

Fisiología Vegetal

Clase - 8

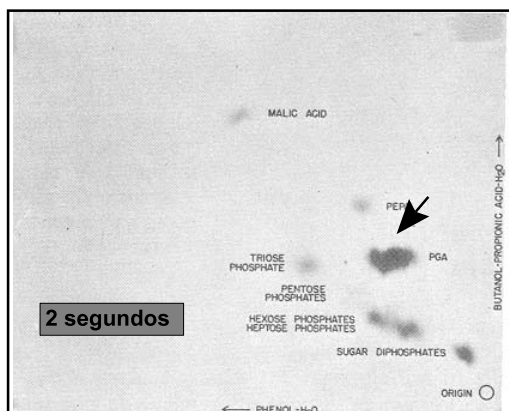
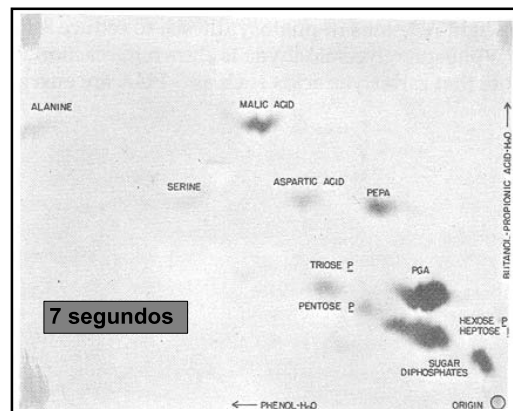
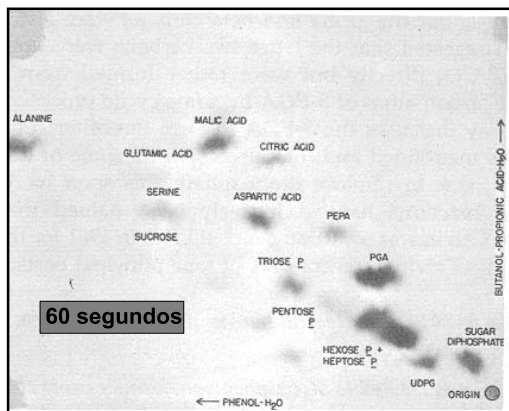
¿Preguntas de la clase anterior?

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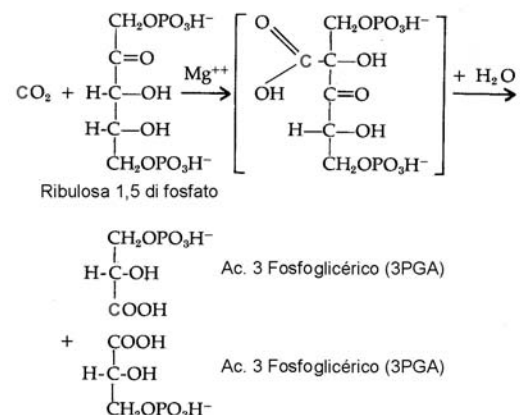
Fijación de CO₂ y Síntesis de Carbohidratos

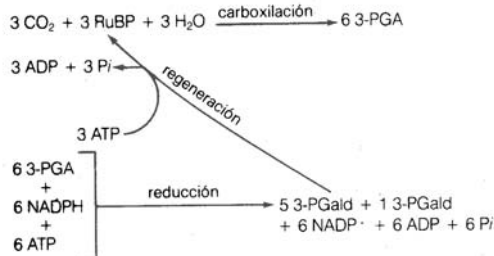
Clase 8

- Calvin, Benson y otros (1949, Univ. California-Berkeley).
- Experimento clásico con *Chlorella* (alga verde)
 - se expone por distintos tiempos a ¹⁴CO₂
 - cromatografía + autoradiografía

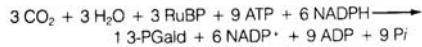


Carboxilación (Ribulosa 1,5 bi fosfato carboxilasa)

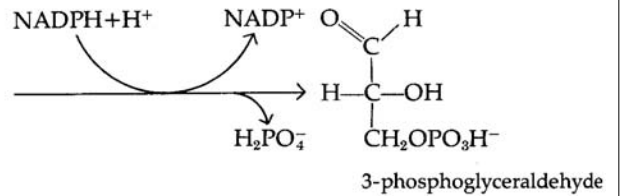
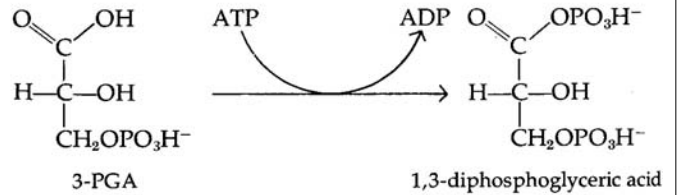




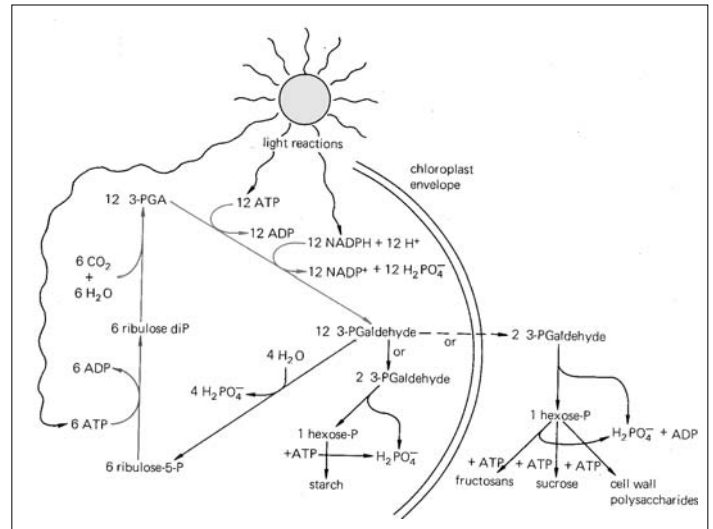
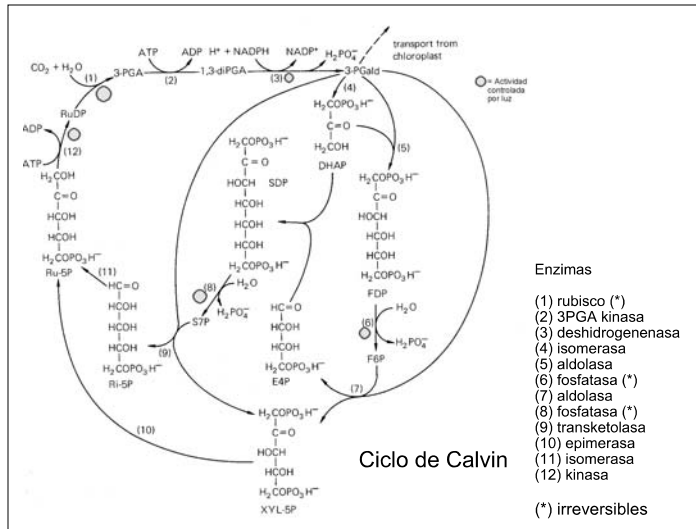
resumen:



Resumen del ciclo de Calvin, con énfasis en las fases de carboxilación, reducción y regeneración.



Reducción

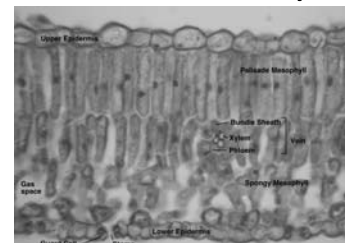


Ciclo de Calvin (premio Nobel 1961)

- **Carboxilación:**
 - ▶ CO₂ y H₂O son agregados a ribulosa 1,5 di P (RudIP) y se forman 2 ácido 3 P glicérico (PGA).
- **Reducción:**
 - ▶ PGA es reducido a 3 P gliceraldehido (3-PGald) usando NADPH y ATP.
- **Regeneración:**
 - ▶ transformación de 3- PGald en fructosa 1,6 di P, xilulosa 5P y eritrosa 4P y sedoheptulosa 7P, generando ribosa 5P y xilulosa 5P, y finalmente ribulosa 5P (Ru 5P). Ru 5P es fosforilada por ATP y se forma la RudIP, que continua el ciclo.

Ciclo de Calvin

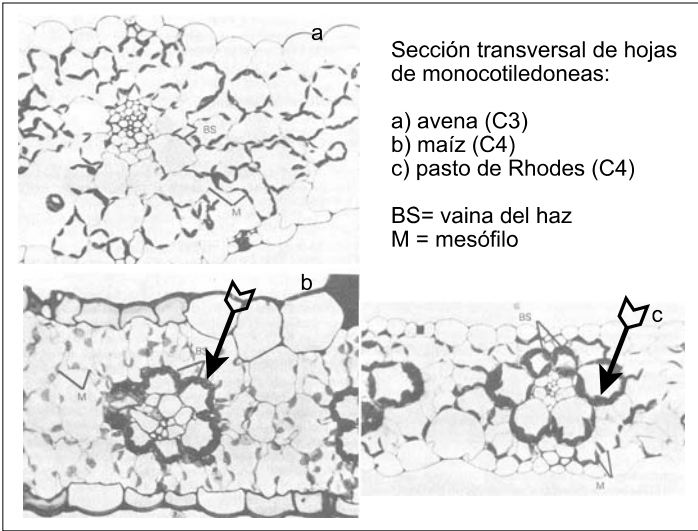
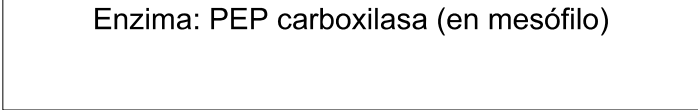
- Por cada 6 vueltas se fijan 6 CO₂ y se genera 1 hexosa.
- En cada vuelta se consumen 2 NADPH y 3 ATP.



Metabolismo C4

- Kortschak et al (1965, Hawaii)
 - Caña de azucar
 - ácido málico, ácido aspártico (C4)
- Hatch & Slack (1965, Australia)
 - Maiz (C4)

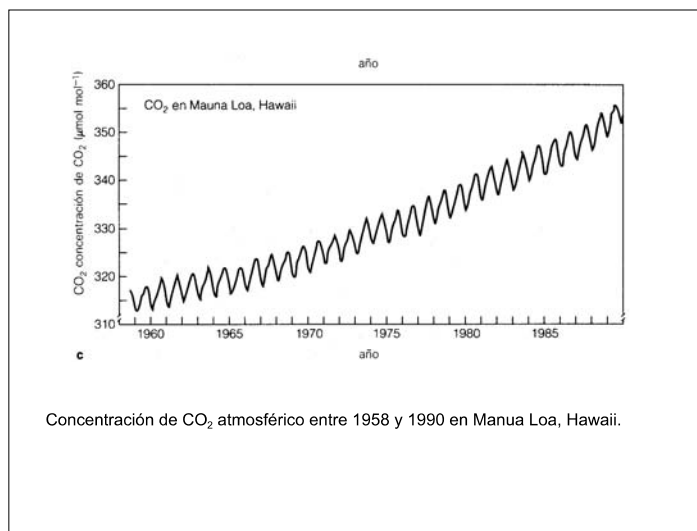
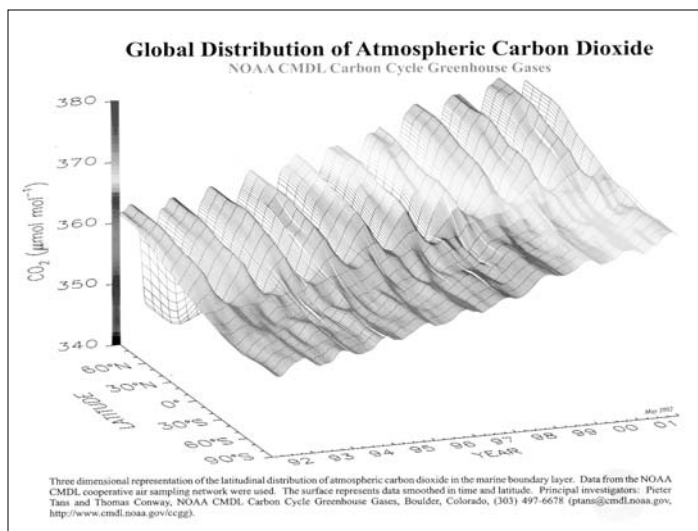
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- The diagram illustrates the following chemical transformations:
- Oxaloacetic acid** (a four-carbon dicarboxylic acid) is converted to **L-malic acid** (a three-carbon hydroxy-carboxylic acid) by the enzyme **Malato deshidrogenasa**. This reaction is coupled with the reduction of **NADPH + H⁺** to **NADP⁺**.
 - L-malic acid** is then converted to **L-aspartic acid** (a four-carbon dicarboxylic acid) and **pyruvic acid** (a three-carbon keto-carboxylic acid) by the enzyme **Transaminasa**.
 - L-alanine** (a three-carbon amino-carboxylic acid) is also shown as a product of the transamination reaction.



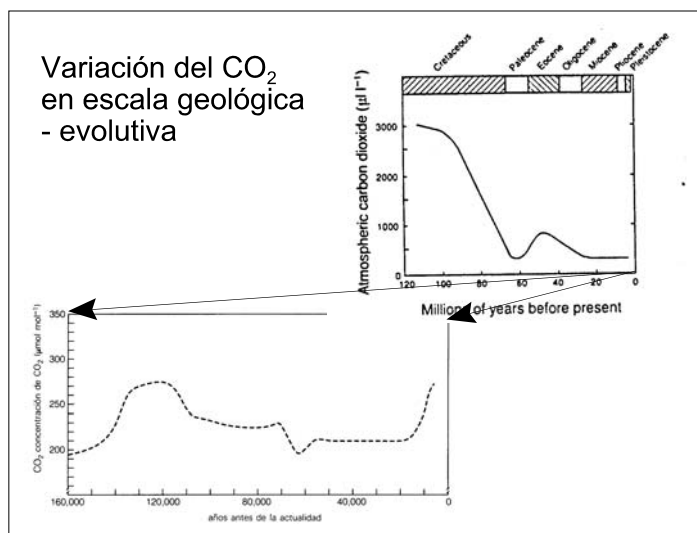
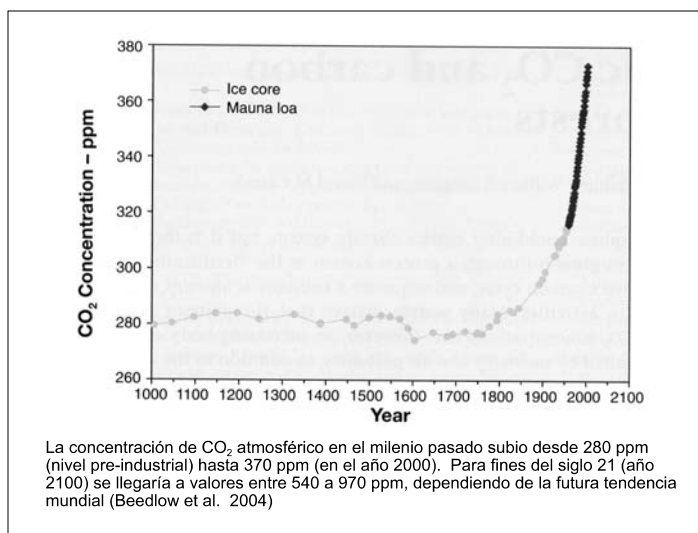
Células del mesófilo y banda del haz en C4

The diagram illustrates the C4 metabolic pathway across two cell types: the Mesophyll cell and the Vascular Bundle Sheath cell. In the Mesophyll cell, CO₂ from the atmosphere enters and combines with PEP to form oxaloacetate, which then becomes malate. Malate moves to the Vascular Bundle Sheath cell, where it is decarboxylated to release CO₂ for the Calvin cycle and pyruvate. Pyruvate returns to the Mesophyll cell. The Calvin cycle in the Vascular Bundle Sheath produces carbohydrates and releases CO₂ for respiration. The C₄ cycle is completed by the conversion of pyruvate back to PEP in the Mesophyll cell.





Concentración de CO₂ atmosférico entre 1958 y 1990 en Mauna Loa, Hawaii.

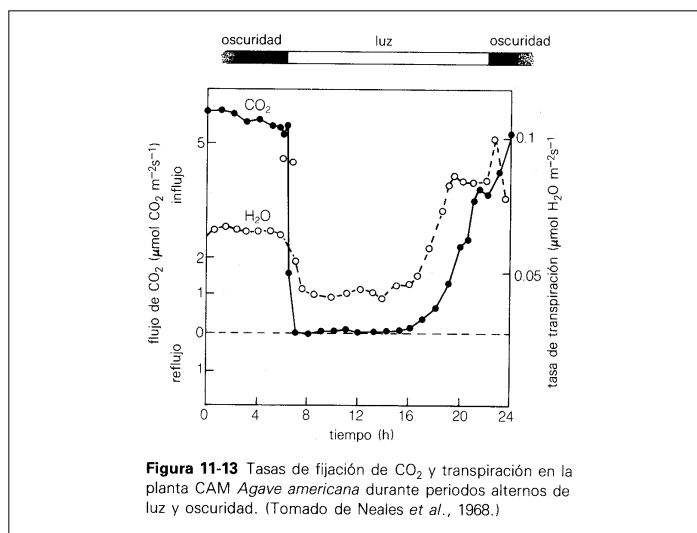


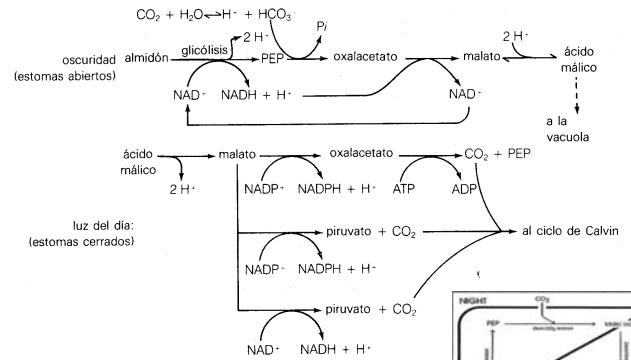
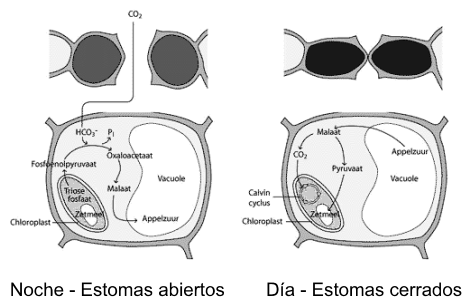
CAM

Metabolismo Ácido de las Crasuláceas

La fijación nocturna de CO₂ en plantas suculentas





Leer

- Salisbury F. y C. Ross (1994) Fisiología Vegetal. Grupo Editorial Iberoamérica, México. ISBN 970-625-024-7. Capítulo 11.