Pasture Fertilization

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PASTURE FERTILIZATON

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TYPICAL AGRICULTURAL FLORIDA SOIL

1. **ENTISOLS, SPODOSOLS, ULTISOLS**
2. **84% SANDS**
3. **87% CONTAIN < 1% OM**
4. **MEDIAN pH OF 5.8, < 2% pH > 8 OR < 4**
5. **62% LOW IN K**
6. **55% HIGH IN P**
7. **MEDIAN CA AND MG, 780 AND 106 KG/HA**

TYPICAL PASTURE FLATWOODS SOIL

MYAKKA, POMONA, POMPANO, TAVARES

96% Sand, 2.5% Silt and 1.5% Clay

Spodic Horizon (Organic Hardpan) 18 -36 in

pH 4.0 – 4.9; CEC 2 – 4;

Extractable P and K - Low

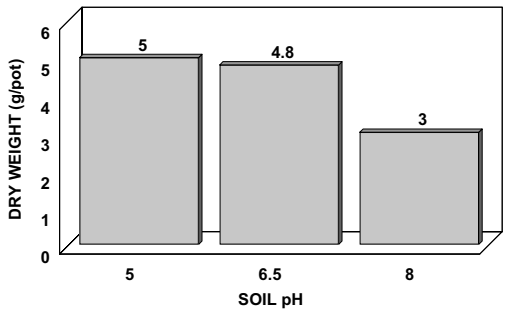
Drainage - Poor to Moderate

PERFERRED SOIL pH FOR MOST PASTURE GRASSES

ACIDIC TO SLIGHTLY ACIDIC

pH 5.0 to 6.5

EFFECT OF pH ON BERMUDA GROWTH

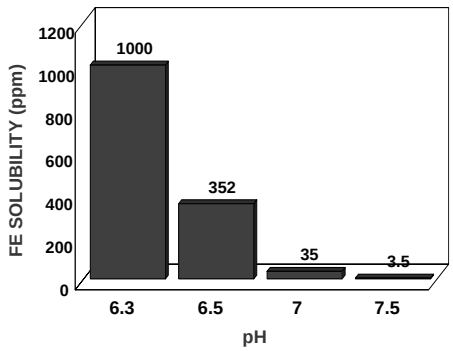


EFFECT OF SOIL pH ON MICRONUTRIENTS

SOLUBILITY OF FE, MN, CU, ZN, AND B *DECREASES* WITH INCREASING pH

SOLUBILITY OF MO *INCREASES* WITH INCREASING pH

SOLUBILITY OF IRON RELATIVE TO pH



NITROGEN

MOST HEAVILY USED NUTRIENT SOURCE

AFFECTS GROWTH RATE AND COLOR

CAN BE EASILY MISUSED

FATE OF NITROGEN

TAKEN UP BY GRASS	40-70%
LOST TO VOLATILIZATION	0-60%
LOST TO LEACHING	0-50%
LOST TO RUNOFF	0-20%

NITROGEN RECOMMENDATIONS

NOT BASED ON SOIL TEST

MOST SOIL N SOURCES LEACH RAPIDLY IN ACID SAND SOILS

N FERTILIZATION BASED ON GRASS REQUIREMENT, INTENSITY OF MANAGEMENT, AND DESIRED GROWTH RATE AND QUALITY

NITROGEN ANALYSIS

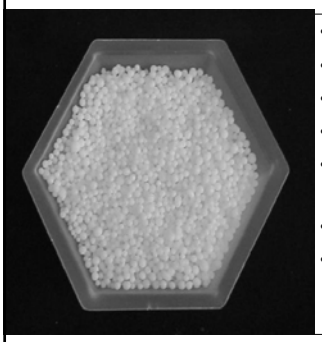
TISSUE ANALYSIS - TOTAL KJELDAHL N

BAHIA TISSUE N LEVELS:

< 1.8 % LOW
1.8 – 2.5 % SUFFICIENT
> 2.5 % HIGH

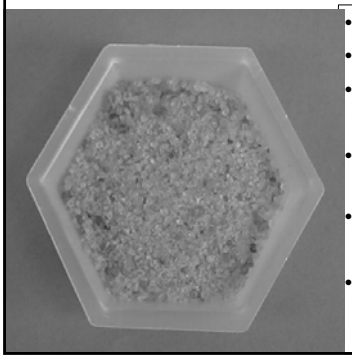
RECOMMENDATIONS BASED ON %N, DESIRED GROWTH RATE AND QUALITY

Ammonium Nitrate



- 34% N
- Very soluble
- Highly leachable
- Subject to volatilization
- Low acidity
  - 1.8kg acid/kg
- High salt index -2.99
- Can be explosive

Ammonium Sulfate



- 21% N $(NH_4)_2SO_4$
- Soluble and leachable
- Subject to volatilizatio
  on high pH soils
- Very acidifying - 5.35 k
  acidity/kg N
- Use most of the time
  advantageous on bahi
- High salt index - 3.25
  may burn.

Contains both N and S

ACIDITY AND ALKALINITY PRODUCED BY N SOURCES

N SOURCE	N (%)	CAL. EQUIV*
AS	21	535
NH3	82	180
AN	33.5	180
Ca(NO3)2	15	135B
NaNO3	16	180B
KNO3	13	200B
UREA	46	180

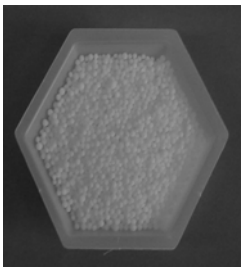
* POUNDS OF CALCIUM CARBONATE NEEDED TO NEUTRALIZE THE ACIDITY FORMED FROM 100 POUNDS OF N.

NITROGEN SOURCE RELATED TO FE AND MN LEVELS

NITROGEN SOURCE	SOIL pH	TISSUE (ppm) FE	MN
NH4Cl	6.8	155	32
NH4NO3	7.0	160	12
NaNO3	7.5	140	10
$(NH4)_2SO4$	6.0	180	74
Ca(NO3)2	7.2	140	8

Nitrogen Fertilizer Sources

Urea



- 46% N
- Soluble Synthetic Organic
- Nonionic, highly leachable
- Highly Subject to volatilization
- Low acidity - 1.8/kg N
- Low salt index - 1.62

Reactions of Urea in Soils

$$(NH_2)_2\,CO + 2H_2O \xrightarrow{\text{Urease}} (NH_4)_2CO_3$$

$$(NH_4)_2\,CO_3 \xrightarrow{\text{Heat}} 2NH_3\uparrow + CO_2 + H_2O$$

If urea is applied to the surface as much as 40% of the applied N may be lost by volatilization.

VOLATILE LOSS OF NH3 FOLLOWING SURFACE APPLICATION OF LIME AND NITROGEN TO A BAHIAGRASS SOD ON A LEON F.S. pH 5.8

N SOURCE	NO LIME	1 TON 4 M PRIOR
AS	0.5 %	19.7%
UREA	29%	36%
AN	0.3%	3.4%

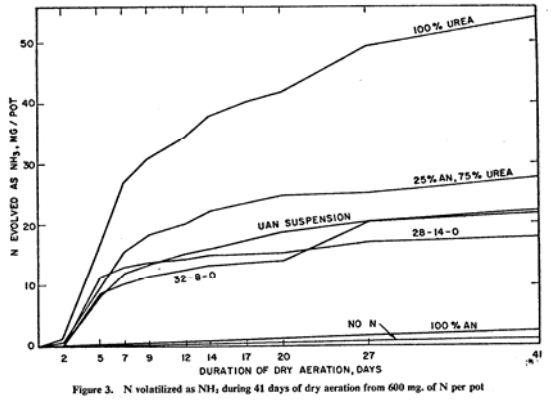


Figure 3. N volatilized as NH_3 during 41 days of dry aeration from 600 mg. of N per pot

Nitrogen Solution Fertilizers

Non-Pressure Solutions

1. URAN 28, 30 or 32 % N
   - **Urea-NH_4NO_3 solution, most common N solution, specially in Florida**
   - **Salt-out temp = 32º F**
   - **Can be either surface or foliage applied.**
2. FERAN 21 % N
   - **NH_4NO_3 dissolved in water.**
   - **Salt out at 58 º F**
3. SODAN 20 % N
   - **NH_4NO_3 and NaNO3 dissolved in water**
   - **Used more in tropical areas, salt-out at 58 º F**

NON-PRESSURE N SOLUTIONS

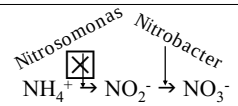
4. 10-34-0 AND 11-37-0

   MADE BY REACTING ANHYDROUS AMMONIA AND PHOSPHORIC ACID IN A PIPE REACTOR

   USED AS A BASE SOLUTION TO MAKE OTHER COMPLETE MIX SOLUTIONS

   IF MADE USING SUPERPHOSPHORIC ACID POLY ACID CONTENT ENABLES THE FORMULATION OF HIGHER ANALYSIS SOLUTIONS.

Nitrification Inhibitors



- Nitrate is leached easier than ammonium-N
- Fall application for plant uptake in the next growing season (mid-western)
- Some nitrification inhibitors include:
  - **Nitrapyrin (N-Serve)**
  - **Dicyandiamide (DCD)**
  - **NBPT((N(N-butyl)-triphosphoric triamide)**

STABALIZED N SOURCES

UMAXX AND UFLEXX
UREA WITH NBPT AND DCD ADDED
NBPT INHIBITS UREASE
DCD INHIBITS NITRIFICATION

ADVANTAGES
1. **MORE ECONOMICAL THAN MOST SLOW-RELEASE N SOURCES**
2. **DON'T VOLATILIZE AS MUCH N AS UNSTABALIZED UREA**

Fertilization Management for Bahiagrass Pastures

High-N Option
160 # N **P and K at Recommended Rates**
Above Average Production

Medium-N Option
100 # N **Soil test Low P - Apply 25 lbs P_2O_5**
Soil test Low K - Apply 50 lbs K_2O
If Hay Produced Apply an additional 80 lbs N

Low -N Option - Grazed Pastures
50 # N **No P or K applied**
If this practice is followed more than one year soil test and apply P and K every third or fourth year.

If the pasture is used for Sod production P and K will have to be applied according to soil test for proper root and mat production for lifting

Fertilization Management for Improved Perennial Warm-Season Grasses

(Bermuda, Star, Limpo and Digit)

Grazed Established Stand - 160 # N
40 # P_2O_5 & K_2O

If Intensively Grazed Bermuda or Star may use 200 # N

PHOSPHORUS NUTRITION

PLANTS NEED P FOR:

- **PHOTOSYNTHESIS**
- **ENERGY TRANSFER AND STORAGE**
- **ROOT GROWTH**
- **MOST RESPONSE DURING EARLY GROWTH STAGES**

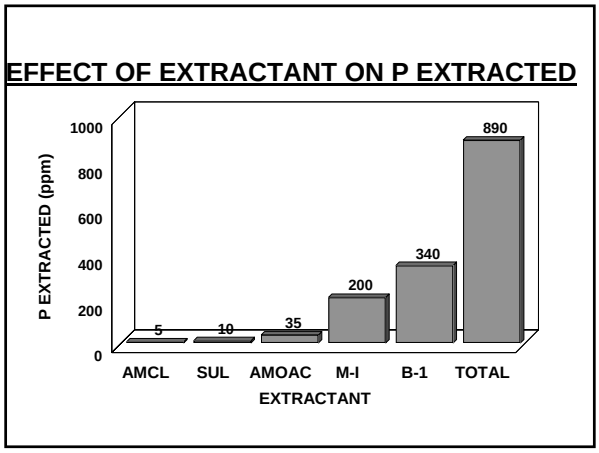
PHOSPHORUS ANALYSIS

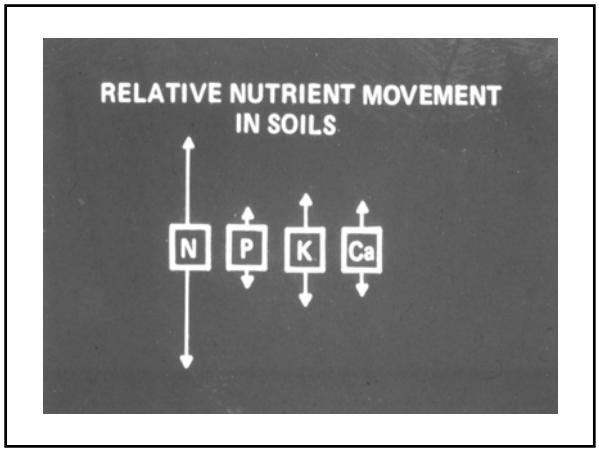
SOIL ANALYSIS - MEHLICH I EXT. P NON-LEACHABLE IN MOST SOILS - BUT LEACHES IN SAND SOILS
< 15 PPM P LOW
- MEHLICH I DISSOLVES P NOT AVAILABLE TO PLANT
- CORRELATED WITH PLANT GROWTH

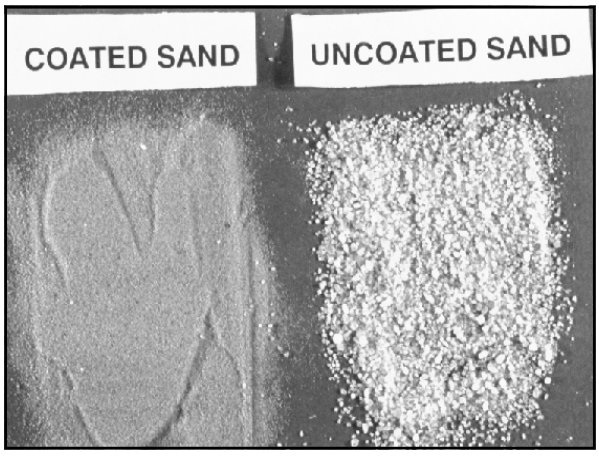
PHOSPHORUS ANALYSIS

RECOMMENATIONS BASED ON:

- **SOIL TEST P AS CORRELATED WITH ANTICIPATED GROWTH RESPONSE**
- **TISSUE P CONCENTRATION CORRELATED WITH SOIL TEST LEVEL, GROWTH AND QUALITY RESPONSE**


EFFECT OF EXTRACTANT ON P EXTRACTED
P EXTRACTED (ppm)
1000
800
600
400
200
0
5
10
35
200
340
890
AMCL
SUL
AMOAC
M-I
B-1
TOTAL
EXTRACTANT


RELATIVE NUTRIENT MOVEMENT IN SOILS
N
P
K
Ca


COATED SAND
UNCOATED SAND

Phosphorus Retention by a Leon fine sand as affected by liming.

Ca applied as $CaCO_3$	Soil pH	P Retained
lbs/Acre		
0	4.6	55
400	5.6	58
1600	6.5	71
2800	7.0	89

POTASSIUM USE IN PLANTS:

1) VITAL IN PHOTOSYNTHESIS
2) IMPROVES WATER USE EFFICIENCY
3) PROMOTES ROOTING
4) IMPROVES TOLERANCE TO DISEASE AND STRESS

POTASSIUM ANALYSIS

SOIL ANALYSIS - ***MEHLICH I EXT.***
K HIGHLY MOBILE IN SAND SOILS OF LOW OM ANALYZE FREQUENTLY

- < 35 PPM K LOW

POTASSIUM ANALYSIS

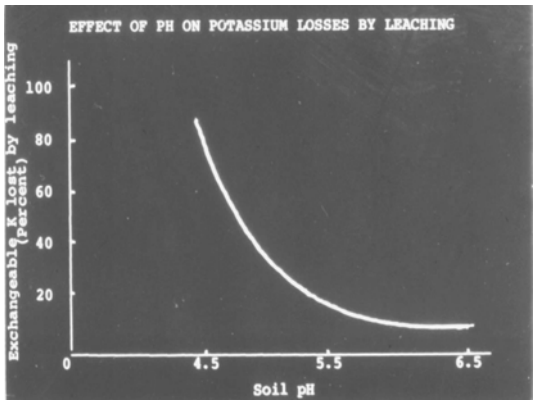
RECOMMENDATIONS BASED ON:

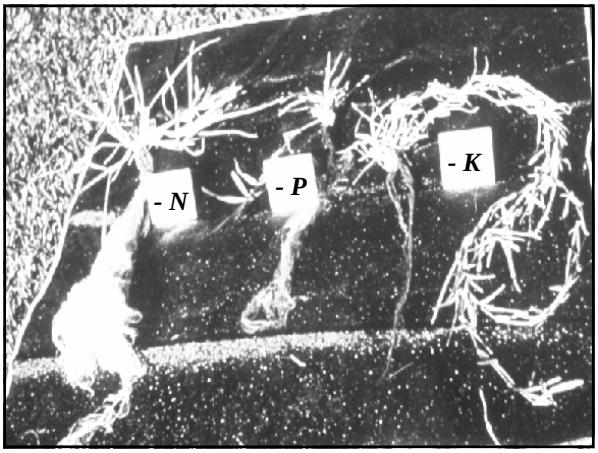
SOIL TEST LEVELS AS CORRELATED WITH ANTICIPATED RESPONSE

TISSUE K LEVELS AS CORRELATED WITH GROWTH AND QUALITY RESPONSE.

SOIL POTASSIUM

* **K LEACHES RAPIDLY IN SAND SOILS**
* **K TYPICALLY LOW IN FLORIDA SOILS**
* **RESPONSE TO K FERTILIZATION MOST LIKELY WHERE K REQUIREMENT IS HIGH**
* **ADEQUATE K FERTILIZATION PROMOTES STRONG ROOT GROWTH AND TOLERANCE TO STRESS AND DISEASE**





C ALCIUM ANALYSIS

SOIL ANALYSIS

- **BASED ON MEHLICH I**
- **NO INTERPRETATION**
- **MEHLICH I DISSOLVES CALCIUM PHOSPHATES**
- **CSP, LIME, IRR. H_2O**

CALCIUM ANALYSIS

TISSUE ANALYSIS

- **TOTAL CALCIUM**
- **Ca DEFICIENCIES MAY OCCUR IN SOME VEG.**
- **HIGH RATES OF Mg AND K REDUCE TISSUE CA LEVELS**
- **RECOMMENDED % Ca 0.5 TO 1.0%**

MAGNESIUM ANALYSIS

SOIL ANALYSIS - MEHLICH I

- < 20 PPM LOW

- Ca/Mg RATIO NOT IMPT.

- SOIL Mg STATUS IMPT.

MAGNESIUM

Mg COMMONLY LOW TO DEFICIENT IN SAND SOILS

MEHLICH I EXTRACTABLE LEVELS OF LESS THAN 40 LBS/ACRE MG CONSIDERED DEFICIENT

HIGH K FERTILIZATION MAY INDUCE A MG DEFICIENCY ON SOILS CONTAINING MARGINAL LEVELS OF MG

HIGH K FERTILIZATION MAY INDUCE 'GRASS TETANY' IN ANIMALS GRAZING LOW MG GRASS.

USUALLY SUPPLIED AS DOLOMITIC LIME, $MgS0_4$ (EMJEO) OR $K_2SO_4 \cdot MgSO_4$ (SUL-PO-MAG)

MAGNESIUM ANALYSIS

TISSUE ANALYSIS - TOTAL Mg

- HAVE OBSERVED A RESPONSE TO APPLIED Mg WHEN SOIL Mg DROPPED BELOW 20 PPM AND TISSUE < 0.15% Mg

ALTHOUGH SULFUR OCCURS IN THE SOIL AS THE SULFATE ($SO_4^=$) ION, THE MAJOR SOIL SOURCE IS ORGANIC MATTER. THEREFORE, ORGANIC MATTER LEVEL AND RATE OF ITS DECOMPOSITION STRONGLY INFLUENCE SULFUR AVAILABILITY.

SULFUR RECOMMENDATIONS

- **EXT SOIL TESTING LAB DOES NOT ANALYZE FOR S**
- **LITTLE RESPONSE/CORRELATION DATA EXISTS**
- **BECAUSE OF LOW % OF OM MOST FL SOILS LOW IN S**
- **S DEFICIENCY SYMPTOMS RESEMBLE N DEFICIENCY - USE OF AS SHOULD SOLVE THE PROBLEM IF IT EXISTS**

*** RESPONSE TO S APPLICATION ON BAHIA IN GAINESVILLE.**

Notes:

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