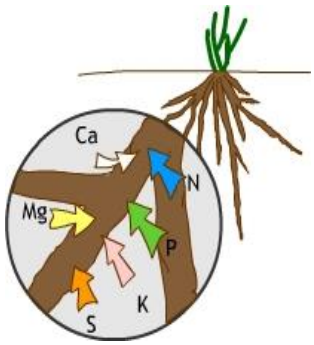
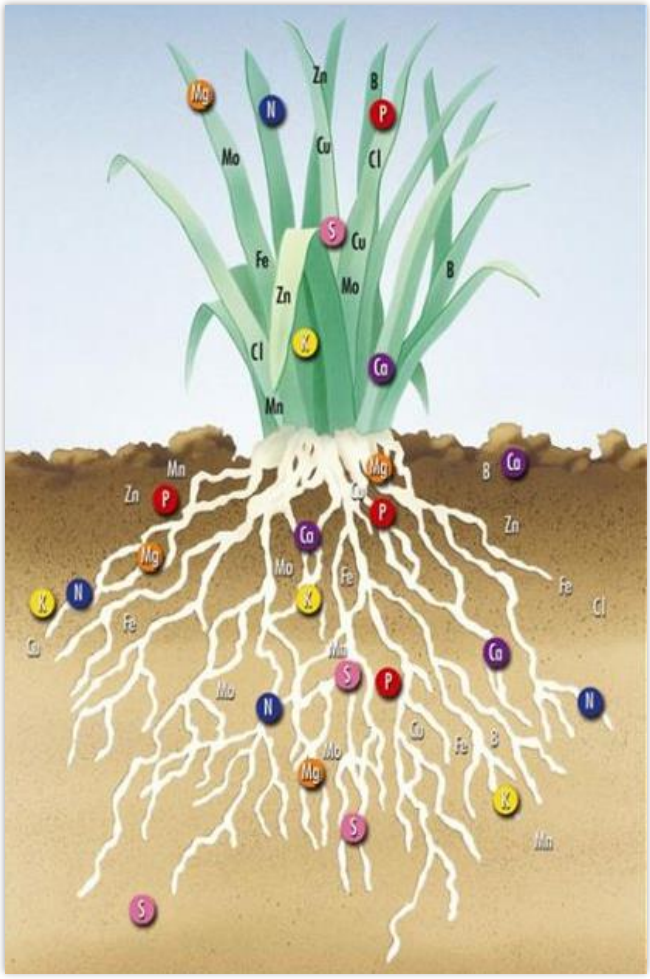
3.0 – Supplying Nutrients to Crops

- Plants need _____ for healthy growth and development.
- ***Plant nutrition*** involves the absorption of nutrients for plant growth and is dependent on _____, often referred to as nutrients.
- Three of the 16 elements comprise _____ of a plant's tissue by dry weight:
  _____
- They are considered to be _____as we can NOT buy these.
- The plant acquires these three elements through natural processes from _____.

Six essential elements in addition to oxygen, hydrogen, and carbon are required in greater quantity than the others; they are called _____.

- The macronutrients are
  _____
  _____
  - 1. Nitrogen, phosphorus, and potassium are considered _____because they are used in complete fertilizers.
    - Nitrogen _____.
    - Phosphorus encourages _____.
    - Potassium provides _____.
  - 2. Calcium, magnesium, and sulfur are said to be _____ because plants need them in moderate amounts.
    - These secondary macronutrients may or may not be used in complete fertilizers.
  - Absorbed by roots from soil/compost



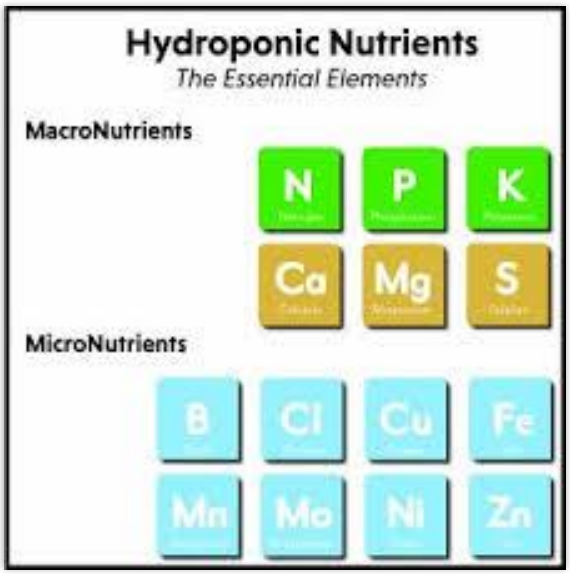


- The other seven essential elements, called _____, are needed in small quantities.
- These are sometimes called trace elements. They are

  _____

  _____

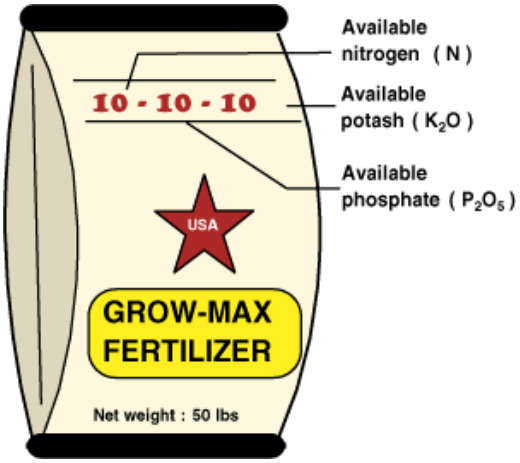
  _____
- Six of these (boron, copper, iron, manganese, molybdenum, sodium, and zinc) are supplied to plants as _____.
- Chlorine is not added to fertilizers since plants obtain sufficient quantities of chlorine from the _____.
- A little phrase can be used to help memorize the 16 essential elements for plant growth.



- *It is **"C. B. Hops Café Mighty Good, Closed Monday, See You Zen."***
- It represents the following: Carbon (**C**), Boron (**B**), Hydrogen (**H**ops), Oxygen (H**O**pkins), Phosphorus (Ho**P**kins), Potassium (Hop**K**ins), Nitrogen (Hopki**N**s), Sulfur (Hopkin**S**), Calcium (**Ca**fé), Iron (ca**fé**), Magnesium (**M**ighty **g**ood), Chlorine (**Cl**osed), Manganese (**M**o**n**day), Molybdenum (**Mo**rning), Copper (See you = **Cu**), Zinc (**Z**e**n**).
- Other elements play important roles in plant growth and development.
- For instance, silicon (Si) improves _____.
- Nickel (Ni) is another element considered important for _____.
- Plants receive most of the nutrients they need from the _____.

- In order to maintain healthy plants, a grower must provide the right type and amount of nutrients to the media so the plants can _____.
- 1. A _____ can be performed to determine which nutrients are present and which nutrients are deficient or lacking. (Armstrong City Water)
- 2. When nutrients are deficient in the water, the plant growth is _____.
- It is common for plant leaves to show symptoms of a _____by turning colors.
- When _____is deficient in the soil, a plant's older leaves turn _____.
- Abnormal yellowing of plant leaves is a condition called _____.
- A plant will show _____ in the stem or leaf when _____ is deficient.
- Many times, the nutrients needed for plant growth are _____ in our water reservoir, but the plants _____to the nutrients.
- Nutrient availability is influenced by the _____ in your nutrient water.
- ***pH*** measures the amount of acidity or alkalinity and is based on the amount of _____present in the water.
- Soil pH can range from _____.
- A pH reading of _____.
- Substances that have pH readings _____.
- Substances with pH readings _____.
- Plants have _____ that are ideal for maximum plant growth.
- Most plants grow best at a pH of _____ because the most nutrients are available for the plant to absorb in that range.

- Some important horticultural plants (azaleas) do better in a medium that has a more acidic pH.
- A pH test can be performed to determine the pH of the water, and amendments (pH up or pH down) can be added to modify the pH.
- _____ is commonly added to water in order to _____ the pH.
- _____ or sulfur compounds can be added to the water to _____ the pH.
- In our class we just use _____.
- When choosing Nutrients to add in your system, look for the _____on the container.
- The _____states the percentage of primary nutrients (_____) present.
- The analysis is written as _____ (i.e., 15-10-26), which represent the _____ of nitrogen, phosphorus, and potash present in the nutrient solution.



- _____

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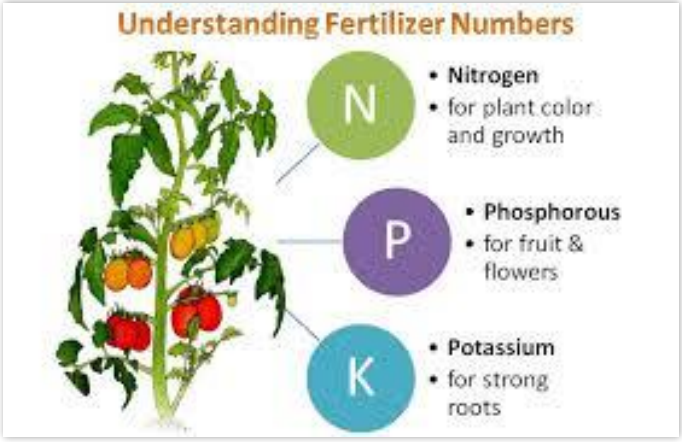

- If a fertilizer contains all three primary nutrients, it is called a _____
- If a fertilizer is lacking any of the three primary nutrients, it is an _____.
  - The fertilizer analysis does _____

- The rest of the fertilizer composition consists of _____ (necessary for the fertilizer to be applied) and possibly some _____.

Plants have different nutrient requirements based on the _____.

- The first stage is when the plant is a young _____.
- In the second stage, _____.
- This is followed by the _____, the _____, and the _____
- Each stage calls for _____.
- In the vegetative stage, plants use _____, whereas the flowering stage requires _____.

- Fertilizers are typically applied as _____fertilizer or as _____ fertilizers.

1. ***Water-soluble fertilizers*** _____.

- The concentrations of the water-soluble fertilizers are also _____.
- The fertilizer concentrate is then mixed with the water in _____.

- All the plants of a particular crop receive the _____of nutrients, which assists in producing a _____.
- In addition, adjustments to the _____in solution can be _____.
- Nutrients in solution are measured in _____.
- Fertilizer rates can be taken from _____or to

_____ with their injector system, or growers can calculate the amount of fertilizer needed to reach a desired PPM.

- In either case, it is beneficial for a grower to understand how to calculate parts per million (PPM) of fertilizer nutrients.