



Mula Education Society's
Arts, Commerce and Science College
Sonai, Tal. Newasa, Dist. Ahmednagar - 414 105

Reaccredited with 'A' Grade by NAAC, Bangalore & Certified by ISO 9001 : 2015



Department of Botany

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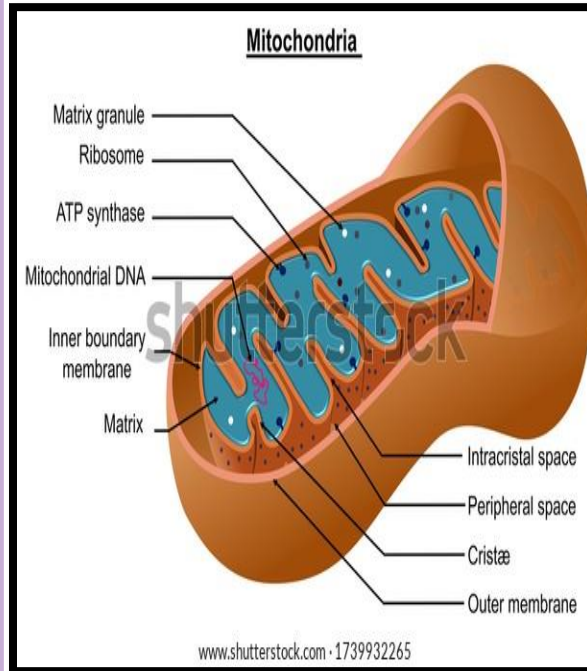
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■ ***Introduction:-***

1. The mitochondria are the **filamentous organelles** of all aerobic cells of higher animals & plants & also of certain algae, fungi & protozoa.
2. They play a **major role in breaking down the nutrients & generating energy rich molecules for the cells.**
3. Many of the biochemical reactions involved in **cellular respiration** occurs within the mitochondria.
4. The chloroplast remains **distributed homogeneously** in the cytoplasm of plant cells. The chloroplast performs **photosynthetic activity &** by the process of photosynthesis it **synthesizes carbohydrates** which contain chemical energy. This energy is further utilized by living organisms for their metabolic activities.

■ STRUCTURAL FEATURES



I. Mitochondrial Membranes :

Outer soft & Inner folded membrane

Each membrane is **60-70 Å⁰** thick.

Space between these two membranes is **Inter membrane** or **Perimitochondrial Space**.

Cristae variable invaginations that **increase** the surface area of membrane that **holds proteins** involved in the **ETS cycle**.



II. Matrix :-

Present in Inner compartment.

Contains dense proteinaceous material.

Composed of line grannuals ,Lipids, Proteins,
DNA, 70S ribosomes & t-RNA molecules.

The enzymes of Kreb's cycle are also present.

There are 1-6 mitochondrial DNA molecules in a single Mitochondrion.

III. Mitochondrial Subunits

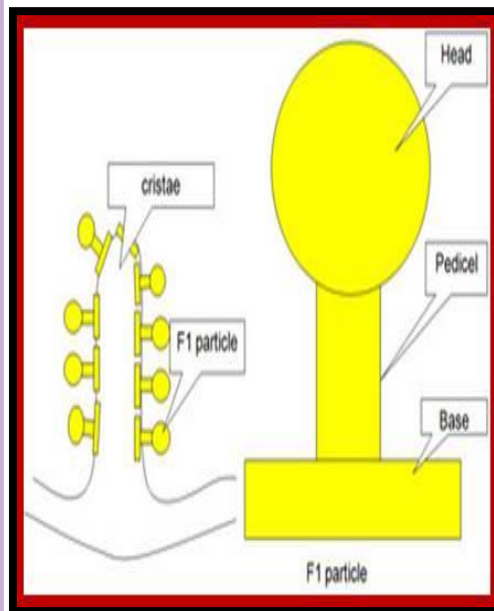
The stalked particles on the inner surface of inner membrane are known as subunits of Fernandez-Moron or elementary Particles or F 1 Particles or Oxysomes or electron transport particles.

Each F 1 Particle consists of **3 parts**

- A polyhedral round **head** with **75-80 A⁰** in diameter,
- Stalk** with **30-35 A⁰** diameter and **45-50 A⁰** Length,
- Base** of **30-40 A⁰** width

Function of F 1 Particle :-

Responsible for **electron transport & Oxidative Phosphorylation** .



■ Functions of Mitochondria :-

- i. Generates energy so it is called as “Powerhouse of cell”.
- ii. It produces ATP molecule through the process of cellular respiration.

(Note :-Kreb's Cycle takes place in Mitochondria).

- iii. Plays a vital role in lipid metabolism.
- iv. Helps to maintain a proper concentration of calcium ions within the cell compartments.
- v. It plays important role in extra Cellular inheritance.
- vi. It has ability to regulate the cell metabolism.
- vii. The enzymes essential for the oxidative deamination of amino acids are present in mitochondria.

■ *Chloroplast* :-

The word chloroplast came from Greek word **khloros** means “green” and **plastis** means “formed”.

It has chlorophyll which **functions by trapping the solar energy** & used for the synthesis of food in all green plants.

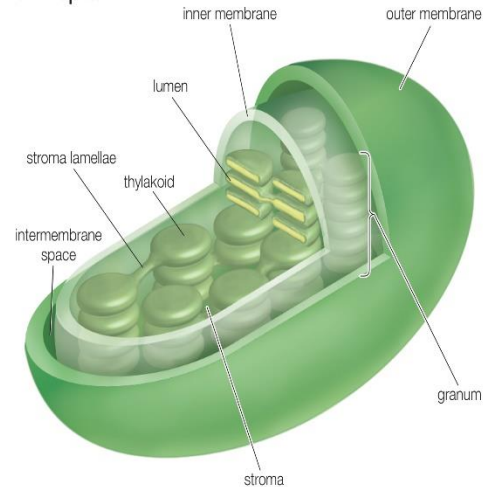
The shape of chloroplast varies as **spherical, oval, discoid in different plant cells.**

However in many algae **the shape of chloroplast may be star shaped.**

Generally chloroplast measures **2-3 μ in thickness 5 – 10 μ long.**

The number of chloroplast is usually **20-40 per cell of higher plants.**

Chloroplast



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The chloroplast is consisting of **3 components** namely envelope, stroma and Grana.

I. Envelope :

The entire chloroplast is bound by an envelope which is made up of **double membranes**.

Each membrane is about **40-60 Å⁰** in **thickness**.

The space between inner & outer membrane is known as **Periplastidial space** or **intermembrane space**.

Exchange of material between chloroplast & cytoplasm occurs across this double membrane.

II. Stroma :-

The space within the inner membrane is filled with watery, proteinaceous substance called as **Stroma**.

The chloroplast DNA, 70S ribosomes, Starch grains & proteins are present in the stroma.

It carries machinery necessary for the CO₂ fixation.

III. Grana :-

The stroma contains small cylindrical structures called **grana**.

Its size ranges from 0.3-1.7μm in various species.

Each granum consist of a disc like membranous sacs known as **Thylakoids**.

These thylakoids are **arranged just like a pile of coins**.

The grana are interconnected by the network of anatomizing tubules called **stroma lamellae**.



The thylakoid membrane contains the entire enzymatic component essential for photosynthesis.

The quantasomes are defined as morphological unit capable for absorbing a quantum of energy.

Each quantasomes carries 230 chlorophyll & 48 carotenoid molecules as the chief components & beside many other protein & lipid molecules all essential for harvesting light energy & for photophosphorylation.



■ **Functions of Chloroplast :-**

1. Useful for the synthesis of food by the process of photosynthesis.
2. Its structure causes absorption of light energy & converts that energy into biological activity.
3. Production of NADPH_2 & evolution oxygen through the process of photolysis of water.
4. Produces ATP by phosphorylation.
5. Useful for the conversion of PGA into different sugars & stores as starch.
6. In higher plants the chloroplast posses coil of DNA in their stroma. Hence are responsible for the cytoplasmic or extra nuclear inheritance.



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