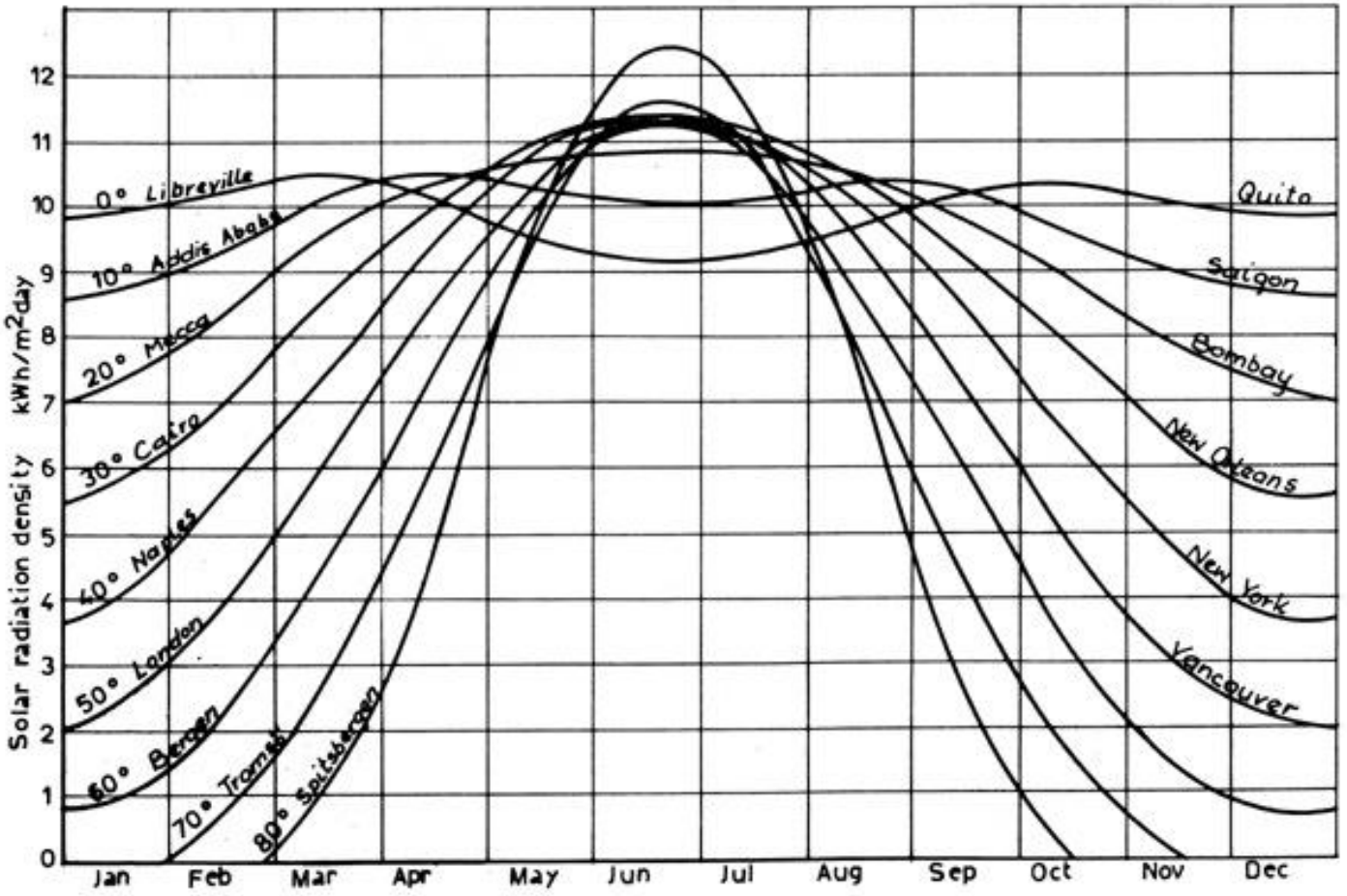
Indoor Growing with Artificial Lights

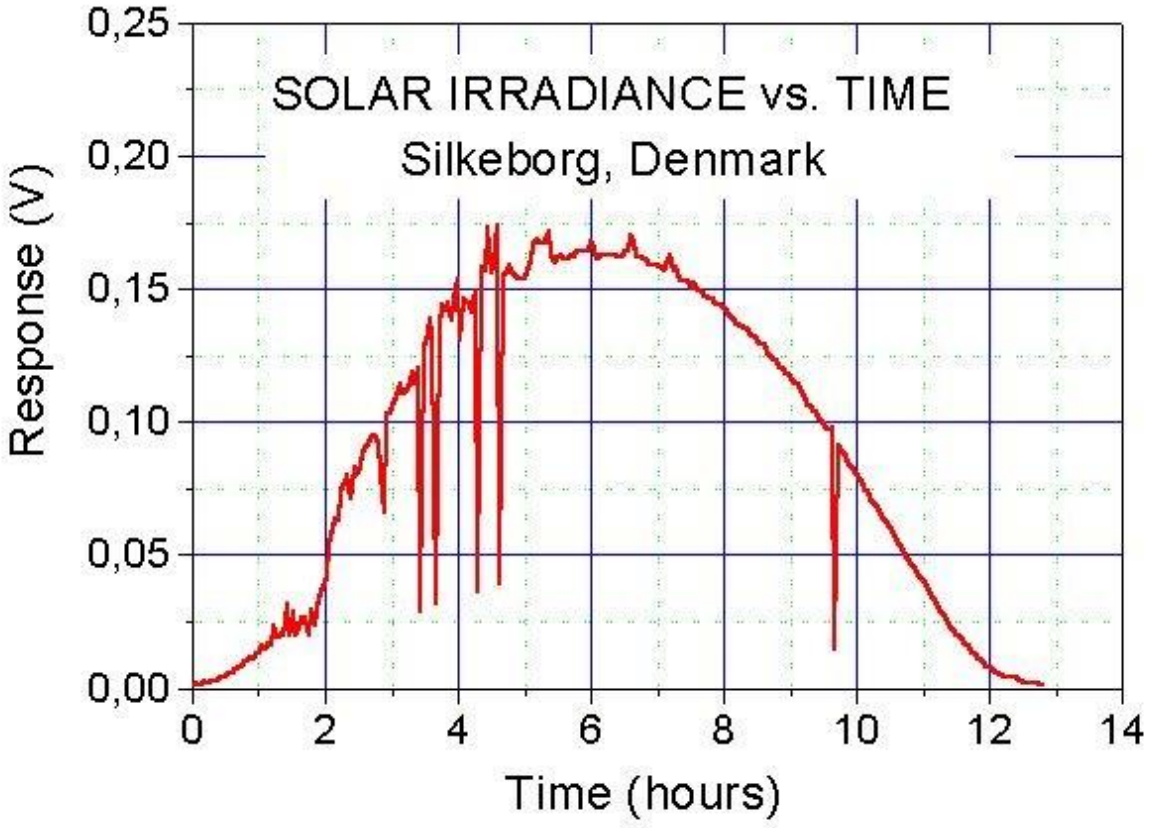
Kevin Frender

Black Dog LED

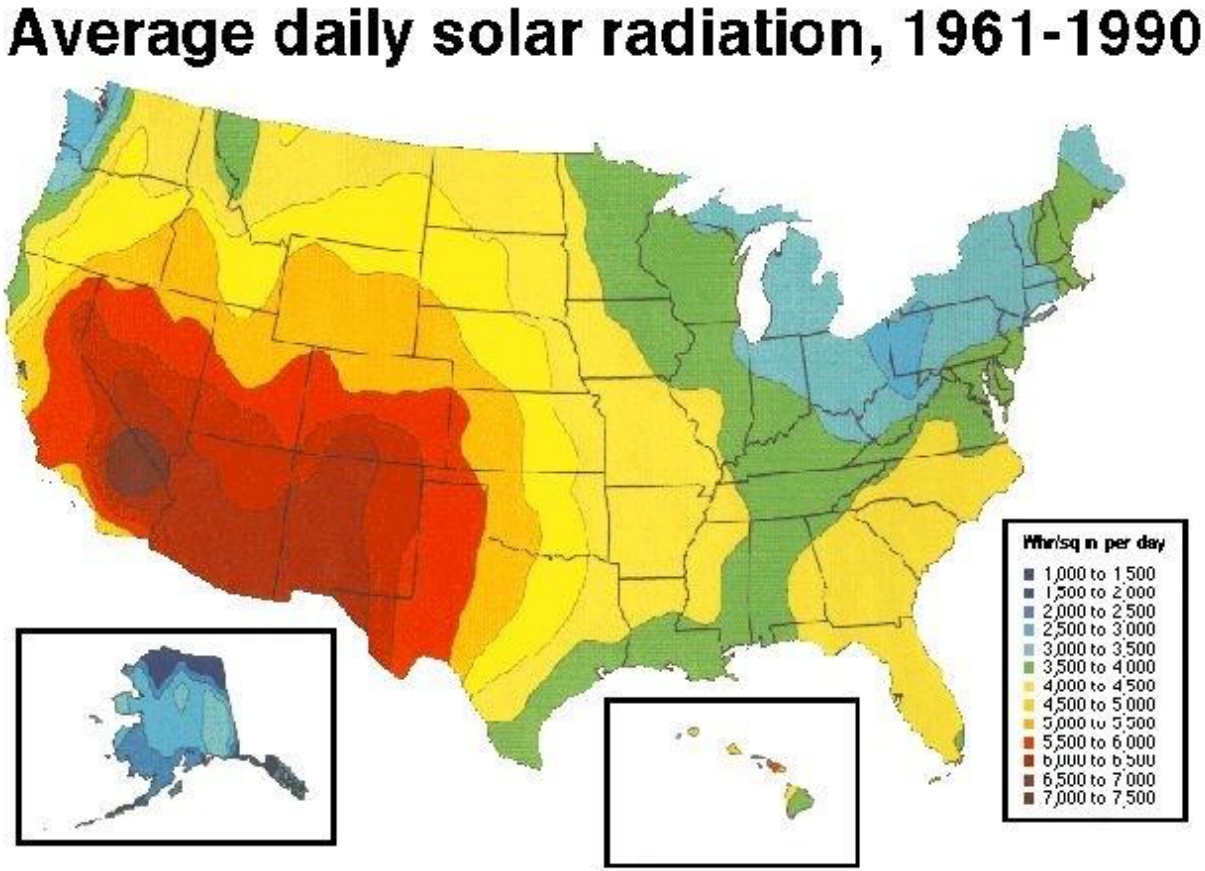
Seasonal Variation in Solar Irradiation with Latitude



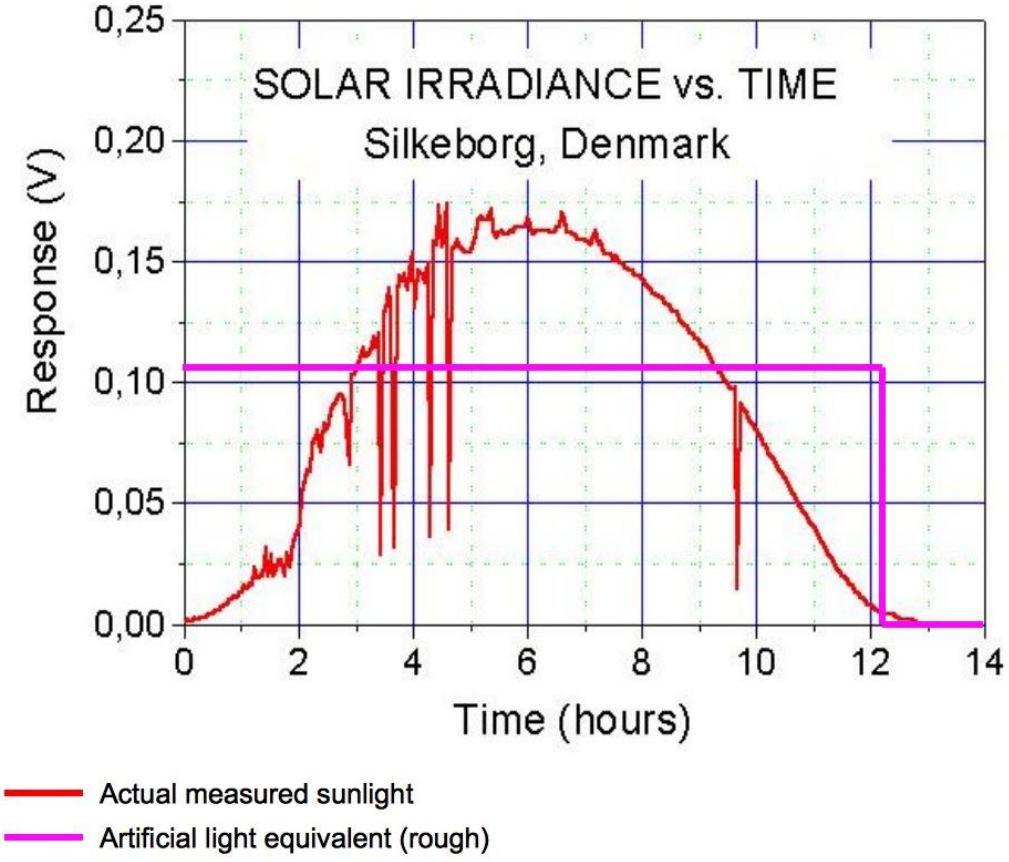
Daily Variation in Solar Irradiation



Regional Variation in Solar Irradiation



Artificial Light is Consistent

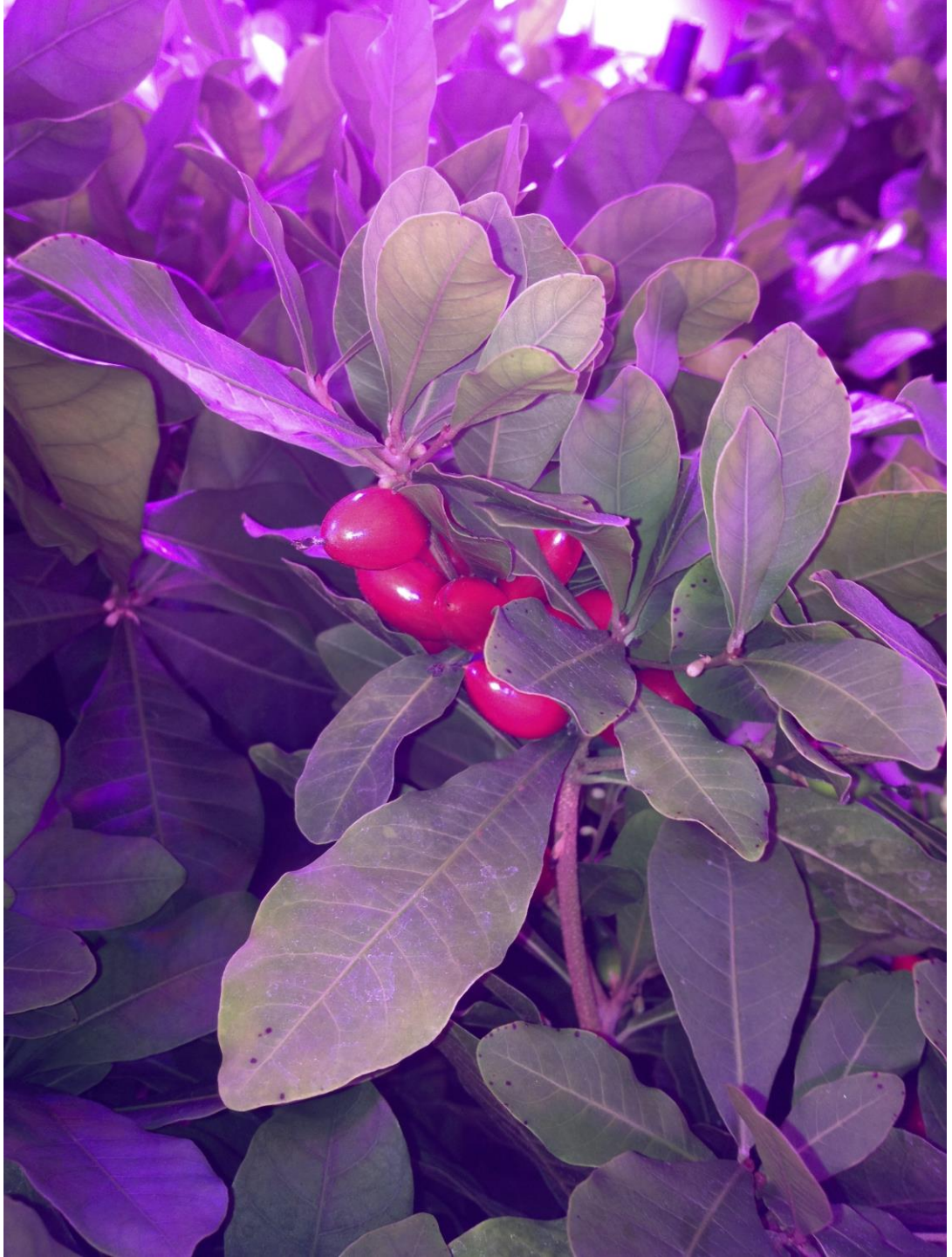


Information Online is Skewed

- Mostly about Cannabis
- Even when they say it's for "tomatoes"
- Much not applicable to other plants
  - Determinate / indeterminate
  - "Veg" and "Flowering" cycles
  - Flowering photoperiod
  - Switching spectrums
  - Etc.

Ultraviolet Light is Important

- Pigmentation
- Flavonoids
- Vitamins
- Antioxidants



Available Artificial Plant Lights

- Incandescent
- Fluorescent
- Induction
- HID
  - Metal Halide
  - High Pressure Sodium
  - Ceramic Metal Halide
- LED

Incandescent

- Space heater
  - happens to produce some light
- Not good for growing plants
- No mercury

Fluorescent

- Good for shorter plants
- Compact fluorescent are for humans
  - Straight T5 bulbs are for plants
- Different spectrums available
- Some have UV light
  - depends on the bulb
- Contains mercury

Induction

- Very low intensity
- Generally have balanced spectrum
  - Good for leafy plants, flowers and fruit
- Works best for very short plants, kept very close to the light
- Some have UV
  - depends on the model
- Contains mercury

Metal Halide

- Best for leafy plants
  - not enough red light for ideal flowering / fruiting
- Has some UV
- Infrared waste (heat)
- Contains mercury
- Bulbs 500+ °F

High-Pressure Sodium

- Good for flowering and fruiting
  - Plants will get leggy (not enough blue)
  - Works well combined with metal halide
- No UV
- Infrared waste (heat)
- Contains mercury
- Bulbs 1000+ °F

Ceramic Metal Halide

- Color-balanced
  - Works well for leaves, flowers and fruits
- Has some UV
- Bulbs often cheaper than MH / HPS
- Not as efficient as MH / HPS
- Mostly 400W or less
- Contains mercury
- Bulbs 1500+ °F


HYDRO FARM
Horticultural Products

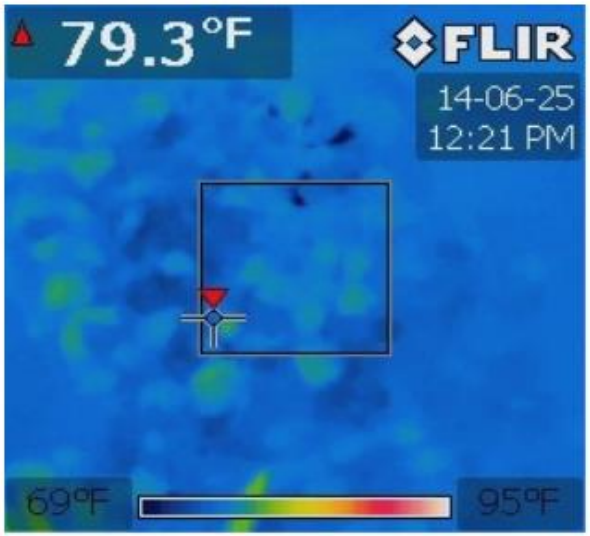
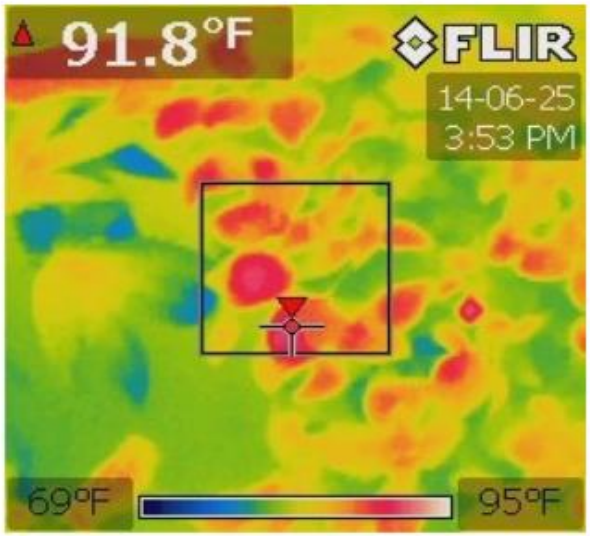
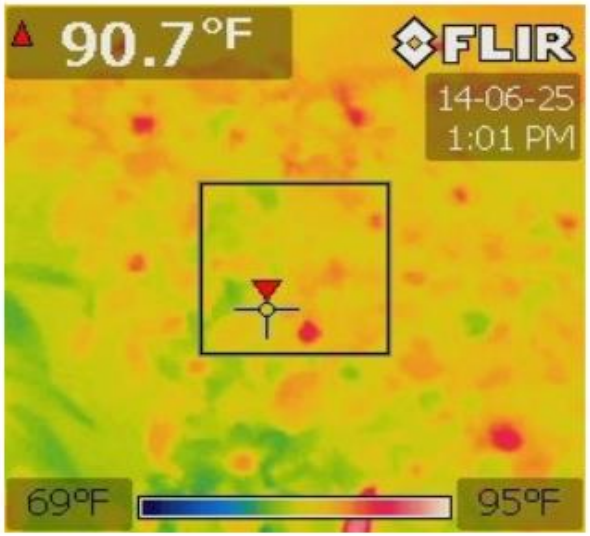
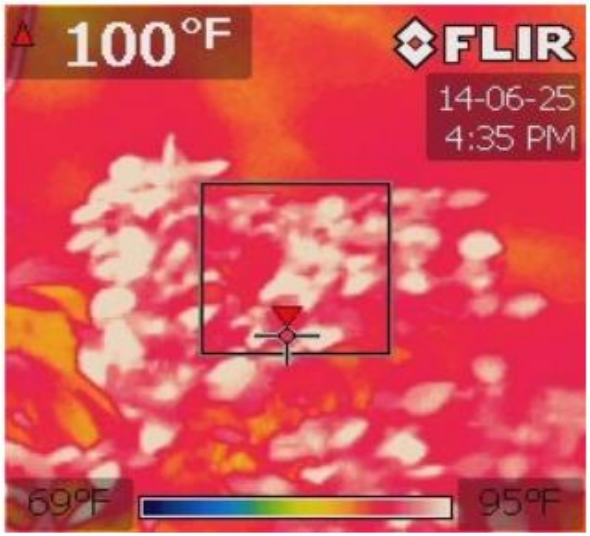
LED

- Huge variation in available lights
  - Bad ones give LEDs a bad name
- **Contains no mercury!**
- Diodes about 120 °F


DA LUMINAIRE SERIES (DAUR)

Properly-Designed LED Grow Lights

- Grow plants better
- More efficient
- Work for leaves, flowers and fruit
- Are expensive
  - Quick return on investment
- Require less cooling
- Run your grow area warmer

	Black Dog LED Platinum XL-U (750W)	High Pressure Sodium (1000W)
75 °F ambient room temperature		
84 °F ambient room temperature		

LED: Buyer Beware

- White LEDs are for humans
  - Not efficient for plants
- Spectrum matters!
- Absurd coverage claims
- Poor designs won't last
- Secondary lenses / "advanced optics"
- "Most efficient"
- "LED Watts" vs. reality

LED: What to look for

- At least 3W, ideally 5W diodes
  - Not 10W or larger (yet)
- UV and near-infrared
- Large heat sinks, active cooling
- Primary lens
- No secondary lens
- Actual power draw- not “LED Watts”

More LED Information

http://www.blackdogled.com/faq

Artificial Light Growing Tips

- Light movers eliminate shadowing
  - 20-40% more yield
- Reflective surroundings
  - Orca Film
  - Flat white paint
- For HID, a safety lens is important
  - Bulbs explode occasionally
  - 500-1700 °F: **will burn you or start fires**
  - Helps contain toxic mercury