Name of Subject :- Botany

Semester ——— B.Sc. II

Topic ——— Plant Physiology (Photorespiration)

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Lecture No: 10

Photorespiration

The light dependent uptake of O_2 and release of CO_2 is called photorespiration.

Photorespiration occurs only in chlorophyll containing cells.

This photorespiration is quite common in all C_3 plants. But in C_4 plants this photorespiration is almost negligible.

This photorespiration is adversely affected when the concentration of O_2 is increased, but when the concentration of CO_2 is increased the photorespiration also decreases.

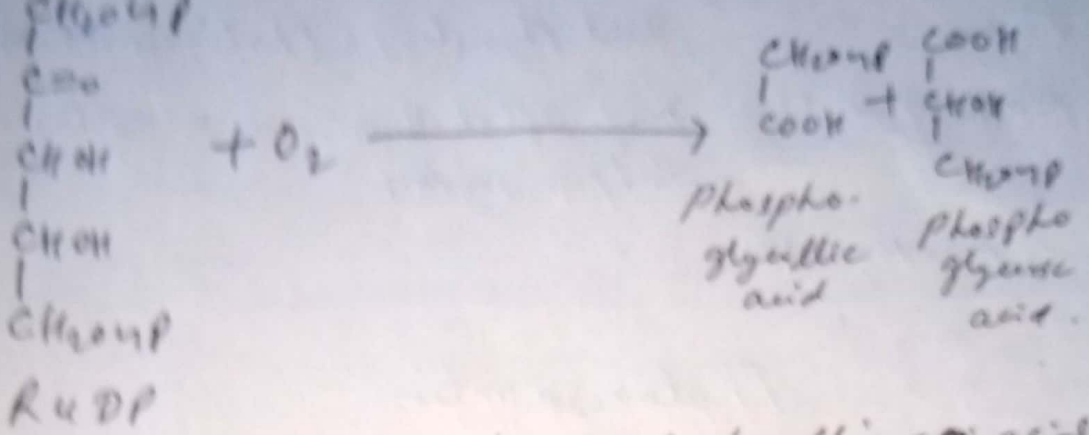
The site of photorespiration is proxisum, cytoplasm and mitochondria as well as chloroplast.

This is also important to note that ageing has favourable effect on photorespiration i.e. When the age of plant increases the rate of photorespiration increases.

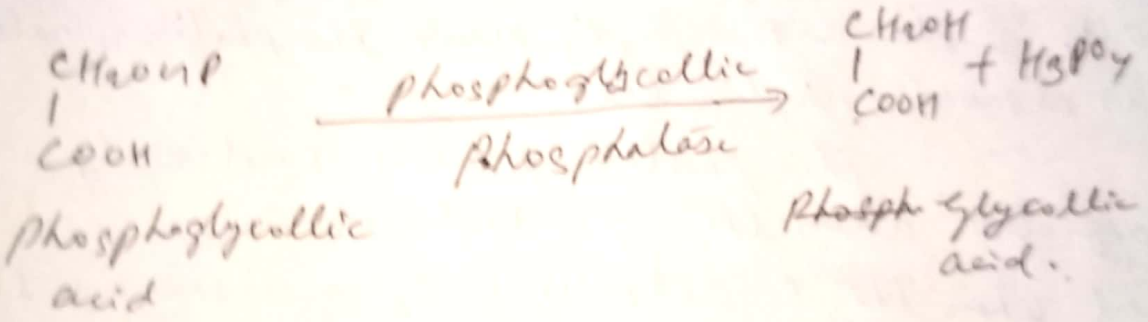
Mechanism of Photorespiration

The substrate of photorespiration is glycollic acid. $CH_2OH \cdot COOH$. This glycollic acid is derived from phosphoglycollate and the phosphoglycollate in its turn derived from RuDP. RuDP in the presence of enzyme RuDP Carboxylase which actually functions as oxygenase reacts with

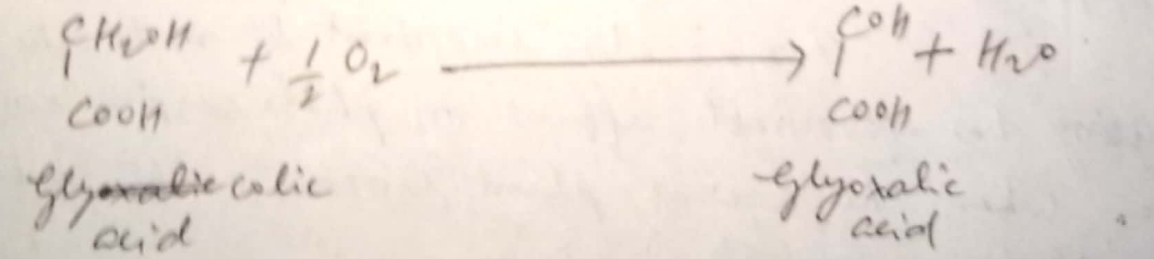
atmospheric O_2. This RuDP splits into a molecule of PGA and phosphoglycollic acid.



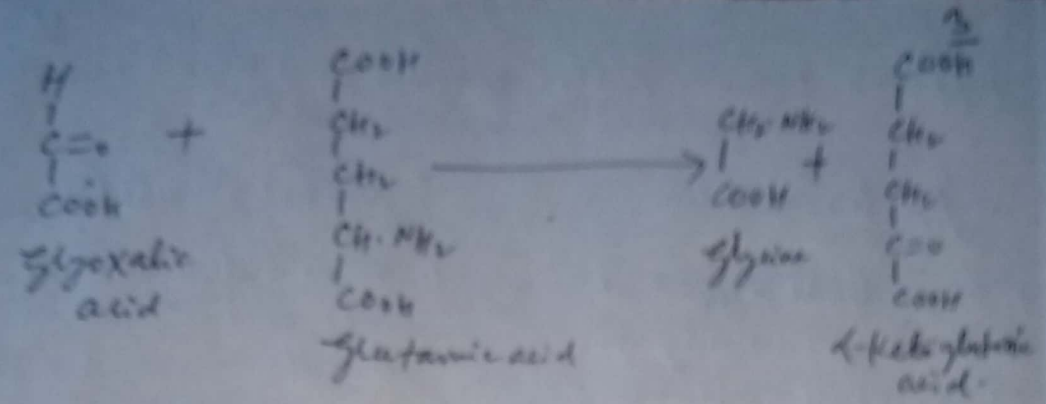
Now this phosphoglycollic acid loses its phosphate radical to form glycollic acid in the presence of enzyme "phospho glycollic phosphatase.

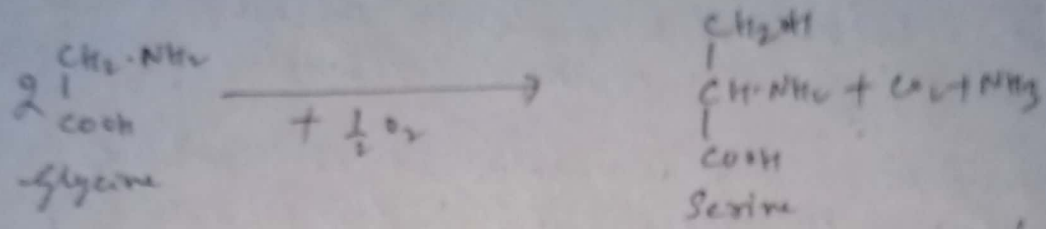


This glycollic acid is then oxidised by reacting with O_2 to form glyoxylic acid.



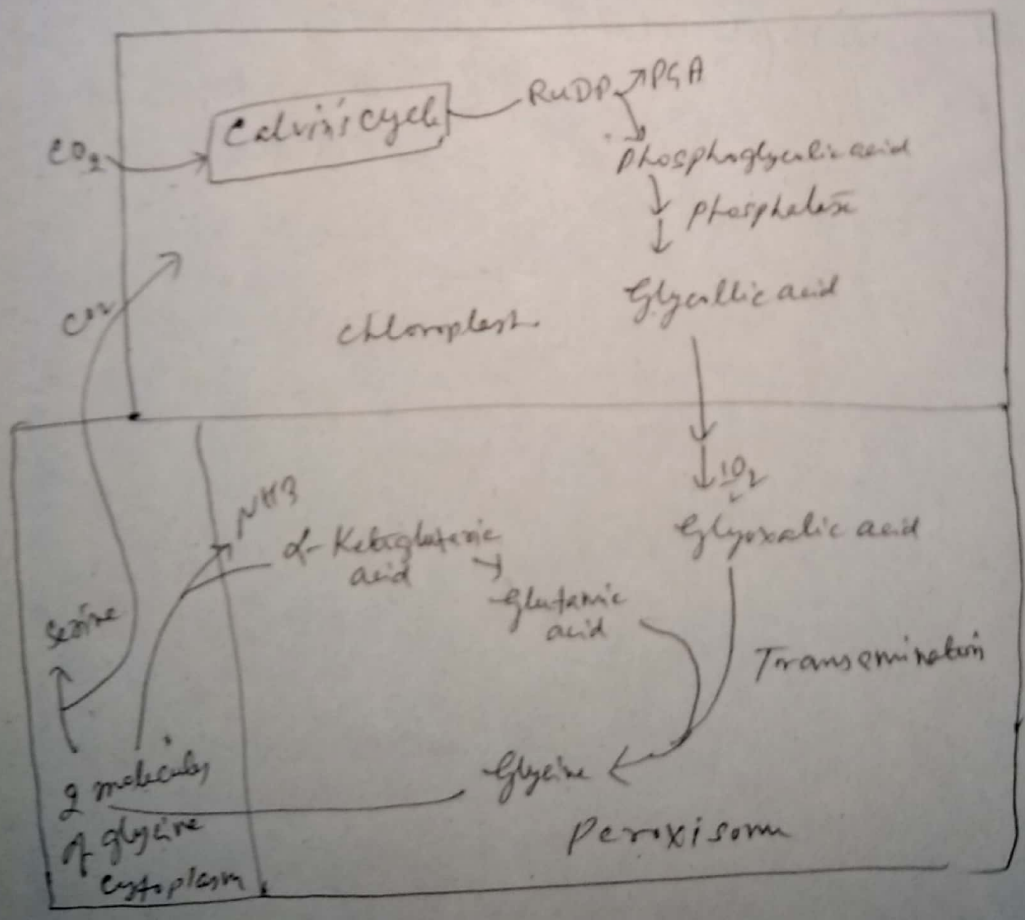
Thereafter this glyoxalic acid moves out of the chloroplast and enters into the peroxisome (a cell organell). There inside the peroxisome this glyoxalic acid by transaminated reaction is converted into an amino acid.





ultimately this CO_2 enters into calvin's cycle and NH_3 is utilised in the regeneration of glutamic acid.

From above discussion it is quite apparent that this photorespiration is a wasteful metabolic activity.



Sketch diagram of Photorespiration