The effects of cutting length and IBA treatment on stem cutting propagation of 
*Schefflera arboricola*
Dylan Davies  
BSc. Agr Env, Major: Environmental Biology, Minor: Ecological Agriculture  
*McGill University, Department of Plant Science*

Introduction  
The dwarf umbrella tree, *Schefflera arboricola*, is a common tropical foliage plant in the ornamental houseplant industry. Because of its popularity, the extensive cultivation of this plant has led to a significant amount of literature on various techniques involved in propagating it. Additionally, many different cultivars have been developed including variegated and dwarf varieties. This project will focus only on the standard (wild) variety. The objective is to determine how stem cutting size and rooting hormone application influences the root formation rate in *S. arboricola*.

Propagation Methods  
This section will provide an illustrated summary of the techniques used in the propagation of *S. arboricola*. While these methods were used in the context of a plant propagation experiment, this same methodology can be applied to both commercial and personal propagation purposes.

STEP 1: Preparation  
The first step is to find a parent plant that will provide sufficient plant material for the propagation project. It is important to inspect the parent plant for pathogens and to assess the overall health of the plant. Any pathogens found on the parent plant can potentially be transferred to the cuttings, so it is important to apply proper cleaning and disinfection practices for any observed pathogens. It is also important at this stage to disinfect both the tools and the work site to avoid contamination during the propagation process.

STEP 2: Branch Removal  
Once the parent plant has been prepared for cuttings, you can go ahead and cut off some plant material. The cut should be done using clean, sharp secateurs that can easily sever semi-woody tissue. The cut should be done right above a node in an effort to reduce the amount of stem tissue above the last node on the plant. The branch that is removed will be used in the next step to produce the individual cuttings.

STEP 3: Individual Cuttings  
In this step, individual cuttings will be taken from the branches removed in the previous step. These cuttings should be taken using a sterilized razor blade and a sterilized cutting board. The image to the left provides an example of cuttings that can be taken. In this image, the top cutting is a 3-node cutting, the
middle two are 2-node cuttings and the bottom one is a 1-node cutting. Each of these cutting lengths is appropriate for stem propagation. This experiment used an equal number of all three to compare the propagation success of each type of cutting.

STEP 4: IBA Application

This is an optional step as *S. arboricola* is able to form roots even without the use of a rooting hormone powder. However, rooting hormone can often increase the rate of root formation and overall rooting success of stem cuttings. This experiment included treatments both with and without Stimroot #1 in order to assess the effect of this treatment on this plant.

STEP 5: Inserting into Soil Medium

Once the cuttings are prepared, they can be place into a tray filled with rooting medium. A 50/50 mixture of perlite and sphagnum moss was used in this experiment. The perlite provides the medium with adequate drainage, while the sphagnum moss provides the mixture with water retention capacity. This creates an environment that is favorable for root formation.

STEP 6: Mist Frame

Once the trays are filled with cuttings, they can be placed in the mist frame. The mist frame will provide the moisture that the cuttings require while they root. The cuttings should be left in the mist frame until they form a good amount of root mass. In this experiment, the cuttings were left in the mist frame for 6 weeks.

STEP 7: Removal from Mist Frame

Once substantial root mass is formed, the cuttings can be removed from the rooting medium and the mist frame. Some cuttings may even begin to form shoots at this stage. The cuttings that did not form roots can be discarded or returned to the mist frame until they form roots. For those that did root, the roots should be cleaned of as much of the rooting medium as possible without damaging the roots.
STEP 8: Planting in Soil

The rooted cuttings should now be planted in a potting soil mixture that will provide them with the nutrients they need to grow. In this experiment, the cuttings were planted individually in small plastic pots containing agromix soil.

* Illustrations done by Dylan Davies

**Experimental Design**

The experiment consisted of 6 different treatments in order to adequately assess the effects of cutting length and hormone application on propagation success. The 6 treatments had 10 cuttings in each and were each replicated twice in order to increase the sample size. The 6 treatments were created using a combination of the IBA treatment (whether or not IBA was used) and cutting size (1, 2 or 3 node cuttings). This gave a total of 60 cuttings per experiment. This experiment was performed twice, resulting in a total of 120 cuttings (60 cuttings per experiment, with two replicates).

**Results**

This experiment found that the treatment with the highest success was the 3-node cuttings treated with IBA rooting hormone (with an 18/20 rooting success rate). The lowest success rate was observed in the 1-node cuttings without IBA powder (with an 8/20 success rate). The success rate increased with cutting size in both the IBA and non-IBA treatments. The IBA treatment increased rooting success for both the 1-node and 3-node cuttings, however it resulted in a decrease of rooting success in 2-node cuttings. The results for rooting success are listed in Table 1.

<table>
<thead>
<tr>
<th></th>
<th>1 node</th>
<th>2 node</th>
<th>3 node</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBA</td>
<td>14 (n= 20)</td>
<td>12 (n=20)</td>
<td>18 (n=20)</td>
</tr>
<tr>
<td>No IBA</td>
<td>8 (n= 20)</td>
<td>14 (n=20)</td>
<td>14 (n=20)</td>
</tr>
</tbody>
</table>

Several of the cuttings produced shoots while still in the mist frame. The rate of shoot emergence was recorded and listed in Table 2. The greatest shoot emergence rate was found in the 3-node treatments with IBA powder application. The lowest shoot emergence rate was found in the 1-node cuttings with IBA powder application. While there is no apparent trend in the effect of either treatment on the rate of shoot emergence, there appears to be a combined effect.

<table>
<thead>
<tr>
<th></th>
<th>1 node</th>
<th>2 node</th>
<th>3 node</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBA</td>
<td>0 (n= 20)</td>
<td>8 (n=20)</td>
<td>14 (n=20)</td>
</tr>
<tr>
<td>No IBA</td>
<td>2 (n= 20)</td>
<td>8 (n=20)</td>
<td>4 (n=20)</td>
</tr>
</tbody>
</table>

**Discussion**

The results shown in Table 1 suggest that the IBA powder can increases the rooting success of *S. arboricola*. There was some variability in the results as the 2-node cuttings without IBA powder
performed better than the ones with an IBA treatment. Due to the small sample size (total n = 120), it is difficult to determine whether this occurred as a result of the treatments or due to stochasticity.

The cuttings with more nodes appeared to perform better than those with few nodes, however there is a lot of variability in this regard as well. This may be due to the cutting having more stored energy to be devoted to root formation, however this can only be speculated as causation cannot be implied from these results. The 1 node cuttings without IBA powder performed the worst out of all the treatments, suggesting that this is the worst combination to use for propagation this plant. The 1-node cuttings with IBA performed better, suggesting that the IBA powder can reduce the disadvantage associated with a 1-node cutting.

The results shown in Table 2 suggest that the combined treatment of IBA powder and 3-node cuttings can increase the shoot emergence rate of *S. arboricola*. This therefore brings up the question of what are the underlying mechanisms that support this increase. The IBA powder may not only increase the root formation rate, but reduce the time it takes for the cuttings to form roots by stimulating root formation. If these cuttings form roots sooner, this may provide them with a substantial enough root mass to support the formation of shoot tissue. Similarly, the increased cutting size may provide additional energy that will allow the cutting to form shoot tissue. This speculation is questioned by the 3-node no-IBA treatment that had a shoot emergence rate of 4/20. It appears that without the IBA treatment, the cuttings do not form as much shoot tissue, as they would have with an IBA treatment.

It is also important to acknowledge certain variables that may influence stochasticity in the results. The literature suggests that basal cuttings have a higher rate of root formation than distal cuttings (Hansen, 1986). There was an effort made to spread the source of the cuttings out evenly among treatments, however it is possible that certain treatments received a greater proportion of basal cuttings than distal ones. This could influence both the root formation rate and the shoot emergence rate of the cuttings, which render the results less indicative of the effects of the tested variables.

**Conclusion**

This experiment produced variable results, however general trends in the results suggest that an IBA treatment on a 3-node cutting results in the greatest rooting success as well as shoot formation rate. The small sample size and the cutting position may cause stochasticity in these results, which makes it difficult to identify any causal relationships in the data. Nonetheless, the results can be used as an indication of the trends in stem cutting treatments that influence propagation success. Additionally, it would be valuable to compare the rate of success of the cuttings to the amount of plant material used. This is because it may be more economically feasible to apply a slightly less successful treatment that uses less plant material for maximum production.

**References**


**Acknowledgements**

I would like to acknowledge the contribution of the following people:

Dr. Danielle Donnelly, for all of the tips, help and guidance throughout the entire project.

Guy Rimmer, for the support and management of the greenhouse.

Anne Glaude, for her help during filming and data collection.