

HIGH TIMES

Electric Sunshine, Part 2

BY NICO ESCONDIDO · TUE AUG 11, 2015



DIGITAL HPS SYSTEMS

HPS, or high-pressure sodium, bulbs are one of the most popular HID (high-intensity discharge) lamps in use today. Heavier in the orange-to-red wavelengths, HPS bulbs provide excellent spectrum for the flowering phase of cannabis plants. The systems noted below are digital HPS systems, meaning their bulbs are specifically constructed for electronic and digital ballasts. While most HID bulbs will work in these types of ballasts, compatibility issues exist as they are not engineered to operate at the high frequencies electronic and digital ballast utilize. Non-digital HPS bulbs used in these ballasts will have a much shorter life cycle than those manufactured for electronic or digital ballasts.

Gavita Pro 1000e DE US



If you're looking for a winner in our lamp trials, look no further than Gavita's premier digital HPS Pro system. It's available in both a 240-volt and 120-volt version, which means that both the European and North American markets can take advantage of this exceptional lamp. The double-ended bulb technology allows for a true-burning, long-lasting bulb whose life won't be cut short by the incompatibility issues that plague the majority of HID bulbs on the market today, which cannot withstand the high hertz counts created by the new electronic and digital ballasts.

The 1,000-watt bulb—now manufactured solely by Gavita after Philips bolted from the horticultural cannabis market—fits in two specialized sockets that attach to the included ballast for an all-in-one system. The ballast itself offers five different settings: 600, 750, 825, 1,000 and 1,150 watts. The data shown here were produced at the 1,150-watt setting, at a 2-foot distance from the bulb, while utilizing the new, highly effective Gavita reflector being sold with the 2015 units. With this new reflector, the coverage stretches just past a 4x4 area. The one downside to this system is that it does create a bit of heat, so it's recommended that those with smaller gardens—or without adequate atmospheric controls—purchase the Gavita units that come with remote ballasts, thereby eliminating some of the heat buildup in the growroom.

Genesis DE 30

After the initial partnership between Gavita and Philips a few years back that produced these digital HPS wonders, a few other smart lighting companies caught on to the technology and formulated their own versions. Of these, one of the more economical units comes in the form of the Genesis DE 30.

Utilizing a Ushio Pro Plus double-ended bulb, the Genny DE 30 produced a spectral curve that was very close to the Gavita in range, but fell short in its PAR rating. The unit also features dimmable positions at

600, 750, 1,000 and 1,150 watts. If there's one drawback to this lamp, it's the reflector hood, which could be improved to increase both canopy penetration and the coverage area, which currently stands at just over 3x3. Still, this is a very good lamp as well as a great value for budget-minded consumers.

CERAMIC BULBS

Referred to mainly as ceramic discharge lamps (CDLs), ceramic bulbs are a relatively new source of light that represent a variation on MH bulbs, which are themselves a variation on the older mercury-vapor bulbs. The discharge is contained in a ceramic tube usually made of sintered alumina (aluminum oxide), similar to what has traditionally been used in HPS bulbs. CDLs create plasma light, the same as the sun and other HID lamps.

SunBrightCDL Agro Grow Light



Perhaps the most pleasant surprise in the entire field came from the CDL manufacturer Boulder Lamp Inc., who absolutely crushed it in our lighting trials. Utilizing a 315-watt Philips Ceramic Agro Bulb, the SunBrightCDL provided extremely broad and intense spectrum across the board.

The spectral curve of this CDL was one of the fullest in the group. And with over 60 percent of its light energy being generated around the blue and red spectrums, it hit the right spots in terms of a plant's natural absorption curve. Its PAR value, at 686 $\mu\text{mol}/\text{m}^2/\text{s}^1$, was almost unbelievable for such a low-wattage bulb. Although manufactured in Colorado, these lamps require 208 to 240 line voltage. The units come pre-assembled with an electronic ballast attached to the top of the reflector hood, with dimming as an available option.

LED SYSTEMS

An LED, or light-emitting diode, is a two-lead semiconductor light source. When a specific voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing light in the form of photon energy. This light is not plasma light, but it is electroluminescence. The color of the light (corresponding to the energy of the photon) is determined by the energy-band gap, or electron hole, of the semiconductor. Diodes are also mono directional in their functioning, emitting light in only one direction.

American Green Truth M16 LED Lamp

Admittedly, this author has not been the biggest supporter of LED lamps in the past. However, we always knew that sooner or later the technology would become less expensive and that eventually LEDs would begin to catch up to our beloved HID bulbs. As is evidenced by our cover photo, we've finally found one that sets a new standard for LED lighting.

This strong M16 LED lamp, designed by Truth Lighting (and recently acquired by AG), came in second on the list of PAR ratings, testing very high at $781.71 \text{ mol/m}^2/\text{s}^1$. With 144 5-watt diodes mixing red, blue and white, this isn't surprising. The M16 performed well in terms of spectrum, displaying the typical but much broader spikes in the blue (450 nm) and red (625 to 675 nm). The blue wavelengths, which are the frequencies carrying the highest amounts of usable photon energy, were especially potent on the M16, likely contributing heavily to its high PAR value.

However, its price tag (\$1,350) and energy consumption (a 760-watt actual power draw) detracts from some of the competitive market advantages usually associated with LEDs. Still, the M16 can be recommended as one of the few stand-alone LED lamps on the market for your flowering room.

California Lightworks Solar Storm 440



The other LED lamp that we tested, the Solar Storm 440 from California Light Works, was an intriguing product that was scalable on both the red and blue wavelengths for various phases of growth. It also included a UVB bulb (281 to 320 nm) on each side of the lamp for added punch during flowering.

The SS440 uses only red and blue diodes and can be described as a full-spectrum lamp, though it does offer switches for both Veg and Bloom spectrum, as well as an on/off switch for the UVB bulbs. Still, with a maximum PAR value of 381.68 mol/m²/s¹ and a two-tone spectrum, this is an ideal high-end supplemental lamp that can help boost light energy and plant production. The manufacturer-suggested retail price on this unit is \$1,049, though it can be found for as low as \$899 on various websites.

PLASMA LAMPS

Plasma lamps are a type of gas-discharge lamp not dissimilar to HID bulbs. However, instead of using electricity to excite the gases into illumination, plasma lamps utilize radio-frequency power. These internal-electrode-less lamps were originally invented by Nikola Tesla and often feature bulbs that are only an inch or two in size.

Chameleon Plasma Grow Light

The PAR values test results can be a bit misleading. This is because they represent tests conducted at a 2-foot distance from the light source. However, this plasma grow lamp from Chameleon actually possessed an extremely low heat signature, thereby allowing growers to place the lamp even closer to the plants than usual. At a 1-foot interval, the PAR value more than doubles, increasing to a whopping 845.60 mol/m²/s¹. However, Chameleon recommends a distance of 18-inches off the canopy, which will supply 600 mol/m²/s¹ and keep a minimum coverage area of 3x 3. That being said, this plasma lamp also boasted one of the better overall spectrums in these trials. However, these lamps do leave a little bit to be desired in red wavelengths as their intensity falls off around the 650nm mark, producing a blue-ish hue over the plants. As technology progresses, and more red is added to the spectrum, these lamps are becoming more and more a two-stage lamps for both veg and flower. In fact, Chameleon now offers the addition of red LED diodes, which bring a significant amount of red spectrum that can take your plants to full-term.

INDUCTION LAMPS

Also similar to both HID and plasma lamps, the induction lamp is another gas-discharge bulb, though it uses neither electricity nor radio frequency to illuminate its gases; instead, it utilizes an electric (or magnetic) field to fire up the bulb.

Marigold Lighting Induction Lamp

As was also the case with plasma lamps, induction lamps ran into a rating problem in our standardized tests, one that involved the plant's proximity to the light source. This induction lamp from Marigold Lighting runs very cool, allowing growers to move it much closer to the garden canopy, thereby increasing the PAR value.

This particular lamp also uses a highly specialized, proprietary blend of phosphors that correspond more closely with the absorption curve of cannabis plants during photosynthesis. Looking at its spectral curve, we see that it has color spikes throughout, with good intensity for the red

wavelengths. Keeping these induction lamps from 6 to 12 inches above the plants will result in better yields to match the healthy, well-developed plants they produce.

FLUORESCENT LAMPS

The original in energy-efficient grow lighting, fluorescent lamps offer some of the best spectrum out there. They also run cool to the touch and can be placed just inches above garden canopies. The downside is usually their intensity, though in recent years larger fixtures have been taking aim at that issue.

Marigold Lighting Econolux T5HO Fluorescent



The eight-bulb T5HO fluorescent fixture from Marigold is another step in the right direction: It offers four different bulb types, including a higher red, higher blue and UV (both A and B) so that growers can create a more customized spectrum for the various stages of plant development.

These lamps are relatively inexpensive and, when used properly, can easily replace a 400-watt HID lamp. Still, many growers tend to slide these units into nurseries, which is always a great option· but an even better idea is to use them in conjunction with HID lamps for healthier and happier plants.

Their cost-effectiveness and lower price tags make them an attractive option for growers looking to boost quality without sacrificing their budget· or the environment.