Cannabis Care manual

Molds & Fungus • Nutrient Deficiencies • Pests • Diseases

pH Management • Organic Controls • Environmental Stresses

NOTICE

DISCLAIMER

This book and all references are for educational, entertainment, and archival purposes only. The information and directions in these writings, individually and collectively, are in no way to be considered as a substitute for consultations with a duly licensed physician regarding diagnosis and / or treatment of disease and are not intended to diagnose or treat. Possessing and growing marijuana is illegal under federal laws. The author and publisher do not advocate breaking the law. Persons considering implanting procedures herein should consult an attorney before doing so. Some substances discussed herein may be toxic. Readers should consult appropriate expert advice if considering utilizing any information in this book. The author makes no expressed or implied warranties whatsoever, including accuracy or reliability with respect to information contained in this book.

This book offers no medical, legal, or related professional advice. The reader is encouraged to use good judgment when applying the information herein contained and to seek advice from a qualified professional if, and as, needed. The information and guidelines in this book are intended to encourage personal responsibility and to support proper medical care. I do not grow or condone the growing of anything *illegal.* Any information herein should not constitute advice

or be considered advice to assist in activities that are deemed illegal. This text is for private consumption only, and by reading any further you agree that you know your local laws and accept 100% personal liability of any illegal actions you commit. This book is made available for entertainment, archival, and informational purposes only, in accord with the First Amendment of the United States of America Constitution. The author advocates absolutely no illegal activities of any kind, and makes no express or implied warranties of merchantability, fitness for any purpose, or otherwise, with respect to this eBook and the information it contains. For medical, legal, or spiritual advice, the author urges that you consult the appropriate licensed practitioner.

In many areas it is illegal to own seeds, grow cannabis or use cannabis. It is recommended that you consult your local authorities to see what your countries legal status is regarding the use and / or cultivating of cannabis. The author does not want you to break the law, nor was this book intended for that purpose. This is an educational book showing you how cannabis is grown. DO NOT BREAK THE LAW. Many places have permitted medical marijuana users to grow and use their own medicine in the privacy of their very own homes. Readers who wish to use marijuana medicinally should always consult a physician or qualified health practitioner before doing so. Persons considering implementing procedures described herein should consult with an attorney before doing so. The author and publisher do not accept liability for any actions any person may have taken after reading this book.

In many countries the use and possession of marijuana is illegal. This book is intended for educational purposes only. The author does not condone ANY illegal activity. The author will not be held not responsible for any property damage, personal injuries, equipment damage, illegal activities, or anything else. You acknowledge and agree by using any information contained in this book that it is 100% at your own risk!

The following information presented in this book is for informational and entertainment purposes only. Marijuana is a controlled substance and is illegal to grow, own, or sell in most countries. The author does not wish to encourage anyone to act in conflict with their national laws

and is not held responsible for any of your actions. This document is for the purpose of supplying information to the public. The publisher, authors, and others associated with the production of this book and website do not advocate breaking the law. All text and illustrations are for descriptive purposes only. The publisher and the authors do not recommend you try anything presented in this document. You are encouraged to read any and all information available about cannabis to develop a complete background on the subject. The author and publisher have tried to the best of their abilities to describe the most current cannabis growing methods. However, there may be some mistakes in the text that the author and publisher were unable to detect. This book contains current information up to the date of publication. Neither the publisher nor the author endorses any products or brand names that are mentioned or pictured in this book. These products are mentioned or pictured for illustration and education only. Any advice provided in this document—electrical, financial, scientific, etc.—is given for example purposes only. Neither the publisher nor the authors assume any responsibility for any actions associated with this advice. The information contained in this book is intended for use only in jurisdictions where the activities contained therein are legal. No claim of the accuracy, safety, or legality of the following instructions contained in this book is made and it is not recommended to follow them. You are responsible for your own actions if you do so. Nothing contained in this book should be construed to be legal or medical advice.

The information contained herein is for legal medicinal cannabis cultivation and use only. To read this book you must have a medical license or prescription to hold, use, or grow legal cannabis. The use of any of this information for illegal activities of ANY KIND holds YOU 100% liable for breaking the law. This book features content about marijuana; content includes information about cannabis cultivation, the recreational use of marijuana, the medical uses for marijuana, and other topics that some viewers may find offensive. All content in this document is for EDUCATIONAL and ENTERTAINMENT purposes ONLY. The author will not be held responsible for any behavior or actions taken on any external sources, nor does the author control what happens on any site that links out from this document. You are 100% liable for your own actions.

LIMIT OF LIABILITY/DISCLAIMER OF WARANTY

While the publisher and author have used their best efforts in preparing this book, they make no representations or warranties with respect to the accuracy or completeness of the contents of this book and specifically disclaim any implied warranties of merchantability or fitness for a particular purpose. No warranty may be created or extended by sales representatives or written sales materials. The advice and strategies contained herein may not be suitable for your situation. You should consult with a professional where appropriate. Neither the publisher nor author shall be liable for any loss of profit or any other commercial damages, including but not limited to special, incidental, consequential, or other damages. Readers should be aware that Internet websites offered as citations and/or sources for further information may have changed or disappeared between the time this was written and when it is read.

BAD GUY NOTICE

Hey you, the internet is a big place and a lot of files can be downloaded illegally. I get it. I get that some of you may have obtained my book by stealing it. I want you to know I spent nearly 5+ years working really really hard to give this gift to the community and bring this incredible information to you. If it truly helps you and you enjoy and get a lot out of it, I would really appreciate it if you could head over to my website and purchase an authentic copy.

Put good vibes out into the universe, get good vibes back sevenfold!

Thanks so much, I know you'll do the right thing.

Introduction

Many marijuana growers are commonly faced with various undesirable ailments which negatively affect their precious cannabis crops. Plant sicknesses, problems, fungi, diseases, pest infestation, and other destructive forces can be very frustrating for any grower regardless of skill level. Once invested in a grow setup, you must take every step to ensure it stays a healthy bountiful harvest. This eBook has been specifically designed to be a reference to identify, prevent, and *annihilate* any problems one may encounter throughout the entire cannabis cultivation process.

Note: For a quick troubleshooting reference, please head to the back of the book

Avoiding Problems

As the old adage goes, "An ounce of prevention is worth a pound of cure." This is especially relevant when it comes to caring for cannabis. Expect the unexpected; there are many different problems that can attack your grow room., you must be ready!

Avoiding Pests

- The best way to avoid pests is to keep your grow room very clean. Try to keep the floor clear of old leaf material, grow medium, dirt, etc.
- Keep your pets out of your grow room! They can carry all sorts of germs and can often be the carriers for pests.
- Always keep the grow room at optimal temperatures. Mites thrive in overly warm, moist environments. If you happen to have a mite infestation, keeping the temperature as low as possible, around 70°F(21.1°C), will also help slow a mite infestation if one should occur.

Avoiding Mold/Fungus/Plant Problems

- Keep good air circulation in your grow room; always have air circulating around the plants and try to keep at least one outside source of intake or exhaust going.
- Use a carbon air filter whenever possible to filter mold and fungus from the air.
- Keep the humidity between 40-80% in your grow room. In more humid climates a dehumidifier is strongly recommended.
- Keeping the temperature down around 70°F(21.1°C) will help keep mold and fungus under control.

Avoiding Chemical Burn/Nutrient Lockout

- Check pH levels of nutrient solution(or soil) on a daily basis.
- Never mix nutrients together by themselves; always mix nutrients in plenty of water.
- Keep pots, reservoirs, and grow mediums clean.
- Flush soil based plants with a full gallon of plan water at once a month.

Marijuana Plant Stresses

Plant stress causes stunted growth which means weak tiny buds. Stress in marijuana plants is caused by imbalances of the plant chemistry. Generally plant stress disrupts the normal chemical reactions happening within the plant and causes ethylene(the aging hormone) to start developing in the cells.

Plant's typically don't like any sudden shock to their systems. Any unusual event in the marijuana plant's lifecycle will drastically alter its internal chemistry and result in retarded growth.

Some of the most common marijuana plant stress causes are:

Nutrient Stress: Usually cased by too much, not enough, or an imbalance of the nutrients[fertilizers]. This can attract diseases or certain pests and disrupt root function.
Irregular Photoperiod: Irregular light cycles will change the hormonal balance in marijuana plants that are dependent upon the length of light and

dark photoperiods to determine when to flower. Odd or infrequent lighting schedules stress plants.

Water Stress: There is a lack of water or too much water for the plant to absorb. Water stress in marijuana plants causes abscisic acid to build up and closes down the plant's stomatas.

Mineral Stress: Caused by mineral imbalance in plant tissues, usually due to nutrient problems or by adding to re-circulating mixes. This causes plant growth to slow dramatically. By the time the results are visible, the problem is already well into the advanced stages. It usually takes the typical cannabis a week or so to recover from mineral stress.

pH Stress: The pH of the nutrient solution is changing all the time as the plant uses the minerals in the surrounding nutrients and as the water is transpired by the leaves & evaporates from the nutrient solution. Wildly fluctuating pH levels will reduce or even block the marijuana plants nutrient uptake resulting in deficiencies and severely hindered development.

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 asap, either by moving the lamps or moving the plants.

Aging Stress: As a plant gets older its nutrient uptake requires change. A tissue analysis will show the plant using totally different quantities of each nutrient as it ages. In highly supercharged garden systems, the nutrient fed to marijuana plants is different for each week of growth. Mature or aging marijuana plants need far less(as well as certain amounts of) nutrients, incorrectly providing the wrong amount of nutrients can severely stress your plant.

Plant Damage: Any damage causes the plant to change its chemistry in order to now prioritize tissue repair instead of bud development.

Root Damage: Whether it be physical or chemical root damage, both cause the plant to divert its chemistry to keep the roots advancing and creating new root hairs to absorb food. Roots can't actually rebuild themselves when damaged; they just seal off the damaged section and move around it. Ensuring optimum nutrient feeding and proper root handling are critical for a satisfactory grow.

Environmental Extremes / Plant Diseases: External stressors and disease can cause a plant to stress and age prematurely and cause slow, stunted growth.

Common Plant Problems

The problems that plague growers are myriad so it is difficult to say what the best approach is to this topic. Perhaps the best approach is to make this guide practical for troubleshooting purposes. To this end. You should first find the part of the plant or type of plant material that is showing a symptom that makes you think there is a problem. From there, find the listed symptom that best describes what you are seeing and you will hopefully find the problem and suggested fixes. This section is intended for troubleshooting and diagnosis. If you would like to familiarize yourself with the symptoms of the most common problems then skim seed issues, root issues, ph and water related leaf symptoms, stem issues, and problems with harvested marijuana.

Seeds

Seeds are the foundational elements of all new generations of cannabis. Any problems with this base of life will result in poor performance throughout the entire grow. The ideal seed is a dark green, almost brown(and may also have stripes or other markings depending on genetics). A viable seed will be plump and firm. Applying slight pressure on the seed's outer coating will not crush it. These factors can really make the difference between a small spindly wilting plant and a vigorous healthy plant. A plump particularly ripe seed within a batch indicates improved fast growing genetics and a stronger seed that is more likely to survive to maturity.

Brittle/White Seed: If a slight pressure with your fingertip crushes seeds then your seeds are not viable. They are immature. You should move along to other seeds, if you produced these seeds yourself than you need to be sure to pollinate the plant early in flowering and to let the seeds grow until they are starting to fall out naturally and are fully ripe and mature.

Green Seed: A green seed is simply an immature seed. If the seed is firm and doesn't crush easily under a fingertip then it might still be saved if you do not have a dark viable seed to replace it(only use less than ideal seed if you can't avoid it). In order to save a green seed place it inside a damp paper towel in a dark warm place and check on it every few hours.

The color of the seed will darken as it first ripens and it may eventually sprout. You should plant this seed very close to the surface if it sprouts since it may not have the nutrient stores that a fully mature seed would have. With the appropriate attention and care, an immature green seed can grow into a full flourishing plant with expressing full genetic potential.

Small Seeds: Always choose the largest seeds you can. Unfortunately many plants simply do not produce large enough seeds. Some strains produce small seed exclusively.

10 Top Reasons Your Seeds Wont Germinate

1. Too Cold: Cold temperatures can kill seedlings and prevent germination. Cool temperatures can result in slow, uneven germination, and attack by soil diseases. You may want to start your seeds indoors, before outplanting. Make sure planting dose not done too early, when it is still cold and there is a frost hazard.

2. Too Hot: High temperatures result in excessive soil desiccation and injury to seeds and seedlings.

3. Too Wet: Seeds need to be damp, not soaking wet for germination. Excess water prevents oxygen getting to the seed. Poorly drained soils may also cause soil fungi-related diseases. The condition of wet soils may be improved by

adding perlite. which will aerate your soil.

4. Too Dry: A certain amount of water is essential for germination, so maintaining a constant soil moisture during the germination period is vital, cover containers with glass or plastic sandwich wrap to prevent your soil from drying out.

5. Planting Too Deep: This will result in delayed emergence - seeds may not be able to grow enough to reach the surface on the limited food storage within the seed. Soil temperature is also lower with depth. Plant your seed 1/2 and inch to an inch down for best results.

6. Planting Seeds Too Shallow: If you plant your seeds too shallow they can dry out quickly.

7. Soil Too Firm: Making your soil mix too firm can prevent oxygen from getting to your seeds and affect drainage.

8. Soil Too Loose: Soil that is too loose will result in too much air surrounding the seed(s) - they will not absorb moisture and will most likely dry out.

9. Soil Fungus: Seeds can root well or seedlings can fall over and die. Over-watering, poor drainage, and lack of aeration will increase the likelihood of this occurring. Plant seeds in sterilized potting mix, and make sure your containers are cleaned properly.

10. Non Viable Seeds: If your seeds have not been stored correctly they can deteriorate. As aforementioned, look for viable quality dark brown seeds. Avoid immature seeds(typically light colored or whitish).

Roots

Roots are the base of the plant. Water, nutrients, and hormone supplements will be passed up from the roots into the plants internal tissues. You need a strong, healthy, thriving root system to be able to efficiently pass enough nutrients and to support the plant at its maximum growth rate. Since the root structure isn't usually visible it is important to take proper preventative measures in order to ensure your roots never develop problems. Sick stressed roots can display certain symptoms...

Tight Packed Roots Curling Around the Edge of Container: This symptom is often accompanied by less than optimum growth. Your roots simply don't have enough room. Give them some more space by transplanting to a larger container disturbing the root ball as little as possible. Many people massage the bottom and sides of the root ball very gently just enough to untangle the tips but not so much as to actually break the root ball. If when transplanting you see that the roots did not take advantage of the container's horizontal space it means you didn't transplant often enough early on. You should transplant from smaller to larger container.

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; rosetting or dead tip; dieback; dark green plant boron deficiency.

Sparse or Insubstantial Roots: This solely depends on your stage of growth. But generally speaking roots will grow well in a medium with a carefully maintained pH and lots of oxygen. This can be an early sign that you need more oxygenation. This is most likely caused by poor drainage in the soil(as water

pulls air into the pot from the top as it drains down the bottom) or perhaps you should add an air stone to your reservoir in a hydroponic system.

Slimy, Smelly Roots: Lack of oxygen has causes condition known as Pythium, or "root rot" in which your roots have begun to turn putrid. You can try to save a rotting plant but you should remember that the impact on upon the results of your grow are going to be substantial and you should take mental note and take it as a learning experience. Please see below for the entire root rot remedy.

Stems

Stems are the support trunks of your plant, including all its leaves and flowers. Each and every stem on the plant is important and is essential to the part it connects. Stems internally have a layer that transports nutrients and another layer of soft pulp that transports water. Because of this, stems are almost entirely composed of water weight and weight become nearly nothing when dried. For the best end result from your harvest, both in potency and quantity, you will want nice strong thick stems.

Leaning Branches: If your branches are leaning down under the weight of your flowers the best thing you can do is tie them up. This can be partially avoided by installing a circulating fan in an indoor grow room simulating the natural wind, the movement will cause your stems to strengthen.

Thin, Spindly Stalks: The most common cause of this symptom is lack of light. If plants are not getting enough light they will stretch to reach their light source. You probably need a bigger light and/or need to move it closer to the plants. Early on this can be partly solved by burying the plant more deeply when transplanting. Roots will eventually grow out of the newly submerged stem. You can also help this condition by installing a circulating fan - the fan will simulate wind and the movement will drastically strengthen stems. A weak root system may also contribute to this symptom.

Broken Stem: This was probably caused by you trying to the bend the plant. Its okay, don't panic the plant will probably be fine. Just tape the stem back together and support it by tying to a stake if needed in order to take the

pressure off the break while the wound heals. In time the plant will heal itself and will have a knot where the break was located. You should allow your plant time to recover before stressing the location.

Leaves

The leaves of the plant are its solar panels and lungs. Through its leaves the plant will absorb the power of the sun and utilize it in the process of photosynthesis. The leaves on your plant are usually the first to show signs that something is going wrong. With few exceptions, damage to the leaf material will not recover after the problem is remedied and you should look to the new growth for signs the problem is resolved and the overall condition of the plant should show improvement.

Drooping Leaves: The most common causes of this symptom are over and under watering. If you are using a soil grow are you allowing the soil surface to get completely dry before watering again? You should be. If in a hydroponic grow you need to take measures to get oxygen to your roots. Otherwise, water your plant. In a soil grow you will want to fully saturate the pot with water when you water and then let the top inch or two of the soil dry out before drowning her again. As an added note, if you are using soil and it never seems to dry out then you may have purchased a bag of topsoil and not potting soil. This soil will not drain at all. You need a proper soil mix.

Broad Leaves with Edges Curled Down: This is a sign of excessive humidity. This usually won't harm the plant but less than optimal conditions result in a less than optimal growth and harvest. The width of the leaf is also determined by genetics so broad leaves alone are not a sure indicator of whether your environment is too humid.

Narrow Leaves with Edges Curled Up: This is a sign of low humidity. Like excess humidity this will not harm the plant but less than optimal conditions result in a less than optimal growth. Genetics again affect leaf broadness as well.

Crispy Leaves: Your fan leaves are drying up because you are over fertilizing and the concentration of nutrients in the planting medium is so strong that it is drawing water from the plants. Stop fertilizing. If you can, flush the planting containers to remove some of the excess nutrients.

Yellowing of the Leaves (from the bottom of the plant upward): This can be a sign of nitrogen deficiency or of over fertilization. If accompanied early by browning and necrosis of the leaf tips then you may be over fertilizing. Adding extra fertilizer when you are already over-fertilizing will kill a plant at any stage of growth so it is safer to flush the plant(if using a pot use three times as much water as your container size) with clean water to remove the excess nutrients. If this helps then excess nutrients are the problem. This could be because you are feeding the plant too much or if later in the growth cycle could be caused by excess nutrient salts building up in the soil. If this does not help then you may need to add more Nitrogen into your fertilizer mix. These symptoms can also be caused by a pH imbalance.

This symptom will also be seen late in flowering on many strains and is perfectly natural as the plant draws in nutrients from the leaves toward the end of its life. Some growers prefer to give extra nitrogen to slow or prevent this and others like to let nature take its course. Either will produce a satisfactory harvest.

Brown/Purple Spots and/or Dark Green Leaves on Stunted Plant: This is generally a sign of phosphorus deficiency. You may need to add more phosphorus to your water or you might have a pH imbalance.

Brown/Tan/Pale Spots Throughout Leaves: You may have a phosphorus deficiency or you may have contracted a pest. Refer to the section on pests for more information on detecting and removing a pest infestation.

Yellowing Between Leaf Veins: This is likely a potassium deficiency. More on this later... You need to add to your water or correct a pH balance. Potassium can also be locked out by salt buildup so if your pH is correct you may try a flush before adjusting nutrients.

Older Leaves Yellow From the Center Outward, Leaf tips brown progressing inward, pale new growth: Look to trace element deficiency for these problems. Magnesium and Calcium are likely culprits. You can add a bit of dolomite lime to your water(1 tsp/gallon) or add a supplement such as cal-mag, or cal-max, or similar. As always with any nutrient deficiency your problem may actually be a pH imbalance. More on this in a bit.

Leaves Turn Pale Yellow or White with Green Veins: This is a sign of iron deficiency. Add more trace nutrients or chelated iron. Again, pH imbalance could also be the culprit.

Leaf Moisture Stress Symptoms and Solutions

It is quite normal to hear groans from growers having leaf problems. Many newer growers exercise much concern for their leaf problems, minute or otherwise. Unless insect damage has occurred or the plant is suffering from a severe case of calcium deficiency, the plant is trying to tell you that it is water stressed. It's hard to tell exactly what the culprit is, and unfortunately the solution the confused grower chooses oftentimes is not the right one. A mis-diagnosis only serves to make matters worse by promoting further decline. Here are some of the more common causes that can induce these common symptoms included with a few simple solutions. Ultimately though the most effective and correct solution is in the hands of the grower.

Over-fertilizing: The most common cause of leaf cupping aka leaf margin rolling, leaf margin burn, and leaf tip curl/burn is the overzealous use of too much plant food in relationship to factors such as plant vigor and rate of growth. The first unit of a plant to show moisture stress is the leaf at its margins and/or tips, reflected by margin rolling (cupping) or burning. A hard, crispy feel to the leaf frequently occurs as well, as opposed to a soft and cool feel of a happy leaf. When you have a high concentration of salts in solution (or in the root medium) compared to lower salinity levels found in the plant?s tissue, water is actually drawn out of the plant across the root gradient in order to fix the ppm imbalance. IOW, this is a natural, osmotic response that serves to equalize salinity levels on both sides of the root?s epidermal gradient. Back off on the amount and/or frequency of plant food. Too much plant food can also

burn the roots, especially the sensitive root tips, which then creates another set of problems. Note for the bio folks - as soil dries, the concentration of the remaining salts rises further exacerbating the problem.

High Heat: The plant is losing water via it?s leaves faster than what can be replaced by the root system. The leaf responds by leaf margin cupping or rolling (up or down) in order to conserve moisture. A good example is reflected by the appearance of broad-bladed turf grass on a hot summer day, high noon, with low soil moisture levels - the leaf blade will roll in and the grass will take on a dull, greyish-green appearance. Upon sunrise when moisture levels have returned to normal, the leaf blade will be flat. Lower the heat and concentrate on developing a large, robust root system by practicing sound plant culture. An efficient and effective root system will go a long way to prevent heat induced leaf dessication and leaf margin curling. One short episode of high heat is enough to permanently disable or destroy leaf tissue and cause a general decline in the leaves affected, which often occurs to leaves found at the top of the plant located near HID lamps. If the damaged leaf does not fully recover, no matter what you do then one can only look to new growth for indications that the problem has been corrected.

Excess Light: Believe it or not, you *can* give your favorite plant too much light. Cannabis does not receive full sun from sunrise to sunset in its natural state. It is shaded or given reduced light levels because of adjacent plant material, cloudy conditions, rain, dust, twilight periods of early morning and late afternoon, and light intensity changes caused by a change in the seasons. Too much light mainly serves to bleach out and destroy chlorophyll as opposed to causing leaf cupping, but it often goes hand-in-hand with high heat for indoor growers. Again, back off on the light and concentrate on developing/maintaining an efficient and robust root system.

Over-watering: This practice only serves to weaken the root system by depriving the roots of proper gas exchange. The roots are not getting enough oxygen which creates an anaerobic condition causing root decline and root rot with the end result showing up as leaf stress, stunted growth, and in severe cases, death. A lot of times growers think the plant is not getting enough plant food (which it can't under such adverse conditions), they add more nutrients for

a "curative", and just add insult to injury.

Under-watering: Not only is the plant now stressed due to a low supply of adequate moisture, but carbohydrate production has been greatly compromised. Step up the watering frequency, and if need be, organic growers may need to water from the bottom up until moisture levels reach a norm throughout the medium. If the pot feels light to the lift - it's time to water. Don't wait until the soil pulls away from the sides of the pot or leaves droop before you water. And of course, leach once in a while to get rid of excess salts.

Flowers

It goes without saying that flowers are what growing marijuana is all about. They are the only part of the plant that contains high enough concentrations of psychoactive compounds to be used without additional processing after drying. Flowers are also critical to seed production and the continuation of the species.

White Pistils Turn Purple/Red/Orange: This is not a problem and means you have done something right. It is common for pistils to change color if they are not pollinated.

Flowers are Stunted with Hard Bumps between Pistils: Your plant is likely pollinated. The bumps are seeds!

Internode Spacing is Wide and Buds are Airy: This is probably caused by a wide variation between your daytime and nighttime temperature. If using lights indoors you can do a number of things to keep temperature under control: The simplest adjustment is to make sure your lights run at night when it is coolest and are off during the day.

White Fluffy or Powdery Coating on Buds: Don't mistake this with the sparkling trichomes crystals that will coat the flowers and the surrounding leaves in a fairly uniform manner. This is either mold or it looks whispy and weblike may be a pest. Either way it must be removed from your garden. If it's identified a pest then please refer to pest section but if its powdery mold remove it from your garden immediately. Do NOT smoke or eat moldy bud you

could get sick and may even die.

Buds Are Small: The buds are the culmination of the entire grow and their size will reflect literally everything else you have done. For big buds you need healthy roots that deliver lots of nutrients. You need to deliver proper nutrient levels. You need to supplement CO2 during flowering and have proper ventilation when not supplementing. Temperature control is crucial. You also will need to prune your plants properly, removing smaller growth with little potential so that your plants may concentrate on the main bud or buds.

Buds Aren't Sticky/Resinous: The flowers simply aren't ready yet. Let them develop a little bit longer. An early finishing strain will take a full eight weeks of flowering and some strains will take twelve weeks. Give your plants the time they need to mature.

Harvested Flowers: Many people mistakenly believe that they are done when they harvest their flowers but in many ways the challenge is only started. Now you have a big pile of potentially usable bud and must treat and tend it to completion with out problems, especially mold.

Crispy Crumbly Buds: You simply let your bud dry too much and probably too fast. Employ a re-moisturizing strategy.

Pliable Stems with Dry Bud: There is likely more moisture on the inside. Depending on just how dry the bud is you could move on to the curing stage using a slow cure to draw the moisture out from the center of the plant, or let it dry longer.

Powdery or Whispy Tendrils in Flowers: This is mold/mildew. You need to let your buds get more air. Do not try to save or smoke moldy bud.

Buds Smell and Taste Like Hay/Lawn: Characteristic of immature bud. This can often be solved with a long slow proper cure.

Buds Burn down to a Hard Black Ash: Too much phosphorus was left in the plant during flowering. A slow dry and long cure will help. Next time do a proper

flush before harvest.

Harsh Smoke: Proper slow drying and curing will give you a smooth smoke.

Clones

Clones require tender care and love during their early stages of development. Many growers encounter problems with these delicate entities.

Wilting Clones: If your clones are wilting make sure they're firmly seated in the medium. If they are "too firmly" seated, you may have bent or broken the stem and stopped water uptake. Make sure that the lights aren't too bright, fluorescents are all that's needed. Next time, an anti-transpiration spray will greatly reduce wilting - they form a waxy barrier that keeps water inside the cutting.

Also, the cuttings may be too large with too much leaf mass. You can trim off the half of the fan leaves to reduce area or take smaller cuttings.

Be sure to monitor closely the ambient air temperature as anything above 80°F(26.6°C) is starting to get too hot and this will serve to accelerate both transpiration and the drying out of your grow medium.

Yellowing Leaves on Cuttings: A lot of times clones will start to turn yellow. When trying to root, some yellowing is fine but if the yellowing is taking over and roots have not shown then you need to check to make sure the growing medium is close and tight to the stem. Allowing *any* air to get down into the hole will dry out the lower stem and can delay roots growing. Also making sure the medium is moist but not saturated is very important.

Lighting does not have to be very close when your clones are un-rooted, after showing roots is when it's important and the light moves closer.

Plain tap water that is pH adjusted is just fine till the clones have rooted. Giving any nutrients will kill them until they have been rooted, even then when giving clones nutrients for the first time needs to be a little bit weak.

When using a humidity dome for cloning, you want to make sure if you do mist your plants, do not mist them heavily - you don't want to spoil your plants. Misting too heavy will delay rooting.

If the temperature in the medium where the roots are at is under 65°F(18.3°C), you'll want to use a heating mat. Temperatures of around 75-80°F(23.8-26.6°C) are optimal. Anything over 80°F(26.6°C) will cause transpiration and dry out your medium to quickly and roots will not have a decent chance of growing. Colder temperatures cause roots to slow, causing yellowing in the leaves and severe stunting.

Yellowing on the leaves of a clone is not always a sign of cold temperatures, there could be other problems such as growth medium being too saturated, roots being delayed from cloning method, water temperatures being to warm if using a bubble cloner, etc. Leaves that turn yellow on clones essentially mean it is using stored nutrients from the leaves to help it try to root. Clones that become cold before having a chance to root will less likely root at all.

Some strains are more difficult to clone than others, some can also root faster and some can take much longer. It seems Indica dominant strains have a much easier time cloning, whereas Sativa dominant strains are pickier and require "tweaking" your cloning method if you want to get a higher success rate.

Seedlings Stretching: If your plants are stretching than it can be caused by a few things. Not enough light exposure, lighting not close enough, or it's the wrong kind of light. Stay away from incandescent bulbs as they tend to produce more heat than good. Same goes for halogens; they are worthless and cause more heat than anything else. Instead get a HPS(High Pressure Sodium), MH (Metal-Halide), Fluorescent Tubes, or some compact fluorescents!

HPS lighting will keep your plant short and stubby while cool florescent tubes and compact florescent(blue spectrum) and MH will keep your plant bushy, while soft white will keep your plant tall, having a mixture will have tall and bushy plants! Nothing wrong with having mixed spectrums! Or if you can safely, just go grow outside and save energy.

If you are growing in hydroponics its good to change your water every 2 weeks TOPS to keep out bacteria growth and to keep your plants with a good supply of fresh water.
A good rule to go by for how much PPM each part of your plants growth has is as follows:

(This is just a guideline and in different situations the ppm would need to be changed)

-Seedlings should be around 50-150 PPM
-Unrooted clones to be around 100-350 PPM
-Small plants to be around 400-800 PPM
-Large plants to be around 900-1800 PPM
-Last week of flowering use plain water.

If you see dark or patchy spots on your leaves, that could mean you have mold. Check for dark patchy areas on the leaves and if you do have mold, lower the humidity and get a better ventilation setup going to prevent further occurrences.

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

Water

Water is a major factor when growing healthy plants. Not only do plants require large amounts of water, there are also many different specific kinds of water to use. Bottled water, tap water, Reverse Osmosis water(RO), purified water, and distilled water.

Out of all these different kinds of water sources, the most important factor is that you avoid sodium at all costs. Sodium will completely lock out any nutrients you have given your plants. Sodium is the first thing plants take in when uptaking nutrients. When this happens, a buildup of salts occur and locks out nutrients in your soil/hydro setup; resulting in weak buds and stunted growth. Using a water that has sodium, like from bottled water, tap water, or from a water softener, is exactly what you want to stay away from.

Plants suffering from sodium toxicity show a vast amount of problems, dependent upon how resilient your strains are, and how healthy your plants are overall. These factors play a great deal in the final outcome. Marijuana plants are most susceptible to this under 3 weeks of age. Sodium causes stunting droopiness and most of the time, nitrogen, magnesium and calcium are the nutrients to be locked out first; twisting and discoloration on the leaves, mostly lower to middle is where it starts.

They will always have a droopy look to them even when your soil is kind of dry; the leaves never stay perky when there is too much sodium in the system(soil ad hydroponics alike). Sometimes your plants will not recover and they unfortunately wont grow - usually it's the younger plants less than 3 weeks of age. In order to fix this problem you need to flush your soil out with a lot of clean sodium free water.

Flush with as much clean water as you can with a volume of 2x the amount of the size of your container. So if you have a 2 gallon size pot; use 4 gallons of water to flush it out. If you are using hydroponic system flush out your system with clean water & let it sit for about 15 min. Shortly after, flush it out and put more clean water in, then you can apply your nutrients.

Hard Water: Hard water causes nutrients to not be absorbed properly in your plants, in order to find out if you have hard water you can by test strips from a pool store or hardware store. Strips will tell you pH levels, mineral content and any other things that may be lurking in your water. Anything over 200ppm is considered to be "hard" water, but it's the higher numbers like 350ppm and beyond that you need to be concerned with. If you do have hard water, you may want to consider installing a reverse osmosis system. Reverses osmosis systems not only clean the water, but also removes the calcium and magnesium and other mineral deposits from pipes and other questionable sources. High levels of calcium and magnesium are what primarily contribute to hard water. If you choose to use a reverse osmosis, you will need to supplement your plants with a little more calcium and magnesium to make up for the slight loss.

PH Problems: Too high or too low a PH can lock up nutrients in the form of indissoluble 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 critical nutrients. This type of problem is seen more often in soil mixes, where inconsistent mixing of the medium's components leads to "hot" spots.

One of the first signs of having a slight PH problem is your plant having part of its leaves twisty and spotty with brown, yellowish, red spots within each other. Sometimes they don't have to have all the colors, they could just be spots that have yellowish brown, or just reddish brown and can happen anywhere on the plant. These discolorations mainly start on big fan leaves then move on to little leaves.

Nutrient Problems

Marijuana plants are very adaptable, but a general rule of thumb is to use more nitrogen & less phosphorous during the vegetative period, and the exact opposite during the flowering period. For the vegetative period try a N:P:K ratio of about 10:7:8 (which of course is the same ratio as 20:14:16), and for flowering plants, 4:8:8. Check the pH after adding nutrients. If you use a reservoir, keep it circulating and change it every 2 weeks.

A general guideline for TDS levels is as follows: seedlings = 50-150 ppm; unrooted clones = 100-350 ppm; small plants = 400-800 ppm; large plants = 900-1800 ppm; last week of flowering = taper off to plain water.

These numbers are just a guideline, and many factors can change the actual level the plants will need. Certain nutrients are "invisible" to TDS meters, especially organics, so use TDS level only as an estimate of actual nutrient levels. When in doubt about a new fertilizer, follow the fertilizer's directions.

Incorrect feeding of your plants can cause nutrient toxicity or nutrient deficiencies.

Function of Elements in Plant Health

Boron(B): Stimulates cell division, flower formation and pollination.

Calcium(Ca): Raises soil pH; promotes root hair formation and early growth.

Chlorine(Cl): Needed for photosynthesis; stimulates root growth and aids water circulation in plants.

Cobalt(Co): Improves growth, water circulation, and photosynthesis.

Copper(Cu): Stimulates stem development and pigment formation.

Iron(Fe): Stimulates the formation of chlorophyll and helps oxidize sugar for energy; also necessary for legume nitrogen fixation. It regulates the respiration of the plant's cells.

Magnesium(Mg): Aids in chlorophyll formation and energy metabolism; it increases oil production in flax and soy beans; helps regulate uptake of other elements. It also promotes healthy, disease-resistant plants. It is generally available in acidic soils.

Manganese(Mn): Necessary for the formation of chlorophyll.

Molybdenum(Mo): Needed for nitrogen fixation and nitrogen use in the plant; stimulates plant growth and vigor much like nitrogen.

Nitrogen(N): Necessary for chlorophyll and genetic material (DNA & RNA) formation; stimulates green, leafy growth.

Phosphorous(P): Necessary for genetic material (DNA & RNA) formation; stimulates fruit, flower and root production, and early season growth; increases disease resistance.

Silicon(Si): Increases number of seeds; strengthens cell walls of plants.

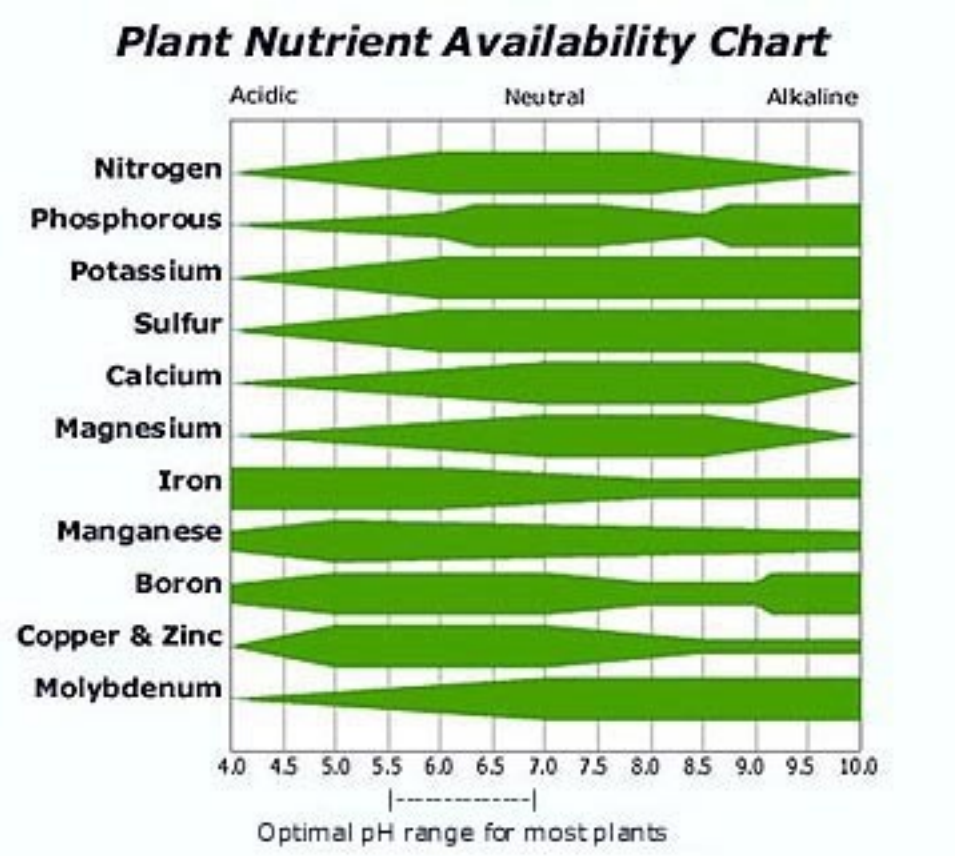
Sodium(Na): Increases resistance to drought; increases sugar content in some crops.

Sulfur(S): Aids in formation of certain oil compounds that give specific odors to some plants such as onions, garlic, mustard, etc; increases oil production in flax and soy beans.

Zinc(Z): Stimulates stem growth and flower bud formation.

Mobile Elements & Macro Nutrients

Mobile Elements are mostly going to affect the older leaves first then work their way to other leaves. Following this, the nutrients will be taken from old leaves to assist in newer growths. Mobile elements are more likely to exhibit visual deficiencies in the older leaves, primarily due to the heavy resource demand on newer foliage development.



SYMPTOMS	N	P	K	Ca	S	Mg	Fe	Mn	B	Mb	Zn	Cu	Over Fert.
Yellow Upper Leaves	No	No	No	No	Yes	No	Yes	No	No	No	No	No	No
Yellow Middle Leaves	No	No	No	No	No	No	No	No	No	Yes	No	No	No
Yellow Lower Leaves	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	No	No
Red Stems	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	No	No
Necrosis	No	No	Yes	No	No	Yes	No	Yes	Yes	No	No	Yes	No
Spots	No	No	No	No	No	No	No	Yes	No	No	No	No	No
Growing Shoots Die	No	No	No	No	No	No	No	No	Yes	No	No	No	No
White Leaf Tips	No	No	No	No	No	Yes	No	No	No	No	Yes	No	No
Stunted Growth	Yes	Yes	No	Yes	No	No	No	No	No	No	No	No	No
Deformed New Growth	No	Yes	No	No	No	No	No	No	No	No	No	No	No
Yellow Tips	No	No	No	No	No	No	No	No	No	No	No	No	Yes
Twisted Growth	No	No	No	No	No	No	No	No	Yes	No	No	No	No

Nitrogen (N) - Mobile Element and Macro Element

Necessary for all phases of plant growth. 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.

Nitrogen plays a key role for your plants; it is directly responsible for production of chlorophyll, photosynthesis, and amino acids(which are the building block of Proteins). These myriad of enzymes help the plants growth in terms of leaf and stem development and the how well the vigor of your plants is.

Symptoms of a Nitrogen Deficiency: 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, and these leaves may die and drop. Leaf margins will not curl up noticeably. Chlorosis will eventually spread throughout the plant. Stems, petioles and lower leaf surfaces may turn purple. Little new growth, yellow leaves: this being more pronounced in older leaves. Earlier fall leaf drop. New shoots may be red to red-brown.

Symptoms of a 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. Breakdown of vascular tissue restricting water uptake. Stress resistance is drastically diminished.

Nitrogen Deficiency Solution: For a quick fix you can make weekly foliar applications of fish emulsion or manure tea. Over the long-term apply aged compost, manure, soybean meal or cottonseed meal to the soil once in Spring. Seaweed extract will improve the soil environment thus giving nitrogen fixing bacteria a boost.

A good solid N-P-K ratio will fix any nitrogen deficiency. Any chemical or organic fertilizers that have Nitrogen in them will fix a nitrogen deficiency., Peters all purpose plant food 20-20-20 is good, Miracle grow All purpose plant food, Miracle grow Tomato plant food(only mixing at ½ strength when using chemical nutrients, or it will cause nutrient burn!), as well and blood meal. If you need to give your plants a quick solution to nitrogen and you want to use blood meal, I suggest making it into a tea for faster use, where blood meal is slow acting, but when made into a tea it works quicker! Other sources of nitrogen are dried blood, cotton seed meal which is slow acting, insect eating bat guano which is fast acting. Bone meal is a gradual absorption when not made into a tea(also an excellent source of phosphorus). Fish Meal Or Fish Emulsion is a good source of nitrogen and is medium acting. Worm castings are good; gradual absorption. Seabird guano, All purpose Millennia Seabird Guano, Original Seabird Guano All Purpose, Crabshell(slow absorption), Fox Farm Grow Big(fast acting) can help with Nitrogen deficient plants and bring down your pH as well.

Here are a list of things that fix a Nitrogen Deficiency:

Chemical Nutrients

Advanced Nutrients Grow (2-1-6)
Vita Grow (4-0-0)
BC Grow(1.2-3.2-6.5)
GH Flora Grow (2-1-6)
GH Maxi grow (10-5-14)
GH floraNova grow (7-4-10)
Dyna gro Grow (7-9-5)

Organic Nutrients

Dr. Hornby's Iguana Juice Grow (3-1-3)
Advanced Nutrients Mother Earth Grow (1.5-.75-1.5)
Earthjuice Grow (2-1-1),
Pure Blend Pro (3-1.5-4)
Bone Meal(0-10-0)
Blood Meal(12-0-0)

Fish Emulsion (5-1-1)
Seabird Guano (11-13-3)
Crab Shells(2.5-3.0-.5)
Pure Blend Grow (0.4-.01-.5)
Marine Cuisine (10-7-7)
MaxiCrop Seaweed (1-0-3)
Super Tea (5-5-1)
Mexican Bat Guano (10-2-0)
Sea Island Jamaican Bat Guano (1-10-0)
Kelp Meal (1-0-2)
Seaweed Plus Iron
Neptune's Harvest (2-4-0.5)
Alaska Start-Up(2-1-2)
Bio-Grow (1.8-0.1-6.6)
Age old Grow (12-6-6)
AGE Old Kelp (.30-.25-.15)
Neptune's Harvest (2-4-1)
Maxicrop Seaweed(.1-0-1)
METANATURALS Organic grow (3-3-3)
METANATURALS Organic nitrogen (16-0-0)

So adding any one of the compounds listed above should fix your nitrogen deficiency! Nitrogen deficient plants usually recover in about a week, affected leaves will not recover.

Note: Blood Meal, Dried Blood, Guanos, Kelp Meal, Cotton Seed Meal, Peat Moss, Sulfur and fish meal are all acidic and can bring your ph down, so if you add these please monitor your ph when using those.

Bone Meal, Rock Phosphate, Wood Ashes pretty much all ashes, Shellfish Compost and Crab Meal are all alkaline and can make your ph go up, so if you add any of these please monitor your ph.

Nitrogen Toxicity Solution: 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 Nitrogen-deficient late in flowering for best flavor.

Phosphorus (P) - Mobile Element and Macro Element

Necessary for strong stems, fruiting, rooting and seed making.
Phosphorus is a component of certain enzymes and proteins, adenosine triphosphate(ATP), ribonucleic acids(RNA), deoxyribonucleic acid (DNA) and phytin. ATP is involved in various energy transfer reactions, and RNA and DNA are components of genetic information.

Symptoms of a Phosphorus Deficiency: 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 deficient plants exhibit slow growth 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. Plants deficient in Phosphorus will exhibit an overall dark green with purple, blue or reddish cast to leaves particularly on underside, veins and stems and some plants respond to lack of P with yellowing. Foliage may be sparse, small and distorted becoming mottled and bronzy with maturity. Very distinctive symptoms. Excess foliage with no flowers can also indicate lack of (P). 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.

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

Phosphorus Deficiency Solution: Lower pH to 5.5 – 6.2(hydroponics), 6 -7 clay soils, 5.5 – 6.5 potting soils. Some deficiency during flowering is normal, but too much shouldn't be tolerated. Any chemical or organic fertilizers that have Phosphorus in them will fix a Phosphorus deficiency. A quick fix is to spray plant weekly with fish emulsion until symptoms quit. Apply a light soil dressing of wood ashes. Incorporate aged compost into the soil to boost microorganisms.

Your long term strategy is to mix rock phosphate or aged manure into the soil in Fall. If you have a phosphorus deficiency you should use any N-P-K ratio that is over 5. Again, Peters all purpose 20-20-20 is a good mix. Miracle grow Tomato

plant food, Miracle grow All purpose plant food(only mixing at ½ strength when using chemical nutrients, or it will cause nutrient burn!). Other forms of phosphorus supplements are: Bone meal, which is gradual absorption, I suggest making it into a tea for faster use, where bone/blood meal is slow acting, but when made into a tea it works quicker! Fruit eating bat guano, which is fast absorption, worm castings, which is gradual absorption, fish meal, which is medium absorption; soft rock phosphate, which is medium absorption, Jamaican or Indonesian guano, which is fast absorption. Crabshell, which is slow absorption. Tiger Bloom also works, which is fast absorption.

Here is a list of compounds to help fix a Phosphorus Deficiency:

Chemical

Advanced nutrients Bloom (0-5-4)
Vita Bloom (0-7-5)
BC Bloom (1.1-4.4-7)
GH Flora Bloom (0-5-4)
GH Maxi Bloom (5-15-14)
GH Floranova Bloom (4-8-7)
Dyna-Gro Bloom (3-12-6)
Fox Farm Tiger Bloom (2-8-4)
Awsome Blossums

Organic

Dr. Hornby's Iguana Juice Bloom (4-3-6)
Advanced Nutrients Mother Earth Bloom (.5-1.5-2)
Fox Farm Big Bloom (.01-.3-.7)
Earth Juice Bloom (0-3-1)
Pure Blend Bloom (2.5-2-5)
Pure Blend Pro Bloom (2.5-2-5)
Buddswell (0-7-0)
Sea Island Jamaican Bat Guano (1-10-0)
Indonesian Bat Guano (0-13-0)
Rainbow Mix Bloom (1-9-2)

Earth Juice Bloom (0-3-1)
Bio Bloom (2-6-3.5)
Age Old Bloom (5-10-5)
Alaska Morbloom (0-10-10)
Metanaturals Organic Bloom (1-5-5)

Any of these will cure your phosphorus deficiency. Affected leaves will not show recovery but new growth will appear normal.

Note: Blood Meal, Dried Blood, Guanos, Kelp Meal, Cotton Seed Meal, Peat Moss, Sulfur and fish meal are all acidic and can bring your ph down, so if you add these please monitor your ph when using those.

Bone Meal, Rock Phosphate, Wood Ashes pretty much all ashes, Shellfish Compost and Crab Meal are all alkaline and can make your ph go up, so if you add any of these please monitor your ph.

Phosphorus Toxicity Solution: If you added to much chemical fertilizers and or organics,(which is hard to burn your plants when using organics) You need to Flush the soil with plain water. You need to use 2 times as much water as the size of the pot, for example: If you have a 5 gallon pot and need to flush it, you need to use 10 gallons of water to rinse out the soil good enough to get rid of excessive nutrients.

Potash/Potassium (K) - Mobile Element and Macro Element

Potassium is necessary for strong root systems and for forming starch, protein and sugar. Potassium is involved in maintaining the water status of the plant as well as regulating the 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 severely reduce yield and quality.

Symptoms of a Potassium Deficiency: Sickly looking plants, undersized fruits, leaves showing marginal and interveinal yellowing. Yellowing starts on older leaves and progresses upwards. Leaves may crinkle, turn brown and roll upwards. Blossoms may be distorted and small. Plant has little resistance to

heat, cold and disease problems. Potash deficiency is mostly in the upper levels of soil.

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.

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 cold environmental conditions.

Potassium 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.

Potassium Deficiency Solution: For a quick fix you can spray plant weekly with fish emulsion until symptoms quit. Over the long term apply seaweed, manure, granite dust or greensand to the soil in fall. Hardwood ashes may be applied to soil anytime. Any Chemical/Organic nutrients that have potassium in them will fix a potassium deficiency, but set the pH to 6.5 before application. Again Peters All Purpose plant food 20-20-20, will cure the potassium deficiency, Miracle grow Tomato plant food, Miracle grow All purpose plant food(only mixing at ½ strength when using chemical nutrients, or it will cause nutrient burn!). Some other supplements of potassium are: Wood ashes, which are fast absorption, Kelp Meal, which is medium absorption, Greensand, which is slow absorption, granite dust, which is slow absorption. Sulfate of Potash, Sulfate of Potash Magnesia, Muriate of Potash, which are all medium absorption. Foxfarm Growbig which is fast absorption (FFGB can bring your ph down as well). Earth Juice Meta-K, which is fast acting (can also serve tobring down your ph level as well).

Leaves will never recover, but the plant will show recovery after about 4 to 5 days when using a fast acting nutrient.

Note: Wood Ashes can make your ph go up, so please monitor your ph whenever utilizing it.

Potassium Toxicity Solution: If you added too many chemical nutrients and/or organics, you need to flush the soil with distilled water. You need to use 2 times as much water as the size of the pot, for example: If you have a 5 gallon pot and need to flush it, you need to use 10 gallons of water to rinse out the soil good enough to get rid of excessive nutrients.

Magnesium (Mg) - Micronutrient and Mobile Element

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

Symptoms of a Magnesium Deficiency: A lack of magnesium is characterized almost identically with iron deficiency but the older leaves, generally at the bottom of the plant, show marginal and interveinal reddening or yellowing with leaf base and midrib staying green. Later in the season interveinal necrosis may occur. Leaves may be brittle and thin with leaf curling and stunted growth. In the Fall as temperatures cool plants are unable to take up Mg and leaves will turn a purple color.

Magnesium deficient cannabis 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. The tips may also twist.

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

Magnesium Deficiency Solution: Epsom salts(magnesium sulfate) can be used for magnesium deficiency. You can use it watering with a mix of 1-2 teaspoons or Epsom salts dissolved in 1 gallon of water or using the mix as foliar spray. Make 3 applications 6 weeks apart. Other treatments include adding fish meal, basic slag, greensand or dolomitic limestone. 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. Keep soil pH above 6.5, keep hydroponic pH above 5.5, and lower EC for a week.

If the starting water is above 200 ppm(this hard water will lock out mg due to the excess calcium). Either add a 1/4 teaspoon per gallon of epsom salts or lime(both will effectively reduce the lockout or better still; 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 inevitably lock up other nutrients.

Any Chemical/Organic nutrients that have Magnesium in them will fix a Magnesium deficiency(only mixing at ½ strength when using chemical nutrients or it will cause nutrient burn!) Other nutrients that have magnesium in them are: Epsom salts(fast absorption). Dolomite lime and or garden lime, which is slow absorption. Sulfate of Potash, Magnesia which is medium absorption. Worm Castings, which is slow absorption. Crabshell which is also slow absorption. Earth Juice Mircoblast, which is fast acting.

Magnesium Toxicity Solution: If you added too many chemical nutrients and/or organics(it is hard to burn your plants when using organics), then you need to flush the soil with plain water. You need to use 2 times as much water as the size of the pot, for example: If you have a 5 gallon pot and need to flush it, you need to use 10 gallons of water to rinse out the soil good enough to get rid of excessive nutrients.

Zinc (Zn) - Micro Nutrient and Immobile Element

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.

Symptoms of a Zinc Deficiencies: Zinc deficiencies are mainly found on sandy soils low in organic matter and on organic soils. Zinc deficiencies occur more often during cold, wet Spring weather. New and intermediate leaves are small, yellow, sometimes with a grayish cast. Narrow and older leaves may drop. Small shoots may show rosetting followed by dieback. Test the soil for a pH Imbalance, making sure that the pH is between 5.8 and 6.2. A pH imbalance can inhibit the absorption of zinc and other nutrients.

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

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.

A Zinc deficiency may also produce "rosetting"; the stem fails to elongate behind the growing tip, so that the terminal leaves become tightly bunched.

Zinc Deficiency Solution: Use fertilizers that generate acidity. Organic compounds such as zinc chelates(zinc EDTA and zinc NTA) are about five times more effective than inorganic salts with equivalent amounts of zinc.
Apply aged organic manure.

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.

Zinc Deficiency Solution: Any Chemical/Organic nutrients that have potassium in them will fix a Zinc deficiency. (Only mixing at ½ strength when using chemical nutrients or it will cause nutrient burn!)
And any of the following nutrients will fix a zinc deficiency: Zinc sulfate, zinc chelated, or zinc oxides are adequate fertilizer sources for zinc. Or you can bury galvanized nails in the soil. (Make sure you take off the sharp point at the end to prevent roots from being damaged) Garden Manure, which is slow acting. Greensands, Cottonseed Meal are both medium/slow absorption as well.

Zinc Toxicity Solution: If you added excess chemical nutrients and/or organics(it is hard to burn your plants when using organics), then you need to flush the soil with plain water. You need to use 2 times as much water as the size of the pot, for example: If you have a 5 gallon pot and need to flush it, you need to use 10 gallons of water to rinse out the soil good enough to get rid of excessive nutrients.

Sulfur (S) - Micro Nutrient and Immobile Element

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.

Symptoms of a Sulfur Deficiency: Leaves are pale yellow-green at any stage of development. Shoots are stunted. Similar to chlorosis. Perform a soil test; correct as necessary. 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. Upper stems of plant may appear 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 .

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

Sulfur Deficiency Solution: Lower pH to 5.5 – 6. Add sulfur or potassium sulfate as necessary. Use caution when applying sulfur compounds, however. Too much sulfur ("sulfur toxicity") appears as veinal chlorosis followed by rapid defoliation of the lower leaves. Mix 1-2 teaspoons of Epsom salts per gallon of water until condition improves. Any Chemical/Organic nutrients that have Sulfur in them will fix a Sulfur deficiency(only mixing at ½ strength when using chemical nutrients or it will cause nutrient burn!) Other sulfur nutrient supplements are: Rain water, Ammonium Thiosulfate(all are fast absorption). Garden Sulfur, Sulfate of Potash, and Gypsum work wonders as well.

Note: Caution when using gypsum to an already acid soil (pH that is less than 5.5) can have a very bad effect on different types of plants by affecting the absorption of soil aluminum, which is poison to plant roots.

Sulphur Toxicity Solution: If you added excess chemical nutrients and/or organics(it is hard to burn your plants when using organics), then you need to flush the soil with plain water. You need to use 2 times as much water as the size of the pot, for example: If you have a 5 gallon pot and need to flush it, you need to use 10 gallons of water to rinse out the soil good enough to get rid of excessive nutrients.

Calcium (Ca) - Macro Nutrient and Immobile Element.

Calcium plays an important role in maintaining cell integrity and membrane permeability.

Symptoms of a Calcium Deficiency: Young leaves are small and distorted with curled back leaf tips. Shoots may be stunted and show some dieback, roots will be stunted. These young leaves are affected first and become small and distorted or chlorotic with irregular margins, spotting or necrotic areas. Bud development is severely 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.

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.

Calcium Deficiency Solution: To fix a calcium deficiency you can treat by foliar feeding with one teaspoon of dolomite lime or garden lime per quart of water. Also, any Chemical/Organic nutrients that have Calcium in them will fix a Calcium deficiency(only mixing at ½ strength when using chemical nutrients or it will cause nutrient burn!). You can also take crushed up dolomite lime or garden lime in a gallon of water and water it in the soil. 1 to 2 teaspoons per gallon of water, which will be slow acting. Garden Gypsum, which is medium absorption. Limestone, which is medium absorption, Rock Phosphate and Animal wastes which are both medium/slow absorption.

Note: Caution when using gypsum to an already acid soil (pH that is less than 5.5) can have a very bad effect on different types of plants by effecting the absorption of soil aluminum, which is poison to plant roots.

Calcium Toxicity Solution: If you added excess chemical nutrients and/or organics(it is hard to burn your plants when using organics), then you need to

flush the soil with plain water. You need to use 2 times as much water as the size of the pot, for example: If you have a 5 gallon pot and need to flush it, you need to use 10 gallons of water to rinse out the soil good enough to get rid of excessive nutrients.

Iron (Fe) - Micro Nutrient and Immobile Element

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.

Symptoms of an Iron Deficiency: New leaves are the most symptomatic and when condition is most severe they can be all yellow or white but still have green veins. Overall you see yellow leaves with green veins leading to marginal scorching or browning of leaf tips. Tip leaves, especially basal areas of leaflets, intense chlorotic mottling; stem near tip also yellow. Fruits have poor color. Shoot diameter is small. Iron deficit often occurs when the soil pH is higher than 7.5 meaning it is more alkaline. Lack of Fe is common in plants living next to concrete walls, foundations etc. Perform a soil test; correct soil pH to 7.0 or lower. Pronounced interveinal chlorosis similar to that caused by magnesium

deficiency but on the younger leaves as well as leaves exhibit chlorosis (yellowing) of the leaves mainly between the veins, starting with the lower and middle leaves.

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

Iron Deficiency Solution: Lower soil pH to 6.5 or less. Avoid fertilizers that contain excessive manganese and Zn. In iron-deficient soils, add bone meal or blood meal organic amendments, or add iron sulfate or chelated iron liquid or granular inorganic amendments. For a quick fix you can apply chelated iron directly to soil or as a foliar spray. Over the long-term improve the soil by adding 1-2 inches of compost in the spring every year. Any Chemical/Organic nutrients

that have potassium in them will speedily fix a Iron deficiency(only mixing at ½ strength when using chemical nutrients, or it will cause nutrient burn!). Foliar feed with chemical fertilizer containing Fe or rusty water can work well. Other supplements that have Iron in them are; Iron chelates, Ferric oxide, Ferrous oxide, Ferrous sulfate, all of these are fast absorption. Greensand, Cottonseed Meal is slow absorption, Garden Manure, which is medium absorption. Manure is most common organic iron source to use.

An Iron Deficiency is also 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 or less(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.

Iron Toxicity Solution: If you added excess chemical nutrients and/or organics(it is hard to burn your plants when using organics), then you need to flush the soil with plain water. You need to use 2 times as much water as the size of the pot, for example: If you have a 5 gallon pot and need to flush it, you need to use 10 gallons of water to rinse out the soil good enough to get rid of excessive nutrients.

Manganese (Mn) - Micronutrient and Immobile Element

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.

Symptoms of a Manganese Deficiency: Similar to a Nitrogen deficiency, leaves display marginal scorching, rolling and reduced width. Yellowing may also occur between leaf veins or total yellowing on youngest leaves.

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: Chlorosis, or blotchy leaf tissue due to insufficient chlorophyll synthesis. Growth rate will slow and vigor will decline.

Manganese Deficiency Solution: Perform a soil pH test; correct to 6.5 or lower. In deficient soils, add millorganite or houorganite treated sludge organic amendments, or add manganese sulfate inorganic amendments.

Foliar feed with any chemical fertilizer containing Mn, or mix with water and water your plants with it. Any Chemical/Organic nutrients that have Manganese in them will fix a Manganese deficiency(only mixing at ½ strength when using chemical nutrients or it will cause nutrient burn!). Other nutrients that have Manganese in them are; Manganese chelate, Manganese carbonate, Manganese chloride, Manganese dioxide, Manganese oxide, Manganese sulfate, which are all fast absorption. Garden Manure, Greenssand are both good sources of manganese and are medium/slow absorption.

Manganese Toxicity Solution: If you added excess chemical nutrients and/or organics(it is hard to burn your plants when using organics), then you need to flush the soil with plain water. You need to use 2 times as much water as the size of the pot, for example: If you have a 5 gallon pot and need to flush it, you need to use 10 gallons of water to rinse out the soil good enough to get rid of excessive nutrients.

Chloride (Cl)

Chlorine is involved in the evolution of oxygen in the photosynthesis process and is essential for cell division in roots and leaves. Chloride raises the cell osmotic pressure and affects stomata regulation and increases the hydration of plant tissue.

Symptoms of a Chloride 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.

Chloride Toxicity: Burning of leaf tip or margins. Bronzing, yellowing and leaf splitting. Reduced leaf size and lower growth rate.

Chloride Deficiency/Toxicity Solution: Levels less than 140 ppm are safe for most plants. Chlorine sensitive plants may experience tip or marginal leaf burn at concentrations above 20 ppm.

Boron (B) - Micronutrient and Immobile Element

Boron amounts in the soil is directly proportional to the amount of organic matter. 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.

Symptom of a Boron Deficiency: Youngest leaves may be red, bronze or scorched also small, thick or brittle. New shoot tips may form what is called a witches broom. Stems stiff; terminal buds die and growths die back; lateral shoots developed, giving plant flat top; leaves highly tinted purple, brown and yellow. Fruit and vegetables may have heart rot. Fruits pitted and corky areas in skin; ripening is uneven. Boron deficiencies are found mainly in acid, sandy soils in regions of high rainfall, and those with low soil organic matter. Borate ions are

mobile in soil and can be leached from the root zone. Boron deficiencies are more pronounced during drought periods when root activity is restricted.

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.

Boron Deficiency Solution: Apply household borax at a rate 1 tablespoon borax to 12 quarts of water. This amount will treat a 100 foot row of vegetables or 10 square feet of soil. Apply two times 2-3 weeks apart.

One of the ways you can fix a boron deficiency is to either foliar spray or water accordingly. Treat with one teaspoon of Boric acid (sold as eyewash) per gallon of water (only mixing at ½ strength when using chemical nutrients or it will cause nutrient burn!). Other nutrients that have boron in them are: Borax, Boric Acid, Colemanite, Sodium pentaborate, Sodium tetraborate, which are ALL fast absorption. Garden Manure and Bone Meal are both good boron supplements, but are slow/medium absorption.

Boron Toxicity Solution: If you added excess chemical nutrients and/or organics(it is hard to burn your plants when using organics), then you need to flush the soil with plain water. You need to use 2 times as much water as the size of the pot, for example: If you have a 5 gallon pot and need to flush it, you need to use 10 gallons of water to rinse out the soil good enough to get rid of excessive nutrients.

Copper (Cu)

Copper is a constituent of many enzymes and proteins. Assists in carbohydrate metabolism, nitrogen fixation and in the process of oxygen reduction.

Symptoms of a Copper Deficiency: Copper deficiencies are mainly seen on sandy soils which are low in organic matter. Copper uptake decreases as soil pH increases. Increased phosphorus and iron availability in soils decreases copper uptake by plants. Small leaves with necrotic (dead) spots and brown areas near the leaf tips. Rosetting of the leaves and dieback of terminal shoots. 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.

Copper Deficiency Solution: One way to treat a copper deficiency is by foliar feeding with Copper Sulphate, Cu sulfate, Cu chelates, These three may also be used in soil. Any Chemical/Organic nutrients that have copper in them will fix a copper deficiency(only mixing at ½ strength when using chemical nutrients or it will cause nutrient burn!). Other nutrients that have copper in them are: Granular, Garden Manure, Greensand.

Copper Toxicity Solution: If you added excess chemical nutrients and/or organics(it is hard to burn your plants when using organics), then you need to flush the soil with plain water. You need to use 2 times as much water as the size of the pot, for example: If you have a 5 gallon pot and need to flush it, you need to use 10 gallons of water to rinse out the soil good enough to get rid of excessive nutrients.

Note: Damaged leaves will NOT recover.

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.

Symptom of a Molybdenum Deficiency: 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 have proven toxic so your plant might not be too good to smoke.

Molybdenum Deficiency Solution: One way to fix a Molybdenum deficiency is to foliar spray with Molybdenum, such as Miracle Grow All Purpose plant food and Miracle Grow Tomato Plant Food. These can also be used to mix in with

water as well. (Only mixing at ½ strength when using chemical nutrients, or it will cause nutrient burn!)Other nutrients that have Molybdenum in them are: I think Peters All Purpose Plant food does, as well as Greensand, Lime. Green sand and lime is slow/medium absorption, while Peters All Purpose Plant Food is fast absorption.

Molybdenum Toxicity Solution: If you added excess chemical nutrients and/or organics(it is hard to burn your plants when using organics), then you need to flush the soil with plain water. You need to use 2 times as much water as the size of the pot, for example: If you have a 5 gallon pot and need to flush it, you need to use 10 gallons of water to rinse out the soil good enough to get rid of excessive nutrients.

Sodium (Na)

Sodium encourages 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.

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.

Nickel (Ni)

Nickel is required by plants for proper seed germination. Though Ni deficiency symptoms are not well documented; symptoms include chlorosis(yellowing of plant tissue) and interveinal chlorosis in young leaves that that goes down to plant tissue necrosis(browning and death of plant tissue). Other things are poor seed germination and decreases in crop yield.

Nutritional Lockout

One of the most frustrating difficult common problems growers encounter is Nutritional Lockout. Nutrient Lockout basically occurs when the optimal nutrient levels are not pH and nutritionally balanced so your plants cannot get access to a specific nutrient or group of nutrients it needs, and consequently it develops a deficiency. After being in your tank for 5 or 6 days, and being eaten for 5 or 6 days, the nutrients become imbalanced. Perhaps you are growing plants that ate all the nitrogen first and just snacked around the iron, magnesium and calcium, or vice-versa. It can also be caused by a chemical reaction in the medium/solution that causes a toxic substance to block the roots, or causes a chemical reaction that creates another substance that changes the chemical properties of the other nutrients. There can be many causes, but almost always the results are discoloration in the leaves, yellowing or rust spots, or curling up of leaf tips. It also becomes apparent when your plants were consuming a gallon or half gallon of water every day, and then suddenly when you check the levels the next day, they did not drink any water at all. This is a classic case of Nutritional Lockout.

The 8-Step Complete Nutritional Lockout Remedy

Step 1) Check the roots. If they are discolored, reddish or brown, or present an unpleasant odor, you have a problem. If they are weak, soft or mushy, you have a problem. Also while checking the roots, observe the temperature of the water. If it is warmer than "luke warm" you have a problem. This problem is probably what is referred to as "root rot" or a disease known as PYTHIUM. Remove the dead brown roots by trimming them away with sharp scissors. DO NOT leave them in the tank.

Step 2) Check the humidity and temperature of the grow area below the lights in the "growing zone" when the lights are on. A temperature of above 82°F(27.7°C) or below 67°F(19.4°C) will slow growth, but it is not a serious problem that will kill your plants. Temperatures below 62°F(16.6°C) or above 90°F(32.2°C) will stop growth. An extremely high temperature in the upper 90s or below 58°F(14.4°C) can slowly result in death of your plants. The most efficient temps for growth are between 72-80°F(22.2-26.6°C). Any Humidity between 40% and 60% is acceptable and desirable.

Step 3) Check the "lights off, nighttime" temperature. Most desirable is ten to 10-15°F(-12 to -9.4°C) cooler than the daytime "lights on" temperature, averaging 66-70°F(18.8-21.1°C).

Step 4) Check the distance between the tips of the plant and the tip of the light bulb. If you observe yellowing or leaf curling tips, then move the lights one inch further away. A good rule of thumb if you use HID lights, is hold the soft palm of your hand at the leaf tip and see if the bulb is too warm to your hand. If you use Stealth Hydro's compact fluorescent bulbs, we recommend a distance of three or four inches for the 65 and 85 watt bulbs and 4 inches to five inches for the 105 watt bulbs. More mature plants can handle the bulbs slightly closer.

Step 5) Check the position of your fans. Air movement is very necessary for the health of your plants, but too strong of a fan can cause wind burn. Direct your fan toward the tops of the plants and toward the lights. Never position the fan blowing strongly downward on the leaves.

Step 6) Add 1/4 teaspoon of hydrogen peroxide to a quart of water and add it to the tank of six gallons already in the tank. Wait ten minutes and then turn the water and nutrition solution pump off to prepare to drain the tank. Poor at least a cup of clean water through each grow cup, onto each rockwool cube and through the hydroton rocks.

Step 7) Drain or pump the tank empty as possible without damaging the pump by running it dry. Add two gallons of additional clean water with 1/4 teaspoon of hydrogen peroxide again and then drain it away too. Again, empty the tank as empty as possible without burning up your pump.
Step 8) Add fresh PH balanced water and nutritional packets as prescribed. pH test it again.

Note: The above 8 steps should repair and remedy any health problems that your plants experience within the next two days. Now is the time to try and determine what caused the problem to start with, by investigating and researching typical hydroponics problems and illnesses.

Pests

Pests are a constant threat to any grower be it farm crops, a vegetable garden, or growing marijuana. Parasitic insects have been evolving for millions of years to infest, devour, and destroy plant matter in order to ensure their own proliferating survival. This section will focus on prevention, identification and eradication of blights afflicting marijuana growers today.

As you continue growing, you will sooner or later face pests. Pests are able to destroy all of the plants in your garden if they are in same room. Pests will find your indoor environment to be ideal and full of life-sustaining food. It is crucial to know what pests are attracted most to cannabis, how exactly they thrive, and what the typical symptoms include.

An iilluminated pocket magnifier and daily inspection can save your garden from ruin. Often, pests are hiding on the underside of leaves. In order to get an accurate view of pests and their effects on your plants a magnifier of at least 10x magnification power will be required. Keeping a close watch over your garden is essential to ensure a successful healthy harvest.

Prevention

It has been said over and over that an ounce of prevention is worth a pound of the cure and we cannot reiterate this maxim enough. Prevent outbreak first and foremost, then treat if necessary. Basic cleanliness can help on a massive scale to ensure you never walk up to your garden to have a flood of pests greet you. You work hard and spend your even harder earned money to produce a crop of smoke, don't risk creating a bug buffet by casual laziness. The following are the major rules to follow in basic pest and disease prevention.

Always

-Use compost that has been processed properly. A medium heated to 140°F(60°C) will kill any larvae, eggs and fungus that is residing there. Cutworms eggs are very common in manure and compost; the marijuana plant has no defense against cutworms rampaging through its roots. When properly composted, both mediums reach these temperatures. Check for the seal of a

regulating authority certifying the product.
-Do not use mulch. This easily-accessible, moist, shaded medium is a perfect retreat for incoming pests and fungus. The risk isn't worthwhile.
-Keep outdoor tools outside, and indoor tools inside. If there are parasites in either garden, bringing in foreign object will introduce an infestation into your garden quicker than you can say Mary Jane. Tools used for regular yard work should always be sterilized if brought indoors. Rubbing alcohol, soap and water, or a quick pass with a handheld torch will work best for maximum sterilization.

Outdoors

-Spray regularly with a pesticide targeted at worms and mites. Returning with the regularity necessary to eradicate an infestation is not usually possible. Check the surrounding area for presence of pests and treat preventively. Spraying should commence in early to mid-Summer. This is when the larvae of most pests are becoming fully mobile and airborne. Pesticide should be reapplied every few weeks.
-Companion planting is useful as it discourages insect populations. Transplanting foliage with similar characteristics to cannabis will spread out incoming populations of insects allowing the predatory nature of the outdoors to take its course. Additionally, transplanted companion plants will likely become infected prior to your plants giving you the opportunity to halt their spread before it touches your bud. Please, use common sense and inspect companions before transplanting them. Companion planting is useless indoors as bugs have nowhere else to go.

Indoors

-Keep your grow room a closed space in order to control the environment properly.
-Forced air circulation is one of your chief weapons against bugs. Powerful ventilation with filtration ensures spores and smaller flying insects do not have opportunity to proliferate. Winds created by oscillating fans make it difficult for bugs to hold on or set up nests.
-You should regard outdoor shoes as toxic inside your grow room. They are easily the most disease and pest infested item of clothing you own.
-Wash your hands! Hands are dirty, and you will be coming in direct contact with your bud. Don't come back from a hike in the woods and walk into your

grow room. Don't play in the mud and then decide to check your garden. Wash up!
-Sweep always, mop often, keep debris off your medium. Do not provide tasty snacks to incoming insects, a broom is far cheaper than pesticide.
-If your air intake comes from outside, install a filter designed for heating and cooling systems. These commercial filters are designed to keep pests and disease outside of your grow room.
-Healthy plants will be the best defense you can possibly have. Often marijuana grows quickly enough to outpace pests, especially when healthy.

Identification and Treatment

No matter the preventative measures you engage in, a pest population will infiltrate your crop eventually. For growers with larger gardens, keep your eyes on weak plants! Pests generally tend to infect and flock to one plant first, build up numbers and launch an offensive on every nearby edible object. Most insects lay thousands of eggs during their lifespan of mere weeks. If ten pests lay 100 eggs and their offspring each lay 100 eggs, your pest population has jumped from 10 to 100,000. This can occur within DAYS. Pay special attention to sickly plants, the evolutionary process dictates vulnerability to preying organisms. Using chemicals on plants destined to be inhaled should ALWAYS be used as a last resort. Commercial and chemical pesticide have the creatures they eradicate listed on the label. Remember if you do choose to use chemicals that you will be lighting this stuff on fire and inhaling the smoke. If you have to use a poison, allow sufficient time for the radiation to die down. Use these long before harvest.

There are four methods you can employ to combat pests.

Repression: If the means to exterminate your particular bug isn't immediately available, there are usually countermeasures you can take to slow infestations or decrease numbers of current pests. Taking these countermeasures during treatment further increases the effectiveness of the method you choose to utilize.

Predators: The internet has opened up the world to the grower for specific predatory insects that will dine or destroy others voraciously. Most predators commonly identified in gardens are so specialized that the specific pest is completely defenseless.

Manual Removal: Exactly what it sounds like. Picking the things off, crushing eggs, removing branches that have colonies in place. If caught early enough, manual removal can control pests sufficiently so they will not fully infest your plants.

Spray: When applying pesticide in a spray, ensure you use a spreader sticker. This is any type emulsifier that aids the pesticide in sticking to the leaves and commercial products are readily available for purchase. When your plant is budding this is especially necessary because the leaves of your plants are developing coatings of resin that will shed what you are spraying. If not purchasing a product, a teaspoon of dish soap per gallon of water will work fine. Any type of spray applied to plants will slow its growth temporarily as it will clog the stomata on the underside of leaves. Spraying water 1-2 days after application of a spray can help to clear stomata and aid the plant in resuming vigorous growth.

The prevention sections will be all but useless to the outdoor gardener, however the treatments will be equally effective. Pests are listed alphabetically and predators are identified by exact species to avoid any confusion.

Aphids

Prevention: Aphids are most present indoors when lots are present outdoors. The aphid CAN fly when looking for a new home. Sticky traps placed on the floor near plants and hanging near the top will help discourage their forays indoors.

Identification: Aphids are usually grey but can range to any color. Regardless of their color, aphids will feast on any part of your plant by biting into leaf, stem, and bud alike while sucking the life out of the plant. The first sign of Aphids is usually leaf damage, sometimes holes appear in the leaves, the edges look 'chewed' or the leaves start to 'deform', the plant again wilts and the growth is seriously affected. Once attached, the aphid becomes stationary and fairly easy to spot. A 10-15x magnifier will be sufficient for positive identification. Female aphids do not require mating to reproduce and will excrete a live female

offspring between 3 and 100 times every day. These offspring are hungry! Ants parading around the base of your plant can also be a sign of aphid infestations. Ants naturally farm aphids to feed off their excretions. Aphids suck sap from reaching your plant's tissues causing leaves to wilt and turn yellow. After infestation has progressed you may notice buildup of aphid excretion called honeydew. Aphids thrive on weak vulnerable plants.

(Aphids drink juices out of your plant until the leaf yellows, collapses in on itself, and shrivels.)

Treatment

Repression: If your plant can survive in a set of conditions, the aphid can as well.

Predators: The Lacewing(*Chrysoperia* species) is the most effective and available predator to wipe out aphids. The larvae of this flying insect tear through aphid colonies voraciously. Release 1-20 lacewings per plant depending

on infestation level as soon as aphids appear, their eggs take a few days to hatch. Of course the ladybug is also an excellent predator to the aphid and freely available, especially during summer. Indoor gardeners may choose to utilize the lacewing instead of the ladybug due to its incredible attraction to HID lights. If you indoor boys use ladybugs, plan on 50%(no exaggeration) of them dying immediately from flying directly into the bulb. Within 7-10 days, all the ladybugs will have committed suicide in an HID garden. *Verticillium lecanii* is a fungus that is very aphid specific and effective.

Manual Removal: This is a very effective treatment against aphid infestations. Once the aphid begins feeding it is immobile and easily crushed with fingers or a sponge containing an insecticidal solution.

Spray: Insecticidal soap, pyrethrum(aerosol) and homemade sprays are very effective. Apply two or three times daily at 5-10 day intervals.

Beetle Borers

Prevention: Beetle borers are primarily found in outdoor gardens. Cleanliness and good habits will keep these pests out of greenhouses and indoor grow rooms.

Identification: The beetle borer is the larvae of a large variety of beetles and a particularly nasty pest. These larvae leave entry holes at the base of stalks where they continue chewing through the stems of your plant. A brown trail of death will follow the path of a beetle borer, these pests cause severe enough damage to water transportation systems of plants everything around the trail dies. If the base of branches or heaven forbid the main stem of the plant are infected, death can quickly follow for everything outwards of the trail.

(Note the entry hole on the left of the picture and subsequent trail to the location of the larvae.)

Treatment

Repression: Keeping indoor grows clean is the only countermeasure.

Predators: The borer is a large enough tunneling insect that no effective predator has been identified. Predatory nematodes can help control grubs in the soil but this is a largely preventative measure and not a treatment.

Manual Removal: The best and virtually only way of controlling beetle borers. If damage is sited, follow the trail and cut the borer out of your plant. Oftentimes damage is already done when a beetle borer is located. If the branch or affected area does not bounce back quickly or is obviously done for, remove it with a clean cut from a knife or scissors.

Spray: The beetle borer lives inside the hardy stalks of your plant making sprays nearly useless. Bacillus papillae is a beetle specific fungal powder and can have limited success. If the beetle is in the main stem of your plant and you cannot get to it without endangering the life of your plant, injecting a product called rotenone directly into the stalk with a hypodermic syringe will kill the grub.

Caterpillars & Loopers

(The common cabbage looper.)

(The common garden caterpillar.)

Prevention: These pests are the larval stage of moths and butterflies. Both moths and butterflies take a small measure of time to lay their eggs, easy to spot, and cannot hang on to plants when forced air circulation is employed properly. Loopers and caterpillars are therefore primarily an outdoor pest.

Identification: A caterpillar has lots of legs. Loopers have sets of feet at both ends and arches its back to pull its rear feet forward. These worms can be any color, any size above half an inch, and are the industrial shit machine of the insect kingdom. These worms will chew through leaves, buds, stalks, and even the main stem leaving trails of caterpillar poop wherever they go. Fungus and rot quickly follow when this type of fecal matter is present, caterpillars and loopers are a central figurehead of natural decomposition. Caterpillars and loopers primary damage is mass defoliation. If you feel these pests may be present, a quick spray of pyrethrum followed by a shake to your plant will cause some of them to fall out of wherever they are.

(Caterpillars and Loopers rapidly cause defoliation.)

Treatment

Repression: These worms live in any conditions your plant can, are laid by adult moths and butterflies, and do not reproduce until later in their adult stage. Repress by not letting more moths into your garden!

Predators: The parasitic wasp *Trichogramma* is effective in combating caterpillars and loopers. This wasp, as all parasitic wasps do, lays its eggs on the caterpillar and the hatching larvae eat the worm alive.

Manual Removal: Pick them off and crush them.

Spray: A homemade mix of hot pepper and garlic, a Bt pesticide, or repeated doses of pyrethrum.

Fungus Gnat

(An adult fungus gnat.)

(Fungus gnat as a maggot.)

Prevention: Do not overwater, keep the relative humidity of your garden low, do not let the surface of your grow medium stay soggy. Cover hydroponic medium surfaces to prevent growth of green algae.

Identification: Fungus gnats attack your plant in their adult stage and larval stage. The maggot of the fungus gnat is almost invisible to the human eye with see-through bodies and a black head. These maggots infest the upper roots of your plants and can spread throughout the entire root system in hydroponic mediums. Maggots love dark, moist, soaked environments. Check the medium at the base of your plant for these pests, fungus gnat larvae are notoriously happy in rockwool. These creatures infest root systems, damaging larger roots and consuming root hairs. This causes your plant to weaken, slow its growth, and fading in the foliage. These wounds to the roots make marijuana insanely vulnerable to several types of fungus. Maggots love dying plant matter and will only infest more heavily the more damaged your plant becomes. Adult gnats are grey to black, very small and have very very long legs. Females lay eggs

prolifically at the rate of 200 eggs weekly and will usually be found at the base of your plant along with maggots. Additionally, these little pests will stick to your sticky flowering green like crazy and are basically impossible to remove.

(Fungus gnats have successfully damaged the root system of this plant. Note the yellowing leaves and the two plants leaning over as their root systems are beginning to rot.)

Treatment

Repression: Reducing surface moisture in your plants medium will slow fungus gnats reproductive cycle dramatically, the drier the better. Applying an anti-algae product around the bases of your plant will kill any growing green algae and reduce the food sources of growing maggots. Yellow sticky traps placed 2 inches from the base of your medium will snag a good chunk of departing adults.

Predators: Introducing a predator for the gnats themselves has proved ineffective at eliminating a population. The predatory soil mite *Hypoaspis* and nematode *Steinemema feltiae* will severely impact the insect population if introduced to soil grows. These creatures will not be effective countermeasures in hydroponic application.

Manual Removal: Impossible. You can swat a few but your threat is from what has already been laid underground.

Spray: Neem or insecticidal soap applied as a soil drench will kill eggs and larvae present in 1-3 applications. Any pesticide spray containing the fungal culture Bacillus thuringiensis var. israelensis (Bt-i) will successfully eradicate adult gnats. Apply soil drenches and spray simultaneously every 5-10 days.

Leaf Miner Maggots

Prevention: Environmental control indoors and in greenhouses will prevent the leaf miner fly from laying its eggs in your plant.

Identification: Leaf miners are maggots usually 1/8th inch thick when hatching. It is very rare that a grower will notice them before they notice the damage they cause. These maggots burrow through leaves leaving brown and light green trails behind them. The maggot will usually be visible inside the leaf it is burrowing through.

(Trails are easily visible in the wake of leaf miners.)

Treatment

Repression: Leaf miner maggots live inside tunnels in your plant and are well protected against measures you take against them. Yellow sticky traps are

effective for adult leaf miner flies.

Predators: The parasitic wasps *Dacnusa sibirica*, *Diglyphus isaeo*, or *Opius pallipes* are effective predators of maggots.

Manual Removal: Crush the maggots inside leaves with your fingers, doing so is easy given they trap themselves inside the leaves. Cut infested leaves off your plant and burn them or treat in excess of 140°F(60°C).

Spray: Sprays are ineffective against these maggots as they are entirely protected within their tunnels. Water your plant with a .5% solution of neem, this works very quickly and will stay in your plants tissues for around 4 weeks successfully repelling any further incursions.

Nematodes

There are hundreds of thousands of different species of nematode, some are harmful to marijuana but these are rare. Most often they attack roots but some attack the upper sections of the plant. Nematodes that are harmful to marijuana plants are for the most part microscopic, and the varieties that are visible are so rare you'd have a better chance being struck by lightning. If your plant is growing slowly, turning yellow and dying, or being slowly eaten away with no visible signs you might just have harmful nematodes. Nematode infestation closely resembles nitrogen deficiency. Taking a soil sample is the best method of detecting nematodes. Take a small tube and punch a core sample out of soil, or inspect hydroponic roots carefully. Roots being attacked by nematodes will be soft, mushy, and beginning to fall apart. The best countermeasure to not contracting nematodes is to use clean soil every time. It takes a fair amount of time for a infesting nematode to build up sufficient numbers to attack your plant, re-using soil invites these circumstances.

Treatment

Nematodes can be eradicated with a neem soil drench and neem oil applied as a spray.

Root Maggots

Prevention: Use new or sterilized soil every time you grow. Maggot eggs stay dormant until spring and love areas containing plant roots. Place an 18-inch collar of foam rubber around the base of the plant to ensure flies cannot lay their eggs.

Identification: Maggots eggs are deposited by seed corn or cabbage flies visiting the base of your plant. If your plant becomes less stable, yellows or darkens severely at the base of its stalk, or ceases growing larger you should check the loose soil at your plant's base. If the white wriggly bastards are there, they are already busy at work chomping through your plants roots until they transform into flies, lay more eggs, and fly to another plant.

(Notice how the plant seems to be nutrient starved and is turning pale uniformly. These are the symptoms of damaged roots.)

Treatment

Repression: Maggots will be undetectable until hatched.

Predators: Parasitic nematodes *Steinernema feltioe* or *Heterorhabditis bacteriophara* will control maggots

Manual Removal: Impossible given the damage is taking place underground.

Spray: Using a soil drench of neem and horticultural oil will poison all root maggots and maggot eggs that are present.

Slugs and Snails

(The common slug.)

(The common brown snail.)

Prevention: A flat, dry area surrounding your plants will make passage for these creatures difficult.

Identification: They look like the picture above. Slugs and snails create web-shaped holes in foliage. Slugs and Snails can easily kill seedlings and clones.

(Snails and slugs will defoliate your plants usually at night. Look for their presence on larger leaves first as smaller leaves have trouble supporting their weight.)

Repression: Indoors lower the humidity as much as possible, this will impair movement and force the pests toward water. A thin line of diatomaceous earth or salty sand will create an impassable barrier. A copper ring on the bottom of your plant's stem will also keep these pests from climbing upwards.

Treatment

Spray with a 50/50 ammonia/water solution. Ammonia penetrates the pest's skin immediately and causes a rapid death.

Spider Mites

Prevention: Keep your growroom clean. Fully disinfect growroom with pesticide and 5% bleach solution before growing again after infestation.

Identification: A spider mite lives underneath the leaves of your plant and is invisible to the naked or untrained eye. These mites exist by sucking liquid that keeps your plant alive. They have eight legs and are classified a spider rather than an insect. Spider mites will be fully visible using a handheld magnification device of 15x or greater. The mites are yellow/white, red, or most commonly are brown with two spots. These mites will spin webs which are a little easier to spot, but unfortunately this means the mites have been around awhile. Misting undersides of leaves will make webs much more visible and aid in detection. Females become fertilized for life once they mate and lay about 100 eggs every 5 days. 75% of all spider mite eggs become female.

(This is the end of the progression of leaf damage due to spider mites, shortly after this point the leaf will die off completely. Note the stippling and spotting across the leaf.)

Treatment

Repression: Mites thrive in temperatures of 70-80°F(21 to 27°C) with average to high humidities. Cooling off your room to 60°F(16°C) and dropping the relative humidity will slow the reproduction and damage rate of the spider mite. 50% humidity and below is where they get uncomfortable. Spraying jets of water across undersides of leaves will literally blast colonies loose and slow the march of these pests considerably.

Predators: *Neoseiulus (Amblyseius) californicus* and *Mesoseiulus (phytoseiulus) longipes* are the two most common and effective predators available for purchase. These predators can eat 20 eggs or 5 adults daily and die when their food supply (i.e. spider mites) has been exhausted. 20 predators per plant is a good jumping off point.

Manual removal: The tiny size of the spider mite makes manual removal ineffective.

Sprays: Neem oil is the most effective. Other effective methods are pyrethrum, horticultural oil, and insecticidal soap. Spraying three times at 5 to 10 day intervals should be sufficient to destroy a mite population if sanitary conditions are maintained. Eggs of the spider mite hatch in 5-10 days. The first spray kills adults, the second will destroy newly hatched mites, and the third will kill the stragglers. If you choose to use pyrethrum, rotate to another chemical if you spray frequently. This will ensure mites will not develop a resistance to synthetic pyrethrum. BE EXTREMELY CAREFUL IN CHOOSING A CHEMICAL MITICIDE IF YOU CHOOSE TO DO SO! Several miticides have DDT or fungal relatives that are toxic if inhaled by humans!

Symphilids

(Symphilids are very fast moving and tiny creatures found underground.)

Prevention: The Symphilid hatches from eggs that are deposited constantly over the course of the females life. This pest is most commonly found in used soil, manure, and compost that has not been sterilized. Always use new soil and ensure your compost or manure is fully sterilized before using in your garden. Wash your hands before coming into your garden from outdoors.

Identification: These pests live underground and feed on roots. Usually not found in hydroponic gardens, this is a burrowing arthropod and has difficulty living without soil. The adult female Symphilid is the larger of the two reaches a maximum of 6mm long and lays eggs constantly wherever she travels year

round. Eggs are fully grown in 3 months as this is a slower moving infestation. The trade off is this pest can live for years and is constantly voracious. When not covered in dirt, the symphilid is white and resembles a millipede. These pests chew through your root hairs like candy, the bigger the root system the bigger the colony. If left unchecked, these pests will result in the death of anything growing in infested soil. The root damage these pests inflict renders roots defenseless against fungus. Watering roughly can aid in detecting these pests, they float! If your water mixes up the top inch or two of soil, watch for tiny worm looking things zipping for cover. The Symphilid can frustrate many attempts at eradication and is capable of burrowing up to 7 feet deep into soil to escape harsh conditions.

(More plants with infected root systems. Note how the buds appear deflated, necrotic, and all plants in this room are seeming to collapse.)

Treatment

Repression: Reduce the moisture of your soil to the bare minimum. Symphilids burrow deep underground when they sense drought however they will not entirely leave a food source. Dry conditions will force these root chompers deeper into the ground and away from the central root ball of your plant. Root damage will continue, but in a less dangerous location. Ironic that watering is the simplest detection and drought is the stopgap.

Predators: The symphilid is native to new zealand and little is known about their biology. With over 160 species in a vague field there is not a effective predator that will work across species. The symphilid moves too quickly for predatory mites to be effective.

Manual Removal: Alas, the recourse of manual removal against underground pests is always minimal. If you sight these pests on the surface of your soil, kill them! This is a slower moving infestation and killing a few females will aid your plant more than you think.

Spray: Symphilids require very thorough soil drenching to eradicate. Other root munching pests do not have the depth capabilities of this creature, ensure your ENTIRE medium is soaked or you will see reappearance. Symphilids are resistant to oils and soaps and their eggs are tougher than any root predator in this thread. A simultaneous application of tobacco juice and neem as a soil drench has proven effective against the symphilid. 10 cigarettes per gallon of water, soaked until the water color is between tea and coffee is sufficient. Apply this juice alongside a neem drench twice spaced 4 days apart. If symphilids appear eradicated, take a soil sample from the bottom of your container, inspect, and re-drench if necessary.

Thrips

(An enlarged picture of the thrip, these insects are smaller than a pinhead.)

Prevention: Keeping clean habits is the only defense against a thrip infestation. These tiny insects will go unnoticed even by the most cautious grower until they reach damaging levels.

Identification: The thrip is commonly a greenhouse pest. It is difficult for the thrip to reproduce in large quantities outdoors and they must hitchhike into indoor gardens. These little guys are TINY! Thrips can be almost any color,

move very quickly and have wings. They can be hard to see individually however detection should not be difficult. Thrips have a tendency to move in herds together, ripping tiny strips off the top of your leaves and drinking juices below. This can deprive plants leaves of chlorophyll so thoroughly they become brittle, dark, and crumble. Tiny black lines present across leaf surface, thats their toilet. The flying thrip can easily infest your garden very quickly if protected from outdoor conditions. The female thrip bores a hole into plant matter and leaves her eggs there in a hole so small you will need a magnifying glass to even know it is there. In cannabis the thrip prefers to thrive, eat, defecate and reproduce primarily inside buds. Shaking branches will send these pests flying and jumping for other places.

(Pictured above; the right leaf is earlier in thrip damage progression, and the left is in severe damage. Damage done by thrips to leaves that initially resemble scaling but the damage becomes clear as the thrips progress.)

Treatment

Repression: Forced air circulation using powerful enough fans to move air throughout your greenhouse or grow room can keep the thrip from being able to hang on or move. Regular misting of water will flood the thrips on the leaves and slow their travel, reproduction, and ability to damage your plant. Sticky traps will help, however the thrip is happy eating in the same area for its entire life cycle. Low migration reduces effectiveness of sticky traps.

Predators: Nearly any predatory mite is effective in combating thrips. Parasitic wasps may also be used, however the sheer numbers of thrips limits their ability.

Manual Removal: You might be able to see herds of the tiny specks moving around your plant, crushing these will reduce their numbers of course but is not effective overall.

Spray: Pyrethrum or insecticidal soap sprayed 2-4 times at 5-10 day intervals will nuke thrips back to the stone age.

Whiteflies

Prevention: If there are whiteflies in your area, sticky traps will catch whiteflies quickly especially if colored yellow. Adult whiteflies are strongly attracted to the color yellow and will fly into traps before flying to your plant. Yellow paper covered in glue or sticky substance would work as well.

Identification: Whiteflies look like its bitty white moths, the adults have wings. The easiest method of detection is shaking limbs on your plants, if tiny moths fly away from under leaves you got some whiteflies. Eggs are also attached to the leaves along the underside. These pests also suck liquids from your plant much like the spider mite. Whiteflies begin attacking marijuana plants from the top down and prefer to attack the weakest plant available. If you only find whiteflies infesting the top of a single plant, you've caught an infestation as it begins. Leaf damage from the whitefly almost exactly mimic the damage caused by spider mite attacks. The further damage progresses, the more strength and vigor the plant will lose.

(The stippling and spotting on leaves damaged by whiteflies closely resembles the damage done by the spider mite.)

Treatment

Repression: The whitefly is a difficult pest to control given that all the adults fly. The best slowing measure you can employ is yellow sticky traps placed around your plants then toss them when full. This will only control adults who leave eggs and larvae behind constantly, traps will not eradicate your whitefly problem.

Predators: *Encarisa formosa* is a species of miniature wasp that only attacks whiteflies. This small wasp does not attack humans and kills whitefly populations by laying eggs on whiteflies. When hatched, the wasp larvae eats its way through the whitefly, literally devouring it from the inside out. Slow and painful, just like they deserve. 2 predators per plant should do the trick if the infestation is caught before it becomes severe. Repeat every 2 weeks until 2

weeks after whiteflies cannot be spotted. Ensure you clean plants and grow area thoroughly if you have sprayed against mites or flies as these treatments will also kill this wasp.

Manual Removal: Not effective.

Spray: Easily smacked down with insecticidal soap, natural sprays, or pyrethrum. Prior to spraying, remove any leaves that are more than 50% damaged and burn them. If you can't start a fire anywhere, heating them to excess of 140°F(60°C) will do the trick. Whiteflies die easily, however they lay eggs prolifically and love re-infecting damaged plant matter. Apply spray against the whitefly at 5 to 10 day intervals until 10 days after whiteflies have not been detected.

Plant Sickness, Fungi, & Disease

Again, prevention is key. Keeping a clean grow room at optimal temperatures as well as utilizing a proper feeding strategy will ensure a problem-free heavy frosty sticky harvest.

Stem Canker (Stem Rot)

Stem cankers form on stems from a fungus that looks remarkably similar to white and yellow leaf spotting. The environment can affect the way stem cankers can live; wet humid weather is what makes this wretched fungus thrive. Canker fungus infection enters through an open cut, wound, pruned wound, or pest infestation that has caused damage by eating leaves or chewing on the stems, and can also be transferred through rainwater. It can also get in through using cutting utensils that are not sanitary which have fungus or bacteria on them.

Identification: Damage to the plant occurs in the form of a yellowish-brown discoloration on the lower portion of the stalk. Later, the leaves turn yellow and fall off as the plant dries out and dies.They form mostly on the stems, but severe cases spotting starts to form on the leaves from internal tissue being cut of nutrients and water. In between nodes is where the stem cankers start to form, and move up the plant, around the 3rd, 4th and 5th node is where it will mainly affect the plants. Stems will have brown lesions; and eventually acquire a dark reddish-brown sunken canker in the stem. Sometimes, if severe, the wound may reopen and appear split in the middle and can also create a bulge. The lesions can extend up the plant over 3 or 4 nodes - once this happens the plant starts to wilt from vascular uptake being cut off. Many growers confuse these symptoms with root rot when the plant starts to wilt and leaves turn yellowish brown and or spots. This is also because the actual stem canker does not show itself yet once this starts to happen. Once the stem canker has been observed and if not treated, the leaves will start to wilt with yellow, white and

brown spots, similar to a white and yellow leaf spot. When plants are affected by this, the plant is more susceptible to more fungus and viral infections from air borne spores. Proper treatment and preventative measures of this deadly fungus are CRUCIAL.

Prevention: Preventing stem cankers is very similar how you would prevent any other cannabis fungus problems. Treat wounds to your plant with H202, making sure your plants are free of pest's and if you use tools to LST(Low Stress Training) your plants pruning, and training, then make sure all tools are properly sterilized before and after using them. Spraying your plant with fungicides in the months or times this fungus spreads is also(obviously) effective. It's very important that you catch this fungus before it gets too bad, once the damage has been done to the plant; the only way to get rid of this is to chop the plant down and treat the area that has been infected. Planting other plants near and or around this area can and will re-affect other plants when a new growing season starts.

Treatment: Once your plant does have this, using fungicides until it is gone is crucial; if the canker has worsened foliar feeding is a must to help keep the plants vigor, strength and stamina in fighting the fungus. Stem cankers take over by slowly reducing the plants uptake and thus takes over the susceptibility of the plant and the fungus then takes over and worsens more quickly. Using anyone of these products will help control or eliminate stem cankers. (If the plant is in an advanced stage of a stem canker infection, nothing can save it and the plant must be cut down and tools sanitized to stop the spread of the fungus.) When using chemical and or organic control methods, do not directly spray the buds! For health and safety reasons, stay away from spraying around the buds if at all possible.

Physan 20
TR-11000 Pyrethrum
Garden Disease Control
Multi Purpose Fungicide
Top Spin
Safer's Garden Fungicide
Concern Copper Soap Fungicide

Guardian Angel
Serenade Garden Disease Control OMRI
Safer 3-in1 Garden Spray OMRI
Sulfur Vaporizer
Organocide
SM-90
Any fungicide containing lime sulphur
Concern Copper Soap Fungicide

Fusarium Wilt

Experimental laboratory testing involved releasing this fungus in an area; it later had devastating effects on cannabis plants even after winter had passed - it stubbornly remained thriving in the soil! Seedlings that were planted were killed

several years after the fungus was released. This fungus can be airborne and transmitted like any other fungus and pathogens, it gets in through susceptible plants that have been wounded through environmental factors like animal attacks, pruning, LST(Low Stress Training), pest infestation and using cutting utensils that are not sanitary that may have fungus or bacteria on them. Fusarium wilt causes internal damage to vascular lines inside the plant and severely blocks the plants ability to carry water and nutrients.

Identification: Symptoms include; wilting of the plant, leaves becoming necrotic and yellowing wilting of the leaves(may appear similar to a nutrient deficiency - with Fusarium wilt leaves will yellow and stay on the plant, whereas with a nitrogen deficiency the leaves will yellow and fall off). While not affecting

the roots, it does affect inside the plant cell walls. Taking a look inside the plants walls will reveal a red-brown color inside the tissue. Stems will change color from normal green and purple hue, to a dark purple to blackish color. This pathogen can get confused with root rot, because the symptoms this pathogen shows are nearly the same as root rot, but roots are not affected. This clogging effect inside is what causes the external symptoms. While this fungus is traveling inside the plant, the toxins spread to uninfected areas and causing the clogging effect internally. These toxins are what causes the other uninfected tissue to start to show the secondary problems including slow wilting of the leaves, stem collapse, stem discoloration and overall droopiness. This can appear as if the plant is dry and has no water. This fungus is a real killer to cannabis plants, any remaining plants that are survived can be severely stunted. Fusarium Wilt thrives in warm moist temperatures.

Prevention: Fusarium Wilt is by far one of the hardest things for cannabis to overcome, that is to say, if it ever even does overcome it. Your plant health, environment, and strain all have a lot to do with whether or not Fusarium wilt will entirely take over your plants. This pathogen mainly affects cannabis and hemp family, but can affect other plants - but does not show the damaging effect it has on cannabis. This pathogen was breed specifically to attack wild cannabis plants and growers who grow their plants outdoors. There is no form of organic control for this type. The reason for this is because the fungus is so strong and not susceptible to much of anything unless you get it right when it starts. If you do not get it in time, it thrives in the plants and consumes and kills the plants.

Treatment: There are only a few certain ways to control this deadly fungus; one is to fumigate the area you are growing in killing the pathogen in the soil while it is dormant. When you grow in this area again, your plants are much less likely to get it. The only other way your plants could get this if not from the soil, is in the unlikely event that airborne spores get in through open wounds on your plants leaves, stems and stalks. Plants that produced seeds when infected with Fusarium wilt should not be used, as the pathogen stays dormant on the seed and attacks it when the seedling emerges and causing the "damping off" effect; thus killing the seedling before it even has a chance to grow it's real first set of leaves. Acidic soil helps boost Fusarium wilt. Stay away from acidic soils.

Counteract this by using dolomite lime, or green sand using potassium and calcium enriched organic nutrients can help fight off and prevent Fusarium wilt, excessive amounts of nitrogen, phosphorus can speed up Fusarium wilt tremendously.

If your plant gets this it will surely die, the only thing you can do is try to reduce the destruction by foliar feeding areas that are not infected, cut off infected areas discard them away from your growing areas and treat the wound with H2O2(Hydrogen Peroxide).
Making sure you clean your tools afterwards is important. Treating with fungicides will not work in controlling this.

Powdery Mildew

Powdery mildew is a common fungal disease that can seriously damage indoor and outdoor crops. Powdery mildew can rapidly infect crops in both vegetative and flowering stages, coating leaves, stems and buds in fungus.
Powdery mildew typically thrives in cool, damp, shaded and poorly ventilated

areas. Airborne spores brought into the grow room land on leaf surfaces and will germinate given favorable conditions. High night humidity levels often trigger the growth of mildew spores. Powdery mildew can attack indoor crops year round. This fungus is almost impossible to stop in late flowering, so early detection and control is essential. Perpetual harvest, dense ScrOG/SOG systems, and damp basement grows are particularly vulnerable to powdery mildew. Strains vary in their susceptibility.

Identification: Early signs of powdery mildew include white powder/fuzzy patches on leaves (usually low in the canopy) and a fuzzy white coating on lower stems. These fuzzy mycelium patches produce airborne spores that rapidly attack adjacent plants; mildew will eventually coat leaves and entire plants, reducing photosynthesis, plant vigor and bud quality.

Plants on the edge of a garden, in corners and under stress are attacked first; infection usually starts in the lower canopy where conditions are optimal. As infection progresses, mildew will spread to the top of the plants and finally attack the buds.

Infected buds may appear normal; but are internally dusted with white powder (which cannot be removed by drying), and have a stale, musty/moldy smell when dry. Smoking or trimming infected buds can cause sickness and lung infections, and is not recommended. Infected leaves should be discarded. Lower buds are the most susceptible.

Prevention: Preventative gardening techniques can be very effective in defending against powdery mildew. Maintain healthy plants. Stressed plants are often attacked first, so it is important to monitor and remove unhealthy plants.

Detection. Inspect corners, edge and lower portions of the garden frequently. Remove infected leaves, or move infected plants out of the main garden.

Do not water plants at night. Reduce or stop watering before the lights have gone out to help evaporate and reduce room humidity.

Reduce plant density. Spread plants apart to improve air circulation. Do not place plants directly against walls or into corners, typically areas of poor air circulation. Pull plants 6-1 away from walls or reflective surfaces, and blow air to these areas.

Prune. Remove the lowest leaves as the plants mature and prune the bottom 1/3 of the plant during veg to increase airflow inside the lower canopy. Remove all unnecessary growth. Put an oscillating fan down low to blow through this pruned area.

Foliar feeding. Foliar feeding can sometimes cause excessive nighttime humidity levels. Discontinue if mildew appears.

Harvest early if mildew is a problem.

Treatment

Environmental: Improving grow room conditions is an excellent way to passively prevent and minimize damage by powdery mildew.

Monitor humidity levels. A quality humidity gauge should be used to monitor day and night r.h levels. Avoid prolonged high humidity levels: 50-60% r.h is ideal. Humidity must be kept below 70% during the night; levels over 80% will guarantee infection within 48 hrs.

Ventilation. Constant air movement inhibits mildew, and lowers humidity. Use oscillating fans on all sides of a garden to circulate the air. Ventilate air out of the grow room periodically during the night cycle to reduce humidity from irrigation and transpiration. Once mildew is established, oscillating fans may actually spread spores throughout the garden. Stop fans, treat infected areas, and then resume airflow.

Heat night air. Warm air holds more moisture than colder air. Heat helps dry the air and lower humidity during the night cycle. Heat the room at night and exhaust the room periodically to remove this warm/moist air.

Dehumidifier. Very effective in preventing mildew from spreading. Set controls for 40-60% and let run during night cycle.

Hepa filter. Filter the intake with a Hepa filter to eliminate spores from entering room. Inspect and change filter frequently.

Ionizer / Ozone generators. Leak some output to kill airborne pathogens and spores.

Sulphur burner. These devices vaporize (not burn) elemental sulphur, coat the room with a fine film of sulphur, inhibiting PM spores from germinating. Also inhibits insects to some degree.

Run for 12 hours initially(at night, exhaust blower off, circulation fans on), then 1-4 hrs/night thereafter. Many growers discontinue when buds begin to form,

others will let it run up to the last week. Very effective prevention.

Chemical: Chemical control should be considered a last resort. Chemicals should be sprayed only in veg or early flower to prevent absorption into the buds and burning bud hairs. Chemicals may have to be applied repeatedly to be effective, and may take a few days for noticeable results. Use a surfactant to help adhere chemical to leaf surface. Some chemicals are more harmful than others; follow label directions and observe precautions.

Always spot spray first. Spraying individual leaves can be an option.
Note: many chemicals will leave a residue that appears similar to powdery mildew!

Alkaline water. Alkaline water can affect powdery mildew, as mildew cannot grow in basic conditions. Mist plants generously with water at 8.0+ pH frequently; discontinue when buds begin to mature to prevent budrot.

Alkaline water does not seem to affect buds or bud hairs. The effect is temporary, but drastically slows mildew grow and spread. Reapply every 4-5 days.

Baking soda(sodium bicarbonate). Sodium collapses the powdery mildew:s internal cell walls. Baking soda leaves an alkaline residue on the leaves, which should be washed off with water before more is applied.
Foliar spray: 15ml / gallon

Garden sulphur. A common non-toxic spray, sulfur interferes with mildew cellular respiration. Spray young plants weekly before hairs form(or spray lower leaves only), then discontinue. Do not wash off. Dried sulphur spray looks similar to mildew. For best results, prune plants in veg/early flower, then spray lower stems and foliage. Warning: can give a sulphur taste if sprayed directly onto buds!

Foliar spray. 15-20ml sulphur powder/Liter water. Keep well mixed when spraying. Will not wash off buds. Re-application may be necessary.

Neem Oil. Protects and kills mildew by inhibiting respiration; also protects against mites and may improve plant vigor. Results are noticeable in a couple of days.

Pro-silica(Soluble Silicon). Increases resistance to pathogens by accumulating in(leaf and root) cells of plants, providing a barrier against penetration by invading fungi such as powdery mildew and Pythium. Foliar applications leave deposits of siliconon the leaf surface that promote effective physical barriers toinfection. Pro-silica is alkaline.
Foliar spray: 1 part in 5.

SM90. A natural plant extract in a vegetable oil base.
Foliar spray: 10ml/liter.

Malatox. This is a wonder cure. Mildew completely vanishes for up to 7 weeks! Make sure you spray before the first week of flowering.
Foliar spray: 2.5ml per liter of water.

Biological:

Unpasterized milk. Must be fresh, not store bought (which is pasteurized). Dilute 10 parts water to 1 part milk. Works, although the milk may smell.

AQ10. A biofungicide. Ampelomyces quisqualis is a fungus that parasites the powdery mildew organism. It helps over a long duration. Effective only in initial stages of infection though.

Plant Shield. Plant Shield is a foliar spray(General Hydroponics), which kills many types of leaf and root fungus. Trichoderma harzianum strain T-22. Safe to use. Takes 2-10 days.

Serenade. The fermentation product of a bacterium, bacillus subtillis, that inhibits cell growth of fungi and bacteria. It is effective and easy to spray or use as a dip. Contact fungicide.

Damping-Off

Damping-Off is a fungus that is in soil mixtures, it attacks seeds and seedlings before and after it emerges from the shell. Seedlings that get attacked by this fungus usually die, considering the plant doesn't have a fighting chance nor a system setup to help fight the fungus. A range of growth stages the plant can be attacked, up to 8 sets of true leaves, or 3 leaf nodes. Leaves, roots, and stems can be affected. Damping-off can be easily confused by excessive fertilization(Nutrient Burn), high levels of salts from either water or nutrient solution build up, excessive heat or cold, excessive or insufficient soil moisture.

Identification: The Cotyledons show on the soil surface can whither and die or healthy looking seedlings may suddenly fall over. Infection first starts right below the soil line. Once attacked, the seedling and vegetative stage plants will start to rot, lower part of the stem will be soft, brown and or leaves will turn purplish hue and can yellow, brown and then fall over or shrivel up; can be any one of these or all symptoms. Seedlings, or vegetative stage plants then can

start to fall over from stem being so soft and starting to rot inside out, one item contributes to this problem is over watering, putting seedlings, or small plants into a big pot; when you water the soil down lower soaks up excess water and ends up sitting in the middle to bottom part of the soil in the pot. When this happens fungus begins to build up due to them not having a deep enough or a big root system to absorb all the excess water, then it ends up turning into damping-off. Later stages of damping-off in vegetative stage seedling, the leaves will droop and turn yellow, as if the plant was over watered. Stems will be severely weaken and may fall over from being under developed and skinny. Older plants can build up a resistance to damping-off, but if they do not, older plants show long skinny stems, stunted roots, and stem discoloration. Soil that is rich in nitrogen, soggy soils, or soil that stays wet for long periods. Even hydroponics systems can get damping-off; mediums that stay too saturated, although you have a less likely chance of getting damping-off in hydroponics systems.

Prevention: In order to help prevention you should try to start seedlings in "starter cups", drinking cups you get from the store; putting drainage holes in the bottom of the cups is extremely important in helping avoid damping-off, allowing excessive water drain so the bottom half of the mixture will not stay wet. You can still over water, but your chances of getting damping off are much less than that of a seedling put into a big pot with lots of soil. Making sure you have holes and a good amount of perlite in your mixture helps greatly. Cups having drainage holes are recommended. Putting seeds into the soil at a low depth helps out, just putting it an inch or two at the most helps avoid the fungus. Avoid starting planting in rich soil mixtures, not only can you burn them when they emerge out of the soil, but too much nitrogen can lack root growth and aggravate damping-off. Try using a seed starter mixture, not watering heavily, and avoid watering everyday, seedlings in cups should only be watered a bit every 2 days, seedlings with 2 to 3 sets of leaves in cups can start to be watered more heavily where water starts to drip out the drainage holes, only then you should water like this every 3 days. Over watering is one of the biggest causes of damping-off. Using sterile soil helps greatly, Allow great air flow and circulation in your grow room, allow the surface to dry before watering again, using moisture meters, or sticking your finger down in the soil near the edge of the pot to test for wetness down in the soil. Testing the soil near the edge of

the pot helps to avoid bothering root development.

Treatment: Once Seedlings have already emerged from their seed shell and end up getting affected by damping-off, they have a very high chance they will not survive and there is nothing you can do about it; by the time it shows in seedlings, it will already be to far too late. Using a fungicide on the seed before putting it into soil mixtures helps to avoid post emerge damping-off. Vegetative stage plants with a few sets of leaves has a better chance of fighting it off, and using a fungicide can help depending on how far along the fungus has spread. Using any of these products below can help avoid or kill damping-off. (If using on seedlings or seeds, use organic-based fungicides.) Chemical control should only be used on older plants, not seedlings.

Physan 20
Garden Disease Control
Multi Purpose Fungicide
Top Spin
Captan
Thiram
Apron
Safer's Garden Fungicide
Concern Copper Soap Fungicide
Guardian Angel
Serenade Garden Disease Control OMRI
Safer 3-in1 Garden Spray OMRI
Organocide
SM-90

Bud Rot (Bortrytis)

Budrot(Botrytis) is a very common worldwide fungus that attacks both indoor and outdoor crops under certain conditions. Budrot is also known as brown rot, grey mold and other names. Airborne Botrytis spores can be found everywhere, all times of the year, and will attack many different species of plants. Botrytis will attack flowers, and eventually leaves and stems.

Growers running sea of green, perpetual harvest, remote grows, outdoor, or multiple strains (each with different flowering periods) should keep an eye out for Botrytis near harvest time.

Outdoor growers need to be hypersensitive to weather conditions near harvest time. Rain, morning dew, frost and cool fall nights may increase the risk of budrot and powdery mildew.

Fully developed marijuana buds provide ideal conditions for spore germination: warm and moist plant tissues. Botrytis will initially attack
the largest and densest buds in the garden, because they provide the ideal

conditions for germination. Weak plants will also be attacked rapidly.

Identification: Budrot will infect and turn colas to mush in a matter of days and may destroy a crop in a week if left unchecked. Botrytis loves warm, and humid(50% or over humidity) conditions. Lowering humidity will slow and stop spore germination. Good ventilation and decent air circulation help prevent infection. A grow room may smell noticeably moldy if Botrytis has attacked one or more colas. Once a cola has been infected, Botrytis will spread incredibly fast. Entire colas will turn to brown mush and spores will be produced, attacking other nearby colas. Ventilation may spread viable spores throughout the room.

Prevention: During early vegetative growth and flowering, prune undergrowth to promote air circulation. Install a Hepa filter into room and intake air sources. Introduce low levels of ozone into room air. Ozone is effective against pollen, powdery mildew and other airborne spores. Lowering room humidity(warming nighttime air and venting frequently or using a dehumidifier) will help drastically

as well. Also, decreasing watering cycles and amounts will reduce room humidity. Large, dense colas should be periodically inspected. Brown tissues deep within the bud will smell moldy and may become liquid. Remove fan leaves during the last few days before harvest to promote air circulation.

Treatment: Once budrot has been detected, the grower should isolate infected buds by removing them from the growroom immediately and harvesting the infected colas, followed by a rapid dry of the harvested colas. Take immediate steps to reduce room humidity. Afterwards, the entire crop should be carefully inspected for infection and damage. The grower may want to harvest early if more than one rotting cola has been found. Spores may have spread and are germinating deep within other colas.

Serenade controls the Botrytis nicely, as there are no toxicity issues with using this compound. To apply, simply spray on leaves and shoots to provide complete coverage. Best results will be had be pre-treating plants before signs of disease set it and then every week to protect newly formed foliage.

Fungus

Fungus is most prominent during flowering. It is during this time your buds are susceptible to a fungus or bud rot. Growing conditions for fungus are ideal when temperatures are between 60-80°F(15.5 to 27°C) and the humidity is high. The fungus is very destructive and spreads quickly. These kinds of fungi are airborne and can travel to other bud sites with ease. If you already have been infected by them the best thing you can do is cut off and remove the infected area and then discard out of the grow area, then get a hold of some anti-fungal spray and apply.

Identification: Looks extremely similar to bud rot.

Prevention: DO NOT foliar feed at night, tends to make humidity higher rather than when you water in the day the water has time to evaporate where at night will linger in the air. Try to keep the humidity down to the range fungus do not grow to well in. Keep leaves away from soil making sure they do NOT touch the soil. Keep cooler temperatures at night while plants are on there down time.

Keep a good amount of ventilation around your grow, and if you have plants outside, always keep them quarantined away you're your indoor plants until you know they are safe. When watering plants at night, wait till the morning or afternoon to water. Keep a happy plant and a sterile grow room and it will not become prone to infections. Checking plants often can aid in getting rid of any fungus that may attack other leaves and or bud! Have a lot of air going around the plants for bad ventilation = sick plants and a breeding ground for spores!

Treatment: Fungi can kill your crop quicker than you can utter Mary Jane, so invest in some SAFE fungicide and spray down the plants as much as you can and as *soon as you can*. The faster the safer. If you have had problems with fungus before, do NOT spray them you will contribute to the fungus becoming resistant to the spray/chemicals you are using. Neem2, neem oil works wonders! Potassium Bicarbonate, Baking soda and for other chemical agents you can use Plant Shield, Serenade and pythium. These are the most popular and they work very very well.

Quick Troubleshooting Cannabis Problems

Refer to this section if your plant has a specific problem, we have the solution!

Seeds

SYMPTOM	SOLUTION
Brittle/white seed.	If a slight pressure from your fingertips crushes the seeds then they are not viable. If you produced these seeds yourself you need to be sure to pollinate the plant early in flowering. You will also need to let the seeds grow until they are starting to fall out naturally and are fully ripe and mature.
Green seed.	Immature seed. You might be able to save a green seed. Simply place it in a damp paper towel in a dark warm place and check it every few hours. The color of the seed will darken as it first ripes and it may eventually sprout.
Small seed.	Always pick the largest seeds you can. Many plants do not produce small seeds though, some seed strains are known to exclusively produce small seeds.
Seeds will not germinate.	Please refer the *Ten Top Reasons Why Your Seeds Wont Germinate* portion of this manual.

Roots

SYMPTOM	SOLUTION
Tightly packed roots, curling around the edge of the container(this symptom is often accompanied by slow, sickly growth and branches that develop with more distance between limbs.)	Your roots don't have enough room. Give them space by transplanting them to a larger container, taking care not to disturb the root ball.
Smelly, slimy roots. Water, Nutrition solution or roots are discolored brown or have an unpleasant odor. You notice your water is becoming brownish in color, or smells distasteful. Your solution does not smell pleasant and appetizing like fresh lettuce. Your roots are not the same shade of white that they once were a week ago.	Uhoh. Root rot(pythium). Lack of sufficient oxygen being supplied to your roots causes this. Toss your plant. Saving it will cause complications to your other plants in your grow area and the vegetable material of the plant as well.

Stems

SYMPTOM	SOLUTION
Leaning branches.	If the weight of your flowers are too much for your stems causing them to lean, the best thing you can do is tie up the branches. This can be partially avoided by installing a sufficient oscillating fan in an indoor grow room simulating the wind. The movement will cause the stems to strengthen.
Purple stems.	A purple stem doesn't necessarily indicate an unhealthy plant. Purple Stems could be a result of plant genetics, if this is the reason, you are to expect a purple stem throughout the

	entire life of the plant. A baby sprout with a purple stem is almost always 100% natural. Young seedlings are still adjusting to their environment and may be slightly lacking in a nutrient. If this is the case, healthy plants will regain their green/greenish-brown color within a few days to a week or two tops. If you have ruled out the possibilities of genetics and the seedlings adjustments to life, you should begin looking for a nutrient deficiency. Purple stems are commonly caused by a Phosphorous(P) or Magnesium deficiency, if there is a Phosphorous deficiency you may also notice symptoms such as brittle leaves or greyish spots. To assist the uptake of Phosphorous (as well as most other nutrients) you should ensure the pH is slightly acidic-- 6.0 will suffice.
Spindly, thin stalks.	Lack of light. When plants do not receive enough light they begin to stretch to the light source. You need either a bigger light source, or need to move the light closer to your plants. Installing an oscillating fan will also help this by strengthening stems. A weak root system may also contribute to this problem.
Broken stem.	Don't panic! Your plant and stem will probably be fine. Hold the stem in place using a stake/stick for support, apply honey to the wound, and bind it with a cloth bandage wrap with pores.

	Give it time to heal before bending it again.
Seedlings stretching.	Low light conditions. They also need a gentle wind. Plants will also stretch when subjected to conditions of high humidity.
Cracked stems, no healthy support tissue.	Boron deficiency - add any plant food containing boron.

Leaves

SYMPTOM	SOLUTION
Drooping leaves.	Over-watering & under-watering are the most common causes of this symptom. If using soil make sure you allow the surface to get completely dry before watering again. If using a hydroponic system make sure your roots are getting sufficient oxygen.
Narrow leaves with edges curled up	Sign of low humidity. This will result in a less than optimal growth and harvest if not fixed.
Larger leaves turning yellow. Smaller leaves still green. Leaves are a uniform yellow or light green; leaves die & drop; growth is slow. Leaf margins are not curled-up noticeably. Are your leaves light green or yellow in colour?	Nitrogen deficiency - add nitrate of soda or organic fertilizer.
Veins are green, but leaves are yellow. Leaves may turn a pale yellow, or white with green veins.	Iron Deficiency. Add more trace nutrients or chelated iron. pH might also be the culprit.

Broad leaves with edges curled down.	Excessive humidity. This wont necessarily harm the plant, but it will stunt its growth.
Older leaves will curl at edges, turn dark, possibly with a purple cast. Also if plant is in Flowering, doesn't look like it is dying but looks red or dark green/yellow. Leaves are dark green or red/purple. Stems and petioles may have purple & red on them. Leaves may turn yellow or curl under. Leaf may drop easily. Growth may be slow and leaves may be small. Possibly even brown/purple spots and/or dark green leaves on a stunted plant. Do the leaves have an overall dark green color with a purple, red, or blue pigmentation?	Phosphorous deficiency - add commercial phosphate. May have a water pH imbalance. Possible pest contraction.
Mature leaves develop a yellowish cast to least veinal areas or leaves curl up, twisting and have a yellow coloration.	Either a light burn, air circulation problem, or most likely a Magnesium deficiency - add commercial fertilizer with a magnesium content. Or add Epsom salt 1/3 table spoon to 3 gallons of water is fine.
Mature leaves turn yellow and then become spotted with edge areas turning dark gray. Tips of leaves turn brown and curl slightly. Leaves are browning or yellowing. Yellow, brown, or necrotic(dead) patches, especially around the edges of the leaf, which may be curled. Plant may be too tall. Are the leaf tips curling down, do they have yellow margins which are turning into dark dead spots?	Potassium deficiency - add muriate of potash.

Margins of the leaves are turned up, and the tips may be twisted. Leaves are yellowing (and may turn brown), but the veins remain somewhat green. Leaf tips curling up; do the leaves have yellow margins / tips with green veins? Mature leaves develop a yellowish cast to least veinal areas.	Magnesium(Mg) deficiency - add commercial fertilizer with a magnesium content.
Tips of leaves are yellow, brown, or dead. Plant otherwise looks healthy & green. Stems may be soft. Leaves are curled under like a ram's horn, and are dark green, gray, brown, or gold.	Over-fertilization(especially N), over-watering, damaged roots, or insufficient soil aeration(use more sand or perlite. Occasionally due to not enough N, P, or K.
Tips of leaves turn brown and curl slightly.	Potassium(K) deficiency.
The plant is wilted, even though the soil is moist.	Over-fertilization, soggy soil, damaged roots, disease; copper deficiency (very unlikely).
Small wrinkled leaves with yellowish vein systems. Leaves are twisted. White areas form at leaf tips and between veins. Leaves twist, then turn brown or die. Do the leaves have an inter-veinal banding appearance?	Zinc(Zn) deficiency - add commercial plant food containing zinc. Occurs in alkaline soils. Zn deficiency can be treated by burying galvanized nails in the soil. Chemical fertilizer containing Zn can also be used.
Young leaves become deformed, possibly yellowing	Molybdenum deficiency - use any plant food with a bit of molybdenum in it
You observe the leaves becoming dry or even crispy, perhaps shriveling, and the tips curling upward. The leaves do not appear glossy, moist and vibrant.	Wind Burn. You had the fan blowing downward toward the upper side of the leaves, instead of blowing up through the node spaces or toward the lights.
Are leaf tips yellowed and curled down?	Sulfur(S) deficiency.

Do the leaves have burnt blotches on them?	pH fluctuation.
The leaves will curl downward. They grow very dark dull flat green and then the tips show signs of burn.	Overfeeding, use of too much/strong nutrients.
The entire plant, both upper and lower leaves, will show lime or light green in color. The plant will not eat, drink or show growth.	Underfeeding and weak nutrition
Leaves are light green or yellow beginning at the base, while the leaf margins remain green. Necrotic spots may be between veins. Leaves are not twisted.	The lights are too close to the plant. Rarely, a Calcium(Ca) or Boron(B) deficiency. If not you may just have a weak plant.
Leaves appear yellow at the base, the tips are fine.	Manganese Deficiency(Mn). Supplement accordingly.
Indoor soil vegetative phase leaves curl downward like claws.	Over-watering or under-watering. Your plant may have outgrown its pot. Only solution is to get a bigger pot to transfer your plant to grow in.
Leaves are yellow or white, but the veins are mostly green.	Iron(Fe) deficiency.
Clouds of tiny white insects fly up from foliage when disturbed, plants look generally unhealthy.	Whiteflies infestation. Use sticky yellow traps. Insecticidal soap. Most general purpose insecticides, including neem, nicotine pyrethrin, malathion, sevin.
Leaves look sucked and dry, possibly black dots on the leaves.	Hydroponics plant burns – if not a bug infestation(patches and holes in your plant)it is a nutrient problem. Your nutrient solution is too strong. Dilute it!

Hydroponics System: Discoloration in the leaves, yellowing or rust spots, or curling up of leaf tips. You know that you have made recent pH adjustments. You notice the plants did not eat or drink because they did not consume the same amount of water they used yesterday. You see rust spots. The large lower leaves are prematurely dying and you are not in the Flowering stage.	Uhoh, Nutritional Lockout. You might know you may have used too much of the PH Adjustment Solution. You may have failed to test the pH often enough.

Flowers

SYMPTOM	SYMPTOM
White pistils turn purple/red/orange.	This isn't a problem! You're doing things right. It's common for pistils to change color if they aren't pollinated.
Flowers are stunted with hard bumps between pistils.	Your plant is likely pollinated. The bumps are seeds.
Internod spacing is wide and buds are airy.	Too much of a wide variation between your daytime and nighttime temperature. Regulate your temperature in your grow environment properly.
White fluffy powdery coating on buds.	Don't confuse this with sparkling trichomes crystals, this is either mold or if it looks whispy and web-like it may be a pest such as the dreaded spider mites. If it is a pest read the pest section and handle accordingly. If it is a pest it must be removed from your garden immediately. Do NOT ever smoke or eat moldy bud, you can get

	very sick or even die.
Buds are small.	Buds are literally the final product cumulation of the entire grow. Their size reflects literally everything else. Make sure your plant has a healthy root system, proper nutrient levels, CO2 supplementation during flowering, proper ventilation, controlled temperatures, and make sure you prune properly.
Buds aren't sticky/resinous.	The flowers aren't ready yet. Let them go for a little longer. Give your plants the time they need to mature. An early maturing strain will take about a full 8 weeks of flowering and some strains will take twelve weeks.
Abnormal bud growth / Hermaphrodite.	You began a 12/12 lighting cycle before your plant was properly in Pre-Flowering.
Plants won't flower, even though they get 12 hours of darkness for over 2 weeks.	The night period is not completely dark. Too much nitrogen. Too much pruning or cloning.

Harvesting

SYMPTOM	SYMPTOM
Crispy crumbling buds.	You let your bud dry too much and most-likely too fast.
Powdery or whispy tendrils in flowers.	This is mold/mildew. You need to let your buds get more air. Do not try to save or smoke moldy bud. You could die.
Pliable stems with dry bud.	There is likely moisture on the inside. Depending on how dry the bud itself is you could move on to the curing stage using a slow cure drawing the moisture out from the center of the plant or let it dry longer before curing.
Buds smell and taste like hay/lawn.	This is a characteristic of immature bud. This can often be partially solved with a long slow cure.
Buds burn down to a hard black ash.	Too much phosphorous left in the plant during flowering. A slow dry and long cure will help. Next time properly flush before harvest.
Hydroponic system kettle rust / scales in your bucket.	You haven't been maintaining your pH level and/or your water is hard. Drain and clean your reservoir and mix a new batch of nutrients to the correct pH level. Some growers use a Reverse Osmosis water filtering system to clean their tap water. Distilled water also has a stable pH level of 7.0.
Harsh smoke	Proper slow drying and curing will give you a smooth smoke.

Nutrients

SYMPTOM	SOLUTION
Magnesium(Mn)	A Magnesium deficiency is pretty common since marijuana uses lots of it and many fertilizers don't have enough of it. Mg deficiency is easily fixed with ¼ teaspoon/gallon of Epsom salts (first powdered and dissolved in some hot water) or foliar feed at ½ teaspoon/quart. When mixing up soil, use 2 teaspoon dolomite lime per gallon of soil for Mg. Mg can get locked-up by too much Ca, Cl or ammonium nitrogen. Don't overdo Mg or you'll lock up other nutrients.
Potassium(K)	Too much sodium(Na) displaces Potassium(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.
Nitrogen(N)	Plants need lots of Nitrogen(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.
Zinc(Zn)	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.
Phosphorous(P)	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 Nitrogen, Potassium, and Magnesium deficiencies; so red stems are not a foolproof sign of Phosphorus deficiency. Too much Phosphorus can lead to an Iron deficiency.
Manganese(Mn)	Manganese(Mn) gets locked out when the pH is too high, and when there's too much iron. Use chelated Manganese.
Iron(Fe)	Iron(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". Too much Iron(Fe) without adding enough Phosphorus can rapidly cause a Phosphorus deficiency.