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Commentary

Methods Involved in Aerobic and Anaerobic Fermentation

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DESCRIPTION

Fermentation is the chemical transformation of organic substances into simpler compounds by the action of enzymes and complex organic catalysts, which are produced by microorganisms such as yeasts, bacteria or molds. Enzymes act by a process called hydrolysis, which breaks down or predigests complex organic molecules to form smaller compounds and nutrients. Some of the products of fermentation are wine, beer, vinegar, yogurt, cheese, sauerkraut, kimchi, pepperoni, pickled cucumbers, etc.

Based upon the respiration, fermentation is of 2 types namely aerobic and anaerobic.

Aerobic fermentation

Aerobic fermentation occurs in presence of oxygen. Wine, beer and acetic acid vinegar needs oxygen in the primary or first stage of fermentation. For example, preparation of acetic acid vinegar is done by exposing the surface of the vinegar to oxygen as much as possible, which helps in creating healthy, flavorful vinegar with the correct pH.

Anaerobic fermentation

Anaerobic fermentation is a method in which cells are used to extract energy from carbohydrates when oxygen is not available in the surrounding environment. This process can follow glycolysis as the next step in the breakdown of glucose and other sugars to produce molecules of Adenosine Tri Phosphate (ATP) that create an energy source for the cell.

Anaerobic fermentation is of 2 types namely ethanol fermentation and lactic acid fermentation.

Ethanol fermentation: It converts two pyruvate molecules, which are the products of glycolysis, into two molecules of ethanol and two molecules of carbon dioxide. This reaction is a two-step process in which pyruvate is converted to acetaldehyde and carbon dioxide by the enzyme pyruvate decarboxylase. Yeast and certain bacteria perform this type of fermentation. It is used in the production of wine, beer and bread.

Lactic acid fermentation: It is a biological process in which glucose and other 6-carbon sugars are converted into cellular energy and the metabolite lactate. The pyruvate molecules from glucose metabolism may be fermented into lactic acid. It is used to convert lactose into lactic acid in yogurt production. It is of 2 types namely homo lactic acid fermentation and hetero lactic acid fermentation.

Homo lactic acid fermentation is a process in which only lactic acid is produced with absence of byproducts whereas hetero lactic acid fermentation is a process in which lactic acid is produced along with some of the byproducts like gases.

Advantages of fermentation

1. Preserves and enriches food, improves digestibility and enhances the taste and flavor of foods.
2. Potential of enhancing food safety by controlling the growth and multiplication of pathogens in food.
3. Low energy consumption.
4. Detoxification of food.

Disadvantages of fermentation

1. Hazardous microbial contamination always exists in fermented food.
2. The uneven distribution of salt in lactic acid fermented fish products and contamination of *Aspergillus flavus* in traditional starter cultures for rice wine and soybean sauce result in severe food poisoning incidences.
3. Obesity and cancer issues.

Applications

1. Used in the production of antibiotics and ethyl alcohol.
2. To produce alcoholic beverages like beer from barley or wheat and wine from grapes.
3. Used to store vegetables in the form of pickling.
4. Aerobic bacteria are used to ferment organic material in waste water.

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