**Grow Manual**

**1 - Germination**

**You can jump right in by planting seeds straight into soil. But this doesn't guarantee anything will grow. Seeds can be tricky things to get to sprout sometimes. Germinating the seeds before they go into the soil helps ensure you get healthy normal growth. There are a few ways to do this, we'll just discuss a simple and fool-proof method. Take your seeds out of storage (cool, dry place right?) and place them in a bowl of room-temperature water. Cover with a paper towel just to keep dust out and put somewhere dark.**

**Overnight the seeds will slowly begin to soak up water and when they reach about 80 percent absorption they will sprout baby roots. These rootlets will almost be too small to see, but you can sometimes see the tiny hairs reaching out from the seed case. Any seeds that are still floating the next day will need more time, or may never germinate. The ones that that have white rootlets growing can be placed into soil. The germinated seeds need to be handled very carefully. Don't use your bare hands, use a sterile spoon.**

**2 - Propagation**

**Propagation is the time given to a new seed placed in soil to grow roots or a cloned cutting to take root in it's growth medium. Like germination, this is not a necessary step but is still a wise one to include. Propagation involves letting the new-borne plant exist in optimal conditions for early growth. When the plant has taken hold and established itself, it can be taken off propagation and moved on to the vegetative period.**

**Be sure to plant your seed or cutting in a small amount of soil or growing medium. Too much soil or medium will deprive the baby plant of water. Two inch mini pots and rock cubes are sold especially for this purpose. Water the medium thoroughly, then place in a warm environment, not too close to the lights and in high humidity. The humidity can often be kept artificially high using a clear plastic bag taped around the top of the pot. But sure to leave enough room for the baby to grow up into.**

**The first sign of growth will be a thin stem that unrolls from the seed and grows two small leaves. These leaves will eventually die and fall off. For now they are determining the light leaves. So as soon as they are unfurled, move the babies up closer to the lights. But not so close you'll burn them. Consult the lighting chapter for more on this.**

**Homemade propagation chamber:**

**3 - Vegetation**

**segetation is the next major phase in plant growth. During vegetation the lights should operate a 18 hour on, 6 hour off schedule. This will keep the plant from flowering and give it time to spread a strong root system and grow plenty of healthy branches for bearing buds. Plants can be kept in this growing phase forever if the grower doesn't change the light schedule to 12 on, 12 off. This is how mother plants can be kept and clones taken over and over.**

**Lighting can be scheduled to turn on during the "off peak" period at night so save on electricity costs. Remember not to let any light fall onto plants during their dark period, this can cause problems like hermaphrodite plants. Gently bend young stems back and forth every day or two. This will encourage strong healthy stems to grow, you'll need these to hold up the swollen buds later.**

**Liquid fertilizer can be added during the veg phase that has an N-P-K balance of 20-20-20 with trace nutrients. But use liquid fertilizer very carefully, too much can easily kill your plants. Start at a quarter strength of what the packet recommends and work up slowly.**

**Early vegetative growth:**

**4 - Flowering**

**When plants are at least 12 inches tall, big enough to mature, they can be moved to flowering. This is the period when the plants put their energy in producing buds. It's these buds that we want to consume. Dark cycles of twelve hours or more will induce flowering. After that it is simply a matter of maintaining the light schedule and allowing no light to interrupt the dark periods.**

**Liquid fertilizer high in P is great for flowering, so 5-30-15 would be good.**

**Flowering cannabis plant:**

**5 - In-doors**

**In-door growing is very popular and not as hard as it may seem. Most of the materials are readily available and growing inside can be easier to control than the great out-doors. Plus,growing in-doors allows for constantly producing gardens to continual produce buds. By choosing to grow in-doors you're deciding to control all aspects of the plant's lives. You'll make sure they are the correct temperature, well fed, watered just enough and safe from pests and plagues.**

**Line the inside of your grow space with a reflective material like Mylar or dull white paint. Glossy white paint and mirrors will actually absorb more light then they reflect so do not use them. Keep all electrical wiring and appliances up off the ground to avoid danger from water spills.**

**An in-door grow space must be well light and well ventilated. While plants don't need oxygen like we do, they do need carbon dioxide. Venting helps draw in fresh CO2 for the plants to feed on and also helps keep the grow space from over-heating. The space must be light proof for the dark periods. And efforts must be made to stop odours leaking out. If these challenges can be overcome then growing in-doors will be a breeze.**

**5.1 - Hydroponics**

**Hydroponics is the growing of plants in a liquid medium. The stems of the plants are secured and the roots hang down into a liquid medium which has it's temperature, pH and nutrient levels monitored and controlled. This can be a somewhat complex path to take, too complex to deal with properly here, but the results can be very impressive. Yield and potency tend to be higher for plants grown hydroponically.**

**Hydroponics is covered in more detail in the Hydro Manual.**

**5.2 - Venting**

**When growing in-doors, venting stale air is big concern. Ducting and fans will most likely be needed to bring in fresh air and vent out old warm air. Remember to line vents up so that cool air enters at the bottom and warm air is expelled at the top (because hot air rises). The smell of vented air is very recognizable so filter the air with activated carbon or o-zone treatment. This is a vital security measure.**

**Venting will probably need to be silent or as near as possible. For this you should use either small PC fan's which will run next to silent when first installed or larger squirrel cage fans. This are bulky but can be completely silent.**

**If the vents can blow against young plants it will help them grow big and strong. But don't worry about this too much if it's not possible. Another option which achieves the same strong plants is to have a small internal fan that oscillates back and forth, moving the air around inside your grow space.**

**So called "squirrel fans" are grower favourites for their efficiency and quietness:**

**6 - Out-doors**

**Cannabis grown out-doors is probably the best and the strongest. The natural light, fresh air and abundance of soil is what makes out-door growing so much more robust. When growing out-doors, you no longer have to worry about light levels, venting and smell. But you do now have to worry about soil quality a lot more and pests become a bigger problem. So obviously there are advantages and disadvantages. Plus, growing outside is only a real option in specific parts of the world, too far north or south will mean the light levels are probably too low.**

**Security also becomes a big factor in out-door grows. Even if the growing is legal where you are, the plants will still be prime targets for thieves. Fences and greenhouses can help with this but no solution is perfect. Also make sure you plan access to water when picking an out-door grow spot. Lugging water to your grow site can be a lot of work so try to find a local water source that you can use. Be sure to check the water source's pH before using it.**

**Guerilla growing is the technique of growing on someone else's land to avoid the dangers of getting caught. This is discussed more in the Advanced Manual.**

**7 - Sexing**

**Unless you want to produce seeds, there is no point in growing male cannabis plants. They will only inseminate the female plants and that will drastically reduce the potency of the marijuana. So sexing your plants early into the flowering period is important. If you bought feminized seeds, you should only have female at this point - but you still need to check and make sure.**

**The sex organs are visible outside the plant and as the two pictures below indicate, the sex organs are quite easy to spot once you know what you're looking for:**

**8 - Temperature**

**Your plants will be very sensitive to temperature. An optimal range is 70 - 80 degrees Fahrenheit (21 - 26 C). Temperatures too low stunt the growth and can kill the plant. Temperatures too high will burn the foliage and can kill the plant. With the addition of CO2 gas, plants can withstand higher temperatures, as high as 95 F (35 C) but this also requires very high light levels so the plant can process the CO2. It is usually a good idea to lower temperatures during flowering phase by a few degrees, this will keep potency high.**

**Digital thermometers are the smart way to properly monitor how hot your grow space is. They will record high and low temperatures so you can get a good idea of the daily average.**

**Transparent shaded light fittings can be connected directly to air vents to remove excess heat:**

**9 - Food**

**Needless to say, your plants will need regular feeding. The art of fertilizing is a delicate balance. First time growers might favour pre-fertilized soil (ie. mixed with manure). This is a good way to avoid having to worry about fertilizer, but you should buy sterilized soil mix or sterilize it yourself. This is to avoid pests and plagues. And take note of how long the pre-fertilized soil will feed your plants for, make sure you switch to liquid fertilizer when the time is right.**

**The range of fertilizer choices is wide. There are commercial ones, organic ones and commercial ones that pretend to be organic. Use what you're happy with. Any fertilizer which helps tomatoes grow should be fine for your plants. Traditionally, soil has been fertilized organically with worm castings or guano (both available in garden centers). When using fertilizer, always aim for less than needed. If the bottle says use X amount, you should use a half of that or less.**

**Fertilizer is graded based on the three core ingredients for growing - nitrogen, phosphorous and potassium. The amounts of these ingredients will be listed as an N-P-K number, like 20-20-20 food has all three ingredients at 20 percent. For rooting and germination periods, high levels of P are desirable. Vegetative growth needs lots of N (tip: human urine mixed 8 ounces to 1 gallon of water works great). An all round 20-20-20 with trace elements should do fine.**

**Most fertilizers will cause a pH change in your soil, so be mindful to monitor pH before and after fertilizing. You don't need to fertilize at every watering and remember to stop feeding a few weeks before harvest so the plants can be flushed out fully and safe to consume. Over fertilizing kills more plants than any single other factor!**

**Fertilizer product with N-P-K rating highlighted:**

**10 - Water**

**Your plants will need water to grow big and strong. You have to resist the temptation to over-water as this will cause fungus and mould to grow. Rotting roots is an easy problem to fall victim to and a hard one to spot until it's too late because the roots are under soil. The water should be at room temperature (not too hot or cold) and should be pH tested to ensure it's safe.**

**There are a lot of different grades of water, from tap water to bottled mineral water to rain water. Unless you have specific reason to doubt the quality of your tap water, it is likely to be perfectly safe to use on your plants. If you are paranoid about the water quality, use filtered or distilled water (available in garden centers) mixed 9 parts to 1 with mineral water.**

**Adding hydrogen peroxide (often just sold as peroxide) to your water can be an effective way to ward off some pests and plagues. Peroxide is usually sold as 5 percent solution. Mix this with your water supply as 1 part peroxide, 5 parts waters. The peroxide breaks down into water and oxygen. The stray oxygen will nourish the roots (which need oxygen not CO2) and will kill fungus, mould and gnats. Be sure to check the pH after mixing in your peroxide.**

**Shake beads of water off your leaves as they can burn the plants:**

**11 - pH**

**pH is a measure of acidity. It is important that you monitor and track the pH of your plants environment. You can test the pH of soil by wetting it thoroughly and testing with a digital pH meter or pH litmus paper strips. Both of these should be available from garden centers or hardware stores.**

**pH is measured on a scale of 1 to 14. The lower the pH reading the more acidic. A pH value of 7 is neutral and higher than 7 is alkaline. Optimal pH for cannabis growth is between 6.5 and 7.0 for soil (5.8 and 6.2 for hydro).**

**Measure the pH of soil that has been fertilized and after the nutrients have been leeched a little by the plants, this is make sure the change of pH is taken into account. ph-Up products exist to raise the pH higher and ph-Down products will bring it back down.**

**The pH of your soil mix can be stabilized by adding dolomite lime (calcium-magnesium carbonate). This will last several weeks and help to maintain a constant pH reading throughout. Make sure to buy fine lime, and add based on 1 cup per cubic foot of soil. Mix the lime into your soil, water - then wait a day to test pH before using.**

**Small amounts of composted leaves or peat moss will lower the pH of soil. Crushed egg or oyster shells will help raise soil pH.**

**Plants showing signs of pH problems will suffer from leaves turning yellow or brown, drying up and shrivelling. The leaves may also develop dark spots. Bear in mind these symptoms could be related to other problems, but you should check the pH in case that is the cause.**