To: Don Summers  
Manager, Nursery Extension

From: Allan McDonald

Date: 92-03-02

Re: Sx92202Q - Effects of Five Different Ammonium/Nitrate Based Fertilizers at Two Different Nitrogen Levels, on Conifer Seedling Growth

INTRODUCTION

In 1990, at Saanich Test Nursery, a trial was initiated to investigate the effects of various ratios of ammonia:nitrate on the growth rate of the seedlings of four conifer species. The species used were: coastal Douglas fir, western red cedar, lodgepole pine, and interior spruce. In all species except the red cedar, the ratio of ammonium to nitrate in the fertilizer affected the rate of top growth of the seedlings while root dry weights remained unchanged (McDonald and Zedel, 1990).

In the 1990 trial, it was expected that a higher percentage of ammonium in the fertilizer would be reflected by a faster growth rate due to the differences in the ways that the two types of nitrogen are metabolized by the plant. In fact, the 100 percent ammonium treatments demonstrated slower growth than some of the ammonium:nitrate blends. This was attributed to ammonium toxicity. The growth of the western red cedar was unaffected by the ammonium:nitrate contents and it was felt that this might indicate that 100 ppm nitrogen is excessive for optimum growth in cedar.

This trial will investigate the effects of the same ratios of ammonium:nitrate on the rate of conifer seedling growth, but at lower overall nitrogen levels. Significantly lower levels are expected to provide a more controlled growth rate in western red cedar in addition to ensuring that the growth rates of the other species aren't affected by ammonium toxicity.

MATERIALS AND METHODS

The trial will be conducted from April to November, 1992 at the B.C. Ministry of Forests' Saanich Test Nursery in Saanichton, B.C. Seedlots from three conifer species are to be double-sown into PSB
Styrofoam containers (160 cavities per container, 62 ml/cavity). The styroblocks will be loaded with the standard 3 peat:1 vermiculite media, incorporating 2 kg/m³ 12 mesh and finer dolomite lime, and 0.75 kg/m³ Micromax¹. STEM² will be applied throughout the season at 0.5% of the fertilizer weight.

The seedlots to be used are:

<table>
<thead>
<tr>
<th>Spp</th>
<th>Seedlot</th>
<th>Zone</th>
<th>Grid, class, elev.</th>
<th>Germination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sw</td>
<td>04177</td>
<td>(MRB)</td>
<td>93H11/B3/04177/0.91 - 95% 436 s/g</td>
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<tr>
<td>Fc</td>
<td>16501</td>
<td>(CSM)</td>
<td>92D08/B3/16501/0.40 - 94% 99 s/g</td>
<td></td>
</tr>
<tr>
<td>Cw</td>
<td>20202</td>
<td>(1050)</td>
<td>92H04/B2/20202/0.23 - 91% 816 s/g</td>
<td></td>
</tr>
</tbody>
</table>

All fertilizers are to be blended to produce a final analysis of 20-20-20 and will be applied at either 75 or 50 ppm Nitrogen as "growers" and 50 ppm Nitrogen as "finishers" on all species.

Each conifer species will be treated with the following fertilizer treatments:

1. **Nitrogen supply:** 100% Ammonia, 75 ppm N
2. **Nitrogen supply:** 75% Ammonia : 25% Nitrate, 75 ppm N
3. **Nitrogen supply:** 50% Ammonia : 50% Nitrate, 75 ppm N
4. **Nitrogen supply:** 25% Ammonia : 75% Nitrate, 75 ppm N
5. **Nitrogen supply:** 100% Nitrate, 75 ppm N
6. **Nitrogen supply:** 100% Ammonia, 50 ppm N
7. **Nitrogen supply:** 75% Ammonia : 25% Nitrate, 50 ppm N
8. **Nitrogen supply:** 50% Ammonia : 50% Nitrate, 50 ppm N
9. **Nitrogen supply:** 25% Ammonia : 75% Nitrate, 50 ppm N
10. **Nitrogen supply:** 100% Nitrate, 50 ppm N

The treatments will be set out in a random complete block design with 5 replicates/treatment.

**EVALUATION**

Static sample data, in which the same sample seedlings are measured at intervals throughout the season, will be collected and used to generate growth curves. Random samples collected at the time of

¹Trace element supplement produced by Sierra Chemical Co.
²Soluble Trace Element Mix produced by Peters Fertilizer Co.
bud-set and at the end of the year will be processed for morphological comparison. Tissue analysis samples are to be collected during the growing season and analyzed for nitrogen levels. Conductivity and pH will be measured on soil samples collected over the summer to ensure that adequate soil conditions were maintained.

During the growing season, observations will be made on the incidence of disease and general appearance (colour differences, growth) of the seedlings. At the end of the year, all seedlings are to be graded as per standard Ministry specifications. The number of seedlings culled on the basis of height, root collar diameter, root development or incidence of disease will be recorded.

Statistical analysis (PC SAS ANOVA and various multiple stage tests) is to be performed and the morphological data. Duncan's, Student- Neuman-Keul's, and T tests will be used to examine groupings of height and root collar diameter.

Allan McDonald
Saanich Test Nursery

cc. Drew Brazier
    Susan Zedel
    Bev Wells
    Curt Clarke