

Effects of Concentration of Auxin on Rooting from Woody Stem Cuttings

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Introduction to Treatments Used

1. Control (50% ETOH)
2. 1000 ppm IBA in 50% ETOH
3. 3000 ppm IBA in 50% ETOH
4. 8000 ppm IBA in 50% ETOH

Plant material

Salix alba 'Tristis' (Niobe Weeping Willow; Salicaceae, Willow Family)

Results

Here are the results and observations for this experiment, sorted by week:

- **March 2, 2006** - All the plants are looking healthy. The 3000 ppm IBA treated plants have the most developed root systems thus far, with an average rating of 2.2. Most of the plants have sprouted catkins, which are the flowering appendages of these willows. These have all been pinched off, to encourage the cuttings to develop leaves and roots instead of reproducing. The control group, which has been treated only

with 50% ETOH, has only had minimal root growth, with an average rating of 0.6. This is the same level of growth as the 8000 ppm IBA treated plants. The plants treated with 1000 ppm IBA had an average rating of 1.4.

- **March 9, 2006** - All treatment groups have shown gradual improvement since last week. The control group has sprung forward with average root ratings of 1.4, the 1000 ppm IBA group has ratings of 1.8, the 3000 ppm IBA group has ratings of 2.6, and the 8000 ppm IBA was at an average of 1.4. Long white roots are growing very long from the underground nodes of the cuttings, with many smaller roots growing from the bottom ends. The plants treated with the IBA have longer roots than the control plants, with more root hairs growing along the length. The 8000 ppm IBA plants appear a little slower than the 1000 or 3000 ppm, perhaps stunted by too much hormone.
- **March 23, 2006** - In the two weeks since the last observation, the plants' growth appears to have leveled-off. A few of the plants have up and died, losing their few leaves, and becoming dry and brittle. The plants that have survived are mostly rated fours and fives, so this appears to be a sort of infant-mortality problem, where the plants that survive the first phase are very likely to survive for the long-term. The plants treated with 1000 ppm IBA appear to have no change since last observation, with average root ratings of 1.8, but two of the plants have died, and the other three have grown larger. Similar things have happened to the other groups, with some deaths, and more growth in the living. The control group has average root ratings of 1.8, the group treated with 3000 ppm IBA has average ratings of 3.0, and the plants treated with 8000 ppm IBA are at 1.6.
- **March 30, 2006** - A few more plants have died since last week, but the remaining plants are growing larger and healthier every day. Only two plants are still living in the 8000 ppm IBA group, where the average root rating is 2.0. The root balls of both these plants, as well as the larger plants from the other groups, are growing down into the perlite bases of our mist boxes. This means they have grown at least down two to three inches through the sand. The largest plant, growing in the 3000 ppm IBA group, with an average rating of 2.8, has a secondary shoot that is nearly as long as the original cutting. The group treated with the 50% ETOH has root ratings of 2.0, a slight increase from last week. All of the control plants are still alive. The plants treated with

1000 ppm IBA has an average of 1.4, a large drop from last week, due to the surprise death of one of the stronger-looking plants.

- **April 6, 2006** - No more plants have died, confirming the ‘infant-mortality’ theory of this experiment. The control group has shown good improvement, continuing it’s 5/5 living rate. It has average ratings of 2.6, second best in the experiment. The other plants appear to have stalled in their root development, as they are still almost all rated at fives. For 1000 ppm IBA, the rating is still 1.4. For 3000 ppm IBA, the rating is still 2.8, and the rating for 8000 ppm IBA is still 2.0. An interesting trend has emerged regarding the deaths of the plants. Only one plant has died from the 1000 ppm IBA group, two plants have died from the 3000 ppm IBA group, and three plants have died from the 8000 ppm IBA group. This could perhaps indicate that large concentrations of IBA can be toxic to this species of willow. This could also be a mere coincidence, to see such a nice correlation between concentration and survival rate, so a larger sample space would be advisable for the next experiment.

Tables

Average Root Ratings for <i>Salix alba</i>					
Treatments	3/02	3/09	3/23	3/30	4/06
Control (50% ETOH)	0.6	1.4	1.8	2.0	2.6
1000 ppm IBA in 50% ETOH	1.4	1.8	1.8	1.4	1.4
3000 ppm IBA in 50% ETOH	2.2	2.6	3.0	2.8	2.8
8000 ppm IBA in 50% ETOH	0.6	1.4	1.6	2.0	2.0

The rating scale for root growth was:

- **0** - No root growth
- **1** - Callus only
- **2** - Few root beginnings
- **3** - Substantial root growth
- **4** - Significant root growth
- **5** - Very significant root growth

Discussion

Overall, the different concentrations of auxins appeared to have a significant effect in not only the growth of adventitious roots, but also in the premature deaths of the cuttings. As noted above, the stronger the concentration of the IBA auxin treatment to a stem cutting, the higher the chance of death for the cutting. This is most likely just a statistical anomaly, requiring many more trials before concluding that this is the true explanation for the deaths. For the plants that survived, they grew very well, with many leaves and secondary shoots forming. Some of the cuttings had doubled in total length by the time this experiment was concluded. As far as rooting quantity and quality, of the plants that survived through the entire experiment, the plants treated with IBA appeared to have a more developed root system, with longer, thicker roots. As far as auxin concentration is concerned, 3000 ppm IBA appeared to have the best results with root development. If this experiment were to be repeated, I would use many more samples. This would help eliminate some of the discrepancies and uncertainty involved with using only a small number of cuttings. I would also try to pick a standard size for the cuttings, both in length and diameter. The smaller diameter twigs appeared to be more likely to die before producing enough root and leaf structure to survive, before running out of stored food.

Recommendation

For propagating *Salix alba* from woody stem cuttings, the best treatment appears to be 3000 ppm IBA in 50% ETOH.