Beginners Guide to Growing Marijuana

By: Widow Maker © 2006 – RollItUp.Org

I have been growing for 15 years off and on. Some of my techniques may be out dated so if some of you grow nerds see something wrong with my techniques please send me an email and we can fix it. I would like to make sure we get the best knowledge to the people. I'm sure I left a few things out but...

I can't go into every detail but these are the basics...

Seeds

If you want some killer pot you have to start out with killer seeds. You will want to do a little research before you pick out the strain you are going to grow. Some strains like the outdoors and lots of light and some strains prefer indoors under lower light conditions. I like indoors because you can control the plants environment. Plus you don't have to worry about pest and critters eating your plants. Well not totally but your chances are better than the open outdoors.

The seed is where it all begins. You can't just take any old pot seed and expect it to grow bad ass weed. It's all in the genetics. To grow bad ass weed you have to have bad ass seeds.

I hear these are some good places to find places to reliably buy seeds (to USA)...
http://www.seedbankupdate.com/su.html

Germinating

I use a couple paper towels and a glass. Some people use a plate but I don't. Basically I get my paper towels moist with tap water and throw all my seeds in the towel and wrap them up and place them in the glass in a dark space. You want the towels good and moist but not too wet cause I have rotted seeds from over watering my glass. As long as there is less than a 1/2 ounce of water in the bottom of the glass then you should be ok. Some people freeze their seeds over night before they germinate but I also don't practice this and have very good results doing it my way. Usually after 3 days my seeds crack and are beginning to show a root. Once the majority of the seeds have roots then you are done with this step.

Here is how I do it step by step. I used a blue shop towel just to show how I use the towel. I would normally use a regular white paper towel.


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200
100
ROLLITUP.ORG

3 days later...

Grow mediums

Some people swear by soil and soil less mediums. If you decide to go this route make sure you get some quality soil. I have been using miracle grow potting soil with pretty good results. Just make sure it drains water well. You can add sand or Perlite to make the soil more drain-able and aerated. Once you get past the cups you will want to transplant into bigger pots. A good rule of thumb is for every foot of growth you will want 1 gallon of pot space.

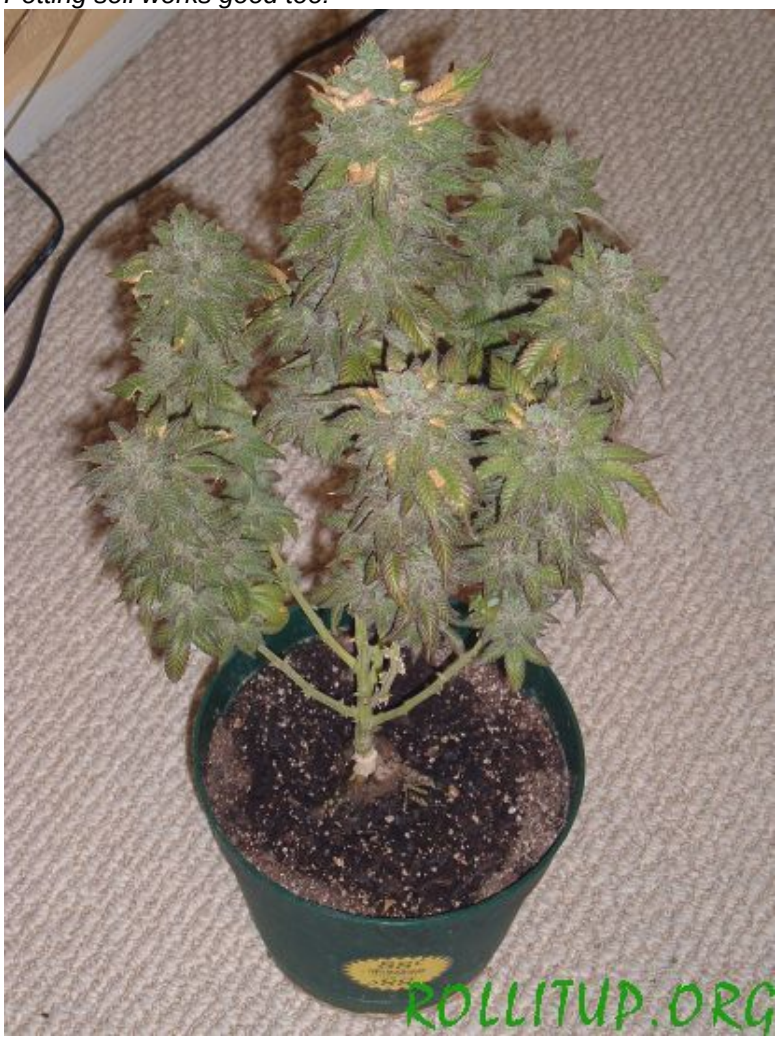
I still start out with the rock wool and transplant to dirt later on. But if you can't get rock wool then soil will be fine to start in too. Just make sure you allow your medium to dry out before watering. You want the roots to stretch and search for that water. The heart of the plant is its root system so roots are what I work on first. You can purchase a moisture meter from Wal-Mart for under $10. It really helps.

The most common hydroponics medium is rock wool. It works well. It is like fiber glass but its rock instead. It holds water and air very well. There are many different mediums you can use but to start out a new plant I use 1 inch rock wool cubes. The main thing you need to think about is what kind of system you are going to use and go from there. Rock wool holds lots of water and doesn't need watering as often as say volcanic rocks.

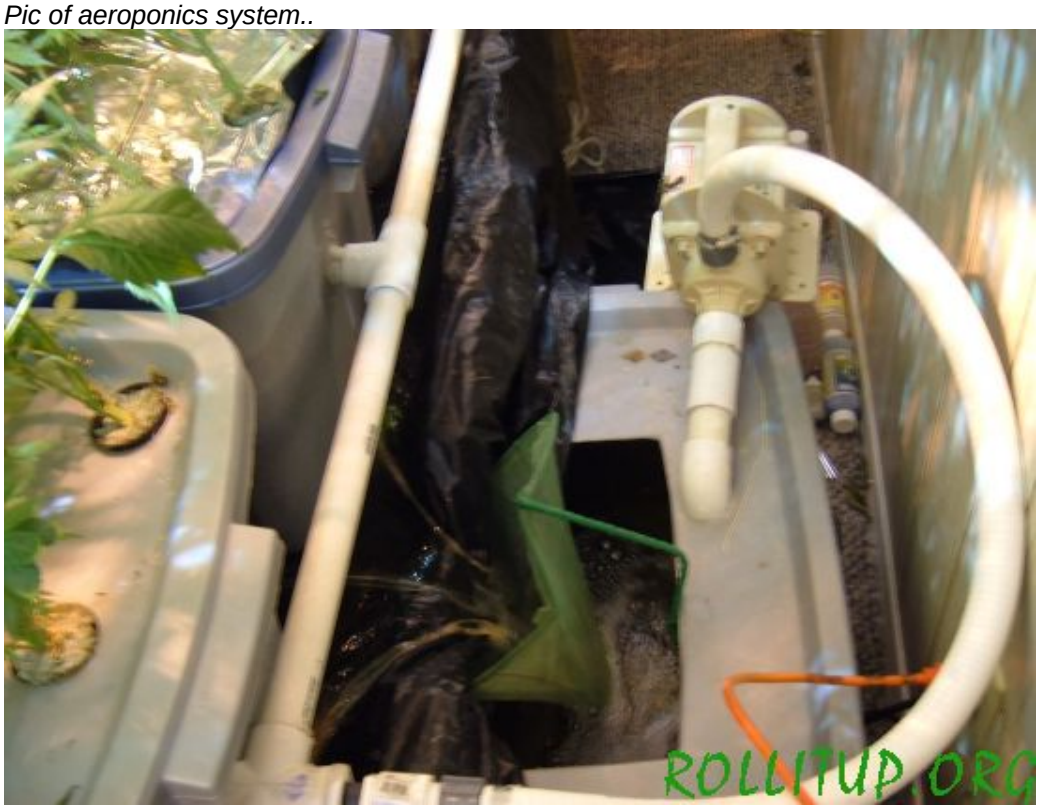
Water can be a medium also. I really like aeroponics. That is my favorite system. It always has the perfect o2/ h2o ratio. So it's never starved or flooded. It always grows.

Some 1" rock wool cubes

Potting soil works good too!



Pic of aeroponics system..

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Planting the seed

Once you figured out what medium you are going to use make sure your medium is moist before you start. Rock wool needs to be soaked 24 hours in 5.5 ph water before you start because the glue in the rock wool has a high alkaline level. Dirt is usually pretty neutral so just water will work for now. I will get into ph later. Like I said I use rock wool cubes but for dirt I would use a small clear plastic cup (16 oz) to start my plants. I like to see my roots grow at this stage but people will say don't use clear pots. All you have to do is place the sprouted seed in the medium about a half inch deep. Cover the seed gently with dirt or if you're using rock wool just kind of pinch the hole a little with your fingers. Shazzzam your on your way to growing some grade A kill. Before I go any farther we need to learn more about what's going on in our system.

I fill my cup with moist soil.

Then I poke about a half inch deep hole.

Place 1 seed in my hole.

Then I gently cover it up. Make sure you water it in.

Lights

I strongly suggest using a combination of cool white and warm white florescent bulbs for growing your newly hatched plants. Place the lights about an inch away from the lights. It's ok if the plant grows into and touches the light a little since fluorescents don't get very hot. You will be fine. Just try to keep an average of one inch away. In less than a week you should see the roots working their way to the bottom of the cup. After this stage you can upgrade pots. I would suggest a gallon pot for your next transplant. You can continue using the florescent bulbs but they really don't put off enough light for fast growth. Compact florescent bulbs (CFLs) work good too. You will want a bunch of them.

You can use any combination of HID or CFL lights to grow from start to finish if you'd like. *Refer to the later area of this section* *for details on light systems.*

High Intensity Discharge (HID) Lamps

I like to use MH (metal halide) lights for my vegetative cycle (first 2-6 weeks of life after seedling stage). They emit a lot of the blue spectrum which the plant likes for root, stem and leaf growth. Depending on the size of your garden will determine what wattage you should use. I do it big so I use 1000 watt bulbs.

They come in 250, 400 and 600 watts and a few others. Your plant will love this light.

HPS (high pressure sodium) bulbs are like MH lights but they put out a lot of red light. The plant likes this light when flowering (flowering is induced by setting the lights on a timer to be on for 12 hours and off for 12 hours). It's also a little bit brighter than a MH light of the same wattage. A 1000 watt MH puts out around 80,000 lumens and the HPS put out about 125,000 lumens. And yes brighter is better. These lights are not cheap and if you can only afford one then just get the HPS light.

The MH and HPS lights (High intensity discharge) put out lots of heat. You will need a good ventilation system or a good a/c to keep the room from getting too hot. Some light hoods have built in vents you can hook up an a/c duct to exhaust the heat. Another thing that should be addressed here is a light mover. I talked my friend into buying one for his crop and he yielded 3 times more than normal. We use the light tracks that go back and forth across the room but they also make sun circles that twist in a circle. Either way you will get the whole crop good light instead of just a few plants directly under the light with a stationary light.

For a stationary light you will want to keep it at least 14-24 inches away from the tops of your plants. With a track you can lower the lights to 12 inches or less. With the hood we use we can touch the tops of the plants with the light hood without burning the plant. These cool tube hoods are not cheap but they seem superior to everything else I have used. See pic. But a good rule of thumb is to place your hand under the light and if it burns your hand it will burn your plant.

Here are some florescent tubes.

A metal halide bulb.

A high pressure sodium bulb.

The light mover.

Compact Fluorescent Lighting (CFL)

A Compact Fluorescent Light is a type of fluorescent that was originally designed to replace the standard E26 Edison Incandescent Lamp. The reason being, CFL's will put out the same amount of visible light using much less power and a significantly longer rated life span. Even though the price of the CFL's is higher than Incandescent bulb's, they are generally rated to run anywhere from 8,000 to 15,000 hours. There many advantages of using CFL's. Maybe you are growing personal smoke, or you can't afford an HID system, or an HID system just isn't practical. For some, HID lights aren't available in their area. However, CFL's are sold almost anywhere (Home Depot, Lowes, Wal-Mart, etc…). CFL's are in general a much cheaper growing solution, and their just plain simple to use –self-ballasted and it screw's into a regular light socket. I'm NOT saying CFL's are better for growing than HID's, but in some cases it's the only thing that will work.

CFL Wattage

Now sometimes there can be a lot of confusion when it comes to power of the light due to poor labeling but we will do our best to clear all of that up. Normally

light manufacturers that make CFL's generally will put two numbers on the box your CFL comes in. One is Actual Wattage and one is the Incandescent Equal. As you can see here on this CFL the Actual Wattage is 23 Watts, and its Incandescent Equal is 100 Watt's. You need to totally ignore the Incandescent Equal and pay attention only to the Actual Wattage of the Bulb.

23w (100w equivalent) 2700K CFL Bulb

Color Temperature

You might see a lot of different labels when shopping at the store for CFL's. Label's including Soft White, Warm White, Cool White, Bright White, Halogen White, Daylight White, and Full Spectrum. And also label's like 2700K, 3000K, 3500K, 4000K, 5000K, 6400K, and 6500K. These are all the color temperature of the light you are using. This is a measure of how warm or cool the light given off by a lamp appears, with warmer colors having a yellowish tinge and cooler colors being tinged with blue. What confuses some people is that the warmer a color is, the colder its color temperature is. (ex. Warm White = 2700K). Bulbs ranging in the 2700K-3000K spectrum are usually labeled Warm White or Soft White, bulbs ranging in the 3500K – 4000K spectrum are bright white or cool white, 5000K is labeled Full Spectrum, and finally 6400K – 6500K is labeled Daylight. You can grow an entire crop with CFL's if you chose the right spectrum of bulbs. For Vegetation you will want to use 6500K or 5000K, and when you flower you will want to switch to 2700K or 3000K . The reason being, throughout the year the plant's outside receive more 6500K light because the day's in summer are long and hot and as Autumn/Winter get's closer the day get's shorter, and gradually receives less 6500K light and more 2700K light as the plant flower's. Do what

you can to avoid bulbs within that 3500K – 4000K because they emit very little light that is useful to your plant.

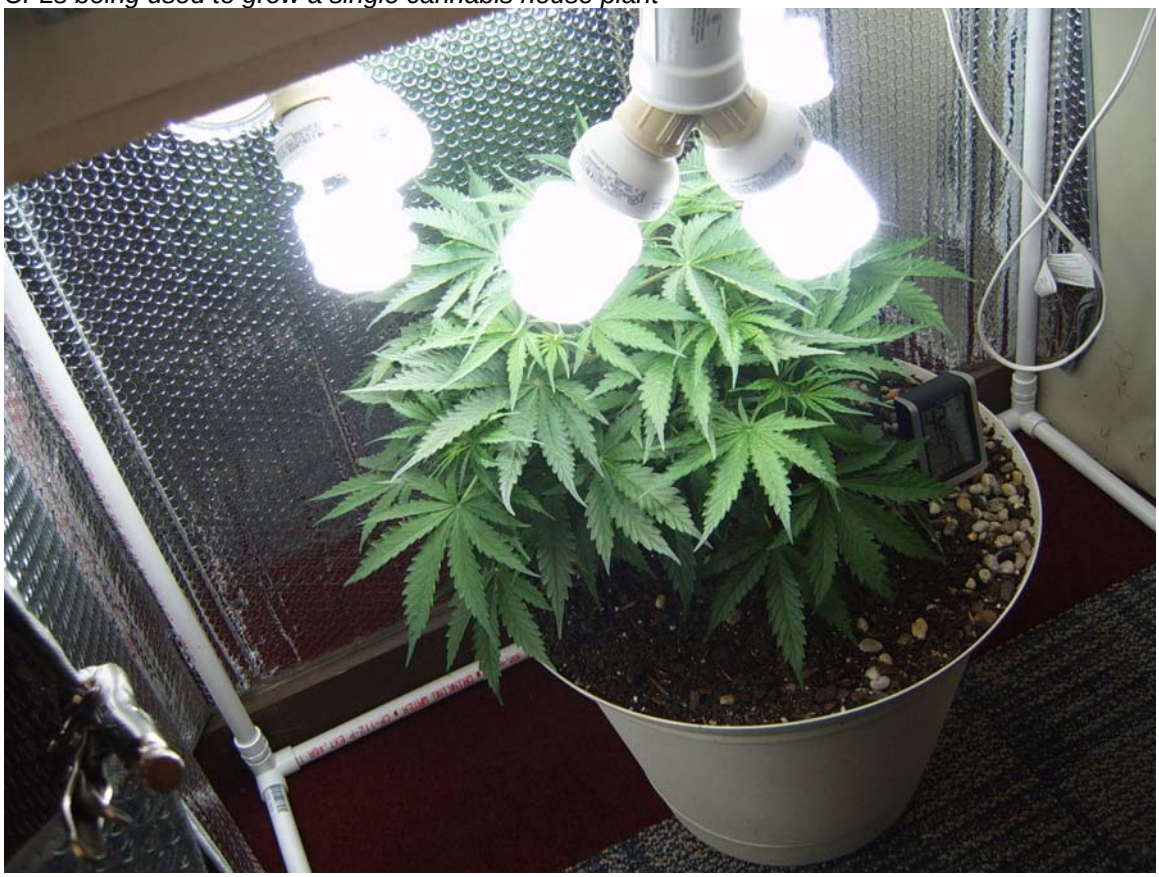
How to Use CFLs

In order to efficiently use CFL's to grow your cannabis you will need to position the lights around 2 – 4 inches from the foliage of the plant. If you place the light too close, then your plant will have nothing to vertically stretch to and it will remain short and stocky. (E.g. My First Grow) Some people combat this by adding CFL's to the side of foliage instead of on top of it. On the other hand if the light is too far away from the plant, the stem will suffer elongation (stretching), which will result in loose and fluffy buds. It is very important to note that when using CFL's it's a daily "battle" to have lights in the right spot. Many of us are in our grow areas at least once a day anyway, so to move your bulbs a bit really isn't that big a deal. Also many people wonder is it better to have many low watt CFL's or just a few high watt CFL's. Both way's are capable of provided you a good harvest but I suggest you chose the configuration that is easiest for you and your grow area.

Where to Get CFLs

Many low wattage (23-42) CFL's can be bought at locate retail giants, such as Wal-mart, Lowes, Home Depot, and just about any hardware store you can find. If you are looking to purchase higher wattage (42 – 200) CFL's I would recommend ordering them online. http://www.1000bulbs.com/2-to-200-Watt-Compact-Fluorescent-Screw-In-Light-Bulbs/ has very good prices on CFL's ranging from 2 – 200 Watt's. http://www.buylighting.com/Non-Dimmable-Compact-Fluorescent-s/75.htm has a good selection ranging from 5 – 200 Watt's in a wide range of spectrums. I have used both of these sites several times and I would recommend them to anyone that plan's to grow with CFL's.

CFLs being used to grow a single cannabis house plant



Things to Know About Lighting

Refer to this index if you're having trouble making sense of lighting concepts

Color rating- Measured in Kelvin (K). The higher the number is, the more bluish the light. 4000K-7000K is mostly on the blue side of the spectrum, while 3000K and under goes from a white spectrum, to a redder spectrum.

How much light is needed?
The minimum amount of light required by marijuana plants is around 3000 lumens per square foot. However, it's not 100% accurate, since although you may have a 10,000 lumen light, the amount of light that reaches the plant varies with the distance between the light and plants, and reflectivity of the grow box. The ideal amount is somewhere around 7000-10,000 lumens/sq ft, and as long as the plants do not burn, as much light can be used as you want*. (*note, the sun produces about 10,000 lumens / sq ft, on a sunny summer day).*

Determining lumens for your grow area
Determine the square footage of your area (example in a 4 foot by 4 foot area,

there is 16 square feet) If you have a 1000 watt High Pressure Sodium, that produces (approx.) 107,000 lumens. Divide this by 16 (your square footage) 107,000 / 16 = 6687 lumens per square foot. So just divide the total amount of Lumens, by the total amount of Sq ft, and that's your lumens per square foot.

How far away from my plants do the lights go?
The lights in your grow room should be as close as possible to the plants without burning them. There is no such thing as too much, unless there is sufficient heat to dry out and burn the leaves. A good rule is to put your hand under the light, if its too hot for your hand, chances are that the plants will be too, so move the light up until your hand feels more comfortable. For seedlings and clones, I keep them a little further away from the light, because they are very susceptible to burning and drying out, at these stages.

Efficiency is very important when choosing a type of light. The wattage is not the most important thing, as you can see below, different types of light produce different amounts of lumens per watt. A 300 watt incandescent will produce about 5100 lumens. While a 300 watt Metal Halide (just an example, they do not come in 300 watts), will produce 27,000 lumens. Obviously this is far more efficient for growing, while still using the same amount of electricity.

Approximate light production
Incandescent: 17 lumens / watt
Mercury vapor: 45-50 lumens / watt
Fluorescents: 60-70 lumens/watt
Metal halide: 90 lumens / watt
High pressure sodium: 107 lumens / watt

Incandescent lights: Incandescent bulbs are the most popular type of lights in the world. They may come advertised as incandescent, tungsten, quartz, halogen, or simply standard. The important thing about incandescents is this: they suck.

There are some incandescents which are sold as 'grow lights.' They usually have a blue coating and usually come in 60W and 120W sizes. While they may seem like a good choice to new growers, they are next to useless; they produce some light at a usable spectrum, but only have about a 5% efficiency and generate more heat than usable light. Most of us have these in our homes right now. Don't use them for growing; instead opt for a Compact Fluorescent as a cheaper but more efficient alternative.

Fluorescent lights: Fluorescents are a lot more useful than incandescents. They're efficient enough and cheaper than HID lights. Compact fluorescent tubes are popular with growers because of their good output to size ratio. Compared to standard 4' tubes, compact fluorescent bulbs are smaller, and more can fit into a

given area. Fluorescents are good for small grows on a tight budget, and for novice growers, since they do not require any special sort of wiring or understanding of the necessary bulbs for a given fixture, and are very widely available.

Fluorescent lights come in many different Kelvin ratings; often the spectrums are labeled on packaging as being 'cool white' or 'warm white.' Cool white is more blue, and is good for the vegetative stages of growth, and warm white light is more orange or reddish, and is best for the flowering stage.

High Intensity Discharge (HID) Lighting Systems

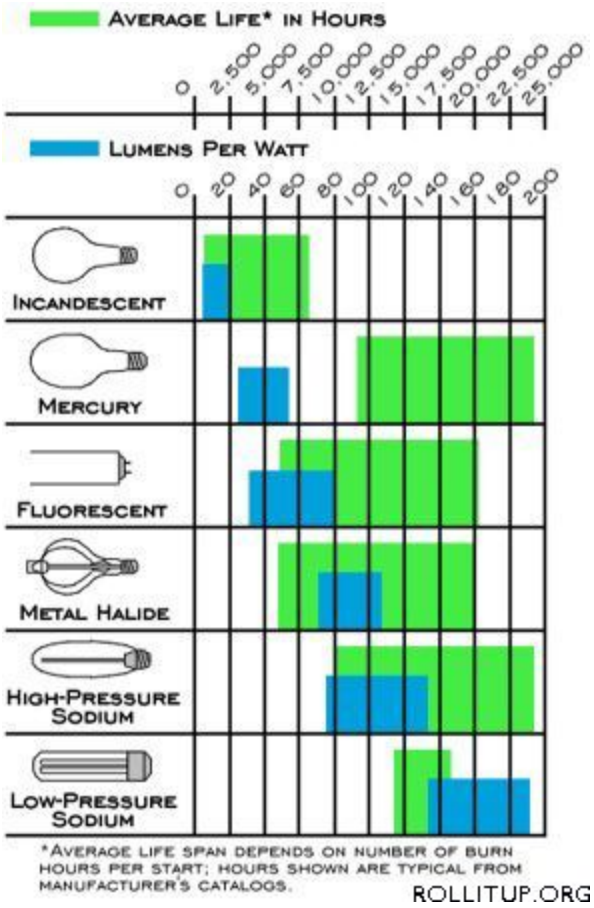
Mercury Vapor (MV)
Mercury vapor lights are not the most efficient light for growing. They are very bright, and relatively cheap. They do emit light at the wavelengths necessary to support your plants growth, but not nearly as good as a MH or HPS light. Much of the light emitted by MV lights is bluish-white. Street lighting is what most MV lighting is used for.

Metal Halide (MH)
Metal halide lighting systems are optimal for use in the vegetative phase of growing. They emit mostly blue light, which encourages vigorous growth of foliage. They are very efficient, but can get rather expensive to start with; fluorescents may seem more appealing because of their lower price, and they are not much different when compared on a lumen-to-lumen cost level. These lights can be used through-out the grow, but will most likely result in light, fluffy buds.

High Pressure Sodium (HPS)
High pressure sodium lights emit mostly orange, yellow, and red spectrum light, which is perfect for the flowering stage of the plants growth. They are (in my opinion) the most efficient type of light available for any application. HPS lights can be used through-out the entire grow. They produce denser and usually larger buds than any other light.

HPS lights are generally a little more expensive than MH systems of similar wattage. They are more commonly used by experienced growers because of their ability to produce tighter buds, higher lumen-output-per-watt, and will produce from start to finish.

I'll also add this graph below; i hope this post helps some of you out.



Electricity

NOTE: *This applies to a HID lighting grow. CFL growers need not be concerned with any of this.*

This is going to be your biggest expense after your light investment. It takes a lot of electricity to run a grow room. You have lights, vents, charcoal canisters, air conditioners and a few other things like pumps and fans. My bill has risen about $350-$500 with my system. It’s fairly large so yours probably won’t get this high. I have 3 1000w lights, a big 220 a/c and a few fans and canister.

Don't steal electricity. Whatever the bill is just pay it. If the elec. company reads their grid meter and things don't add up they will start investigating. That will probably get you busted. The power company can see what your meter is doing every day. They can see the power jump up at 8pm and drop back down at 8am every day. But don't worry because everything is pretty much automated. A real person doesn't get involved unless there is a problem. The cops can use this to bust you, but they wont check unless they have reason to believe you are doing something wrong. If that’s the case you are already busted. They just use that to help get a warrant.

One major important thing is not to overload your circuits. 1000watt HPS and MH

lights pull 9 amps. So if you are going to have a multi light system you may need to run some more cables to your breaker box. I always build a 220v power/timer box. I already know I will blow all the breakers in the room with ease. They sell these boxes for $200-300. I make mine for about $60-$80. I put about 8 110v plugs and around 4-6 220v plugs in it. I also use a 220v hot water heater timer. It works great up to 50 amps.

Here is a pic of the 220/110v timer box I make.

The ballast for my HPS lights.

Fertilizers

I use a hydroponics solution even for my soil plants. Basically it has everything a plant needs to live in it since water alone doesn't have these. There are 14 nutrients that a plant needs to survive. But all we are going to talk about are the main nutrients. N-P-k. Nitrogen, phosphorous and potassium. Ever wondered what those 3 numbers on the front of the bottle meant? Well there you go.

During our grow cycle the plant likes a fertilizer high in nitrogen. Something like 20-5-5. It uses the nitrogen for strong stem and leaf growth. After you change over to your flowering cycle you will want a fertilizer that is high in phosphorous and potassium. Something like 5-15-15 should work well.

I use a two part solution that I feed the plant all year round. I use enhancement solutions for root, grow or bloom for what ever cycle I am in. It is a bit more costly this way but I have had good results so I am staying with it. Its more for the semi-advanced grower since a little more thinking is involved.

Here are my grow nutrients.

And my budding nutrients. This shit gets expensive.

PPM

Parts per million is how we measure the amount of fertilizer (salts) that's in the water solution. You will need a ppm meter to read this. I have a $50 one and also a $300 one that reads ph and ec. Basically start out cheap and when a few crops start rolling in then buy the big baller stuff unless you can afford it up front unlike most of us.

I try to keep my seedlings and clones at about 100-250 ppms. After about 10 days I bump up the ppm to around 500-600 ppm for the next 2-3 weeks. After about a month I raise it to 800-1000 ppm. When I start to bud I am at around 1000 and start taking it up slowly to no more than 1500 ppm. I don't suggest going past 1300 till you have a couple crops down.

If you over fertilize your leaves will start to burn. If you see this you will need to flush immediately. Just use pure water and basically drown the plant. Four times the amount of grow medium should be fine. One other thing. If I use tap water it usually has a ppm of 250 in my area. I pretty much add 250 to whatever I'm shooting for. So for a 1000 ppm my meter will read 1250. I will get into waters later.

After the hairs on my buds get 1/4 red I stop feeding the plant nutrients and just give them pure water. This will allow the plant to use up the nutrients it already has and makes the smoke taste a lot smoother with out all the chemical taste.

These are my ppm and ph meters.

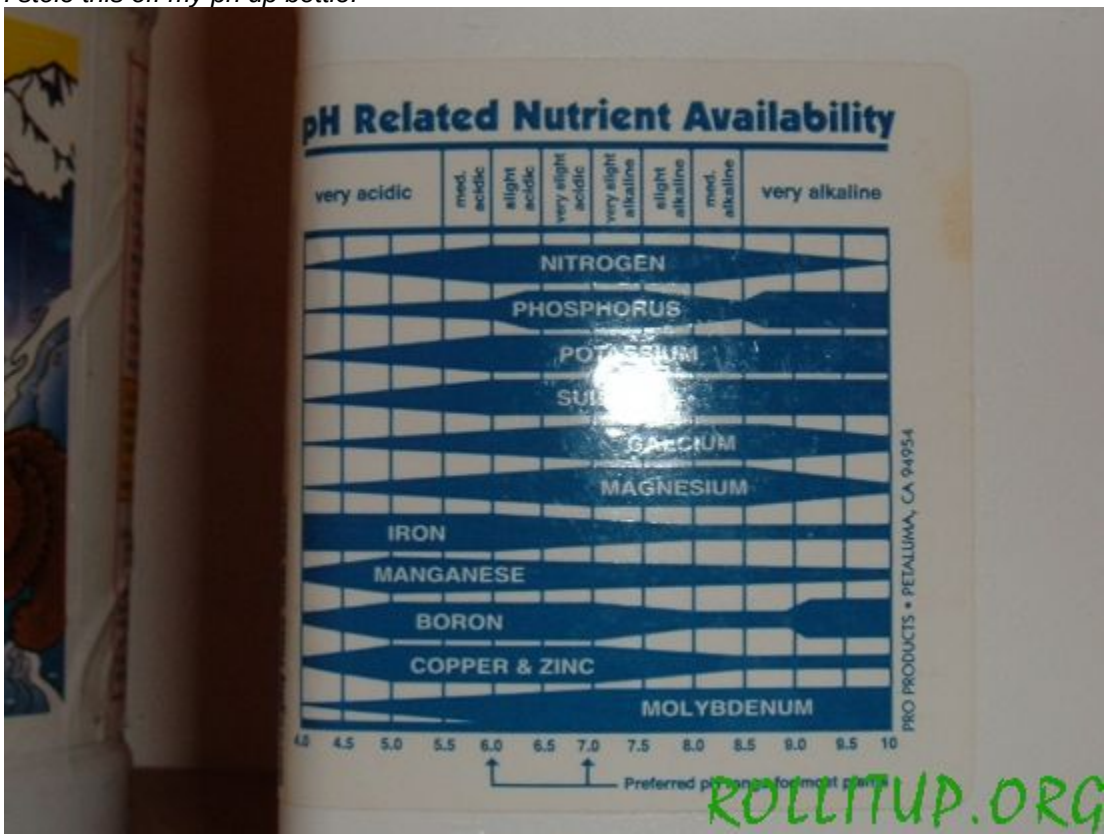
Over fertilized.

Ph

Ok so we need to control our ph in our nutrient solution/ medium for healthy plant growth and good nutrient absorption. Weed likes a slightly acidic medium. For soil plants I keep my ph around 6.2-6.8. For hydroponics I keep a lower ph of 5.5-6.5.

So how do I figure what my ph is? Buy a ph meter. Mine is a cheap digital meter that cost me $75. Mine is for water but they sell them for soil too. They can get expensive into the $300 range. If you're tight on cash you can also buy ph drops. It's been a while but I think they are less than $10. So now you got your meter and need to change your ph. I go to the local hydroponic store and buy a bottle of ph up and ph down. You can also use baking soda to go up and vinegar to go down.

I stole this off my ph up bottle.

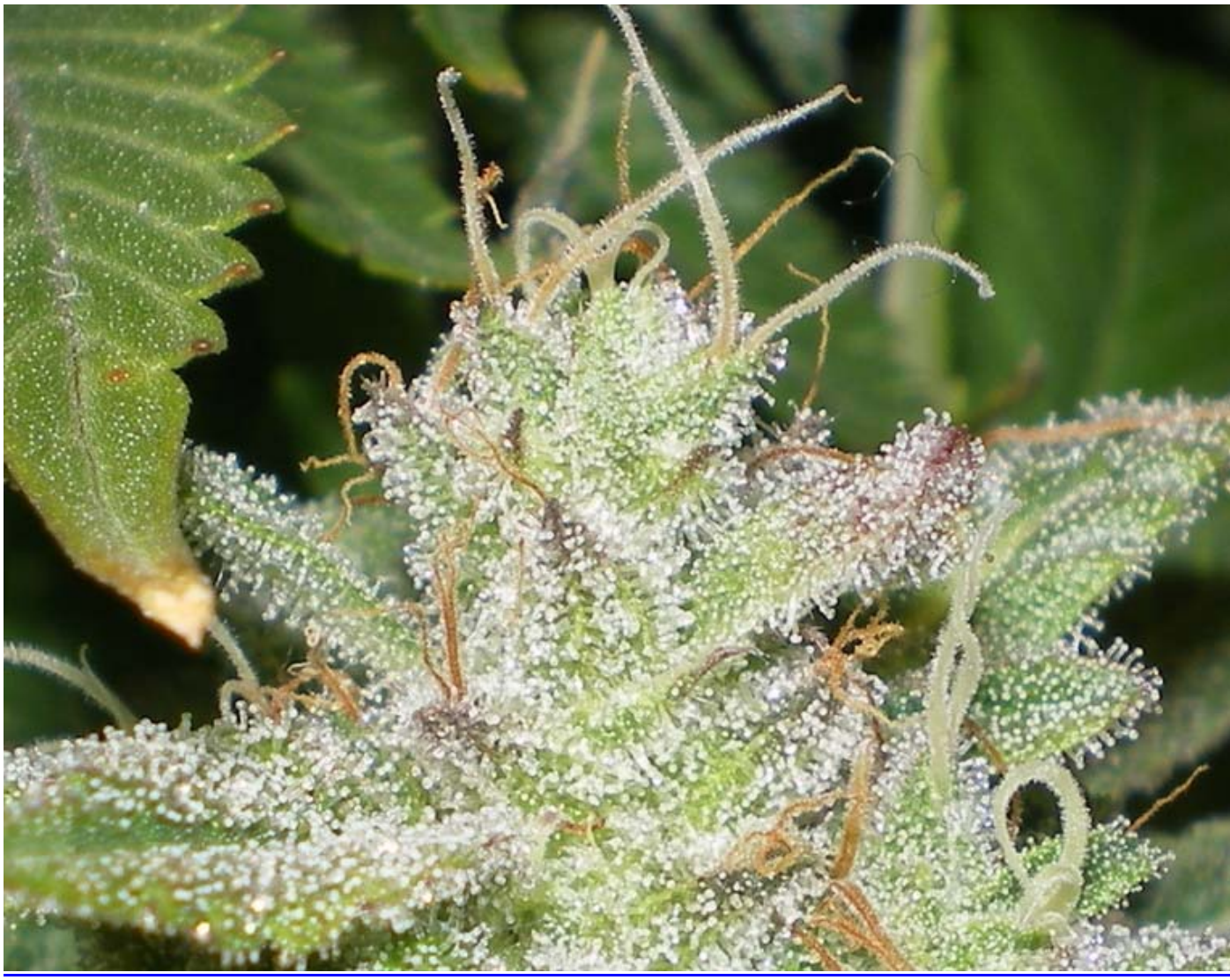


Harvesting

When to Harvest

After the plant has achieved adequate growth in its vegetative stage (first 2-8 weeks of life) and you have induced flowering by changing the light schedule to 12 hours of light and 12 hours of darkness, you need to know when the right time to harvest is.

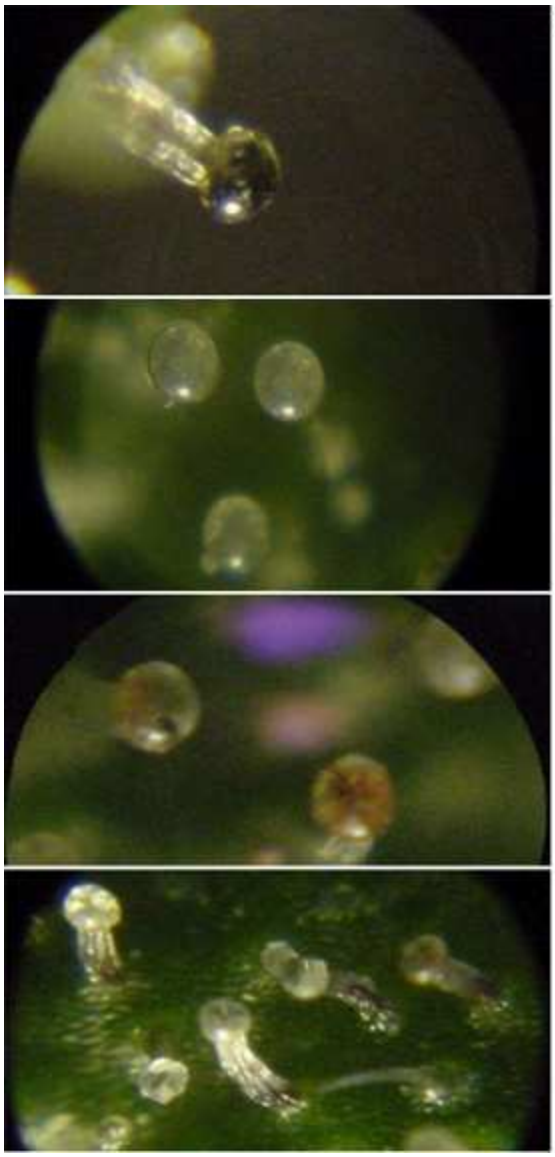
There are two ways to determine when a plant is ready for harvest. One way is by looking at the pistils. Pistils start out as white, and as the plant ripens the hairs start to turn red on the bud area of the plant. If using this method, harvest when the hairs are from 20% red, to 80% red, 20% is a milder high and 80% is a couch lock high. Some varieties of cannabis may not get a lot of amber in the trichomes, but with practice you will learn the difference with the plants. Notice the difference in the color of the hairs in the picture?



The next method which is the best one to judge when the plant is ready, is to look at the trichomes. The Trichome are the crystals you see developing on the buds. This is where most of the THC is stored.

When you look at them they look a lot like small clear mushrooms. At first they start out clear, then cloudy, and then a amber reddish color. Depending on the high you want will depend when you harvest. Do not harvest when clear. When they are cloudy you can harvest for a more energetic high. When they are 50% to 80 % amber in color you will want to harvest if you are looking for a heaver body and mind numbing stone. The first picture is a close up of a bud shot. You will notice trichomes all over the bud.

The next shot you will notice the trichs are about 60 to 70% amber in color.



When to Harvest Cannabis

The trichome method / Pics and Article by Mrmadcty

Clear Trichome
Not enough potency yet. Harvesting now will decrease yield.

Cloudy Trichome
Havesting when "most" trichomes are cloudy or milky will give you a "up/heady/energetic/rushy" high.

Amber Trichome
Havesting when "most" trichomes are amber will give you a narcotic/ couchlock high.

Half Amber / Half Cloudy
Havesting when you have a 50/50 mix of amber and cloudy trichomes will give you a combination of head and body high.

Drying Harvested Bud

Living marijuana leaves are 80 percent water; colas are about 70 percent water. Marijuana dried for smoking contains only eight to 10 percent water, or about 10 percent of the original amount. There are several methods used to evaporate water; these have little effect on potency, but can affect the taste, bouquet, and smoothness of the smoke. Generally the slower the dry, the smoother the taste. Excess drying and drying methods that use heat will evaporate some of the volatile oils that give each grass its unique taste and aroma.

Grasses which are dried as part of the curing process usually have a smooth, mild taste, because of the elimination of chlorophyll and various proteins. Cured marijuana may also be a little sweeter than when first picked, because the curing converts some of the plant's starch to simple sugars.

Some grasses are tasty and smooth-smoking when they are dried without curing, especially fresh homegrown buds which retain their volatile oils and sugar. Many home growers have acquired a taste for "natural" uncured grass, with its minty chlorophyll flavor; such marijuana is dried directly after harvesting.

Slow Drying
Slow drying is probably the method most commonly used to dry marijuana. Because of the slowness of the dry, a slight cure takes place, eliminating the bite sometimes associated with quickly dried grass.

There are many variations of the technique, but most commonly whole plants or separated colas are suspended upside down from a drawn string or from pegs on a wall in a cool dark room, closet, or other enclosed space. A large number of plants may take a week or two to dry. The drying time for small numbers of plants can be increased (for a slight cure) by placing the plants in large, open paper sacks that have ventilation holes cut in their sides. The drying room should have no heavy drafts, but mould may form on the plants if the air is stagnant. If weather is rainy or the air humid, increase ventilation and watch for any mould. Plants should be dried quickly under moderate heat if any mould appears.

Many experienced growers prefer slow drying to curing. There is little chance of error with this method, and buds usually smoke smooth and develop a pliable consistency. Slow-dried ripe buds retain their delicious, sweet aroma and taste.

Fast Drying
The fast dry-method produces a harsher smoke than slow drying, but it is often the most convenient method to use. The plants are suspended in the same way as for slow drying, but the temperature in the drying area is increased to between 90 and 115 degrees, often by means of electric or gas heater. The drying area is kept well-ventilated with a fan. As the plants dry, they are removed from the drying area. By this method, plants in a tightly packed room can be dried in less than four days, but the exhaust will contain the deliciously pungent odor of drying marijuana.

Indoor growers often hang plants to dry over radiators or stream pipes. Leaves are dried by placing them on a tray over a radiator or on top of the light fixture.

Marijuana that is fast-dried retains its original green color and minty taste.

Oven Drying
Oven drying is often used by gardeners to sample their crop. Small quantities of

material can be quickly dried by being placed in a 150 to 200 oven for about 10 minutes. Larger quantities can be dried in trays that contain a single layer of material or in a dehydrator. Oven-dried and dehydrator-dried marijuana usually has a harsh taste and bite, and loses much of its bouquet. The method is often used to dry marijuana which has been cured and dried but is too moist to smoke, or to dry marijuana which is to be used for cooking or extractions. It is an adequate method for obtaining dry material for testing and emergencies, but the main harvest should not be dried in this way. Oven drying works best with leaves. When leaves are dried together with buds or shoots, remove the material from the oven periodically, to separate the faster-drying leaf material (before it burns) from the slower drying buds. One way to do this is to place all the material on a wire screen over a tray. Every few minutes rub the material across the screen. Dried material falls unto the tray and is removed from the oven. Repeat until all the material has dried.

Oven curing works well when closely watched. Dried marijuana that is left in the oven will lose potency quickly. Any time the marijuana begins to char, most of the potency will already have been lost. This should not be a problem unless you are careless, or allow the temperature to go above 200 degrees.

Sun Drying
Some growers dry their crops right in the field. There are many methods of sun drying. In Oregon, some growers break the main stem about two feet from the ground. The leaves and buds dry gradually, since they are still partly attached to the plant. Other growers spread burlap and cover it with plants left to dry. Fan leaves are left on the plants to protect the drying buds from the sun. The grass is manicured after drying. Growers in Arizona shade drying plants with cheesecloth.

Sun-dried marijuana usually has a taste similar to that of oven-dried. Often the sun bleaches it slightly but also destroys some of the delicate bouquet. Prolonged exposure to the sun will decrease potency, although there is no noticeable loss if drying is done quickly.

Dry Ice
Many home growers have written to us that the dry-ice cure increases the potency of marijuana considerably, and we would be remiss not to mention it.

Dry ice is frozen carbon dioxide. When it melts (sublimates), it turns from a solid directly into a gas. This gas absorbs some moisture from the frozen marijuana and partially dries it.

There are many variations of the dry-ice method. Fresh or partially dried material is usually used, although some enthusiasts claim that the cure also works with dried material. The marijuana is placed in a coffee can or similar container with a lid, along with at least an equal volume of dry ice. Puncture the lid so that the gas can escape as it evaporates. Place the can in a freezer to prolong the

evaporation process. When the dry ice is gone, the grass is dried, but still moist.

Some growers claim that simply freezing the grass increases potency. They often freeze fan leaves or other less-potent material for a couple of months before smoking it. This is said to work only with fresh (wet or dried) grass.

Curing Harvested Bud

Curing is a process employed to naturally enhance the bouquet, flavor, and texture of marijuana. Curing does not lower potency when done correctly, although poor curing methods often result in some less of THC.

Curing is not an essential procedure, and many growers prefer the "natural" flavor of uncured grass. Sweet sinsemilla buds usually are not cured.

Curing is most successful on plants which have "ripened" and are beginning to lose chlorophyll. It is less successful on growing tips and other vigorous parts which are immature. These parts may only lose some chlorophyll.

Curing proceeds while the leaf is still alive, for until it dries, many of the leaf's life processes continue. Since the leaf's ability to produce sugars is thwarted, it breaks down stored starch to simple sugars, which are used for food. This gives the grass a sweet or earthy aroma and taste. At the same time, many of the complex proteins and pigments, such as chlorophyll, are broken down in enzymatic processes. This changes the colour of the leaf from green to various shades of yellow, brown, tan, or red, depending primarily on the variety, but also on growing environment and cure technique. The destruction of chlorophyll eliminates the minty taste that is commonly associated with green homegrown.

There are several methods of curing, most of which were originally designed to cure large quantities of tobacco. Some of them can be modified by the home grower to use for small marijuana harvests as well as large harvests. The methods used to cure marijuana are the air, flue, sweat, sun, and water cures.

Air Curing
Air curing is a technique developed in the United States for curing pipe and cigar tobacco. It was originally done in specially constructed barns made with ventilator slats which could be sealed; a small shed or metal building can easily be adapted for this use. However, this method of curing works only when there is enough material to keep the air saturated with moisture.

Wires are strung across the barn, and the marijuana plants or plant parts are hung from them, using string, wire twists, or the crooks of branches. The plants material should be closely spaced, but there should be enough room between branches (a few inches) so that air circulates freely. The building is kept

unventilated until all the material loses some chlorophyll (green colour). This loss occurs rapidly during warm sunny weather because heat builds up, which hastens the cure. In wet or overcast weather, the temperature in the chamber will be cooler, and the process will proceed more slowly. If these conditions last for more than a day or two, unwanted mould may grow on the plants. The best way to prevent mould from forming is to raise the temperature to 90F by using a heater.

After the leaves have lost their deep green and become pale, the ventilator or windows are opened slightly, so that the temperature and humidity are lowered and the curing process is slowed. The process then continues until all traces of chlorophyll are eliminated. The entire process may take six weeks. Then the ventilators are opened, and an exhaust fan installed if necessary, to dry the material to the point that it can be smoked but still is moist, that is, bends rather than crumbles or powders when rubbed between thumb and forefinger.

Flue Curing

Flue curing differs from air curing in that the process is speeded up by using an external source of heat, and the air circulation is more closely regulated. This method can be used with small quantities of material in a small, airtight curing box constructed for the purpose. Large quantities can be hung in a room or barn as described in Air Curing.

A simple way to control the temperature when curing or drying small amounts of marijuana is to place the material to be cured in a watertight box (or a bottle) with ventilation holes on the top. Place the box in a water-filled container, such as a pot, fish-tank, or bathtub. The curing box contains air and will float. The water surrounding the box is maintained at the correct temperature by means of a stove or hotplate, fish-tank or water-bed heater, or any inexpensive immersible heater. Temperature of the water is monitored.

With the marijuana loosely packed, maintain water temperature at 90 degrees. After several days, the green tissue turns a pale yellow-green or murky colour, indicating yellow or brown pigments. Then increase temperature, to about 100 degrees, until all traces of green disappear. Raise the temperature once again, this time to 115 degrees, until a full, ripe colour develops. Also increase ventilation at this time, so that the marijuana dries. Plants dried at high temperature tend to be brittle; so lower the temperature before drying is completed. This last phase of drying can be done at room temperature, out of the water bath. The whole process takes a week or less.

Marijuana cured by this technique turns a deep brown colour. Immature material may retain some chlorophyll and have a slight greenish cast. Taste is rich yet mild.

Sweat Curing

Sweat curing is the technique most widely used in Colombia. Long branches containing colas are layered in piles about 18 inches high and a minimum of two feet square, more often about ten by fifteen feet. Sweat curing actually incorporates the fermenting process. Within a few hours the leaves begin to heat up from the microbial action in the same way that a compost pile ferments. Then change in color is very rapid; watch the pile carefully, so that it does not overheat and rot the colas. Each day unpack the piles, and remove the colas that have turned color. Within four or five days, all the colas will have turned color. They are then dried. One way to prevent rot while using this method is to place cotton sheets, rags, or paper towels between each double layer of colas. The towels absorb some of the moisture and slow down the process.

Sweat curing can be modified for use with as little marijuana as two large plants. Pack the marijuana tightly in a heavy paper sack (or several layers of paper bags), and place it in the sun. The light is converted to heat and helps support the sweat.

Another variation of the sweat process occurs when fresh un dried marijuana is bricked. The bricks are placed in piles, and they cure while being transported.

A simple procedure for a slow sweat cure is to roll fresh marijuana in plastic bags. Each week, open the bag for about an hour to evaporate some water. In about six weeks, the ammonia smell will dissipate somewhat, and the grass should be dried. This cure works well with small quantities of mediocre grass, since it concentrates the material.

Sun Curing
A quick way to cure small quantities of marijuana is to loosely fill a plastic bag or glass jar, or place a layer between glass or plastic sheets, and expose the material to the sun. Within a few hours the sun begins to bleach it. Turn the marijuana every few hours, so that all parts are exposed to the sun. An even cure is achieved in one to two days. Some degradation of THC may occur using this method.

Water Cure
Unlike other curing methods, the water cure is performed after the marijuana is dried. Powder and small pieces are most often used, but the cure also works with whole colas. The material is piled loosely in a glass or ceramic pot which is filled with luke-warm water. (When hot water is used, some of the THC is released in oils, which escape and float to the top of the water.) Within a few hours many of the non-psychoactive water-soluble substances dissolve. An occasional gentle stirring speeds the process. The water is changed and the process repeated. Then the grass is dried again for smoking.

THC is not water-soluble; so it remains on the plant when it is soaked. By eliminating water-soluble substances (pigments, proteins, sugars, and some

resins), which may make up 25 percent of the plant material by weight, this cure may increase the concentration of THC by up to a third.

Marijuana cured by this method has a dark, almost black color, and looks twisted and curled, something like tea leaves. The water cure is frequently used to cure dried fan leaves and poor-quality grass.

Plant Problems

Check the following things:

- Plants have plenty of water
- Soil is seven PH or even a little less
- Your light cycles (Photo-periods) are correct
- No pools of water anywhere
- Constant fresh air

Symptom: Bigger leaves are turning a yellowish color while the smaller leaves are green.
Cause: Nitrogen deficiency - add nitrate of soda or organic fertilizer.

Symptom: Older leaves will curl at edges, turn dark, possibly with a purple cast.
Cause: Phosphorous deficiency - add commercial phosphate.

Symptom: Mature leaves develop a yellowish cast to least veinal areas.
Cause: Magnesium deficiency - add commercial fertilizer with magnesium content.

Symptom: Mature leaves turn yellow and then become spotted with edge areas turning dark gray.
Cause: Potassium deficiency - add muriate of potash.

Symptom: Cracked stems, no healthy support tissue.
Cause: Boron deficiency -add any plant food containing boron.

Symptom: Small wrinkled leaves with yellowish vein systems.
Cause: Zinc deficiency - add commercial plant food containing zinc.

Symptom: Young leaves become deformed, possibly yellowing.
Cause: Molybedum deficiency - use any plant food with a bit of molybdenum in it.

Plant Abuse

Heat Stress:
Look closely below and you'll see the brown leaf edges that are indicative of heat stress. This damage looks a lot like nutrient burn, except it occurs only at the tops of the plants closest to the lamps. There's only one cure for this...get the heat away from the plants, either by moving the lamps or moving the plants.

Figure 1

Nutrient Solution Burn:
There's a good chance that this leaf was subjected to nutrient solution burn. These symptoms are seen when the EC concentration of hydroponic solutions is too high. These symptoms also appear when strong nutrient solution is splashed onto the leaves under hot HID lamps, causing the leaves to burn under the solution.

Figure 2

Many hydroponic gardeners see this problem. It's the beginning of nutrient burn. It indicates that the plants have all the nutrients they can possibly use, and there's a slight excess. Back off the concentration of the nutrient solution just a touch and the problem should disappear. Note that if the plants never get any worse than this leaf (figure 3), then the plants are probably just fine. Figure 4 is definitely an over-fert problem. The high level of nutrients accumulates in the leaves and causes them to dry out and burn up as shown here. You must flush with clear, clean water immediately to allow the roots to recover, and prevent further damage. Now find the cause of the high nutrient levels.

Figure 3 (left) and Figure 4 (right)

Over Watering:
The plants in figure 5 were on a continuous drip system, where nutrient solution is constantly being pumped into the medium. This tends to keep the entire root system completely saturated. A better way would be to periodically feed the plants, say for 1/2 hour every 2-3 hours. This would give the roots a chance to get needed air to them, and prevent root rot and other problems.
Don't be thrown off by the fact that the plants in figure 5 are sitting in still water; this is actually an H2O2 solution used to try and correct the problem. Adding an air stone to the tub would also help add O2 to the solution.

Figure 5

pH Fluctuation:
Both of these leaves in figure 6 and figure 7 are from the same plant. It could be over fertilization, but more likely it is due to the pH being off. Too high or too low a pH can lock up nutrients in the form of undisolvable salts and compounds, some of which are actually toxic to the plants. What then happens is the grower then tries to supplement the plants diet by adding more fertilizers, throwing off the pH even more and locking up even more nutrients. This type of problem is seen more often in soil mixes, where inconsistent mixing of the medium's components leads to "hot" spots.

Figure 6 (left) and Figure 7 (right)

Ozone Damage:
Ozone damage typically found near the generator. Although a rare problem, symptoms generally appear as a Mg deficiency, but the symptoms are localized to immediately around the generator.

Figure 8

Nutrient Problems

Quick Deficiency Guide

Nitrogen: Entire plant is light green in color; lower leaves are yellow; growth is stunted....

Phosphorous: Entire plant is bluish-green, often developing a red or purpleish cast; lower leaves may be yellow, drying to a greenish-brown to black color; growth may be stunted...

Potassium: Leaves have a papery appearance; dead areas along the edges of leaves; growth is stunted...

Magnesium: Lower leaves turn yellow along the tips and margin and between the veins; the lower leaves wilt...

Calcium: Young stems and new leaves die...

Zinc: Leaf tissue between the veins is lighter in color; yellowed; papery in appearance...

Iron: Leaf tissue appears yellow, while the veins remain green...

Copper: Leaf edges appear dark green or blue; leaf edges curl upward; young leaves permanently wilt...

Sulfur: Young leaves turn pale green, while the older leaves remain green; plant is stunted and spindly...

Mananese: Growth is stunted; lower leaves have a checkered pattern of yellow and green...

Molybdenum: Leaves are stunted, pale green, and malformed...

Boron: Young leaves are scorched at tips and margins...

Root Stunting:
Root stunting is characteristic of calcium deficiency, acidity, aluminum toxicity, and copper toxicity. Some species may also show it when boron deficient. The shortened roots become thickened, the laterals become stubby, peg-like, and the whole system often discolours, brown or grey. Symptoms localized at shoot growing points. New shoots unopened; young leaves distorted; dead leaf tips; pale green plant copper deficiency New shoots withered or dead; petiole or stem collapse; shoots stunted; green plant calcium deficiency Young leaves pale green or yellow; rot setting or dead tip; dieback; dark green plant boron deficiency

MOBILE ELEMENTS
Mobile elements are more likely to exhibit visual deficiencies in the older leaves, because during demand these elements will be exported to the new growth.

Nitrogen (N)
Nitrate - Ammonium is found in both inorganic and organic forms in the plant, and combines with carbon, hydrogen, oxygen and sometimes sulfur to form amino acids, amino enzymes, nucleic acids, chlorophyll, alkaloids, and purine bases. Nitrogen rates high as molecular weight proteins in plant tissue.
Plants need lots of N during vegging, but it's easy to overdo it. Added too much? Flush the soil with plain water. Soluble nitrogen (especially nitrate) is the form that's the most quickly available to the roots, while insoluble N (like urea) first needs to be broken down by microbes in the soil before the roots can absorb it. Avoid excessive ammonium nitrogen, which can interfere with other nutrients. Too much N delays flowering. Plants should be allowed to become N-deficient late in flowering for best flavor.

Nitrogen Deficiencies:
Plants will exhibit lack of vigor, slow growth and will be weak and stunted. Quality

and yield will be significantly reduced. Older leaves become yellow (chlorotic) from lack of chlorophyll. Deficient plants will exhibit uniform light green to yellow on older leaves, these leaves may die and drop. Leaf margins will not curled up noticeably. Chlorosis will eventually spread throughout the plant. Stems, petioles and lower leaf surfaces may turn purple.

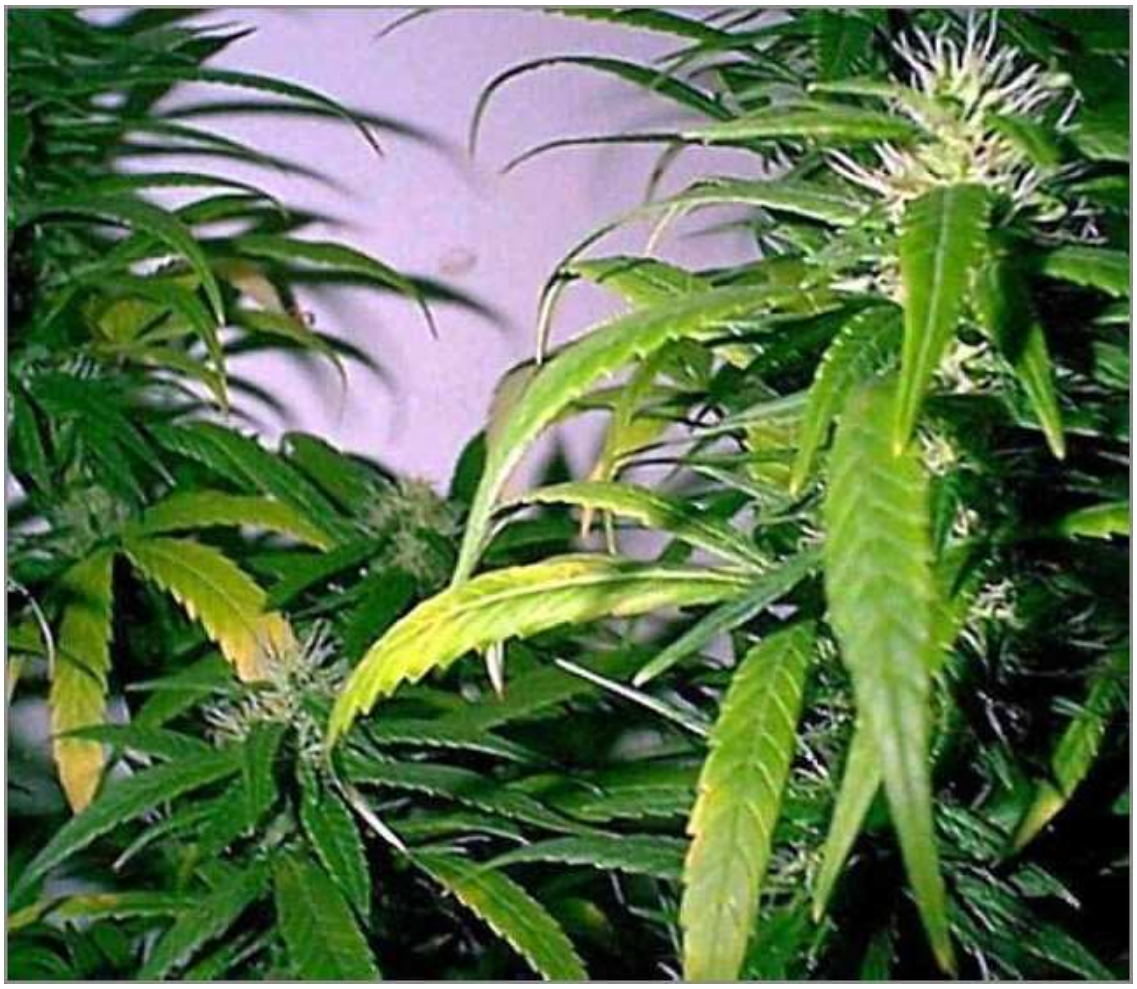


Figure 9

As seen in figure 10 consumption of nitrogen (N) from the fan leaves during the final phase of flowing is 100% normal.

Figure 10

Nitrogen Toxicity:
Leaves are often dark green and in the early stages abundant with foliage. If excess is severe, leaves will dry and begin to fall off. Root system will remain under developed or deteriorate after time. Fruit and flower set will be inhibited or deformed.

With breakdown of vascular tissue restricting water uptake stress resistance is drastically diminished.

Phosphorus (P)
Phosphorus is a component of certain enzymes and proteins, adenosine triphosphate (ATP), ribonucleic acids (RNA), deoxyribonucleic acids (DNA) and phytin. ATP is involved in various energy transfer reactions, and RNA and DNA are components of genetic information.

Phosphorus (P) deficiency:
Figure 11 is severe phosphorus (P) deficiency during flowering. Fan leaves are

dark green or red/purple, and may turn yellow. Leaves may curl under, go brown and die. Small-formed buds are another main symptom.

Phosphorus deficiencies exhibit slow growing, weak and stunted plants with dark green or purple pigmentation in older leaves and stems.

Some deficiency during flowering is normal, but too much shouldn't be tolerated. Red petioles and stems are a normal, genetic characteristic for many varieties, plus it can also be a co-symptom of N, K, and Mg-deficiencies, so red stems are not a foolproof sign of P-deficiency. Too much P can lead to iron deficiency. Purpling: accumulation of anthocyanin pigments; causes an overall dark green color with a purple, red, or blue tint, and is the common sign of phosphate deficiency. Some plant species and varieties respond to phosphate deficiency by yellowing instead of purpling. Purpling is natural to some healthy ornamentals.

Figure 11

Figure 12 shows Phosphorus (P) deficiency during vegetative growth. Many people mistaken this for a fungus, but look for the damage to occur near the end of leave, and leaves the color dull grayish with a very brittle texture.

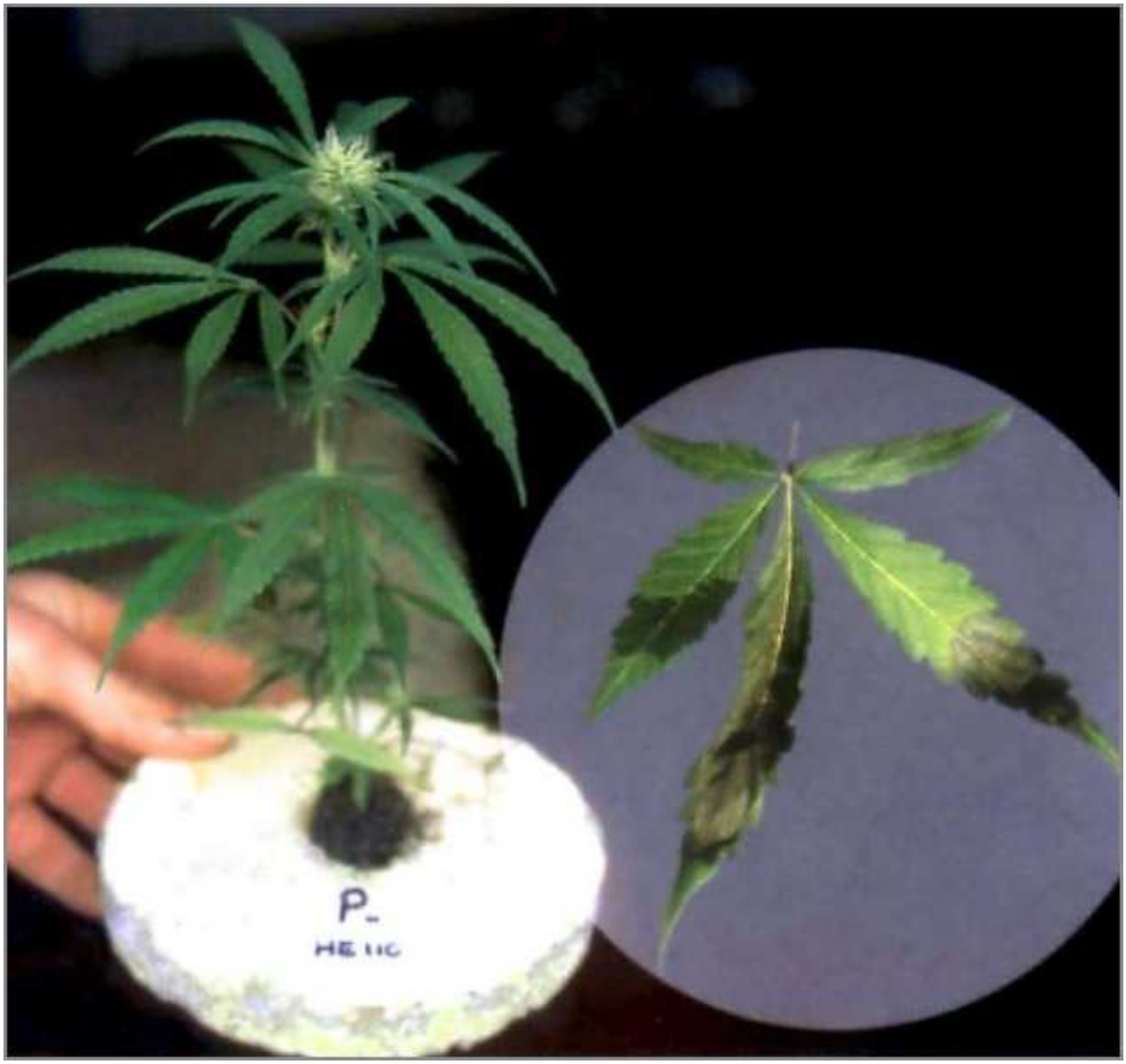


Figure 12

Phosphorus (P) Toxicity:
This condition is rare and usually buffered by pH limitations. Excess phosphorus can interfere with the availability and stability of copper and zinc.

Potassium (K)
Potassium is involved in maintaining the water status of the plant and the tugor pressure of it's cells and the opening and closing of the stomata. Potassium is required in the accumulation and translocation of carbohydrates. Lack of potassium will reduce yield and quality.

Potassium deficiency:
Older leaves are initially chlorotic but soon develop dark necrotic lesions (dead tissue). First apparent on the tips and margins of the leaves. Stem and branches may become weak and easily broken, the plant may also stretch. The plant will become susceptible to disease and toxicity. In addition to appearing to look like iron deficiency, the tips of the leaves curl and the edges burn and die. Potassium - Too much sodium (Na) displaces K, causing a K deficiency. Sources of high salinity are: baking soda (sodium bicarbonate "pH-up"), too much manure, and the use of water-softening filters (which should not be used). If the problem is Na, flush the soil. K can get locked up from too much Ca or ammonium nitrogen, and possibly cold weather.

Figure 13

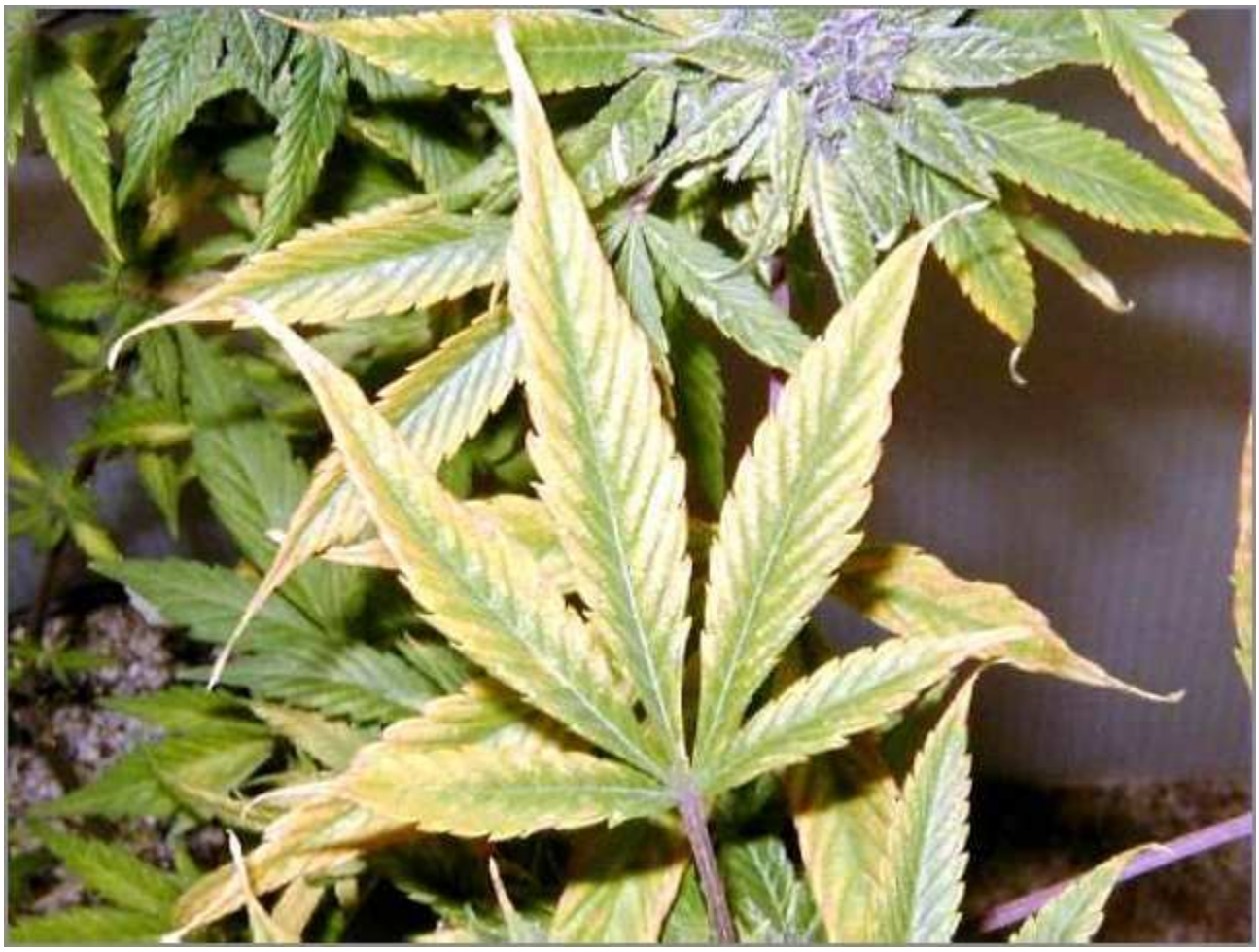


Figure 14

Potassium (K) Toxicity:
Usually not absorbed excessively by plants. Excess potassium can aggravate the uptake of magnesium, manganese, zinc and iron and effect the availability of calcium.

Magnesium (Mg)
Magnesium is a component of the chlorophyll molecule and serves as a cofactor in most enzymes.

Magnesium (Mg) deficiency:
Magnesium deficiency will exhibit a yellowing (which may turn brown) and interveinal chlorosis beginning in the older leaves. The older leaves will be the first to develop interveinal chlorosis. Starting at leaf margin or tip and progressing inward between the veins. Notice how the veins remain somewhat green though as can be seen in figure 15.

Notice how in figure 16 and 17 the leaves curl upwards like they're praying? They're praying for Mg! The tips may also twist.
This can be quickly resolved by watering with 1 tablespoon Epsom salts/gallon of water. Until you can correct nutrient lockout, try foliar feeding. That way the plants get all the nitrogen and Mg they need. The plants can be foliar feed at ½ teaspoon/quart of Epsom salts (first powdered and dissolved in some hot water).
When mixing up soil, use 2 teaspoon dolomite lime per gallon of soil.
If the starting water is above 200 ppm, that is pretty hard water, that will lock out mg with all of the calcium in the water. Either add a 1/4 teaspoon per gallon of epsom salts or lime (both will effectively reduce the lockout or invest into a reverse osmosis water filter.
Mg can get locked-up by too much Ca, Cl or ammonium nitrogen. Don't overdo Mg or you'll lock up other nutrients.

Figure 15

Figure 16

Figure 17

Magnesium (Mg) Toxicity:
Magnesium toxicity is rare and not generally exhibited visibly. Extreme high levels will antagonize other ions in the nutrient solution.

Zinc (Zn)
Zinc plays a roll in the same enzyme functions as manganese and magnesium. More than eighty enzymes contain tightly bound zinc essential for their function. Zinc participates in chlorophyll formation and helps prevent chlorophyll destruction. Carbonic anhydrate has been found to be specifically activated by zinc.

Zinc Deficiencies:
Deficiencies appear as chlorosis in the inter-veinal areas of new leaves producing a banding appearance as seen in figure 18. This may be accompanying reduction of leaf size and a shortening between internodes. Leaf margins are often distorted or wrinkled. Branch terminals of fruit will die back in

severe cases.
Also gets locked out due to high pH. Zn, Fe, and Mn deficiencies often occur together, and are usually from a high pH. Don't overdo the micro-nutrients, lower the pH if that's the problem so the nutrients become available. Foliar feed if the plant looks real bad. Use chelated zinc. Zinc deficiency produces "little leaf" in many species, especially woody ones; the younger leaves are distinctly smaller than normal. Zinc deficiency may also produce "rosetting"; the stem fails to elongate behind the growing tip, so that the terminal leaves become tightly bunched.

Figure 18

Zinc Toxicity:
Excess Zinc is extremely toxic and will cause rapid death. Excess zinc interferes with iron causing chlorosis from iron deficiency. Excess will cause sensitive plants to become chlorotic.

IMMOBILE ELEMENTS
Immobile elements will show their first symptoms on younger leaves and progress to the whole plant.

Sulphur (S)
Sulfate is involved in protein synthesis and is part of the amino acids, cystine and thiamine, which are the building blocks of proteins. It is active in the structure and metabolism in the plant. It is essential for respiration and the synthesis and breakdown of fatty acids.

Sulphur (S) deficiency:
The initial symptoms are the yellowing of the entire leaf including veins usually starting with the younger leaves. Leaf tips may yellow and curl downward. Sulfur deficiencies are light green fruit or younger leaves with a lack of succulence. Elongated roots and woody stem. Although it's hard to see in figure 19, the upper stems of this plant are purple. Although many varieties of cannabis do get purplish stems, the trait generally extends the entire length of the plant's stem, and not just near the top as in this specimen.

Figure 19

Sulphur Toxicity:
Leaf size will be reduced and overall growth will be stunted. Leaves yellowing or scorched at edges. Excess may cause early senescence.

Calcium (Ca)
Calcium plays an important role in maintaining cell integrity and membrane

permeability.

Calcium Deficiency:
Young leaves are affected first and become small and distorted or chlorotic with irregular margins, spotting or necrotic areas. Bud development is inhibited, blossom end rot and internal decay may also occur and root may be under developed or die back. Deficiency will cause leaf tip die-back, leaf tip curl and marginal necrosis and chlorosis primarily in younger leaves. Symptoms: young leaves develop chlorosis and distortion such as crinkling, dwarfing, developing a strap-like shape, shoots stop growing and thicken.

Calcium Toxicity:
Difficult to distinguish visually. May precipitate with sulfur in solution and cause clouding or residue in tank. Excess calcium may produce deficiencies in magnesium and potassium.

Iron (Fe)
Iron is an important component of plant enzyme systems for electron transport to carry electrons during photosynthesis and terminal respiration. It is a catalyst for chlorophyll production and is required for nitrate and sulfate reduction and assimilation.
Iron deficiency:
- Pronounced interveinal chlorosis similar to that caused by magnesium deficiency but on the younger leaves.
-Leaves exhibit chlorosis (yellowing) of the leaves mainly between the veins, starting with the lower and middle leaves.

Caused by factors that interfere with iron absorption of roots: over irrigation, excessive soluble salts, inadequate drainage, pests, high substrate pH, or nematodes. This is easily corrected by adding an iron supplement with the next watering.

Fe is unavailable to plants when the pH of the water or soil is too high. If deficient, lower the pH to about 6.5 (for rockwool, about 5.7), and check that you're not adding too much P, which can lock up Fe. Use iron that's chelated for maximum availability. Read your fertilizer's ingredients - chelated iron might read something like "iron EDTA". To much Fe without adding enough P can cause a P-deficiency.

Note : When adding iron to the solution, it is often necessary to not use fertilizer for that watering. Iron has a tendency of reacting with many of the components of fertilizer solutions, and will cause nutrient lockup to occur. Read the labels of both the iron supplement and the fertilizer you are using before you attempt to combine the two.

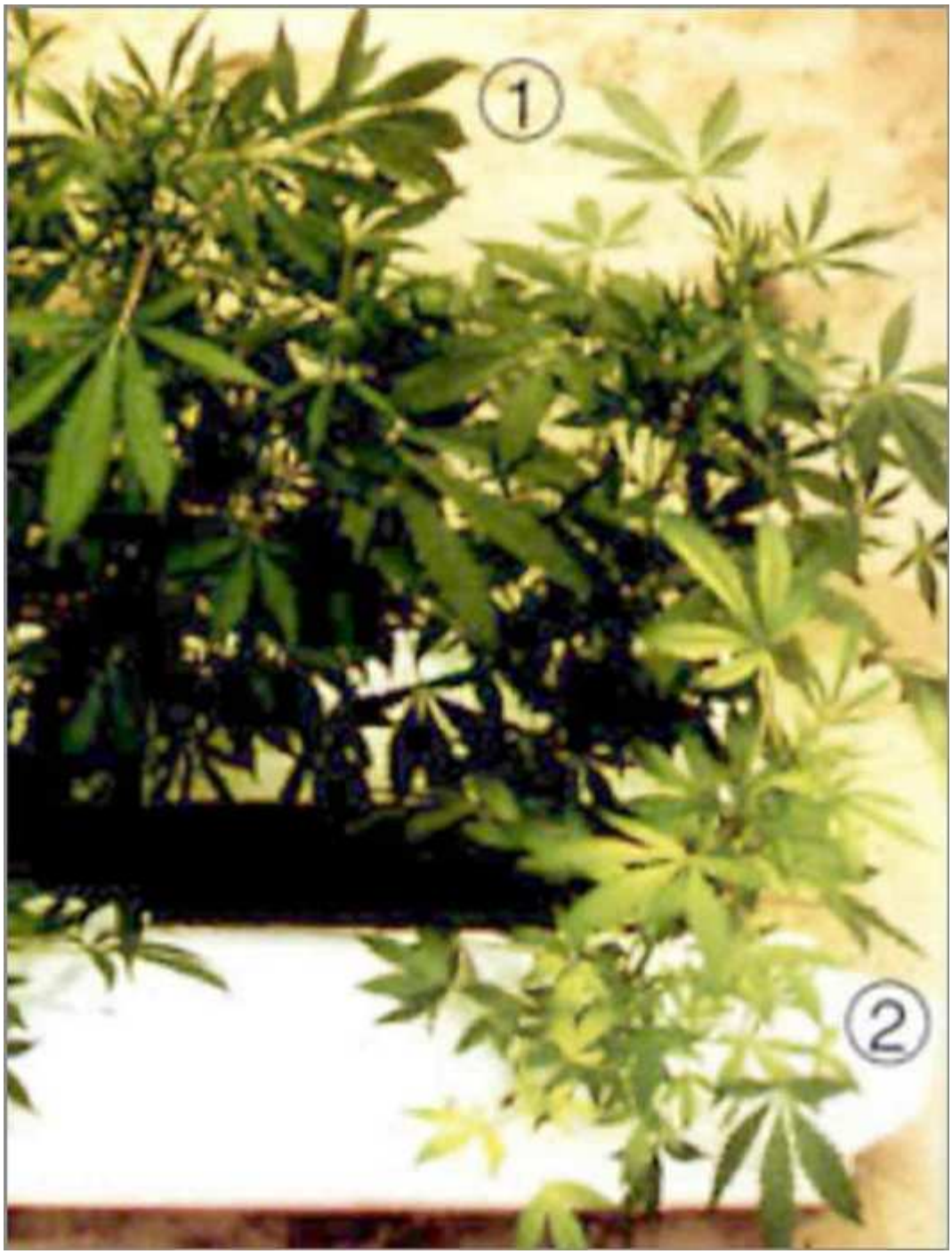


Figure 20

Iron Toxicity:
Excess accumulation is rare but could cause bronzing or tiny brown spots on leaf surface.

Manganese (Mn)
Manganese is involved in the oxidation reduction process in the photosynthetic

electron transport system. Biochemical research shows that this element plays a structural role in the chloroplast membrane system, and also activates numerous enzymes.
Manganese Deficiency:
Interveinal chlorosis of younger leaves, necrotic lesions and leaf shredding are typical symptom of this deficiency. High levels can cause uneven distribution of chlorophyll resulting in blotchy appearance. Restricted growth and failure to mature normally can also result.
-Mn gets locked out when the pH is too high, and when there's too much iron. Use chelated Mn.
Manganese Toxicity:
Toxicity:Chlorosis, or blotchy leaf tissue due to insufficient chlorophyll synthesis. Growth rate will slow and vigor will decline.

Chlorine (Cl)
Chloride is involved in the evolution of oxygen in the photosynthesis process and is essential for cell division in roots and leaves. Chlorine raises the cell osmotic pressure and affects stomata regulation and increases the hydration of plant tissue. Levels less than 140 ppm are safe for most plants. Chloride sensitive plants may experience tip or marginal leaf burn at concentrations above 20 ppm.
Chlorine Deficiency:
Wilted chlorotic leaves become bronze in color. Roots become stunted and thickened near tips. Plants with chlorine deficiencies will be pale and suffer wilting.
Chlorine Toxicity:
Burning of leaf tip or margins. Bronzing, yellowing and leaf splitting. Reduced leaf size and lower growth rate.

Boron (B)
Boron biochemical functions are yet uncertain, but evidence suggests it is involved in the synthesis of one of the bases for nucleic acid (RNA uracil) formation. It may also be involved in some cellular activities such as division, differentiation, maturation and respiration. It is associated with pollen germination.
Boron Deficiency:
Plants deficient in boron exhibit brittle abnormal growth at shoot tips and one of the earliest symptoms is failure of root tips to elongate normally. Stem and root apical meristems often die. Root tips often become swollen and discolored. Internal tissues may rot and become host to fungal disease. Leaves show various symptoms which include drying, thickening, distorting, wilting, and chlorotic or necrotic spotting.
Boron Toxicity:
Yellowing of leaf tip followed by necrosis of the leaves beginning at tips or margins and progressing inward before leaves die and prematurely fall off. Some plants are especially sensitive to boron accumulation.

Copper (Cu)
Copper is a constituent of many enzymes and proteins. Assists in carbohydrate metabolism, nitrogen fixation and in the process of oxygen reduction.
Copper Deficiency:
Symptoms of deficiency are a reduced or stunted growth with a distortion of the younger leaves and growth tip die-back. Young leaves often become dark green and twisted. They may die back or just exhibit necrotic spots. Growth and yield will be deficient as well.
Copper Toxicity:
Copper is required in very small amounts and readily becomes toxic in solution culture if not carefully controlled. Excess values will induce iron deficiency. Root growth will be suppressed followed by symptoms of iron chlorosis, stunting, reduced branching, abnormal darkening and thickening of roots.

Molybdenum (Mo)
Molybdenum is a component of two major enzyme systems involved in the nitrate reeducates, this is the process of conversion of nitrate to ammonium.
Molybdenum Deficiencies:
Often interveinal chlorosis which occurs first on older leaves, then progressing to the entire plant. Developing severely twisted younger leaves which eventually die. Molybdenum deficiencies frequently resemble nitrogen, with older leaves chlorotic with rolled margins and stunted growth.
Molybdenum Toxicity:
Excess may cause discoloration of leaves depending on plant species. This condition is rare but could occur from accumulation by continuous application. Used by the plant in very small quantities. Excess mostly usually does not effect the plant, however the consumption of high levels by grazing animals can pose problems so she might not be too good to smoke.

Sodium (Na)
Sodium seems to encourage crop yields and in specific cases it acts as an antidoting agent against various toxic salts. It may act as a partial substitute for potassium deficiencies. Excess may cause plant toxicity or induce deficiencies of other elements. If sodium predominates in the solution calcium and magnesium may be affected.

Silicon (Si)
Silicon usually exists in solution as silicic acid and is absorbed in this form. It accumulates as hydrated amorphous silica most abundantly in walls of epidermal cells, but also in primary and secondary walls of other cells. It is largely available in soils and is found in water as well. Inadequate amounts of silicon can reduce tomato yields as much as 50%, cause new leaves to be deformed and inhibit fruit set. At this time toxicity symptoms are undetermined.

Cobalt (Co)
Cobalt is essential to many beneficial bacteria that are involved in nitrogen

fixation of legumes. It is a component of vitamin B12 which is essential to most animals and possibly in plants. Reports suggest that it may be involved with enzymes needed to form aromatic compounds. Otherwise, it is not understood fully as to its benefit to plant growth, but it is considered essential to some animal health issues.

Equipment Suppliers

This resource may not be accurate anymore but at the time of this compilation (2009) here's where I obtain my equipment.

Lights:
High Tech Garden Supply

HTGS has good service and tosses deals when you call them up directly I haven't done that yet but people on here are getting deals from just calling up. They aren't good on nutrients tho a little pricey on that note.

***Shipping*:** Great usually shipped out the next day and there in 2 days.
I've had free upgrades from them just because they were out of stock on my reg item.

Fans: Known for Fans and bulbs
Metal Halide Light Bulbs, Light Fixtures & Tennis Court Lighting - Businesslights.com

Businesslights has some of the lowest prices on vortex fans and ductboosters.

They have inline fans going as low as $109. And a lot of sites charge much more for the same fan.

Shipping: Around $18 for my order (the flat rate) there.
Great customer service, got emailed back within the day.

Nutrients: Good deals on Nutrients
Grow Lights, Advanced Nutrients, Hydroponic Supplies and more at Hydroempire http://www.cheaphydroponics.com

Both of these are great sites for nutes but not so well on lights (kind of pricey on that). Hydro systems aren't bad priced but I can't comment on that since I haven't ordered one from either.

Great customer service direct line none of that put you on hold sometimes I did get the answering machine so I just called back later

Grow tents:
http://www.cheaphydroponics.com

This is a great site also. Homebox XS used to run $89 now its $100 but still cheaper than going direct to the Homebox Yahoo store.

Hydroponics | Hydroponic Supplies is great for drip systems and pH meters and net pots small stuff like that. They don't really toss deals but do have live help. I think I'm going to learn how to build one myself because it is cheaper.
Shipping is sometimes slow (too about 2 weeks for some items to ship out due to out of stock) but it gets to my door so I don't truly complain.