Post Harvest Biochemical Changes in Vegetable

M. Madhumitha[1*], V. Sundaram[2] and M. Karthikeyan[1]

[1]PG Scholar, Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal, U.T. of Puducherry.
[2]Faculty, Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal, U.T. of Puducherry.
Corresponding Authors: madhumithamurugaiyan68@gmail.com

Introduction

Vegetables are important in rational nutrition, rich content of nutrients and energy, especially as a favorable influence on the functions of the physiologic human organism. Comparing vegetables and other foods of animal origin can say that vegetable products have a lower food value and a lower heat, but have special importance in human nutrition, the high content of vitamins, minerals etc. Many species of vegetables containing high amounts of digestible carbohydrates (starch, sucrose, glucose, fructose) non-digestible carbohydrates (cellulose, hemicellulose, pectin, protides).

Degradation of chlorophyll

The most obvious change which take place is the degradation of chlorophyll and is accompanied by the synthesis of other pigments usually either anthocyanins or carotenoids. They can give rise to a wide range of colours (from red to blue). The chloroplasts in green immature fruit generally lose chlorophyll on ripening and change into chromoplasts which contain carotenoid pigments. Carotenoids are normally synthesized in green plant tissue a major product being beta-carotene. However, in many fruits additional - carotene and lycopene is synthesized during ripening

Pigment	Colour	Vegetables
Chlorophyll	Green	Leafy vegetable, capsicum, beans, peas and chillies
Carotenoids	Yellow, orange, red	Carrot , pumpkin and green leafy vegetable
Lycopene	Red	Tomato
Anthocyanin	Red, purple and blue	Brinjal
Anthoxanthins	Colourless white to yellow	Cauliflower, onions, spinach

Interconvention of starch - sugar

As a fruit maturity progresses, the starch reserves get hydrolysed into sugars (glucose, fructose or sucrose) and this is considered as a distinctive event during fruit ripening. Further the complex sugars viz. sucrose are broken down into simple sugars viz. glucose and fructose with the catalytic action of enzyme invertase. In certain crops like potato and peas, the starch-sugar conversion is an important critical issue.

In pea, the higher sucrose content in noticed in fresh immature stage and gets converted into starch with the attainment of maturity. Changes in carbohydrates include starch to sugar conversion undesirable in potatoes, cassava but desirable in other fruits. Changes in sugar-to-starch conversion undesirable in peas and sweet corn, desirable in potatoes, cassava and breakdown of complex starch molecules to simple sugars, CO2 and water through the process of respiration.

Texture change

Pectin substance in cell wall and middle lamella starts degrading due to increased levels of two enzymes pectinesteraces and polygalacturonases. Pectic acid (lost gel forming property) is found in over ripe, very soft fruits and vegetables. Propectin is insoluble form of pectic substances binds to calcium and sugars in the cell wall. On maturation and ripening, propectin gradually broken-down to lower molecular weight fraction which are more soluble in water. The rate of degradation of pectic substances is directly correlated with rate of softening of the fruit.

Organic acid

Organic acids are get reduced during ripening, due to utilization of organic acids as substrate for respiration, upon maturity further synthesis also get reduced.

Tomato

The concentration of malic acid decreases while that of citric acid increases considerably and in red ripe fruits clearly exceeds the content of malic acid. Several maximum and minimum in acid concentrations occur during development. Tomato shows constant proportions of citric and isocitric acid (200:1) and 30:1 respectively).

Sweet pepper: The concentration quinic and ascorbic acid can be found in noticeably higher amounts than in

tomatoes. Proportions of citric and isocitric acid in sweet pepper is 30:1. Additionally, succinic acid was detected in tomatoes and fumaric and shikimic acid in sweet pepper. Glucose and fructose, in approximately equal amounts, are the main sugar components; their concentrations are increased during ripening, especially in sweet peppers. The leaves of tomatoes and sweet pepper contain more malic acid and less citric acid than red ripe fruits, though here as well citric acid predominates.

Potatoes contain citric, malic, quinic, succinic, fumaric and soluble oxalic acid (in order of decreasing amounts).

In cucumbers malic acid notably exceeds citric acid. Both acids hardly change in concentration during ripening. Sugar content decreases during ripening.

Flavouring compound

Although fruit flavour depends on the complex interaction of sugars, organic acids, phenolics and volatile compounds but the characteristic flavour of an individual fruit or vegetable is derived from the production of specific flavouring volatile. These compounds are mainly esters, alcohols, aldehydes, acids and ketones.

Vegetable	Compound
Cucumber (raw)	2,6-Nonadienal
Cucumber (cooked)	Dimethyl disulphide
Potato	2-Methoxy-3-ethyl pyrazine, 2,5-Dimethyl pyrazine
Radish	4-Methylthio-trans-3-butenyl isothiocyanate

Ascorbic acid

L-ascorbic acid (Vitamin C) is the naturally occurring ascorbic acid in fruits. An increase in ascorbic acid content with the increase in fruit growth has been and the levels declined with the advancement of maturity and onset of fruit ripening in sweet potatoes, potato, asparagus and okra during the course of post-harvest handling.

Phenolics

The phenolic content of most fruits declines from high levels during early growth to low levels when the fruit is considered to be physiologically mature and thereafter susceptible to the induction of ripening.

Protein

During ripening of some fruits, although the total nitrogen content is constant, an increase in the protein content is observed, which is mainly due to biosynthesis of enzymes.

During ripening, a shift also occurs in the amino acid and the amine fraction. These shifts are not uniform and are affected by type and ripening stage of fruits.

Lipids

Little is known about changes in lipids. Changes have been found in the composition and quantity of lipids, especially in phospholipid fraction.

References

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