



Unit II - Topic 3

Chemical changes during fruit ripening, its methods and regulations.

Maturity standards; Importance and methods of Maturity determinations; Fruit ripening is a complex process involving various biochemical and physiological changes in the fruit. The key changes during fruit ripening are often associated with alterations in texture, color, flavor, and aroma. Here are some of the chemical changes that occur during fruit ripening:

1. **Starch to Sugar Conversion:** In many fruits, starches stored in the fruit are converted into sugars, such as glucose and fructose. This conversion is catalyzed by enzymes like amylase.
2. **Acid Degradation:** The acidity of the fruit decreases as organic acids, like citric acid and malic acid, are broken down. This contributes to a decrease in sourness.
3. **Cell Wall Softening:** Pectin, a component of the cell wall, is broken down by enzymes like pectinase, leading to a softening of the fruit texture.
4. **Ethylene Production:** Ethylene is a plant hormone that plays a crucial role in the ripening process. It triggers the expression of genes associated with ripening, such as those encoding enzymes responsible for the conversion of starches to sugars.
5. **Flavor and Aroma Compound Formation:** The synthesis of volatile compounds, responsible for the characteristic flavor and aroma of ripe fruits, increases during ripening. These compounds include esters, aldehydes, and alcohols.

Methods of Fruit Ripening:

1. **Natural Ripening:** Fruits are allowed to ripen naturally on the plant until they reach the desired stage of ripeness. This method is common for tree fruits like apples and peaches.



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2. **Controlled Atmosphere Storage:** The storage environment, including temperature, humidity, and gas composition, is controlled to slow down or speed up the ripening process. This method is often used for fruits like apples and bananas.
3. **Ethylene Treatment:** Exposure to ethylene gas can accelerate the ripening process. Ethylene chambers or ethylene-releasing compounds are used to achieve uniform ripening in some fruits.
4. **Climacteric and Non-Climacteric Fruits:** Climacteric fruits, like bananas and tomatoes, continue to ripen after harvesting. Non-climacteric fruits, like citrus and grapes, do not ripen significantly after being detached from the plant.

Regulations and Standards:

Regulations regarding fruit ripening often focus on quality, safety, and labeling. Different countries may have specific standards for fruit ripeness, especially for fruits traded internationally. Standards may include criteria for size, color, firmness, and other quality attributes. Additionally, regulations may be in place to ensure the safe and ethical use of ripening agents, such as ethylene gas or calcium carbide.

It's essential to follow local and international regulations to ensure that fruits meet the required quality standards and pose no harm to consumers. These regulations help maintain the integrity of the fruit industry and protect consumers from potential hazards