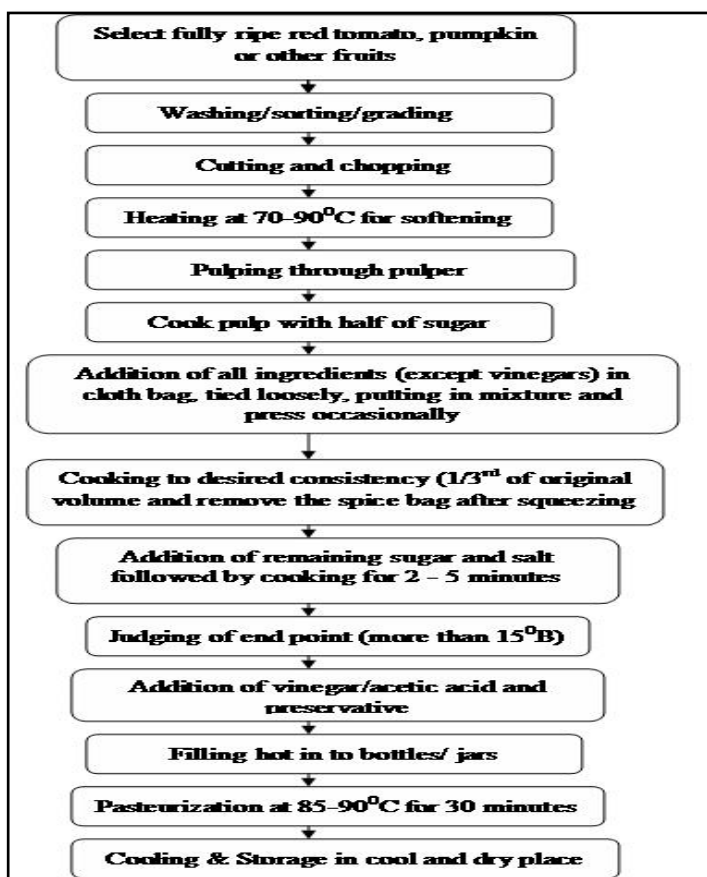
- **Depending on the degree of concentration, tomato paste can be grouped as:**

- a) Light tomato paste containing 25-29 % of salt free tomatoes
- b) Medium tomato paste containing 29-33 % of salt free tomatoes
- c) Heavy tomato paste containing not less than 33 % of salt free tomatoes

3) KETCH UP:

One of the most popular fruits and vegetable items made in our nation is tomato ketchup. The pulp of ripe tomatoes is cooked with sugar, salt, spices and vinegar to a fairly thick consistency before being put into glass bottles. It has a broad market appeal because to its appealing red colour and spicy flavour. With or without onion and garlic, tomato juice or pulp, spices, salt, sugar and vinegar are combined to make tomato ketchup, which must have at least 12 % tomato solids and 25 % total solids (Singh *et al.*, 2021).

- **Procedure:**



Choose tomatoes that are color-developed and totally ripe and then thoroughly wash them in fresh water. With the help of a stainless steel knife, cut off the green and imperfect parts and throw them away. Smallen the sound parts by cutting them. Gather the prepped fruit in an open container made of aluminium or stainless steel, then smash it with a wooden ladle. Cook the crushed bulk until the skins are separated from the meat, which takes 80-85 °C. By gently rubbing with the bottom of an enamelled mug, strain through a fine mosquito net cloth or a stainless steel sieve with a mesh size of 1 mm. Throw away the peels and seeds.

- **Problem:**

Near the surface of the ketchup within the narrow-necked bottles, a strange black ring that goes by the name of "Black neck" has formed. The separation of watery liquid from the ketchup, the growth of mould and other small flaws are among them. The use of high-quality tomatoes and the use of conventional ketchup preparation techniques can readily eliminate these flaws. The fundamental issue with processing is that when a product comes into contact with air, it turns black owing to the action of iron on the tannins. By avoiding the use of iron tools, avoiding the crushing of tomato seeds and vacuum-sealing the bottles, this may be avoided.

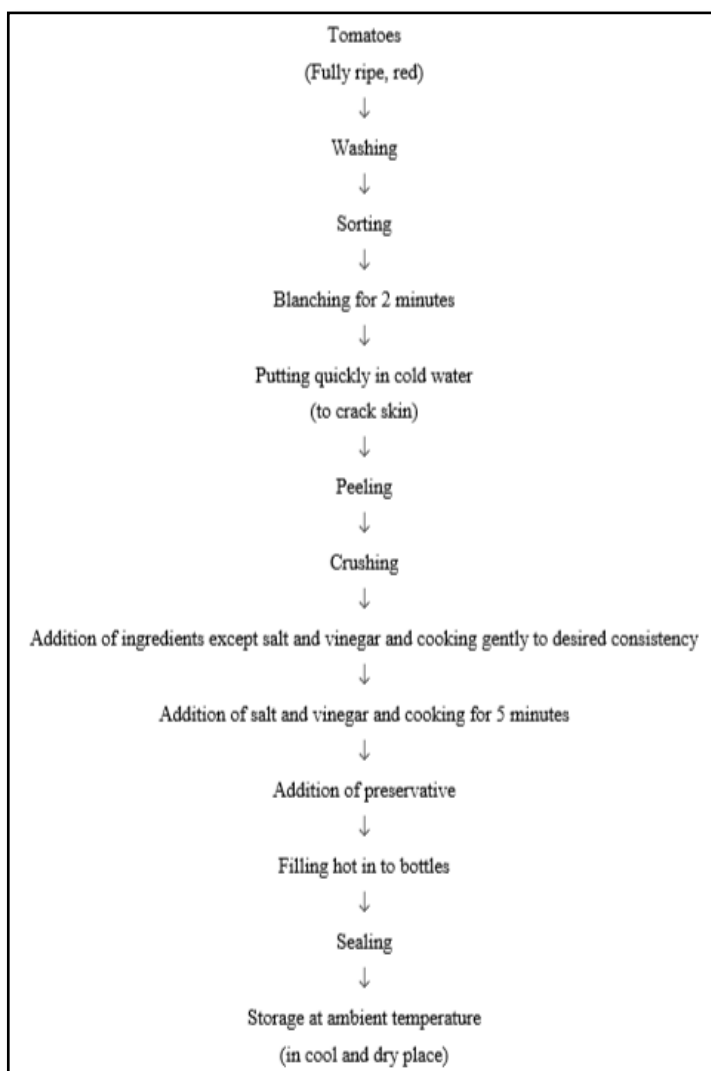
4) SAUCE:

It is a very spicy food item made with ripe, peeled and crushed tomatoes together with salt, sugar, spices, vinegar and either onion or garlic. The preparation process is comparable to that of tomato ketchup, with the exception that the entire unstrained pulp is utilised and the seeds are left in. After being treated in water at 85–90°C for 30 minutes, hot product is poured into bottles or cans. In many ways, tomato sauce's composition resembles that of ketchup, a thicker condiment.

Although almost any combination of fruits or vegetables can be used to make a sauce, tomato sauce, chilli sauce and to a lesser extent mixed fruit sauces like "Worcester" sauce, which includes apples and dates in addition to tomatoes, currently dominate the market in many nations. Compared to ketchup, sauces have a thinner consistency and include at least 15° TSS. The pulp from fruits and vegetables such as pumpkin,

tomato, apple, papaya and plums is effectively utilised to make sauces. As continental sauces, mixed vegetable sauces made with pumpkin, tomato, chillies and carrots are offered for sale.

5) CHUTNEY:



Chutneys are viscous concoctions that resemble jam and are created from a variety of fruits and vegetables, spices, sugar and occasionally vinegar. Chutney may be made using any edible sour fruit as a basis to

balance out the sweetness of the sugar. Depending on the inherent acidity and ripeness of the utilised fruits, the high sugar content has a preservation effect and vinegar may not necessarily be required. The majority of chutneys are cooked, which results in a caramelised syrup and changes the product's flavour, colour and thickness. Through pasteurisation, boiling also helps to preserve the goods (Singh *et al.*, 2021).

6) SOUP:

Today, tomato soup is a rather well-liked product. It is frequently drunk because it has a smooth texture and instantly makes people feel full. The majority of tomato soups sold in stores are made by dry mixing components, with tomato powder and a thickening agent making up the majority of the recipe.. It may be made from either tomato juice or pulp. To prepare soup, ingredients like butter or cream, spices, flour, etc. are utilised. Based on the desired flavour, they are added in various ratios. There are a number of recipes that make tomato soup taste nice (Chavan *et al.*, 2015).

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