DroLED

GRO WITH DRO

HOW LIGHT SPECTRUM AFFECTS CANNABIS GROWTH

HOW LIGHT SPECTRUM AFFECTS CANNABIS GROWTH

This is intended to be an easy to read overview of the correlation between light and cannabis growth in indoor environments. More importantly, how LED (Light Emitting Diodes) as that light source can positively increase your yields, big time!

IN THE BEGINNING:

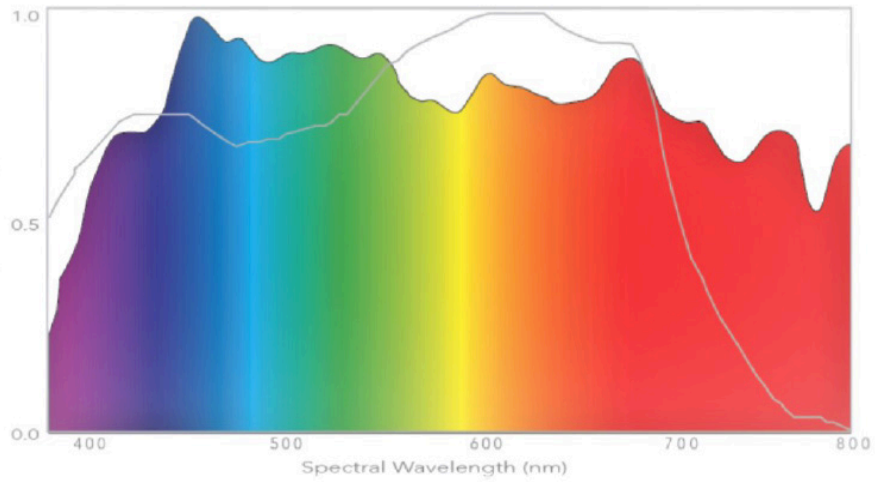
In 1962 the Light Emitting Diode (LED) was invented. In the 1980's NASA began experimenting with LEDs for growing plants. For many decades we have known that varying light spectrums have different effects on plants. Some spectrums seem to have very little effect in plant growth. Other spectrums promote vegetative growth and others increase the yield in flowers and fruits. Prior to LED's we were limited in our ability to isolate and test varying spectrums and their affects on plant growth. Now we know how to maximize those spectrum color wavelengths and intensity to increase yields and potency.

THE RELATIONSHIP BETWEEN LIGHT AND GROWTH:

Everyone knows that plants need light to grow. Plants convert light energy from the sun into stored chemical energy via photosynthesis. But did you know that different parts of the light spectrum can have varying effects on plants? In this brief study we are exploring the two primary markers. 1) McCree Action Curve 2) Photosynthetically Active Radiation (PAR)

THE MCCREE ACTION CURVE

The McCree Action Curve represents the average photosynthetic response of plants to light energy. The McCree Curve, also known as the Plant Sensitivity Curve, begins at 360nm and extends to 760nm. This grey line Action Curve has been placed over a Natural Sunlight spectral distribution chart to see how well a light source can affect plant growth.



HOW LIGHT SPECTRUM AFFECTS CANNABIS GROWTH

PHOTOSYNTHETICALLY ACTIVE RADIATION (PAR)

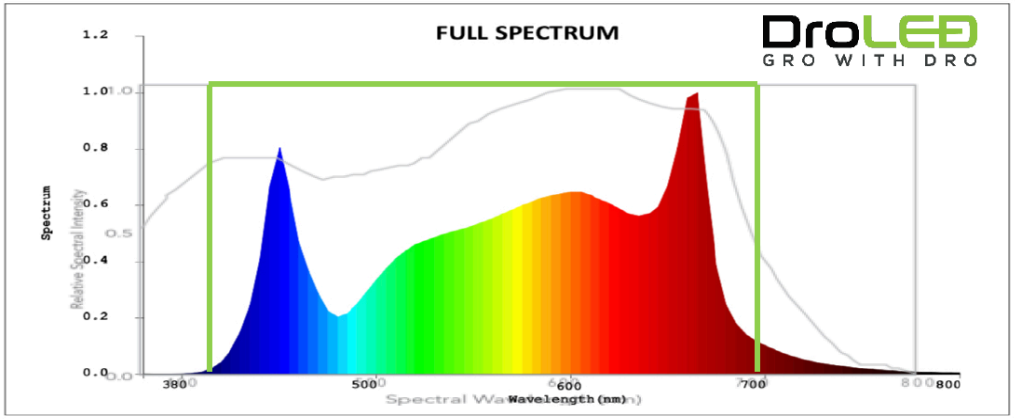
Often abbreviated as PAR, designates the spectral range (wave band) of solar radiation from 400 to 700 nanometers that photosynthetic organisms are able use in the process of photosynthesis. This spectral region corresponds of light visible to the human eye. Light has properties of both photons and waves and in the spectrum of visible light. The usable light that plants can absorb is used for photosynthesis.

Some people think PAR is a measurement of all the light coming from a light source. This is not the case.

PAR is the amount of light that's usable to plants- those wavelengths that will be used for photosynthesis. Just like the difference between a growing area and a canopy, PAR is not the measure of all the light a grow light gives off, but the measurement of the wavelength's plants will absorb. PAR

While the spectral graphics above clearly shows the Action Curve and Sunlight Spectrum it's important to note that PAR is the more valued measurement in the cannabis grow industry and is industry standard. We will look at PAR values in the graphic below. We will also discover how both spectral intensity and wavelength is vital for healthy plant growth. Let's take a closer peak at how specific colors of light affect cannabis growth.

As you can clearly see in the graphic, the proprietary light spectrum of all DroLED Gro Lights is engineered to maximize all stages of growth and maximize all aspects of cannabis quality (details below). It is designed to take out the spectrum guess work for cultivators.



McCree Action Curve: Grey Curve Line

Photosynthetically Active Radiation (PAR): Green Line

HOW DOES CANNABIS USE VARYING LIGHT SPECTRUMS?

ULTRAVIOLET LIGHT (10NM-400NM)

Recent studies show that 385 nm UV light promotes the accumulation of secondary metabolite compounds, strengthens antioxidant progress of plant extracts, but does NOT have any significant effect on the growth processes. Prolonged periods of exposure to UV light can be harmful to plants. However, short periods of Near UV have positive effects like plant aromas, plant color and taste. And it is no secret that UVB can increase THC levels.

BLUE LIGHT (430NM-450NM)

These wavelengths encourage vegetative growth and are vital for young plants and seedlings during the vegetative stage of their growth cycle. Blue light fits with the absorption peak of chlorophylls, which do photosynthesis to produce sugars and carbons1. Sugars and carbons are essential for plant growth, as they are the building blocks for plant cells. However, blue light is less effective than red light for driving photosynthesis. For any plant to reach its optimum size and vitality a full spectrum light source is required.

GREEN LIGHT (500NM-550NM)

Green light plays a role in photosynthesis and vegetative growth because it falls within the range of photosynthetically active radiation. However, its effect on plant growth and development is not as well understood as red or blue light. Plants reflect green light, and therefore they appear green to our eyes. This may lead us to think that green light is not used by plants, but it's simply not true! Only around 5-10% of green light is reflected from a plant and the rest (90-95%) is absorbed or transmitted to lower leaves. We do know that green light increases the overall strength and health of the plant.

When it comes to growing cannabis, many cultivators are most interested in the quality of light used for the flowering stage. In many plants, flowering is mainly regulated by two main photoreceptors: cryptochrome and phytochrome. Both photoreceptors primarily respond to blue light but can respond to green light as well, although to a much smaller degree. Green light is effective at accelerating flowering in several species. Once flowering has begun, it's important to provide plants with a "full spectrum" light that has high amounts of blue and red light, and moderate amounts of green light, for photosynthesis to be optimized.

RED LIGHT (640NM-680NM)

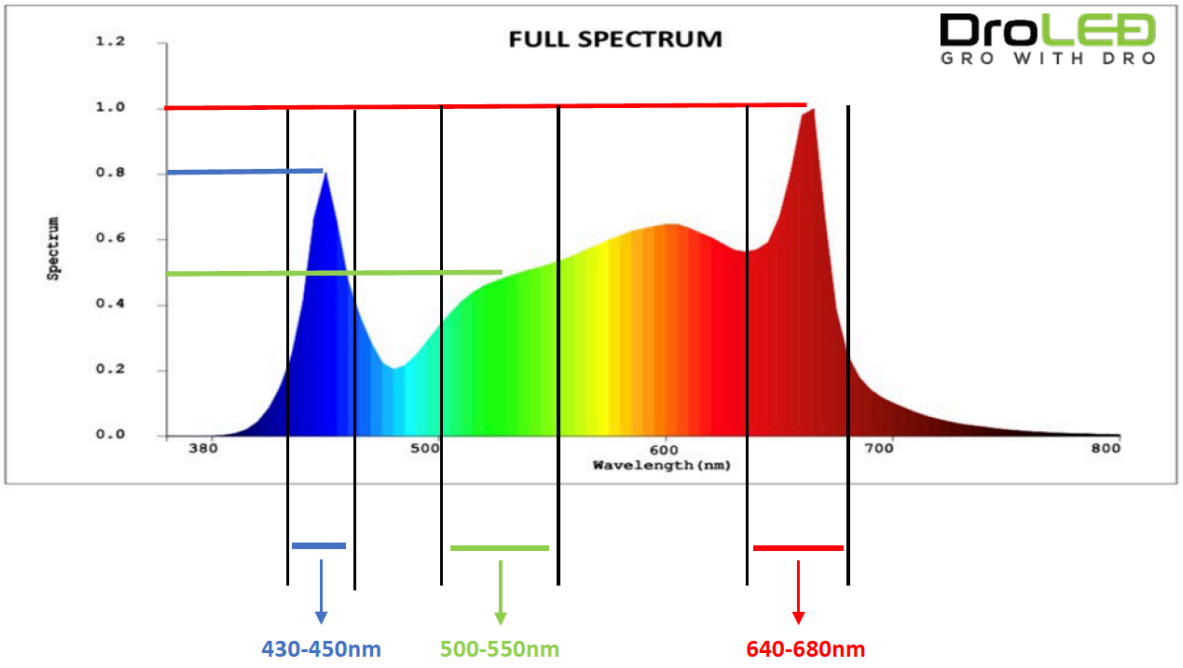
For growing cannabis, many cultivators are most interested in the flowering stage. Red light impacts flowering in two ways. 1) because red light is important for photosynthesis, it is by extension, also important for flowering. 2) red light facilitates flowering time in some species. The 660nm wavelength has a very strong photosynthetic action and exhibits the highest action.

The flowering process is resource-intensive, and there is a strong positive correlation between plant size and bud size. Therefore, a plant with high photosynthetic rates will accumulate more resources that later allow it to produce large, dense flowers.

To have a high yield, it is important that a cannabis plant is provided with high amounts of PAR during the vegetative stage. Therefore, a full spectrum light source is vitally important.

FAR RED (730NM)

High amounts of far-red light accelerate flowering in many species. In some species, far-red light also increases the number of buds produced. As growers, we can use this knowledge to our advantage. If we wish a plant to begin flowering (such as a stubborn cannabis plant that refuses to bud out), we can give it high amounts of far-red light. Or in the case of DroLED lights there always a small amount of far red consistently throughout the grow cycle to help promote consistent budding.



WHY ARE DroLED GROW LIGHTS SO AWESOME?

The founder and engineers of DroLED have specialized in the commercial and industrial-grade LED lighting systems and have been developing LED light fixtures for well over a decade. Commercial and Industrial grade LED lighting systems are required to go through extensive testing and certifications. They must perform at the highest standards, in rigorous conditions and must pass high IP Ratings.

The golden rule for LED lighting longevity and performance is, heat management. Commercial and Industrial Grade LED fixtures are engineered from the inside out for proper heat disbursement. These patented system designs eliminate the necessity of cooling fans. As we all know, the weakest link in any mechanical device, are the moving parts. Additionally, fans require airflow which is another weakness as this allows for water and dust ingress potentially leading to total system failure.

Utilizing these same superior industrial-grade standards DroLED was birthed. DroLED has been a proud leader in the design and manufacturing of innovative high-power, high-yield, truly full-spectrum LED grow lights. DroLED Gro lights have been developed for both the home grower and large commercial growers alike. There is a DroLED Gro model that fits the needs of every customer. Excellent for greenhouse, hydroponic and indoor grow applications delivering unmatched yields and efficiencies.

Our mission is to deliver the best broad application and full spectrum grow lights utilizing the best available industrial-grade technology and innovations, backed by test grows, and without any gimmicks. We created the ultimate grow light that lasts a long long time, can take a beating and give you great yields you desire for decades of maintenance free use.

RISK FREE! If you are not 100% satisfied with your DroLED products simply return it within 90 days and we will give your money back!

WORRY FREE! We provide an industrial-grade 5 year full replacement warranty on all DroLED products.

DroLED VS. HID

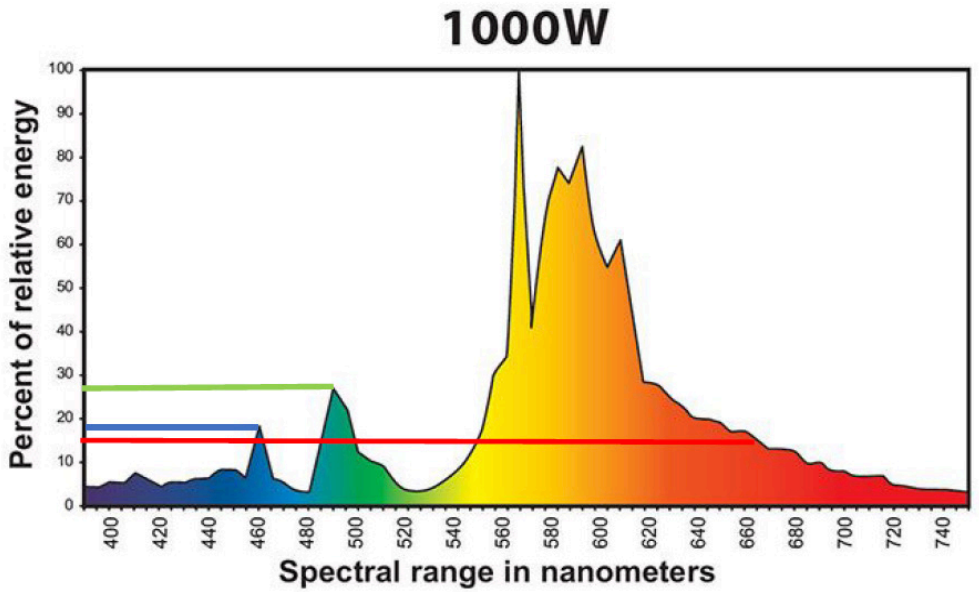
DroLED Gro Lights are better than HID (High Pressure Sodium and Metal Halide) in every way. Yes, we understand most all indoor growers have used HID for decades and that's what they are familiar with. It's not always easy to make the change from a technology you have used for many years to a new technology, even if the new one is better in every way. We are all creatures of habit. However, this change is certain to happen and inevitable. The indoor grow industry isn't the only industry that has made big changes to embrace better technology.

For example, the automobile industry in the early 1980's started switching their automobiles from carburetors to fuel injection systems. In the early 1980s some auto buyers refused to buy fuel injected cars because they simply weren't familiar with the new technology and didn't like the change. They thought, "why change something that works?" Unknown to the auto buyer the fuel injector wasn't some new fancy thing that just popped up. The fuel injector was first used in airplanes in the 1940's and evolved over the decades to be used in in the auto industry. The very last American made vehicle sold in the US market that still had a carburetor was the 1991 Crown Victoria P72 (the predecessor of the Police Interceptor). There were a few other cars with carburetors from foreign manufacturers that continued to sell in the US until 1994 and then the end of the carburetor was final. But why did we switch from the carburetor to fuel injectors? There were two primary reasons, 1) the injectors were far more efficient increasing miles per gallon by almost double and 2) carburetors were clumsy and could be maintenance intensive. There was an old saying during the carburetor years, "pump twice and crank". Meaning you had to pump the gas pedal twice before you turn the key and then it would take a couple seconds for the motor to fully turnover. Today we find all of that to be needless clumsy nonsense as we push a button and the car starts immediately.

Just like with the Automobile industry relationship with injectors, there was an initial resistance to LED grow lighting in the indoor grow industry. And that's understandable because its human nature! But the jury is no longer out. HID is simply antiquated, clumsy, inefficient, maintenance intensive and most importantly, doesn't produce the yields like great LED grow lights. Within just a little over a decade after introducing fuel injectors into the market, all vehicles sold, had fuel injectors. And just like injectors being utilized since the 1940s, LED has existed since 1962. The indoor grow industry will fully transition from HID to LED, its just a mater of time.

There are some major differences between LED and HID. Let's take a look at the Metal Halide 1000W light spectrum graphic below. Keep in mind the science we reviewed in the section titled "How Does Cannabis Use Varying Light Spectrums".

HID vs DroLED



The first thing you will notice of the MH graph is the huge spike in the middle of the wavelength of yellow to light-orange color spectrum. That specific color has very little to no value in the growth or photosynthesis of plants. You can clearly see the intensity of the yellow reached to 100 (1). And the most important three colors severely lack in intensity. All three are under 30 (0.3). The simple reason why Metal Halides can grow cannabis is simply because it is a full spectrum light.

When comparing LED to HID many studies have shown an increase in denser fruits and flowers, oil production and quality and closer inter-nodal spacing. With our proprietary light spectrum, we maximize the yield size in a shorter period.

In addition to spectral control DroLED has another huge benefit over HID. The wavelength pattern that HID (burning state) lights produce is a wide-wavelength and DroLED (solid state) lights produce a narrow-wavelength. Why is this important? Wide-wavelengths tend to spread out from the light and don't reach deep into the canopy. With DroLED the narrow-wavelength pushes deep into the canopy which produces more buds/flowers. With the added optic lens that we apply to each diode we have the broadest footprint of all lights on the market. This coverage area allows for more plants per light.

HID lights produce 65% heat and 35% light and DroLED Gro lights produce roughly 10% heat and 90% light. DroLED Gro lights are completely silent and they do not need to be air-cooled like HID lights, therefore eliminating the need for expensive and clumsy fans and duct work. Lower light temperatures lead to a much more easily maintained ideal grow environment in which your plants would thrive. Because DroLED Gro light diodes are configured at an intensified full color spectrum they are designed to produce the highest levels of growth at the lowest levels of energy consumption. Here's a short list of some of the many benefits of switching from HID to DroLED.

DROLED GROWERS WILL BE ABLE TO:

- simplify their grow rooms (get rid of the ugly and clumsy fans and duct work)
- create a silent grow environment
- drastically save on electricity (60%+ savings)
- keep your grow rooms/facilities cooler
- experience higher yields
- reduce maintenance costs
- reduce the wear and tear on air conditioning units and electricity to run those units.

DroLED VS LED COMPETITORS

"THOSE WHO SLING MUD, SHALL SURELY LOSE GROUND."

That's an old southern quote that simply means, if you talk bad about others you devalue yourself. At DroLED we simply won't talk bad about our competition. The market is large enough for everyone to compete for their customer base and the market will validate, celebrate and grow every company who truly serves the needs of the customer and exceeds their expectations.

That being said, lets discuss what makes us different from other LED grow light companies and you can determine for yourselves our value.

To start, we are the first and only industrial-grade LED grow light in the world. What does that mean?

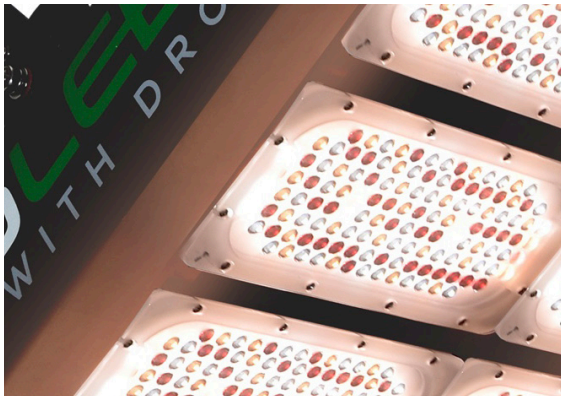
We engineered our grow lights from the inside out to last over 100,000 hours of run time in brutal conditions. As mentioned above the owner and engineers of DroLED have been designing, manufacturing and installing commercial and industrial-grade LED lights in cities, parking lots, gymnasiums, factories and warehouses (to name a few) for over a decade. Therefore, their normal business practices were to build lights that can survive extreme conditions, have extreme light output levels, be the most efficient and last an extreme amount of time at over 100,000 hours (20+ years).

The entire DroLED Gro Light Series can take a beating. Literally! They have a IK/10 rating which are defined as IKXX, where "XX" is a number from 00 to 10 indicating the degrees of protection provided by electrical enclosures (including luminaires) against external mechanical impacts. The IK rating scale identifies the ability of an enclosure to resist impact energy levels measured in joules. Protected against a 5 Kg object dropped from 40 cm in height. You can drive an SUV over them. Trust us...we've done it!

There is a saying in in the industrial/commercial LED industry, "we are no fan of fans." Meaning if your light requires fans built into the body of the light, it wasn't engineered properly and certainly wasn't engineered to last. Common sense tells us that fans are an ingress gate (an opening that dirt and water can enter) that can cause total system failure. Also, everyone knows the weakest part of every mechanical device is the "moving part". Fans do fail and when they do the unit will overheat and the system will shut down as a safety precaution or the unit will fail permanently.

With all DroLED Gro lights there are NO internal cooling fans and they are rated IP67. Which means they can literally be submerged under water. They can swim...trust us...we have tested it! They have been intentionally developed for both the home grower and large commercial growers alike. We believe that every grower should have access to the same level of technology and quality, no matter the size of your grow operation. There is a DroLED Gro model that fits the needs of every customer. Excellent for greenhouse, hydroponic and indoor grow applications delivering unmatched yields and efficiencies. Because of the multiple indoor applications, the lights have both a mounting bracket and suspension cables. The mounting bracket can be angled 180 degrees and multiple fixed positions. This allows for multi-directional light penetration.

DroLED lights are made up of modules containing 126 pieces of 0.56W Osram diodes each. Every light emitting diode has its own optic lens which penetrates deep into the plant canopy reaching multiple levels deep creating more dense yield sites throughout the plant. We only use variations of white and red diodes in each module to create our proprietary spectrums. There are no blue diodes to create that annoying and needless blueish or purplish hue that many LED grow lights have that require wearing UV (blue blocker) sunglasses. We achieve high intensity levels of blue spectrums without those blue diodes.



DroLED lights have the highest canopy penetration of any light in the world. We do not require the light fixture be suspended 6-12 inches above the plant due to weak light penetration like other competitor lights. In fact, we recommend our grow lights be suspended 18-36 inches above the plant (depending on the model). Our true full color spectrum lighting allows for needed photosynthesis for the strength and vitality of the plant growth. As we discovered earlier in this document, the terms “light” and “visible radiation” refer to the wavelength range between 400 nm and 700 nm, which can be perceived by the human eye. Optical radiation with wavelengths shorter than 430 nm is called ultraviolet (UV) radiation. Similarly, infrared (IR) radiation covers the wavelength range above 680 nm.

DroLED Gro lights have a proprietary spectrum that easily delivers these perimeters for maximum yields. After many years of study and controlled application we know that the highest yield and potency (pertaining to light) are achieved through the spectral points of 430-450 and 640-680. Once flowering has begun, it's important to provide plants with a "full spectrum" light that has high amounts of blue and red light, and moderate amounts of green light, for photosynthesis to be optimized. See the graphic below that clearly shows each of those spectral points. Another important factor to point out is the intensity of each spectral points. While Green Spectrum isn't of huge value it does assist in the photosynthesis and overall health of the plant and should not be less than 0.4 intensity. And frankly anything above 0.6 is a waste of light and energy that could be appropriated elsewhere to Red or Blue spectrum colors. By increasing the intensity of the Blue 430-450nm and Red 640-680m to 0.8 and 1.0 maximizes the plant growth and yields in every way.

With the spectrum and intensity in mind, let's look at some of the desired cannabis aspect benefits that DroLED can provide you.

There are basically 5 different aspects to the end product in Cannabis that establish its value. All growers want to increase all aspects and now you can!

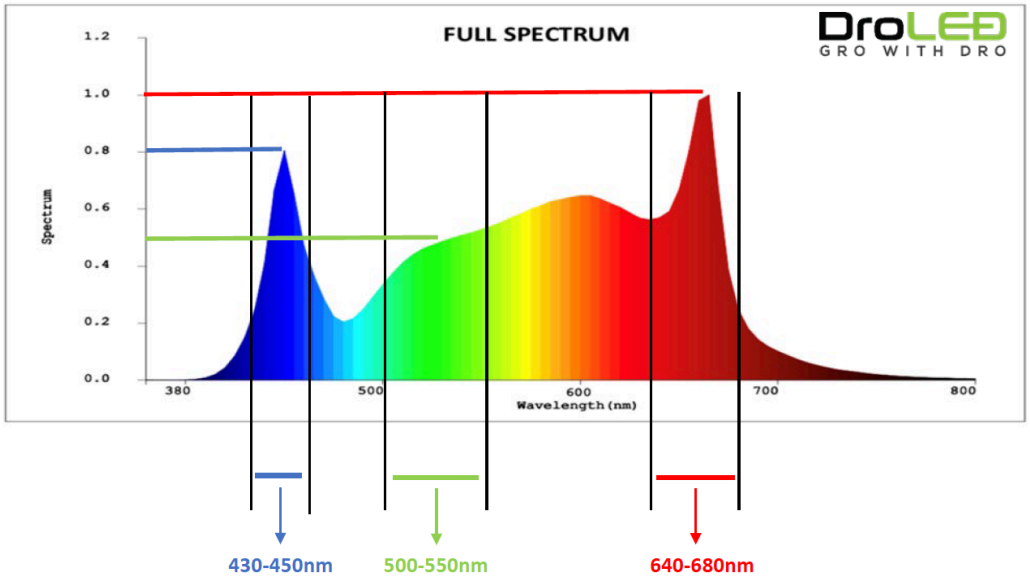
1. Flower weight (Overall flower yield)

2. Flower density (Resin content and oil/wax ratio)

3. Flower cosmetic appeal (colors, structure, as well as density)

4. Fragrance (terpene concentration and fragrancecomplexity)

5. Potency (THC and CBD levels)



We hope we shared some invaluable information that It would be our pleasure to become your LED grow lighting partner no matter the size of your operation. Please feel free to contact us with any questions or any guidance you may need in choosing the right light for your operations.