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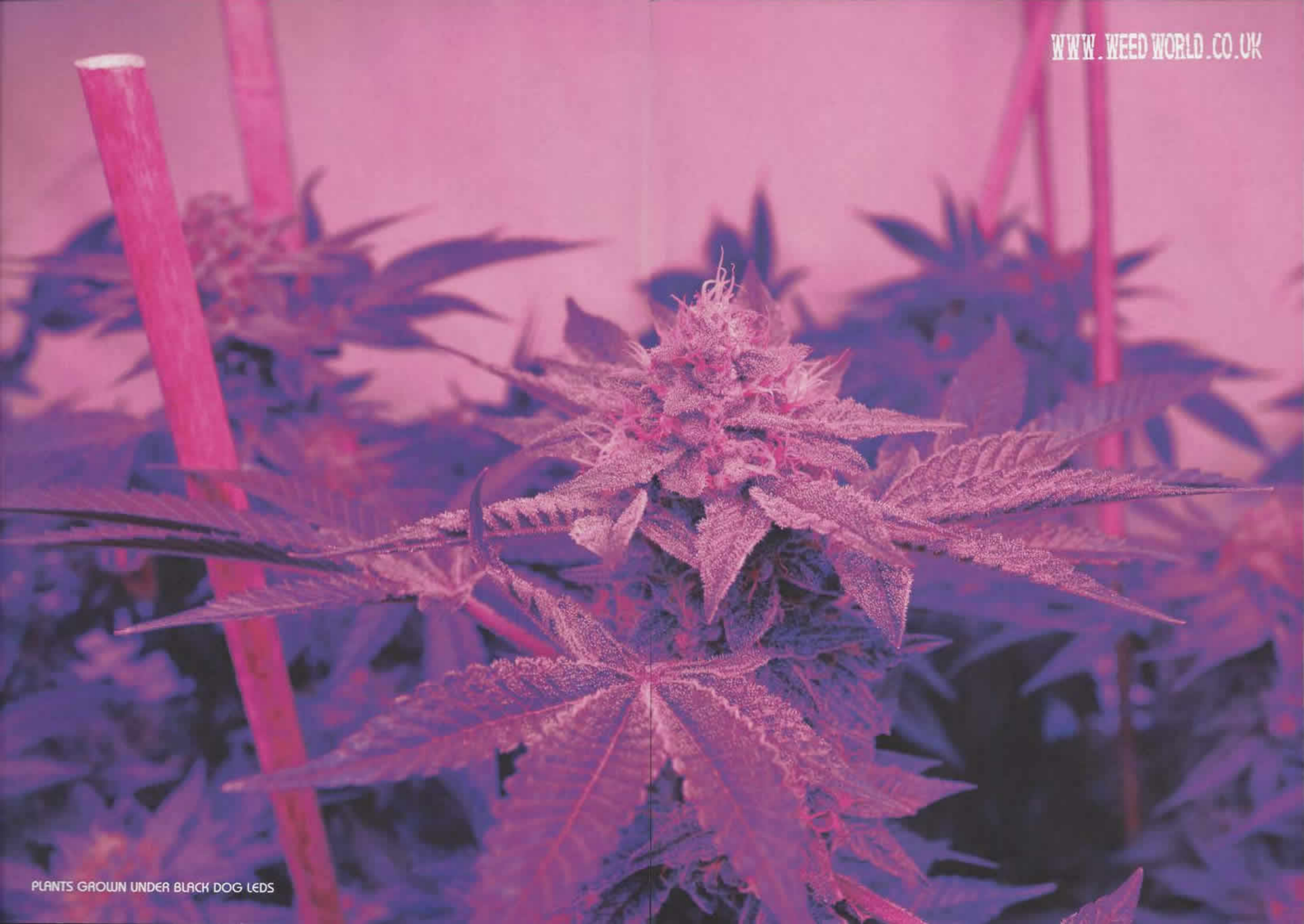


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# AN INTERVIEW WITH BLACK DOG LED BY PROFESSOR LEE



IMAGES COURTESY OF BLACK DOG LED AND CHRIS GUINN



Working in the marijuana industry I get to meet all types of people, be they growers, reformers, patients, celebrities, or industry/technology leaders. Recently, I got a chance to sit down with the team at Black Dog LED to ask them about their amazing lights and LED technology in general. For years there has been a lot of mixed information on these little monochromatic diodes and my chat with the Black Dog crew helped to clear up some of the questions I've been asked. If you've been on the fence about investing in LED lamps for your garden, then this article is for you.

**Professor Lee:** "When someone hears the name Black Dog LED they naturally want to know if there really is a dog, and, if so, what's its name?"

Black Dog: "Yes, there is a dog and his name is Bodhi; he protects our office from rogue squirrels and prairie dogs. You can find a picture of Bodhi on our site ([www.blackdogled.com](http://www.blackdogled.com)) on the About Us page."

**Professor Lee:** "What kind of background did you guys have before Black Dog? Electricians, office drones, ski bums?"

Black Dog: "We come from a variety of backgrounds, all united by a passion to make the best grow lights possible: Corey was a glazer, Noah was in IT and business management, Kevin was a software developer, and John ran a hydroponics store."



Plants grown under Black Dog LEDs produce heavy lush growth oozing with trichomes.



**Professor Lee:** "Did any of your backgrounds transfer to the company or was this a complete step into the unknown?"

Black Dog: "We all have experience growing indoor plants prior to joining Black Dog LED, so that knowledge and experience certainly transferred. Our other accumulated skills are what make us an effective team."

**Professor Lee:** "How did Black Dog come into being, whose brain child was it, and what convinced you to take that leap into a niche market?"

Black Dog: "After taking a bit of a break from growing, Corey decided that he wanted to get back into it and wanted

to specifically try LED lights due to the many issues with HIDs, such as heat, fire potential etc. After many experiments and iterations he finally hit on a combination of technology and spectra which not only worked, but worked better than any other artificial lighting on the market. We've been improving and refining the lights ever since."

**Professor Lee:** "When people talk about using LEDs, the main benefit is that they can save a lot of money. How so?"

Black Dog: "It is true that LEDs can save money, but we think the biggest benefit is better growth and a superior product when grown under LED lights. LEDs save money in many ways:



- By using 20-40% less electricity than equivalent HID lighting, you save on your electric bill every month.
- There are no frequent bulb replacement costs with high quality LEDs. Those \$100 HID bulbs add up over time, and should be properly disposed of due to their mercury content (usually involving a hazardous waste fee). LEDs contain no mercury!
- Because LED lights aren't producing much of their light in the infrared range (as HPS and MH lights do) plant leaves aren't warmed directly by the lights as much as they are under HID lighting. This means that the ambient temperature needs to be about 8 degrees (F) warmer when growing under LEDs compared to HID lights to maintain ideal leaf surface temperatures. This directly translates into a huge savings on your cooling bill – both in sizing and running the equipment."

**Professor Lee:** "Exactly how warm do your fixtures get when they reach operating temperature?"

Black Dog: "In an 85 degree room, the bottom of the light fixture is 122 degrees – warm to the touch, but not even unpleasantly warm. We've seen many cases where plants actually grow up to touch the glass on the bottom of our lights without detrimental side-effects (though this is highly dependent on the variety/kind of plant, environment, and use of light movers)."

**Professor Lee:** "The next thing I've routinely heard people talk about is the difficulty in finding a model that actually works. Why did early LED systems garner such a bad reputation?"

"We feel for our customers who have to deal with the current INCONSISTENCIES between state and federal law."

Black Dog: "For a long time the technology simply didn't exist to make LEDs intense enough to grow plants well, let alone flower them. The first generation of LED grow lights had 1W diodes which don't create light intense enough to penetrate plant canopies. In addition, the first LED grow lights available had extremely limited spectral output – usually one or two colors at most – which will grow plants, but not very well. Outlandish claims made by some companies selling LED plant lights continue to give LEDs a bad reputation. For example, some companies say that a 300W LED panel can replace a 1000W HID light for growing plants. While it is true that municipalities are replacing 1000W HID street lights with 300W LED panels, human night vision is not comparable to plants' energy needs in the process of creating sugars in photosynthesis."

**Professor Lee:** "With recent developments in the new legal marijuana market are you seeing an increase in commercial operations investing in LED technology?"

Black Dog: "Absolutely. The other lighting technologies currently offered for growing plants are mature and have fundamental limitations on improvements. While LEDs have been around for a while, the technology is still rapidly evolving and many innovations are coming down the technology pipeline. People looking at options for indoor grow lighting quickly realize LED has become the superior technology for artificial plant lighting."

**Professor Lee:** "Do you ship internationally? If so, what is the furthest or most exotic place you've shipped a light?"

Black Dog: "Yes, we ship internationally and have shipped to every continent except Antarctica (so far)." "We have lights in Thailand, South Africa, Brazil, many European countries (including Iceland) and Australia."

**Professor Lee:** "Do you see a future where LED sales overtake HID sales?"

Black Dog: "Absolutely. As more and more people see what the right LED lights can grow and how much better they grow than HID, HID bulbs will follow incandescent lights into a historical footnote."

**Professor Lee:** "Have you ever

compared your product to plasma lights?"

Black Dog: "Yes. We've yet to see a plasma light that has enough intensity to grow plants with more than a 6" deep canopy. While they have a better spectrum than some of the other types of traditional lighting, such as Metal Halide, they just don't have the intensity to back up that spectrum, even when put right up against a plant."

**Professor Lee:** "You market yourselves as the most powerful LED lights on the market. Has anybody ever stepped up to challenge you for the title?"

Black Dog: "No serious competitors have stepped up yet. Some are using higher-wattage chips than we do, but these are all "white" LEDs. There is no such thing as an LED that naturally produces white light; the 10W diodes being sold as white LEDs are actually blue LEDs covered with a phosphor which converts the blue light to "white" light, much as fluorescent bulbs do. Unfortunately, about 60% of the light is lost in this conversion, so a 10W "white" LED is actually putting out less light than a 5W monochromatic LED."

**Professor Lee:** "Is it easier being in a business that supplies a product to the marijuana industry rather than being directly in the industry itself?"

Black Dog: "It isn't a matter of being "easier"; we simply have a passion for creating the best grow lights possible. But, not being directly in the cannabis industry does make things like banking easier. We feel for our customers who have to deal with the current inconsistencies between state and federal law."

**Professor Lee:** "Do you ever get any hassles from the authorities because of your connection to the marijuana industry?"

Black Dog: "We've never had any hassles from the authorities, but we have had issues with banks that do not wish to be associated in any way with the industry."

**Professor Lee:** "Tell us about the range of wattages your lamps come in."

Black Dog: "We have 6 models that cover a range of wattages and footprints. Customers often call and ask "what is



your best light?" and we explain that our lights are all the same technology, they are just for different footprints. Our lights range from the 135W BDmicro-U with a 2x2 foot flowering footprint, to the 750W Platinum XL-U with a 4.5x4.5 foot flowering footprint. We are the only company to clearly list honest flowering and vegetative footprints right on our site for every light."

**Professor Lee: "Do you produce only full spectrum models or do you provide individual vegetative and floral models?"**

Black Dog: "We only produce full-spectrum lights; each of our models has the same light spectrum. We used to produce separate veg and flower lights, but after much research and experimentation found that a full-spectrum light works better for both the veg and flower stages."

The "red for flower, blue for veg" mantra came out of having two choices of HID lights: the red-deficient MH bulbs, and the blue-deficient HPS bulbs. While it is true that MH lights work better for veg and HPS work better for flowering, a full-spectrum light works better for plants regardless of their stage. In addition, you don't have the negative impacts of changing spectrums. These negative effects are well documented in research literature and we confirmed them ourselves in our own research."

**Professor Lee: "I've been told your lamps are quite substantial. How large and heavy are they?"**

Black Dog: "Keeping LEDs cool is key to their longevity and efficiency, so we use large (and heavy) heat sinks for our lights to ensure they continue operating as long as possible."

"The 135W BDmicro-U is 13x13x5 inches and weighs 15 pounds; our 750W Platinum XL-U is 18x18x5 inches and tips the scales at 54 pounds."

**Professor Lee: "What kind of garden footprint are they capable of?"**

Black Dog: "Our lights range from the 135W BDmicro-U with a 2x2 foot flowering footprint, to the 750W Platinum XL-U with a 4.5x4.5 foot flowering footprint and 7x7 veg footprint. The Platinum XL-U was the first and, so far as we know, still the only LED light capable of replacing a 1000W HID. In our side-by-side test grow we beat the 1000W HPS by 23% when comparing



With its all-metal frame, five watt diodes, and hefty heat sinks/fans, a Black Dog Light is substantial.



grams per watt AND had higher-quality buds."

**Professor Lee: "The Platinum XL 750 draws 750 watts at the wall, but it has three hundred 5-watt diodes. Why does it only use 750 watts and not 1500?"**

Black Dog: "LED diodes are rated by how much wattage they can theoretically handle if they were perfectly cooled. An LED run at its rated wattage in a real-world environment will degrade very quickly, so no LEDs are ever really run at their full rated wattage. To maximize the longevity of our LEDs, we only run them at half their rated wattage and use massive heat sinks and fans to ensure the LEDs keep cool and performing as well as possible for as long as possible. If this is not taken into account when designing a light, the LEDs will degrade very quickly and the benefits of growing with LEDs will be negated."

**Professor Lee: "Are you considering developing an even larger model that uses 1000 watts or more? And, if you ever did, how big of a footprint do you think it would provide?"**

Black Dog: "We're always looking into new technologies and strategies for lighting. More wattage in a single fixture may give a larger footprint, but the losses incurred by raising the light higher lead to a point of diminishing returns. If you make a light that needs to be raised up because it is very focused, you lose

an amazing amount of the intensity due to the inverse-square law of light. As technology advances so will our products."

**Professor Lee: "Let's talk about the lamp's features. I took a cheap off-brand LED panel apart to see how it worked and a lot of it consisted of left over computer parts crudely hot glued into place. Your models are obviously a much higher quality product than that, but what kind of attributes set it apart from other quality LED lights on the market?"**

Black Dog: "We insist on high-quality parts for our lights because we want the best grow lights possible. We start with only 5-watt LEDs in 15 different colors to create the best spectrum and intensity for growing plants. We include UV LED diodes in our lights even though they cost almost 10 times as much as other colors. We use large heat sinks and actively cool them with fans to ensure our LEDs stay cool to maximize efficiency and extend their life. We use thicker-gauge wiring than is technically required to minimize wire heating, and have oversized housings ensuring efficient cooling of all power converters and other components. A thermal cutoff switch is included to prevent damage to the LEDs if the light is ever run in too-warm an environment. Unlike many of our competitors, we don't use secondary lenses to focus the light from our LEDs. Secondary lenses make the light much more powerful directly



under the panel – and make it look much better in PAR/luminosity tests under the center of the light – but off to the side the intensity diminishes dramatically, to a point where you cannot even grow under it. We utilize 120-degree lenses on our diodes to spread the light out as evenly as possible to realize the effective growing/flowering footprints for each of our models.

We always say you need power AND

spectrum to grow well indoors. As you mentioned we have the most powerful LED grow lights on the market and we utilize 15 different LEDs in our lights to achieve our Phyto-genesis Spectrum™. Most other companies stop at 4-6 different LED colors but we feel the least emphasized advantage to LEDs for growing is the ability to create a spectrum that we could only have dreamed about growing with 10 years ago. This gives us

the ability to customize the spectrum for specific plants as more research is done. Our spectrum already grows plants much better than HPS and MH lights. We stand behind our lights and service all warranty repairs ourselves in Boulder, Colorado, but we strive to create the highest-quality lights to begin with so we don't have to ever repair them."

**Professor Lee: "When did you decide to make the switch to 5-watt diodes and why?"**

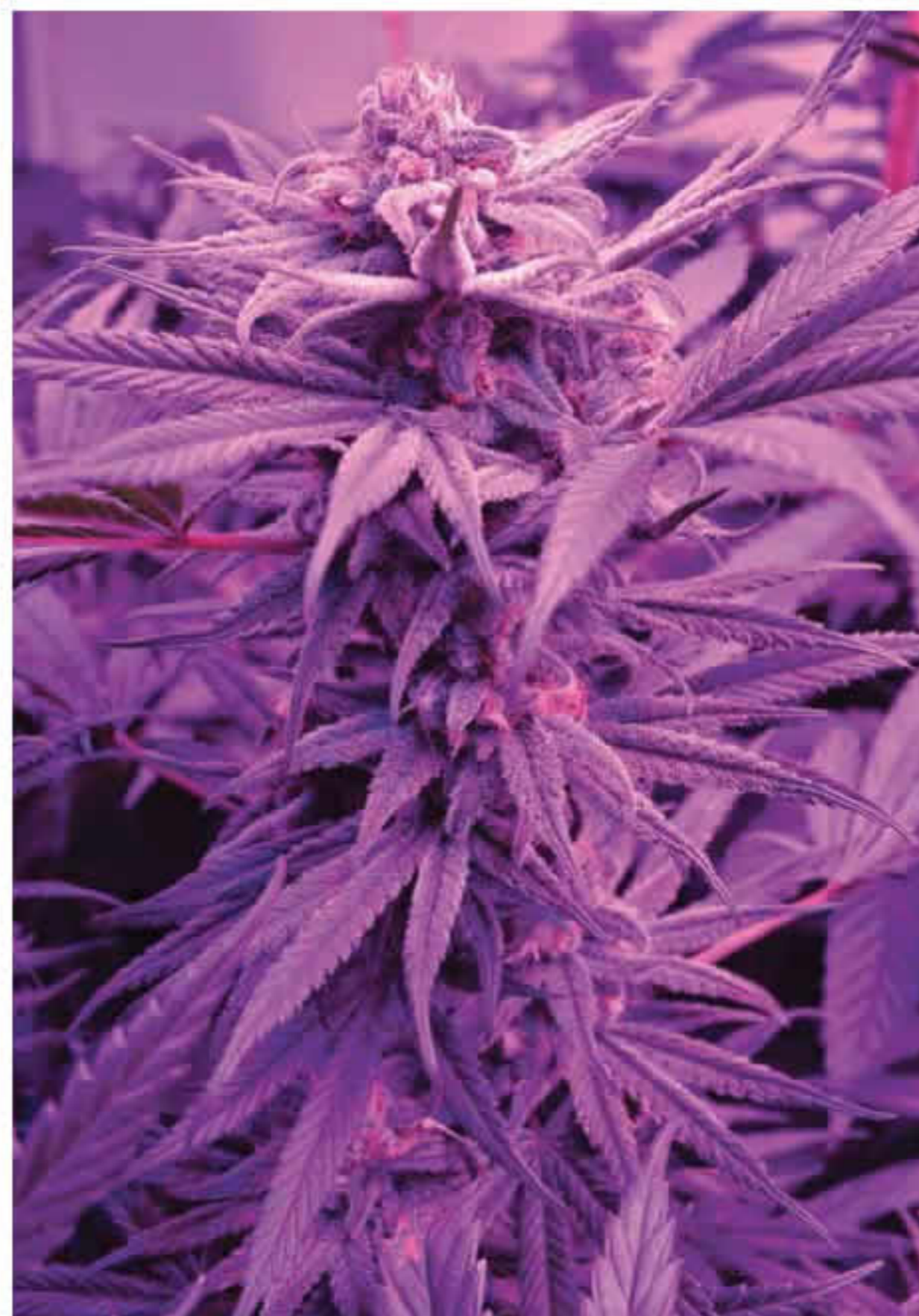
Black Dog: "We started using 5 watt diodes 3 years ago, but not all the colors we needed were available, so we mixed them with 3 watt. Once all the colors in our spectrum were available in 5-watt diodes, we made the switch to exclusively 5 watt diodes, starting just under 2 years ago. The higher intensity of 5-watt diodes better replicates the Sun's intensity and gives better canopy penetration."

**Professor Lee: "Is there some point of diminishing returns where even stronger diodes would prove to be overkill?"**

Black Dog: "Absolutely. As the light gets more intense it requires moving the fixture further away from the plants, incurring huge losses in efficiency. The goal is always to provide the maximum amount of light the plants can handle, in a given space. Of course you need to make this an even spread so you either end up moving the light further away or spreading the light source out. Both of these solutions create more issues."

**Professor Lee: "I know that the exact details of your diode spectrums is proprietary, but can you tell us more about the advantages your product's spectrum provides over the more traditional HID lights growers have been using for decades?"**

Black Dog: "HID lights produce light in specific wavelengths based on what the gasses inside the discharge tube naturally produce when they get very hot. While the spectrum can be tweaked slightly with the addition of other elements, much of the light created by HIDs is of little or no use to plants. For example, HPS bulbs create a significant amount of light in the infrared (invisible to humans) range, where it only serves to heat up plant leaves. While some infrared is necessary for healthy plants, too much of this in the spectrum ratio becomes detrimental to maintaining a



Plants grown under Black Dog LEDs produce 2% to 5% more resin than plants grown under HIDs.





Black Dog LEDs have the spectrum and power to penetrate canopies and produce fantastic results.



healthy garden.

In nature, red light penetrates through plant canopies better than blue, so plants growing under others tend to get more red than blue light. Evolution has tailored plants that want full sunlight to grow taller when they lack a balanced red/blue spectrum. Since HPS bulbs produce much more red light than blue, plants naturally respond by getting leggy, weak growth as they strive to find the right balance of light.

LEDs provide a unique opportunity to tune the spectrum for only what plants really need to grow. By not wasting energy on spectra that plants cannot use effectively, LEDs can be inherently more efficient than any other lighting technology available. In addition, we can utilize LEDs of appropriate colors to target specific pigments in the plants to not only grow them better, but have a high-quality final product. For example, we include ultraviolet in our spectrum even though it doesn't help the plants grow. It triggers the production of natural sunscreens in the plants, which in cannabis happen to include THC and

CBD. In side-by-side grows with identical genetics we've seen increases of 2-5% in THC and CBD concentrations when using our lights versus HPS lighting. HID lights were created to illuminate streets and stadiums. They happen to work OK for growing plants, too, but LED lights work much better when you get the right combination of spectrum and intensity. As we like to say, 'Stop using street lights, and start using plant lights!'

**Professor Lee: "Because some of your LED diodes emit light outside the range of visible light, do you ever have any customers call to complain that they think some of the diodes aren't working or burnt out?"**

Black Dog: "Yes, we get calls weekly from new customers concerned that some of the LEDs are 'burned out' in their new light when it is just the UV and IR diodes they are looking at, hopefully with eye protection on..."

**Professor Lee: "Plants grown under LEDs can be quite a bit lusher and**

**healthier than those grown under HIDs. Why is that? Is it just the rich spectrum or do other factors come into play like the cooler temperatures or anything else?"**

Black Dog: "Because our lights have a balanced spectrum, plants don't need to stretch and get leggy to try and find the light they're looking for. Plants grown under our lights tend to be a lot more compact, dense, and bushy than plants under HIDs because they aren't looking for more or better light. Buds are a lot denser and heavier too! We've found that temperatures actually need to be kept warmer under LED lighting (82-84 degrees) than HPS lighting (generally recommended at 75 degrees) to keep the plants metabolizing and growing efficiently. This greatly reduces the need for ventilation and/or air conditioning!"

**Professor Lee: "When a grower is new to LEDs the violet color of a full spectrum LED is quite foreign to them. Can this create any problems with**



**identifying nutrient or pathological problems that a grower would normally notice because of a change in the color of the leaves? You carry spectrum correcting glasses, correct?"**

Black Dog: "While we use 15 different LEDs for the most complete spectrum available, our spectrum is certainly heavily weighted in red and blue, making plants appear somewhat magenta under our lights, making it harder to identify issues with the plant leaves. While there is enough white light in our spectrum to see any issues, it isn't as easy. We collaborated with Method Seven to create LED Grow Glasses which offer perfect color correction for our spectrum, while also protecting your eyes from the ultraviolet and infrared light produced by our lights. With the glasses, plants appear as they would when viewed under a 5500K light, which is similar to fluorescent lighting, making it easy to diagnose any diseases or deficiencies."

**Professor Lee: "Do you carry any other products other than LEDs?"**

Black Dog: "We do carry accessories that complement our lights such as grow tents, fans, carbon filters, Smart Pot fabric pots, light movers and more. Rather than carrying a range of products, we only carry the equipment we use ourselves that has proven to be high-quality and reliable over time.

We highly recommend using fabric pots such as the Smart Pots when growing in soil under LED lights. Because LED lights aren't putting off a lot of infrared light (heat) like HPS lights, we've found that plants don't dry out (cycle) as quickly under LED lights. Fabric pots help to allow the roots to dry out faster so you can continue cycling nutrients through more frequently. The air-pruning nature of fabric pots also creates a much stronger, healthier root system!

Another favorite accessory are the Light Rail 3.5 light movers, which we get specially modified from Gulala Robotics to handle the extra weight of our lights. We've seen dramatic increases in yields and quality when the light movers are used PROPERLY – not to expand the footprint of the light, but to move the light back and forth within the footprint. By eliminating shadowing from upper leaves, the light mover ensures lower leaves continue to help grow with the plant."

**Professor Lee: "I've spoken to growers that told me Black Dog has excellent customer service."**



Spectrum correcting glasses help grower's spot problems in the garden. Method Seven Glasses pictured here.



Black Dog: "We always strive to provide the best customer service possible, helping people understand differences with growing under LED lights, selecting the appropriate light(s) for their setup, and even answering general growing questions. Our staff have a combined 75+ years of experience growing under artificial light, so we're able to answer most questions that come our way."

**Professor Lee: "What's happening for Black Dog in 2014? Will you be demonstrating your wares at any tradeshows or venues?"**



Black Dog LED is based out of Boulder, CO and can be contacted at:

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