The Effects of Cytokinins on *Crassula ovata*

By Véronique Dubé, for PLNT 310: Plant Propagation

**About the author**

Véronique is a U2 university student, majoring in urban system. However her heart now lies in agriculture, since undertaking the City Farm School program with the Concordia Greenhouse, and subsequently changing her minor for ecological agriculture.

**Introduction**

*Crassula ovata*, traditionally names *Crassula argentea*, is also known as the jade plant, the friendship tree, the lucky plant, the money plant, or the money tree. Such a wide variety of names is partly due to its boundless popularity as an ornamental plant. Native from South Africa, this succulent is now Found in homes and gardens all over the world (Malan et al., 2005).

**Literature and Objective**

Few researches in the existing literature discussed hormone treatment in the propagation of the jade plant, despite its importance as an ornamental plant. The ones that did had conflicting results over the roles and usefulness of hormones in the propagation of the jade plant. They seldom addressed the interaction of the two main growth hormones, auxins and cytokinins. Therefore, the objective of this project was set as clarifying the effects of cytokinins on vegetative propagation by leaf cuttings, in relation to auxin and timing.

**Procedures**

To do so, young leaves will be cut with a sanitized blade from a healthy jade plant. 2 replicates of 7 different treatments on samples of 10 leaves each will be carried, so 140 leaf cuttings will be necessary. Those treatments will be as follow, where the auxin is Stimroot #1, and cytokinin is a kinetin solution at a 1mg/L concentration:

- 1: 10 leaf cuttings, with no treatment (control)
- 2: 10 leaf cuttings, with only auxin treatment
- 3: 10 leaf cuttings, with only cytokinin treatment
- 4: 10 leaf cuttings, with both auxin and cytokinin treatments from the start
- 5: 10 leaf cuttings, with auxin treatment from the start, and cytokinin treatment sprayed after three days
- 6: 10 leaf cuttings, with auxin treatment from the start, and cytokinin treatment sprayed after a week
- 7: 10 leaf cuttings, with auxin treatment from the start, and cytokinin treatment sprayed after a month
The cuttings will sit for a period of 3 days on an open bench to callus. They will then be planted in a moist potting mix made of 2 parts agromix (G6), 1 part sand, and 1 part surface, in a regular seedling flat before going back to the open bench. They will be watered regularly. The treatments will be applied according to the schedule above. After 2 months, the leaves were gently removed from the potting mix to assess rooting success. The most successful one were transferred into a bigger pot.

**Results**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Control (no treatment)</th>
<th>Only auxin</th>
<th>Only cytokinin</th>
<th>Both (auxin and cytokinin)</th>
<th>Auxin, and cytokinin after 3 days</th>
<th>Auxin, and cytokinin after 1 week</th>
<th>Auxin, and cytokinin after 1 month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replicate</td>
<td>1 2 Avg 1 2 Avg 1 2 Avg 1 2 Avg 1 2 Avg 1 2 Avg 1 2 Avg 1 2 Avg 1 2 Avg 1 2 Avg 1 2 Avg 1 2 Avg</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decay</td>
<td>1 0 0.5 4 0 2 1 3 2 2 1 1.5 2 1 1.5 0 1 0.5 2 1 1.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No root</td>
<td>0 7 3.5 1 7 4 1 5 3 2 8 5 3 6 4.5 4 3 3.5 4 7 5.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small root</td>
<td>4 1 2.5 3 2 2.5 1 2 1.5 1 1 1 2 3 2.5 2 2 2 1 2 1.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium roots</td>
<td>5 2 3.5 0 1 0.5 5 0 2.5 2 0 1 2 0 1 3 4 3.5 3 0 1.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long roots</td>
<td>0 0 0 2 0 1 2 0 1 3 0 1.5 1 0 0.5 1 0 0.5 0 0 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total roots</td>
<td>9 3 6 5 3 4 8 2 5 6 1 3.5 5 3 4 6 6 6 4 2 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Replicate 1
(Favourable conditions)

Replicate 2
(Under stress)
Overall, the highest rooting success came from both the controls and the treatment of auxin, and cytokinin after 1 week. The biggest total of long roots came from applying both treatments at the same time. Applying auxin first, and cytokinin after 1 month, kept the most leaves on a state of ‘stand-by’, as they were not rooting, but not decaying either.

However, there are many things to take into consideration in analyzing the results. First, the total count of some treatments at the end of the experiment was sometime not 10. The missing leaves were assumed to have decayed, but there were no evidences of this. Secondly, from initial fear of causing rot by overwatering, the leaves received insufficient moisture for the first 3 weeks of the experiment. This reduced the success of the experiment, partly because Stimroot is water soluble. Hence its effect was delayed.

The results of the 2 replicates were drastically different. This could be explained by location, since the first replicate was closer to other projects, and might have received supplemental moisture this way, hence reducing water stress. It is therefore to compare both results to assess to effects of the different treatments under ‘favourable conditions’, and under stress. From this comparison, we can conclude that auxin seemed favourable in stressed condition, by limiting water loss, something usually associated with callus formation (Ikeuchi et al., 2013), while the presence of cytokinin seemed to hasten any process, be it rooting in favourable condition, or decaying under stress.

**Conclusion**
To conclude, *Crassula ovata* seems very capable of propagating itself without additional hormones. Still, the interaction between both hormones had some positive results, especially in regards to root length, and protecting from stress and decay. However, for a propagator that would not submit his cuttings to such a stressful environment, the cost of hormones might not be worth the results. This experiment used a callusing period of 3 days, but references vary on the necessity of this period, and on its length. Perhaps it could be interesting to further research the interaction between the callusing period length and hormonal treatments.

**Acknowledgement**
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References

Mentioned in this document:


Used for the literature review:


Louw, M. 2012. Propagation and stress physiology of selected Subtropical Thicket species: towards increasing biodiversity at rehabilitation sites. Nelson Mandela Metropolitan University, Port Elizabeth.

