

CANNABIS: PROPAGATION

Cloning methods for commercial growers

Propagation, the method of generating new plants from tissue culture, cuttings, stems or leaves to create clones that are genetically identical version of the donor plant is common practice for cannabis cultivators.

The process of propagation ensures an all female, genetically uniform crop. A clone however, once fully grown may not have all the identical characteristics of the mother plant because a clone's phenotype is influenced by its surroundings and clones from the same mother will develop differently if their environmental conditions are not the same.

Propagating under controlled growing conditions (like a plant growth chamber) can help ensure clones from the same mother will grow in the same way. When environmental influences are controlled, the clone will yield a uniform crop of nearly identical females each time it is grown (Clarke and Watson, 2002).

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Genetic drift, sterility, time frames, resources, and equipment are all factors to consider when choosing a method of propagation for cannabis cultivation.

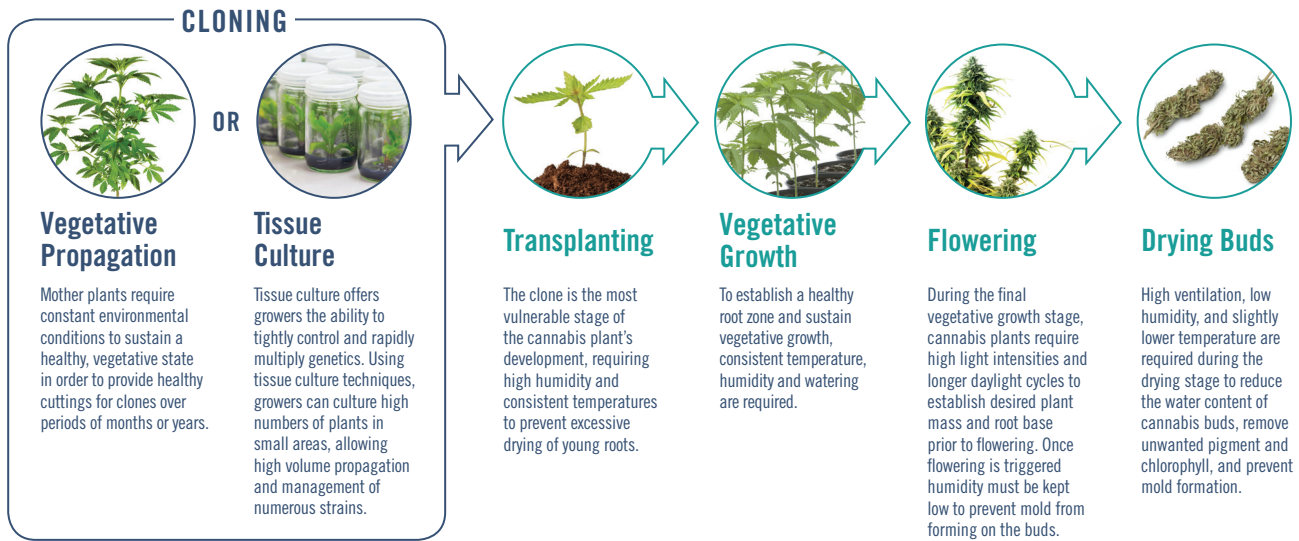
Traditionally, most cannabis growers use a method called **Vegetative Propagation** or vegetative cloning which is a process of taking a stem from a mother plant and rooting it to produce a new plant.

Technological advances in the cannabis industry has spawned interest in **Tissue Culture**, the process of exposing cells or leaf matter in a petri dish to a regimen of nutrients, hormones, and light within a sterile, plant growth chamber to produce clones of the original mother plant.



Reach-in plant growth chamber for cannabis clones

PROPAGATION and the Cannabis Production Cycle



Methods of Propagation

VEGETATIVE PROPAGATION

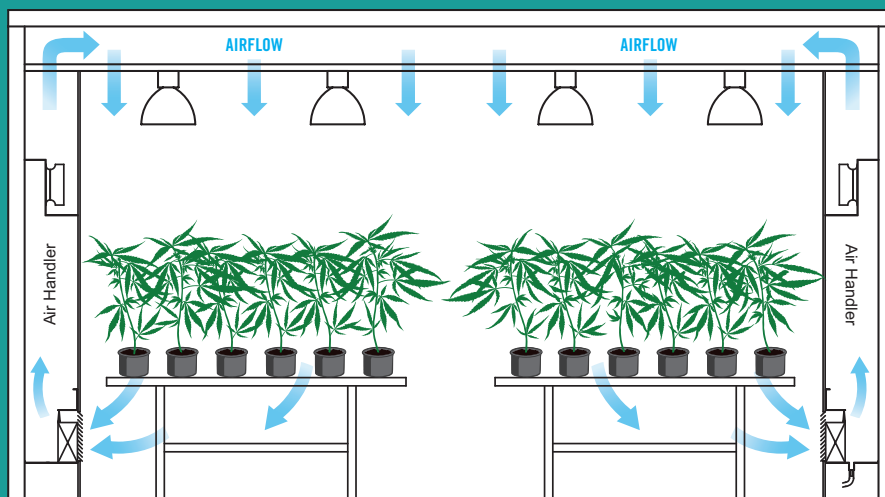
Vegetative propagation is the method of taking cuttings from a mother plant, placing them in trays with liquid rooting solution and exposing them to high humidity and consistent temperature to produce new roots. This is an

essentially simple process, but a process where controlled environmental conditions and healthy mother plants play critical roles in producing a successful crop.

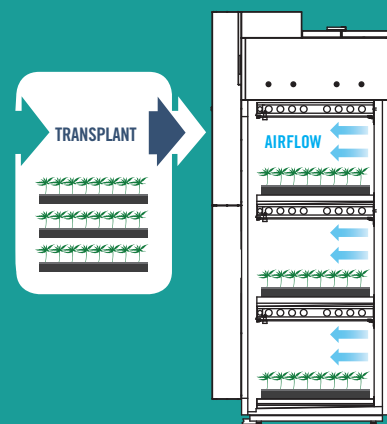
The mother plant can be a cannabis grower's most valuable investment. A mother plant is chosen based on its particular

VEGETATIVE PROPAGATION

To achieve unmatched uniformity of environmental conditions, the Conviron Growth House™ delivers circulating air uniformly downward from the entire ceiling above the growth area. This technique ensures efficient yet gentle disruption of the air boundary layer around each plant, promoting optimum growth and carbon dioxide exchange at all points in the room, and preventing stagnant air that may contribute to pathogen growth.



Mother Room - Conviron Growth House™



Reach-In Chamber ATC60 for Clones

A well-designed mother room can reduce the risk of plants becoming contaminated and passing pests and disease to their clones.

strain and its reliability to reproduce in large scale. It has to have good growth rate, potency, and resistance to fungus and pests. A single plant, kept in a constant vegetative state can provide hundreds of quality cuttings for clone production. A fully equipped mother room with insulated ceiling and wall panels, lighting, air handling, humidity and carbon dioxide systems can deliver uniform environmental conditions so that plants in every corner of the room remain in the same condition. A mother plant in vegetative state can be sustained over periods of months or even years.

A well-designed mother room can reduce the risk of plants becoming contaminated and passing pests and disease to their clones. Circulating air uniformly downward from the ceiling above the growth area ensures effective yet gentle disruption of the air boundary layer around each plant preventing stagnant air from contributing to pathogen growth.

Though vegetative cloning preserves the character of the mother plant, mother plants are not immortal and can become overstressed, which limits the rate at which clones can be harvested. Commercial cannabis growers therefore have sought the ability to produce high volumes of clones

and keep preferred strains indefinitely without the need of dedicated mother plants.

TISSUE CULTURE

Already common in plant science research, tissue culture propagation is finding its way into the field of commercial cannabis cultivation. Though it is a more complex method than vegetative propagation, some growers are recognizing the potential value of this type of cloning.

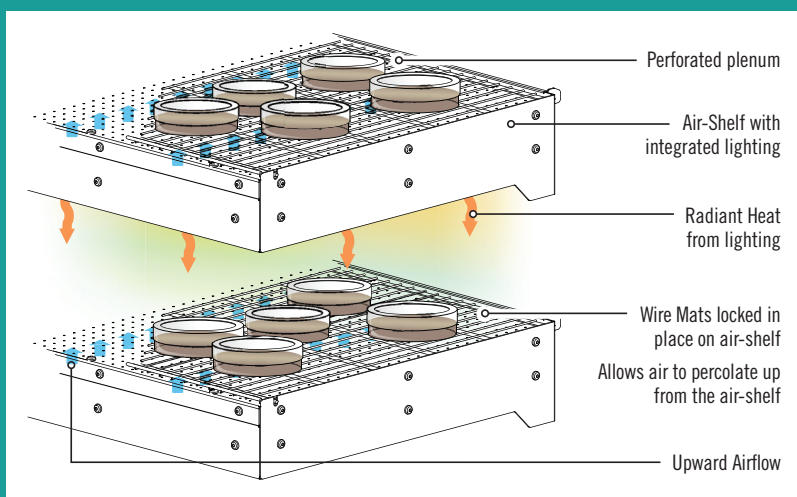
Tissue culture techniques allow growers to rapidly generate a large number of clones from one plant in a relatively small, tightly controlled area. This type of high volume management of numerous strains is commonly referred to as micropropagation.

A tissue culture chamber can deliver uniform temperature, humidity and light to ensure consistent results and maintain cultures. Unless present before the micropropagation method is initiated, pathogen-free plants are nearly certain (Zwenger, 2014). Eliminating molds and viruses offers a significant benefit over vegetative propagation.

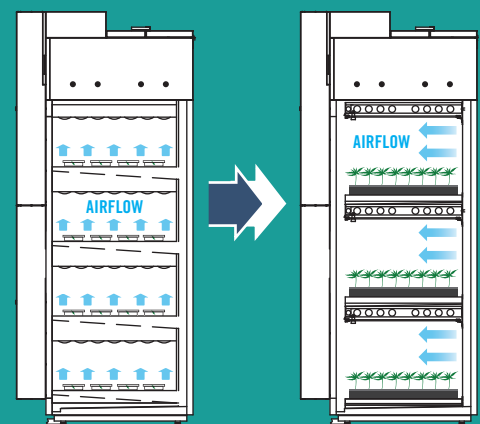
Currently, tissue culture propagation is of primary interest to cultivators in large-scale, high-tech facilities that incorporate strict manufacturing practices. Set-up, operational and maintenance costs typically involve substantial investment for start-up and continued operation. In contrast to tissue culture, vegetative propagation is a much simpler process and a less-costly method of cloning, but requires the space and ongoing maintenance for mother plants.

TISSUE CULTURE

Conviron chambers are designed specifically to minimize the formation of condensation inside the petri dishes and vessels used for tissue culture. Airflow directed upward through these shelves at the underside of the dish ensures the lower zone of the vessel remains cooler than the upper zone. This internal temperature distribution minimizes condensation on the underside of the lid, thereby exposing the culture to a uniform amount of light.



Petri dishes on perforated air shelves inside chamber



*Tissue Culture Reach-In Chamber TC30/80**

Reach-In Chamber ATC60 for Clones

*Walk-In chambers also available

VEGETATIVE PROPAGATION	TISSUE CULTURE
Common with wholesale and retail distribution, home hobbyists	Gaining popularity with commercial, similar to pharmaceutical production, incorporating efficient production practices
Simple to learn and maintain	Requires training, lab-like facilities and tissue growing rooms or chambers
Production scale limited by the number of mother plants and the rate at which clippings can be taken without over-stressing	Production scale limited only by space dedicated to growing cultures
Can carry plant diseases into the next generation	Each plant produced in completely sterile conditions guaranteeing batches to be pathogen free
Mutation may occur over time	Genetic condition of the strain is 100% retained, ensuring integrity of future crops
Mother plants are not immortal and need ongoing care	No need for mother plants; samples taken from production plants. Tissue from mother plants can be kept and stored cryogenically, and reused when needed

Comparison of cloning techniques

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