Growth Regulator Effects on Growth and Development of Excised Mature Iris Embryos in Vitro

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Abstract. Excised mature embryos of iris (Iris sp.) were grown on agar nutrient medium with 6 concentrations each of indolebutyric acid (IBA), naphthalene acetic acid (NAA), 2,4-dichlorophenoxy-acetic acid, (2,4-D), gibberellic acid (GA3), and kinetin (Kn). The number of roots occurring on the seedlings was significantly increased by 10^-7 and 5 x 10^-6 M IBA and 5 x 10^-7, 10^-6, 5 x 10^-6 M NAA. Plant tissue weight was significantly increased by 10^-7 to 10^-5 M NAA, 10^-7 and 5 x 10^-5 M IBA and 5 x 10^-7 M 2,4-D. Number of leaves per seedling was most affected by Kn and GA3 levels of 10^-5 and 5 x 10^-6 M. Root length was longest at 10^-7 M Kn and 5 x 10^-7, 10^-6, and 5 x 10^-5 M GA3.

If embryos of tall bearded iris (Iris sp.) are excised and grown in vitro, inhibition of seed germination is bypassed. Viable seed can be germinated the first year, and most of the seedlings can be flowered in the second year from seed set if excised as soon as the embryo is mature (1).

The major problem involved in raising iris plantlets by embryo excision and in vitro germination is the establishment of the plantlet in a soil medium. Most of the seedlings from in vitro culture have only 1 or 2 long, thin roots and if the roots are damaged in transplanting, the seedlings often die. The purpose of this study was to determine if the plant structure (roots in particular) could be modified by growth regulators to improve the chances of survival.

Iris seeds of mixed parentage were prepared and excised as previously described (3,4). Three embryos were placed in wide-mouthed bottles (110 x 60 mm) on 20 ml of autoclaved Murashige-Skoog (2) nutrient agar supplemented with thiamine•HCl, nicotinic acid, pyrodoxine•HCl, and glucose at 0.1, 0.5, 0.5, and 2.0 mg/liter, respectively. Kn, GA3, IBA, NAA, and 2,4-D were individually supplied at 10^-7, 5 x 10^-7, 10^-6, 5 x 10^-6, 10^-5, and 5 x 10^-5 M concn. Control embryos received no growth regulators. Each treatment was replicated 8 times with 3 embryos per bottle. The bottles were placed on a table in a growth room with 16 hr light from daylight fluorescent lamps at an average of 50 microeinsteins m^-2 sec^-1 at the embryo level. Room temp was maintained at 26 - 28°C. After 65 days the plantlets were removed from the bottles and the no. of main roots, length of the longest root, no. of leaves, plant ht and wt determined. The values for the 3 embryos in a bottle were averaged to obtain a single value.

Root number. Both NAA and IBA increased the no. of roots per plant. NAA significantly increased the root no. at the lowest concn (10^-7 M) and produced its maximal response at 5 x 10^-6 M (Fig. 1A). IBA did not cause a significant increase until the
Effect of Nutrition on Dieback of Germinating ‘Curtis’ Pecan Seedlings

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Additional index words. Carya illinoensis, minus B, Ca, Cu, Fe, K, Mg, Mn, N, P, S, or Zn. All seedlings receiving deionized water died and treated with either deionized water, a complete nutrient solution or a nutrient solution treated with a complete nutrient solution.

Darrell Sparks

Nutritional studies in pecan can be facilitated by planting seed in sand or perlite and treating the resulting seedlings with the desired nutritional variables. However, tips of both plumule and radicle of seedlings germinated in these media die back shortly after emerging (Fig. 1). Dieback is essentially 100% in all seedlings when perlite is used. Dieback may be less in sand. Germination, as such, is unaffected.

Nutrient solution was added beginning with the time of seed planting during the course of 1 study. Dieback did not occur. This observation suggests the nutrient status of perlite and sand (Table 1) is too low to compensate for an apparent nutrient deficiency or deficiencies in the nut. The objective of this experiment was to study the effect of individual nutrients on

Table 1. Nutrient concn of double acid-extractions of sand and perlite, dry wt basis.

<table>
<thead>
<tr>
<th>Media</th>
<th>N</th>
<th>P</th>
<th>K</th>
<th>Ca</th>
<th>Mg</th>
<th>Fe</th>
<th>Mn</th>
<th>B</th>
<th>Cu</th>
<th>Zn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>20</td>
<td>5.7</td>
<td>0.41</td>
<td>13.7</td>
<td>1.8</td>
<td>0.002</td>
<td>1.8</td>
<td>0.09</td>
<td>0.16</td>
<td>1.02</td>
</tr>
<tr>
<td>Perlite</td>
<td>20</td>
<td>3.2</td>
<td>56.21</td>
<td>29.4</td>
<td>4.9</td>
<td>0.58</td>
<td>5.6</td>
<td>0.02</td>
<td>0.52</td>
<td>1.11</td>
</tr>
</tbody>
</table>

Tissue weight. Embryos on NAA at 10^{-5}M produced the greatest total tissue fresh wt followed by IBA at 5 \times 10^{-5}M (Fig. 1E). Kn and GA3 did not significantly affect plantlet wt at any concn tested, and the effect of IBA was not significant until the concn reached 10^{-3}M. As the concn of the auxin type regulators increased, there was a concomitant increase in callus-like tissue often with many small roots projecting from it.

The addition of 5 \times 10^{-7}M NAA to nutrient agar medium used for the growing of excised iris embryos significantly increased the no. of roots per plant from 1.8 (control) to 6.3 without producing callus tissue nor significantly affecting the other parameters measured. Although IBA at 10^{-5}M did increase root no. it also caused considerable callus growth at the base of the plant. 2,4-D at the concn tested did not increase root no.