

PACKAGING AND MINIMAL PROCESSING

Packaging: Means filling of containers for easy handling, transportation, storage and marketing. Depending upon the nature of crop, distance to be transported and requirement of the consumer the package is to protect the produce and maintain its quality. Requirement for container: Easily transported when empty and occupies less space than when full e.g. Plastic boxes which nest in each other when empty, collapsible card board boxes, fiber boxes, paper or plastic sacks. It should be easy to assemble, fill and close either by hand or by use of simple machine. It must provide adequate ventilation for contents during transport and storage. Its capacity should be according to the market demand. Its dimension and design must be suited to available transport in order to load neatly and firmly. It must be cost effective and readily available. Packaging Material: i) Natural material like baskets made up of bamboo, straw, palm leaves etc. ii) Wood: mango, papaya. iii) Cardboard: Generally corrugated fiber board boxes are used which are light in weight, clean and can readily be presented with publicity and information of the contents. iv) Moulded plastics: reusable boxes moulded from high density polythene are widely used for transporting the produce only in developed countries. v) Paper and plastic film: this is used to line the packing boxes in order to reduce the water loss of the content or to prevent the friction damage. Storage: Storage is very important to make available the commodity for longer period. The practice of the storage must have been evolved during the hunter gather society. Containers made up of plastic material were probably first to evolve to store the products. Shelf life of the fruit depend not only on storage condition but also on type of fruit, maturity level, bruising and decay. Aim of storage:- → Off season availability/round the year availability → Avoiding the glut in the market → Check infection → Enhance the shelf life by controlling respiration rate. 7 Type of Storage: 1. Natural storage:- it is mainly done just after harvesting at the orchard itself. 2. Artificial storage:- it is done by regulation of atmosphere and chemical treatments. Duration of Storage: • Temporary storage:- highly perishable fruits are stored for a short period i.e. up to 5 days in vapourised cool chamber. • Mid term storage:- the fruits are stored maximum up to 6 weeks to avoid the glut in the market during the peak season. • Long term storage:- the fruits are stored for year round supply. Method of Storage: 1. Low temperature storage:- it reduces the rate of respiration. The cold stored fruits should be stored at a temp. of 200C before

bringing to the ambient temp. 2. Controlled atmosphere storage:- fruits are stored in atmosphere of low oxygen and more carbon dioxide than present in the air. The gas mixture of oxygen, carbon dioxide (2-10%) is prepared by gas blending system eg. Apple can be stored at 3.5% oxygen and 1.5% carbon dioxide at 0-4 °C for 5-8 months. 3. Vaporized cool chamber:- these chamber are used for storing the fruits for a short period i.e. up to one week. This is very useful in summer when the temperature is very high particularly for the storage of grapes. Marketing: Marketing in India is poor and orchardist are bound to sell their produce at a through away price through middle mans which are highly are highly exploited but several developments has taken place for marketing the fruits like establishment of NDDDB, Delhi and Horticultural Producer Cooperative Marketing Society, Bangalore and FRESH, Hyderabad provide fresh and graded fruits and vegetables to the consumers at a low price and simultaneously gaining the profit.

MINIMAL PROCESSING OF FRUITS AND VEGETABLES

With increasing urbanization, fragmented life styles, nutritional awareness and dual income have further made the consumer more demanding. Quality and convenience are the new objectives of the food market. Consumers' renewed interest in fruits and vegetables as health foods with low cholesterol, low to no fat and sodium, high levels of vitamins, minerals, fiber and more recently potential antioxidants has accelerated the consumption of fresh fruits and vegetables. In this regard frozen and minimal processed fruits and vegetables would be the foods in future ahead. Minimal processing has a good scope in hotel industry and fast chain restaurants. There has been continuous demand of pre-cut salads, shredded onion and cabbage from airlines. The success in this field would depend on the application of strict sanitation in processing, improved technology in packaging and maintenance of correct temperature during storage and transportation. Minimal processing falls in the realm of an art by which trimmed and cut fruits and vegetables are preserved without causing significant changes in their fresh like properties. Such products are quite suitable for salads, curries, porridge and custard like preparations. Essential requirements in minimal processing of fruits and vegetables (Fig.1) • Good quality raw materials (appropriate cultivar/variety, proper cultivation, harvesting and storage conditions) • Sorting, sizing and grading of the raw material: This provides uniformity and standardization of the finished

products for buying and selling. The most important grade factors are size, shape colour, firmness, flavour, friability, bruises, cut surfaces, chemical composition, disease and soundness. Overripe, undersized and blemished products are separated from those of acceptable quality. • Careful cleaning and washing before and after peeling: Cleaning and washing may be the only preservation treatments in most of the minimal processed fruits and vegetables. Cleaning refers to the removal of the foreign materials. As a unit operation, cleaning is a form of separation concerned with the removal of twigs, stalks, dirt, sand, soil, insects, pesticides and fertilizer residues from fruits and vegetables, as well as containers and equipment. The cleaning process also involves separation of light from heavy materials by gravity, destoning, floatation, picking, screening, and others. In a minimal processed fruit and vegetable process line, washing should be done in an isolated chamber with a restricted number of entrances and human contact to product should be limited. • Good quality water for washing: Water is the key element in the minimal processed products. The source and quality of water must be considered. 14 The water used should be potable, free from the bacterial contamination, undesirable odour and flavour and should be colourless. • Application of various pretreatments: In minimal processing, the trimmed, peeled, cut pieces and shreds of fruits and vegetables are non-thermally treated by dipping them in solution, generally, consisting of potassium metabisulphite (0.01-0.09%), sodium benzoate (0.03-0.08%), citric acid (0.5-1.2%), ascorbic acid (200-300 ppm) and salt (3-6%) at 20-25°C for a few hours or at 5± 10°C for several hours. Sometimes very mild in-pack thermal treatments (70-80°C for 5 minutes) are given to non-acidic products to bring down their microbial loads. However, the intensity of the treatment is very closely monitored and kept at a minimum to avoid heat induced chlorophyll degradation. Minimal processing encompassing various non-thermal pretreatments including ionizing radiations, dipping in soak solutions, etc. offers a promising technology that can be used to improve the wholesomeness of ready-to-eat cut fruits and vegetables. Ionizing radiations used at 1-5 KGy have also been found to check food borne pathogens in pre-cut fruits, vegetables and juices. Irradiation penetrates the entire product to inactivate pathogens that have penetrated the food. • Gentle spin-drying following washing: Soaked products are drained and moisture is removed in a basket centrifuge operating at 1000 rpm. • Gentle peeling, cutting, slicing and/ or shredding: Size reduction describes all

means by which fruits and vegetables are cut or broken into smaller and uniform pieces of definite shape and size. Size reduction may be an essential step to improve taste, digestibility and ease of handling. Unit operations like peeling, dicing, cutting and slicing cause injury to the fruits and vegetables that are perishable and demonstrate rapid deterioration in quality at ambient temperature. Loss of cellular integrity at the cut surface destroys compartmentation of enzymes and substrates, which leads to elevation of respiratory activity and ethylene production, further resulting in enhanced senescence besides providing sites for pathogen entry and substrate for their growth. In addition to this, it may also activate enzymes responsible for browning and oxidative reactions. In order to retard the rate of these reactions the product should be immediately kept at $5\pm 10^{\circ}\text{C}$ after cutting.

- Correct packaging materials and packaging methods: The product is subsequently exposed to the ultraviolet light for ten minutes in a clean room, packed in flexi polymeric sachets and stored at $5\pm 10^{\circ}\text{C}$. Also new approach of eco-friendly packaging material i.e. biodegradable plastics, edible coatings and films can also be used.
- Low temperature during processing: The ambient temperature during various unit operations should be $10-12^{\circ}\text{C}$ and the humidity should be 60-70% RH.
- Correct temperature and humidity during distribution and retailing: The temperature should be around $10-12^{\circ}\text{C}$ with RH around 60-70%.
- Strict hygiene and good manufacturing practices: This would facilitate in controlling the product quality. Techniques like HACCP (Hazard Analysis Critical Control Points) can be used to take account of the various unit operations which may be detrimental for the final product quality. Minimal processed products offer a number of advantages as pre packing allows for more efficient portion control. Solid waste disposal problems and demand on storage under refrigeration are reduced. Supply of a variety of ready to eat items that exhibit excellent uniformity of quality and identity is available over many weeks.

Figure 1: Schematic representation of minimal processing of fruits and vegetables

Marketing Marketing of minimal processed fruits and vegetables require achievement of high level of sensory quality, which is a prime prerequisite. This is dependent upon several factors, such as stage of harvest, quality control for post harvest life, effective packaging using in-form graphics, competitive pricing and providing service at all levels of distribution system. Capability to deliver finished products to customer within 2-3 days from receipt of an order is a vital merchandising potential thrust

area. Since the extensiveness of the distribution system is the foundation of marketing in the industrialized countries. Selection and establishment of a distribution system is a key decision area as it usually binds the firm long term 16 involves heavy investments and can be the deciding factor in determining the success or failure of a marketing strategy. If a product is to sell, it must be made readily available to target segment such as fast food chains, supermarkets, restaurants, hotels, institutional cafeterias and caterers. Quality maintenance is aided by the following procedures in distribution channels;

- Minimize handling frequency.
- Provide continued control of temperature, % RH, modified atmosphere (MA)/ controlled atmosphere (CA) conditions (total environmental control) during storage and transportation.
- Always transfer product from truck to refrigerated storage immediately.
- Always rotate product on a first-in first-out basis, rotate the complete inventory on a weekly basis.
- Never stack individual cases more than five high.

Minimally processed fruits and vegetables are an important and rapidly developing class of minimally processed foods. Unique applications of the basic and food sciences and their supporting technologies and engineering is producing these convenience foods. Minimally processed fruits and vegetables have attracted the interest of many facets of the food industry including such diverse areas as food manufacturers, retail stores, restaurants, carry-out establishments and commissary units. The purpose of Minimally processed foods is to deliver to the consumer a like- fresh fruit or vegetable products with an extended shelf life and at the same time ensure food safety and maintain sound nutritional and sensory quality.