Fertilizer

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A Presentation from the American Rose Society

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This program is eligible for one CR credit if pre-approved by the District and National CR Chairs.

Acknowledgements

- All photos by authors, except where credits are given
- Nutrient availability chart used with permission of the author
- An excellent source – *Consulting Rosarian Manua*l, from The American Rose Society
- No commercial use of this program!

Definition of Fertilizer

Webster defines fertilizer as "any material, as manure, chemicals, etc., put on or in the soil to improve the quality or quantity of plant growth".

Plant Elements

Nutrients

As much as 95% of a plant is made of carbon, hydrogen and oxygen. These nutrients are obtained from the air (from carbon dioxide (CO_2), and from water.

Remaining nutrients are obtained from the soil.

Element Components of a Typical Plant

Oxygen	45%
Carbon	44%
Hydrogen	6%
Nitrogen (N)	2%
Potassium (K)	1%
Calcium (Ca)	.6%
Phosphorus (P)	.5%
Sulfur (S)	.4%
Magnesium (Mg)	.3%

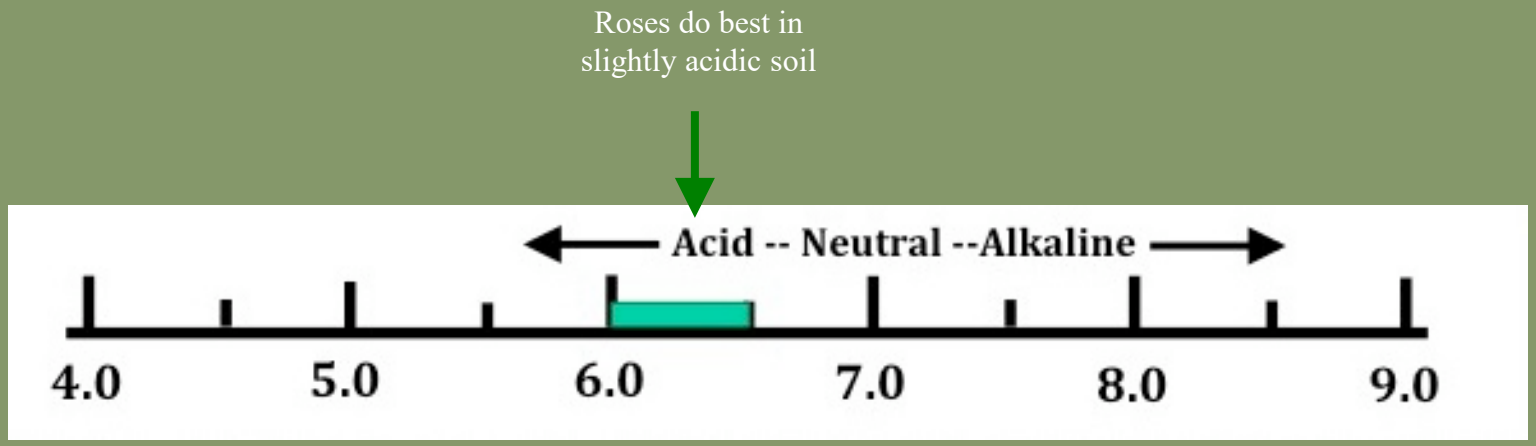
The micronutrients make up the rest – only a very small amount, but…..

C H O P K N S CaFe Mg B Mn CuZn Mo Cl

Soil pH and Roses

- A pH of 7 is neutral, below is acidic, above is alkaline
- Roses will tolerate a wide pH range from 5.5 to 7.8
- Test and adjust the pH if needed, as…..
- *Roses do best in a slightly acidic soil – a pH of 6.0 – 6.5*

Soil pH - Definition



pH is a measure of the acidity or alkalinity

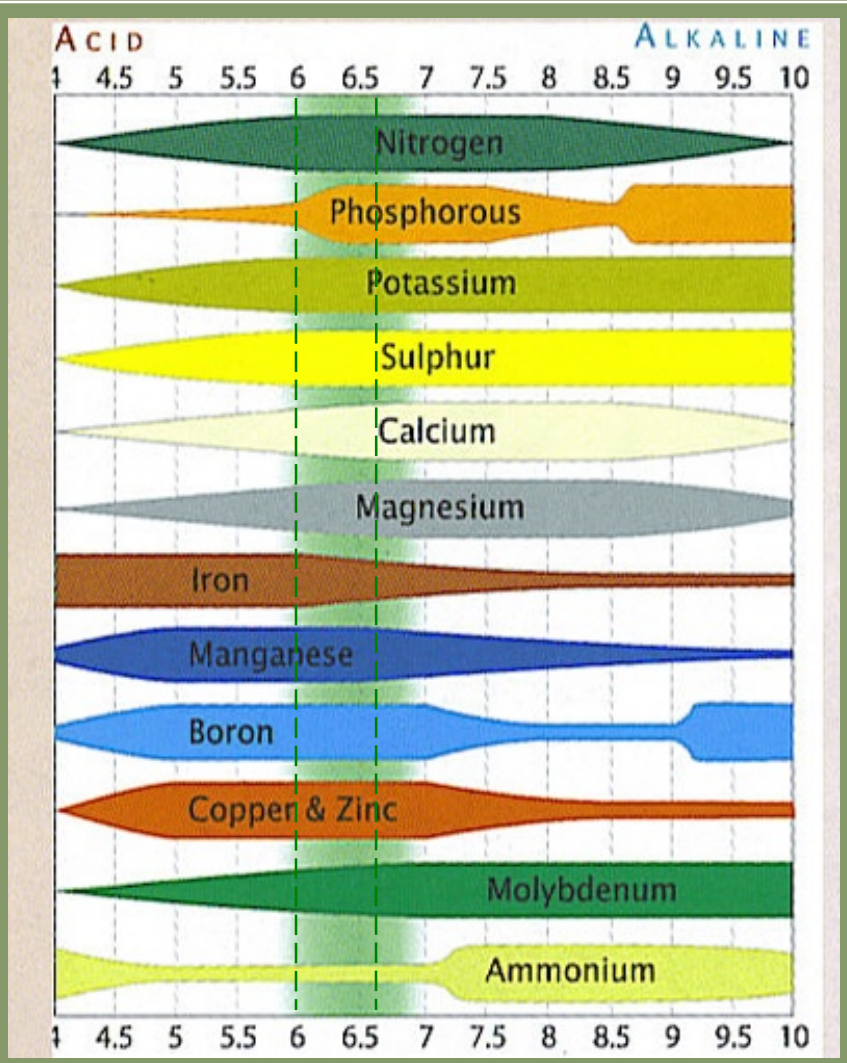
This is a logarithmic scale based on the "powers of ten"

A pH 5.0 is 10 times more acidic than a pH of 6.0

And a pH of 5.0 is 100 times more acidic than a pH of 7.0

Almost all fertilizers (both chemical and organic) tend to make the soil more acidic!

Nutrient Availability vs. Soil pH



Graph used with permission from Hobart Kitchen Gardens

How To Keep pH Correct

If soil is acidic

- Add lime to increase pH
- But it takes time to change the pH - do it in winter!
- Use soil test to determine level of magnesium for type of limestone to add
  - If sufficient, use calcitic
  - If low, use dolomitic

If soil is alkaline

- Add compost, peat or organics to slightly lower pH
- A slow and usually continuous process
- Add sulfur for a quicker lowering

All fertilizers list the NPK ratio!

Represents the %, by weight, of each element

N-Nitrogen

P - Phosphorus

K - Potassium

N - Nitrogen

- Fuels growth of plant
- Gives plant tall, strong canes
- Healthy plant has rich, dark green foliage
- Lacking? – foliage is very light green to almost yellow
- Too much? - not good either – you can really "burn" a plant, weak canes, small blooms

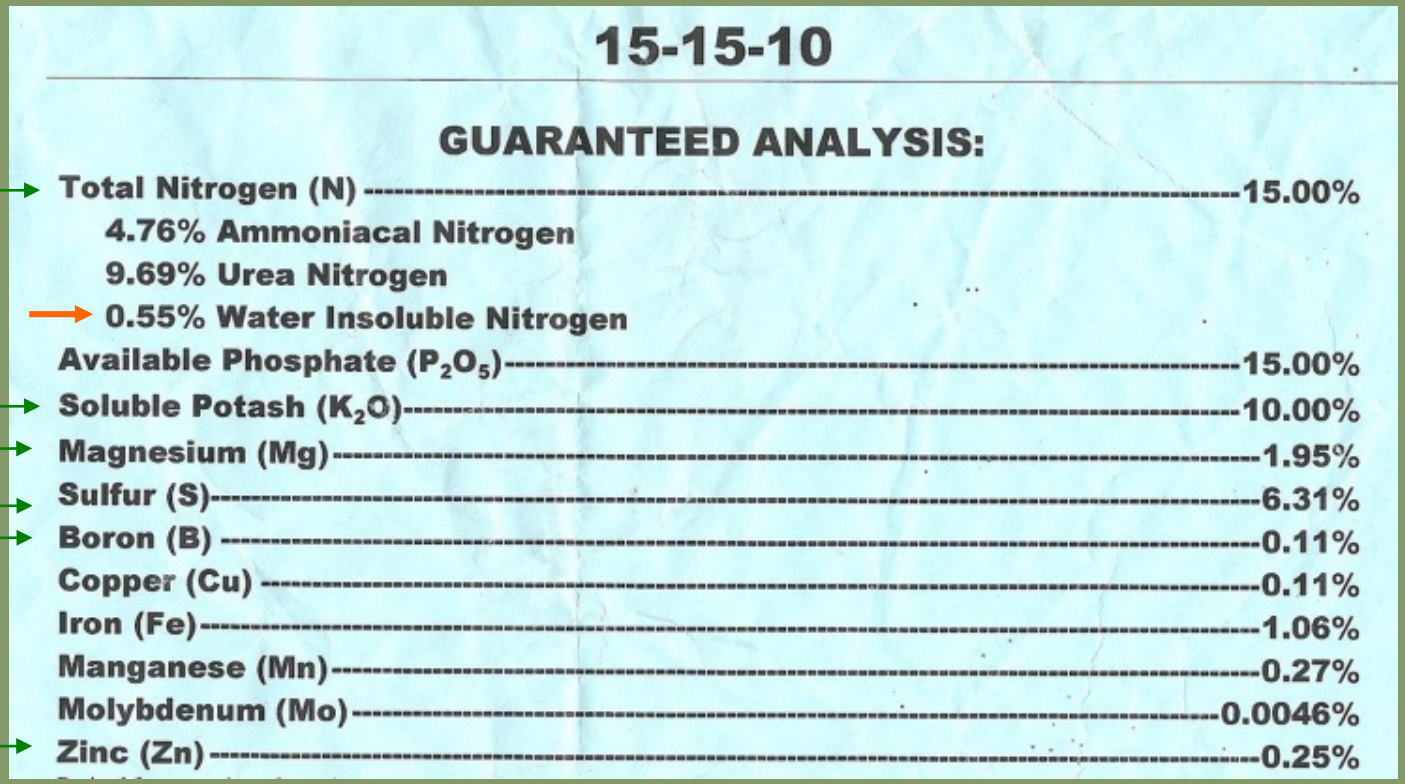
P - Phosphorus

- Stimulates root growth – grow "down"
  - Helps produce a quality plant with big blooms
- May hasten plant maturity, and aid in winter hardiness
- Can get "locked up" in very acidic soils
  - Moves slow – about an inch per year
  - Newly planted roses need it at roots – many rosarians add super phosphate (0-45-0)

K - Potassium

- Promotes all around growth, vigor and bloom color
- Essential in development of chlorophyll by encouraging photosynthesis
- Aids in moving nutrients thru the plant
- Moves very quickly thru the soil – need to replenish on regular basis

Fertilizer Bag Label



The Big 3 NPK

Secondary Nutrients

Micro nutrients

Secondary Macronutrients

- Ca - Calcium - holds cell walls together, makes a sturdier plant
- Mg - Magnesium – very essential part of chlorophyll production for greener, healthy plants. Helps regulate uptake of nutrients
- S - Sulfur - used in development of proteins needed for plant health. Also lowers pH

Minor Micronutrients

- Often referred to as ‘trace’ elements
- Only small amounts are needed in the diet of a rose, but …..
- A lack of one or more may cause a serious decrease in availability of major elements

The Micronutrients

- Fe – Iron
  - Aids in chlorophyll formation and sugar burning enzymes
- Mn – Manganese
  - Aids chlorophyll formation
  - Helps in photosynthesis
- Zn – Zinc
  - Stimulates stem growth and flower formation

The Micronutrients (cont.)

- B – Boron
  - Controls starch formation
  - Stimulates cell division and flower formation
- Cu – Copper
  - Stimulates stem development
- Mo – Molybdenum
  - Needed to make amino acid to stimulate plant growth and vigor

Basic Forms of Fertilizer

- Granular – designed to be scratched into soil, may also be water soluble
- Powdered – designed to be dissolved in water for liquid feeding to soil or foliage
- Liquid – usually a concentrated form to be mixed with water
- Solid – usually ‘spikes’ to push into soil around plant, very slow to dissolve

Types of Fertilizers

Fertilizers are broadly divided into:

Organic

- Includes those which come from once-living organisms. All organic fertilizers tend to have in common:
  - Be very low in nutrient content
  - Be in a slow release form, needing warm soil to do so
  - Have high levels of carbon
  - Slowly adds to level of humus in soil

Chemical (Inorganic)

- Can be in granular, liquid, powdered or solid form, are composed of synthetic chemicals and/or minerals:
  - In general, all chemical fertilizers are salts, which can interfere with water availability to the roots, if too much builds up in the soil
  - Elements are quick acting and readily available

Plants can't tell the difference between chemical and organic!

Commonly Used Organic Materials

- Cottonseed Meal – good for use in high pH soil, as acidic action tends to lower pH while providing nutrients
- Blood Meal – rich in nitrogen, it may do harm if used in excess. Also supplies some essential trace elements, including iron
- Bone meal - slow acting release of phosphorus
- Alfalfa Meal – contains trianconatol, a natural growth stimulant, can be mixed in the soil or used as a tea
- Compost - boosts the level of organic matter and the overall fertility of the soil

A Few More Common Organics

- Fish emulsion – a good source of nitrogen and several trace elements. A strong solution CAN burn plants, particularly in containers
- Mushroom compost – a good slow-release fertilizer when mixed into soil, or as a mulch. It has an NPK ratio of 2-1-1 and a pH of 6.8
- Seaweed or kelp extracts – good source of trace elements
- Manure – a complete fertilizer, but low in amounts it can supply - best aged as fresh manure can burn tender roots, and can also harbor bacteria harmful to humans
- Treated sewage biosolids – general purpose, long lasting, non-burning, but may contain heavy metals that can be toxic in the soil

Another Type of Fertilizer

- Slow release -- of nutrients over a period of time, from immediate up to 9 months
- Works in conjunction with processes in the soil
- Can be activated by temperature, moisture, bacterial activity in the soil, or pH depending on the type of coating used
- Major advantage – reduce chances of fertilizer burn
- Cautions –
  - Timing - plant growth may go late in fall
  - Too much water - nutrients released too fast

Forms of Nitrogen

- Nitrate Nitrogen (NO_3)
  - Most available and fastest acting - w/o any change in the soil
- Ammoniacal (NH_4)
  - Slightly available - must be changed in soil to nitrate form for plant uptake
- Urea ($(NH_2)2CO$)
  - Slowest available – must undergo major soil action
- Nitrite (NO_2)
  - Rarely used – too expensive

Frequently Observed Nutrient Imbalances

- Nitrogen Deficiency
  - Leaves show a pale yellow-green color, plant is stunted with smaller stems
- Oxygen Deficiency
  - Symptoms similar to nitrogen deficiency, but adding nitrogen will not correct problem
  - Probably due to over watering or poor drainage Leaf veins show a yellowing, followed by inter-veinal yellowing

Nutrient Imbalances (cont.)

- Iron Deficiency
  - Opposite look of oxygen deficiency. Areas between veins shows yellowing, while veins remain green
- Leaf Burn
  - Edges turn brown from lack of water – over fertilizing, heat stress, spray burn, etc.

Symptoms of Nutrient Deficiencies

- Many are problems of availability, not supply!
- Nutrients may be present in the soil, but are unavailable because of the pH range
- Generally, micronutrient deficiencies are rarely seen

Symptoms of Nutrient Deficiencies (cont.)

- Affecting mature (older) leaves first
  - Nitrogen, Magnesium, Phosphorus & Potassium
- Affecting younger plant parts first
  - Iron, Manganese, Boron, Copper, Calcium, Zinc & Molybdenum
- Where observed – older/new leaves? younger plant parts?
- Use available resources, e.g., internet, CR manual, etc., to identify the symptoms, confirm the diagnosis – then treat!

Some Do's and Don'ts

- Test your soil – If the pH is way out of the 6.0 – 6.5 range, important nutrients in the soil may be unavailable to the plant
- Soil must warm before using chemical fertilizers to activate the microorganisms that break it down, or it just leaches into the soil and can get into water sources
- Constant use of chemical fertilizers without adding organic material can deteriorate the soil structure and its overall health
- Feed often, but don't overdo it – every 4-6 weeks is adequate. Be conservative in what you add – more is NOT always better!
- Water deep before and after fertilizing – a MUST! Helps dilute so as not to burn, plus helps move nutrients to root zone

Hi-Tech Applicator & Spreader

A Memory Aid

N-Nitrogen

P - Phosphorus

K – Potassium (Potash)

Remember the phrase
Up – Down – All Around

1st Number – Up
2nd Number – Down
3rd Number – All around

- Up: Nitrogen promotes growth above the ground
- Down: Phosphorous promotes good, healthy roots
- All around: Potassium benefits the whole plant

Questions?

Thank you

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