SEMI-PROCESSING OF TOMATOES

PRACTICAL ACTION
Technology challenging poverty

technical brief

Practical Action South Asia has helped a Farmers Society in Matale, Sri Lanka to establish a small business to diversify their activities and provide an additional source of income. Tomatoes that can not be absorbed by the market, due to glut during tomato season, are processed into a product with a higher value. What makes this small business so interesting is that the tomatoes are *part-processed* to a stable, pasteurised tomato juice. This juice is then sold to processors who manufacture other tomato products.

Flow diagram

Equipment	Action	Quality control
	Accept	
Weighing scales	Weigh	
Sorting table	Sort	Reject poor quality and weigh
	Keep the good quality tomatoes	
Water	Wash	
Mechanical pulper	Pulp	Reject seeds & skins and weigh
	Keep the Tomato juice	
pH meter/litmus paper	Check Acidity pH = <4.5	Add citric acid if necessary
Refractometer	Check Solids	Total soluble solids = 5.0°Brix - 8.0º This varies depending on variety
Industrial gas cooker	Heat	Temperature = 90°C
Clean food grade plastic drums, bottles	Fill	Pour hot juice into drums
	Cool to ambient room temperature	Usually cooled in air. Water can be used if easily available.
Sodium metabisulphite	Add preservative	approximately 700ppm
	Seal drums	
	Store	
	Dispatch	

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So this small business does not have the additional capital requirements of bottling equipment and bottles nor does it require a complex distribution system for its product. The key factor is to supply tomato juice which has advantages to the 'downstream' processor in terms of price per unit and convenience (time and equipment).

Guidance notes

Acceptance
The procedures outlined in this document are the way Matale farmers have agreed to run the Unit, procedure may vary, they do not have to be the same. The farmers deliver the tomatoes between 3-5 p.m. everyday. The processing is done up to about 12 p.m. everyday during the season. If there are messages that need to be conveyed (minimum, maximum of supply, changes in working hours etc.) to the farmers (suppliers) these messages are put up on a notice board at the delivery point, so that the person who delivers tomatoes can take the message back. Farmers are not allowed inside the processing area.

The farmers are asked to supply fully ripe tomatoes which cannot be sold as fresh tomatoes to the middlemen. Tomatoes of any shape, size and variety and without split skins are accepted. Bruised tomatoes are accepted provided that the skin is fully intact. The farmers, who are members of the society have been given thorough instructions and they have agreed upon the quality of the raw material. They were accustomed to sort tomatoes according to requirement of a '*mudhalali*' (middleman) and reject the overripe damaged fruit in the field. As a change to this traditional way of harvesting, they now further sort the rejects and select tomatoes which could be processed. They understand that bringing unsuitable fruit would only increase the production cost. Farmers bring the tomatoes packed in boxes.

Weighing
The tomatoes are accepted through a half door, weighed and a receipt given to the farmer which indicates the weight of the tomatoes (minus the individual rejects of the previous day). The farmers have requested that the seeds extracted from a previous days production are returned to them for preservation for use in next season.

Sorting
Sorting is done by putting tomatoes onto a 'sorting table' which has slight gradient at one end. The good quality tomatoes gently roll into a basin of water and the rejected tomatoes (spoilt, damaged with broken skins) are collected and weighed. Each 'delivery' is sorted separately so as to identify accepts/rejects for each farmer.

Washing
The good quality tomatoes are thoroughly washed in clean water to ensure they are free of soil and other foreign matter.

Pulping
The clean tomatoes are fed into an electrically driven mechanical pulper with a 1-1.5 HP motor. This separates the juice from seeds and skins. The tomatoes are rubbed against a perforated drum by two brushes which are fixed to the central shaft driven directly by the motor. The juice passes through the perforated drum into the outer stationary drum and collected through an outlet. The remaining seeds and skins are pushed out through an outlet connected to the inner perforated drum.

Acidity
The acidity of the juice is checked to ensure that it is below pH 4.5. If it is higher than pH 4.5, citric acid should be added until the desired acidity is achieved.

Solids
The total soluble solids of the juice is measured as the industry requires a minimum of 5°Brix for the juice. Usually it is about 6-7°Brix. If it is lower than 5° Brix, the juice can be mixed with juice recovered from tomato which has higher brix value. It should be noted that the refractometer should only be used with juice at ambient temperature. Juice at high temperatures will give an incorrect reading.

Heating
The juice is heated in a large stainless steel pan to 90ºC, for about 45 minutes, using an industrial gas stove.

Filling
The hot juice is poured into clean, food grade, plastic drums. Just before use the drums should be thoroughly washed with clean water. It is recommended to use boiling water or, ideally, 35% hydrogen peroxide solution for the final rinse. Cleaned, empty drums should be stored upside down on racks.

Preservative
Add 700ppm of Sodium (or potassium) metabisulphite to the drum and seal very quickly. Mix the metabisulphite by shaking the barrels after sealing**.**

Sealing
The drums should be sealed as quickly as possible to minimise the loss of the preservative. As the juice cools down, if there is a good seal, then a slight vacuum will be formed, which also helps preservation.

Storage
The sealed drums must be carefully moved and stored in clean space at ambient temperature (25-30ºC). Care should be taken not to damage the seal while moving the drums. If the seal is broken the levels of sulphur dioxide will start to decrease and there will be no vacuum. This will cause the juice to ferment and thus be unacceptable for the consumer and for further processing.

Dispatch
The price per litre of tomato juice is negotiated with the buyers mainly in Colombo. The drums are transported in a lorry from the processing unit. Members are paid for the supply of tomatoes. The profits left after covering the costs are divided according to the quantity of tomatoes supplied by each member. These are then deposited into individual bank accounts at the Regional Rural Bank in Matale.

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References and further reading

- *Tomato Processing*, Practical Action Technical Brief
- *How to grow tomato and peppers: agrodok 17:* M. Amati et al, Agromisa, 1989
- *Small-scale Food Processing: A Directory of Equipment & Methods*, S. Azam-Ali et al, ITDG Publishing, 2003
- *Tomato and Fruit Processing, Preserving and Packaging: An example of a village Factory*, G. Klein, CIEPAC/TOOL, 1993