**PHOTORESPIRATION/OXIDATIVE PHOTOSYNTHETIC CARBON/C2 PHOTOSYNTHESIS/ C2 CYCLE/GLYCOLATE METABOLISM** 1. Photorespiration is a special type of respiration coupled with photosynthesis. 2. It is a side reaction initiates a pathway called photorespiration. 3. It is a process which involves loss of fixed carbon as CO2​ in plants in the presence of light. 4. It is initiated in chloroplasts. 5. It wastes energy and decreases sugar synthesis. 6. This process does not produce ATP or NADPH and is a wasteful process. 7. Photorespiration is a wasteful pathway that competes with the Calvin cycle. 8. It begins when Rubisco acts on oxygen instead of carbon dioxide. 9. It is a respiratory process in many higher plants by which they take up oxygen in the light and give out some CO2, contrary (opposite) to the general pattern of photosynthesis. 10. This absorption of O2 and release of CO2 in light by green tissue are termed Photorespiration was named by DECKER. 11. It is also known as the oxidative photosynthetic carbon cycle, or C**2** photosynthesis. 12. It is a process in [plant metabolism](https://en.wikipedia.org/wiki/Plant_physiology) where the [enzyme](https://en.wikipedia.org/wiki/Enzyme) Rubisc[o](https://en.wikipedia.org/wiki/RuBisCO) oxygenates (release) [RuBP](https://en.wikipedia.org/wiki/RuBP), by using some of the energy produced by photosynthesis. 13. The C**4**  plants has ability to avoid photorespiration which makes these plants more hardy than other plants in dry and hot environments. 14. Photorespiration is closely related to the CO**2**  compensation points and usually occurs only in those plants which have comparatively high CO**2** compensation point. Such as Tomato, Wheat, Oats, Chlorella (Algae). 15. The photorespiration, involves a complex network of enzyme reactions and takes place in the three cell organelles chloroplast, peroxisome and mitochondria.

**REACTIONS OF C2 CYCLE** The reactions of C**2**  cycle occurs in following steps :-

**Step – I** :- 1. First of all in chloroplast, RuBP accepts CO**2** and O**2**  both, when chloroplast is exposed to light. 2. Here the interesting thing is observed that the enzyme RuBP carboxylase cannot only react with CO**2**, but also with O**2**. 3. Now enzyme RuBP oxygenase in the presence of high concentration of oxygen converts RuBP into 1 molecule of PGA (Phosphoglycerate) and 1 molecule of P – Glycolate (Phosphoglycolic acid/Phosphoglycolate). 4. The P – Glycolate is dephosphorylated into glycolate in the presence of an enzyme Phosphotase, which forms the substrate for photorespiration. 5. The glycolate is the earliest stable product, which have a 2 – Carbon compound. So the photorespiration is also called C**2** cycle.

**Step – II** :- 1. The glycolate now diffuses out of the chloroplast and enters into the peroxisome. 2. In peroxisome the glycolate is oxidized (photorespired) to Glyoxyoxylate and Hydrogen peroxide (H**2**O**2**) in the presence of an enzyme Glycolate oxidase. 3. The H**2**O**2**  is completely destroyed by catalyse , whereas Glyoxyoxylate is transmitted into Glycine in the presence of an enzyme Transaminase.

**Step – III** :- 1. The 2 molecules of Glycine (1 from Serine), now enters into mitochondria, where they are decarboxylated to produce CO**2**, NH**3** and Serine in the presence of an enzyme Glycine decarboxylase and Hydromethyl transferase. 2. The Serine diffuses into the peroxisome, where it is converted into Glycerate. 3. The Glycerate enters into the chloroplast to produce Carbohydrate.

FRUCTOSE CO2

O**2** CHLOROPLAST TRIOSE – P RuBp

Rubisco PGA RuBP Oxygenase

GLYCERATE P – GLYCOLATE

Phosphotase

GLYCOLATE (2 C)

H2O

GLYCERATE Catalyse GLYCOLATE

H**2**O**2** Glycolate oxidase

PEROXISOME OH – PYRUVATE GLYOXYLATE

NH**3**

SERINE GLYCINE

Transminase

MITROCHONDRIA SERINE NH**3** GLYCINE

CO**2**

Fig :- Glycolate metabolism OR C**2** – Cycle JANARDAN PRASAD SINGH VISTHAPIT MAHAVIDYALAYA, BALIDIH DEPARTMENT OF BOTANY