Root Zone Heating & Cooling of Cannabis
Roots
Sustainable Agricultural Technologies Ltd

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Israeli-based and publicly traded on the Australian Stock Exchange, Roots Sustainable Agricultural Technologies Ltd. (ASX: ROO) is developing and commercialising disruptive, modular, cutting-edge technologies to address critical problems in agriculture, including plant climate management and the shortage of water for irrigation.

Roots has developed proprietary know-how and registered patents to optimise performance, lower installation costs, and reduce energy consumption to provide maximum benefit to farmers.
Temperature

Root temperature is the most influential factor in plant physiology for growth, productivity and quality. An optimum temperature range is essential to productivity, health and output quality.

Roots’ technology cools and heats the root zone of crops, maintaining optimum temperature ranges year-round

Optimal Temperature

The optimal day temperature range for cannabis is 15° to 30°C (59 to 86 °F).

Temperatures above 31 °C (88 °F) and below 15.5 °C (60 °F) decrease THC potency and slow growth.

At 13 °C (55 °F), the plant undergoes a mild shock.
Root Zone Temperature Optimisation (RZTO)

Roots’ heating and cooling technology is comparable to the revolution of drip irrigation, targeting the root zone rather than the canopy.

**Advantages over existing options include:**

- Pioneering a **two-in-one system**, which is able to heat and cool plants at the root zone
- RZTO technology uses **sustainable low-energy, shallow ground source coils** for heat exchange for both heating and cooling
- **Increased crop yield and quality**, with growing cycle shortened for early or late planting
- **Energy-efficient**, saving up to 80% of energy costs compared with traditional air heating or cooling
- **Faster ROI** than competing solutions, which are expensive to buy and operate
- **Addresses climate management problems** in greenhouses and open fields
- **Real-time results tracking** via smartphone and PC software
- **Eco-friendly** - competes favourably with fossil-based air heating companies and air cooling mats for plants
- **The only technology** able to influence root zone temperatures in an open field (sun-grown cannabis)
Young cannabis plants in the vegetative stage prefer temperatures slightly warmer than in the flowering stage, in the 70-85°F (20-30°C) range.

In the flowering stage (when cannabis plants start to form buds), it's best to keep temperatures slightly cooler, around 65-80°F (18-26°C) to produce the best colour, trichome production and smell. A 10 degree difference between night and day temperatures produces the best results and is especially important in the flowering stage for highest quality bud development.
Root Zone Temperature Optimisation Technology

Two-in-one heating and cooling
Results

Temperature Comparison: Heated vs. Unheated
Sun-grown, open field in Washington State

Up to 18°C difference between heated roots and unheated roots
Results

Cannabis | Outdoor Medical Cannabis

Interim Results

Heated plants wet-weight increased by 40-270% * compared to unheated control crop

* Depending on the different strain and different agricultural configuration installation
Results
Temperature Comparison: Cooled vs. Uncooled
At 40°C air temp and 33°C control pot temp Roots’ technology maintained a 20-25°C root temp range at cooled pots.

Ambient Temperature | Untreated Roots Temperature | Cooled Roots Temperature

Up to 15°C difference between cooled roots and uncooled roots. Stable & optimal temp. range.
Results
Cannabis | Indoor Medical Cannabis
World-first cooling of cannabis roots

Cooled plants dry-weight increased by +40% compared to uncooled control crop
Is this right for you?

Growing Conditions

Greenhouses | Open Field

Greenhouse

Pots, growbags and in-soil plantings

No distress caused to the crop

Outdoor growing
Is this right for you?

Growing Methods

Pots | Growbags | Soil