

5-Phase Model[®]

in Large Blocks | One-Transplant System



Phase 1: Propagation of Cuttings

Phase 2: Vegetative Growth

Phase 3: Flower Setting

Phase 4: Flower Swelling & Bulking

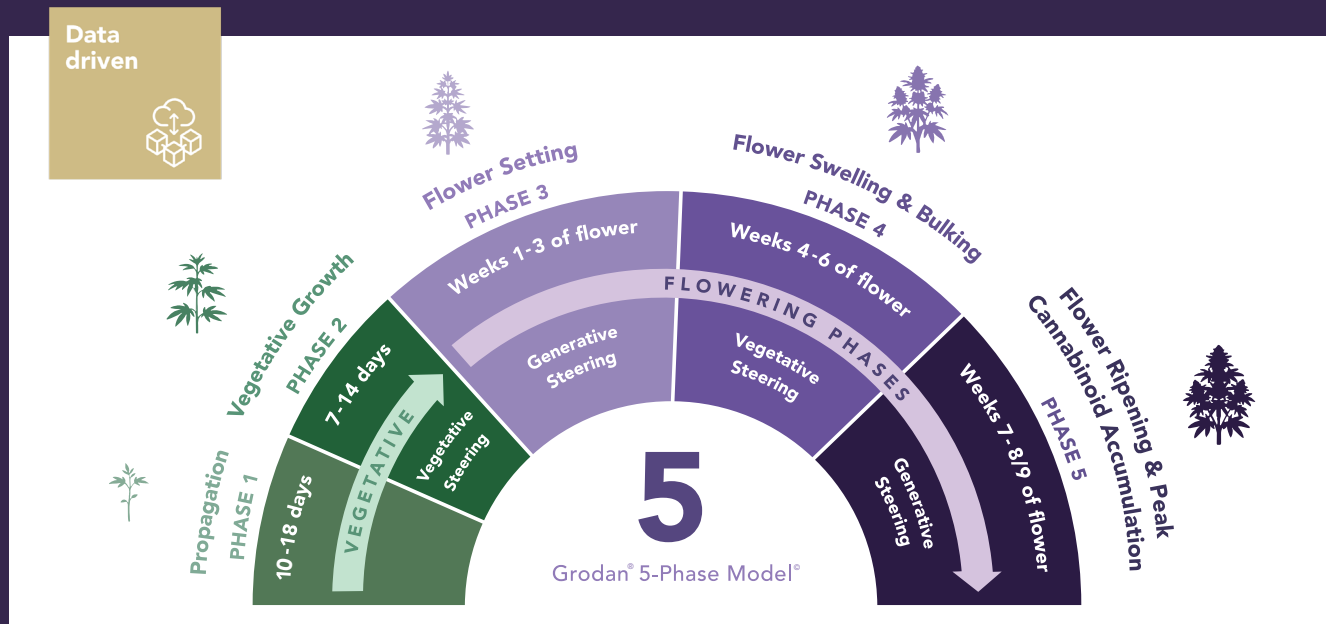
Phase 5: Flower Ripening & Peak Cannabinoid Accumulation

5-Phase Model® in Large Blocks | One-Transplant System

A simple framework that breaks the crop cycle into 5 phases, so you know what to do and when to do it.

Grodan's latest cannabis growing advice builds on its decades-long leadership in vegetable cultivation by translating the proven 6-phase methodology into a clear, cannabis-specific 5-Phase Model®.

Each chapter pairs Grodan's substrate configuration with phase-specific objectives, root-zone and canopy management targets, and tailored crop steering advice, so growers can visually and quantifiably confirm they are on track at every stage of growth.

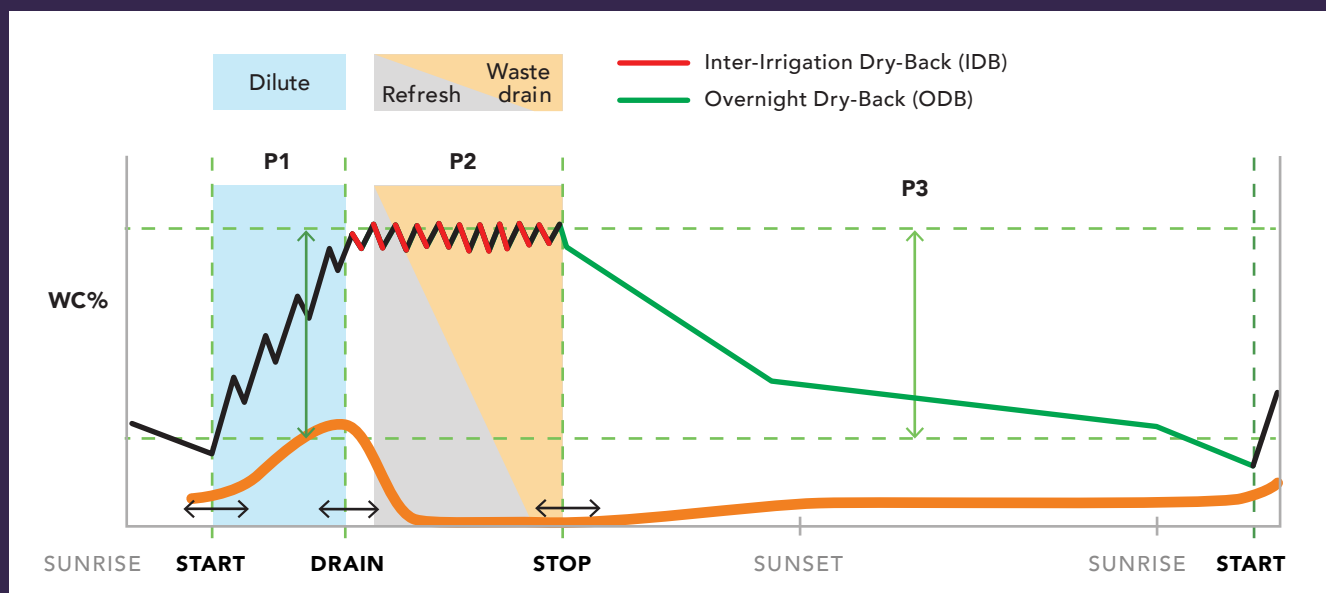


Grodan's DAY-DYNAMIC MODEL

P1 - First irrigation to first drain | P2 - First drain to last irrigation | P3 - Last irrigation to first irrigation

Inter-Irrigation Dry-Back (IDB): Dry-back in between P2 irrigation events.

Overnight Dry-Back (ODB): Dry-back from last irrigation of the day to first irrigation of the following day.





Propagation of Cuttings

This structured, phase-based approach enables proactive steering of the crop rather than reactive growing, helping cultivators drive uniformity, optimize inputs, and consistently achieve the desired plant architecture and yield outcomes that Grodan is known for worldwide.

Simpler crop management. More predictable outcomes.



PHASE 1



Phase 1

Propagation of Cuttings

Typical duration

~10-18 days

Start of Phase

Cuttings are placed into the Grodan propagation plugs.



End of Phase

Roots visible at the plug base; propagation plugs are well rooted and the cuttings are ready to be transplanted into blocks.

Phase Objective

Fast and disease-free callus formation and root-initiation. The plugs should be maintained at a moderate volumetric water content (WC%) to avoid stem rot and damping-off while the cuttings form calluses and initiate roots. The aim is to colonize the plugs with healthy and active adventitious roots, while gradually acclimating the cuttings to lower humidity levels, in preparation for humidity dome/tent removal and relocation to the vegetative space.

This will ensure uninterrupted growth momentum at transplanting. It is critical to supply adequate nutrition (sufficient and balanced electrical conductivity) from initial wetting through subsequent irrigations to maintain healthy plant tissue and prevent mineral deficiencies.



Crop Target

Maintain turgid and healthy leaf tissue and avoid wilting. Be mindful of the cutting density. Avoid overlapping leaves in the propagation trays and facilitate adequate airflow to prevent fungal growth on the leaf tissue and stems.

Propagation Environment — Humidity Dome/Humidity Tent/Propagation Chamber

Parameter	Day 1-4	Day 5-7	Day 8-10	Day 11-18
Temperature	75-80°F/ 24-27°C	75-80°F/ 24-27°C	75-80°F/ 24-27°C	75-80°F/ 24-27°C
Relative Humidity	80-90%	75%+ ↓	72-75% ↓	72%+ ↓
Light Duration	18-20 hrs	18-20 hrs	18-20 hrs	18-20 hrs
Light Intensity	150-200 μmol/m²/s	150-200 μmol/m²/s	150-200 μmol/m²/s	150-200 μmol/m²/s

Table 1.1

↓ Relative humidity should be reduced gradually across the phase to acclimate cuttings to vegetative room conditions before dome/tent removal.

Root-Zone Target

Grodan Propagation Plugs should be saturated with a balanced nutrient solution holding an electrical conductivity (EC) of 1.5-2.5 mS/cm, and a pH of 5.5.

A moderate decrease in water content (WC%) before each irrigation event will encourage callus formation and reduce the incidence of disease ingress.



Phase 1 Root-Zone & Irrigation Targets

Grodan Plug Options	1", 1.5", 2", and Macroplugs (1.5" round)
Tray Density	39-50 cuttings per tray
Initial Saturation EC	1.5-2.5 mS/cm
Initial Saturation pH	5.5
Initial Saturation Temperature	65-68°F/18-20°C
Irrigation Trigger (Tray Weight)	40-50% decrease from starting tray weight
Photoperiod	18-20 hrs
Light Intensity	150-200 µmol/m²/s

Table 1.2

For more detailed information on the process of taking, irrigating, and maintaining cuttings, please refer to the **Grow Guide**.

Process

The following steps cover the full propagation process from plug saturation through transplant readiness. Maintaining hygiene, climate consistency, and the correct nutrient solution at every stage is the foundation of uniform and healthy propagation.

Step 1: Saturate the Grodan Propagation Plugs

Saturate the Grodan propagation plugs using a balanced fertilizer solution at EC 1.5-2.5 mS/cm and pH 5.5 before taking or inserting cuttings. Two methods are suitable:

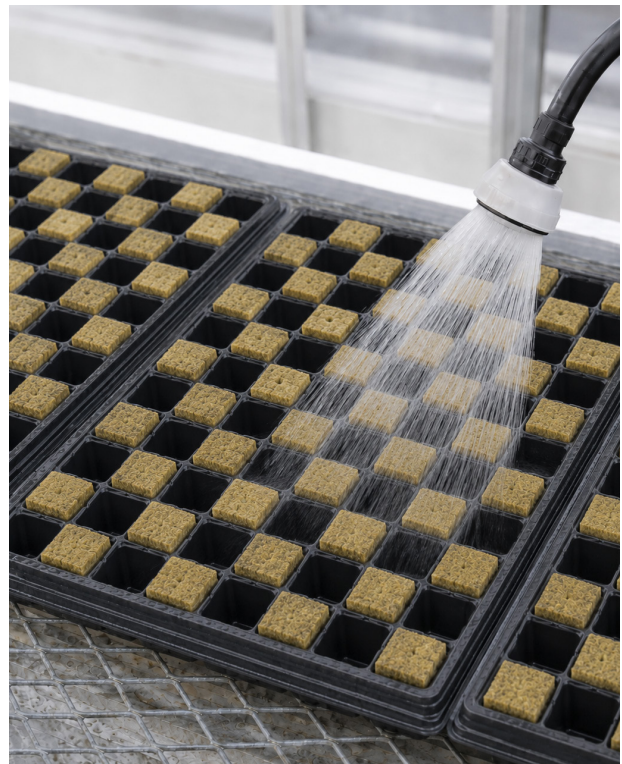
Method 1 Submersion

Submerge the entire tray of propagation plugs into the nutrient bath and allow to soak for approximately 5 minutes, or until all air bubbles have been displaced. Remove the tray and allow excess solution to drain before proceeding.



Method 2 Overhead Saturation

Apply the nutrient solution via an overhead watering wand fitted with a coarse spray head. Apply slowly and make several passes over the plug trays until all plugs are uniformly saturated.



Step 2: Prepare Mother Plants and Take Cuttings

Preparing mother plants before propagation ensures the cuttings are healthy, well-hydrated, nutritionally balanced, and physiologically primed for rapid rooting and uniform propagation success.

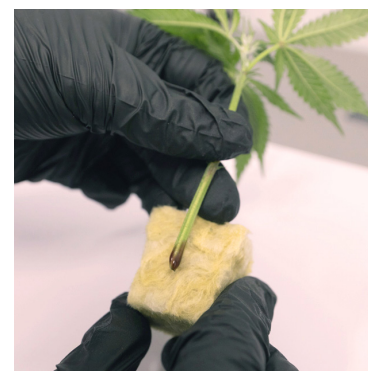
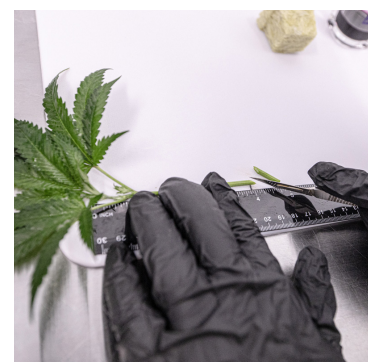
Mother Plant Preparation (2-3 hours before taking cuttings)

The following steps should be carried out in the mother room **2-3 hours** before cuttings are severed:

- 💡 Reduce light intensity by 25-50% for the duration of cutting severance to reduce transpiration stress on both mothers and cuttings.
- 💧 Increase room humidity to 75-78% for the duration of cutting severance.
- 💧 Ensure mother plants have been re-saturated from the previous overnight dry-back (P3) and have achieved some drain before cuttings are severed; this confirms the plant is well-hydrated and nutrient solution is actively moving through the tissue.
- 🌱 An adequate number of healthy mother stock plants is essential for consistently selecting high-quality shoots.

Taking Cuttings

1. Take cuttings from the tops of mother plants. Apical cuttings root fastest and produce the most uniform plant development. Cuttings should be **3.5-5 inches/8-12 cm in length** with uniform stem diameters.
2. Remove all nodes and leaves below the top 2-3 growth points. Remove upper and lower leaves as necessary to prevent leaf overlap in the trays.
3. Trimmed cuttings should be placed into a sanitized cup containing 1-2" of nutrient solution with an **EC of 1.5-2.5 mS/cm and a pH of 5.5** to maintain turgor and reduce wilting risk while the tray is being filled.
4. At this point, an optional disinfecting, anti-fungal, or integrated pest management (IPM) dip can be applied, if desired.
5. Using a sanitized implement, cut the base of the stem at a **45-90° angle**.
6. Dip the base of the cutting in prepared rooting hormone and insert immediately into a saturated Grodan propagation plug. Process cuttings as quickly as possible; do not leave prepared stems exposed to air.
7. Continue until the tray is filled to the desired density.
8. Label each tray with cultivar name, date, and **starting tray weight**. Starting weight = tray + insert + saturated plugs + cuttings, weighed together, excluding the humidity dome.
9. Place filled trays in humidity dome, humidity tent, or propagation chamber. Maintain environmental setpoints as shown in the table above. (Table 1.1)



Step 3: Root Development and Daily Monitoring

10. To prevent fungal disease, avoid leaf overlap and contact between leaf tissue and the inside surface of the humidity dome. Wipe the inside of humidity domes dry daily, or replace daily with dry, sanitized domes.
11. Inspect cuttings daily for wilting, damping-off, or mold. Remove any failed cuttings immediately — diseased material left in the tray can rapidly spread to healthy cuttings.
12. After the first **48 hours**, begin weighing trays daily with the humidity dome removed. Record the weight of each tray.
13. Irrigate each time the tray weight has dropped by 40-50% of the initial labeled **starting tray weight**. A moderate dry-back between events promotes callus formation and reduces disease risk — do not irrigate on a fixed schedule.

Transplant Readiness

After approximately 14-18 days, the rooted cuttings should be ready for transplanting into large blocks. Daily visual assessment from day 10 onward is critical — some cultivars will root faster than 14 days.

Ready to Transplant ✓



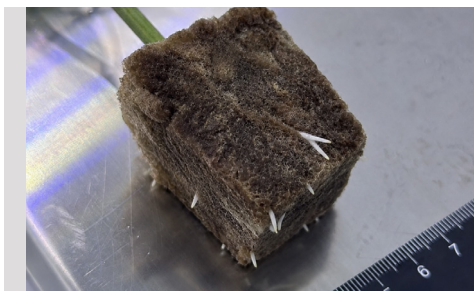
4-5+ white root tips visibly exiting the sides or base of the plug

Roots are short, compact, and actively growing

Cutting is turgid with no signs of wilting or yellowing

Nearly all plugs in the tray showing root emergence

Not Yet Ready/CAUTION ✗



Few or no root tips visible at plug base or sides

Excessively long, branching, or brown roots — possible overwatering

Significant variation in root development across the tray

Any wilting, damping-off, or soft stem tissue at the base

Avoid excessive root development before transplant ✗

Excessively long or densely branched roots at the base of the plug are often a sign of overwatering and/or delayed transplant. Roots of this type are more prone to tissue die-off when placed into the Grodan blocks and can inhibit rapid rooting-in. Transplant as soon as readiness criteria are met.

For detailed guidance on mother plant management, clone selection, rooting hormone protocols, and sanitization procedures, refer to the [Grodan Cannabis Grow Guide](#), Propagation of Cuttings chapters.

Points of Special Interest

Nutrition from day one

Providing a balanced nutrient solution at EC 1.5-2.5 mS/cm from the initial plug saturation — rather than plain water — is critical for preventing mineral deficiencies during the rooting period.

Weight-based irrigation

Irrigating on the basis of measured tray weight rather than a fixed schedule is the most reliable method for avoiding both overwatering and underwatering in propagation. Record the starting weight of every tray at plugging and irrigate only when the 40-50% weight decrease threshold has been reached.

Airflow & disease prevention

Fungal disease — particularly *Botrytis* spp. (bud-rot) and damping-off — is the primary threat during propagation. The most effective prevention is physical: avoid leaf overlap, wipe or replace humidity domes daily, remove failed cuttings immediately, and begin humidity reduction from day 5.

Humidity acclimation before transplant

Reducing relative humidity gradually from 80-90% on day 1 to 72%+ by days 10-18 acclimates the cuttings to the lower humidity levels of the vegetative room. Skipping this acclimation and moving directly from high humidity to the vegetative environment often causes a temporary setback in growth momentum at the transplant stage.



Build Uniformity from Day One

Strong crops don't happen by accident. Grodan propagation plugs provide a consistent environment for rooting.



Reduce variability, improve irrigation decisions, and create more uniform plants before transplant.

See what's happening inside the root-zone.

[Explore GroSens Suite.](#)

5-Phase Model® in Large Blocks | One-Transplant System



Vegetative Growth

This structured, phase-based approach enables proactive steering of the crop rather than reactive growing, helping cultivators drive uniformity, optimize inputs, and consistently achieve the desired plant architecture and yield outcomes that Grodan is known for worldwide.

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Phase 2

Vegetative Growth

in Large Blocks | One-Transplant System

Typical duration

~7-14 days

Start of Phase

Roots visible at the plug base; propagation plugs are well rooted, and the cuttings are ready to be transplanted into large blocks.



End of Phase

Plants have expanded vegetative tissue and leaf area index to intercept photons and support flower production. Photoperiod is adjusted to induce flowering.

Phase Objective

Crop Target

Root-Zone Target

Create a strong, vigorous, vegetative foundation to support maximum flower and secondary metabolite production.

Ensure fast and uniform rooting into the large block.

The roots should be distributed throughout the entirety of the substrate.

Build a uniform, robust canopy structure to intercept maximum DLI (daily light integral) during the flowering phase.

Encourage compact plants with short-to-moderate internode spacing and strong lateral branching.

Fast rooting from the plug into the block will facilitate early vegetative steering and the development of a strong root system throughout the entire volume of the growing media. This will support maximum water and nutrient uptake in later phases of growth.

The EC used for initial saturation of the block must be high enough to sustain healthy plant growth during the transplanting and acclimation process, especially when light intensities are low during transition.

Day-level WC% decreases gradually from field capacity at transplant to 65% within the first few days, driving horizontal root distribution and branching.



Phase 2 Root-Zone & Irrigation Targets

Start Time	+1 hr after lights on or 1-2% decrease in WC%
Stop Time	Stop as needed to achieve 10% overnight dry-back (P3)
Target Day-Level WC	80%+ at transplant, decreasing to 65%
Overnight Dry-Back (P3)	10%
Inter-Irrigation Dry-Back (P2)	2-3%
Initial Saturation EC	2.5-3.5 mS/cm
Initial Saturation pH	5.5
Initial Saturation Temperature	65-68°F/18-20°C
Drip EC	2.5-3.5 mS/cm
Substrate EC	2.5-4.5 mS/cm (rising toward flower initiation)
24-Hr Drain Volume	0-10%
Steering Impulse/Shot Strategy	Vegetative/Small, Frequent

Table 2.1

Block Saturation Prior to Transplant

Grodan’s large blocks must be fully saturated with a balanced vegetative nutrient solution before the propagation plug is transplanted. This process is crucial to the success of the entire cultivation cycle. The blocks should be saturated with an EC of 2.5-3.5 mS/cm and a pH of 5.5. Two methods are suitable:

Method 1-Submersion

Submerge blocks in a balanced vegetative nutrient solution with an EC of 2.5-3.5 mS/cm and a pH of 5.5. Allow them to sink, then remove them from the solution once bubbling stops. Check weights against the reference table saturation weights.



Method 2-Overhead Watering

Saturate blocks via overhead watering by applying 2x or more the volume of the block via multiple passes with short rest times in between. Continue applying the solution until the blocks reach reference table saturation weights.



Description - Blocks	Dimensions (LxWxH) in cm	Dimensions (LxWxH) in inches	WC advice in grams (minimum)*
Grodan Mini-Block 1.5"	4x4x4	1.5x1.5x1.5	57
Grodan Mini-Block 2"	5x5x5	2x2x2	110
Grodan Block 4	7.5x7.5x6.5	3x3x2.6	275
Grodan Block 5.6	7.5x7.5x10	3x3x4	500
Grodan Block 6.5	10x10x6.5	4x4x2.6	550
Grodan Block 7.5	10x10x7.5	4x4x3	600
Grodan Block 10	10x10x10	4x4x4	800
Grodan Block Jumbo	15x15x10	6x6x4	1800
Grodan Block Hugo	15x15x14.2	6x6x6	2650
Grodan Block Uni-Block	20x20x10	8x8x4	3200
Grodan Block Big Mama	20.3x20.3x20.3	8x8x8	6400

Table 2.2

***QUALITY CHECK**

To ensure optimal and uniform initial wetting: Weigh a few sample blocks and confirm they meet the minimum wet weight advice specified in Table 2.2.

Managing the Canopy During Phase 2

Vegetative growth is where the crop builds its physiological momentum. The objective is the rapid, balanced development of roots, leaf area, and branching to maximize light interception and establish the structural and metabolic capacity that will support flowering. The canopy architecture and source capacity established in this phase set the ceiling for yield potential in every subsequent stage.

Shade avoidance must be actively prevented. When plants are overcrowded or light intensity is insufficient, they respond to low photosynthetic photon flux density (PPFD) with a shade-avoidance response, redirecting resources into rapid stem elongation in an attempt to out-compete neighbors for light. In its more severe form this produces etiolation — elongated, structurally weak stems with wide internodal spacing and thin tissue that may bend or collapse under future flower load. The resulting plant is both mechanically compromised and metabolically inefficient, with poorly distributed bud sites and asymmetric growth between the apical stem and lateral branches. The goal is the opposite: a compact, sturdy plant with tight internodes, achieved through adequate plant spacing and sufficient, uniform light intensity.



Light intensity should be managed deliberately through the Phase 1 to Phase 2 transition. At transplant, match the PPFD and mimic the climate conditions the plants experienced at the end of propagation for approximately 48 hours to minimize transplant stress and prevent light shock while the root system establishes contact with the block. Thereafter, increase PPFD incrementally and consistently until the target vegetative intensity is reached, allowing the developing canopy to acclimate to higher light loads without inducing stress.

Pruning during this phase should be limited to cleanup — removing shaded interior leaves and thin, spindly lower branches that fail to intercept light and contribute minimally to assimilate production. Any major structural training or topping should be completed in this phase while the plant retains the vegetative vigor to recover quickly and resume uniform growth before flower induction.

Managing the Root-Zone During Phase 2

In each block place two **0.3-0.5 gallons per hour (gph)/1.2-2.0 liters per hour (lph)** drippers in opposite corners. Following transplanting, the blocks will be very wet and may not need irrigating, but it is important to keep the propagation plug hydrated until the roots can penetrate the block. To accomplish this, but avoid overwatering, it is advisable to provide a daily irrigation of ~1% of the substrate volume for ~1-3 days using the same EC as that used to saturate the block. This will ensure good contact between the plug and block.

The strategic objective throughout vegetative growth is to gradually lower the day-level WC% from field capacity at transplant to 65%, targeting 10% dry-backs overnight (P3) and 2-3% dry-backs between irrigation events in the P2 period. This will stimulate the roots to colonize the entire volume of the growing media. Use data from the GroSens root-zone sensor to structure the irrigation strategy rather than setting a fixed schedule. The demand for water will initially be low, so it is important not to over-irrigate the block in the first days after transplanting. Irrigating too much will lead to algal growth on the block, slow plant development, and increased pest and disease pressure.



The EC in the block should be allowed to increase daily. An increasing EC in this phase will help to create a compact and resilient plant. The increase in EC will happen naturally through a combination of decreasing WC% and the realization of a low drain volume (0-10%). The pH in the block will increase due to strong uptake of nitrate. This is a normal reaction in this phase due to the fast vegetative growth response of the plant.

Ensure you have adequate 24-hour temperature and CO₂ in relation to light intensity. To promote fast growth and create compact plants only a very small difference in day-night temperature is required. Excessive elongation due to shade-avoidance response should be discouraged by ensuring plants are not overcrowded or overlapping. Overcrowding plants in the vegetative phase can create weak and elongated plant structure with strong asymmetry between the apical stems and lateral branches.

Points of Special Interest

LED and transpiration

LED fixtures generate significantly less radiant heat compared to legacy HID (high-intensity discharge) lighting, reducing canopy temperature and transpiration per μmol of light delivered. Transpiration volumes in vegetative growth under LED are typically 10-20% lower than under equivalent-PPF HID lamps. Use GroSens WC% trend data rather than fixed schedules to determine the correct irrigation frequency and stop time.

Block EC target at flower induction

Aim to build the block EC to 3.5-4.5 mS/cm by the end of Phase 2. This elevated EC in the root-zone creates a mildly generative pre-conditioning effect and reduces the risk of excessive vegetative response (stretch) in the first weeks of flowering.



Uneven root development in the vegetative phase creates canopy variability that compounds.

Uneven root development, unstable dry-backs, and poor irrigation timing during the vegetative phase create canopy variability that compounds through the rest of the cycle.

GroSens helps growers monitor root-zone behavior in real time, making it easier to achieve:

- **Stronger Roots**
- **Uniform Plants**
- **Predictable Transitions Into Flower**

Build a more uniform crop from the root-zone up.
[Explore GroSens Suite.](#)





Flower Setting

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Simpler crop management. More predictable outcomes.



Phase 3

Flower Setting

in Large Blocks | One-Transplant System

Typical duration

~21 days (weeks 1, 2, & 3 of flower)

Start of Phase

Plants have established sufficient leaf area and vegetative tissue to intercept available light and sustain the metabolic demands of flowering. Photoperiod is shifted to short-day to induce flowering.



End of Phase

Flower sites are established at all nodes and pistils are fully emerged. Internode and shoot elongation has ceased and the plant's canopy structure and height are fixed.

Note: Some cultivars may have slightly longer generative flower setting requirements due to genetically determined growth habits.

Phase Objective

Maintain crop health, growth momentum, and nutrition while managing the transition from vegetative to reproductive growth. Use generative signals to encourage plants to shift energy allocation from vegetative structures to reproductive structures.

Control plant stretch using a host of generative steering signals (in addition to changing the photoperiod) to direct plant energy toward establishing uniform bud sites at all nodes rather than excessive internode elongation.



Crop Target

Encourage compact plants with short internode spacing and strong lateral branching. White pistils should be visible at all bud sites starting in week 2.

Uniform development across the canopy. Fast bud initiation will create more opportunity for swelling and bulking of the flower sites during Phases 4 and 5.

Root-Zone Target

The transition from vegetative growth to flowering places new demands on the root system. Maintaining an active, healthy root-zone with full colonization of the growing media volume is essential — the root system established in Phase 2 is now the primary driver of nutrient and water delivery to developing flower sites.

Fertilizer regimen should be adjusted to support nutritional demands of flowering. Progressively increasing the overnight dry-back (P3) and allowing the root-zone EC to rise across weeks 1-3 of flowering reinforces the generative steering impulse, helps consolidate plant architecture by suppressing further internode elongation, and creates the mild root-zone stress that promotes reproductive development over continued vegetative growth.



Phase 3 Root-Zone & Irrigation Targets

Start time	+~0.5-2 hrs after lights on or 1-2% decrease in WC%
Stop time	+~2 hrs before lights off or stop time required to achieve 15-25% overnight dry-back (P3)
Target Day-Level WC	60-65%
Overnight Dry-Back (P3)	15-25%
Inter-Irrigation Dry-Back (P2)	4-6%
Drip EC	2.5-3.5 mS/cm
Substrate EC	4-9 mS/cm
24-Hr Drain Volume	10-20%
Steering Impulse/Shot Strategy	Generative/Large, Infrequent

Table 3.1

Managing the Canopy During Phase 3

By weeks 2-3 of flowering, the canopy will typically be dense with overlapping foliage and shaded interior growth. A moderate defoliation and pruning strategy is appropriate for most cultivars at this stage — remove fan leaves and underdeveloped bud sites in the lower canopy that are receiving insufficient light to contribute meaningfully to yield or assimilate production.

Thin, weak interior branches should also be removed — these act as energy sinks, diverting assimilates away from primary and secondary bud sites without producing commercially viable flower material.



Managing the Root-Zone During Phase 3

During weeks 1 through 3 of flower, the plant is simultaneously elongating, establishing flower sites, and sustaining rapid canopy expansion. The root-zone must supply adequate and balanced nutrition for all three demands.

Water uptake and transpiration will increase and the overnight dry-back (P3) should be progressively built from an initial starting point of ~10-15% to a consistent ~25% by day 21 — this trajectory reinforces the generative steering impulse.

Substrate EC should be allowed to gradually increase or “stack” across consecutive days.

This applies a calculated and controlled stress that suppresses further vegetative development and drives reproductive resource allocation.

However, under high light intensity, increasing EC, and large overnight dry-backs (P3), daily

drain and nutrient refreshment become critical — without adequate and uniform pore water solution refreshment, pH drift and ion accumulation in the root-zone will compromise nutrient availability and root health.

Equal attention should be given to the daytime re-saturation trajectory. If the peak daytime WC% is trending downward across consecutive days, the substrate is not being adequately re-hydrated during the P1 irrigation window. In cases where drain is being achieved at a low WC% — indicating rapid channeling of solution through the substrate rather than full re-saturation — shifting to smaller, more frequent shots during the morning re-saturation period will improve hydraulic distribution throughout the block and allow the target daytime WC% to be recovered and held.

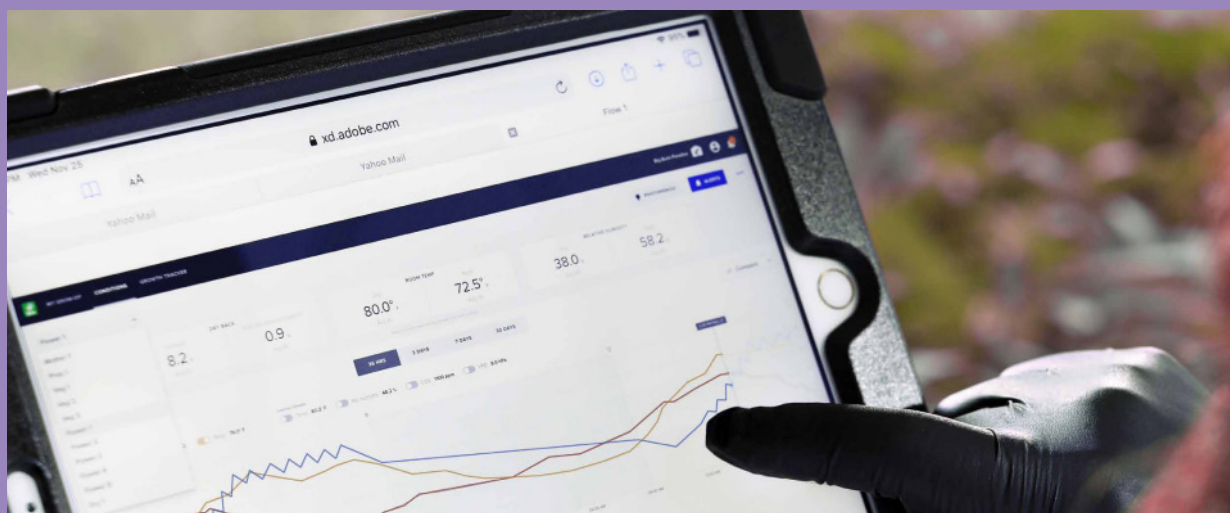
Excessively low water contents should be avoided, as this can place undue stress on the root system and make re-saturating the substrate challenging.



The generative transition defines the crop cycle. Steer it with precision.

GroSens helps growers monitor root-zone behavior in real time, so you can see how the crop is responding and steer the transition into flower with greater control.

See what's happening inside the root-zone. [Explore GroSens Suite.](#)





Flower Swelling & Bulking

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Phase 4

Flower Swelling & Bulking

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Typical duration

~21 days (weeks 4, 5, & 6 of flower)

Start of Phase

Flower sites are established at all nodes and pistils are fully emerged. Internode and shoot elongation has ceased and the plant's canopy structure and height are fixed.



End of Phase

Flowers are approaching size maturity; flower swelling and expansion have slowed; dry matter is still accumulating.

Phase Objective

Realize maximum flower swelling, density, and calyx development by supplying adequate water and nutrients to support peak transpiration and dry matter accumulation.

Transition from generative steering to a vegetative impulse to prioritize flower swelling.



Crop Target

Flowers visibly swelling, expanding, and densifying week-over-week; calyxes stack tightly with minimal gaps; fan leaves remain green and turgid, not yellowing.

Canopy should be managed to allow adequate airflow, maximum light absorption onto flowering sites, and optimal sink:source ratios.

Climate conditions should be balanced to maintain a steady rate of flower development.

Root-Zone Target

Root quality and activity should be protected to ensure crop resilience through the end of the cycle.

Now that the plant has thoroughly shifted its energy allocation toward flower development, vegetative balance should be increased substantially and root-zone stress should be reduced via: frequent shots, higher daytime WC%, reduced substrate EC, and reduced overnight dry-back (P3), compared to Phase 3.



Phase 4 Root-Zone & Irrigation Targets

Start time	+~0.5-1 hr after lights on or 1-2% decrease in WC%
Stop time	+~1-2 hrs before lights off or stop time required to achieve 10-15% overnight dry-back (P3)
Target Day-Level WC	60-65%
Overnight Dry-Back (P3)	10-15%
Inter-Irrigation Dry-Back (P2)	2-3%
Drip EC	2.5-3.5 mS/cm
Substrate EC	4-7 mS/cm
24-Hr Drain Volume	20-30%
Steering Impulse/Shot Strategy	Vegetative/Small, Frequent

Table 4.1

Managing the Canopy During Phase 4

Peak dry matter accumulation in the flowers during weeks 4-6 places the plant's assimilate balance under maximum demand. Developing flowers are the dominant sink for photosynthetically derived carbohydrates, and the rate at which they bulk is directly constrained by the source capacity of the canopy — that is, the functional, light-intercepting leaf area available to supply them.

If the number of active flower sites exceeds what the canopy can adequately supply, individual bud development will be carbon-limited, resulting in airy, underdeveloped flowers regardless of the quality of the root-zone or nutrient strategy.

If shaded fan leaf growth is excessive, a conservative additional defoliation may be appropriate; however, the primary pruning and defoliation that sets the canopy structure should have taken place in Phase 3.



Managing the Root-Zone During Phase 4

The transition from Phase 3's generative steering to Phase 4's vegetative impulse is a critical strategic pivot in the cultivation cycle. Several parameters can be shifted in Phase 4 to bring back vegetative balance and encourage flower swelling:

Root-zone EC can be decreased slightly by achieving consistent daily drain volumes. Substrate EC reduction should be performed gradually over the course of several days, not via sharp reductions in drip EC or excessively large runoff events.

This will maximize nutrient balance and uptake efficiency for peak flower development and prevent scenarios of prolonged osmotic stress, protecting root health and quality.

The decrease in WC overnight (overnight dry-back P3) should be reduced to bring vegetative balance and speed to the crop and encourage swelling and bulking of the flowers.

A reduction in overnight dry-back (P3) to 10-15% can be achieved by increasing the irrigation window — starting irrigation earlier in the day (but only after transpiration has begun) and by stopping irrigation later in the day.



In Phase 4 it is especially critical to ensure proper morning re-saturation of the substrate to maintain high daytime WC%, thus providing easily available water to the plant. It is ideal to bring that substrate back to roughly 60-65% WC by the end of the P1 re-saturation phase to support maximum transpiration and photosynthesis.

Failing to do so forces the plant to expend increasing metabolic energy extracting water against the tension of drying substrate pores — energy that would otherwise be directed toward the biosynthetic processes driving flower bulk, dry matter deposition, and secondary metabolite production. The shot strategy can be adjusted to smaller, more frequent irrigation events to reinforce the vegetative signaling and keep the WC% rising in the morning.



Peak Flower Demand Is Where Irrigation Mistakes Become Expensive.

GroSens helps growers monitor root-zone behavior in real time, making it easier to protect crop performance during the most valuable stage of the cycle.

See what's happening inside the root-zone.

[Explore GroSens Suite.](#)





Flower Ripening & Peak Cannabinoid Accumulation

This structured, phase-based approach enables proactive steering of the crop rather than reactive growing, helping cultivators drive uniformity, optimize inputs, and consistently achieve the desired plant architecture and yield outcomes that Grodan is known for worldwide.

Simpler crop management. More predictable outcomes.



Phase 5

Flower Ripening & Peak Cannabinoid Accumulation

in Large Blocks | One-Transplant System

Typical duration

~14-21 days (weeks 7 & 8/9 of flower)

Start of Phase

Flowers are approaching size maturity; flower swelling and expansion have slowed; dry matter is still accumulating.



End of Phase

Plants are ready for harvest; pistils at primary bud sites predominantly turn orange/brown and dry, receding into calyx. Trichomes may be turning cloudy/amber under magnification. Some cultivars accumulate anthocyanins and darken in color.

Phase Objective

Maximize secondary metabolite production — cannabinoids, terpenes, and flavonoids — by applying a final generative steering impulse that signals the plant toward senescence and reproductive completion.

Maintain root health, nutrient balance, and strategic climate to prevent fungal disease and microbial contaminants.



Crop Target

Deploy mild temperature, relative humidity, and CO₂ reductions that encourage flower ripening, coloration (cultivar-dependent), pistil drying, and preservation of terpenes before harvest. Fan leaves may change color in this phase if nutrient translocation to ripening flowers and younger leaves occurs — this is normal and should not prompt corrective climate or irrigation action.

Climate and airflow must be active in this phase to encourage moisture dissipation from the boundary layer around the leaves and avoid *Botrytis* spp. (bud-rot) and other microbial contamination.

Root-Zone Target

Resume generative irrigation signaling by gradually reducing the maximum day-level WC% from the start of Phase 5 to the final harvest. The shot strategy should be shifted to higher volume shots at lower frequencies, targeting adequate dry-backs between irrigation events in period 2 (P2).

Larger overnight decreases (P3) in WC% can also be resumed to encourage ripening. Good oxygen penetration in the root-zone is paramount in this final phase to preserve root health and integrity. As the crop approaches senescence and root activity declines, total water uptake may decrease, so resist the urge to irrigate based on the clock alone. In addition to creating drier root-zone conditions overall, a mild reduction in drip EC may be implemented in the final 5-10 days, optionally, to match the decreasing nutrient demands of the crop.

However, low EC, high WC% combinations should be carefully avoided in this phase, and excessive runoff to reduce the substrate EC is not warranted.



Phase 5 Root-Zone & Irrigation Targets

Start time	+~1-2 hrs after lights on or 1-2% decrease in WC%
Stop time	+~2+ hrs before lights off or stop time required to achieve 20-25% overnight dry-back (P3)
Target Day-Level WC	55-60%
Overnight Dry-Back (P3)	20-25%
Inter-Irrigation Dry-Back (P2)	4-6%
Drip EC	1.8-3.0 mS/cm
Substrate EC	5-8 mS/cm
24-Hr Drain Volume	10-25%
Steering Impulse/Shot Strategy	Generative/Large, Infrequent

Table 5.1

Managing the Canopy During Phase 5

Avoid any unnecessary pruning or defoliation as this creates open wounds where moisture accumulates and *Botrytis* spp. (bud-rot) can establish; in a dense, mature canopy with reduced airflow, any open wound is a liability.

Moderate ambient temperature reductions in this phase stimulate anthocyanin biosynthesis in receptive cultivars, deepening purple and red pigmentation, and slow terpene volatilization at the canopy surface. Both are desirable outcomes — but temperature reductions must be balanced with dehumidification requirements; relative humidity must be reduced carefully in conjunction with temperature. Canopy temperature must never be lowered beyond the point at which the dehumidification system can maintain a vapor pressure deficit (VPD) of 1.1-1.3 kPa, day and night.

Cooler air holds less moisture, and dehumidifiers have a finite removal capacity. When temperature reductions outpace dehumidification capacity, relative humidity rises and microbial contamination conditions are created at precisely the moment the crop is most vulnerable. VPD stability is the constraint — temperature reduction is only appropriate within it.

Elevated CO₂ concentrations stimulate photosynthesis and carbon fixation, which keeps the plant in a physiologically active, growth-oriented state. Ripening — senescence of reproductive tissue, trichome maturation, and the terminal accumulation of cannabinoids and terpenes — can be impaired by excessively high CO₂ levels which offer diminishing photosynthetic return, so growers may want to titrate concentrations downward in the final week of production to save resources and encourage maturation. Critically, CO₂ concentration also stimulates stomatal aperture, so growers should pay close attention to transpiration and dry-back (P2) rates when adjusting ambient concentrations.



Managing the Root-Zone During Phase 5

Botrytis spp. (bud-rot) risk increases significantly as flowers become denser and begin retaining moisture. The grower's primary defense is root-zone management that keeps the substrate EC sufficiently stable or elevated and prevents excessive humidity in the canopy from over-irrigating.

The target is to gradually reduce the maximum daytime WC% from approximately 60-65% at the start of this phase to 55-60% in the final weeks of production. The goal is a smooth, controlled trajectory toward harvest, not an abrupt dry-back.

This generative signal is best achieved through larger, less frequent shots, large inter-irrigation dry-backs (P2) of 4-6% in period 2, and larger overnight dry-backs (P3) (20-25%) than those achieved in Phase 4.

Any irrigation practice in Phase 5 that results in low substrate EC and/or chronically elevated WC% creates a strongly negative osmotic gradient between the root-zone solution and plant tissue — driving passive water uptake beyond what transpiration demand requires. This surplus water floods into flower tissue, often causing bracts and calyxes to swell with water weight. Excessively moist floral tissue creates ideal conditions for *Botrytis* spp. (bud-rot) germination and spread.

Root pressure in dark periods can also exacerbate disease as stomata close and transpiration drops

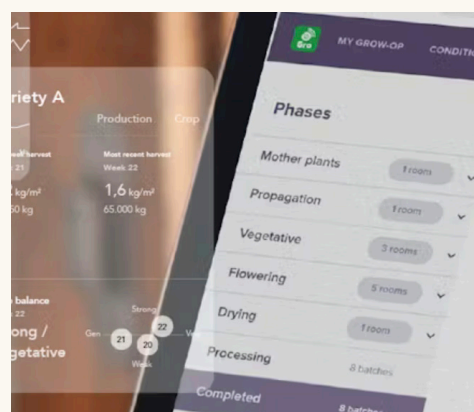
to near zero while root cells continue actively pumping ions into the xylem, building osmotic pressure that drives water passively into the roots and upward into plant tissue with no transpirational outlet; this dynamic forces additional moisture into flower tissue, leaf margins, and intercellular spaces. To mitigate these risks, consider stopping irrigation on the earlier side and resuming in the morning once plants are actively transpiring, rather than irrigating close to the lights-off period.

Reducing (not eliminating) nitrate concentration in the nutrient solution during Phases 4 and 5 can support ripening and reduce disease pressure by accelerating the natural senescence of fan leaves, upregulating secondary metabolite biosynthesis, strengthening cell walls, and suppressing the production of new soft vegetative tissue that is most susceptible to fungal infection. Traditional high-volume water flushing is not recommended in Phase 5 as it creates a strong vegetative signal, can disrupt secondary metabolite accumulation, and risks root damage. Grodan block and slab technology provides excellent, stable EC control through efficient drain, without the need for excessive flushing. As the crop's metabolic demand declines in Phase 5, the drip EC and slab EC can be gradually titrated downwards while maintaining generative irrigation signals. The goal is a stable decrease in line with the crop's slowing nutritional requirements, not a sudden shock. Excessive application of water or fertigate with a low EC can reduce final flower quality and invite microbial proliferation. 

The Last Weeks of Growth Carry the Highest Risk to Flower Quality

GroSens helps growers monitor root-zone behavior in real time, making it easier to maintain proper dry-backs, avoid excess moisture, and finish the crop with greater consistency and control.

Protect flower quality through the final stretch.
[Explore GroSens Suite.](#)



This is what control looks like

With Grodan, you're not left guessing.

You're working with a consistent root-zone, clear signals, and a system designed to be repeatable. From propagation to harvest, every phase becomes easier to manage and more predictable.

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Talk to a Grodan advisor to **start a trial.**

Data
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