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NITROGEN SOURCE EVALUATION FOR RABBITEYE BLUEBERRIES

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The proper selection of a nitrogen (N) source for growing blueberries in Texas is critical. In the acid sandy soils of East Texas, there are at least five criteria for selecting a nitrogen fertilizer: 1) the N should be in an ammonium N form, 2) the N source should be slow release and not be readily leached from soils after a heavy rainfall, 3) the N source should not cause salt burn to plants, 4) the N source should not cause a rapid decline in soil pH over time, and 5) the N source should be inexpensive. To evaluate the most appropriate N sources for blueberry plant growth in Texas, a greenhouse study was conducted in 1985. The efficacy of 8 N sources on rabbiteye blueberries was determined.

MATERIALS AND METHODS

Rooted 'Tifblue' cuttings were grown in a 1:1 peat:sandy loam soil mix in 2 gallon containers. Plants were established in a greenhouse for 3 months before treatments were applied. Plants were then fertilized 4 times at 90 day intervals with one of 8 N sources at rates equivalent to 0, 112, 224, or 336 lbs N/ac per application. Eight nitrogen sources or combinations of N sources were utilized (Table 1).

RESULTS AND DISCUSSION

For a combination of all N sources, best plant growth occurred at the 112 lbs N/ac application rate (Table 2). Higher N rates were comparable or worst than the 0 N rate. As N rate increased, soil-peat mixture pH decreased (became more acid) and electrical conductivity increased (became more saline). Excessive N rates can be extremely detrimental to blueberry growth. The cause of the growth reduction by excessive rates of N is due to the increase in growth media electrical conductivity and the dramatic reduction of media pH to levels below optimum for blueberry production.

Roots, tops and total plant dry weight averaged across all N rates were all affected by N source (Figure 1). Best growth of all

parameters occurred in plants fertilized with sulfur coated urea (SCU), followed by NH_4NO_3, nitro-form and urea. Least growth occurred with $(NH_4)_2SO_4$. These results were similar for all N rates, except for NH_4NO_3. Plants fertilized with NH_4NO_3 had one of the better growth rates at the 112 lbs N/ac rate but the poorest growth at the 336 lbs N/ac rate (data not shown).

The lowest media pH and highest media electrical conductivity occurred with $(NH_4)_2SO_4$ fertilization, while urea and nitro-form resulted in the least reduction in pH and lowest EC (Figures 2 & 3).

Nitrogen in the form of $(NH_4)_2SO_4$ appears to be especially deleterious to blueberries under conditions such as high fertilization rates and acid sandy soils. Soil pH reduction to below 4.0 and toxic E.C. increases can occur rapidly. This indicates that $(NH_4)_2SO_4$ should be used only at low rates and when soil pH is above 5.2. Other N sources will also lower soil pH with time. It is unlikely that the soil pH in the field would not decrease as rapidly as that of soil-peat mix in the container. However, the potential exists and consequently soil pH should be monitored yearly regardless of N source.

For the N sources used in this experiment, those based on urea were the most effective for blueberry plant growth. This is particularly true for SCU. Sulfur coated urea was the least toxic N source at the highest N rate, even though it raised the media EC to levels comparable to some of the poorer performing N sources. The slow release properties of SCU may account for some of its effectivenss. Results from long term field fertilizer studies in Kentucky verify that SCU is a good N source for blueberries.

Straight urea and urea in the form of urea-formaldehyde (Nitro-form) were almost as good as SCU. Urea did not reduce the media pH as much as predicted by its potential acidity values. This means that under Texas soils, urea N sources have less potential to reduce pH to below optimal levels than do other N fertilizers.

Several research reports indicate that nitrate-N can be harmful to blueberries. Our data indicate that NH_4NO_3 resulted in good plant growth at the low N rates. At soil pH less than 5.0 the use of fertilizers containing some N as nitrate does not seem to be harmful at the low fertilizer rates.

CONCLUSIONS

Slow release N-sources containing urea, such as nitro-form or SCU, should be the most effective fertilizer source under the high rainfall-sandy soil conditions of East Texas. These sources do not have as great a potential to reduce soil pH to below the optimal level as do several of the other N sources. However, the expense of nitro-form compared to other N sources may make its use prohibitive. Urea N appears to be the best overall N source if a highly soluble N form is needed.

Table 1. Nitrogen sources used.

N Source	Element %
Ammonium sulfate $(NH_4)_2SO_4$	21%
Ammonium nitrate (NH_4NO_3)	34%N
Urea	46%N
Urea-ammonium nitrate (UAN)	32%N
Sulfur coated urea (SCU)	36%N, 17%S
Nitroform	38%N
Urea-ammonium sulfate 2:1	38%N
Urea-ammonium sulfate 1:2	29%N
No nitrogen	0%N

Table 2. Effect of N rate on soil and plant parameters.

N Rate (Lbs/Ac/Application)	Plant Dry Wt. (g)	Soil pH	Soil EC (mmho/cm)
0	33	5.4	.15
112	51	4.6	.42
224	37	3.9	.64
336	22	3.6	.78

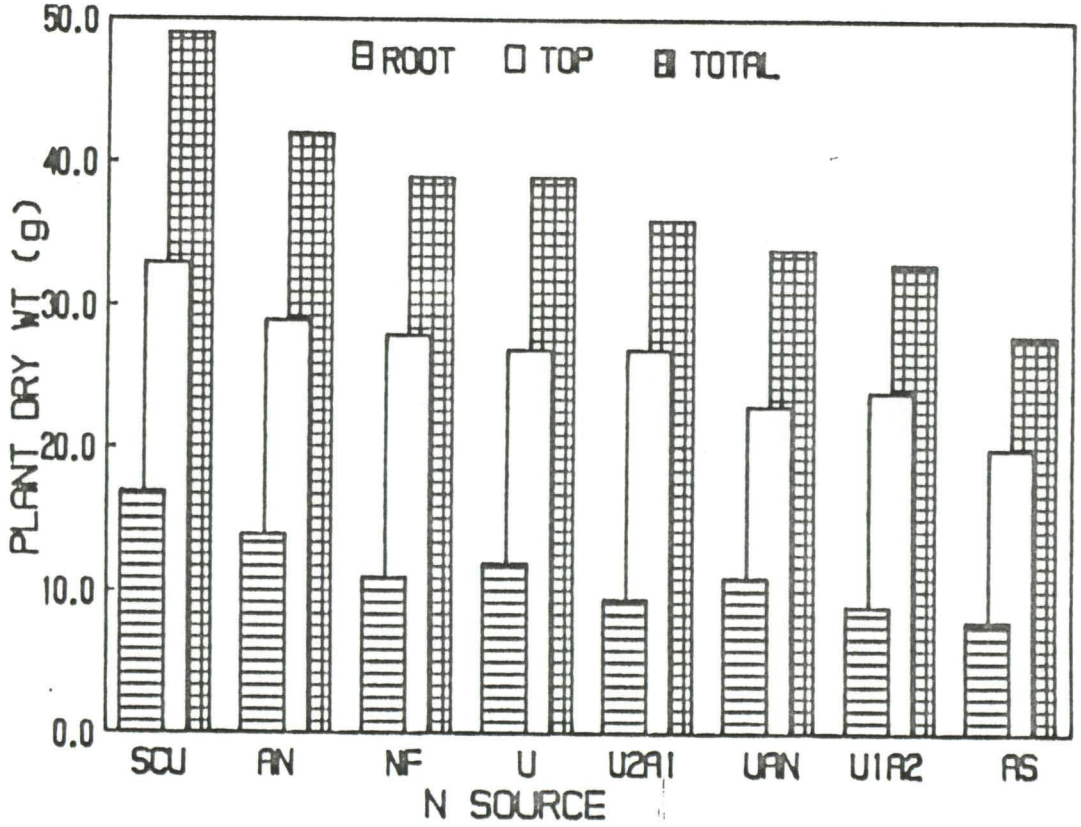

Figure 1. Effect of Nitrogen source on root, top and total plant dry weight of 'Tifblue' rabbiteye blueberries. Values are averages across all N rates. (SCU - sulfur coated urea, AN - ammonium nitrate, NF - nitro form, U - urea, U_2A_1 - urea:ammonium sulfate (2:1), UAN - Urea - ammonium nitrate, U_1A_2 - Urea:ammonium sulfate (1:2), AS - Ammonium sulfate).

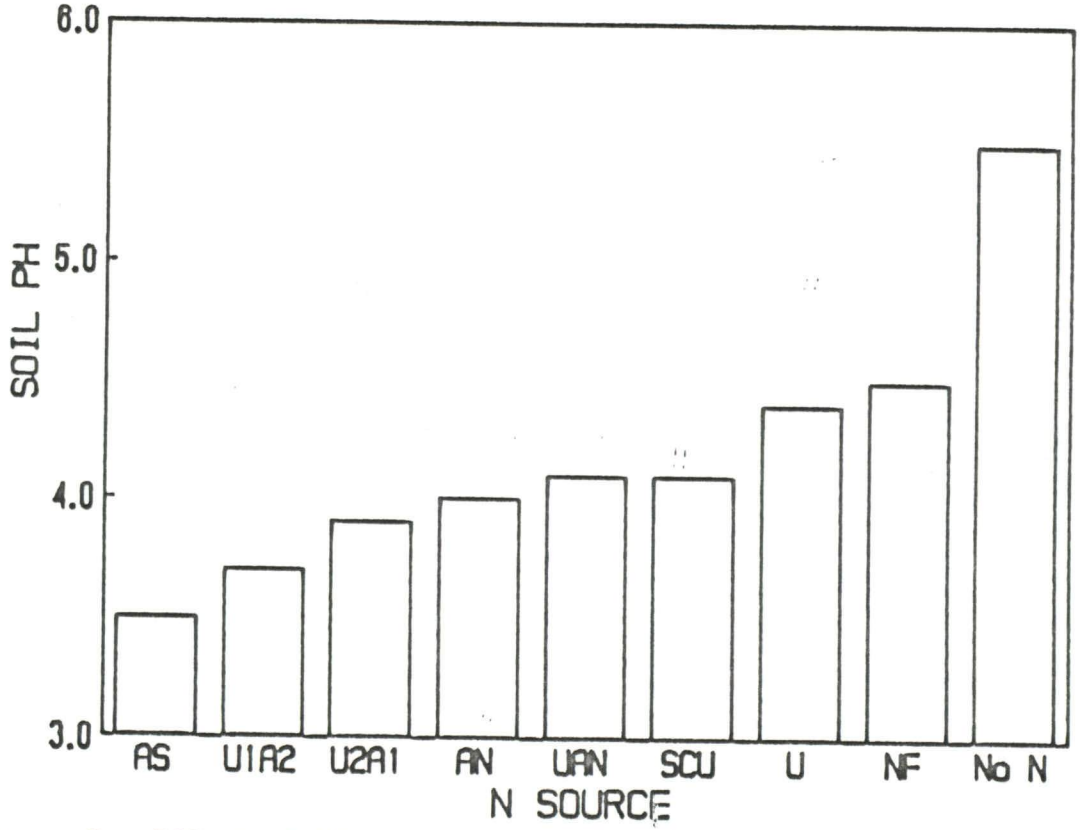

Figure 2. Effect of Nitrogen source on soil pH. (AS - ammonium sulfate, U_1A_2 - urea:ammonium sulfate (1:2), U_2A_1 - urea:ammonium sulfate (2:1), AN - ammonium nitrate, UAN - urea - ammonium nitrate, SCU - sulfur coated urea, U-urea NF - nitroform, NO N - 0 lbs N/ac rate).

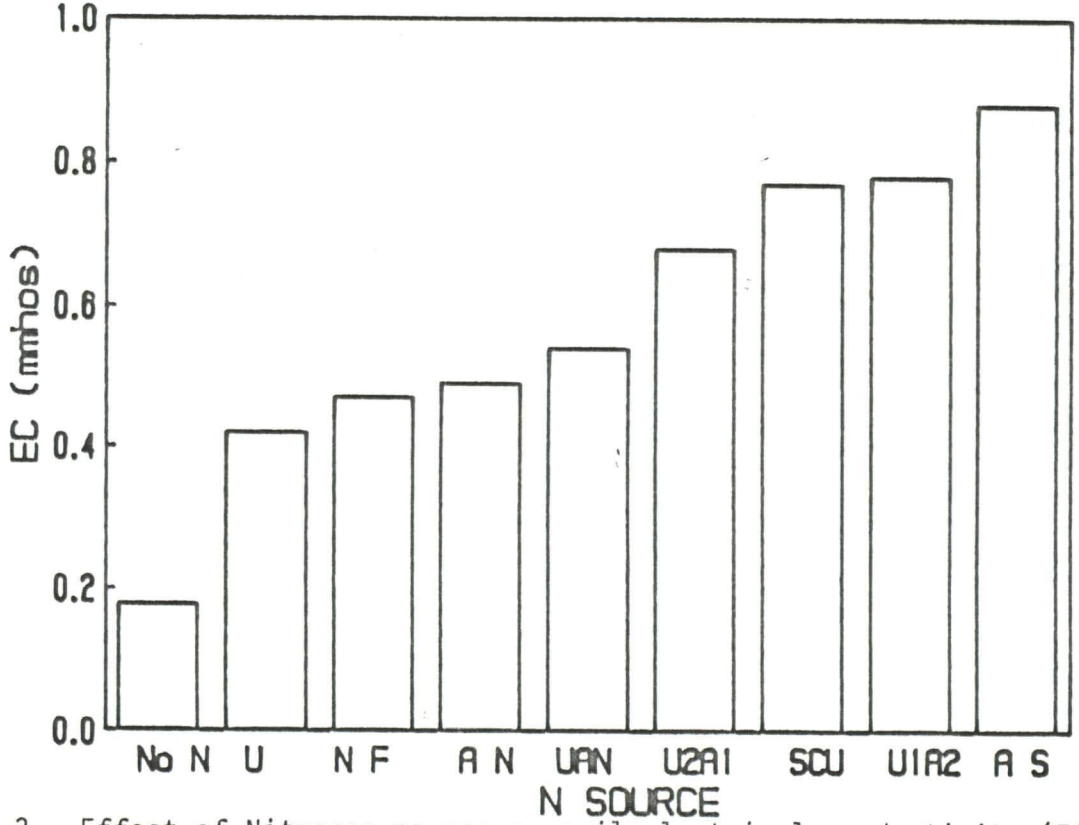

Figure 3. Effect of Nitrogen source on soil electrical conductivity (EC). (No N - 0 lbs N/ac rate, U - urea, NF - nitroform, AN - ammonium nitrate, UAN - urea-ammonium nitrate, U_2A_1 - urea:ammonium sulfate (2:1), SCU - sulfur coated urea, U_1A_2 - urea:ammonium sulfate (1:2), AS - ammonium sulfate).