



PETIOLE NITRATE MONITORING



● Petiole Nitrate Monitoring

For high yields, cotton must have the right amount of nitrogen during all phases of growth and fruit development. But for years cotton farmers have had difficulties in figuring the right amount of nitrogen to apply. Depending upon soil and climatic conditions it is easy to have too much or too little nitrogen available for cotton. Due to the nature of the soil nitrogen and the manner in which cotton responds to it, nitrogen has a greater potential for increasing or decreasing yield than any other nutrient.

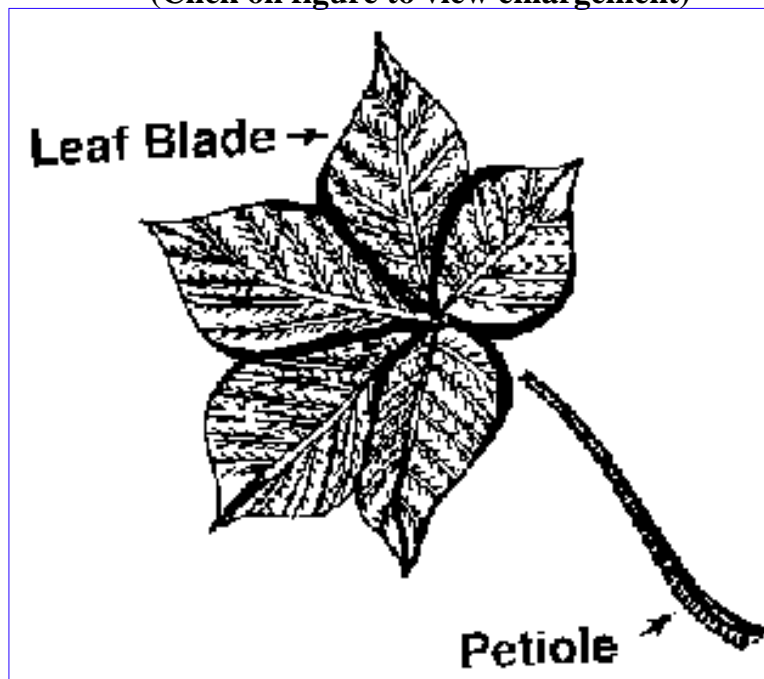
Inadequate nitrogen results in small stalks, pale green to yellow leaves, small bolls, fruit shed and low yields. If low nitrogen is detected early enough during the growing season, proper nitrogen application can mean sizeable yield increases.

Too much nitrogen delays maturity, causes rank growth, encourages diseases and increases the risk of boll rot and reduced lint quality. Also at critical periods, excessive nitrogen can cause cotton plants to shed pinhead-sized squares.

Cotton response to nitrogen fertilization varies from one year to another, primarily because of climatic conditions. An optimum amount of preplant fertilizer nitrogen in a "normal" year may be excessive in a "wet" year and deficient in a "dry" year. Researchers have found that by monitoring the nitrate-nitrogen content of cotton petioles (leaf stems), adjustments can be made in the nitrogen fertilization program during the growing season to compensate for seasonal variations. ([See Figure 1.](#)) Such adjustments aid in achieving top yields by avoiding excess nitrogen in early and late season and insuring adequate nitrogen during crucial fruiting periods.

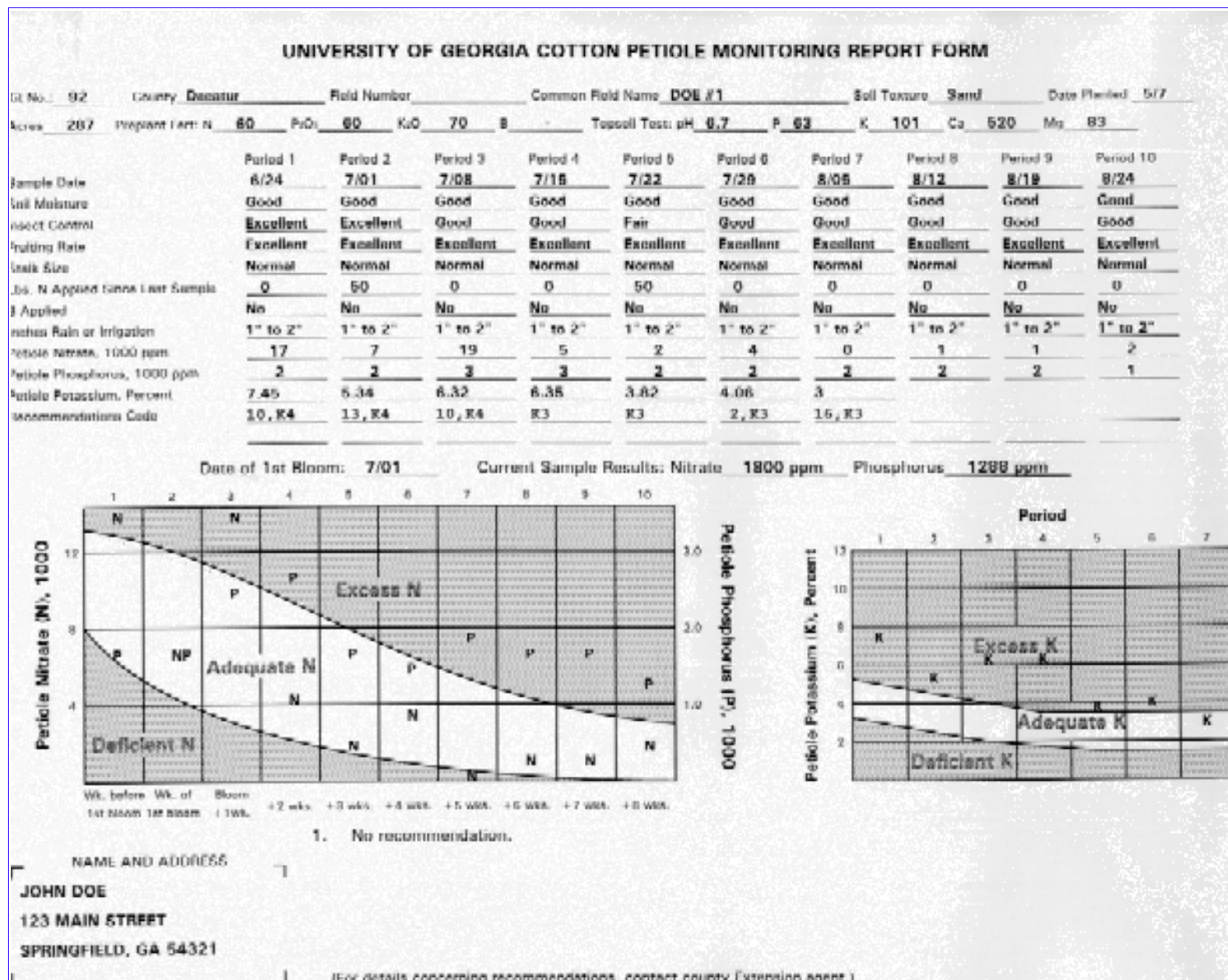
● **Figure 1. Diagrammatic Sketch of Cotton Petiole.**

(Click on figure to view enlargement)



Cotton petiole analysis consists of chemically monitoring the nitrate-nitrogen and phosphorus content of cotton petioles for a ten-week period. The monitoring program starts one week prior to first bloom and continues for nine consecutive weeks. Following each test a computer printout is sent to the grower which graphically shows the nitrogen and phosphorus content along with the appropriate recommendations ([See Figure 2](#)).

● **Figure 2. Petiole Analysis Report Form Graph (Click on figure to view enlargement)**



● **NITRATE AND PHOSPHORUS RELATIONSHIPS**

Petiole nitrate-nitrogen and phosphorus levels serve as indicators as to the relative amounts of unused nitrogen and phosphorus in the plant vascular system. Both elements are potential components of amino acids and proteins. In densely fruiting cotton through about the fifth week of blooming, there is an inverse relationship between the nitrate and phosphorus levels. As nitrates increase, phosphorus tends to decrease. As phosphorus increases, nitrates tend to decrease. The relationship between the two elements provides useful clues as to how effective the plant is using nitrogen and to how it is responding to growth conditions. For example:

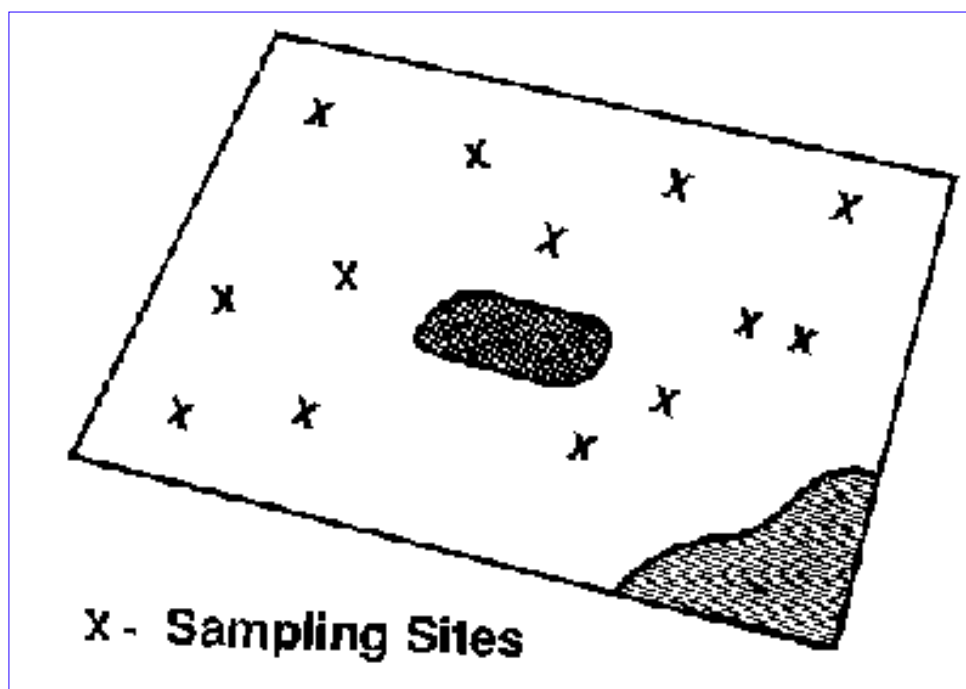
1. When nitrates are decreasing and phosphorus is increasing, this is an indication of adequate moisture, heavy fruiting and rapid use of nitrogen.
2. When both nitrates and phosphorus are decreasing, this is an indication of drought stress.
3. When there is a sharp increase in both nitrates and phosphorus, this is a response to above normal moisture conditions. Fruiting may or may not be good. Conditions are conducive to insect damage.
4. When nitrates are increasing and phosphorus is decreasing, this indicates that moisture is adequate, fruiting is poor, and fruit loss is possible.

● PROPER SAMPLING TECHNIQUES

Petiole samples must be taken in the proper manner for results to be of value. Use the following steps to insure good and timely results.

1. Obtain petiole analysis kits from the county Extension office. The kits contain information forms, sampling instructions and pre-addressed mailing envelopes.
2. Fill out blanks and follow instructions on the front of the kit.
3. Begin sampling about a week before first bloom. This will be about 45-50 days after a full stand. At this time, the white tip of the first blooms can be seen emerging from the oldest squares.
4. Take 25 to 35 leaf petioles from the same areas of the field each week. The areas selected should represent average conditions of the field. Do not take samples from small areas which are widely different and which cannot be fertilized separately. ([See Figure 3.](#))

- **Figure 3. Sample fields at random.**
(Click on figure to view enlargement)

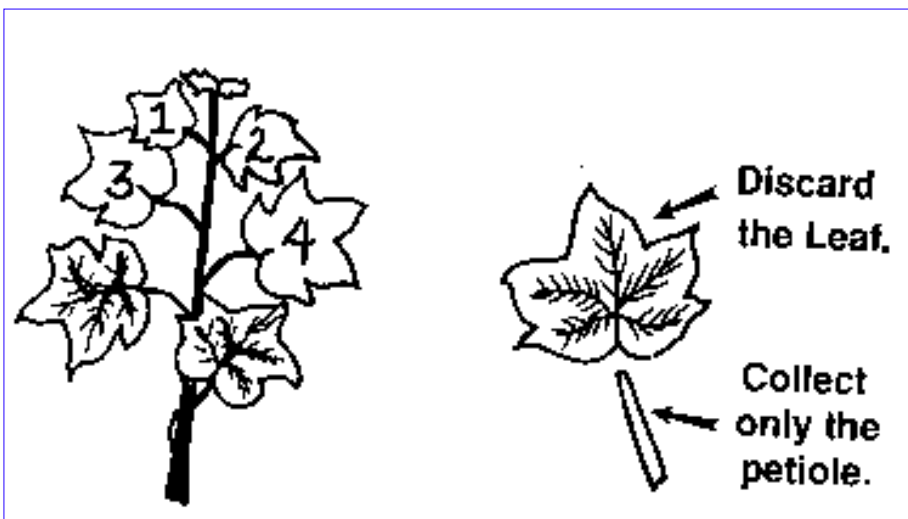


5. Take petioles from the first fully expanded leaf from the top. This is usually the fourth vegetative leaf from the top on the main stem. Do not count the small leaves (smaller than a quarter) on fruiting spurs at the terminal. Sample only primary leaves on the main stem and avoid taking leaves from fruiting or vegetative branches. Do not sample leaves or petioles that are abnormal in appearance. ([See Figure 4.](#))

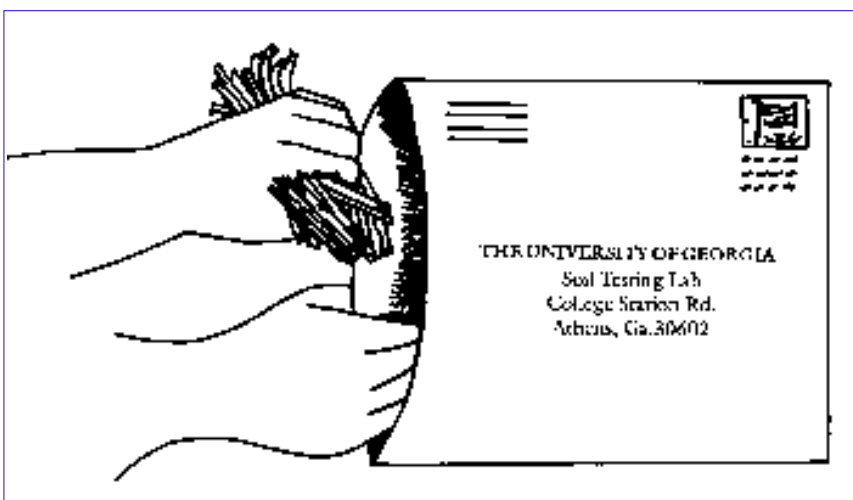
6. Fill out information form completely. The information supplied on the form affects the recommendation. Therefore, for accurate recommendations, fill out the forms be completely. Place the information form and fresh petioles in the pre-addressed envelope and mail immediately. ([See Figure 5.](#))

7. Results will be returned in five or six days. Be prepared to apply recommended treatments promptly.

- **Figure 4. Plant part to sample.**
(Click on figure to view enlargement)



- **Figure 5. Petiole Mailing Kit.**
(Click on figure to view enlargement)



● UREA APPLICATION

Petiole analysis will indicate a need for nitrogen about two weeks prior to the appearance of plant symptoms. If petiole nitrate-nitrogen is low during the first three weeks of blooming, a soil application, foliar application or both will be recommended. After that time, only foliar applications of urea nitrogen will be recommended. Urea has been found to be an effective and safe source of nitrogen to apply to a developing cotton plant. It is absorbed by the leaves and transported rapidly to the developing fruit which enhances maturity. It can be applied as a foliar application as follows:

Ground Application:

- For young plants - 10 lbs. of urea (4.5 lbs. N) in 5 to 10 gallons of water or insecticide solution per acre.
- For older plants - 15 lbs. of urea in 1 to 5 gallons of water or insecticide solution per acre.

Aerial Application:

- 10 lbs. of urea (4.5 lbs. N) in 5 gallons of water or insecticide solution per acre.

When foliar applied urea is recommended, apply it promptly. The longer nitrogen deficiency exists, the greater the potential for fruit shed.

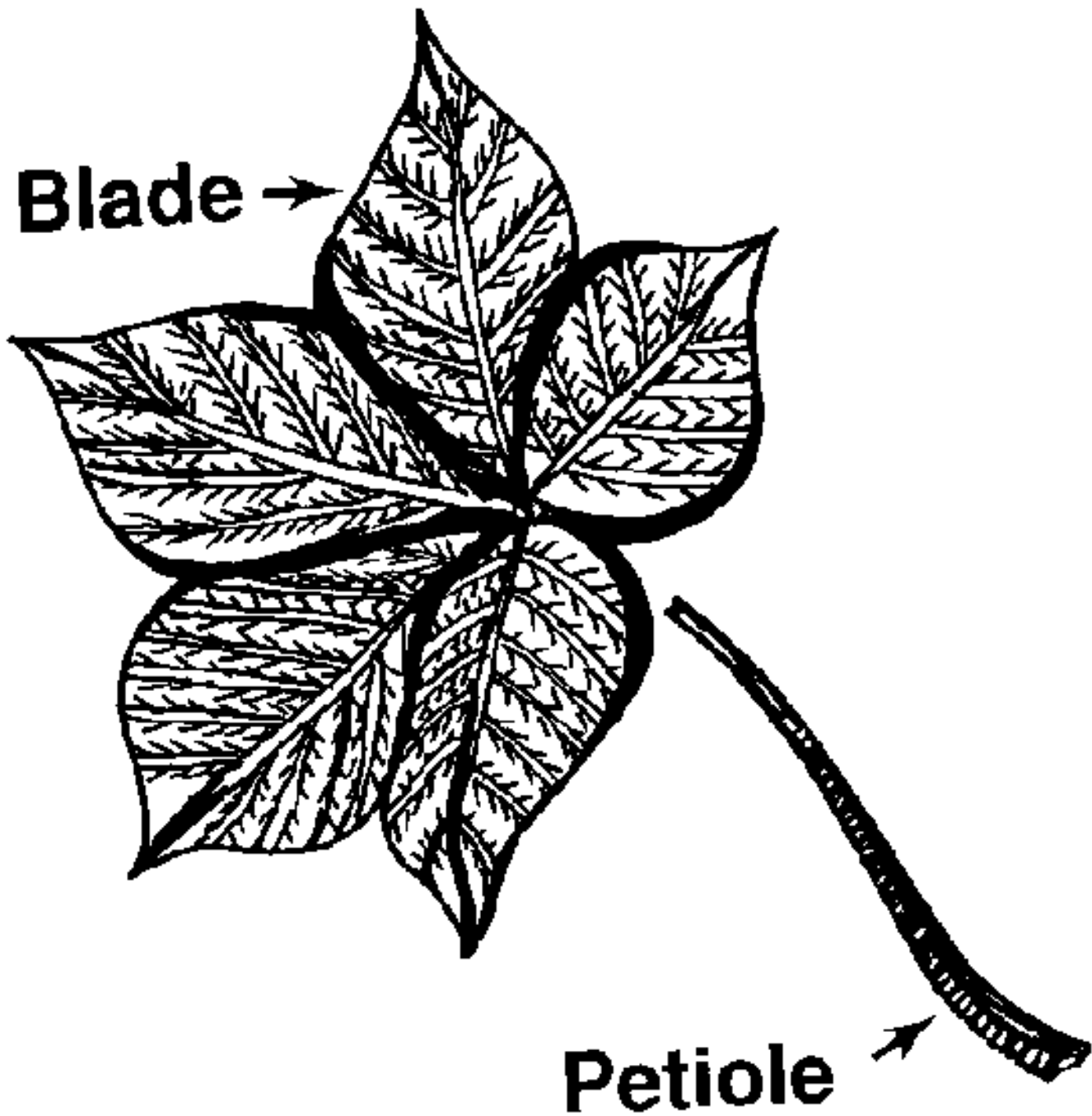
Discontinue foliar application when plants wilt by noon because wilting plants do not absorb and translocate urea. Contrary to late soil applications, foliar applications of urea do not increase plant height.

Prepared by: C. Owen Plank, Extension Agronomist, - Soil Testing & Plant Analysis;
Steve Hodges, Extension Agronomist, - Soils and Fertilizer;
Johnny L. Crawford, Extension Agronomist, - Cotton.
University of Georgia Extension Service



[Return to Cotton Fertility: Week 1](#)

Leaf Blade →



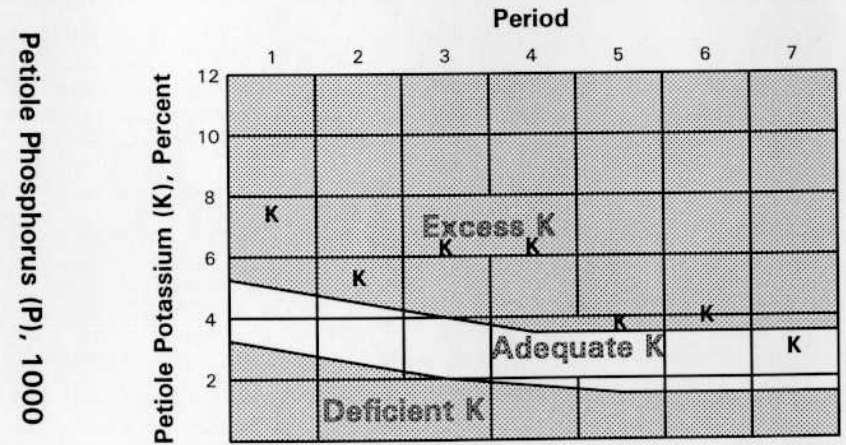
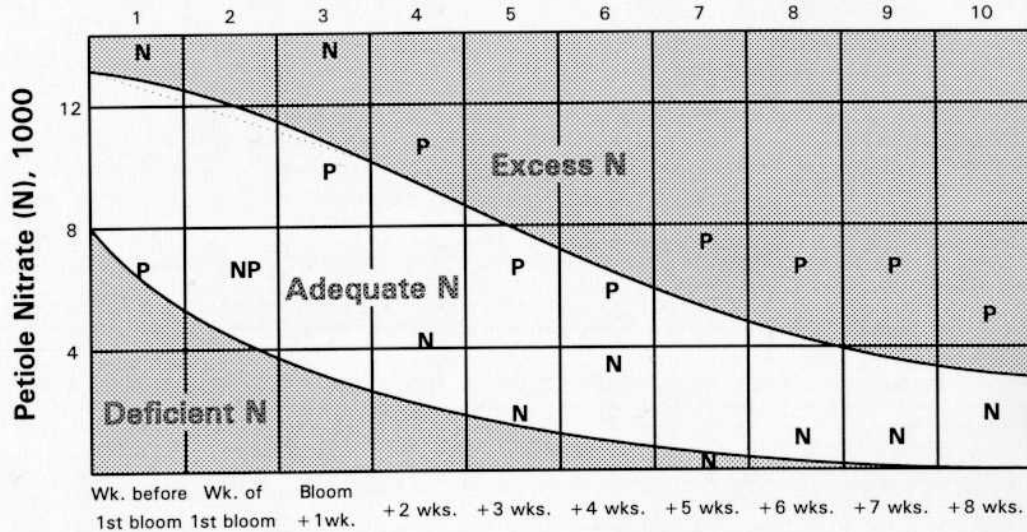
Petiole →

UNIVERSITY OF GEORGIA COTTON PETIOLE MONITORING REPORT FORM

Kit No.: 92 County Decatur Field Number _____ Common Field Name DOE #1 Soil Texture Sand Date Planted 5/7
 Acres 287 Preplant Fert: N 60 P₂O₅ 60 K₂O 70 B _____ Topsoil Test: pH 6.7 P 63 K 101 Ca 520 Mg 83

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8	Period 9	Period 10
Sample Date	<u>6/24</u>	<u>7/01</u>	<u>7/08</u>	<u>7/15</u>	<u>7/22</u>	<u>7/29</u>	<u>8/05</u>	<u>8/12</u>	<u>8/19</u>	<u>8/24</u>
Soil Moisture	<u>Good</u>	<u>Good</u>	<u>Good</u>	<u>Good</u>	<u>Good</u>	<u>Good</u>	<u>Good</u>	<u>Good</u>	<u>Good</u>	<u>Good</u>
Insect Control	<u>Excellent</u>	<u>Excellent</u>	<u>Good</u>	<u>Good</u>	<u>Fair</u>	<u>Good</u>	<u>Good</u>	<u>Good</u>	<u>Good</u>	<u>Good</u>
Fruiting Rate	<u>Excellent</u>	<u>Excellent</u>	<u>Excellent</u>	<u>Excellent</u>	<u>Excellent</u>	<u>Excellent</u>	<u>Excellent</u>	<u>Excellent</u>	<u>Excellent</u>	<u>Excellent</u>
Stalk Size	<u>Normal</u>	<u>Normal</u>	<u>Normal</u>	<u>Normal</u>	<u>Normal</u>	<u>Normal</u>	<u>Normal</u>	<u>Normal</u>	<u>Normal</u>	<u>Normal</u>
Lbs. N Applied Since Last Sample	<u>0</u>	<u>50</u>	<u>0</u>	<u>0</u>	<u>50</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
B Applied	<u>No</u>	<u>No</u>	<u>No</u>	<u>No</u>	<u>No</u>	<u>No</u>	<u>No</u>	<u>No</u>	<u>No</u>	<u>No</u>
Inches Rain or Irrigation	<u>1" to 2"</u>	<u>1" to 2"</u>	<u>1" to 2"</u>	<u>1" to 2"</u>	<u>1" to 2"</u>	<u>1" to 2"</u>	<u>1" to 2"</u>	<u>1" to 2"</u>	<u>1" to 2"</u>	<u>1" to 2"</u>
Petiole Nitrate, 1000 ppm	<u>17</u>	<u>7</u>	<u>19</u>	<u>5</u>	<u>2</u>	<u>4</u>	<u>0</u>	<u>1</u>	<u>1</u>	<u>2</u>
Petiole Phosphorus, 1000 ppm	<u>2</u>	<u>2</u>	<u>3</u>	<u>3</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>1</u>
Petiole Potassium, Percent	<u>7.45</u>	<u>5.34</u>	<u>6.32</u>	<u>6.35</u>	<u>3.82</u>	<u>4.06</u>	<u>3</u>			
Recommendations Code	<u>10, K4</u>	<u>13, K4</u>	<u>10, K4</u>	<u>K3</u>	<u>K3</u>	<u>2, K3</u>	<u>16, K3</u>			

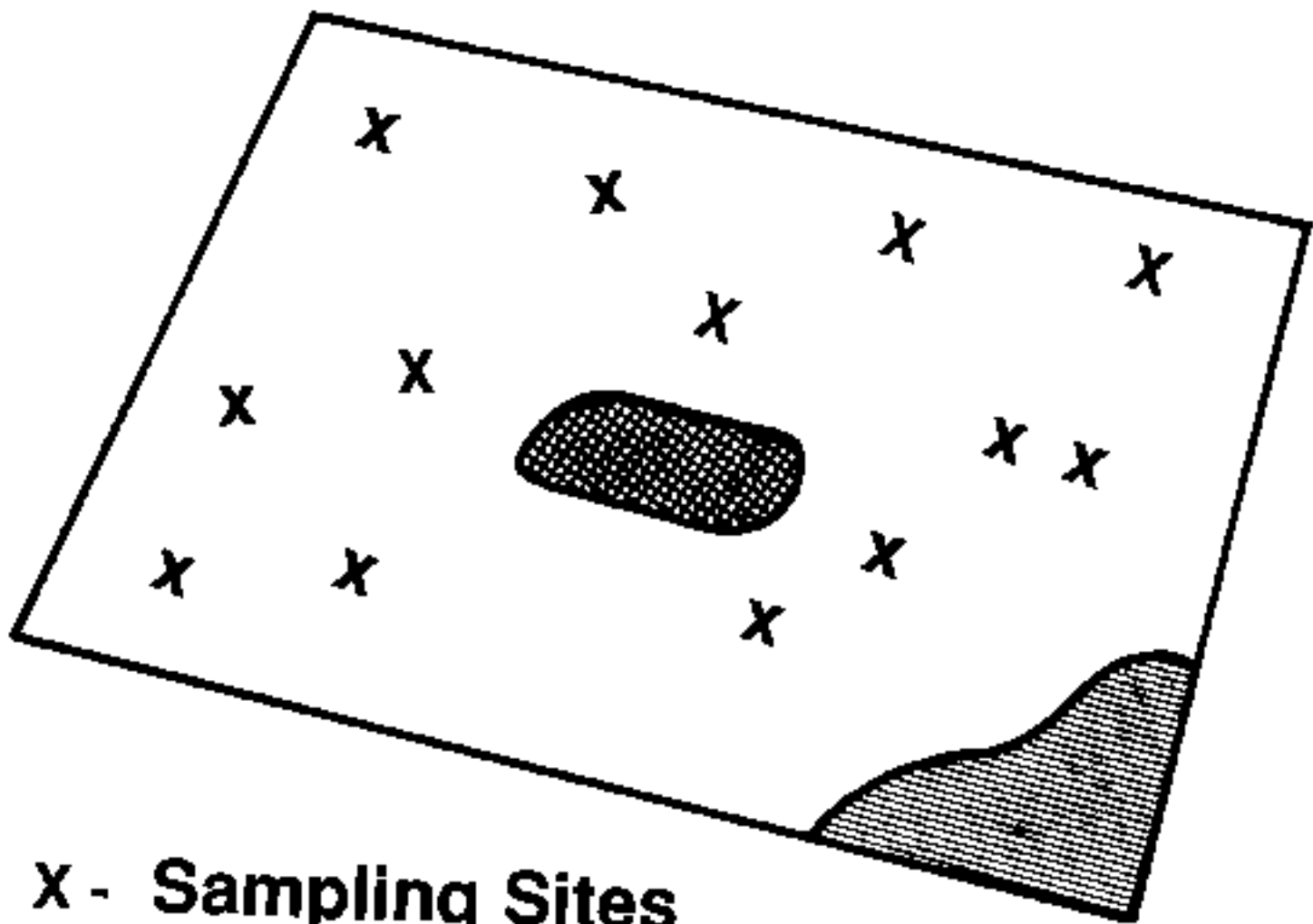
Date of 1st Bloom: 7/01 Current Sample Results: Nitrate 1800 ppm Phosphorus 1288 ppm



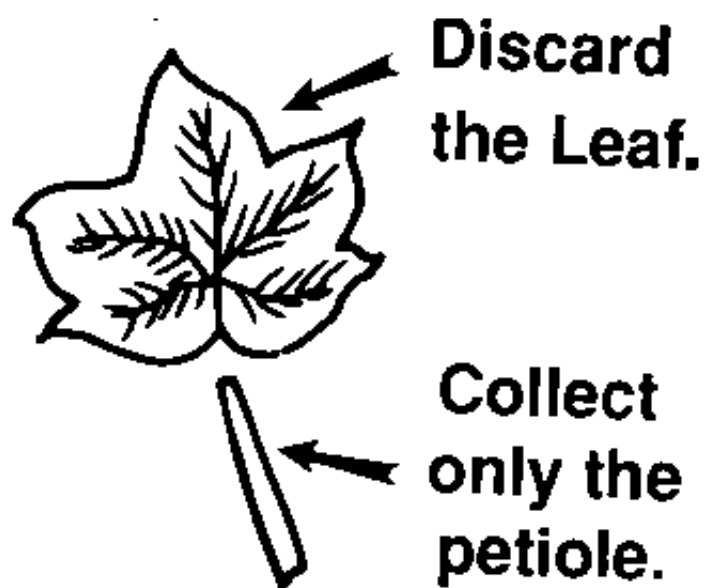
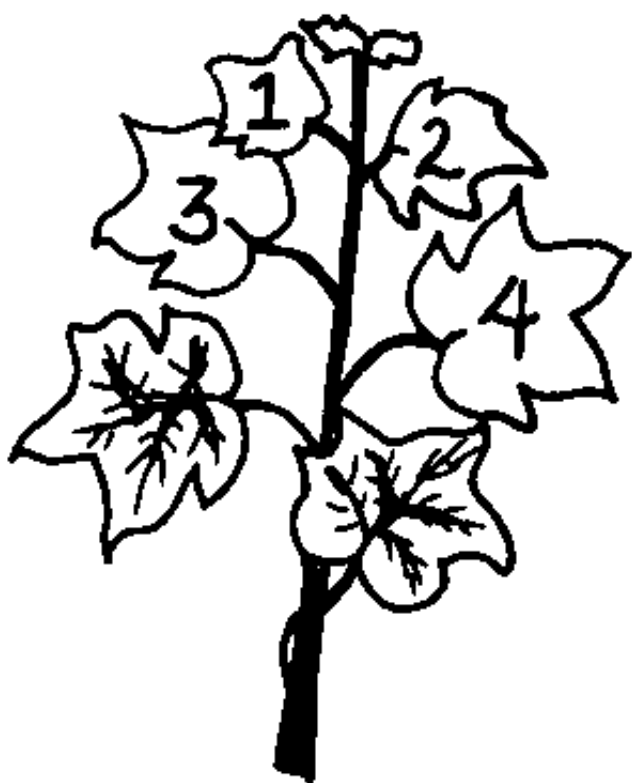
1. No recommendation.

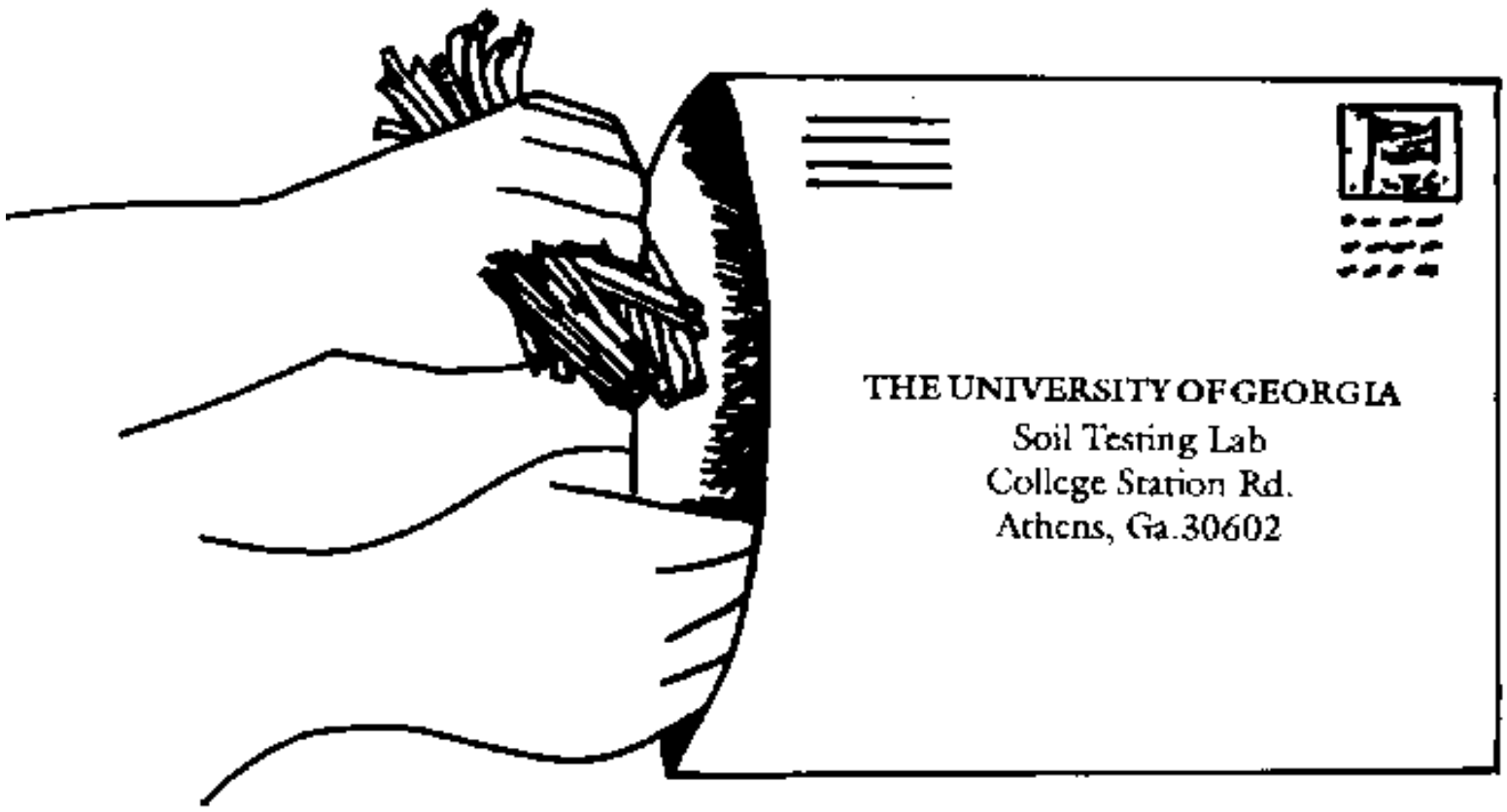
NAME AND ADDRESS
JOHN DOE
123 MAIN STREET
SPRINGFIELD, GA 54321

(For details concerning recommendations, contact county Extension agent.)



x - Sampling Sites





THE UNIVERSITY OF GEORGIA
Soil Testing Lab
College Station Rd.
Athens, Ga. 30602



COTTON FERTILITY

Internet Inservice Training



WEEK 1:

Nitrogen Fertilization



At the end of this week, you should know:

- 1. The forms and amounts of nitrogen required for optimum cotton production.**
- 2. Optimum timing for nitrogen applications.**
- 3. Effects of Pix applications on nitrogen response.**
- 4. Effects of previous crops on nitrogen requirements.**
- 5. The benefits of broiler litter for cotton.**
- 6. Guidelines for applying broiler litter to avoid cotton growth problems.**
- 7. How to use the petiole nitrate monitoring program.**
- 8. Effects of foliar boron applications along with foliar nitrogen applications.**



[Nitrogen Fertilization: General Information](#)



[Use of Poultry Litter](#)



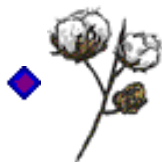
[Petiole Nitrate Monitoring](#)



[Foliar Boron](#)



Return to Cotton Fertility Training Schedule



Attendance:

1638 108990

