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Production and marketing of fruits and vegetables must delve into

production aspects, marketing aspects, processing and manufacturing aspects.

There is tremendous production of fruits and vegetables in a shorter period.

Therefore, to avoid the post-harvest loss and to increase substantial returns to

processors for off season consumption.

Availability of cheap labour, Government Subsidy for cold storage and

processing units, convenience of roads in case for marketing and transport.

Availability of cans, bottles, and other equipment at cheap rate, there is tremendous

for export of processed products like Jam, jelly, marmalade, pickles, etc.

dehydrated and dried vegetables in addition to domestic demand in India

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**3rd Year, 2nd Semester**

**Post-Harvest Management and Value Addition of Fruits and Vegetables**

**Credit: 2(1+1)**

**Teacher: Dr. Rajesh singh**

**LECTURE – 2**

**Maturity**

Maturity is the basis for determining exact moment/stage to pick a crop.

Good quality is obtained when harvesting is done at the proper stage of maturity. Fruits harvested before optimum maturity may not ripen adequately and may not develop adequate flavour, while crops harvested late (over mature) will have a shorter postharvest life and will deteriorate easily.

**Maturity indices**

Maturity indices are the sign or indication the readiness of the commodity for harvest. It is the basis for determining harvest date.

**Types of maturity**

**A. Physiological maturity**: It refers to the stage in the development of the fruits and vegetables when maximum growth and maturation has occurred. It is usually associated with full ripening in the fruits. The Physiological mature stage is followed by senescence.

Example, A French bean pod of okra is at its physiological maturity when seeds are fully developed and the pod is which will dehisce with little pressure.

**B. Horticultural/Commercial maturity**: Horticultural maturity refers to any stage of development when the commodity has reached a level of development sufficient for its intended use. It is sometimes referred to as commercial maturity.

Example, A papaya with green pulp and peel that has attained maximum size in already commercially mature as a vegetable but a tinge of yellow colour has to develop when it is used for dessert.

**C. Harvest Maturity**: It may be defined in terms of Physiological maturity and horticultural maturity. It is a stage, which will allow fruits/vegetables at its peak condition when it reaches to the consumers and develop acceptable flavour or appearance and having adequate shelf life.

Example, For local market and for processing, fully coloured tomato fruits are harvested. However, for a distant market fruit which have started developing colour are harvested.

**Determination of maturity**

The methods of determining harvest maturity are as follows

** Physical methods:** Size, shape, colour, texture etc.

** Chemical methods**: Total Soluble Solids (TSS), acidity etc.

 **Physiological methods**: Respiration and ethylene production.

 Apart from the above measures, abscission, accumulated heat unit, specific gravity, duration after flowering, firmness, dry matter, juice content, Oil content, waxiness, tenderness etc can also be used to determine the optimum stage of harvest maturity.

**Some important measures of maturity of fruits and vegetables are described in the following:**

**(i) Fruit Color:** Fruit skin or flesh color changes as the fruit matures or ripens. These changes can be determined subjectively by the harvester. However, color meters and color charts have been developed for determining harvest times for apples, tomatoes, peaches, chili peppers etc. However, some fruits do not exhibit any perceptible color changes during maturation and thus this parameter cannot be effectively used. Color changes also differs among different cultivars of the same fruit.

For example, the Hayward cultivar of kiwifruit maintains its green flesh during maturation while ‘Sanuki Gold’ cultivar changes gradually to golden-yellow. Some cultivars of avocado also maintain their green skin color during maturation.

**(ii) Firmness:** Some fruits may change in texture during maturation and these changes can be used to determine the harvest time. Textural changes are detected subjectively by touch or gentle squeezing. However, objective measurement can be achieved using pressure testers and texture analyzers.

**(iii) Soluble Solids Content and Starch content:** During maturation, starch in non-climacteric fruits is converted to sugars. For climacteric fruits, starch accumulates during maturation. Therefore, harvest maturity can be determined by measuring the sugar content or starch content. Usually, the sugar content is measured in terms of total soluble solids content using a Brix hydrometer or refractometer. Starch content is measured using iodine to qualitatively determine the amount of starch. This method is used in determining the maturity of pear cultivars whereby the fruit is cut into two and dipped into a solution containing potassium iodide and iodine.

**(iv) Number of days from Fruit set:** Fruit set refers to the transition of a flower to fruit after fertilizationFor instance, in alpanso and pairi mango varieties, it takes about 110 to 125 days after fruit set for surface color to change from dark green to olive-green and flesh color from white to pale yellow.

**(v) Specific gravity**: The specific gravity of fruit can be considered as an index for maturity grading. Water has a specific gravity of 1.00 and common salt solution (2.5% NaCl) has a specific gravity of 1.02 and both are used in the maturity grading of mango fruits (Kapsa and Katrodia 1997). e.g. specific gravity of mango range between 1.01-1.02.

**Maturity index of important horticulture crops:**

|  |  |  |
| --- | --- | --- |
|  | **Horticulture Crops** | **Maturity index** |
| 1. | Mango | Tapka |
| 2. | Banana | Finger filling/ Angularity |
| 3. | Jackfruit and watermelon | Tapping |
| 4. | Muskmelon | Netting or Full slip stage |
| 5. | Onion and Garlic | Neck fall (50%) |
| 6. | Citrus | Juice content (50%) |
| 7. | Avacado | Oil content |
| 8. | Apple | T stage |
| 9. | Pineapple | Flatting of eyes |
| 10. | Litchi | Flatting of tubercles |
| 11. | Sapota | Drying of latex, Spine fall |
| 12. | Grape | TSS, Acid ratio |
| 13. | Pomegrante | Colour change, Mettalic sound |

**Objective type question:**

1. Post harvest losses accounts upto:
2. 10% (b) 25% (c) 80% (d) 50%
3. “Prevention of food adulteration” act was passed in:
4. 1956 (b) 1954 (c) 1915 (d) None of the above
5. The specific gravity 1.01 to 1.02 is a maturity indices for which var of mango?
6. Dashehari (b) Alphanso (c) Neelum (d) Langra
7. Post harvest handling losses of fruits:
8. 10-20% (b) 20-40% (c) 40-60% (d) 60-80%
9. T.S.S. is measure by:
10. Refractometer (b) lactometer (c) Hydrometer (d) Jellymeter
11. (AICRP) All India Coordinated Research Project on Post harvest Technology of horticultural crops was started by the ICAR in;
12. August 1978 (b) August 1968 (c) August 1988 (d) August 1958
13. Regional Research Laboratory (R.R.I.) is located;
14. Mysore (b) Ludhiana (c) Lucknow (d) Jammu
15. Maturity indices of Avacado;
16. Juice content (b) Tapka (c) Tapping (d) Oil content
17. Maturity indices of Citurs;
18. Juice content (b) Oil content (c) Finger filling (d) T stage
19. Maturity indices of Muskmelon;
20. Neck fall (b)Tapping (c) Netting (d) Flatting

**Answer key:**

1. (b) 2. (b) 3. (b) 4. (b) 5. (a) 6. (a) 7. (d) 8. (d) 9. (a) 10. (c)