

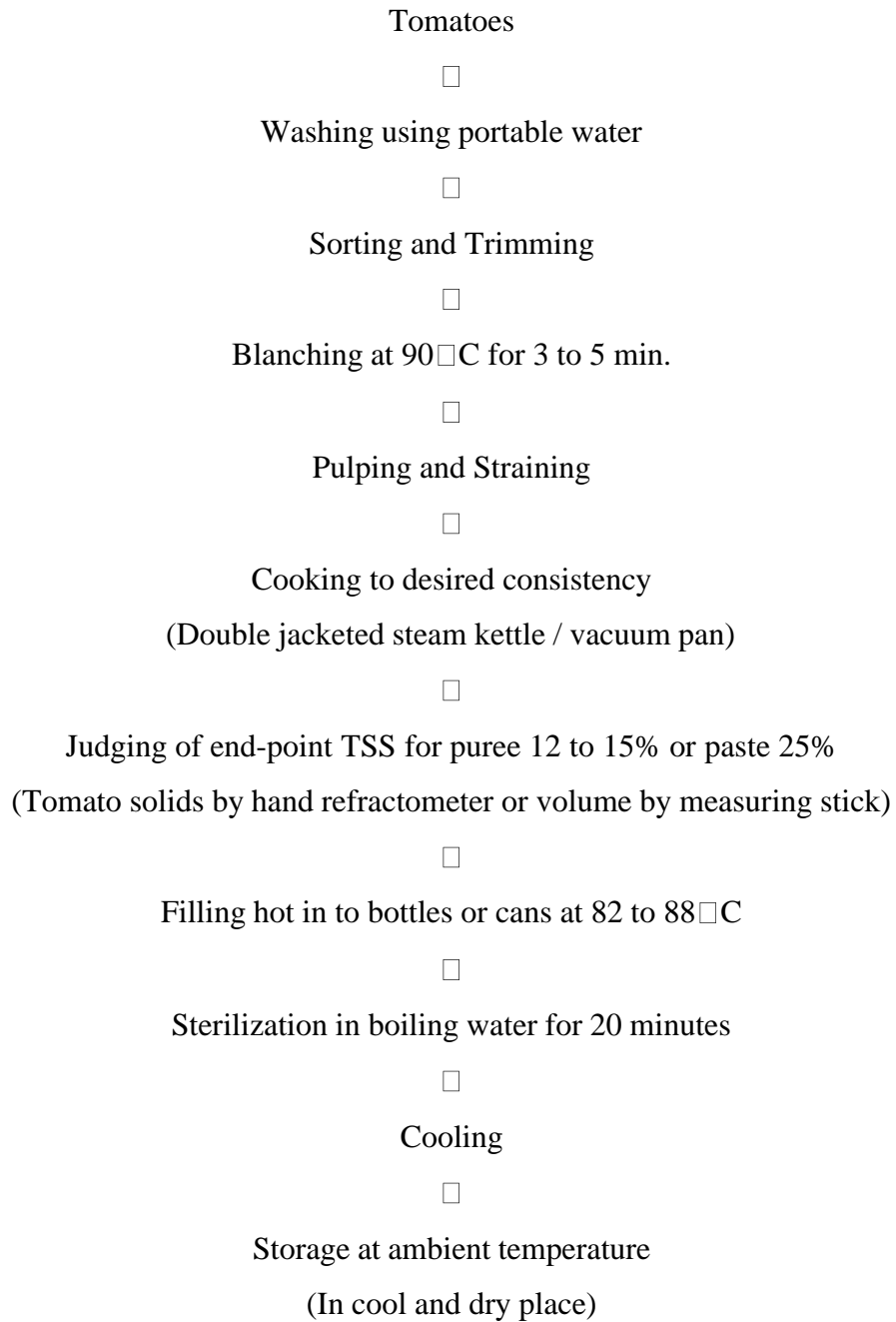
Unit III – Topic IX

Processing of tomato paste and puree

Tomato paste is made by de-seeding and de-skinning the tomatoes and cooking/concentrating them for several hours. Sometimes it can be sweetened for flavor. It is a thick, dark red concentrate. Tomato paste is made from whole processing tomatoes generally containing between 4.5 to 6.0 percent tomato solids. With regard to solid content, the industry normally refers to TSS (total soluble solids), a measure which excludes all insoluble solids. In accordance with generally accepted market standards, tomato paste must contain at least 14 percent TSS. On average, 6kg of fresh tomatoes are required to make 1 kg of tomato paste at 26 to 28° Brix. Most common tomato paste in is “concentrate” or double concentrate with 26 to 28° Brix, but “concentrate” or triple concentrate with 36 to 38° Brix is also present in the market.

Tomato puree differs from tomato paste in consistency and depth of flavor. Tomato paste is more concentrated and has got a very strong flavor, whereas tomato puree had diluted flavor and is thinner in consistency. Tomato puree contains between 11 and 14 percent TSS, and differs from paste only because of the lower concentration.

Figure 1: Processing Flow-Sheet for Tomato Puree/Paste





Tomato Puree



Tomato Paste

This above technology aims at processing and preservation of glut season tomato for use during the off-season. Hybrid tomatoes, suitable for the production of tomato concentrate/ paste, are made into pulp in a pulper. The pulp is concentrated to puree (12-15°Brix) or paste (25°Brix) in an open steel vessel / a steam kettle. Sodium benzoate is added as a preservative @ 250 ppm or 0.1% and packed for storage.

Table 1: Tomato puree and paste at various level of Total soluble solids (TSS %)

Concentration of TSS	Tomato puree	Tomato paste
Light	8.0 - 10.1	24.0 - 28.0
Medium	10.1 - 11.3	28.0 - 32.0
Heavy	11.3 - 15.0	32.0 - 38.5
Extra heavy	15.0 - 24.0	over 38.5
Concentrated tomato juice	20.0 - 24.0	--

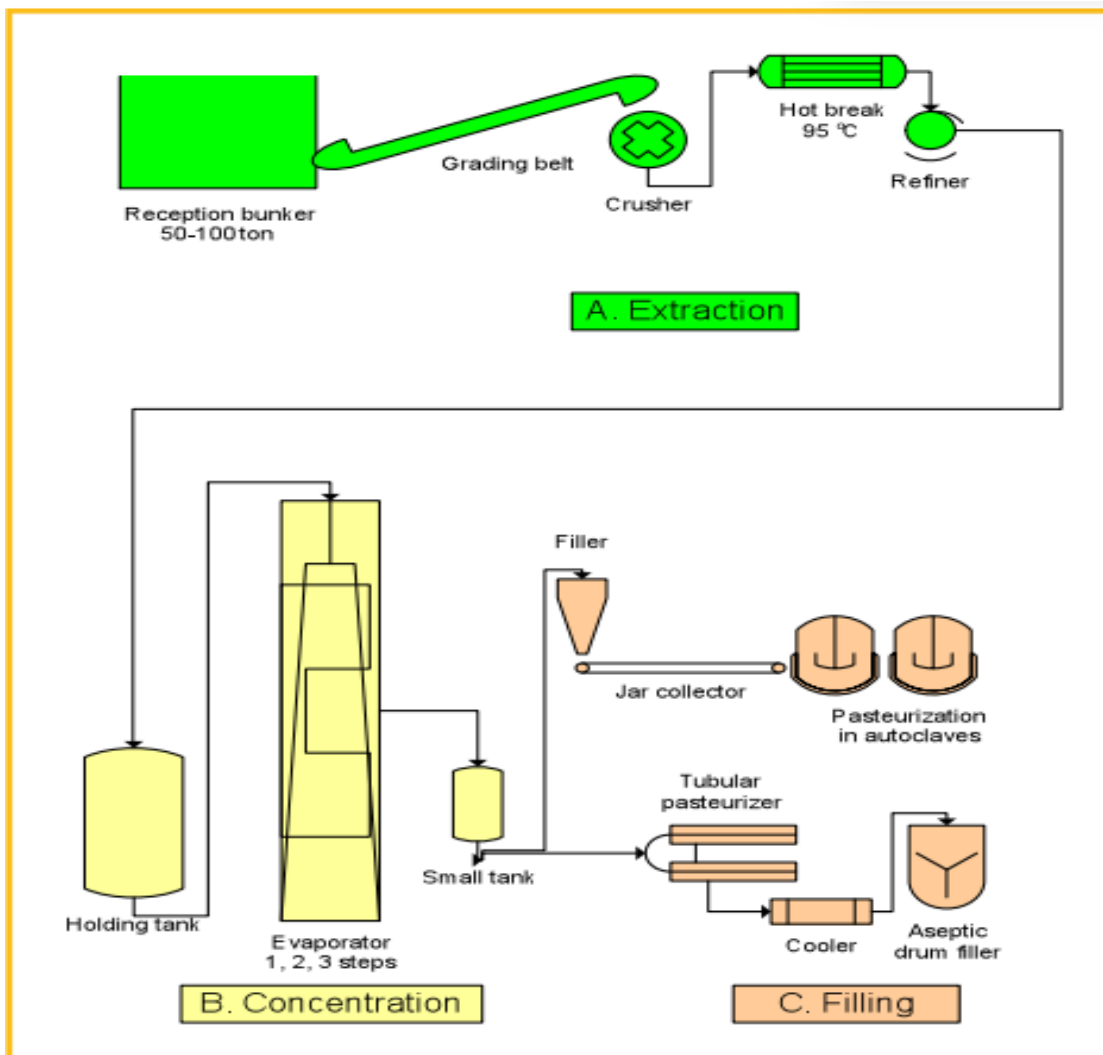
Tomato pulp without skin on seeds, with or without added salt and containing not less than 9.0 percent of salt free tomato solids is known as “medium tomato puree”. It can be concentrated further to “heavy tomato puree” which contains not less than 12 percent solids. If this is further concentrated so that it contains not less than 25 percent tomato solids, it is known as tomato paste. On further concentration to 33 percent or more of solids, it is called concentrated tomato paste.

Pilot Scale Production of Tomato Paste

1. **Product.** Tomato paste is a thick paste made from ripened tomatoes with skin and seeds removed. Depending on its manufacturing conditions, it can be used to make either ketchup or reconstituted tomato juice. Tomato paste is concentrated tomato purée. Purée has a Brix of 15–20 and paste has a Brix of 25–36.
2. **Raw material.** The preferred raw material is processing tomato of 5–6.5 Brix, but consumption tomato of 4–5 Brix is more often used.
3. **Yield benchmarks.** The actual yield (on partially irrigated, poorly managed open land) is 15–25 tons/ha. The potential yield (on irrigated open land) is 60–120 tons/ ha. Greenhouse yield (year-round and with good management) is 300–600 tons/ha.
4. **Processing ratio.** Five to 7 kg of tomatoes are needed for 1 kg of paste. The higher the sugar content (measured in Brix) of the raw tomato, the better/ lower the processing ratio.
5. **Production process.** After reception in 10–50 ton bunkers filled with water, the tomatoes are crushed by a pulper. The pulp is then pumped through a heat exchanger at a temperature of 95 °C to destroy the pectinase released during pulping (this is known as “hot break”). The pulp is sieved to remove seeds and skin, which constitute 3–4% of the weight. Next, water is evaporated from the pulp by adding steam. One kg of steam removes 1 kg of water. This is called the “effect”. To double or triple steam use efficiency, two or three effect evaporators are in use and the steam is recycled two or three times. To maintain quality, the temperature in the evaporator must be as low as possible; therefore, a vacuum is created above the pulp so that water will boil at 70°C. Once the paste has the required concentration, measured in Brix, it leaves the evaporator to be pasteurized and packaged.

6. **Packaging.** Industrial paste (to be repacked or reused later) is packed in aseptic bags of 25–250 litres and kept in steel or plastic drums. Consumer paste is either filled in tins of 30–900 g or in glass jars of 200–3,000 ml.
7. **Quality description.** The paste must be bright red and have the right consistency: solid, not liquid. It must have a true tomato aroma and be free from off-tastes or smells.

Figure 2: Flow diagram of tomato paste process at pilot scale level (paste jar filling and aseptic drum filling)



Shelf Life Stability of Tomato Puree/ Paste

Tomato is processed in the forms of pulp, paste, juice, ketchup, puree (Hayes *et al* 1998). A number of studies have used hedonic measurements to determine the end of shelf life for tomato products. However many of these studies did not go long enough to find the end of shelf life.

Food processors store tomato pulp under conditions available in their premises. It has been observed that temperatures varying from as high as 20 to 40°C, refrigeration (4 to 10 ° C) to as low as 20 ° C are employed for storage purpose. High temperature storage is detrimental to product quality while lower temperature adds cost to the product (Jamil, 1990). No significant differences were found between the flavor of tomato concentrates stored for six months at 4°C and those stored at 21°C for the same period

Tomato paste could be stored at varying storage condition for 240 days (8 months) with minimum damage to the product quality at lowest possible cost. It was observed that samples stored at low temperature such as 6° C and 10° C remained acceptable after 240 days storage and samples were rejected organoleptically at higher temperatures storage at 25 ° C (Muhammad et al., 2010).

Quality problems

- If the tomato paste is too dark, it indicates that it has been overcooked.
- If it is too liquid, the temperature of the hot break is too low.
- A yoghurt taste indicates the presence of lactic acid bacteria, which results from the raw tomato standing for too long before being processed.

All these problems can be overcome with proper technology

Market issues

The containers require proper labelling with a list of ingredients and net content, as well as the whereabouts of the manufacturer.

Salient Features of Tomato Paste / Puree

- Paste recovery is 14%
- Can be stored up to 6 months in bottles and pouches and up to one year in cans



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- Most suited during the market glut, when the process go down.
- Tomatoes can be used during off –season
- Paste is suitable for manufacture of other products from tomato

Due to increasing standards of living in the cities and the rapid urbanization taking place in the rural areas, consumption of tomato based products is expected to go up steadily. Tomatoes and tomato-based foods are considered healthy for the reason that they are low in calories, but possess a remarkable combination of antioxidant micronutrients. A number of tomato products e.g. ketchup, juice, puree, paste, sauce, pickles are items of common use in households, hotels, restaurants, institutions.