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Minimally processed fresh-cut-vegetables for healthy consumption

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ABSTRACT : The consumers mind has changed now-a-days to an increased emphasis on quality and healthy consumption of vegetables. Generally, as per the consumer demand and convenient a simple methodology is followed for the preparation of minimally processed fresh-cut-vegetables. This paper highlighted the quality of selection, processing and packaging of processed vegetables as per the healthy issues. This direction of research in future helps to reduce the time lengthy of preparation and unhealthy consumption in the faster world.

KEY WORDS : Fresh-cut vegetables, Minimal processing, Process, Post-harvest losses

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India is in second position in world ranking next to China and accounts for about 15 per cent of global vegetable production (Vanitha *et al.*, 2013). Totally 162.89 million MT of vegetable cultivated is around 9.39 million hectares which is about 3 per cent areas in the country (Neeraj *et al.*, 2017). It is estimated that between 30 and 35 per cent of India's total vegetable production is lost owing to poor postharvest practices (Singh *et al.*, 2014). Only less than 2 per cent of total vegetables are processed when compared to 70 per cent in Brazil and 65 per cent in the USA. Approximately 1.5 lakh MT of vegetables is sold in the processed form (Dutta *et al.*, 2015).

India's vast geographical area coupled with varied suitable climate conditions facilitates to grow a variety of vegetables. More than 70 types of vegetables are grown in the country, like tomato, brinjal, chilly, cauliflower, cabbage, peas, potatoes, onions and few common cucurbits and leafy vegetables (Khadatkar *et al.*, 2018). These generate high income and employment, particularly for small farmers. Among the vegetables tomatoes, onion,

brinjal, potato, cabbage, cauliflower, okra and peas are the most important grown vegetables (Lokapur and Kulkarni, 2014). Though India has lot many positives in the vegetable production and marketing sector, it has several disadvantages too. One of the major challenging aspects is lack of minimal processing and preservation.

Middle and upper middle class population is growing very rapidly in India and also the people of whole family are in working motive, resulted in increase in demand for semi-processed food, fast foods, packed foods, ready-to-eat foods (Rais and Sheoran, 2015). Now-a-days peoples of urban India gradually changing their minds for prefer and prepare the traditional foods because of their life style has changed accordingly with their working environment thereby they are addict to comfort and convenience etc. Especially people living in cities are become more health and hygiene conscious. In place of conventional wet markets, they prefer to buy vegetables, fruits and other agri-products from the super markets and modern retail stores and this leads to the entry of more and more corporate into the Agricultural food

marketing (De Corato, 2019). This review paper discussed in detail about the minimal processed food and their preparative methodology for our future needs.

Minimal processing :

It is defined as the handling preparation, packaging and distribution of agricultural commodities in a fresh like state, and may include processes such as peeling, dicing, slicing, trimming and curing for easy consumption of customers (Corato, 2019 and Bhat, 2013).

Minimal processing of raw vegetables has two purposes:

- First is to maintain fresh, pure and without losing its nutritional quality.
- Second is to increase the shelf-life of the produce. The microbiological sensory and nutritional shelf-life of minimally processed vegetables should be at least 4-7 day, but preferably even longer, upto 21days depending on the market, the loss of ascorbic acid and carotenes is the main limiting factor of nutritional quality (De Corato, 2019).

Advantages of minimal processing:

The advantages of minimal processing of vegetable is reduce the Post-harvest losses, which are difficult to predict while harvest. The major agents are producing deterioration mostly being attributed to microbiological causes and physiological damages. The losses at each stage of harvest and post-harvest practices due to improper handling can be large enough to result in a total loss of millions of food commodities every year (Kumar

and Kalita, 2017 and Kiaya, 2014). Minimal process is a conventional methodology to overcome the losses and maintain the food quality as fresh from farm to consumer.

Key requirements for the processing of vegetables:

- Good quality of raw materials (correct cultivar variety, correct cultivation, harvesting and storage condition)
- Strict hygiene and good manufacturing practices use of hazard and critical control point principles.
- Correct temperature and humidity during distribution and retailing.
- Maintain a Low processing temperature during entire course of processing.
- For prevent the browning mild washing additives should be used to maintain the quality.
- Washing should be done for both before and after peeling of vegetables.
- For entire preparation, we should use only good quality water.
- For wash the products only gentle spin is enough to maintain the texture of product.
- We should select correct packaging materials and packaging methods.
- Gentle peeling, gentle cutting, slicing and/or shredding.

Types of vegetables:

Vegetables are classified according to their nature and their sources (Birthare, 2018). Here by the common Tamil Nadu vegetables are classified and furnished in Table 1.

Table 1: Classification of vegetables				
Bulb vegetables	Fruit vegetables	Inflorescent vegetables	Leaf vegetables	Root vegetables
Garlic	Avocados	Artichokes	Cabbage	Carrots
Leeks	Chayote	Broccoli	Lamb's lettuce	Radishes
Onions	Cucumbers	Banana flower	Lettuce	Turnips
	Eggplant	Broccoli rabe	Spinach	Stalk vegetable
	Okra	Cauliflower		Asparagus
	Tomatoes			Bamboo
				Tuber vegetable
				Cassava
				Potato
				Sweet potato
				Taro
				Yam

Common processing method:

In Asian countries the three common methodologies are followed to prepare fresh-cut vegetables (Bansal *et al.*, 2015). Steps in the processes are varying in accordance with the target market, which are furnished in the Fig. 1. Small vendors generally trim the produce prior to cutting and selling in the wet market under ambient conditions. Supermarkets on the other hand, generally wash the produce prior to trimming, cutting and packaging, under hygienic conditions. Vegetables destined for export are subjected to more stringent processing conditions, wherein they are trimmed, cleaned, cut, washed, sanitized, dried and packaged.

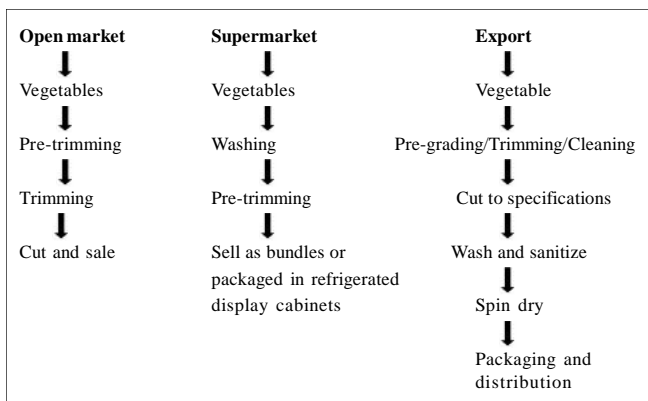


Fig. 1 : Steps in the production of fresh-cut vegetables

Processing unit diagram:

Minimal processing unit should be established as a hygienic set up before start. The basic processing unit diagram is furnished below in Fig. 2. Mostly the processing unit should be locate near the area, where vegetables

grown or available. This reduces transport costs and also reduces the amount of handling, which means that crops are more likely to be in good condition when they arrive at the processing unit (Nichols and Hilmi, 2009 and Peter and Ouaouich, 2004).

Sanitation design of a processing unit:

The external and internal design of the processing unit facilitated with protected air to prevent the product contamination (Faye *et al.*, 2007). The surroundings of the facility should be planted with grass to serve as an efficient trap for air-borne dust. The internal walls of the building should be plastered or rendered with concrete. The surface finish of the walls should have no cracks or ledges, which could harbour dirt or insects. The lower walls of the interior of the plant should be tiled or painted with water-proof gloss paint to withstand splashing during equipment cleaning. The upper walls should be painted with good quality emulsion paint. As far as possible, efforts should be made to use natural light in the building, which may reduce the electricity cost considerably (Quadrennial Technology Review, 2015). The size of the building and the number of windows would depend on the level of investment available for construction. Store rooms do not need windows, but require ventilation. All windows, vents and fans should be screened in order to prevent the entry of insects, birds and rodents. Buildings should be pest-proofed with no gaps under the doors. The floor should be curved to meet the walls in order to prevent the collection of dirt. Doors in the processing area should be kept closed unless they are fitted with thin metal chains or plastic curtains to prevent the entry of flies. Operations

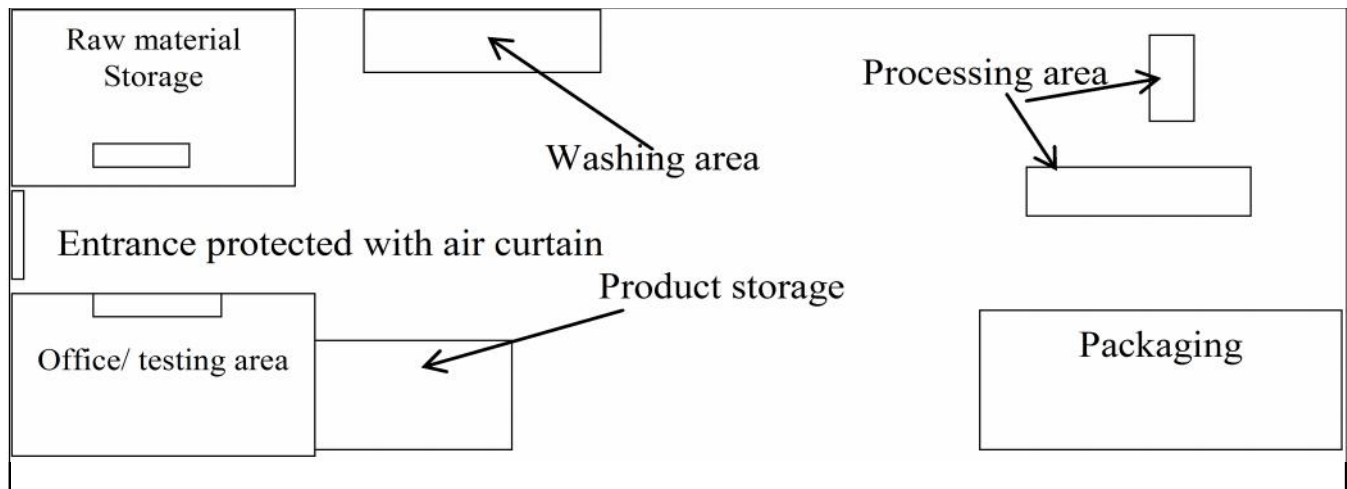


Fig. 2 : Basic processing unit diagram for minimal processing of vegetable

must be kept sanitary by cleaning up spills as soon as they occur and by washing the plant thoroughly at the end of each day of production.

Wire mesh should be placed over drains to prevent the exit or entry of pests. Washing and toilet facilities must be provided for employees, preferably in a separate building. If this is not possible, two closed doors are required between the toilet and the processing area, to prevent insects and odours from entering that area. Window ledges should be sloped in order to prevent them from collecting dust, dirt or old clothes that may be left there by workers. All windows should be fitted with fly-proof mesh. Power lines must be fitted with suitable discs

at least 25 centimeters in diameter in order to preclude the entry of rats into buildings.

Process:

The below diagram Fig. 3 showed that the details of basic operation flow chart for the preparation of minimally processing vegetables in a hygienic way.

Vegetable packaging unit:

Minimal processing can be defined as the handling preparation, packaging and distribution of agricultural commodities in afresh like state and may include processes such as peeling, dicing, slicing, trimming and

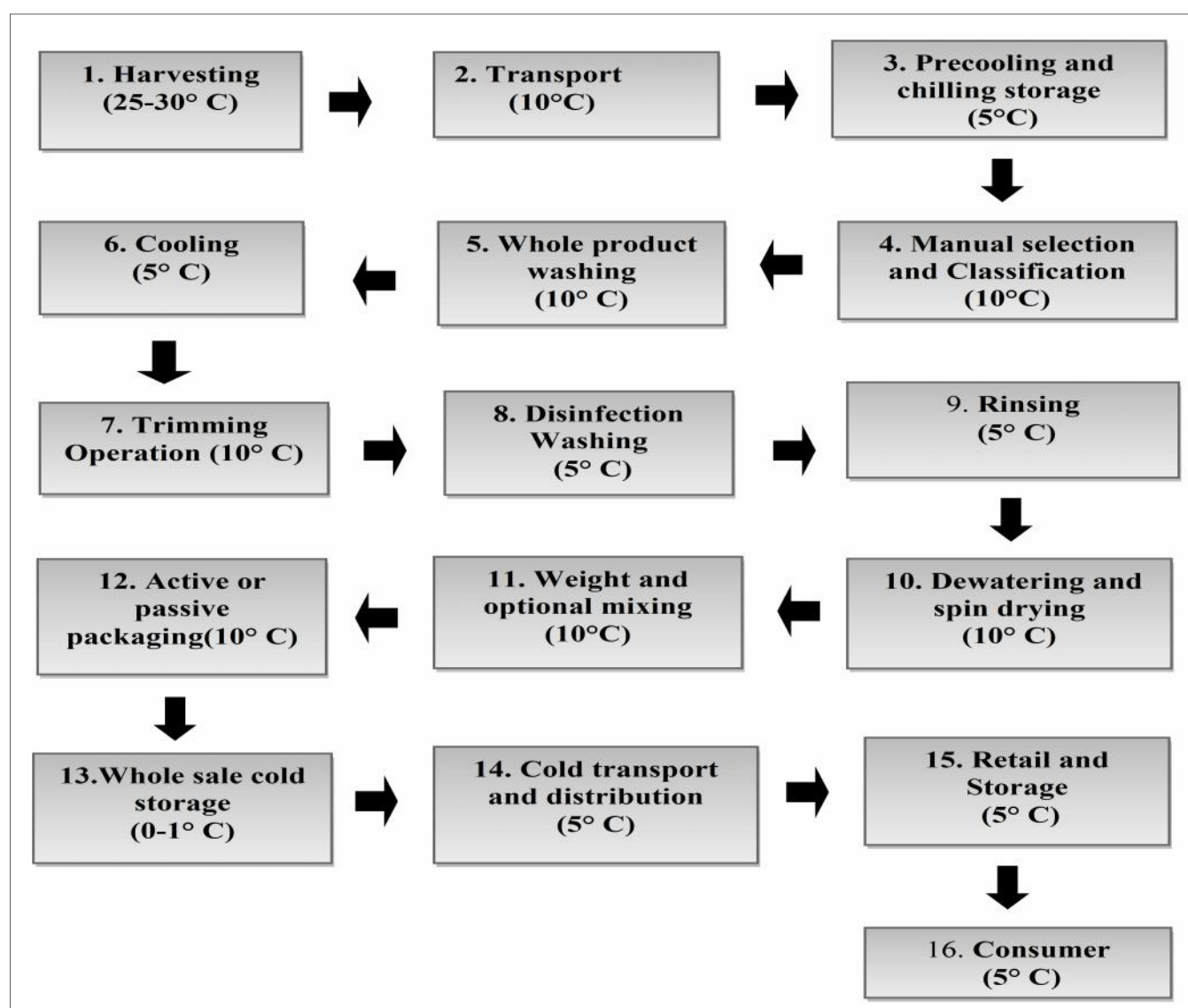


Fig. 3: Basic flow diagram for the minimal processing of vegetables

Table 2 : Causative organisms for quality loss

Sr. No.	Quality attributes	Quality loss
1.	Mold	Microbial spoilage
2.	Oxidation	Rancidity, colour change and nutrient loss
3.	Food chemistry	Odor/ flavour formation
4.	Water movement	Texture change, microbial spoilage
5.	Senescence	Premature ripening

curing. Packaging is a way to protect the food processed material from contamination and prevent it from spoilage (Mohanty and Swain, 2017). The contamination may affect total quality of the package. Some of the food quality loss and their causative organisms listed in Table 2.

Conclusion:

The vegetable sector has grown substantially both in volume and in variety of outputs traded globally. Rising incomes, falling transportation costs, improved technologies and evolving international agreements, have all contributed to this level of growth. This increased level of vegetable production has, unfortunately, not been matched by developments in supply chain management, or by vertical integration of production with processing in many developing countries. Processing activities are of critical importance to expansion and diversification within vegetable sector in that they increase market opportunities for fresh vegetables and add value while minimizing postharvest losses.

Furthermore, processing improves the viability, profitability and sustainability of vegetable production systems by increasing farm incomes and generating rural employment and foreign exchange. Minimal and traditional processing technologies present considerable opportunities for innovation and vertical diversification in the vegetable sector, relatively few small and medium enterprises (SMEs) are able to tap into and benefit from these opportunities. So, this kind of research to a large extent in our country in future helps to reduce the unhealthy consumption and save our precious time in the faster world.

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