Plant Nutrition and Fertilization

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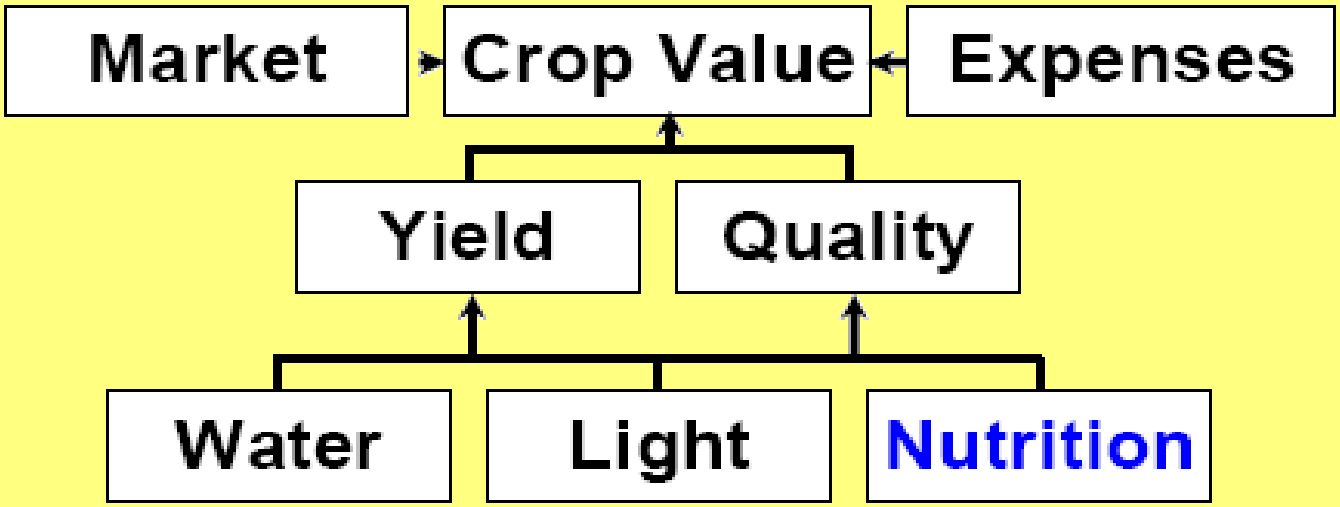
Productivity & Profitability



Plant Nutrition and Fertilization

Nutrition:

Availability and type of chemical elements in plant

Fertilization:

Adding nutrients to soil

Nutrients

Plant needs 16 elements:

- C, H, O,
- Macronutrients
- Microntrients

Macronutrients

- Nutrients required in large quantities are:
- N
- P
- K
- Ca
- Mg
- S

Primary Nutrients

- N
- P
- K

- Primary because they are needed in large quantities

Secondary Macronutrients

- Ca
- Mg
- S

Required only with moderate amounts

Micronutrients

- B
- Cu
- Cl
- Fe
- Mn

- Mo
- Na
- Zn

Nutrients needed in small amounts

What are the roles of each nutrient?

(Refer to handbook)

What makes plant look Unhealthy?

- Leaves discoloration
- Death of leaf tissue
- Stunted growth

Examples

Leaves discoloration

Examples

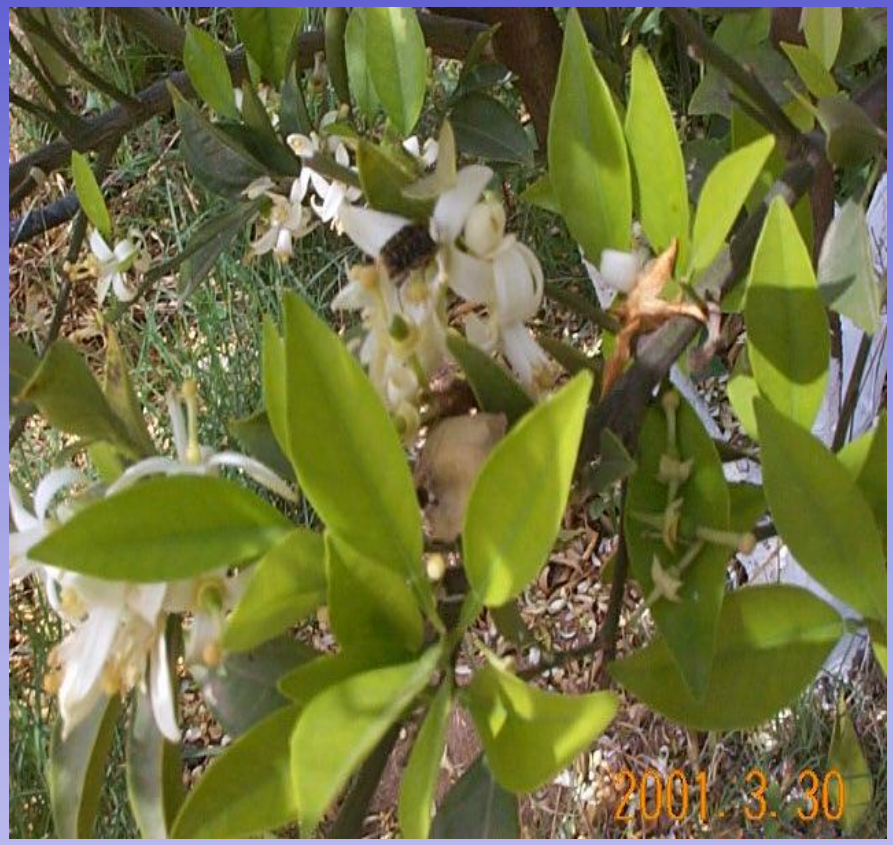
Stunted growth

Nutrient Deficiencies

- N
- peach: pale green-red chlorosis.
- Chlorosis on lower leaves

Nutrient Deficiencies

- N
- Citrus: pale green and chlorosis of leaves

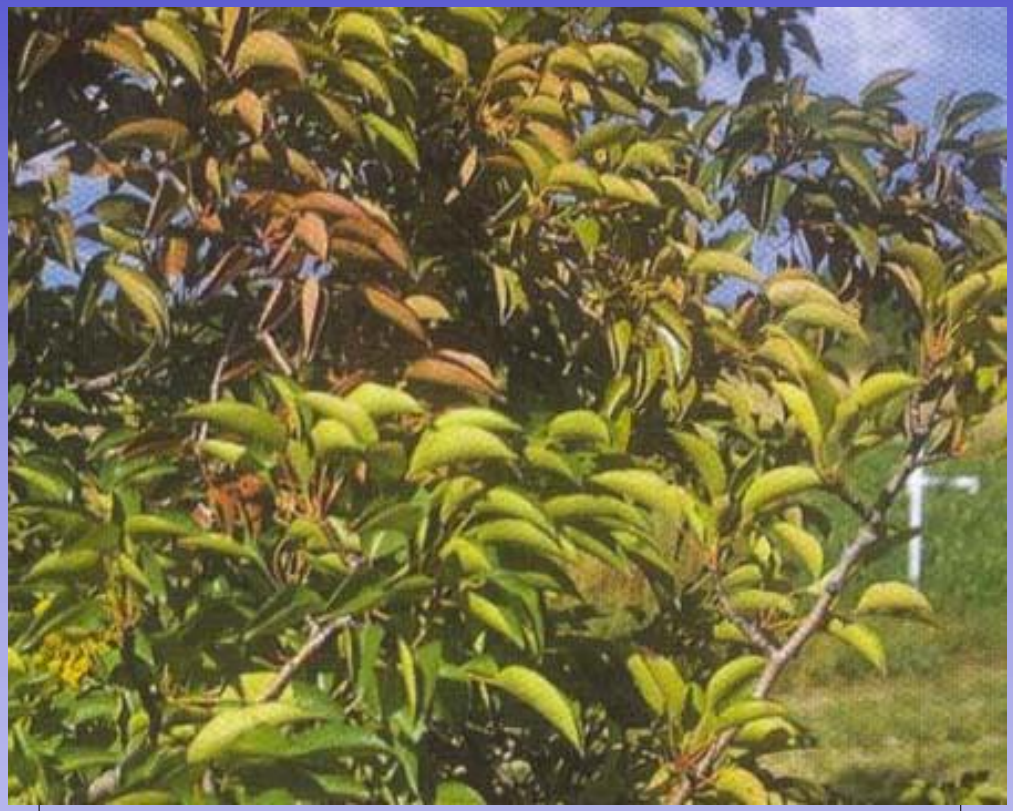


Nutrient Deficiencies

- N (Citrus)
- Nitrogen deficiency (Dark green leaf is normal; the other two leaves are deficient.)
- Nitrogen deficiency (Aging, senescing leaves.)

Nutrient Deficiencies

- N
- pear: pale green to bronze leaves, limited growth



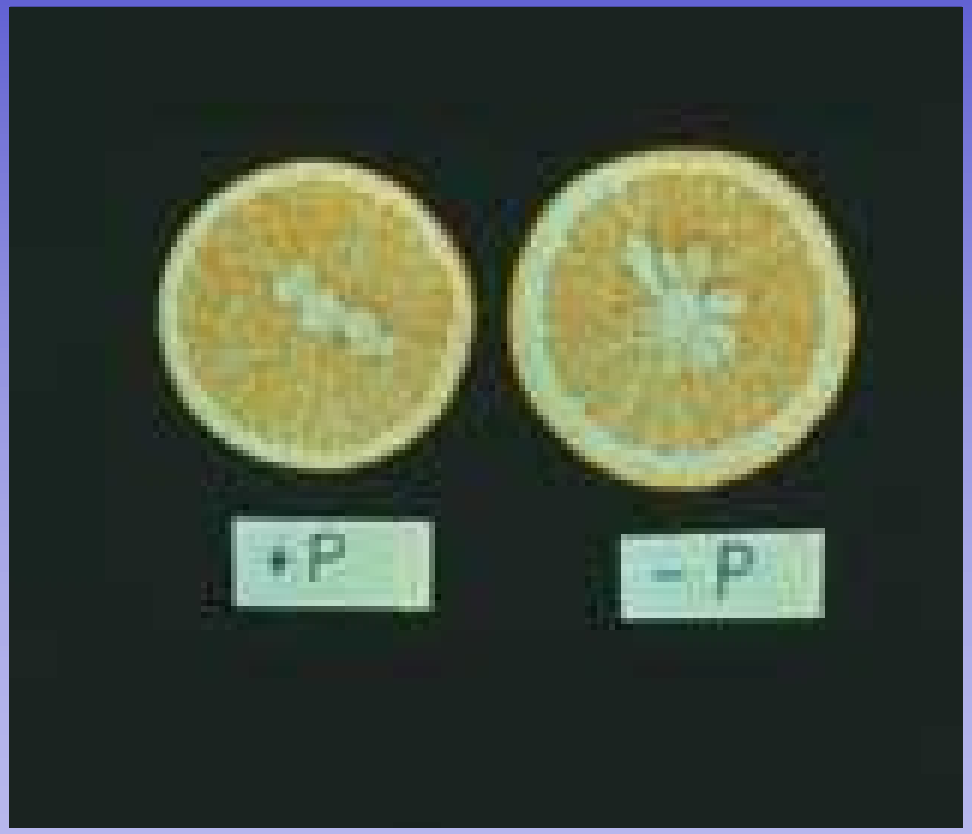
Nutrient Deficiencies

- P

- Purplish coloration of leaves

Nutrient Deficiencies

- P (Citrus)
- Fruit are rather coarse with thick rinds
- have lower juice content which is higher in acid



Nutrient Deficiencies

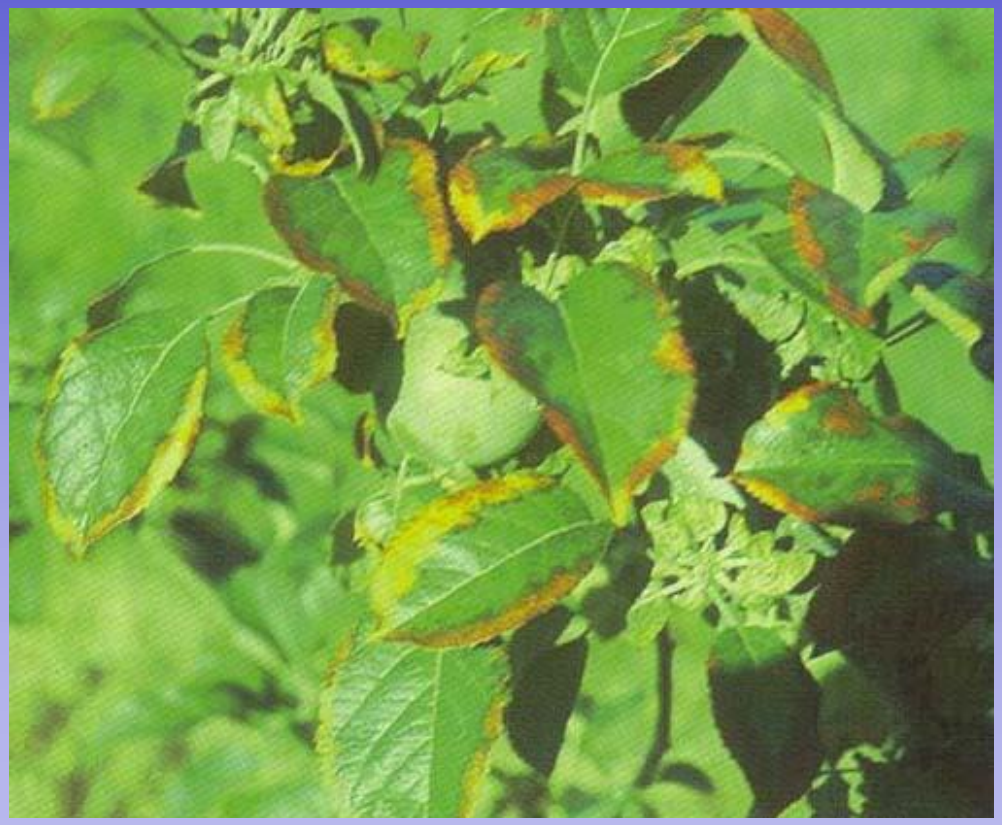
- K
- Chlorosis of leaves
- Brown leaf edges

Nutrient Deficiencies

- K
- K-deficient peach shoot (left): marginal necrosis and leaf curling.

Nutrient Deficiencies

- K
- K-deficient apple showing necrosis (scorching) of leaf margins.



Nutrient Deficiencies

- K (Citrus)
- Fruit are smaller, have smoother, thinner rinds and may be subject to splitting and/or drop

Nutrient Deficiencies

- Mg
- The first symptom is a yellowish green blotch near the base of the leaf between the midrib and the outer edge. The yellow area enlarges until the only green remaining is at the tip and base of the leaf.

Nutrient Deficiencies

- Ca
- Ca-deficiency in apple fruit causes "bitter pit" necrotic lesions just under the skin.

Nutrient Deficiencies

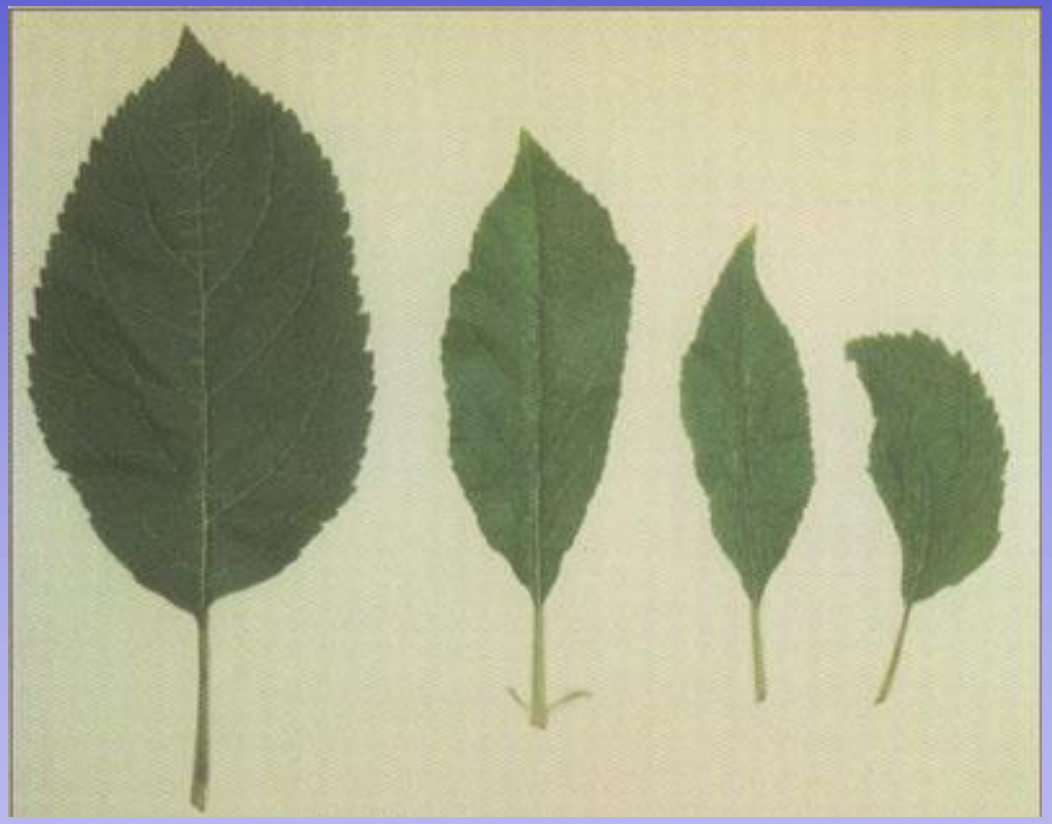
- B
- B-deficient showing dieback of shoot terminals.

Nutrient Deficiencies

- B
- B-deficient apple showing internal bark necrosis where cambial tissues die.

Nutrient Deficiencies

- B
- B-deficient apple (right): leaves are thick and small, and shape is distorted.

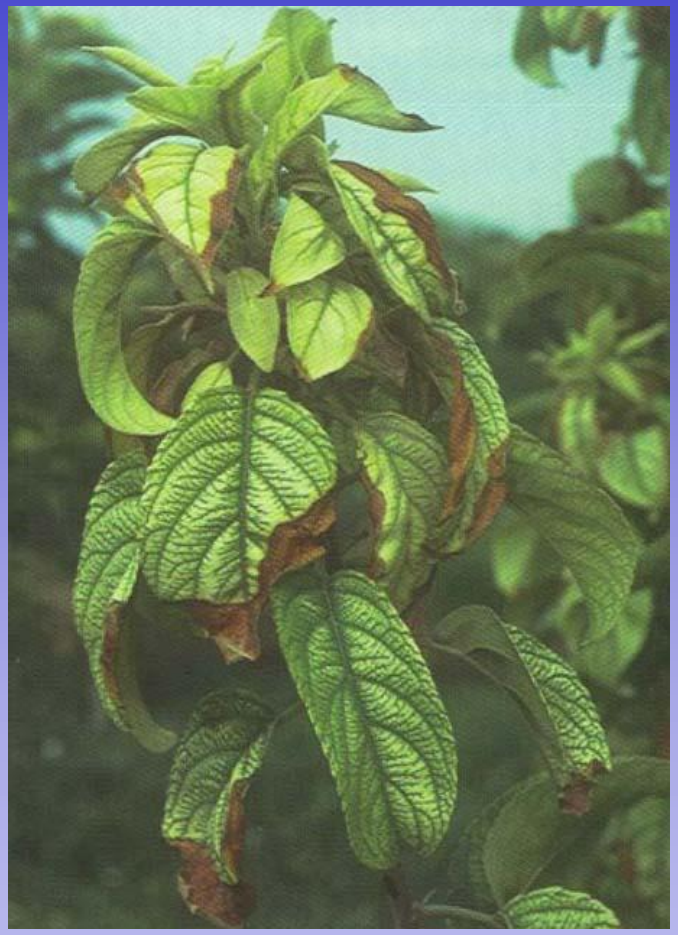


Nutrient Deficiencies

- B
- B-deficient pear fruit showing severe cracking.

Nutrient Deficiencies

- Fe
- Fe-deficient apple: interveinal chlorosis with leaves at shoot tips most affected.



Nutrient Deficiencies

- Mn
- Mn deficient apple: interveinal chlorosis.

Nutrient Deficiencies

- Mn
- Mn-deficient sweet cherry showing interveinal chlorosis.

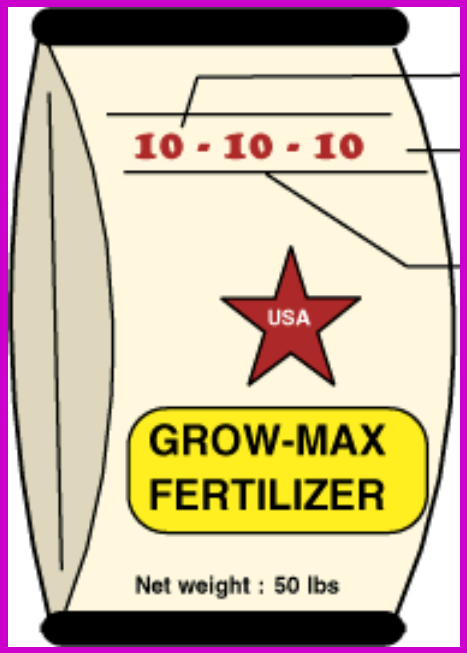
Nutrient Deficiencies

- Zn
- Zn-deficient apple showing "blind wood" where buds on the previous season's wood fail to break or exhibit weak growth.

Nutrient Deficiencies

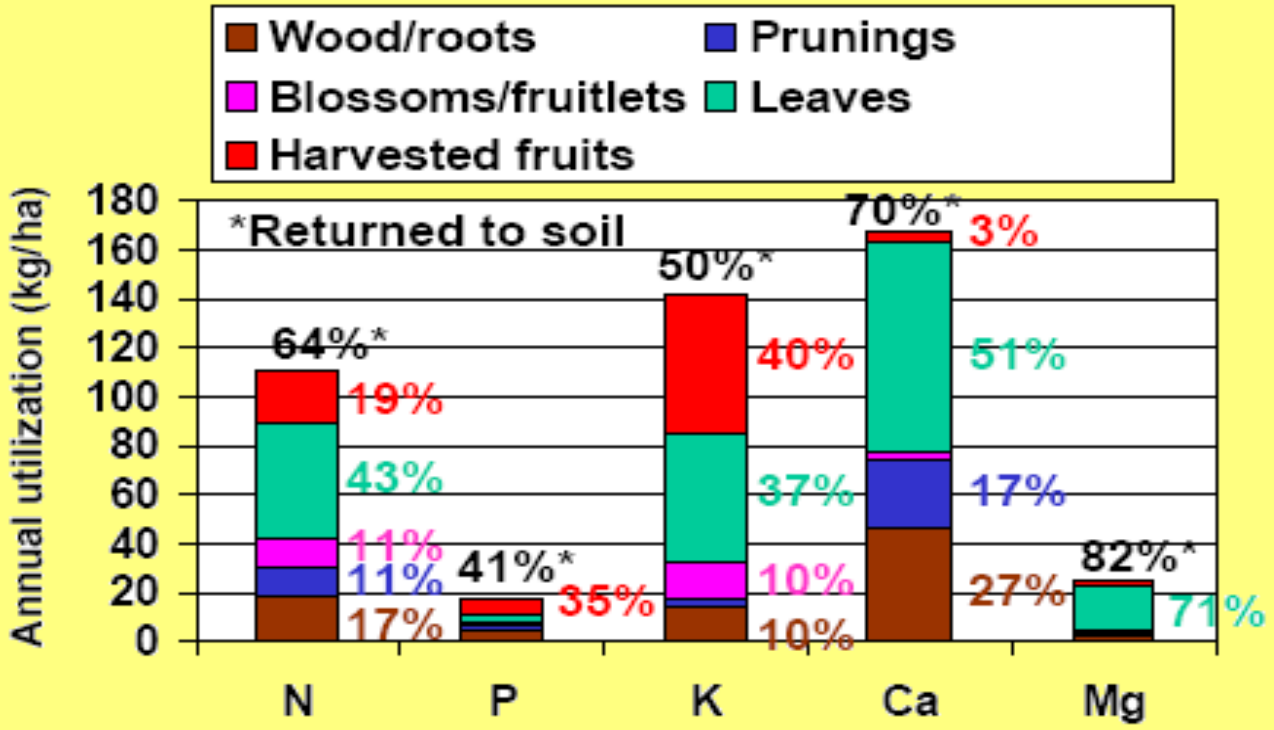
- Zn
- Zn-deficient apple: rosette of growth due to limited extension growth, and small leaves on the previous season's wood.

Fertlizer

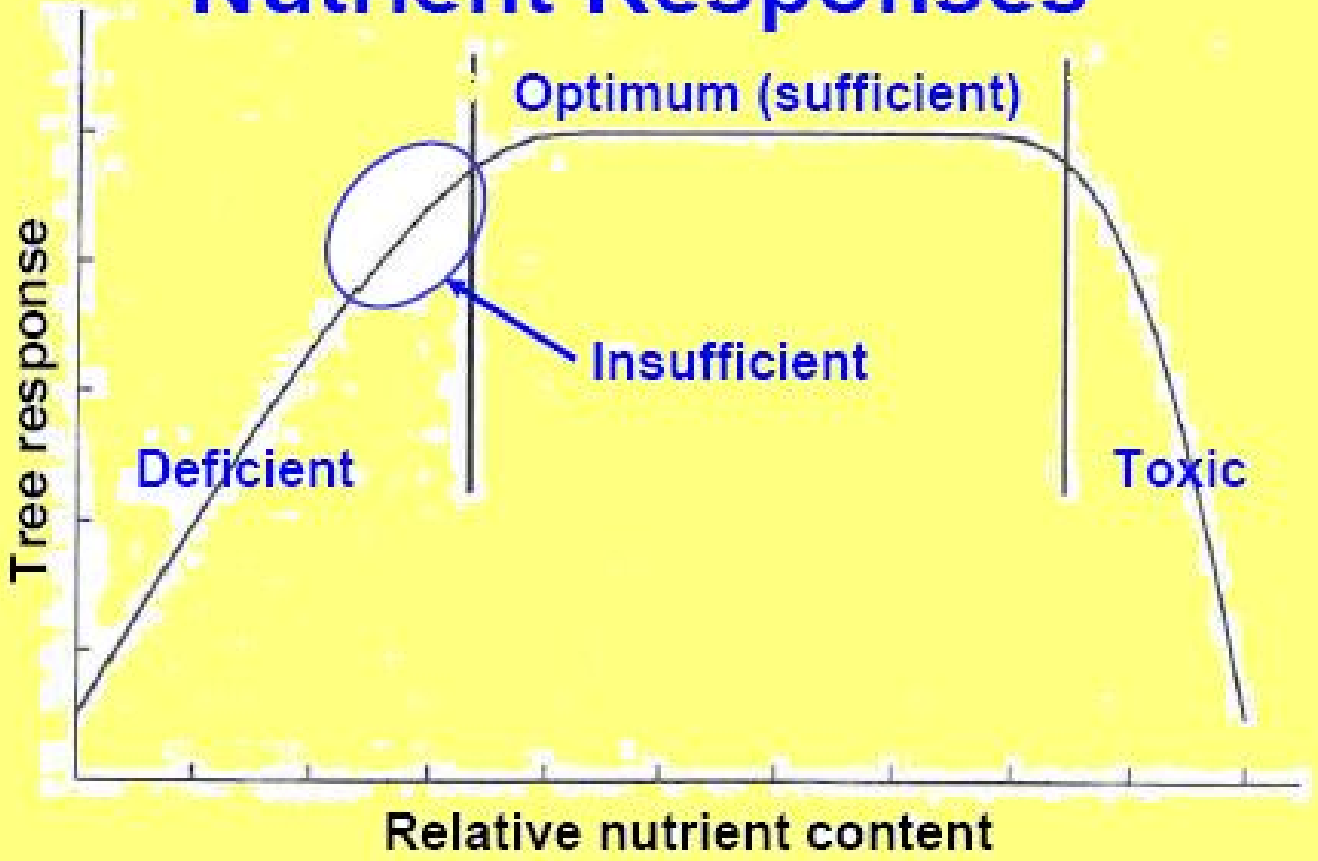


Nutrient Utilization

Mature 'Delicious' orchard



Nutrient Responses



What is fertilizer?

- Any material that supplies one or more of essential nutrients that will increase growth, yield, or nutritional value of the plants and added to the soil or vegetative parts of the plants.

Why do we need fertilizer ?

- Often the soils doesn't hold enough quantities of 16 elements that required for desirable growth and production.
- The nutrients in the soil often used up and need to be replaces,
- Nutrients like nitrogen are easily leached by water and can also be volatilized into the atmosphere.

Fertilizer Classifications

- Fertilizers may be supplied from one or more of the following sources:

1. Inorganic
2. Organic

- Natural Organic
- Synthetic Organic

Inorganic Fertilizer

- Non-living sources (minerals/rocks)
- Chemically made

Characteristics:

- Contain exact amount of any essential element.
- Nutrients in soluble form and quickly available to plants
- Should not come in contact with roots or foliage for long time period

Natural Organic

- Provided from plant or animal residuals

- Characterestics:
- N usually predominant
- Slow acting and long lasting, where nutrients are only made available to the plants as the materials decay in soil.

Natural Organic

- Examples:
- Farmyard manure
- **Aquatic plant extracts (seaweed or kelp)**
- **Liquid fish products**
- **Blood, bone, egg shell & feather meal**
- **Humic acids**
- **Bird guano**
- **Plant extracts**
- **Compost (properly processed)**

Natural Organic

- Elemental sulfur
- • Gypsum & dolomitic lime
- • Sodium nitrate (Chilean) – limited use
- • Rock phosphate
- • Potassium & magnesium sulfate
- • Calcium chloride
- • Micronutrients:
- – Soluble boron
- – Zinc, copper, iron & manganese
- sulfates, carbonates, oxides & silicates

Synthetic Organic Fertilizers

- Materials containing synthetic organic N and readily soluble in water such as Calcium cynamide and urea.

When should I apply my fertilizer ?

- Timing means everything to the efficient of fertilizer.
- As a rule, fertilizer needs to be applied when the plant is actively growing.
- So, nutrients will be available when plants need them.

How much fertilizer do I need to apply ?

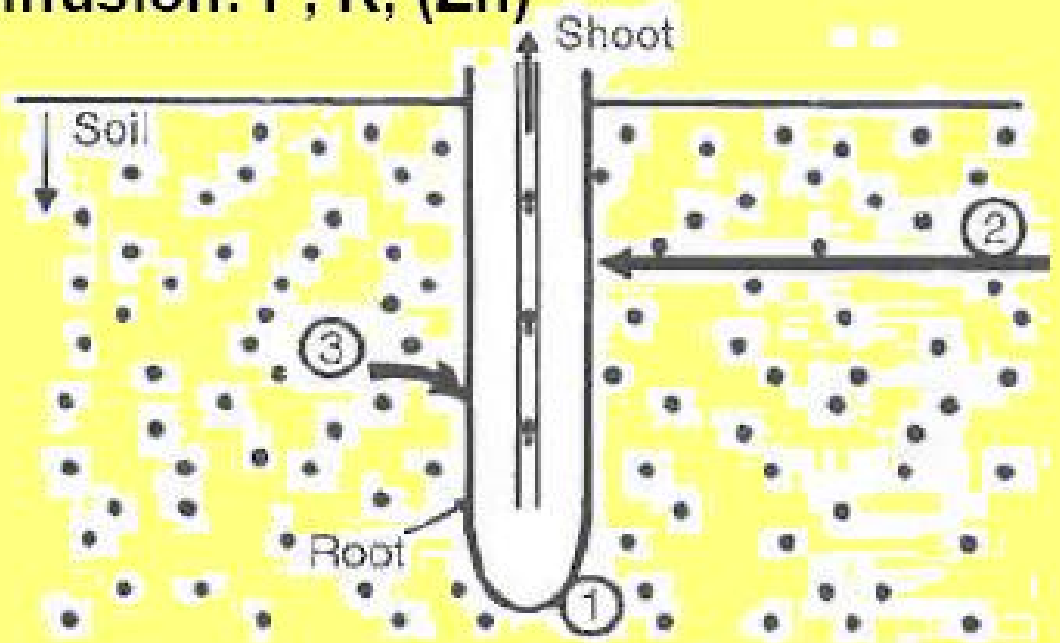
- You will need to know your crop needs as well as the amount of nutrients available in the soil.
- Then apply the amounts of fertilizer that plants need for good growth and yield.

How do I apply my fertilizer ?

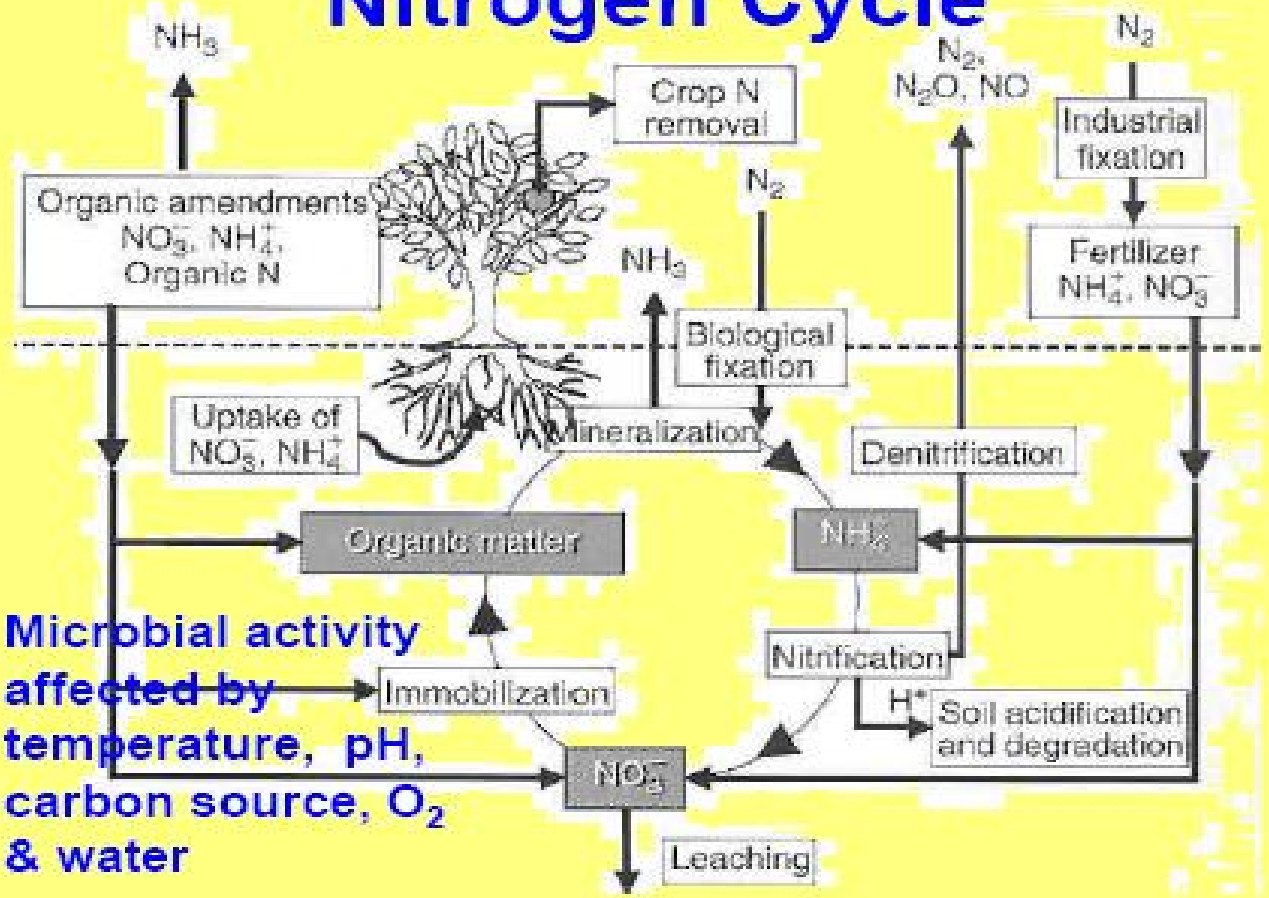
- This depend on the type of fertilizer.
- Granular types can be applied by hand or with spreading equipment.
- Some can dissolved in water, sprayed on the foliage or applied throughout the irrigation system.

Nutrient Pathways to Roots

1. Root interception: Ca, (Zn)
2. Mass flow of water: N, Ca, Mg, S, B, (K), (Zn)
3. Diffusion: P, K, (Zn)



Nitrogen Cycle



Microbial activity affected by temperature, pH, carbon source, O_2 & water

Sources of Info

- Some pictures used in this presentation were found on various internet sites.