Turfgrass Fertility

Clint Waltz, Ph.D.
Associate Professor
The University of Georgia

Soil Test Reports
Interpretation & Understanding

Why Soil Sample?

Information
- Chemical way of estimating the nutrients available to the plant (i.e., a starting point for plant growth).
- Nutritional Needs & Soil Chemistry
  - Tool for making management decisions
- Environmental Protection
  - Phosphorus & Nitrate (NO₃⁻) – separate analysis
Why do we fertilize turf?

**Basic Reasons**

- **Color**
  - We are in a quality business – it must look good

- **Growth & Recovery**
  - Divots, wear and tear, surface interaction (play)
  - Yields are not important

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**UGA Soil Test Report**

**Information**

- County Extension Office
  - Collect & submit
  - Interpret & modifications

- Direct to Ag. Services Lab
  - www.SoilTest123.com
  - Sampling instructions
  - Soil Test Kit

**Components**

- **Results**
  - Nutrients – P, K, Ca, Mg, & Zn
  - Relative sufficiency
  - pH – soil acidity

- **Recommendations**
  - Guide
  - Not instructions
Soil Test Report - Other

Other Information

★ Nutrients
  ✓ Na, Fe, Mn, S, Cu, & B
  ✓ NO₃-N

★ Soil Properties
  ✓ CEC, Base Saturation
    & Acidity
  ✓ EC & Soluble Salts
  ✓ OM

Soil Test - Example

Good Report or Bad

★ pH
  ✓ High – especially for SA
    ✓ Ca & Mg indicators

★ Phosphorus
  ✓ Over applied
  ✓ Not needed this season

★ Potassium
  ✓ Needed

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Purchasing a Fertilizer

Considerations

- **Price**
  - Know what’s in it!

- **Analysis or Grade**
  - % N, P₂O₅ & K₂O

- **Type of Nitrogen**
  - Soluble / fast release
  - Slow release

Analysis, Ratios, & Rates

What’s the Difference

- **Analysis**
  - % N, P₂O₅ & K₂O
  - 16-4-8

- **Ratio**
  - relative amount of N, P & K fertilizer product
  - Helps evaluate a fertilizer product for specific plant demands & soil characteristics
  - 4:1:2

- **Rate**
  - Amount of fertilizer applied over a given area
  - 1 lb N / 1000 ft²
  - More important than the fertilizer analysis or grade
Soil Acidity (pH)

pH

Two Tests
* pH
  ? Need
* Lime Buffer Capacity
  ✓ Adams-Evans Buffer
  ? How much

Adjusting pH (5.5 to 6.5)
* Lime
  ✓ increase pH
* Sulfur & some Fertilizers
  ✓ lowers pH
  ✓ NH₄⁺
  ✓ Urea
**pH - Lime**
- Slowly soluble
- Raise pH
- Pelletized & powdered
- Calcitic – calcium carbonate
  - calcium carbonate (CaCO$_3$)
- Dolomitic
  - calcium-magnesium carbonate (CaMg(CO$_3$)$_2$)

**PH - Turfgrasses**

**Turfgrass Species**
- **5.0 to 5.5**
  - Bahiagrass
- **5.0 to 6.0**
  - Centipedegrass

**Turfgrass Species**
- **5.5 to 6.5**
  - Bermudagrass
  - Centipedegrass - establishment
  - St. Augustinegrass
  - Seashore Paspalum
  - Tall Fescue
  - Kentucky Bluegrass
- **6.0 to 7.0** – Zoysiagrass
Relative Nutrient Availability at Varying Soil pH Values

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Nitrogen (N)

Role in the plant

- Synthesis of proteins & chlorophyll
  - DNA & RNA
  - Protein composes 85% of N in plants
- Needed for growth of all plant parts
- Mobile
  - from old to young growing regions

Courtesy of Dr. Tom Samples – Univ. of Tennessee
**Nitrogen (N)**

**In Soil**
- Increases – U.S.
  - From south to north
  - From east to west
  - Result of temperatures & soil water
- Surface has greatest N concentration
  - Aeration & microbial activity
  - Upper 3 to 10 inches

**Timing N Fertilization**

**Warm-season Grasses**
- Soil Temperatures
  - Active root growth & activity
  - 65°F
  - Consistently – multiple days
  - 4-inch depth
- [www.GeorgiaWeather.net](http://www.GeorgiaWeather.net)
- Combination products

**Is now a good time to fertilize?**

- **Nitrogen**
  - Let soil temps guide
- **Phosphorus & Potassium**
  - Soil test
  - Potassium (K) good carrier
    - preemergence herbicide
    - insecticide
Cultural Practices

Fertilization

- When - soil test
- What to use – Soil Test
- How Much - rarely exceed 1 lb N per 1000 ft²
- Application - uniform (2 directions)

Adverse Affects

High N Fertilization

- Succulence or Juiciness of Vegetation
  - Increased proportion of water w/in cells
- Thinner cell walls
- Promotion of protein synthesis
  - expense of carbohydrate synthesis & accumulation

Adverse Affects

High N Fertilization

- Susceptibility to pests
  - diseases – Brown Patch, SDS, etc.
  - insects – sap suckers
  - thin cell walls
- Susceptibility to environmental stresses
  - drought
Available Sources of N

Plants use inorganic N

- Nitrate (NO$_3^-$)
  - easily leached
- Ammonium (NH$_4^+$)
  - converted to NO$_3^-$ in soil – nitrification
  - Nitrification – rapid in warm, aerated soils
  - lowers soil pH

Origins of N

Organic

- Natural Organics
  - thatch / crop residue
  - sewage sludge
  - poultry feather meal
  - bone meal blood
  - manure

Organic N

Benefits

- low turf burn potential
- uniform N release
- little effect on soil pH
- low leaching losses
Organic N

Suggested Benefits

✓ may enhance plant metabolism & disease resistance
✓ contain sulfur, iron, & trace elements

Organic N

Disadvantages

✗ low N content
✓ 1 to 8%
✓ $$/per pound of nutrient
✗ low N release cool weather
✓ microbe dependent
✓ temperature mediated

Organic N

Disadvantages (cont.)

✗ objectionable odor
✗ salts, heavy metals, weed seeds
✗ increased insect populations
✓ black turfgrass ataenius
Origins of N

**Synthetic Organics**

- water soluble
- urea → NH₄⁺
  - rapid release
- urea formaldehyde
  - slowly soluble
- isobutylidene diurea (IBDU)
  - temp dependent

**Inorganic**

- ammonium nitrate
- ammonium sulfate
- calcium nitrate
- potassium nitrate
- nitrate of soda

**Phosphorus (P)**
**Fertilization**

**Phosphorus (P₂O₅)**
- Reported in oxide form
- 43% P
- Slowly soluble
- Super Phosphate (0-18-0)
- Triple Super (0-45-0)
- Promotes Rooting
- Till into soil

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**Phosphorus Fertility**

**Phosphorus (P)**
- Granular P ferts. are 90 to 100% water-soluble
- Dissolve rapidly in moist soil
- Hydrolysis of water-soluble P increase when temps. increased from 41° F to 95° F
- At field capacity, 50 – 80% water-soluble P will move out of granular in 24 hours; 20 – 50% at 2 – 4% soil moisture.

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**Phosphorus (P)**

**Role in the plant**
- Nucleic acids & nuclei of plant cells
  - DNA & RNA
- Energy
  - ATP – adenosine triphosphate
  - Other P containing components
- Location – growing points / tips
**Phosphorus (P)**

**Forms & Sources**
- Absorbed by plants
  - Phosphate - $\text{H}_2\text{PO}_4^-$ & $\text{HPO}_4^{2-}$
- Sources
  - Natural - superphosphate
  - Organic – e.g. bone meal
  - Chemical – ammoniated phosphate

**Considerations**
- Relatively immobile in soils
- Effect on soil pH
  - Ammoniated phosphates lower soil pH
  - Superphosphate (SP) & triple SP increase soil pH
- Environmental hazards
  - Water quality – algal bloom
  - Soil test for need

**Proper Fertilizer Usage**

**Common Sense**
- Proper rate
- Application (sidewalks)
- Calibration
- Timing
Potassium (K)

Fertilization

Potassium (K₂O)
- 83% K
- “Health” element
- Promotes Rooting
- Stress preconditioning
- Till into soil
- N:K (2:1)
- Part of last application (1:1)

Potassium (K)

Role in the plant
- Maintaining plant’s water status
  - cellular turgor pressure
  - opening & closing of stomata
  - osmotic pressure for water to enter roots
- Enzyme activation
  - associate with >60 enzymes
Potassium (K)

Mobility

 ikea Soil
✓ readily leached
✓ commonly low to deficient in Georgia soils

 IKEA Plant
✓ translocated to young meristematic tissue
✓ interveinal yellowing of older leaves
✓ root entrance competition with K⁺, Ca⁺² & Mg⁺²

Potassium (K)

Forms & Sources

IKEA Absorbed by plants
✓ Ion form – K⁺
✓ From the soil solution

IKEA Sources
✓ Muriate of potash – potassium chloride (KCl)
✓ 1° K-containing fertilizer
✓ Sulfate of potash – potassium sulfate (K₂SO₄)
✓ Saltpeter – potassium nitrate (KNO₃)

Turfgrass Management App

For Sale Application

IKEA iTunes – iPhone & iPod Touch
IKEA BlackBerry

www.GeorgiaTurf.com
Important Dates in 2010

UGA Turfgrass Field Day – August 4
Turfgrass Institute – Dec. 8 & 9
For other local programs contact your CEA

Thank You

Visit
www.Georgiaturf.com