Vegetative Propagation of *Cannabis sativa*

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Introduction

Vegetative propagation of *Cannabis sativa* is done by many growers in the United States. It allows for the production of selected clones, ensures there are only female plants (which prevents fertilization and seed production, which reduces CBD extraction from female flowers), and permits faster maturation rates in comparison to seed. Due to legal constraints, refereed research on cannabis has been highly restricted until the passage of 2018 Farm Bill legalizing the cultivation of hemp. Currently, Utah State University is licensed to study the production of hemp in controlled environments. In response to the great demand for rooted cuttings, growers are interested in improved propagation techniques and efficiency. The purpose of these trials are to help define the requirements for hemp cutting propagation.

Methods

Unless otherwise stated, propagation conditions were as follows:

- Shoot tip cuttings of C. *sativa* 'Trump' or 'Cherry' cultivars cuttings with two fully expanded leaves
- Cuttings dipped in 1:100 ZeroTol, and tools with 70% alcohol
- Cuttings dipped in 1 cm of water then 3000 ppm IBA as a talc-based formulation (Hormodin® 2)
- Stuck in 3:1 peat: vermiculite rooting substrate as Ellepots
- Placed on a mist bench in a glass greenhouse with DeWitt Deluxe .5 oz row cover canopy and an 18-hour photoperiod using 1000W double ended high pressure sodium lights
- Intermittent mist of 8 seconds every 15 minutes. Greenhouse temperature setpoints were 23.5°C with bottom heat at 24°C
- Cuttings were harvested and analyzed when approximately 1/3 of the pots had visible roots, or when cuttings started to decline (approximately 2-3 weeks)
- Cuttings were rated for rooting, number of roots (on 1-5 scale with 1 being no roots and 5 being over 30), length of the longest root, and chlorosis. Cuttings were considered rooted if roots over 2 mm in length were present

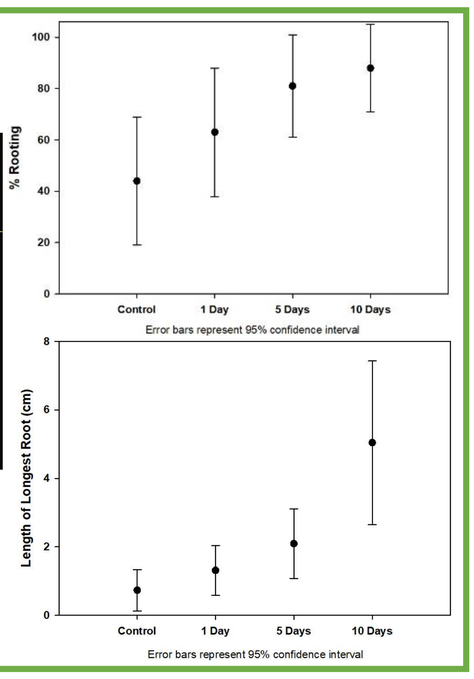
Conclusions

- There are varietal differences in rooting
- Chilling the cuttings for a set amount of time does not reduce rooting
- There is no apparent difference in post rooting growth based on rooting hormone
- Single-node cuttings can be successfully rooted, but they respond differently depending on position on the parent stem
- Shoots from single-node cuttings tend to grow out evenly regardless of node position
- While not significant, wounding appears to enhance rooting of 'Trump'
- While leaf cuttings will root, the inability of the leaves to form an adventitious bud precludes their use as a propagule

Chilling Experiment

The effect of post cuttings storage temperatures on rooting of 'Cherry" was tested by holding at 4°C for 0, 1, 5, and 10 days before sticking. Unfortunately, problems with bottom heat variability preclude a valid comparison of dates, but we can conclude that storage for 10 days still permits over 80% rooting.

Figure 1. Effect of chilling treatments on subsequent root development (control not shown).



Rooting Hormone Experiment

The effect of auxin concentration and formulation was determined by treating with 3000 and 8000 ppm IBA as Hormodin® 2 or 3, and 2000/1000 ppm IBA/NAA or 4000/2000 ppm IBA/NAA as Dip N' Grow® with a 25% ethanol carrier. Upon completion of the trial, cuttings were grown in growth chambers and developed uniformly regardless of the auxin concentration or formulation (data not shown).

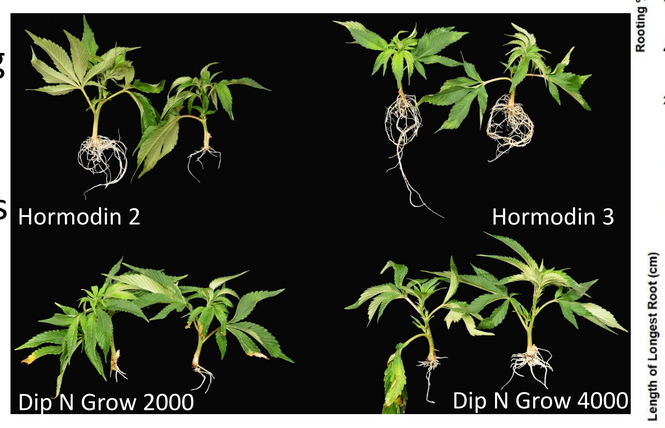
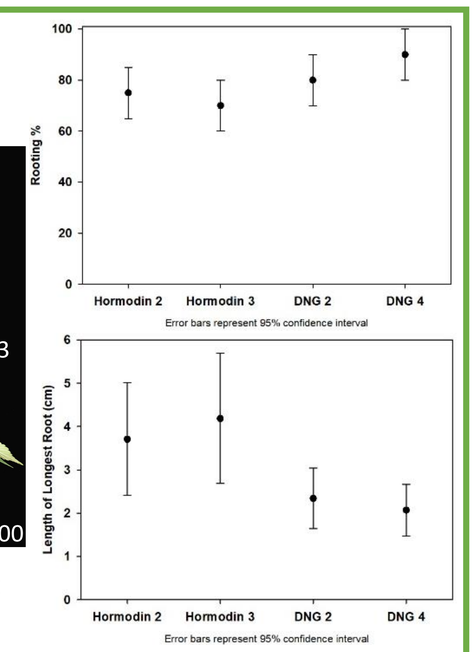


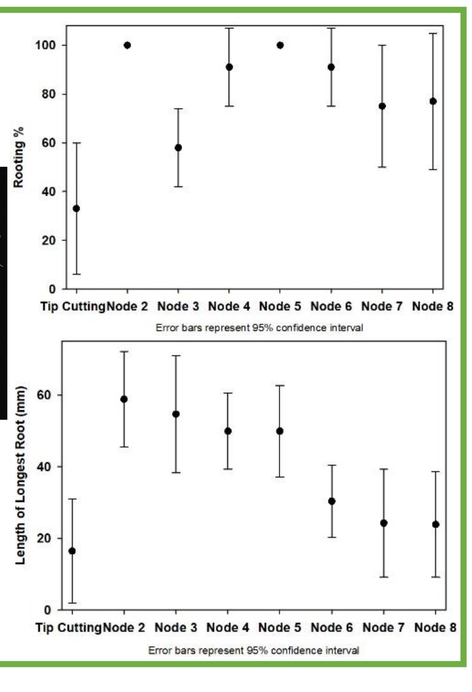
Figure 3. Photographs showing the differences in rooting based on the hormone treatment.



Single Node Cutting Experiment

In an effort to determine sources of variation, the effect of cutting position on rooting was determined. All cuttings were taken from the highest lateral branch of selected stems. The tip was used as our standard cuttings, then the single nodes after that were stuck and rooted. The older the plant material, the harder it was to root. These were grown out, and grew uniformly.

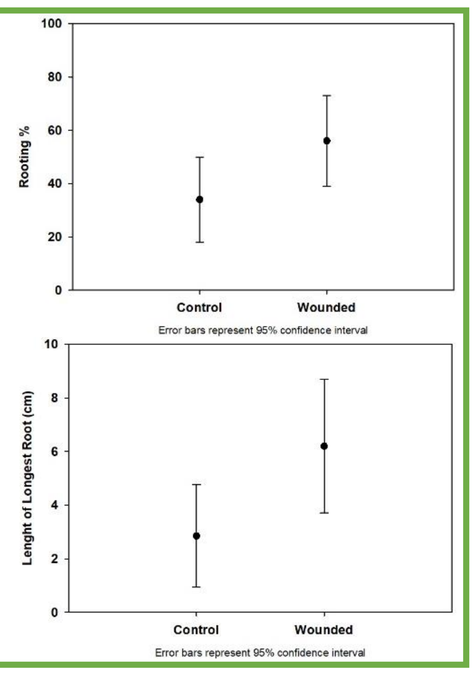
Figure 5. Photographs of *Trump* cultivar, standard cutting (left) to the eighth node (right) below the standard cutting.



Wounding Experiment

Given the woody nature of *Cannabis* stems, an experiment was conducted to see if wounding would increase rooting uniformity. We used a 600 grit wet-dry sandpaper to accomplish this task by pinching the sandpaper and pulling the end of the cutting through three times while reaching all sides. We saw a trend toward better rooting from the wounded cuttings on 'Trump' (harder to root cultivar) as compared to 'Cherry' (data not shown).

Figure 7. Photographs of the best rooted cuttings of the control and wounded treatment.



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