Nutrients and Nutrient Sources

Nitrogen - N

Fertilizer sources

1. $NaNO_3$ (sodium nitrate) - Not a good N source for either pines or hardwoods.

2. KNO_3 (potassium nitrate) - Not a good N source, but a possible K source.

3. NH_4NO_3 (ammonium nitrate) - Good source of N. Most common source used.

4. $(NH_4)_2SO_4$ (ammonium sulfate) - Excellent source of N. Adds S as well as N. Does acidify soil (sometimes that is desirable and sometimes it isn't). Drawback is low N content (20%).

5. $CO(NH_2)_2$ (urea) - Good source of N. Possible loss of N by volatilization of ammonia.

6. SCU (sulfur-coated urea) - Excellent slow release source, but is expensive. Very little loss of N by volatilization. Must watch the solubility score to determine the rate of N release. It may be too fast or too slow to be synchronized with the trees needs.

TYPICAL NUTRIENT BALANCE FOR THE GROWTH OF PINES

NUTRIENT	RELATIVE ABUNDANCE
N	100
K	60
S	50
P	13
Ca	6
Mg	4
Fe	1.5
Mn	0.4
Cl	0.3
B	0.2
Cu	0.03
Zn	0.03
Mo	0.006

From Tim White's NAUTILIS

7. Organics - Highly variable in make-up. Bulky to transport. Source of organic matter and nutrients as well as N. Various sources range from excellent to useless to toxic.

8. Soluble sources of N. There are several chemicals used in these products. They include things like ammonium thiosulfate, and mixtures of urea and ammonium nitrate or sulfate. All are applied as a liquid.

Phosphorus - P

Fertilizer sources

1. Ordinary superphosphate (OSP) - Low P content but does contain S.

2. Triple superphosphate (TSP) - High P content but lacks S.

3. Diammonium phosphate (DAP) - More soluble than either OSP or TSP and does contain a little N.

4. H_3PO_4 (phosphoric acid) - Very soluble source of P. Is used to acidify irrigation water. It must be greatly diluted or trees will be damaged.

Potassium

Fertilizer sources

1. KCl (potassium chloride or muriate of potash) Most common source of K.

2. K_2SO_4 (potassium sulfate or sulfate of potash) - Excellent source of K. The K content is the same as in KCl and it does contain S.

3. Sul-Po-Mag (or K-Mag or sulfate of potash - magnesia) - A mixture of K_2SO_4 and $MgSO_4$. The three common names vary from location to location, but they are all the same material.

Calcium - Ca

Sources

1. Calcitic lime (calcite) - Mostly calcium carbonate ($CaCO_3$). Used principally for soil acidity (pH) adjustment. Does provide plenty of Ca. Must be incorporated with soil.

2. Gypsum (calcium sulfate - $CaSO_4$) - Moderately soluble and does not change soil pH value. Provides both Ca and S and can be applied as a topdressing.

3. Dolomitic lime (dolomite) - A mixture of calcium and magnesium carbonates ($CaCO_3$ and $MgCO_3$). Used principally for soil acidity (pH) adjustment. Does provide plenty of Ca and Mg. Must be incorporated with soil.

4. Calcium nitrate ($Ca(NO_3)2$ - A very soluble source of Ca. Thus, it can be used as a topdressing.

Magnesium

Sources

1. Dolomitic lime - A mixture of calcium and magnesium carbonates ($CaCO_3$ and $MgCO_3$). Used principally for soil acidity (pH) adjustment. Does provide plenty of Ca and Mg. Must be incorporated with soil.

2. Magnesium sulfate ($MgSO_4$ or Epsom Salts) - Provides Mg but does not change soil acidity. Plenty soluble. Thus, it can be used as a topdressing.

3. Sul-Po-Mag (or K-Mag or sulfate of potash - magnesia) - A mixture of K_2SO_4 and $MgSO_4$.

4. Magnesium carbonate ($MgCO_3$) - Called "Mag - car." Useful when Mg is needed to balance a high Ca level. Not available everywhere. Must be incorporated with the soil. Does raise the soil pH value.

Minor elements

Mixtures

1. S.T.E.M. (Soluble Trace Element Mix) - A mixture of soluble sources of the minor elements.

2. FTE (Fritted Trace Elements) - A slow-release form of minor elements. Various mixes are available. Should be incorporated with soil.

Individual elements

1. Boron (B) - Available in several forms (borax, fertilizer borate, Solubor). All are forms of sodium borate. Solubor is convenient to use as a foliar spray.

2. Copper (Cu) - Available as copper sulfate (blue vitriol) ($CuSO_4 \cdot 7H_2O$) Can be used as a foliar spray or as a soil application.

3. Iron (Fe) - Available in several forms (Sequestrene, Tracite, Claw-L, etc.). These can be used as a foliar spray or as a soil application. During hot weather, the foliar spray is more effective.

4. Manganese (Mn) - Available as manganese sulfate ($MnSO_4$). A chelated form is sometimes available. These can be used as a foliar spray or as a soil application.

5. Zinc (Zn) - Available as zinc sulfate ($ZnSO_4$). Can be used a foliar spray or as a soil application.

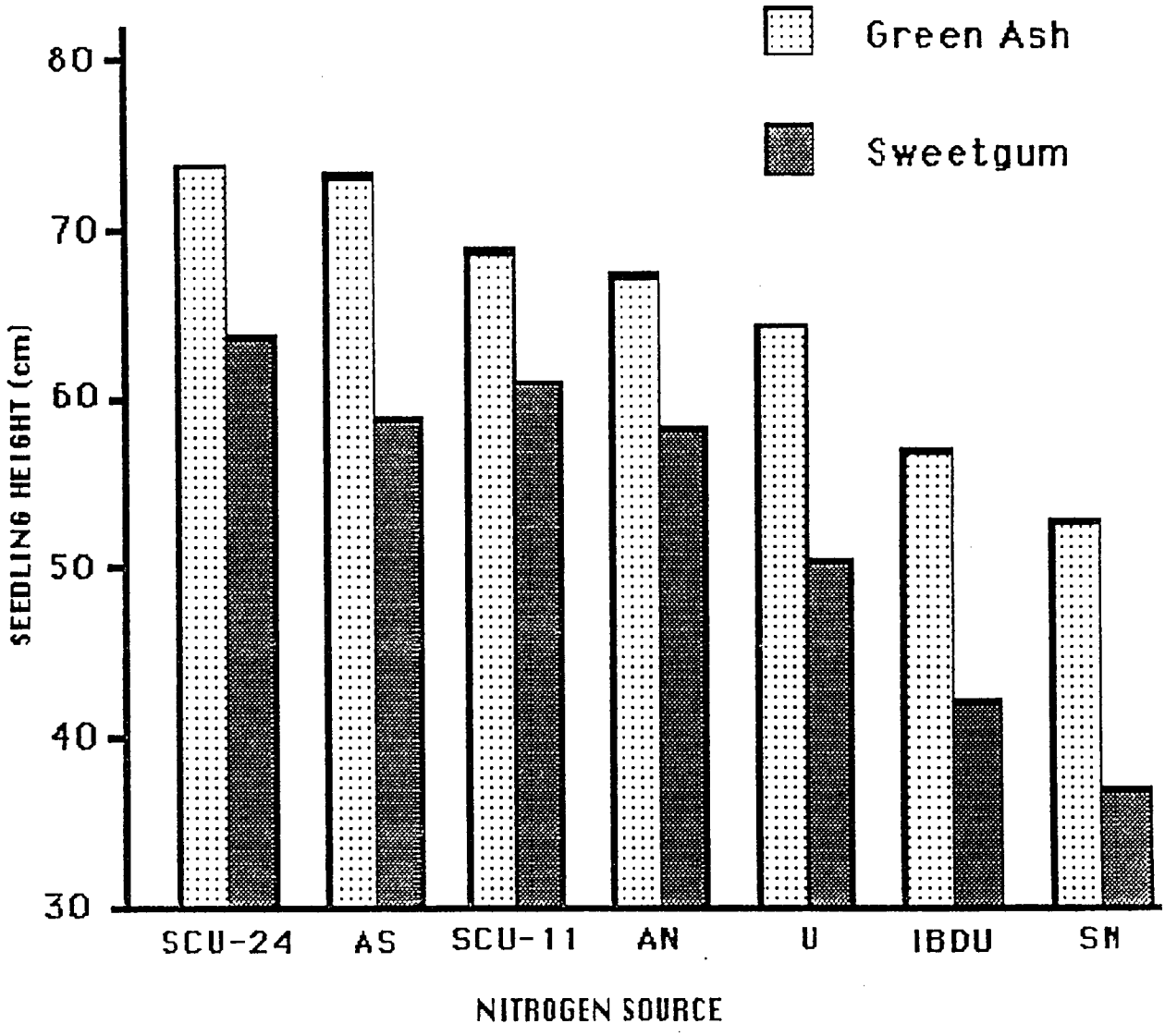

Figure 1. Effect of nitrogen source on height of green ash and sweetgum seedlings at lifting (data summarized from Villarrubia, 1980).