Basic Botany for Master Gardeners

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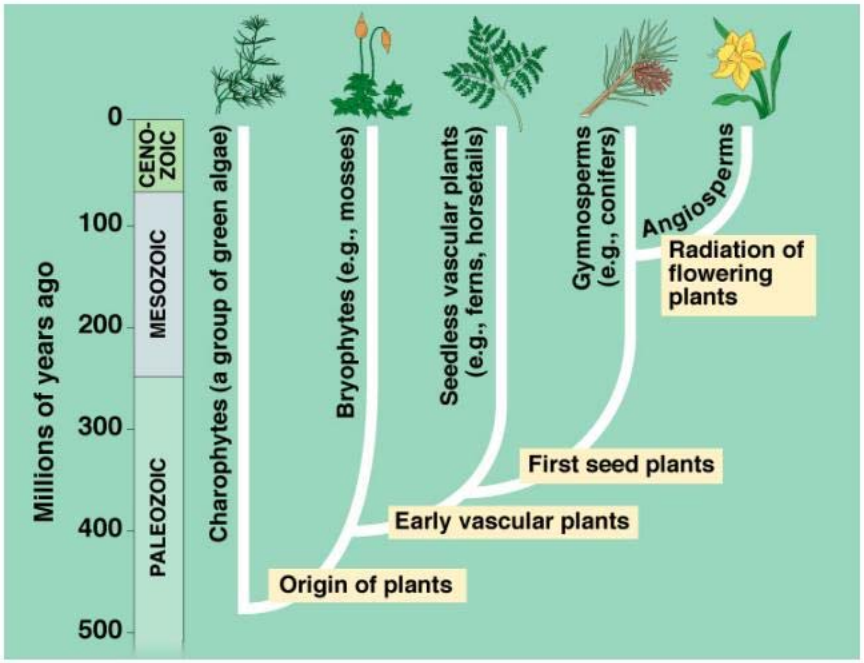
Plant Functions: the Big Picture

- Capture and store enough energy to survive and reproduce (earn a living)
- Out compete neighbors
- Adapt to a variety of environments
- Adapt to herbivory
- Adapt to changing environments

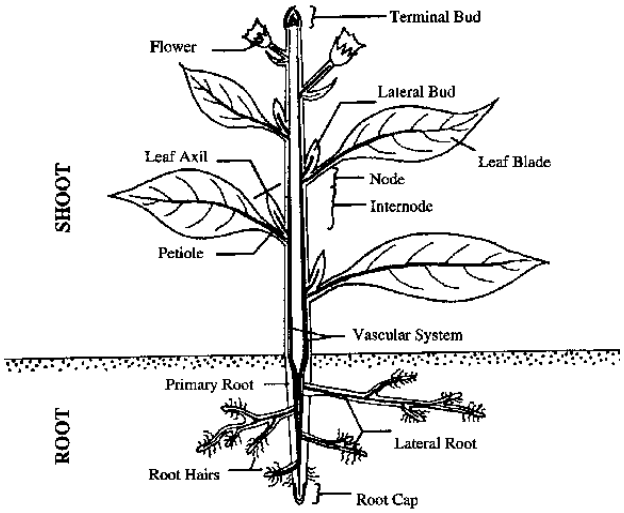


Scientific Names

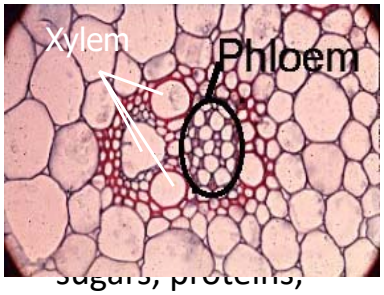
- Kingdom – Plantae
- Division
- Class
- Order
- Family
- Genus
- Species
- Subspecies, Variety, or Cultivar

Plant Diagram

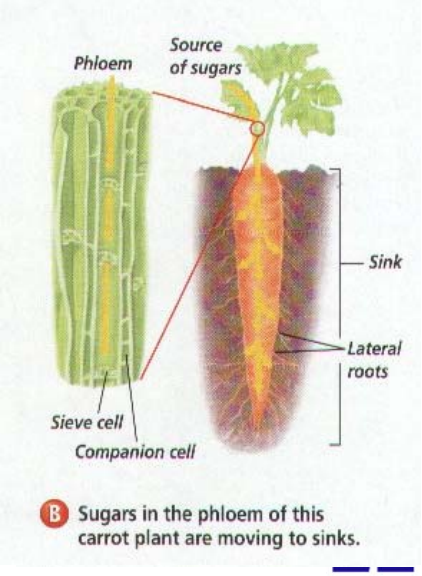
- Leaf
- Stem
- Bud
- Root
- Flower



Movement of Water and Materials

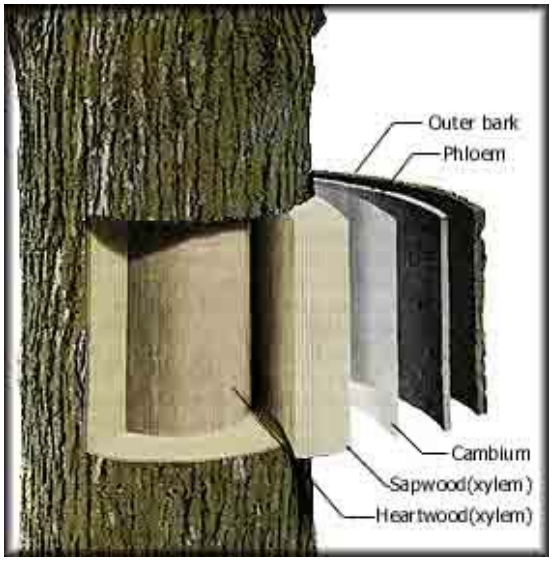


sugars, proteins, etc. downward from leaves

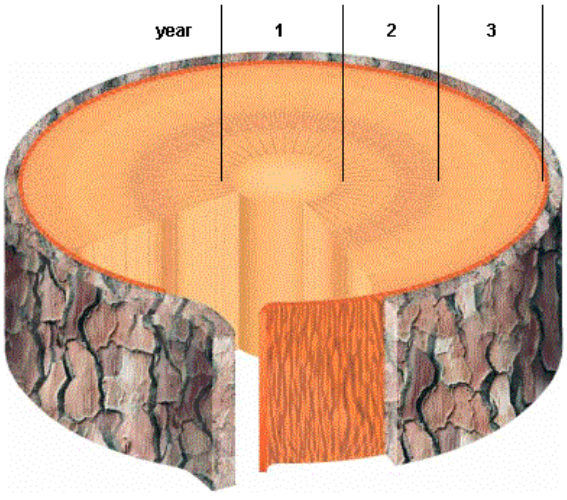


Woody Plant Structure

- Cambium is the thin layer of cells that form xylem to the inside and phloem to the outside



Woody Plant Growth



Secondary Growth Animation

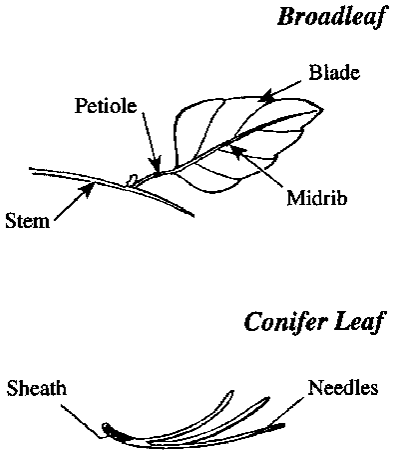
- http://trc.ucdavis.edu/biosci10v/bis10v/media/ch18/secondary_growth_v2.html

Features and Terms Describing Stems

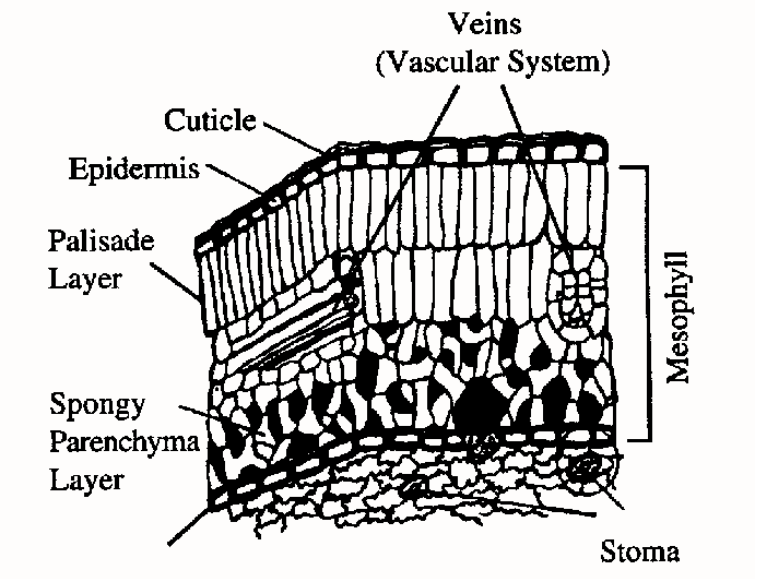
- Nodes
- Internodes
- Shoot
- Twig
- Branch
- Trunk
- Woody
- Succulent
- Stolon
- Crown
- Spur
- Tuber
- Rhizome
- Bulb
- Corm

Leaves

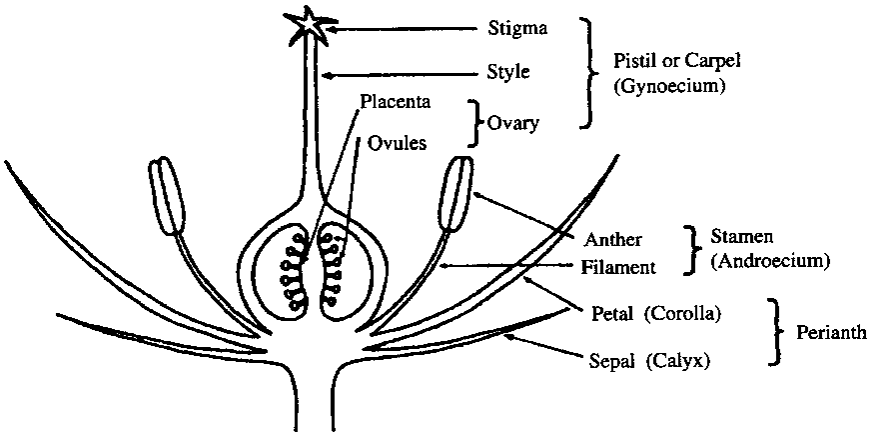
- Venation/Shape
  - Parallel
  - Pinnate
  - Palmate
  - Compound
- Arrangement
  - Alternate
  - Opposite
  - Whorled
  - Sessile



Leaf Anatomy

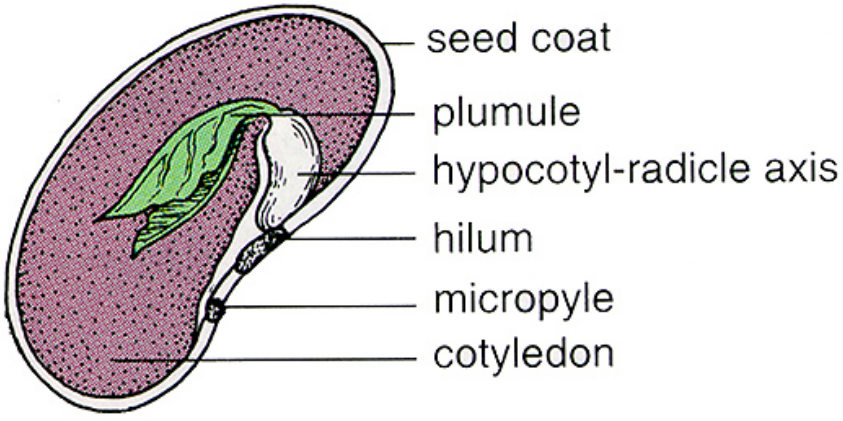


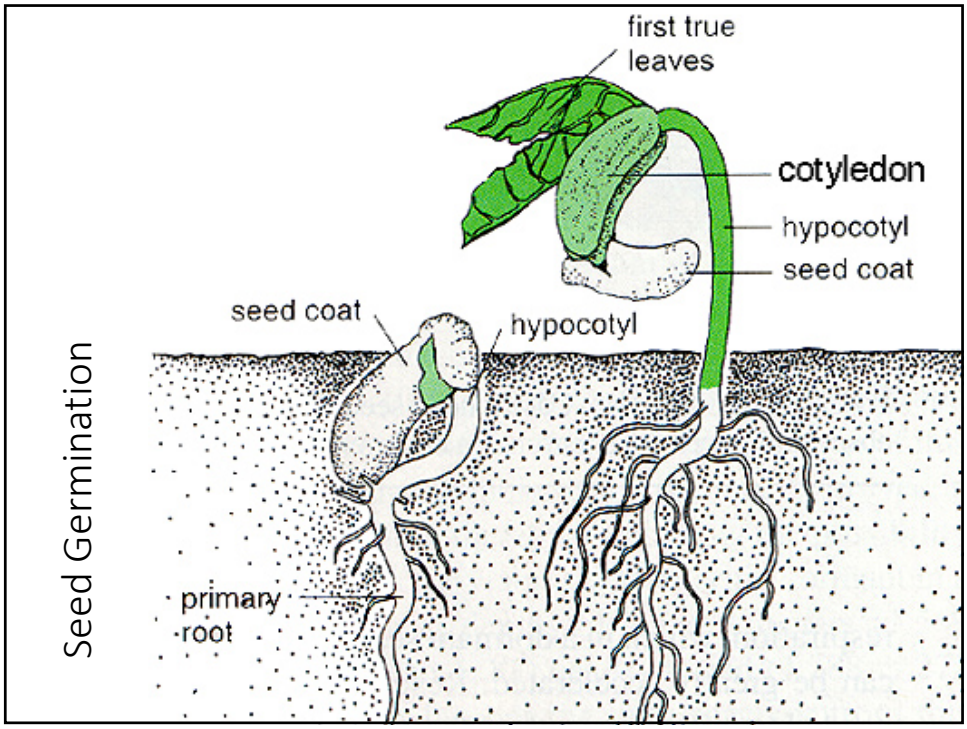
Flowers



How do plants reproduce?

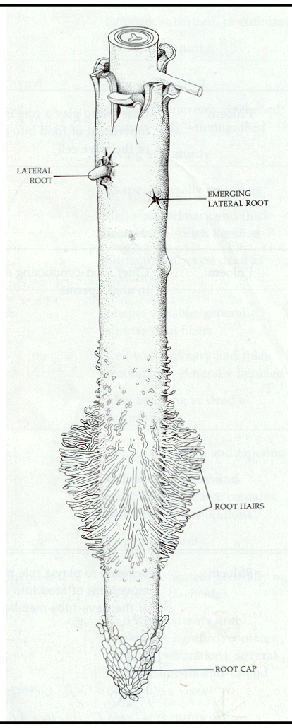
Seed Anatomy



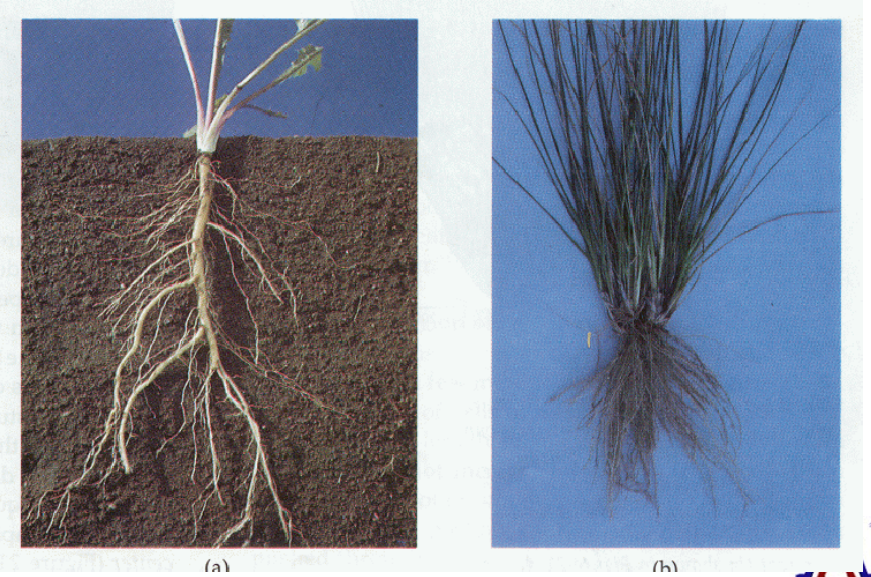


Roots

- Function
  - Anchor
  - Absorb nutrients and water
  - Food storage
- Root hairs
- Lateral roots
- Root cap
- Secondary growth in woody plants



Root Structure



Tap root

Fibrous roots

Photosynthesis

- The source of all food and oxygen on the planet
- Involves an input of light energy from the sun
- Converts light energy into chemical energy (carbohydrates, then proteins, fats, and nucleic acids)
- Requires light, carbon dioxide (CO_2), and water (H_2O).
- Products are sugar ($C_6H_{12}O_6$), and oxygen (O_2).
- Occurs in plant structures called chloroplasts that are rich with the pigment chlorophyll

Chemical Reaction during Photosynthesis

Why do plants do this?

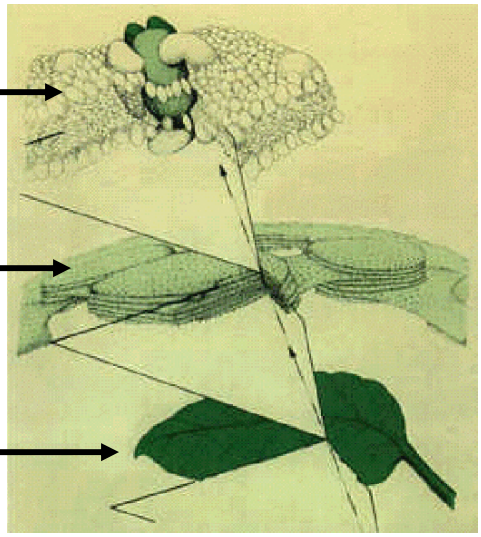
It seems like a lot of work.

Where does photosynthesis occur?

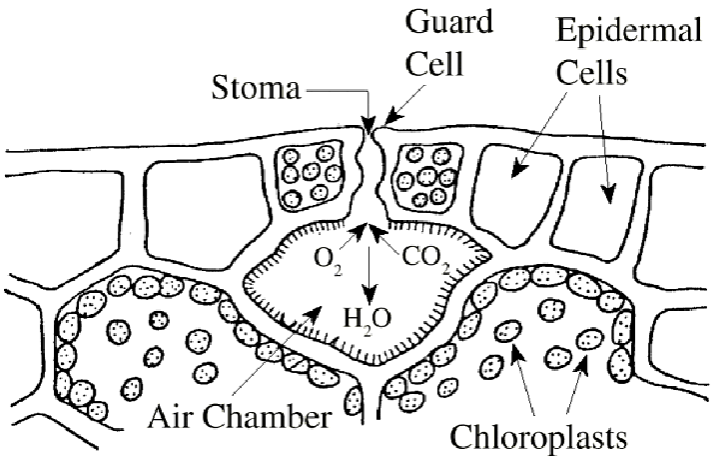
Chlorophyll

Chloroplasts

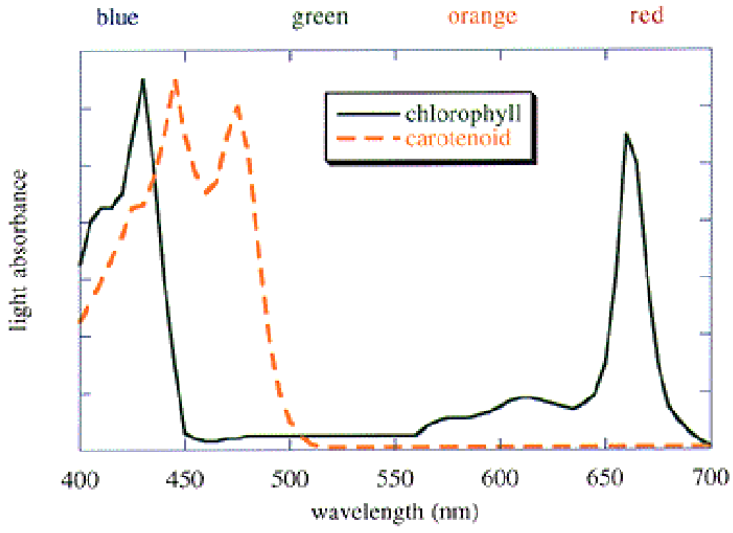
Leaves



Another look at photosynthesis



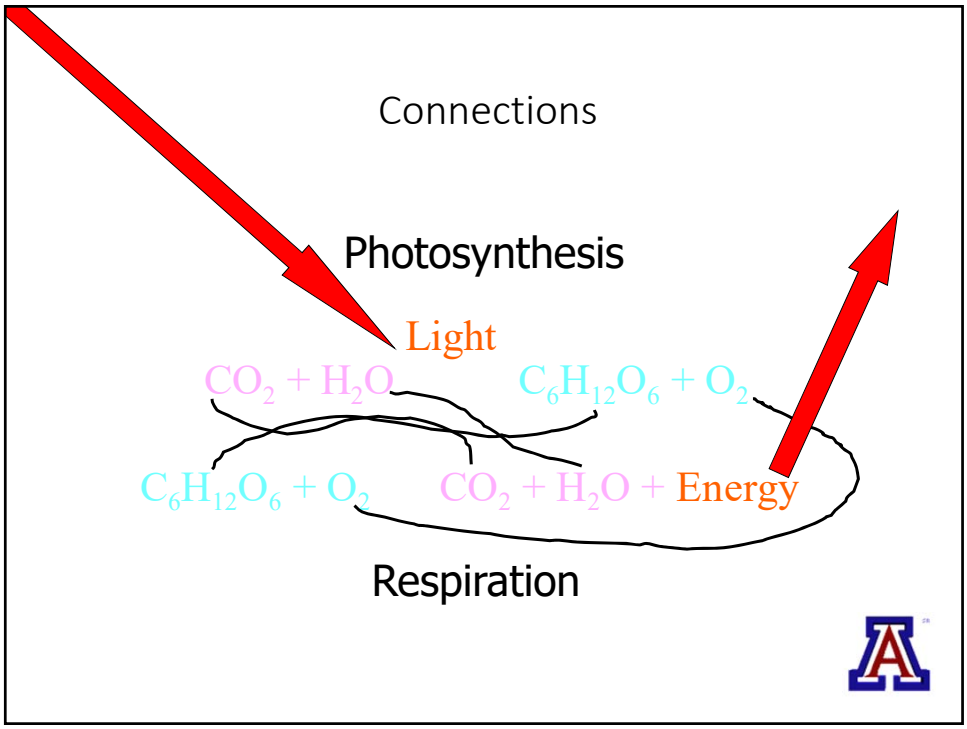
Light and Wavelength



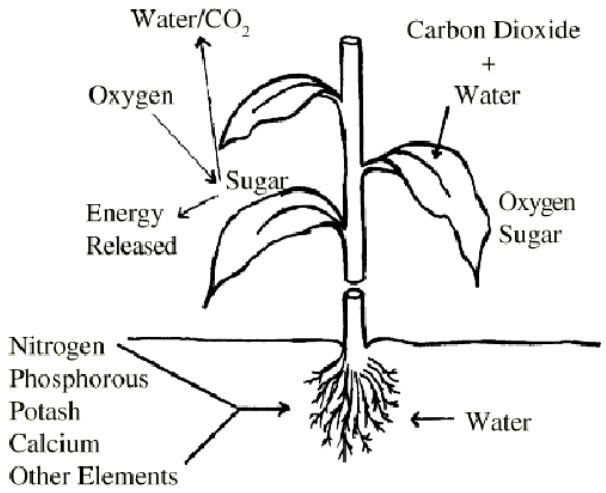
Aerobic Respiration

Is there a connection between photosynthesis and respiration?

Connections



Photosynthesis and respiration in the plant



Transpiration

- Water enter the plant through the roots and exits through the stomata
- 10% of the water is used for photosynthesis and 90% to keep the plant cells turgid
- The water moving into the plant and up through the xylem also transports mineral nutrients
- Environmental factors (temperature, air movement, and humidity) can affect amounts of water transpired at any given time.

Factors Influencing Plant Growth

- Light - quantity, quality, and duration
- Temperature - metabolism, water viscosity, dormancy, flowering, etc.
- Water - humidity, climate/soil moisture, and quality
- Nutrients - 18 essential nutrients need to be relatively available to plants. A few are from the atmosphere. Most are found in the soil.

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Essential Plant Nutrients

Macronutrients

- Carbon (C)
- Hydrogen (H)
- Oxygen (O)
- Nitrogen (N)
- Phosphorus (P)
- Potassium (K)
- Magnesium (Mg)
- Calcium (Ca)
- Sulfur (S)

Micronutrients

- Iron (Fe)
- Boron (B)
- Zinc (Zn)
- Copper (Cu)
- Manganese (Mn)
- Molybdenum (Mo)
- Chlorine (Cl)
- Nickel (Ni)
- Cobalt (Co)