# POST HARVEST PROCESSING MACHINERYS FOR FRUITS AND VEGETABLES.

## BY

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### 1.0 STATUS OF POST HARVEST OPERATIONS OF FRUITS AND VEGETABLES IN INDIA:

**1.1** In case of any product, final quality depends much upon quality of raw material. Unlike agri products like grains and seeds, the fruits and vegetables have wide range of variable parameters for quality when produced – such as size, shape, colour, maturity, weight, firmness, soundness etc. Over and above, being delicate produce, quality gets affected due to improper handling at various stages. Not only is that, due to inadequate technology and facilities in storing and processing, final quality also not up to desired level.

**1.2** India is one of the largest producer countries of fruits and vegetables in the world. It is estimated that about 30% of the produce is wasted for lack of modern storage facilities and high tech pre-processing plants. As a result, hardly about 1.5 to 2% of the produce is processed for consumption.

**Table no. 1 – Reasons of losses - Lack of facilities.**
**Such as:-**

**(a) Pre- cooling**
**(b) Controlled Condition storage**
**(c) Cold Storage**
**(d) Cold transport chains.**
**(e) Proper handling equipment**
**(f) Preprocessing machinery & plants.**

**1.3** In this paper, I wish to present information about post-harvest Pre-processing machineries of most modern technology developed in Europe and U.S.A. I hope this will be of some interest to the industries, markets and consumers at large.

## 2.0 PURPOSE OF POST HARVEST PROCESSING:-

**2.1** These operations are aimed at to enhance quality and shelf life of fruits and vegetables, and thereby to reduce losses. Whereas Pre-cooling, Cold storages, Controlled Conditions storages, Cold chains etc. facilities help enhance shelf life, the proper handling equipment and Pre-processing machineries help enhance quality of produce and thereby help reduce losses.

**2.2** What are the factors defining quality of the produce?
Let me brief you in short about quality parameters before I deal in various processing machineries employed to improve or obtain the defined/desired quality.

### Table No. 2 - Factors defining quality of produce.

| | | |
|---|---|---|
| **Size** | **Maturity** | **Bruises** |
| **Uniformity** | **Colour** | **Scars** |
| **Firmness** | **Chemical** | **Surface Cuts** |
| **Soundness** | **Moisture Content or** | **Dust residues** |
| **Shape** | **Solid content** | **Pesticides residues** |
| **Appearance** | **Whole / Broken** | **Molds etc.** |

## 3.0 POST HARVEST PROCESSING MACHINERYS.

After studying many variable parameters of quality, one would realize the challenge to the machinery manufacturers to design suitable equipment to meet with the varied requirements of each and every customer. Now let me present before you various types of machineries developed in Europe and U.S.A. for processing various fruits and vegetables.

### 3.1 SIZE GRADERS:-

Normally all size graders are designed to classify produce by diameter/width.
However graders for classification by lengths are also available. All these graders use elements like screen mesh, perforated belt, plain rollers, taper rollers, diverging space, traveling chains, rotating rollers, vibratory trays etc. for separating fruits and vegetables to suit size and shape.

## Table No. 3 A - Types of size graders.

(1) Continuous Screen grader
(2) Continuous belt grader
(3) Lift Roll grader
(4) Lift Flap grader
(5) Diverging chain grader
(6) Diverging Roll grader
(7) Drum grader
(8) Length grader

### 3.2 WEIGHT GRADERS

These graders allow classifications of pieces of produce by weight only, irrespective of size and shape. The equipment is normally a conveyor having traveling cups and variable weight measuring devices like tension springs or load cells or electronic sensors. These are costly equipment compared to size graders and hence its use is limited to high value fruits like mangoes, apples etc.

## Table No. 3 B Types of weight graders.

(1) Conveyor type with spring balance weighing device.
(2) Conveyor type with load cell weighing device.
(3) Conveyor type with video and sensors for separation by size and weight.
**(4)** Multi-head weigher**.**

### 3.3 SORTING EQUIPMENT:-

Sorting of produce is carried out either manually or by automatic electronic sorters – to classify produce by size, shape, colour, surface damage, ripening etc. In case of manual sorting, roller conveyors are used in which rollers while carrying the produce rotate the pieces to allow exposure of their all sides of surface. With this type of equipment, mostly all undesired produce is separated by trained persons, under proper lighting. Belt conveyors are also used for manual sorting, but they are not as efficient as roller conveyor. In case of electronic sorter, it has conveyor system facilitating passing of each piece under lights and camera – which sense the programmed defects and rejects them by means of pneumatic ejector systems.

## Table No. 3 C Types of sorters

(1) Manual Vision Sorter:- Live Roller Conveyor
Belt Conveyor
Rotary Table

(2) Electronic Sorters:- To remove produce by colour & other defects, video and sensors type equipped with pneumatic ejectors.

### 3.4 CLEANING AND WASHING OPERATIONS AND EQUIPMENTS

Generally most of the fruits and vegetables carry dust, dirt, spray residues etc when harvested. They are cleaned, graded and sorted in dry condition. However root vegetables, in addition, carry soil, mud etc. Hence it is very essential that the produce is cleaned off these impurities before it is graded and sorted. According to requirement depending upon type and intensity of impurities either dry type cleaning equipment or water washing type equipment or both are used for fresh market. However produce for processing must be washed. In washing and cleaning operations, chemicals are added to wash water for disinfections of fruits and vegetables. Washing is also important operation to reduce level of pesticides in fruits and vegetables.

**Table No. 3 D Type of cleaners**

(1) Web cleaner
(2) Coil cleaner
(3) Star cleaner
(4) Drum cleaner
(5) Brush cleaner

**Table No. 3 E Type of Washers**

(1) Barrel washer
(2) Soaked water washer
(3) Agitated water washer
(4) Conveyor type spray washer
(5) Rotary drum type spray washer

## 4.0 OTHER POST HARVEST PROCESS EQUIPMENTS.

(a) **Sponge Dryer**:-It is used to remove surface water to dry the produce after washing .It consists of sponge rollers to absorb water & squeeze rollers to drain it.

(b) **Wax coating Machine: -** It is carried out on fruits like apples. It reduces water losses and improves appearance of fruits.

(c) **Polishing and Brushing Machine** :- Rotating brushes pressed against produce moving on rollers is used to remove dust and spray residues and to improve appearance of fruits like apples.

(d) **Weighing & Bagging Machine:-** Small lots are weighed & packed or bagged manually with the help of weighing scales .However weighing and bagging equipment with microprocessor system are available which can be set to fill crates/boxes/bags ranging from 1 kgs to 60 kgs as programmed.

**Table No. 4 – Other Post Harvest Processes.**

(1) Sponge drying
(2) Wax coating
(3) Brushing & Polishing
(4) Packing & Packaging
(5) Weighing and bagging

## 5.0 VALUE ADDITIONS BY POST HARVEST OPERATIONS/ PROCESSES.

What are the benefits of post harvest operations and processes?
Whether investment in the processing machineries is worth?
These are valid questions of the industry engaged in business of fruits and vegetables. Here are few tips which will be of help in evaluation of the processing benefits resulting into value addition of the product.

- Cleaned and graded produce fetches higher price in market.
- Process like washing, drying etc. reduces level of pesticides.
- Health conscious consumer prefers hygienic produce even at higher price.
- Post Harvest processing help enhance shelf life of produce.
- When only high value produce stored in cold storage, it saves on undesired grades of low market value.

- Pleasing appearance like fresh produce when washed, waxed or coated, help increase business.
- Graded produce is important for processors of food products hence they can pay higher price.
- Weighing and Bagging equipment allows packing of produce of the required size as per market demand.

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