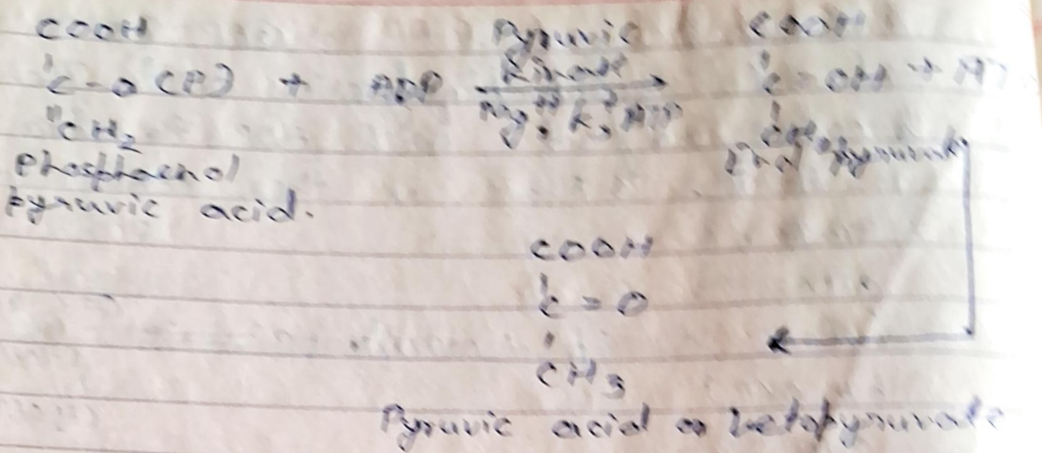


2. FERMENTATION

2. FERMENTATION → In this phase pyru[vic] acid is oxidised anaerobically.

It can occur bo[th] in anaerobic & aerobic condition, the aerobic condition is most common.

Fermentation can occ[ur] in almost all plants with the excepti[on] of Eleide condensation. Among seed a[nd] fruit, where outer covering is relati[vely] impermeable to oxygen. Massive sto[rage] & other tissue similarly show anae[robic] respiration.

Though fermentation co[uld] occur in higher plants tolerency of [...] period. This is because of the follo[wing] reasons —

1. It yields little energy.
2. More substance is decomposed.
3. End products are usually toxic.
4. Active absorption of mineral salts.

Protoplasmic streaming, division and synthesis of several com[...]

not occur in anaerobic condition.

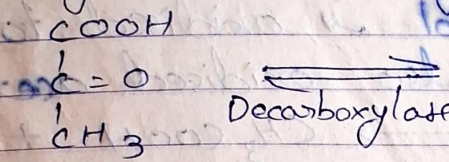
Plants which can perform fermentation fall into two categories.

(I) Obligate anaerobes (Totally anaerobic).

(II) Facultative anaerobic (Partially anaerobic).

Depending upon the nature of end products fermentation is of following types —

(a) Alcoholic fermentation → It occures in fungi like Rhizopas, yeast, Bacteria & higher plants. Here pyruvic acid is decarboxylated to form acetaldehyde. It is then reduced to form ethyl alcohol by dehydrogenase.



Pyruvic acid

$$CH_3CHO + NADH_2 \xrightarrow{\text{Dehydrogenase}} CH_3CH_2OH + NA$$

Ethyl alcohol

(b) Lactic acid fermentation → It occ in Lactic acid bacteria like Lacto baccillums, Some fungal & muscles. this case pyruvic acid is direc reduced to lactic acid by lactic dehydrogenase. The enzymes required FMN & Zn^{++} CO_2 is not relea

$$CH_3COCOOH + NADH_2 \xrightarrow[Zn^{++}]{FMN} CH_3CHOCOOH$$

Lactic ac

(c) Bytryl Acid Fermentation → It has been reported in Chaytridium. Here glucose is converted into Butric acid with the release of CO_2 & $NADH_2$. Acetic acid if available is also converted into Butyric acid.

$$C_6H_{12}O_6 + 2NAD \xrightarrow{\text{decarboxylase}} C_4H_8O_2 + 2CO_2 + 2NADH_2$$

$$2CH_3CHOHCOOH + 2NAD \longrightarrow C_4H_8O_2 + 2CO_2 + 2NADH_2$$

Butyric acid

(d) Acetic acid fermentation → It occurs in acetic acid bacteria like acetobacter. Here ethyl alcohol is oxidised to acetic acid. It can also oxidised acetaldehyde.

$$C_2H_5OH + O_2 \longrightarrow CH_3COOH + H_2O$$

Ethyl alcohol — Acetic acid

(e) Other fermentation → Other fermentation are Butyl alcohol, citric acid, Malic acid, Tartaric acid etc. But their extract mechanisms are not well known.

ENERGY OUT PUT → In glycolysis two molecules of ATP are used during the phosphorylation of glucose. In return 4 ATP molecules gained in this process. The energy of 2 ATP molecule is used by the cells. This is equal to about 17.8 kg calories. In the break down of

glucose into pyruvic acid, the actual energy released is 50 k·cal, out of this 2 ATP molecules are formed. The rest are liberated as heat.

In alcoholic fermentation & lactic acid fermentation 2 ATP molecules are synthesized, but in acetic acid fermentation where ethyl alcohol is utilized, 118·2 k·cal energy is released. The exact amount of ATP formed in other types of fermentation has not yet been calculated correctly.