The pros and cons of different hydroponic cultivation systems

Most successful commercial cannabis growers use hydroponics to cultivate their crop. But there's more to this production technique than meets the eye. **Thomas Walker** explains.

There are a number of methods of hydroponic cultivation. The two main systems use a substrate or employ only nutrient-rich water. In some instances, both methods are used simultaneously.

SUBSTRATES

The following are substrates that can be used for cannabis production in hydroponic systems.

- **Rockwool**

Rockwool is an inert substrate made of spun rock minerals that acts as a medium for roots. Different forms of Rockwool can be used, but the most popular is cubes. Typically, drip irrigation and ebb-and-flow systems are used for irrigation.

Pros

– Excellent water-holding and drainage.
– Excellent oxygen availability for roots.

Cons

– Rockwool cannot be reused.
– It requires frequent watering.
– It is susceptible to temperature changes in the root zone.

- **Lightweight expanded clay aggregate**

Hydroton clay pebbles, also known as LECA (light expanded clay aggregate) is produced by heating clay to more than 1 000°C. This forms small balls of clay with pores that act as sponges to hold water. Drip irrigation and ebb-and-flow systems are generally used for irrigation.

Pros

– Superior oxygen availability for roots.
– It can be used many times with cleaning in-between cycles.

Cons

– It requires constant watering.

- **Coco coir**

This is an organic substrate made from the fibre of coconut shells. The three predominant forms are pith, a fine consistency coco, which resembles coco peat but is a rich, brown colour; fibres, a coarse, hair-like version; and chips, a combination of pith and fibres.

Pros

– Superior buffer against temperature and nutrient issues.
– Excellent for beginners and professionals alike.
– Environmentally sustainable and organic.

Cons

– It cannot be reused in most cases.
– It requires more labour.

DUAL-METHOD AND PURE HYDROPONIC SYSTEMS

The following are hydroponic systems that use substrates and nutrient-rich water, as well as only nutrient-rich water.

- **Ebb and flow**

Plants are rooted in either Rockwool or LECA and placed in a container with a drainage hole. They are irrigated by a pump in a nutrient reservoir beneath the container. When the pump is turned on, the container is flooded. When the pump is switched off, the excess water drains out, returning to the nutrient reservoir.

Pros

– Easier automation.

Cons

– With many plants in one container, diseases and pests can be transmitted more readily.
– Interruptions in the electricity supply can quickly kill plants due to the high watering frequency required.

- **Nutrient film technique**

This is a constant-flow hydroponics system: the nutrient water has to flow continuously over the roots. Plants are rooted in small net baskets filled with LECA and placed in tubes containing the nutrient water. The roots hang down from the net baskets in the flowing water, taking up what they require.

Pros

– Good use of space, with the ability to go vertical.
– Highly efficient use of water.
– Accurate feeding.

Cons

– Very short buffer for interruptions in electrical supply.
– Nutrient water temperature must be closely controlled.
– Algae build-up can become a problem.

- **Aeroponics**

In this case, plants are rooted in small, LECA-filled net baskets that are placed in containers and continuously misted with nutrient-rich water. The roots are suspended in this mist and take up only what is required.

Pros

– Exceptional growth rate and yield.

Cons

– Extremely short buffer for interruptions in power supply.
– Difficult to scale.

- **Deep-water cultivation**

This incorporates both aeroponics and nutrient film by suspending the plants' roots in nutrient-rich water and mist.

Pros

– Exceptional growth rate and yield.

Cons

– An extremely short buffer for interruptions in electrical supply.
– Difficult to scale.
– Pathogens are easily spread amongst plants sharing the same reservoir.
– Temperature of nutrient water must be controlled continuously.

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