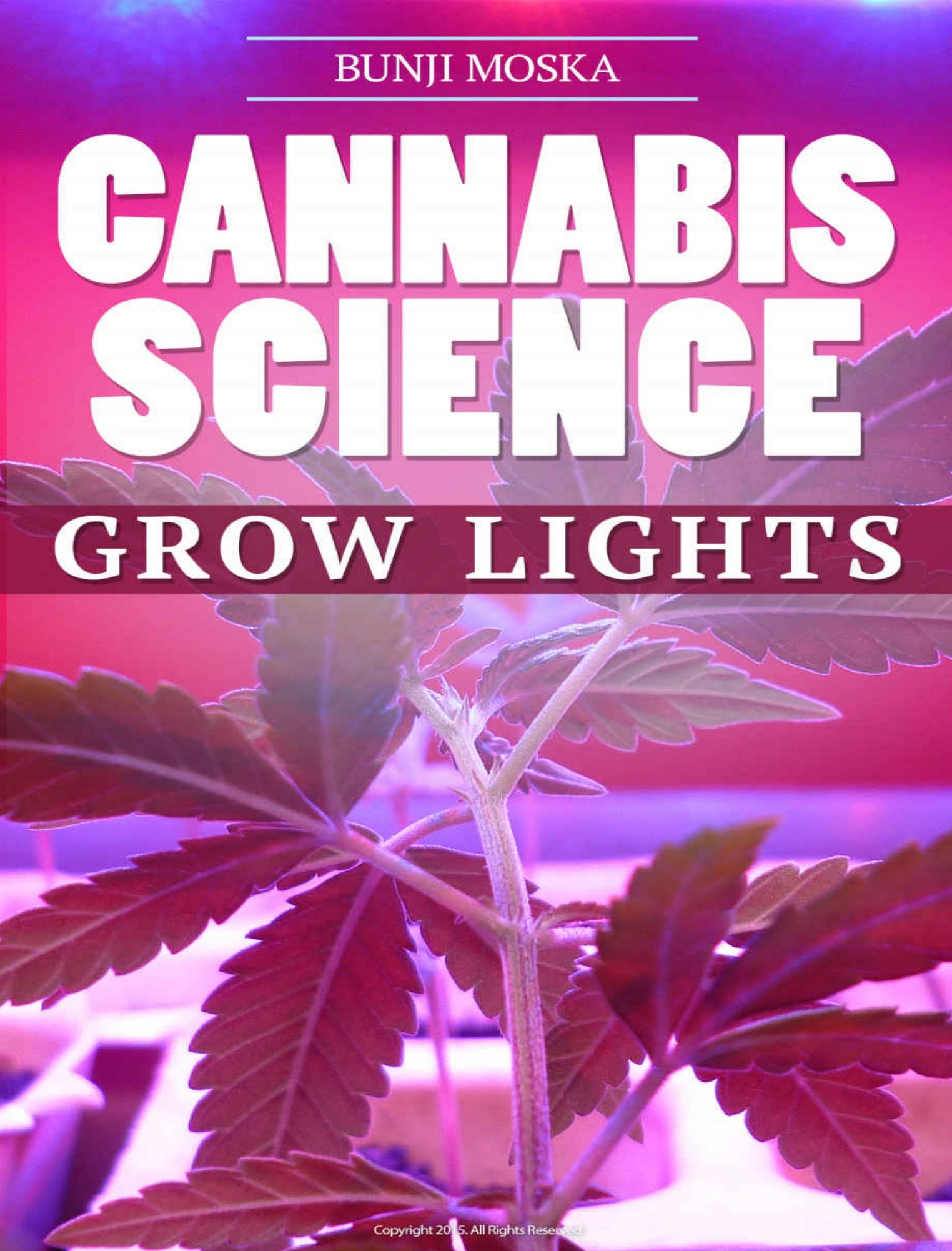
BUNJI MOSKA

CANNABIS SCIENCE

GROW LIGHTS



Cannabis Grow Lights

A **G**uide **t**o LED **G**row **L**ights **a**nd **O**ther **C**annabis **G**ardening **T**ips!

Bunji Moska

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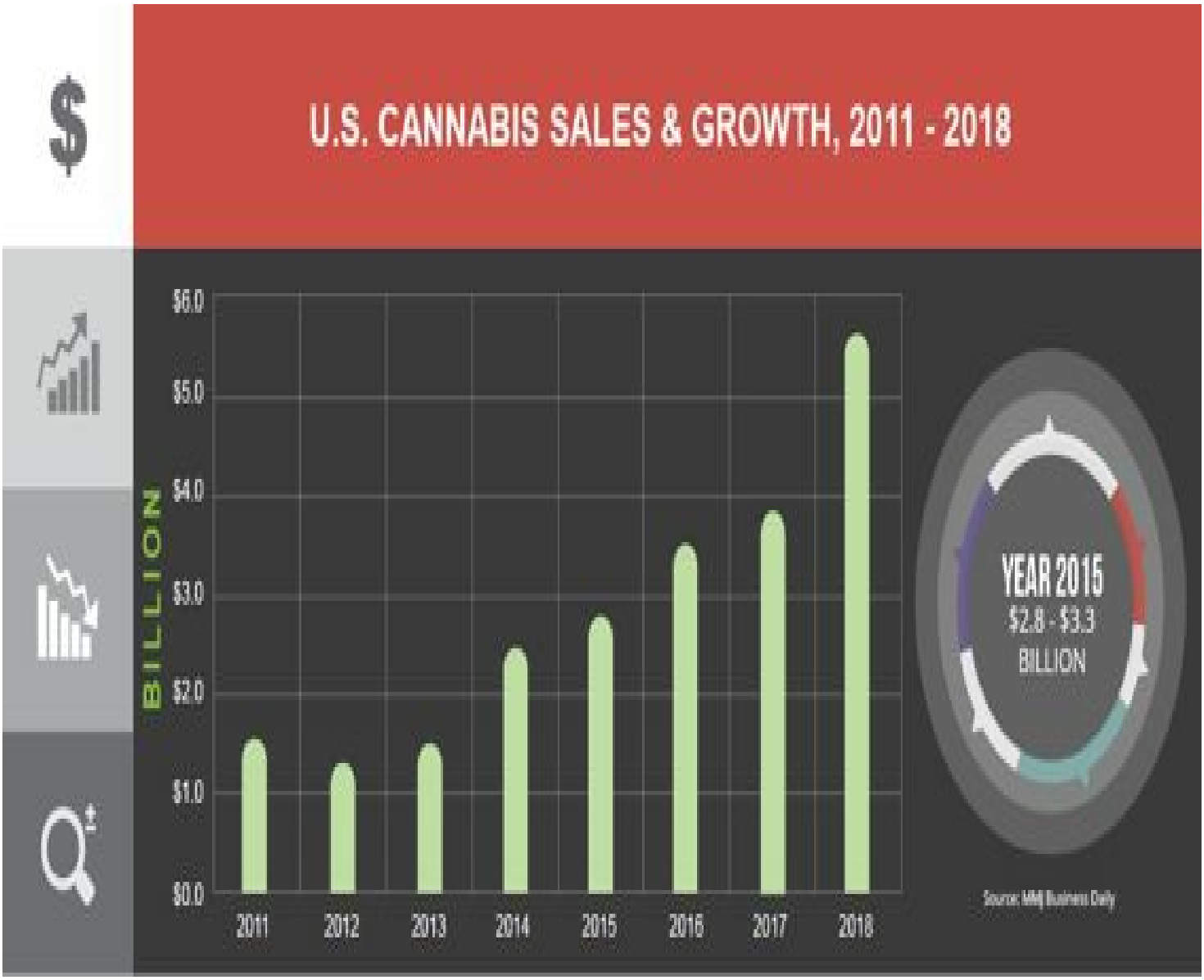
Want To Work In Or Start A Business In The Billion Dollar Cannabis Industry?



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Introduction

With the recent legalization of cannabis in certain states it is hardly unusual that an interest in cannabis production has grown by leaps and bounds. Growing cannabis, especially indoors has become everyone's latest hobby, both because of how cost effective it can be and because it is a massive market to cater to.

Having said that, cannabis is not

just some seedling you stick in the ground that will sprout on command, like a magic bean. In fact of the many things you need to look out for when it comes to cannabis production, **Grow Lights** should top the list.

With a collection of proven steps and strategies on how to simulate proper cannabis grow lights within the comfort of your own home; this book is about to help you get to the next step when it comes to cannabis

farming.

In fact this book does not confine itself to cannabis grow lights, it also delves into basic fertilization systems, closed modular cultivation systems, soil-free indoor gardens and how various other pods and seedlings react to various grow lights. Think of this as your gardening bible for beginners.

The next few chapters will tell you all you need to know about grow lights and indoor gardening secrets,

starting from how you are going to have to create it, what you are going to need, what you are going to have to keep an eye out for of, as well as the basics.

Thanks again for downloading this book, I hope you enjoy it!

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Chapter 1

Gardening with Grow Lights

While ‘gardening’ has always

seemed to inherently be all about nature and the outdoors, modern technology and changes in the way we see things has turned all of this around a bit.

How?

Well, for one, gardening is no longer restricted to the outdoors – indoor gardening has quite literally become the next big thing. Now, while indoor gardening isn't always as easy as gardening outdoors, since we have to replicate many of the

natural factors such as lights, temperature and practically everything else – it still has many benefits, including naturally cleansing your indoor air as well as the obvious wealth of natural products that are all yours.

For cannabis growers, this means not having to deal with low quality products, shady dealers, and complex legal issue, also it doesn't hurt that the plant also serves as something you have the ability to

mass produce and as such profit from. I'll bet you are very interested just about now, but before you go run off to by your own baby cannabis seedlings – let's do a quick run down of logistics, where I can talk to you about what you are going to need and how you are going to pick the right product for your particular situation – sound good?

Great! Let's get this started!

Now, I'm sure you've already

considered quite a few things, but before we get into he issue of lights, let's do a quick run down on what you are going to need to decide on for your indoor cannabis garden –

Soil or No Soil? - Marijuana can be grown both in a soil-based system or under a hydroponic system – taste wise most prefer the soil based system, however hydroponic systems are known to yield more, in less time.

Air and Temperature Control – Any grow room has to have a very specific air temperature and circulation system in order for the plants to even survive! So ensure you have looked into this before going any further!

Pest Control and Nutrients – When it comes to picking the right nutrients and pest control, a lot of this is going to have to be a trial

process – something's work great for some and not so great for others – so choose carefully and just make sure you have a PH tester so you can check PH levels for yourself.

Lights and Mylar – Lighting is quite possibly the most important part of cannabis farming, especially since it's indoors. Like any other herb, cannabis requires certain amounts of light to thrive. What not everyone understands is that by

certain we mean very specific light ranges in very specific cycles for a very specific time. This is where grow lights step in – grow lights are quite simply lights that are used to create an indoor climate that is conductive to plant, or in this case, herb growth.

Furthermore, while we will be discussing the proper lighting required for indoor gardens in depth in the following chapters another issue to keep your eye on is

mylar, which is basically the use of reflections to maximize your grow light utility, while minimizing our bills.

While talk about marijuana lights may sound like a specific issue, the truth is that it is more of a general term used to refer to the combined vegetative and flowering stage of cannabis growth. Both these stages not only require different lighting, but also different light cycles.

Generally, cannabis prefers light in the 420-750 nanometer spectrum. Now while this does vary with each strain of the herb, and with which stage the herb is in, this is definitely a safe range for both.

Grow lights however are not just about providing light for your indoor garden, in fact, grow lights are more commonly associated with the light spectrum. Think of it like this – when the sun shines, do you think all the rays of light are on the

same spectrum? The obvious answer is no.

So when you are setting up your indoor garden, you install grow lights with the intention of either mimicking this spectrum or with the intention of mimicking a slightly more specific spectrum of light, which is perhaps more conductive to the plants growth.

Now that you are armed, with a clear idea of what your Indoor Garden requires and a better

understanding of the concept of grow lights, we are going to move on to the science of grow lights and then use that to help bolster your understanding of the various Grow Lights, LED lights, and other forms of technology that are used for indoor lighting.

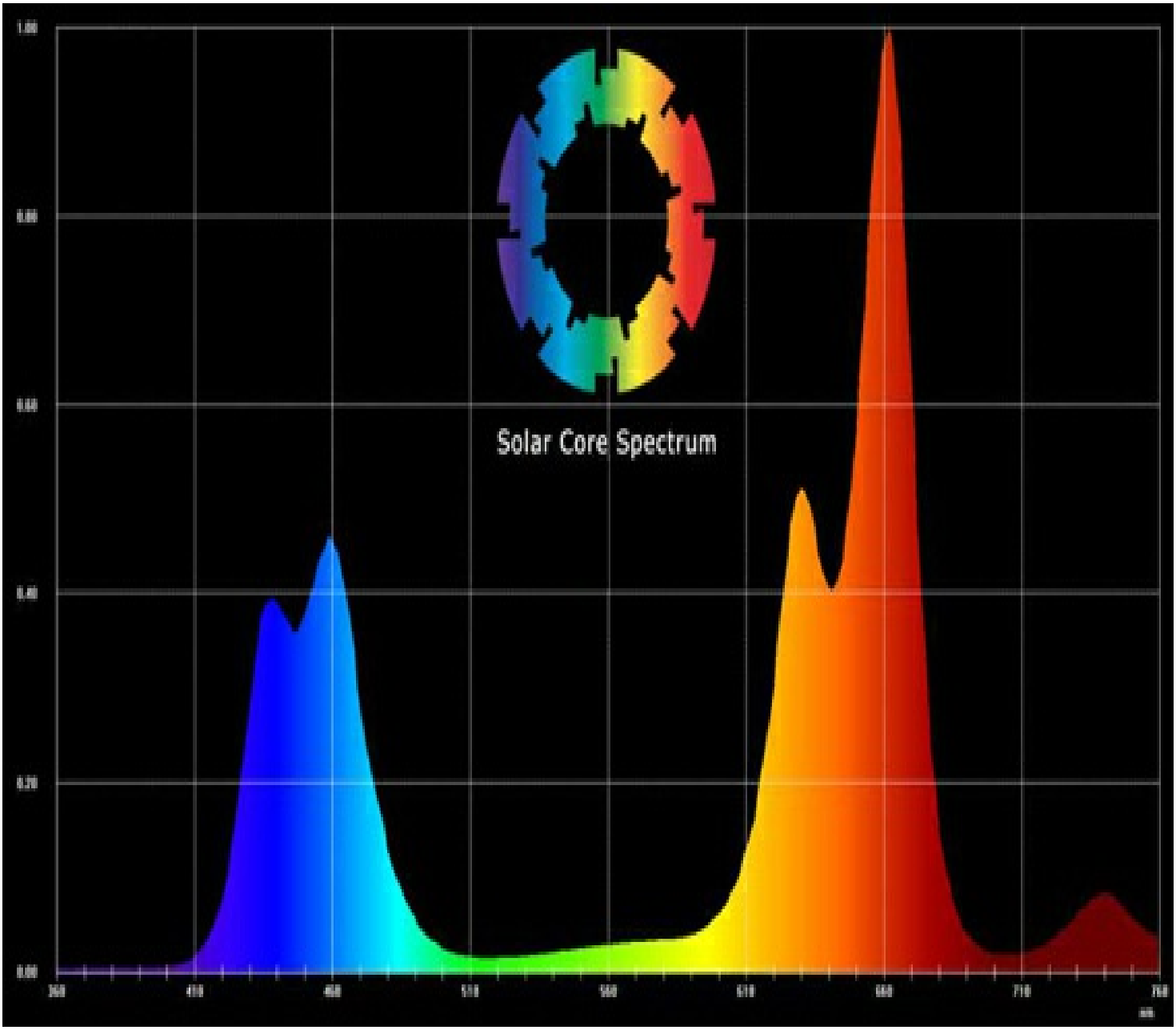
Chapter 2

The Science Behind Grow Lights

Now that you have a better idea of what grow lights are actually all about, let's get to the magic behind them – or in other words, the science behind them. As we have already established grow lights

work in certain ways, and have certain factors which add up to the proper utilization of their light source – the most critical aspects to cannabis growth are an understanding of distance, reflectors and the light spectrum. Issues regarding placement and reflectors are usually dispensed with through bulb choices, a factor elaborated more in Chapter Four.

The Light Spectrum



For now, let us talk about the Light Spectrum. The light that we see is basically made up of the seven

spectral colors, and limited to the 400-700 nanometer range, anything below that is ultra violet, and anything above is infra red.

To provide a more basic break down, a chart of light ranges on the spectral band are provided as follows.

(380-430) nanometers – Violet

(430-500) nanometers - Blue

(500-520) nanometers - Cyan

(520-560) nanometers - Green

(560-590) nanometers - Yellow

(590-625) nanometers - Orange

(625-780) nanometers – Red

While almost all plants can use all of these spectral ranges for photosynthesis, when it comes to growth, certain ranges are more suited to certain plants and even to certain growth stages.

Which side of the Light Spectrum do you need during

the Vegetative Stage?

The sprouting or vegetative stages for example, require more cool lights and temperatures. Violet and Blue ranges, or in other words lights in the 350-500 ranges are better suited. Certain plants allow the cool spectrum to be utilized all the way up to Cyan or the 520 range – in terms of cannabis this particular period lasts anywhere from two to approximately eight weeks.

Metal Halide (MH) lights, are usually used exclusively to produce light in the blue spectrum. This basically allows the lights to mimic the natural light during spring and autumn, and consequently help encourage a type of leafy growth in the plants.

Which side of the Light Spectrum do you need during the Flowering Stage?

In contrast with the Vegetative

Stage, the Pre-flowering and Flowering stages for cannabis are strongly influenced by the orange/red spectrum. Since this particular side of the spectrum mimics Summer – plants show impressive growth, and tend to quickly shoot into the budding or flowering phase if used correctly. Also, having now reached the 750 nm landmark allows the plants to cover the production of both 'Chlorophyll A" and "Chlorophyll B'.

Also, the Flowering Period tends to be better served by High Pressure Sodium Lights (HPS). While technically the sodium in these particular lights cross a little over the red spectrum, they are still a great choice both for economical and production based reasons.

Other light related issues

Another very important thing to keep in mind is that light is subject to the 'inverse square law' – in lay

mans terms – if your light is two times as far away, the actual amount of light they will receive from your source will be a quarter not half. For this reason many people prefer placing plants a little closer to the source, although for bigger gardens this isn't always feasible, mostly because this tends to take away from the plants growth space. Instead a good alternative is to use higher intensity lights, and simply place the plant in a more amply spaced growth area.

Post the initial germination, the first growth phase is commonly known as the vegetative growth phase or the photoperiod. During this particular phase, lighting needs to be provided almost constantly, for 18-24 hours a day. In contrast when the plants hit the flowering stage, the light cycle needs to be dialed down to 12 hours a day, with 12 hours of darkness being put in to induce the summer contrast In fact it is imperative, for maximum growth, that the 12 hour long

darkness is pure darkness unmarred by low lights of any kind.

Basically, this also couples with why cannabis farmers prefer to lean towards HPS lights, during the flowering cycle and separate MH lights during the vegetative period. This understanding of light cycles and a little basic math, in the foot-candle conundrum helps new indoor gardeners easily calculate what periods require what amounts of light, as well as exactly how

much light is being produced and exactly how much of that production is actually reaching the plants in question.

Chapter 3

Types of Grow Lights

Choosing the Right Fit for Your Garden

While we have talked quite a bit about Grow Lights, and how they work there are actually quite a few various types of ‘grow lights’ which you are going to have to be able to pick through. In fact one area we still haven’t covered in terms of grow lights is - costs. Financially speaking, lighting is often the most expensive part of indoor gardening, and with good reason. Top of the line grow lights can cost you

anywhere from $200 to over $500's! That is hardly chump change, and exactly why it is so important for novices to have a clear idea of lighting costs and how they can be minimized.

Now before we go into a lengthy discussion about spectrum-based lights, it is important to note that currently Full spectrum LED lights do exist and are being improved quite a bit. The issue with full spectrum LED's and any LED light,

has always been the requisite wattage, not only is it hard to reach the necessary intensity but it is also an increasingly expensive endeavor. With time, LED spectrum lights will undoubtedly be adapted to perfectly fit in with what growers need, but as they stand now, cannabis growers in almost any medium have a tendency to HPS lights, while some still prefer the combination MH/HPS lighting process.

Also another, area of concern is heat. While light is a necessary component of the gardening process an equally important area is the reduction of hot spots so that your plants don't burn out. The optimal spacing for plants is going to depend both on the density and size of your plants, as well as the number. The general formula you need to apply is -

intensity = light output/distance

squared.

The concept is understood much more easily if you can think in terms of lumens. Simply put if your plant is twice the distance from the light the intensity will be ¼ the lumens. So if a 400 watt bulb provides 145,000 lumens at four inches, at eight inches it provides only 36,000 lumens.

Now keeping these issues in mind lets move on the issue of lights

themselves.

Starting with Metal Halide lights, which cover the cool spectrum and are generally used only for the vegetative stage, the average cost ranges anywhere from $100 to $400, but that is just the upfront cost. Metal Halide lights do have higher maintenance and electricity costs, since almost all wattages pull in about 40 watts over what they are marked down as.

This coupled with the cost of

maintenance is a large part to f the reason why despite the theoretical feasibility growers prefer not to use Metal Halide, lights throughout the entire growth process, usually switching to High Pressure Sodium Lights for the Flowering process.

In fact if we turn to High Pressure Sodium Lights, we find, that although these particular lights are a bit higher in the cost bracket they can actually be adapted for use in both stages of cannabis growth.

Now, while it is true that the lack of blue spectrum lights keeps these lights from being the ideal choice for the vegetative stage, they will still do a reasonable job, the only side effects being that the plants will tend to be more reedy and grow too quickly a factor that may affect it's overall quality.

Another issue worth mentioning is, that whatever costs would be reduced by cutting down to one light source by investing solely in

HPS lights, would likely be worked back up by the high energy bills it would require, due in part to it's inherent tendency to pull high electricity and in part to it's tendency to overheat, which in turn requires air-conditioning or similar forms of temperature control.

More sophisticated growers use these reasons to use combinations of MH and HPS lights, generally by using a switchable light fixture which would allow the grower to

change out the light bulbs as required for the two stages. Reflectors that help maximize the lights already in use are also a smart way to cut costs when it comes to picking out grow lights.

Chapter 4

Understanding Cannabis Garden Types

Up until now we have basically glossed over the medium in which your cannabis will be growing. For most novices, this may seem to be an unusual statement, mostly because even today, most cannabis growers tend to prefer simple soil based gardens. However, cannabis can actually be grown indoors just as easily in any number of hydroponic methods, with just as many mediums! Usually the

selection of these methods are in line with the schedule of the grower, someone who doesn't have as much time would probably lean towards something simple like the wick system where as some one who is really getting into it and has the time to devote to it would probably want to test out something like aeroponics or the Dutch sea of green.

The Wick System –

Let's start off with the *Wick System*, since it's one of the easiest and quite frankly one the most used by newbies. The wick system is basically a way to ensure that you can step out on your plants for a while, or a way to ensure you don't have to be constantly worried about watering times. This is done by using several nylon wicks, about three or four, cut about an inch wide with suitable lengths and a

simple makeshift reservoir slightly larger than your plant container.

The reservoir goes on the bottom, while multiple wicks are passed form the plant container suspended above into the reservoir below through capillary action. While this may not be the best cannabis production method in terms of growth rates, the simplicity of the system does endear it to a very large crowd.

Aeroponics –

In contrast to the wick system, *Aeroponics* is a much more complex system of growing plants. Aeroponics, is basically a suspension method, where the plant is grown with its root exposed in a closed environment, while it's top half grows above. Nutrient rich water systems are used to 'mist' instead of water the roots, which are the highlight of this system.

If you are thinking this all sounds a bit complex, the truth is it is. With issues like a massive structural base, which is required for the entire procedure alone being as difficult as it is to properly set up as well as the, issues such as the roots requiring limited exposure, and the plants also require strictly timed ‘feedings’ as well as clearly balanced CO_2 levels, Aeroponics is far from easy. In fact, because of the mechanical nature of the system and the precarious nature of the

suspended environment, even a power outage could be enough to ruin a batch of crops, and yet when properly implemented the high yield is the reason most advanced growers still tend to lean towards it.

Deep Water Culture aka Bubbleponics –

If you found the first two methods interesting, you will love this third method, which is basically a combination of these two methods

with it's own personal kick. Now in bubbleponics, you have a suspended root system not unlike in aeroponics, only here there is no times mist that provides nutrients. Instead, there is a reservoir at the bottom, which is filled with water and nutrients, which the roots basically trickle down into.

Since cannabis roots also require oxygen exposure to survive, the reservoir also has an airstone, which is used to further oxygenate

the water through an exterior pipe. Deep Water Culture is however an advanced form of cannabis gardening and requires weekly upkeep, as well as an well constructed system and a powerful air pump, factors which tend to rack up costs if you are on a budget.

While these three hydroponic systems are far from the only systems available they do embody the basic structure of most of the systems. Alternative systems such

as ebb and flow or the Dutch methods are also worth looking into if you want to go for a more in depth study.

Chapter 5

Cannabis Seeds for Newbies

Now that we have ensured that you have a clear conception of cannabis

grow lights as well as their requisite environments – let us get down to the unavoidable yet strangely complex issue of cannabis seeds. Something most new growers will soon learn is that, cannabis seeds are available in both feminized and traditional forms. The question then arises, why on earth would anyone want 'feminized' seeds, especially since the plant would require fertilization.

It does sound more than ridiculous

doesn't it? But let's answer one question at a time.

Why do Growers prefer Feminized Seeds?

Feminized seeds are a specially bred strain of cannabis seeds which contain an above 90% quota of female chromosomes. Because of this, most plants that grown from these seeds will flower as females

and as such produce the resinous buds that are sought by most cannabis farmers.

Furthermore feminized seeds are known to grow more quickly and more easily, since these strands do not require the grower to identify and remove male plants in the early flowering stage. This is a particular plus for growers catering to the medicinal use of the herb.

If you have Feminized Seeds how do the plants flower?

The first thing you need to understand in order to grasp the answer to this particular question is that no cannabis plat is truly male or female – I say this because they each have an inherent ability to grow reproductive organs of the opposite sex and fertilize themselves for survival. It's kind of like an asexual birth only it's not

exactly asexual since the plant is fertilizing itself.

When feminized seeds are therefore utilized to force female plants to fertilize other female plants the resulting seeds tend to be absent of male chromosomes, which means the plants resulting from it will be female and therefore of the ideal height, growth and with perfectly resinous buds as preferred for medicinal purposes.

Other than these two types, there is

another type of cannabis seed known as the auto-flowering variety, which is capable of flowering without the reduction of daylight hours during the growth phases.

Use Based Strains

Furthermore, cannabis seeds can be differentiated yet again on the basis of the general strain and purpose. For example, Indica seeds are used to cover strains which are used

almost exclusively for medicinal purposes, with their low THC content and their contrasting high CBD content these seeds are perfect for treating depression and anxiety. Visually, Indica seeds result in plants that are more of the short and stocky variety with very intense odors.

In contrast Sativa seeds are generally pumped up with high levels of THC and low levels of CBD, which is great for treating

pain, and appear to be much bigger than Indica's and also have buds that aren't as dense or potent.

Cannabis Seed Strains

Moving on to actual seeds, the current reigning champion of cannabis stains is the *Super Silver Haze*. Known commonly as Skunk or Haze, the Super silver haze is a hybrid made up of 25% Skunk, 25% Northern Lights and 50% Haze. The strain is perfectly suited for social

settings, providing an energetic high, with a slight edge for cravings. Not only is the strain particularly strong, but it also produces wonderfully well in small indoor gardens.

Another close competitor is the equally if not more popular Satvia strain known as the *AK-47*. With extremely strong odor and smoke, the strain earned it's name from the sheer strength of one hit. The strand is also a very commercially

viable strain, a fact coupled with the fact that it has a relatively low grow time, helps make it the most commercially successful cannabis strain. It is quite literally Bang for your buck!

Rounding up the top three, would possibly be the *Royal Caramel,* easily on of the sweetest and juices strains – the breed is the perfect cross between BlueBlack, Maple Leaf Indica, and White Rhino, and provides a beautiful deep caramel

flavor when smoking up. Also since the plant is 50% Sativa and 50% Indica the crop is both very relaxing and yet still manages to pack a psychedelic kick.

These are some, of the many strains of cannabis strains available to beginning gardeners, other great choices include Big Buddha Cheese, Opium, Warlock, Blueberry, Medicanna or even the Durban Poison and others. While certain strains require a little more work,

the seed-strains mentioned in detail are capable of flourishing even in the hands of a novice since they are mostly low maintenance hybrids.

Chapter 6

Finding the Right Fertilizers and Nutrients for your Cannabis!

Every plant requires just the right amount of fertilizers and nutrients to help keep it healthy and to maximize growth. Think of your

plants as mini-green athletes who need a proper diet and fitness regime to help maximize their performance. Your diet and fitness regime are your fertilizers and nutrients. Now just keep in mind that like any other plant, cannabis also requires a certain amount of nutrition – however once again like any other plant, the cannabis crop also has specific needs at the specific phases in it's life. We have already discussed how cannabis growth has two phases, vegetative

and flowering, however, for the purposes of fertilization we will break this down a little bit more into – Germination Flowering, and Pre-Harvest.

The Germination phase of cannabis relies heavily on the appropriate balance of NPK fertilizers. NPK, is primarily made up of Nitrogen, Phosphorus and Potassium – hence NPK, each of which play key roles in the process of plant nutrition. Proper balances of Nitrogen and

Potassium allow vigorous root growth while ensuring the stem is not too stretched. Basic rations used for these initial levels – present as 7-9-5 or 5-10-5. Fish emulsions are also used as a grower's trick to supplement low nitrogen based formulas.

Since cannabis doesn't generally require full strength fertilization it is important to keep your fertilizing tendencies in check since accidental over fertilization will adversely

affect your plants. In fact more growers prefer to dilute store bought fertilizers, so that the solutions are weak enough to be used twice a week, or even daily – it varies from grower to grower.

Now if we move on to the Flowering phase of cannabis, you will notice that NPK isn't as important anymore, instead you should be turning our head to the phosphorus levels – phosphorous at this stage will not only help growth but will

ensure a good yield, however the calcium, sulfur and magnesium levels also have great levels of impact here. Epsom salts can be used to fill in for magnesium if your fertilizer does not contain it, as is often he case with store bought fertilizer – you should also keep in mind that mixing fertilizer solutions with other fertilizer solutions is risky since they may react with each other – so ensure you have read through the chemical components of each before you try

mixing them – or better yet do what most growers do and stick to one particular fertilizer and add in the required ingredients individually.

Having gone through the germination and flowering phase it seems all we have left to do is harvest our personal stash of cannabis. However, before we do so, it is important to stop fertilizing at least two weeks prior to your harvest – this is to ensure that at the time of harvest your crops no

longer carry chemicals in themselves. Residue can easily be removed on the outside, by using fresh water, a technique that will also help cleanse your cannabis pot if done regularly over the space of two weeks.

While cannabis fertilizers and nutrients are a key part of the growing cycle, don’t forget to ensure the proper lights and climate as you grow your crops. Indoor cannabis gardening is all about

balance and with your newly acquired knowledge abut all the factors relating to it, all you need to do now is ensure that you can keep the balance going! Do it right and soon enough you'll have your very own cannabis garden, not just yielding recreational stashes, but also easily providing you with a quick and easy way to supplement your income.

Conclusion

Thank you again for downloading this book!

I hope this book was able to help give you a glimpse into the wonderful world of indoor cannabis gardening, and help you realize your dream of gardening cannabis with proper grow lights and other relevant features.

Finally, if you enjoyed this book,

please take the time to share your thoughts and post a review on Amazon. It'd be greatly appreciated!

Thank you and good luck!

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