

Name of Subject: - Botany

Semester - B.S. II

Topic - Respiration (Contd). Plant Physiology

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Lecture - 09

Anaerobic Respiration

Anaerobic respiration occurs in the absence or atmospheric oxygen. In it substrate is not completely oxidised. The amount of energy released during anaerobic respiration is quite low in comparison to the amount of energy released during aerobic respiration.

Anaerobic respiration involves following

Steps -

(i) Glycolysis

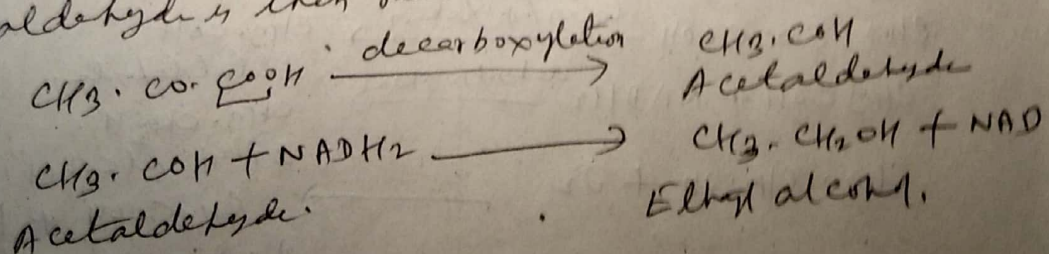
(ii) Incomplete oxidation of Pyruvic acid.

(i) Glycolysis: - It is as such as in aerobic respiration.

(ii) After glycolysis, when O_2 is not available to the cell, anaerobic respiration takes place. During anaerobic respiration the end product of glycolysis i.e. Pyruvic acid is incompletely oxidised.

The following are the different types of fermentation or anaerobic respiration.

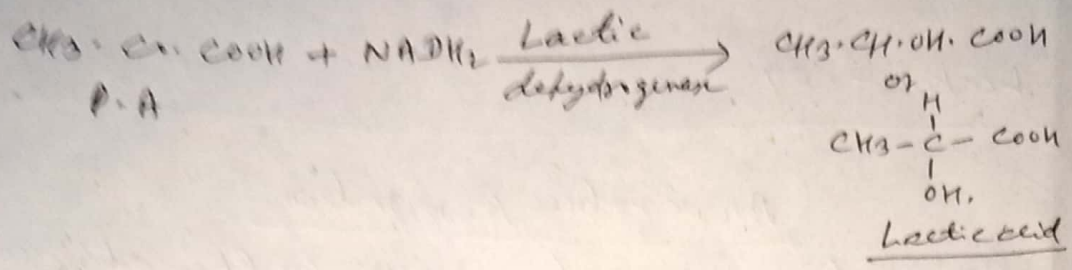
(A) Alcoholic fermentation: - It is most common in plants. In this case Pyruvic acid undergoes decarboxylation and it turns into acetaldehyde. This acetaldehyde is then reduced into ethyl alcohol.



① Lactic acid fermentation :-

This type of anaerobic respiration occurs frequently in animal muscle cells, and in lacto bacteria.

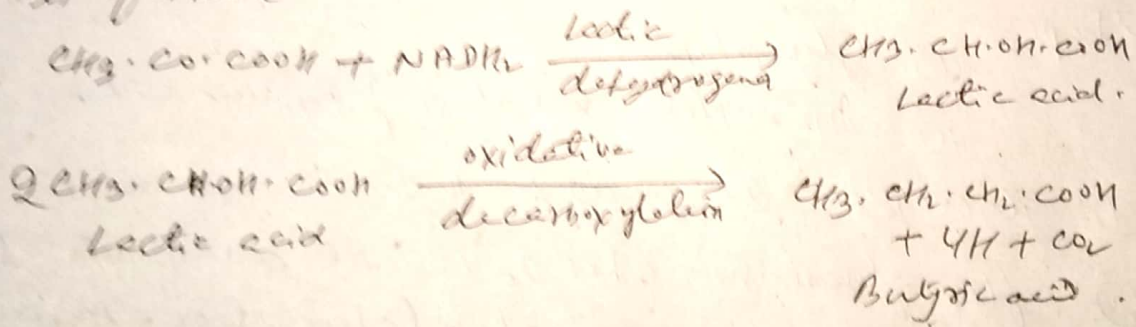
Here in this case pyruvic acid is directly reduced into lactic acid. The enzyme which catalyses the reaction is lactic dehydrogenase. Here NADH₂ acts as hydrogen donor.



② Butyric acid fermentation :-

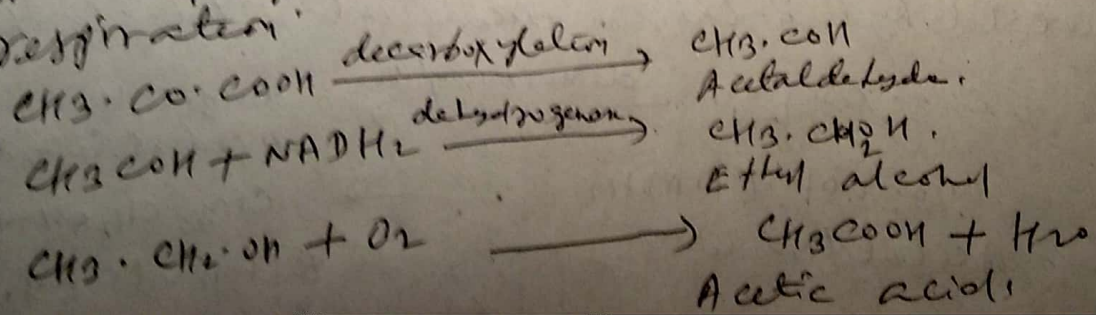
It occurs in a bacterium named clostridium butyricum.

Initially the butyric acid fermentation is exactly like lactic acid fermentation. Then due to oxidative decarboxylation by the butyric acid is formed.



③ Acetic acid fermentation :- This is found in the bacterium called aceto bacteria.

Initially this fermentation is exactly like alcoholic fermentation. But at the end of the reaction, oxygen becomes available and ethanol becomes oxidised into acetic acid. Thus some bio-chemists do not consider this mode of fermentation to be anaerobic respiration.



Difference between anaerobic respiration and fermentation

<u>Anaerobic Respiration</u>	<u>Fermentation</u>
1. It is an intracellular process.	1. It may be an extra-cellular process.
2. It occurs in absence of O_2 .	2. It requires small amount of O_2 .
3. CO_2 is not released.	3. CO_2 is released.
4. It uses either exogenous or endogenous non oxygen compounds as terminal electron acceptors.	4. It energy is produced from organic compounds using endogenous electron acceptors.

Difference between Aerobic respiration and fermentation

<u>Aerobic respiration</u>	<u>Fermentation</u>
1. O_2 is used for production of Energy.	1. It occurs in the absence of O_2 .
2. ^{occurs in} cytoplasm and mitochondria	2. It occurs in cytoplasm.
3. CO_2 and water is produced.	3. End product — alcohol and CO_2 .
4. Complete oxygen oxidation of respiratory substrate takes place.	4. Incomplete oxidation of respiratory substrate.
5. 38 molecules of ATP are produced.	5. Only 2 ATP molecules are produced.