Indoor Growing with Artificial Lights

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Black Dog LED
Seasonal Variation in Solar Irradiation with Latitude
Daily Variation in Solar Irradiation

SOLAR IRRADIANCE vs. TIME
Silkeborg, Denmark

Response (V)

Time (hours)
Regional Variation in Solar Irradiation

Average daily solar radiation, 1961-1990

Energy from the sun on a surface directly facing the sun.
Artificial Light is Consistent

SOLAR IRRADIANCE vs. TIME
Silkeborg, Denmark

Response (V)

Time (hours)

- Red: Actual measured sunlight
- Pink: Artificial light equivalent (rough)
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
LED

• Huge variation in available lights
  – Bad ones give LEDs a bad name

• **Contains no mercury!**

• Diodes about 120 °F
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
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