

# Growing Cannabis

Production Overview and Environmental Parameters

## AEE Technical Roundtable

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# Personal Background

- Commercial Flower Grower in MA for 40 Years.
- Master's Degree in Horticulture from Cornell.
- Consultant to the Cannabis Industry since 2013.
- 40+ Cannabis Projects in USA, Canada, and Australia.
- Focus on Efficiency in Facility Design and Operations.
  - Labor
  - Energy
  - Space Utilization

# General Cannabis Info

## **Major Cannabinoid Compounds:**

- THC - psychoactive compound in marijuana.
- CBD - non-psychoactive compound with medicinal properties.
- Terpenes - aromatic compounds.

## **Plants:**

- Only female plants yield usable product.
- Flowering is daylength dependent.
- Flower Buds Contain Majority of Valuable Cannabinoids.
- Oils extracted for MIPs (Marijuana Infused Products).

## **Demand:**

- Edibles - cookies, candies, creams, and lozenges.
- Concentrated oils - vaping.
- Dried Flower Buds – smoking.
- Current market >60% MIPs and growing.







# Cannabis Production Stages

**Crop Production Time: 12-14 weeks**

## **Clone**

- Period when clippings from 'mother plants' grow roots: 10-14 days
- Bottom heat: +/- 80°F
- 90% RH

## **Veg**

- Period when plants grow vegetatively.
- 18 hours light, 6 hours darkness.
- 14-20 days common.

## **Flower**

- Period when plants produce flower buds.
- 12 hours light, 12 hours darkness.
- 8-10 weeks to harvest, strain dependent.

## **Drying**

- 7-14 days.
- Cool (65°F), dry (40% RH), dark environment, minimal air movement.
- 10-15% final moisture content.

Clone





Veg





# Flower





Drying



# Cannabis Production Overview

## Common Production Methodologies

- Plants grown on benches in plastic nursery pots using drip irrigation.
- Growing media is primarily peat moss or coco fiber (coir).

**OR**

- Hydroponic systems with rockwool cubes or clay pebbles on flood tables with recirculating water.

Less Veg time => smaller plants but more crop cycles/year (6)

More Veg time => larger plants but fewer cycles (3).





# Cannabis Production Requirements

## Water

- pH 5.8-6.2
- R/O systems eliminate potential contaminants.
- Volume per irrigation cycle = +/- 1 qt/sq ft of canopy.

## Nutrients

- Organic or chemical/salt based fertilizers.
- Fertilizer applications affect product taste and yield.
- Plant nutrient requirements based on science, not myth.

## Light

- PAR: Photosynthetic Active Radiation – blue for Veg, red for Flower.
- 'Industry Standard' - one light fixture covers 4' x 4' footprint.
- Both spectrum and intensity effect yield and potency.

## Supplemental CO<sub>2</sub>

- +/-1300 ppm improves plant growth and yields.
- Only necessary during 'lights on' period.
- Source must be highly refined.

# Grow Room Environmental Parameters

- **Lights On:** 78°F +/- 2°, RH 50-55% +/- 3%.
- **Lights Off:** 68°F +/- 2°, RH <50% +/- 3%.
- **Air Flow:** 4 cfm per square foot of floor area.
- **Air Velocity:** 150-200 fpm.
- **Air Changes** per Hour: 15-20.
- LED lighting requires warmer production temperatures due to less heat radiated onto leaf surface.



Questions?

Thank You!

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