It is the stage of fully development of tissue of fruit and vegetables Only after which it will ripen normally.

METHODS OF MATURITY JUDGING

I.COMPUTATIONAL METHODS

1. Calendar date
2.Heat units
3.DFEB

II. PHYSICAL METHODS

1 Fruit retention strength
2 Fruit size and surface morphology
3 Weight
4 Specific gravity
5 Colour – skin, flesh and seed
6 Firmness
7 Ease of separation
8 Brittleness of the floral part
9 Juice content
10 Bulk density Cole crops/lettuce Structural properties – soft/rough
11 Development of abscission layer-Melons

III. CHEMICAL METHODS

1 Titratable acidity
2 TSS/acid ratio
3 Sugars
4 Sugar/ acid ratio
5 Bioelectrical conductance
6 Starch content lodine test
7 Tannin content dates, persimmon and litchi
8 Oil content
9 Juice content

IV. PHYSIOLOGICAL METHODS

1 Rate of respiration
2 Rate of ethylene production
3 Transpiration
4 Production of volatiles

V. GEOMETRICAL METHODS

1 Particles size and shape of the produce
2 Moisture content of produce
3 Particle composition and orientation in a given tissue or food

COMPUTATIONAL METHODS

1. **Calendar date:** is one of the commonly used indices of maturity and is reasonably accurate provided flowering and weather during growing season is normal. But standardization requires Study for many seasons for given variety, location, rootstock etc. Eg. Mango harvesting period – April to July
2. **DFFB (Days from Full Bloom):** is reliable but varies greatly from Year – to – year and location -to- location. In such case the Optimum date of harvest can be predicted by doing night Temperature correction for 15 days fallowing full bloom. For Every 10 F variation from an average night temperature, a Correction of one day is made in the standard figure from full Bloom.
   Eg. Mango 110 -125 day (Var. Alphonso and Pairi), Banana 99 107 days in dwarf Cavendish
3. **Heat units/Day degree:** Optimum maturity is computed by the sum of mean daily Temperature, above base temperature (100°C for apple)for a Period concerned.
   The number of degree days to maturity is determined over a period Of several years. 100C are the temperature at which growth occurs For apple and base temperature varies with crop. The degree day is based on a growth-temperature relation. However This heat units work only within limited temperature. Heat units are not useful for photoperiod sensitive species. A Heat unit is calculated by :- (daily mean temp – base temp) X No. Of Days (flowering to harvest) Base temperature for tomato, Spinach and pumpkin is 150, 20 and 130C, respectively.

PHYSICAL METHODS

1. **Fruit retention strength:** is the force required to pull the fruit from the tree Which indicates the maturity status of the fruit. Eg. Immature fruit required More force to detach from mother plant compared to ripe fruits.
2. **Sound tests:** the sound of a fruit as it is tapped sharply with a finger knuckle Can change during maturation and ripening. This method of testing fruit is Sometimes used by consumers when purchasing fruit. Eg. – Water melon fruit May be tapped in the field to judge whether they are ready to be harvested, Ripe fruit gives dull sound and also in jackfruit
3. **Skin colour :** This is the common method used in fruits to judge maturity, Where, the skin colour changes as the fruit matures or ripens. Colour changes May vary from cultivars, seasons, site, light etc. In most of the fruits GREEN Colour changes to LIGHT GREEN/YELLOW/ RED/ PURPLE VIOLET during Ripening after the optimum maturity. When it is still green it may be possible to Develop the colour after harvest but not all the flavour characteristics. If the Fruit is harvested just as the yellow colour begins to show in the shoulders / Panicles of the fruits, fruit can eventually ripen to an acceptable flavour.
4. **Shape:** The shape referred to the design of the fruit. Shape of fruit can change during maturation. Eg. Banana - individual fingers become more rounded on maturity from angular shape Mango immature fruit shoulder shows slope away from the fruit stalk; on

more mature fruit shoulders become more level with point of attachment (fullness of the checks adjacent to the pedicle)

5. **Size:** The change in size of crop as it is growing are frequently used to determine when it should be harvested. Eg. Litchi, green beans, okra and asparagus and potato related to size at maturity. In banana width of individual fingers can be used for determining their harvest maturity.
6. **Aroma/ Orgnoleptic quality:** Fruits synthesize volatile chemicals as they may give its characteristic odour and can be used to determine whether it is ripe or not with indication of fruit flies. This method has limited scope in commercial application.
7. **Fruit opening:** When the fruit is fully mature on the tree it splits. Eg. - It is common in fruit of spice tree nutmeg, tree. In vegetable like chow chow distal end of the fruit opens and large single seed emerges and germinates.
8. **Abscission:** Abscission layer is formed in the pedicel as the natural development in the fruit advanced. However, fruit harvested at this maturity will have only short marketable life. Eg. watermelons, harvesting before abscission layer is fully developed results inferior flavoured fruit compared with those left on the vine for the full period.
9. **Specific gravity:** is the relative gravity/weight of solids or liquids compared to pure distilled water at 16.70C (620F). Eg. Cherries, watermelon, potato, ber and mango (at 1.015 immature and at 1.02 ready for harvest)
10. **Firmness/solidity:** Here harvester slightly presses vegetables such as cabbage and lettuce with his thumb and finger. Harvest maturity is assessed on the basis of how much the vegetable yield to this pressure. Normally the back of the hand is used for testing the firmness of lettuce in order to avoid damage. Fruit may change in texture during maturation and especially during ripening; excessive moisture loss may also affect the texture of crops.

II. CHEMICAL METHODS

1. **Juice content:** The juice content of fruit increases as they mature on the tree. By taking representative samples of the fruit, extracting the juice in a standard And specified way and then relating the juice volume to the original mass of The fruit it is possible to specify its maturity.
2. **Oil content:** Oil content of the fruit may be used to determine the harvest Maturity of avocados. At the time of picking and at all times there after shall Contain not less than 8% of oil by weight of the avocado excluding the skin And seed. There is good correlation between taste and oil content and dry Matter.
3. **Dry matter:** Rate of dry matter accumulation is used to predict optimum Harvest time by using instrument hydrometer. Dry matter is also being used To as the maturity standard in processing varieties of potato. Potato dry Matter content at the time harvesting should be in the range of 18 – 24.
4. **Sugar:** In climacteric fruit carbohydrates are accumulated during maturation In the form of starch. As the fruit ripens starch is broken down to sugars. In Non-climacteric fruits sugars tend to be accumulated during maturation. In Both cases it follows that

measurement of sugars in the fruit can provide an Indication of the stage of ripeness or maturity of that fruits. Sugar is Measured in terms of soluble solids using Brix hydrometer or Refractometer,

5. **Acidity:** in many citrus fruits and others acidity Progressively reduces on maturation and ripening. Extract the juice from the sample and titrating it against A standard alkaline solution gives a measure which can Be related to optimum time of harvest. It is important to measure acidity by titration and not The pH of the fruit because of the considerable buffer Capacity in fruit juices. This measure gives the brix: acid Ratio

PHYSIOLOGICAL MATURITY

This is the stage where plants attain full development of stage just Prior to ripening Eg, Fruits and vegetables produced for seed Production

HARVESTING

Definition: -Harvesting is a specific and singe deliberate action to Separates the food stuff with or without non edible portion from Its growth medium. Eg. – Plucking of Fruit, Vegetables Flowers Reaping of cereals

- Lifting of fish from water
- Lifting of tuber or roots from soil etc.

1. Identification & judging the maturity of fruits
2. Selection of mature fruits
3. Detaching or separating of the fruits from the tree and
4. Collection of matured fruits.

METHODS OF HARVESTING

1. **Manual harvesting: -** Harvesting by one's own hand is Called manual harvesting.
   The methods of manual Harvesting are

1.Ladder/bag picking method
2.Poles/clippers method
3.Harvesting by means of cutting knives
4.Harvesting by means of digging tools.

2. **Mechanical harvesting**

In region where labour cost is high machine harvest is Popular for processing crops because it could damage the Produce and subsequent faster deterioration. Eg.: Peas for Freezing, peaches for canning and grapes for wine making.

Likewise, machine harvest is used for robust, low-unit-value Ground crop such as potatoes and onions. The main advantages of Mechanized harvesting are speed and the reduced costs per ton Harvested. However, because of the risk of mechanical damage, it Can only be used on crops that require a single harvest.

i. **Mechanical assistance** – These are the simple machine used to Provide assistance to hand pickers with ladder and positioners (tree towers and platforms). Combination of this process is Possible by process by providing bins mounted on trailers moving Along the plant rows. „Flying foxes" (overhead ropeways) are Similar systems provided to convey heavy banana bunches into Packing house.