Grodan®

Part of ROCKWOOL Group

Grow Guide Cannabis Edition

Guides And Tips for Growing in Stone Wool

Volume 2

Chapter 5: Propagation in Stone Wool: Seeds

HIGH PERFORMANCE GROW SOLUTIONS

GRODAN

PROPAGATION OF SEEDS

Introduction

Seed propagation is a critical component of the overall cultivation process for growers, breeders, nurseries, researchers, and a variety of other stakeholders throughout the industry. While clonal and in-vitro methods remain the primary mode of cannabis propagation in controlled environment agriculture settings, the seed industry has made considerable scientific advancements in recent years.

Science-driven breeding companies are ushering in a new era of Cannabis seed production from targeted breeding programs leveraging gene sequencing and editing technology, to the production and commercialization of stable F1 hybrid seed lines.

The highly competitive landscape of the North American Cannabis market drives growers and propagators to seek relevancy by searching for new and genetically diverse cultivars with desirable morphological characteristics, pest and disease resilience, and unique aesthetic and chemical characteristics.

As global seed quality and stability improves, sound propagation protocols for use with consistently engineered, clean growing media will ensure exemplary germination success rates for highly valuable cannabis seed. Currently, the relatively high cost of cannabis seed requires growers to adopt a meticulous, science-backed approach to propagation, mitigating the percentage of seedlings culled.

In this chapter, we will outline a comprehensive protocol for propagation of Cannabis seeds in Grodan stone wool, providing a step-by-step guide informed by institutional research trials and Grodan's 50+ years of experience pioneering best practices in the horticulture industry.

A Note on Seed Selection:

The foundation of successful propagation lies in selecting high-quality seeds. Cannabis seeds should be sourced from reputable breeders or suppliers, ensuring viability, stability, consistency, and vigor. For commercial cultivators, the hierarchy of breeding selection criteria must be well understood and aligned with the cultivator's production goals. For example, a breeding project focused on the efficiency of biomass active pharmaceutical ingredient (API) extraction may place dried flower aesthetic quality low on the selection hierarchy. While a breeding project focused exclusively on finding and selecting the most colorful varieties may fail to prioritize performance indicators such as vigorous plant structure, or resilience to abiotic stressors.

Ideally, seed producers take a balanced approach, prioritizing the following key plant characteristics:

- Yield capacity
- Aesthetic quality
- Chemical profile (secondary metabolites)
- Plant and inflorescence structure
- Resiliency against pests, diseases, and abiotic-stressors

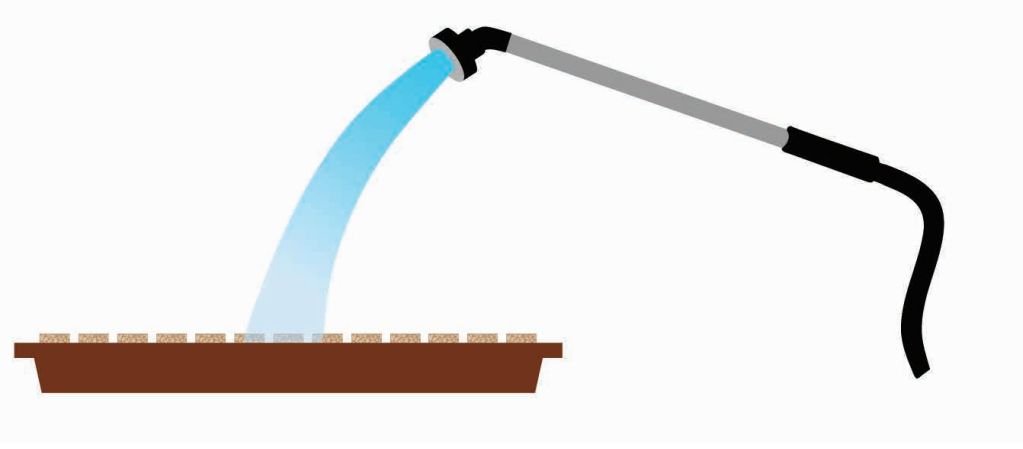
When selecting seeds, factors such as size, color, and hardness can be indicators of quality. Healthy seeds are typically dark-colored, firm, and free from damage or deformities.

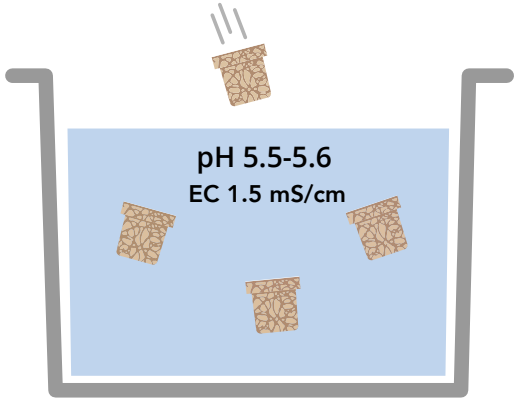
Preparing Propagation Media and Seeding

Grodan® A-OK Plugs are an ideal propagation media for growing cannabis seedlings. Consistently engineered through controlled manufacturing processes, they provide desirable structure, water behavior characteristics, and chemical properties for seedling growth. When using stone wool plugs, every stage of the propagation process can be carefully orchestrated to nurture robust seedlings primed for successful cultivation outcomes.

Process:

1. Soak individual A-OK plugs or complete A-OK sheets in a balanced fertilizer solution with an EC of 1.5 mS/cm, pH adjusted to 5.5-5.6, temperature of ~68° F. Plugs should remain in the solution until they sink and all bubbling stops.





Process Continued:

2. Place plugs in a standard propagation tray with an insert of your choice. Plugs can be planted in a Gro-Smart tray, in contiguous sheets with a basket insert in Grodan® SBS trays or in any other compatible cell-tray insert. Allow excess water to drain away naturally; there should be no standing water in the trays. Plug density per tray may vary depending on the insert utilized, but we recommend starting at a density of somewhere between 50 and 78 plugs per tray.

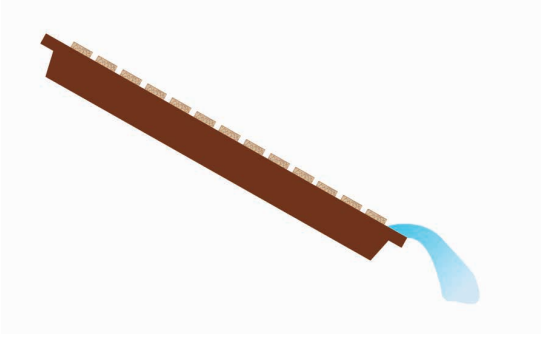
Note if starting a small quantity of seeds, lower densities can be utilized, but spacing plugs out (as described in step 12) may not be necessary after the first week of growth. Trays of seedlings with low densities may dry back quickly and will likely require more frequent irrigation.

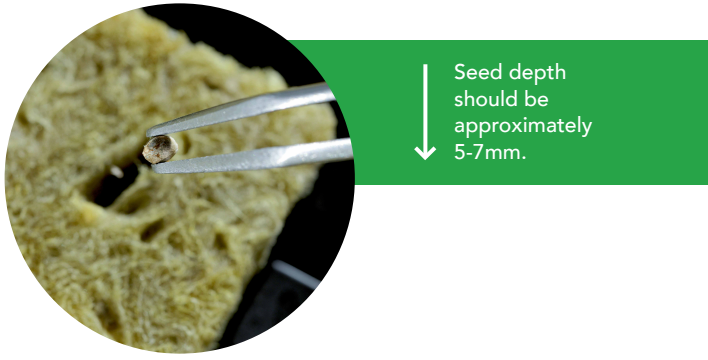
3. Spread seeds out on a clean surface and remove any deformed or broken seeds.

4. While the risk of disease, virus, and viroid transmission tends be lower via the seed propagation process than the clonal propagation process, seeds are capable of carrying plant pathogens if produced from infected parental stock. Consult your seed provider to discuss any recommended seed sterilization protocols prior to planting.

5. Use sterile forceps to place seed in the pre-drilled hole of the plug. Seed does not need to be inserted deeply into the plug. Seeding depth should be approximately 5-7mm. If the seeds you are using are quite large (>5mm), a sterile implement may be used to widen the pre-drilled hole.

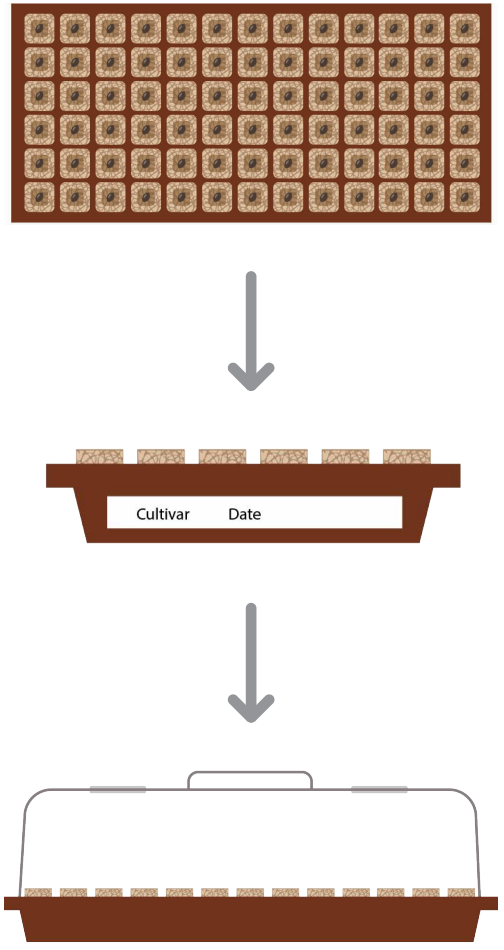
Note Grodan trials indicated sowing seeds at depths of <3mm and greater than >10mm reduced germination rate.





Process Continued:

6. Repeat this process until all seeds have been sown.
7. Label the front of the trays with the cultivar name, date of sowing, and any other relevant information. Leave space on your label for a tray weight. This will be added after the first irrigation.
8. At this point, newly sown seeds must be placed in a controlled environment such as a propagation chamber, greenhouse, or closely monitored humidity dome within a propagation room.



Pro-Tip

Quality Control Checkpoints

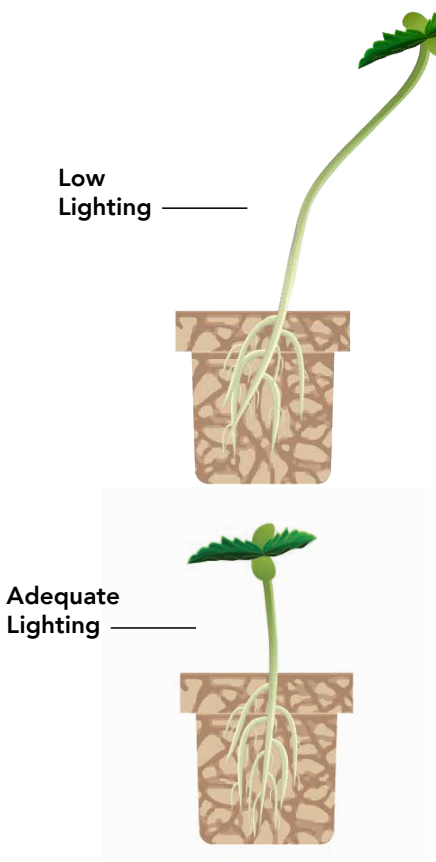
- ✓ Solution temperature verified
- ✓ pH meter calibrated
- ✓ EC meter calibrate
- ✓ No floating plugs
- ✓ No visible dry spots
- ✓ No standing water in tray

Setting the Climate for Week 1

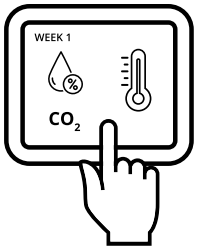
From the time of sowing, growers must maintain specific climate conditions, providing a conducive environment for germination and early growth. In the first week of germination and growth the seedling's environment must be warm and humid, however excessively high temperatures and/or relative humidities could cause fungal growth and general damping-off symptoms. If using humidity domes, it is highly recommended to place a temperature and relative humidity sensor inside the domes to monitor and control ongoing conditions.

Adequate light intensity is critical for successful seed germination and optimal early seedling structure. Cannabis seedlings require moderately high light intensity to remain compact and sturdy. Low light intensity impairs photosynthetic efficiency, limiting the seedling's ability to produce ample energy for metabolic processes. Insufficient light intensity, or placing seedlings too far from light fixtures, can result in etiolation, a phenomenon characterized by elongated, weak stems. In low PPFD (photosynthetic photon flux density) conditions, seedling stems will stretch rapidly, creating a flimsy and compromised plant structure that may bend or collapse.

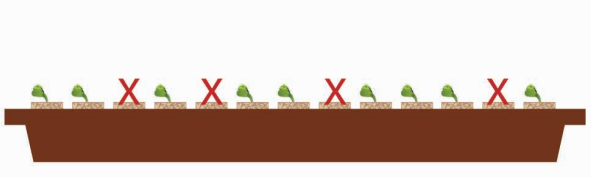
If low light conditions are prolonged, leaf development and biomass accumulation is often delayed as resources are diverted toward stem elongation. Etiolated seedlings are more vulnerable to environmental stressors such as drought, high temperatures, and disease. Their weakened structure and reduced vigor make them less resilient in adverse conditions, increasing the risk of plant damage, reduced yield, and mortality. Checking light intensity carefully with a high quality PAR (photosynthetic active radiation) meter will help set the stage for strong vegetative plants.



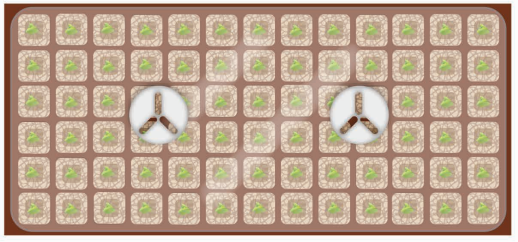
Week 1 Climate Conditions



Temperature Day (°F)	Temperature Night (°F)	Relative Humidity	Photoperiod (hours on/off)	PPFD (umol/m2/s)	CO_2 (ppm)
78	76-78	88-90%	18-20 / 4-6	150-200	500-750



Week 1 Monitoring and Plant Management



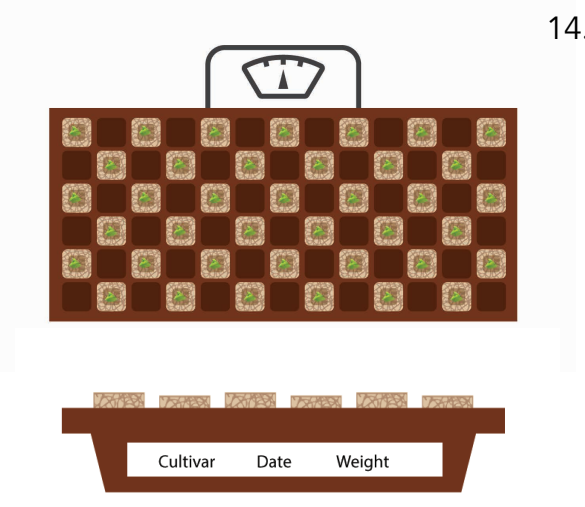
9. After 72 hours, observe the seedling condition from overhead. Remove any plugs that contain seedlings with obvious fungal growth or deformities.
10. After 4-5 days, remove any plugs containing seeds that failed to germinate and/or emerge. Remove any plugs containing seedlings with bent or twisted stems.

Note It is unlikely for high quality and healthy seedlings to emerge more than 5 days after planting.

11. If seed hulls remain adhered to any cotyledons and are inhibiting leaf unfurling you may gently spritz the cotyledon surface with clean water, avoiding wetting the top of the plug or base of the stem. After wetting, the seed hull can be easily removed with clean forceps. It may also fall off naturally, so removal is only recommended if seed hull is inhibiting the first set of true leaves.

Week 1 Monitoring and Plant Management

12. At the 6-7 day mark, if using a 50 or 78-count plug density, begin spreading out seedlings to a 50% density, or checkerboard pattern within propagation trays to allow for optimal spacing, air flow, and light interception. Trays should be at their final lower plant densities now and all stunted or damaged seedlings removed.
13. Typically, between day 6-8 the first irrigation can be applied. Irrigate the plugs lightly (~10-15mL/plug) using a balanced fertilizer with an EC of 1.5-2.0 mS/cm, pH adjusted to 5.5-5.6, temperature ~68° F. Be careful not to over-saturate the plugs, as this can lead to pathogen establishment around the base of the stem.



14. After applying the first irrigation at the final planting density, create a spreadsheet for recording the weights of individual propagation trays. Place individual trays (with insert, plugs, and seedlings, omitting domes) directly onto a scale and record the date and starting weight. We will use the weight decrease from this starting point to determine optimal irrigation times. You may also notate weights on the front of trays for easy referencing.

Pro-Tip

Use weight tracking to:

- Prevent over/under-watering
- Maintain consistent moisture
- Optimize irrigation scheduling

Weighing Protocol

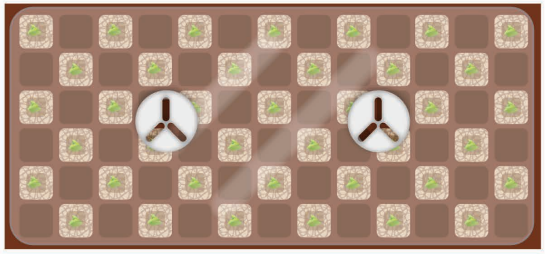
- ☐ Tray
- ☐ Insert
- ☐ Plugs
- ☐ Seedlings

*Do NOT include dome.

Data Recording Format:

Tray ID	Date	Start Weight	Target Range
A1	11/1	2680g	1876-2010g

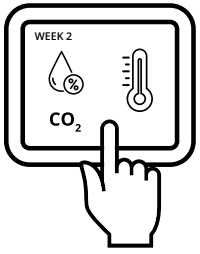
15. If utilizing humidity domes, at the 6-7 day mark the vents should be opened and seedlings should be carefully and gradually acclimated to the new climate set-points outlined below for week 2 of growth. This acclimation process may occur over 2-3 days.



Setting the Climate for Week 2

After 7 days of growth, seedlings will need to receive higher light intensity to maintain optimal structure and growth momentum. Seedlings should be gradually acclimated from a light intensity of 150-200 umol/m2/s to 400 umol/m2/s over the course of the second week of growth. From day 8 until day 12-14, PPFD should be increased by 15-20% per day until the target PPFD is achieved, maintaining the same photoperiod as week 1 of growth.

Week 2 Climate Conditions



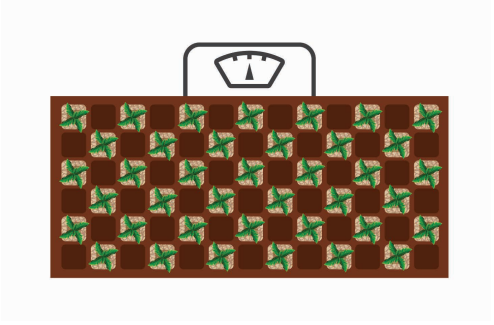
Temperature Day (°F)	Temperature Night (°F)	Relative Humidity	Photoperiod (hours on/off)	PPFD (umol/m2/s)	CO_2 (ppm)
80	73-75	75-80%	18-20 / 4-6	200-400	600-750

Week 2 Monitoring and Plant Management

16. After the first irrigation is applied (between ~ day 6-8) and weights are recorded, trays should be weighed to monitor plug dry-back and determine irrigation timing. When tray weights have decreased by ~25-30% of their initial starting weight, it is time to apply a light irrigation with a targeted spray mechanism or laboratory squeeze bottle.

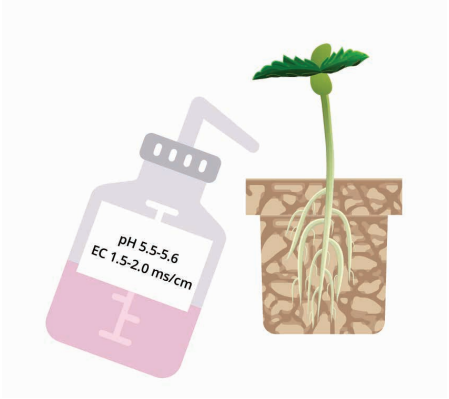
    Example: After first irrigation, weight of tray + plugs + insert + seedlings = 2680 grams
    25-30% decrease = 670-804 gram loss
    2680-670 grams = 2010 grams
    2680-804 grams = 1876 grams

    Apply irrigation once tray weight reaches 1876-2010 grams



17. Irrigate the plugs lightly (~10-15 mL/plug) using a balanced fertilizer with an EC of 1.5-2.0 mS/cm, pH adjusted to 5.5-5.6, temperature ~68° F. Be careful not to over-saturate the plugs, as this can lead to pathogen establishment around the base of the stem.

18. Check tray weights daily to monitor plug moisture levels. Apply irrigations whenever tray weights decrease by 25-30% from initial weight. Typically, under the outlined climate conditions, this results in an irrigation every other day or every 2 days. Irrigation frequency will likely need to be increased throughout the second week of growth.



19. Monitor seedling root development closely during the second week of growth. Seedlings will typically be ready for transplant to a small stone wool block within 12-16 days. A-OK plugs should be well colonized with short pin roots before seedlings are transplanted.

Note If seedlings develop elongated root systems it may be an indication of over-watering. Reducing irrigation volume and avoiding standing water in trays can discourage roots from elongating outside of the plug.

Conclusion

Whether sowing seed for large scale commercial production, breeding projects, or simply germinating new varieties to select mother stock, implementing a precision growing strategy will invariably yield the most healthy and sturdy seedlings. By selecting high quality seed stock and adhering meticulously to the climate and lighting parameters outlined above, growers can quickly and efficiently generate new healthy plants poised for robust vegetative growth.

Seedling Climate and Fertigation Summary Table

	Week 1	Week 2
Temp Day (°F)	78	80
Temp Night (°F)	76-78	75-78
Relative Humidity (%)	88-90	75-80
Photoperiod (hours on/ off)	18-20 / 4-6	18-20 / 4-6
PPFD (umol/m2/s)	150-200	200-400
CO2 (ppm)	500-750	600-750
Fertigate EC (mS/cm)	1.5	1.5-2.0
Fertigate pH	5.5-5.6	5.5-5.6
Fertigate Temp (°F)	68	68

Plant Monitoring & Task Summary Table

Week 1 Monitoring and Tasks Summary						
Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
☐ Prepare media ☐ Sow seeds ☐ Apply week 1 climate		☐ Remove plugs with seeds showing deformities or fungal growth	☐ Remove seedlings that failed to germinate or emerge ☐ Remove any remaining seed hulls from cotelydons	☐ Remove seedlings that failed to germinate or emerge ☐ Remove any remaining seed hulls from cotelydons	☐ Remove seedlings that failed to germinate or emerge ☐ Remove any remaining seed hulls from cotelydons ☐ If using domes begin opening vents ☐ Gradually acclimate to week 2 climate	☐ Spread out seedlings to 50% density ☐ Apply first irrigation and notate weight of trays afterwards ☐ If using domes begin opening vents ☐ Gradually acclimate to week 2 climate
Week 2 Monitoring and Tasks Summary						
Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14
☐ Weigh trays to determine irrigation timing ☐ Increase PPFD 15-20% until 400 umol/m2/s	☐ Weigh trays to determine irrigation timing ☐ Increase PPFD 15-20% until 400 umol/m2/s	☐ Weigh trays to determine irrigation timing ☐ Increase PPFD 15-20% until 400 umol/m2/s	☐ Weigh trays to determine irrigation timing ☐ Increase PPFD 15-20% until 400 umol/m2/s	☐ Weigh trays to determine irrigation timing ☐ Increase PPFD 15-20% until 400 umol/m2/s ☐ Monitor root development to determine transplant timing	☐ Weigh trays to determine irrigation timing ☐ Increase PPFD 15-20% until 400 umol/m2/s ☐ Monitor root development to determine transplant timing	☐ Weigh trays to determine irrigation timing ☐ Increase PPFD 15-20% until 400 umol/m2/s ☐ Monitor root development to determine transplant timing