

PLANT PHYSIOLOGY: PHOTOSYNTHESIS

GLOSSARY:

Accessory Pigment :

The pigment molecules, other than chlorophyll - **a**, which direct and focus their energy towards chlorophyll-**a**.

ADP :

Adenosine Dinucleotide Phosphate.

ATP :

Adenosine Trinucleotide Phosphate.

Biosynthetic phase (dark reaction):

The second stage of photosynthesis, which do not require light for the production of glucose from CO_2 and RuBP.

Biosynthetic Phase :

The phase of photosynthesis, in which synthesis of organic material takes place.

Bundle sheath cells:

A layer of cells in plant leaves and stems that forms a sheath surrounding the vascular bundles.

C₃ Plants:

A plant, which produces the 3-carbon compound phosphoglyceric acid at the first stage of photosynthesis.

C₄ Plants:

A plant, which produces the 4-carbon compound oxaloacetic acid at the first stage of photosynthesis.

Calvin cycle:

The second stage of photosynthesis, not requiring light to occur and during which energy released from ATP drives the production of organic molecules from carbon dioxide.

Carboxylation Phase :

The process in which CO₂ from the atmosphere combines with RuBP and forms a 6-C unstable compound, which split into two molecules of PGA.

Carboxylation:

First stage of Calvin cycle, where fixation and utilization of CO₂ occurs for carboxylation of RuBP.

Carotenoids:

Any of a class of yellow to red pigments, including the carotenes and the xanthophylls.

Chlorophyll:

Any of a group of green pigments, found in the chloroplasts of plants.

Chloroplast :

Chlorophyll containing organelles, present in the cells of green organs of plants.

Cyclic photophosphorylation:

The synthesis of ATP during photosynthesis, coupled to the cyclic passage of electrons to and from P_{700} , the specialized form of chlorophyll **a**, which is involved in photosystem **I**, using a series of carrier molecules.

DHAP:

Dihydroxy Acetone Phosphate.

Electron transport system:

The components of the final sequence of reactions in biological oxidations, composed of a series of oxidizing agents arranged in order of increasing strength and terminating in oxygen.

Endergonic Process:

A chemical reaction requiring input of energy to proceed.

Isotope:

One of the two or more atoms, having the same atomic number but different mass numbers.

Kranz anatomy:

In some tropical plants like corn and sugar cane, the distinctive arrangement of leaf tissue contributing to their relatively faster growth in abundant light.

Light Phase :

Photochemical phase of photosynthesis, in which light is obligatory.

Light reaction:

The first stage of photosynthesis occurring only in the presence of light, during which energy captured from light drives the production of ATP.

Nicotinamide adenine dinucleotide phosphate (NADP):

A coenzyme, $C_{21}H_{28}N_7O_{17}P_3$, occurring in most living cells and utilized similarly to NAD but interacting with different metabolites.

NADPH:

The reduced form of NADP.

Non-cyclic photophosphorylation:

The light-requiring part of photosynthesis in higher plants, in which an electron donor is required and oxygen produced as a waste product, consists of two photoreactions, resulting in the synthesis of ATP and NADPH₂.

P₆₈₀:

A reaction-centre, where chlorophyll a molecule is in association with photosystem II, having an absorption peak at 680 nm.

P₇₀₀:

Reaction-center, where chlorophyll a molecule is in association with photosystem I, having an absorption peak at 700 nm.

PGA:

Phospho Glyceric Acid.

PGAL:

Phospho Glyceraldehyde.

Phosphoenol pyruvate carboxylase (PEP carboxylase or PEPcase):

An enzyme, in the family of carboxylases, catalyzing the addition of CO₂ to phosphoenol pyruvate (PEP) to form the four-carbon compound oxaloacetate:



 **Photolysis:**

The chemical decomposition of water due to action of light.

 **Photooxidation:**

The oxidation of chlorophyll due to high intensity of light.

 **Photophosphorylation:**

Phosphorylation that utilizes light as a source of energy, as in the formation of ATP from ADP and phosphorus during photosynthesis.

 **Photorespiration:**

Oxidation of carbohydrates in plants with the release of carbon dioxide during photosynthesis.

 **Photosynthesis:**

The synthesis of complex organic material using carbon dioxide, water, inorganic salts and light energy captured by light-absorbing pigments, such as chlorophyll and other accessory pigments.

 **Photosynthesis:**

The process in green plants and certain other organisms by which carbohydrates are synthesized from carbon dioxide and water using light as an energy source.

Photosynthetic pigments:

The pigments responsible for the capture of light energy during the light-dependent reactions of photosynthesis.

Photosystem I (PS I):

The second photosystem in the photosynthetic light reactions of algae, plants and some bacteria, discovered before photosystem II.

Photosystem II (PS II):

The first protein complex, in the light dependent reactions, located in the thylakoid membrane of plants, algae and cyanobacteria.

Photosystems:

Protein complexes involved in photosynthesis.

Pigment System:

A system constituted by Chlorophyll-**a** molecules of the reaction centre and other accessory pigment molecules.

Reaction Centre:

A centre, where Chlorophyll-**a** molecules absorb light of specific wavelength and obtain energy, which then converted into chemical energy.

Redox potential:

The tendency of an atom or molecule to give or take up electrons.

Regeneration:

Third and last stage of Calvin cycle, where regeneration of the CO₂ acceptor molecule RuBP occurs.

Ribulose-1, 5-bisphosphate (RuBP):

An important substrate involved in carbon fixation.

Rubisco enzyme:

Ribulose bi Phosphate carboxylase oxygenase enzyme.

RuBP:

Ribulose Bi Phosphate.

Xanthophylls:

Yellow pigments from the carotenoid group, involved in photosynthesis along with green chlorophyll.

Z scheme:

In cyclic phosphorylation and non-cyclic phosphorylation, a diagrammatic representation of the electron flow, showing changes in energy potential of the electrons.