THE CANNABIS GROW BIBLE

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The Cannabis Grow Bible
4th edition

By
Greg Green

Acknowledgements

My thanks to my family and friends for making this book possible. This book is dedicated to growers all over the world. I would also like to say thank you to the members of www.cannabisX.com and www.overgrow.com with a really big thank you going out to X, ~shabang~, The Penguin, Kryptonite, Strawdog, Slowhand, Chimera, BushyOlderGrower, Ralpheme, RealHigh, Clone, cannabisX and Vic High.

This is a book about growing cannabis, written by people who grow cannabis.

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DO YOU WANT TO LEARN HOW TO GROW POT LIKE THIS?

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Picture by BushyOlderGrower.

OR MAKE HASH LIKE THIS?

Picture by BigIslandBud.

THEN CONGRATULATIONS BECAUSE YOU HAVE BOUGHT THE RIGHT BOOK!

PREFACE

This book has been written under adverse conditions. In most countries it is illegal to own seeds, grow cannabis or use cannabis. Maybe it will change for you one day if you make the effort to have your voice heard. Until that day comes it is recommended that you consult your local authorities to see what is your countries legal status with regards to growing cannabis. This book does not want you to break the law nor is it here for that purpose. This book is about cannabis and how it is grown around the world. Even though the contents of this book may show you how to acquire seeds and grow very potent plants, you are responsible for your own actions. We would like to see you grow cannabis however we would not like to see you break the law.

I would also like to say that many countries have permitted medical users to grow cannabis in their home. If they have in your country then this book will be of massive benefit to you and your health.

The Cannabis Grow Bible is part of a foundation series and is a developing project. We listen too and talk with 100's of growers every single year. It is with their advice that we can offer you the latest updates on growing techniques and strains.

The Cannabis Grow Bible is an information system. We hope that you stick with us and learn more about how to grow BIGGER BUD!

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FOREWORD

The book is a grow bible. There is still much work that needs to be done to provide something that is truly of bible size, but that will come in time. The reason why I know this is because cannabis suppression has suspended cannabis information gathering over the past 60 years. I can safely say that you can find books on Roses that are 10 times thicker than this book with heaps more information. Roses are not illegal in most countries, so scientists are free to explore the Rose. Sadly the same can not be said for cannabis.....until now.

The Cannabis Grow Bible (CGB for short) is new. New, in that the book is one of a kind. Those who are willing to take serious risks in getting you this information have discovered most of what you will read and learn here. It is fine and easy for me to compile the book and write it. I am not at risk by printing this book, but those who grew out hundreds of plants in their basement to provide me with raw data on this subject matter are at risk. It is with their help that they have been able to help me parse what is real and what is not in the world of growing cannabis. They have helped take facts and figures and use these to put together a book that would truly help someone grow bigger buds. The results have been outstanding and I am very thankful for what they have done.

In this book you will learn a number of things. Probably too many to remember all in one go if this is your first time growing. That

is why I have broken the book into easy step by step portions. The book runs from start to finish just like a growing plant would. So you can imagine the life cycle of the cannabis plant being the foundation for the style and layout of this book. This is what makes the book work. It is part essay / part science. Too many books do not cover the science very well and others do not cover the practical side very well. Here you will meet both worlds as one.

There are some simple things you need to grow a cannabis plant and this book will explain all those things to you, but there are other things you need to know to grow a super cannabis plant and this is where the book helps too, but it does not cross the two elements over which can sometimes confuse the reader. The book will clearly define what you can or can not do, but most of the time this has nothing to do with your growing experience. It has more to do with how much money you are willing to spend, what cannabis strains you have, and where you are growing.

A grower is not limited by their growing experience. A grower is limited by law, space, money, information and good genetics. We can not help you with money, space and the law, but we can help you with growing information and we can tell you where to obtain good genetics.

Don't ever let bad results hamper your new hobby. That is part of the process of learning. However, this book will point out some mistakes that people have made so you don't have to repeat them and

learn the hard way.

Glance over this book and flick through the chapters. Get an air of what is going on. Then read it all from start to finish. By the time you turn the last page you will probably have a bit of your own home grown bud in a pipe. If you can do that then tell people about this book. It is our goal to get everyone participating in growing the great herb.

This is not the final book on the subject either. This book has been designed in such a way that the book will grow on a yearly basis. We will be adding new chapters, new pictures, new methods and new theories every year. That is why the cannabis grow bible has become the growers handbook of choice.

We hope that you stick with us and we hope that this book will help you to get where you want to go. Happy growing and most of all remember to.....

...HAVE FUN!

Greg Green.

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The Cannabis Grow Bible
By Greg Green

"Since it's inception marijuana is natural, given by God for all living creatures to use. Let peace and sanity prevail. Let the herb grow free. There is no finer hobby on this planet than tending to a garden that gives such delightful rewards." - Greg Green.

Chapter 1

THE CANNABIS PLANT: A BRIEF HISTORY OF CANNABIS AND THE BASICS OF USING CANNABIS

This picture is of a young female Skunk#1 plant developing her flower cluster. This picture is from Strawdog.

Cannabis plants have been living on this planet for thousands, maybe millions of years, and have been doing so for quite some time before man's intervention and after. Cannabis can grow nearly everywhere and anywhere as long as the temperature is not too low and there is enough sunlight and food present for the plant to flourish. In Asia, one can travel to the various regions around Mongolia and visit the cannabis plant naturally growing on the hillsides and across the vast plains, sometimes covering entire hill faces and spreading down onto the valley below. The Cannabis plant is a very adaptable plant and can grow both in and outdoors.

The Cannabis plant has managed to travel across the globe

without the help of man. The seed has been carried by the wind, in bird droppings and has attached itself to animals that can, and do, trek over long distances.

As you can see Mother Nature has distributed this plant in many ways.

The origins of the Cannabis plant are not entirely clear but today it is generally recognized by most biologists and cannabis researchers that it began its life somewhere in the Himalayas (Figure 1.1).

Figure 1.1 - This is section of the map of Asia. The area in the square is where scientists believe cannabis started its Life.

Today, human intervention has caused the Cannabis plant to grow under more controlled conditions and in areas where the plant would not have had a previous history. It is estimated that in most countries there must be at least 2 - 12 different cannabis strains growing wildly.

Wild Cannabis plants are rare in countries that have tried to eliminate the plant by burning fields and conditioning woodlands. In certain countries the Cannabis plant has been identified as a dangerous drug and has been killed off by human beings and law enforcement officials. It is treated as a weed and as a plant that causes social, mental and physical problems. None of these reasons for removing the plant are well founded but the cull of cannabis has occurred anyhow.

The Cannabis plant was used for many things other than the extraction of THC (to be discussed later). Our ancestors, up until the late 1800's early 1900's, used the Cannabis plant to create clothing and other materials. The Cannabis plant or 'hemp' as it is called in the textile industry is a very strong material and will withstand large amounts of stress applied to it. Hemp material is widely regarded as one of the best possible materials for producing fabrics. A pair of trousers made from hemp, or a shirt made from hemp will withstand the test of time. It is a far more superior material than cotton. This should give you some clues as to why the fabrics industry wanted to put a stop to the cultivation of marijuana in the late 1800's. Hemp fabric products will last longer than cotton fabric products thus the buyer buys less over longer periods of time. This is the first instance of the Cannabis plant being subjected to ridicule for capitalist gain.

The Cannabis plant has been subjected to a number of stereotypical formats. The first one is that the resin produced by the plant is physically addictive. This is not true and I will explain why. In psychiatry there is a list of classifications for addictions of all abusive

substances. It is contained in a paper called - ICD-10 (classifications of Mental and Behavioral Disorders) which you can read on-line here. http://www.who.int/whosis/icd10/

Medical doctors are not informed clearly about the use and abuse of cannabis. This is because cannabis research is illegal in most countries or if research is allowed most of the results are suppressed.

The only way a medical doctor can help a person with a cannabis problem is by having some experience with people who have had cannabis problems in the past. There are no special books to turn too. There are no references which explain clearly what to do or IF cannabis is physically addictive. There are no pills for cannabis addiction (there are for alcoholism).

The only place a doctor can go is to the archives of what other countries have said about the drug and its abuse. As a doctor, one would maybe try Holland and read up on some of the material there, or Belgium or Switzerland. There can be found medical research papers that relate to cannabis dependence and all of them say the same thing. (A) Can it be abused? YES. (B) Can it be addictive? YES. (C) Is cannabis abuse or use life threatening? NO, but mental side effects such as depression can be, but only a small percentage of addicts (NOT USERS, BUT ADDICTS) go through this. (D) Has anyone ever died of cannabis use? ONLY 1 PERSON in the history of cannabis has died from its use, but read on. Bruce Lee, the martial arts expert died after taking cannabis, but the death certificate was later changed too 'death by misadventure' because of another medical herb that he took which he did not know he was allergic too. So the correct answer is **0 people**

have died from using cannabis. (E) How do you treat cannabis addiction? Psychotherapy is the only answer.

In fact there are absolutely no reasons for the prohibition of cannabis, other than:

1) It is hard to tell if someone is under the influence of cannabis. Driving/working with machinery is a problem here.
2) People might smoke too much and become a little lazy.
3) Many governments have prohibited it for over 70 years and it would seem very stupid if they told everyone that they where wrong about it.

Now let us look at these points for a moment.

1) Yes it is hard to tell and make no mistake - if you drive after smoking cannabis then you are just as stupid as if you where driving under the influence of alcohol. It is never advised to use cannabis and then perform a procedure, like driving, which requires your total attention. As of yet there is no on the spot breathalyzer test for cannabis use, but there are tests to determine if someone has used cannabis recently, in the last few hours, in the last few days, weeks or months. However, alcohol is not banned in a lot of countries but cannabis is.
2) It happens. Some people do smoke too much pot and they become docile to the point where they just want to watch television and eat. However, if there is no money about, and the person needs to survive or live somehow, you will soon find that person can restore their life

back to the way it was before they started their cannabis binge by simply - Not smoking for a few days. A few days of not smoking is all it takes to rid cannabis of any effects it has had on the human body. There may be residual cannabinoids left in the system but this does not pose any problems and will soon wear away.

This is not that easy with alcohol or heroin user. They will have to go through a long period of detoxification before they can resume a normal life. A cannabis user does not have to go through the detoxification period because there simply is none. Not only does the alcohol user have to spend a few days getting it out of his/her system but they will also have to deal with the withdrawal symptoms. This can last for months. With cannabis, it is simply, stop smoking cannabis and resume operations as normal. (Note: Pharmaceutical firms would love to sell a pill to cure cannabis addiction, but as of yet can not. They can not prove that their pill does anything because there are no cannabis withdrawal systems to observe. Thus the pill would be deemed a fraudulent product if put on the market.) Also many homeless people's living standards in most cases are attributed to alcohol dependence/addiction and rarely, IF ever, is their low living standard attributed to cannabis dependence. Cannabis dependence is psychological. Treatment of cannabis addiction is done by psychiatrists and psychologists and GP's. Heroin and alcohol is treated by psychiatrists, psychologists, GP's and doctors of internal medicine for the somatic systems of addiction.

3) This is a major problem because the government may have to set people free from prison and radically change their justice department’s

stance on cannabis which means that jobs will be lost and revenues (billions of this - $$$) will be lost if cannabis was decriminalized. Cannabis prohibition is a booming industry that creates jobs and capital. However if cannabis was decriminalized then these lost profits could be derived from a new cannabis industry.

Probably one of the best sites for medical information is www.cannabisx.com, www.lycaeum.org, or www.overgrow.com

One other thing to mention is that street cannabis may contain other added drugs. In most clinical cases, a person who complains about cannabis addiction and shows physical signs of addiction is not actually addicted to cannabis. They are addicted to the other drug substances that the supplier has added to his produce to make it stronger. 100% home grown clean cannabis does not contain physical additive properties. People who add other drugs to cannabis are not doing the cannabis community a favor. This is a good reason to grow your own pot.

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There are many strains or versions of the Cannabis plant alive today. Most strains are the result of human intervention and these are the types you will most likely come across or even smoke. Breeders try to produce strains that are tasty, smell good and give the user different types of highs. These are the strains that are best looked out for

because you can be guaranteed that the plant has got a ‘grow history’ behind it and that the seller of the seeds will know a good bit about the plant and how it ‘works’.

This ends our brief look at the history of Cannabis. There is much more to it than just this and many other books that discuss the legal aspects of Marijuana go into great detail about the history of Marijuana. In fact the history of Marijuana is so interesting and deep that a dozen chapters here would not cover the vastness of this plant’s background.

HOW CANNABIS IS USED

Whenever we hear the word Cannabis we think of the famous leaf shape like the one on this book’s cover. Many magazines show joints being rolled thick with leaves. Leaves are in fact the lesser potent part of the plant next to the stem and the roots. The cannabis plant can be divided into 6 main sections (Fig 1.2.). Bud, Stem, Branches, Nodes, Leaves, and Main Cola.

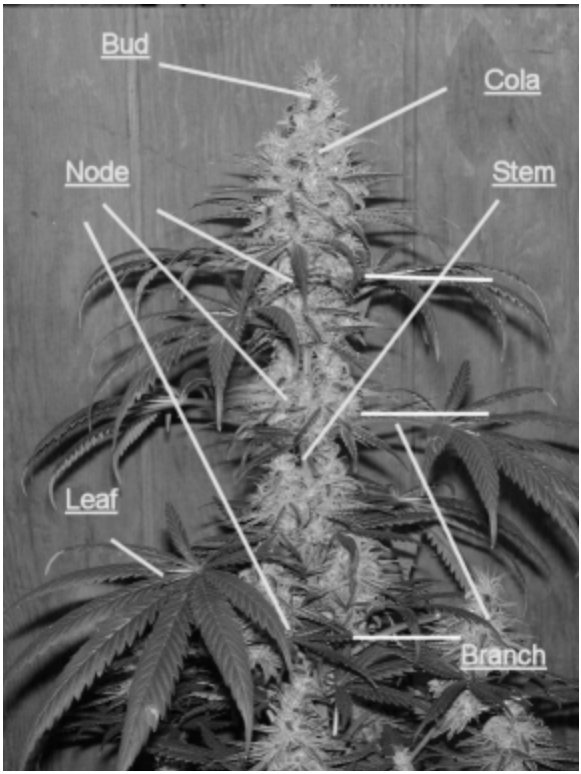


Fig 1.2 - This is a picture by BigIslandBud. Each of the parts of the plant have been Indicated. The 3 horizontal lines on the right show 3 Node levels of branching and where they occur.

The next thing to know is that plants have a gender. The genders are male and female and sometimes a mix gender called the hermaphrodite condition. Now listen to this closely.

1) The male plant is not used for smoking because it contains low levels of THC and does not taste very good, but it can get you high.

2) The female plant when pollinated does produce THC but also produces seeds which prevent larger quantities of bud from being produced.

3) A non-pollinated female (sinsemilla) plant will produce more flowering buds with no seeds and will produce more quantities of THC than the male plant or a seeded female plant. The buds produce resin, which contain THC, and can drip down onto the leaves. When she is fully mature she should produce a very pleasing high depending on the grow method, the strain of plant and when it is harvested.

To put it plainly, males can be smoked but are not very good and are considered vastly inferior to the female plant. The female plant when pollinated produces seeds and can be smoked but is vastly inferior to a non-pollinated female plant (sinsemilla) that produces more bud. It should be the goal of every Cannabis user to grow non-pollinated female plants with big buds. The goal of a cannabis breeder is too produce quality seeds and plants. How both these things are done

is what this book will help you to understand.

At the end of the Cannabis plant's life cycle the plant is harvested. This means one of two things. The plant can be completely uprooted and treated (called a complete harvest) or the plant can be harvested a small bit and used again for a second flowering term (this is called re-veging (Figure 1..3) and re-flowering).

Figure 1.3 - A plant that is being re-veged. Picture by Vic High.

When Cannabis is harvested the harvester concentrates on the best part of the plant, namely the top cola and the buds. The leaves are

the last thing to worry about and the stem and roots are normally thrown away. There are many ways to harvest a plant and we will explain it in detail, later. Once the grower has selected the parts they want, they then set about curing their harvest (Figure 1.4). Curing your harvest is important. It helps one to produce a finer product. After the curing has been done the grower can then choose how he/she wants to finally produce their smokable mix (figure 1.5). They can use the cured plant as it is and smoke it dry or they can produce hash or oils from the curing process.

Figure 1.4 - This is a picture of some cured buds.

Figure 1.5 - This is the result of a good indoor harvest. Both Pictures by Kryptonite.

Figure 1.6 - This is a picture of an indoor garden from Kryptonite.

SPECIES

The next thing one should know about are the different types of Cannabis species. There are 3 main species of Cannabis plants. These are Sativa, Indica and Ruderalis. Each species has its own group of strains which are many. Each species has different characteristics and each strain of each species has its own special identity.

Figure 1.7 - Picture of Sativa leaf by Slowhand.

SATIVA:

Height - Can grow tall. Averages anywhere between, 4 - 15 feet.

Nodes - Has long internodes between branches, 3 inches to 6.

Leaf - Pointy leaves with no markings or patterns.

Figure 1.8 - Indica Leaf picture by Kryptonite.

INDICA:

Height - Small plants. Averages anywhere between 6 inches - 4 feet.
Nodes - Short internodes between branches. 3 inches and less.
Leaf - Rounded leaves with marble like patterns.

Figure 1.9 - This is a picture of some Ruderalis / Indica hybrids from Sensi Seeds. www.sensiseeds.com

RUDERERALIS:

Height - Small plants. Averages anywhere between 6 inches and 4 feet.
Nodes - very short internodes with much branching.
Leaf - Small and thick.

THC

Cannabis plants produce psychoactive ingredients called cannabinoids. The main ingredient of the cannabinoids that gives the high effect is called - delta 9 THC. All strains vary in THC levels that come in different percentages. Some plants may contain 100% THC but the "levels" of THC may be low. Other plants have only 60% THC, but the "levels" of THC may be very high. A good potent plant will have both levels and quantities very high. Cannabis plants also produce something called - delta 8 THC. This ingredient is in low levels but does contribute to the high. When we mention THC levels, we are talking about both delta 8 and 9 THC.

There are also other ingredients that add to the high such as CBD, CBN, THCV, CBDV, CDC and CBL, but are only very minor compared to THC.

The difference between THC levels and THC quantities is that THC levels are genetic. They are not under the influence of the grower. THC quantities on the other hand are. This is to do with bud mass and how much resin can be generated in that bud mass.

Some bud may only contain 20% THC, with a THC level of 5. The same plant grown under better conditions and light will produce 70% THC, with a THC level of 5. The ‘5’ is genetic. The quantities of 20% and 70% are under the grower’s control.

When examining a strain in a seed-bank catalogue one is guided to check for the THC levels of that plant to understand how potent the plant is. Many seed sellers and breeders measure their

plants THC levels and give accounts on how much THC their plants have. Of course many breeders like to exaggerate on how much THC their plants produce, but some do not. If you wish to know more about THC levels it is best to consult your seed-bank or breeder for details.

No complete study of cannabinoids has been made public since this book's publication. This is because cross breeding produces so many different results that it is hard to keep track on what is happening. Some 'old timer' strains are still around and have been tested. This information can be obtained from the larger seed production companies in Holland. THC testing is also an expensive process that requires heavy amounts of research.

The other interesting factor is that some plants do not produce any THC at all. These plants have been genetically engineered (GM) to produce very low levels of THC and are mainly used by farmers in some countries who have permission to grow cannabis for hemp production ONLY. It is best to keep away from these seeds and strains. They will not get you high. There is project called the PMP (potency monitoring project) that is carried out by some government-funded agencies, but the results are questionable.

ZERO ZERO

The other thing that may interest you is that Cannabis can be cured in various forms and one of these popular forms is HASHISH

(Figure 1.10).

Figure 1.10 - This is some raw hash extraction by Kryptonite. This hash is pure without any additives.

Hashish can also be graded and one of the most famous grades of Hashish is called Zero Zero. Hashish making (Figure 1.11) can improve (but sometimes degrade) the overall potency of marijuana.

The grades of Hashish are as follows. 00(zero zero), 0, 1, 2, 3. Zero Zero is by far the most purest form of Hashish on the market today and comes from plants that have high levels of THC in conjunction with a good Hash making technique. Sometimes the technique may be good but the levels of THC in the plant are low. This may produce a grade such as a 2 or a 3.

It is wise to note that the Potency of a plant depends on a number of factors. It should be the goal of every grower to produce a potent, high grade, product. Zero Zero is also a 'western' concept derived from hash types that come from Morocco.

Figure 1.11 - This picture shows some hash being made. The powder-like substance is the collection of trichomes from the plant. This

powder will eventually be solidified to make a bar of hash. Photograph by Chimera.

RESIN

Female plants produce resin glands (Figure 1.12 and 1.14). Some of these glands may have lots of resin but are not very potent. Other plants may have little resin but are very potent. Optimal growth gives rise to a plant that has lots of resin and is very potent. Resin glands are produced all over the female flowers and new leaves. They can be seen clearly with the use of a magnifying aid. These resin glands are correctly called Trichomes.

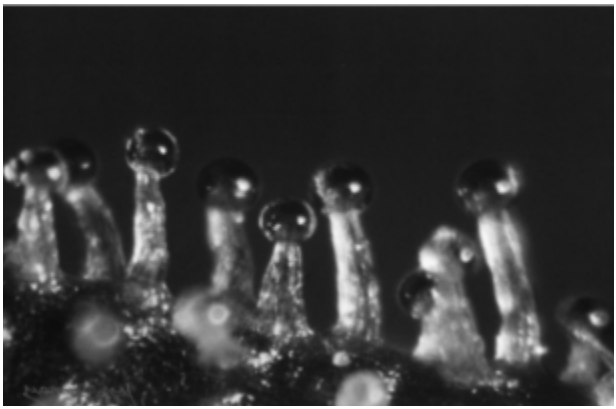


Figure 1.12 - This picture is a macro shot of some trichomes as they look on the plant. Notice the ball shaped tips. These contain

cannabinoids. Photograph by Joop Jumas.

Figure 1.13 - This flowering female is covered in Trichomes. That is what gives this bud her frosty look. Picture by Chimera.

Resin can be rubbed off the bud using the fingers and then rolled into the palms to create small balls of hand rubbed hashish. It is within these glands that one is to find the main concentration of produced cannabinoids and THC. When a plant is in full flowering the resin gland can explode or break dropping resin down onto the leaves below. This can also give the leaves their shiny frosty potent look during flowering. Towards the bottom of the plant are located the fan leaves. These leaves are generally large and collect most of the light for plant growth. Because these leaves are far away from the top of the plant, which produce the most amount of resin glands and buds, they collect the least amount of resin and are not very potent. It is best to consider separating these fan leaves from the rest of the plant after harvest because these leaves will not give you the best quality high.

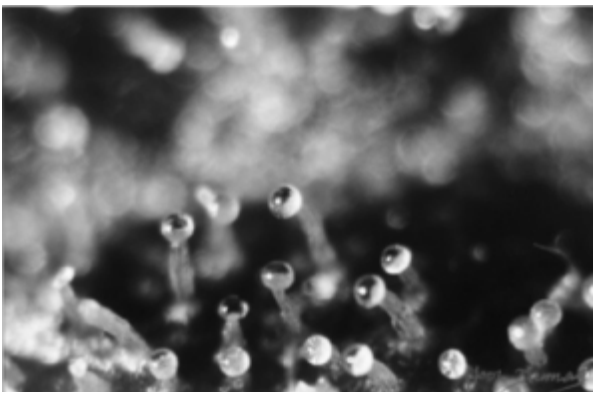


Figure 1.14 - Trichomes Photograph by Joop Jumas.

THE HIGH

We should now have an idea as to what we are looking for in terms of a good quality smoke. We are looking for non-pollinated female plants that have flowered, producing lots of buds with resin glands that contain high levels and amounts of THC. We are also looking for plants that have been well cured and processed in a way that allows us to sample the full flavor, smell and taste of the plant. One must also be aware that some plants are very potent and can literally knock one's socks off. This is where taste comes into play. Some people like plants that give a head high but do not cause one to fall asleep. Other people like plants that give a down effect and cause the body to become less responsive to stimuli. The body down is called 'The couch-lock effect'. The head high is simply called 'The head high.'

Now another thing must be considered here. Remember that we talked about Species of Cannabis - Sativa, Indica and Rudereralis? Well Rudereralis is hardly used much today. Sativa and Indica are extremely common and these 2 species will be the main focus of this book. Also both species have two different forms of high. The high type of each species can also be controlled depending on the time at which you harvest. Not only this but the species can be crossed to produce Indica/Sativa type plants or Sativa/Indica type plants. This may sound all very confusing at first, but it is in fact all quite simple. We will explain more about this in our next chapter.

Chapter 2

SEEDS

Figure 2.1 - Some cannabis seeds by Kryptonite.

At the moment there are approximately 450 seed varieties of Cannabis on the market today. Out of the 450 seed varieties, 200 are worth looking at and out of the 200 varieties about 50 or so are outstanding. Each strain is either a pure species type (taking 2 plants of the same species and crossing them) or a crossbreed of two or more species (taking 2 plants from different species and crossing them).

Out of the 450 seed varieties we said that 200 where good. This leaves 250 left. Those 250 are usually very unstable crossbreed strains. These complete hybrids plants are mixed so much that they can not be classified at either Sativa or Indica. They are classified in a different way and we will explain this in the strain format table below.

Most hybrids do not last long on the market and are primarily found only among breeders who are experimenting with their plant's genetics. Seed producers tend to only produce the following strain categories. Some Hybrids can be excellent though!

PURE SATIVA (This is a pure species)
SATIVA (This is a mostly Sativa species with some Indica)
PURE INDICA (This is a pure species)
INDICA (This is a mostly Indica species with some Sativa)
INDICA/SATIVA (This is a 50/50 cross between a Sativa and an Indica species)

They also produce:

RUDERALIS (This is a pure species)

And some other Ruderalis mixes. However Ruderalis is a problematic plant. It does not produce large quantities of THC, nor does it flower like the other varieties. Ruderalis is considered sub-standard by most growers because it flowers according to age and does not flower according to the photoperiod. We will explain what the photoperiod is in a moment.

Now remember that we said an Indica/Sativa cross would produce two different highs. Well we lied a little. If they are both 50%/50% crosses then the high will be a 50%/50% mix. Indica/Sativa and Sativa/Indica is really the same thing.

Pure Sativa is a total ‘Head High’. Pure Indica is a total ‘Body Stone/couch-lock’. A 50/50 cross will give a 50% ‘Head high’ and a 50% ‘Body Stone’. If an Indica plant is crossed slightly with a Sativa plant it will give a 60% ‘Body Stone’ and a 40%‘Head High’. A Sativa plant that is crossed slightly with an Indica plant will give a 60% ‘Head High’ and a 40% ‘Body Stone’. The 60/40 ratio is most common but some breeders can change that ratio. When choosing a seed, check to see if it is pure or if it has a ratio. Most seed sellers will have this listed along with their seed type. So when we look at some strains that are crossbreeds we must understand which species the plants are leaning towards. Along with the cross you can expect that the plant will look different. Some Sativa plants may be shorter because of the Indica breeding in them and some Indica plants may be taller because of the Sativa breeding in them. This is okay though because later on we will find that as a grower we have control over how a plant will look and grow. As a grower we can influence height and plant features. We can also harvest the plant in such a way that we can produce a different high type. The later you harvest the plant the more you will help produce a couch-lock effect. Harvesting just before peak will induce a cerebral high. If you are working with strains that are for either cerebral or couch-lock highs then you can harvest early or later and help produce some of these ‘high type’ properties.

Figure 2.2 - This is a wonderful harvest picture by GIYO.

Hopefully with the knowledge you have been given so far you are equipped to choose a plant that fits your needs in terms of height, potency and high type. There is no point trying to grow an 8-foot Sativa Bush indoors if you do not have the space for it. 2 foot Indica plants outdoors may not survive if other plants compete with it for light. As a rule we can always shorten the plants lengths through pruning, but rarely can we double the plants height if the strain's genes only allow the strain to grow 2 or 3 feet.

Figure 2.3 - A small grow room by Mr.Zog.

HOW TO GET SEEDS

The best way to get seeds is from a friend who has grown a type of plant that you enjoyed to smoke. This, by far, is the best way because, (1) You will get the seeds for free and (2) you know what the high type will be because you have already tasted it.

The next best way is the Internet. The Internet is full of seed-banks that wish to sell you seeds, but there are a few problems that you may encounter. The first problem is that some of these seed-banks will rip you off. The second is that some of these seed-banks do not ship worldwide. The third is that some of these seed-banks misrepresent their stock. The fourth is that seeds can be very expensive. Some seed-banks sell seeds anywhere between (US Dollars = $, UK Sterling = £) $80/£70 and $300/£290 for 10 - 16 seeds. There are rip-off artists out there, but then again some of these seeds are worth the money because the strain is excellent in vigor and production. So how do we choose our seed-bank and how do we really know what seeds to pick?

CHOOSING A SEED-BANK

As a rule if you find a classy seed-bank then you will find classy breeders using that seed-bank to sell their seeds. If you find a seed-bank then the first thing you should do is to examine what people have to say about that seed-bank. The best way to find this out is to check one of the more popular websites on the net like

www.cannabisx.com or www.yahooka.com. Some web sites give listings and ratings on seed-banks.

You can also do a search on the net using a search engine like AltaVista or Yahoo. Find a good web site that is used by a number of people and not a web site that is used by one person. A community of users is a good place to go for message board forums and chat. Also check to see that the site has a registered URL, like a .com site. If they use a free web site service then consider staying clear of it because it can disappear without trace overnight. Once you have found a web site then run a search on 'seeds'. A listing may appear of all known seed-banks that deal over the Internet. It is best then to check out the reviews on each seed-bank by the public. A good one is www.yahooka.com or www.cannabisx.com. This gives the latest update on each seed-bank and gives them a review out of 5. Find the URL of each seed-bank and check out the prices. Some seed-banks do deals on seeds and you will find that prices do change from bank to bank. The next thing you do before buying anything is to send the web master an E-mail. Ask him/her about their services, what seeds you like, how they delivers, security arrangement, and if they can deliver to your country. In some countries seeds are legal. In others they are not. Wait until they give you a reply. If you do not get a reply then do not use that seed-bank. These people are salesmen and should communicate with you and answer all your questions. Also ask how the money should be sent and ask about postage and packaging. Most seed-banks sell their seeds in batches of 10 - 20. This means that you will get 10 - 20 seeds in the post. Anything can happen. A misplaced

foot in the postal office can kill the seeds, making them not viable. Good seed-banks provide good packaging. Ask about it.

If your seeds do not arrive send an E-mail to the seed-bank and ask them what happened. If they do NOT reply or if your seeds are lost write them a complaint and then post that complaint in one of the web boards like yahooka.com. The more people complain the better the chances of indicating seed-banks that are ripping people off. Also if you get your seeds in good condition then it is always wise to post a good review of that seed-bank. This will also improve your communication with that seed-bank the next time you buy seeds (you may get discounts). If you do not have access to the web then you will have to get addresses for these seed-banks and send them a letter asking for further information. Some seed-banks have even advertised in the back of this book.

WHAT TO LOOK FOR IN CHOOSING SEEDS

Okay, so now you have an idea of what type of plant you want and the seed-bank that you are going to use. The next step is too check if the seeds are for indoor or outdoor use. There is a saying that all cannabis seeds can be grown indoors and outdoor. This is true, but that is not what the breeder had intended. If the breeder had created a plant that does well indoors then it is suggested that you only grow these seeds indoors. If you grow outdoors and the plant does not produce that well, then you know that you should have followed the breeder's advice. Next time take that advice. There is nothing stopping you from

experimenting, and some growers have produced excellent results by putting outdoor seeds indoors or putting indoor seeds outdoors, but it is best if you follow the advice you are given, especially if you are new to growing.

Figure 2.4 - Outdoor Sativa.

Figure 2.5 - Indoor Sativa.

Both of these pictures, figure 2.4 and 2.5, show a mostly Sativa strain growing outdoors and indoors. As you can see this would probably be labeled an outdoor strain because of its size. The grower, mullummadman, has been able to grow it both ways though.

You may also find that a number of similar strains have been produced by different breeders. When you look at the seed-bank list you may see 1 - 4 types of the same plant. What is going on here you ask? Well, let us take Skunk#1 for example. Skunk#1 is a mostly Sativa plant but there are about 7 breeders who have provided a certain

seed-bank with these seeds. Each seed breeder tries to develop the best plant possible for that strain type. You will find that some breeders are good and others are not so good. Make sure that you check with the seed-bank to see which breeder's strains are the best. Always choose the best. The reason for choosing the best is that later you can **PRODUCE YOUR OWN SEED** from that strain! Welcome to the wonderful world of Marijuana growing.

Search for Serious Seeds and Paradise Seeds on the internet. They are both Dutch seed companies.

The next thing to look for is flowering times. Each strain is a bit different on flowering times. In a nutshell flowering is the next cycle after your plant shows its sex. There are 3 main stages in plant growth. Germination, Vegetative growth and Flowering. It is towards the last days of flowering that you should begin your harvest. If the seed-bank says, Skunk#1 Flowering time: 7-9 weeks then you should be able to know roughly when your plant will be ready for harvest (in this case it will 7 - 9 weeks from the time your plant starts to flower).

Some plants have shorter flowering times and others have longer. This is a guide to help you understand how long it will take, after vegetative growth is complete, before you will have a chance to savior your plant’s delights. The last piece of advice is this. Always consult someone about your strain type. Who knows, they may be able to recommend something better.... Or maybe even have a private seed stash of their own.

Figure 2.6 - This is some Skunk#1 by Strawdog.

Figure 2.7 - Seeds enough to grow a 1000 plants! Picture by Kryptonite.

Figure 2.8 - This is another great picture of some female bud by Kryptonite.

GROWING FACTORS

This is important to bear in mind before you grow your weed. Have you got the time to take care of your plants? Are you going to be taking long holidays? Have you got someone you trust to take care of your plants? And if you do how secure is your grow area? How do the people you live with feel about this? Can you hide the smell when the plants start to flower? Are you prepared to pay money on lights and other grow items? Are you prepared to pay the costs of a higher electricity bill? Are people going to see your grow room? Are people going to walk past your grow site outdoors? Is the meter man going to see your grow room? Is the gas man going to see your grow room? Are you sure that you really want to do this?

Figure 2.9 - This is an example of how some outdoor plants can get

really big and tall. Sometimes they can be hard to hide. Picture by Mullummadman.

If you are negative on any of these points above then I suggest that you resolve those issues before you move on.

The next thing I am going to tell you is the most important thing you will ever hear when growing marijuana. People have lived their whole lives growing cannabis and have never had an encounter with the law. It is so simple, but very hard to do. If you can do it then you are halfway to being an expert grower. Are you ready for it?

NEVER TELL ANYONE THAT YOU ARE GROWING CANNABIS!

If you do this then you will never have a problem other than someone accidentally walking into your grow area. NEVER EVER TELL ANYONE ANYTHING, EVER. If you can do this then you will have more security than a castle equipped with guard-dogs henchmen and the works. Loose lips cause 99.9% of all security related issues being breached. 00.1% is caused because you did not take the time out to conceal your area well enough. Loose lips sink ships.

If you plan to share your crop with your friends then do it by another means, like - 'Hey guys look what I just bought'. The only people who should know that you grow are the people who live with you. If your husband/wife has loose lips, then maybe you should consider guerrilla growing outdoors (explained later.) Other than that, these are the most important factors you need to consider. Never grow at home if other people are not going to know about it. This is bad and always causes problems in the end. So what does that say? Growing on your own is the best way. Growing with other people is a problem unless you know they are okay with it. You will have to figure some of these things out for yourself.

The next factor is bugs and pests. Always, always have a bottle of pesticide that kills SPIDER MITES. Spider Mites can reduce your plants to garbage within a couple of days.

NEVER EVER BRING A PLANT INSIDE THAT HAS BEEN OUTSIDE. People who have done this have managed to kill nearly every plant in their house because they brought a plant indoors that had spider mites. Marijuana plants are very vulnerable to mite attacks

because the spider mites love to suck marijuana plants dry. They are tiny, about half the size of this dot --->> . I can not stress how important this is. We will talk more about pests later.

The next thing we will talk about is what we expect our seeds to do before they become full flowering plants.

Figure 2.10 - This is example of what pest damage can do to your crop. Notice how the leaf has been eaten away. Picture by Slowhand.

THE LIFE CYCLE OF THE MARIJUANA PLANT

Figure 2.11 - Another wonderful bud shot from Chimera.

We said before that a plant would grow in three main stages. Germination, Vegetative growth and flowering. Plants actually grow in 6 stages. Here is the life cycle of the cannabis plant.

Germination:

This is the initial stage of growth and occurs when your seed's embryo cracks open and the seedling produces a root. This root fixes itself into the soil and pushes the newborn seeding up and over the soil surface. Following surface contact two embryonic leaves open outwards to receive sunlight, pushing the empty seed shell away from the seedling. It takes anywhere between 12 hours to 3 weeks for seeds to germinate. Once the plant has reached this stage it goes into the seedling stage.

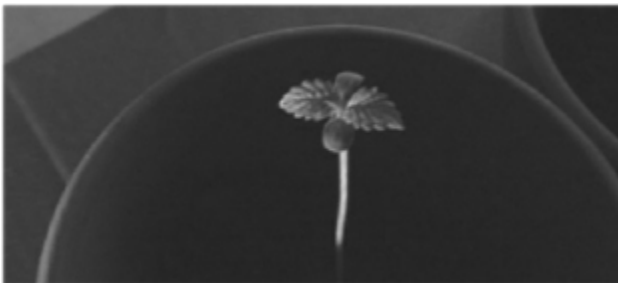


Figure 2.12 - This is a great picture of an Indica seedling by Strawdog.

Seedling Stage:

After the first pair of embryonic leaves are receiving light (Figure 2.12), the plant will begin to produce another small set of new

leaves. These leaves are different from the last and may have some Marijuana characteristics such as the three-rounded finger shaped points. As the seedling grows, more of these leaves are formed and bush upwards along with a stem. Some stems are very weak at this stage and need the support of a small thin wooden stake tied to the seedling with some fine thread. The seedling stage can last between 1 and 3 weeks. At the end of the seedling stage your plant will have maybe 4 - 8 new leaves. Some of the old bottom leaves may drop off.

Figure 2.13 - Here is a picture of a cannabis plant in vegetative

growth. This picture is from GIYO.

Vegetative Growth:

The plant now begins to grow at the rate which its leaves can produce energy. At this stage the plant needs all the light and food it can get. It will continue to grow upwards producing new leaves as it moves along (Figure 2.13). It will also produce a thicker stem with thicker branches and with more fingers on the leaves. It will eventually start to show its sex. When it does this it is time for the plant's pre-flowering stage. It can take anywhere between 1 and 5 months for the plant to hit this next stage.

Pre-flowering:

At this stage the plant slows down in developing its height and starts to produce more branches and nodes. The plant fills out in the pre-flowering stage. During this phase of the plant cycle your plant will start to show a calyx which appears where the branches meet the stem (nodes). Pre-flowering can take anywhere between 1 day to 2 weeks. (See last page of this book for pre-flowering/calyx illustration)

Figure 2.14 - This is a great picture of a flowering plant. It should be indicated here that this plant is a female. Picture by GIYO.

Flowering:

During this stage the plant continues to fill out. The plant will show its sex clearly. The male plant produces little balls that are clustered together like grapes. The female plant produces little white/cream pistils that look like hairs coming out of a pod. Each of the plants will continue to fill out more and their flowers will continue to grow. It can take anywhere between 4 to 16 weeks for the plant to fully develop its flowers (Figure 2.14). During this time the male's pollen sacks would have burst spreading pollen to the female flowers.

Figure 2.15 - Seeded bud picture
by Shecky Greene.

Seed:

The female plant will produce seeds at this point if she has received viable pollen from a male plant. The seeds grow within the female bud and can take anywhere between 2 weeks to 16 weeks, to grow to full maturity. The female pistils may change color before finally bursting the seedpods, sending them to the soil below. (Breeders like to collect their seeds before the seedpods burst.)

These are the six stages of the life cycle of a cannabis plant. It is important to know that if the males are separated from the females and killed off then the females will not become pollinated. Let us go back a step and describe what happens here.

FLOWERING NON-POLLINATED FEMALES
(SINSEMILLA CROP)

Figure 2.16 - This is some bud by Giyo. The picture is upside down because it is freshly harvested bud strung up.

During this stage the plant continues to fill out. The plant will show its sex more clearly. The female plant produces little

creamy/white pistils. The plant will continue to fill out more and its flowers will continue to grow. It can take anywhere between 4 and 16 weeks for the plants to fully develop. During this time though there are no males to pollinate the female plants. The buds will grow larger and develop more resin glands. Resin may drop down onto the leaves and the plant becomes very sticky. The pistils on the buds begin to get thicker and cluster into balls. The reason for the high increase in bud growth is that the female plant is trying her best to attract male pollen. Towards the last days of flowering the pistils will change color Indicating that the plant is ready for harvest.

CYCLE TIMES

Given the above data it can take anywhere between 10 weeks and 36 weeks for a plant to grow to maturity. That is, again, anywhere between 2.5 months to 9 months. The most common grow time is 3 to 4 months. All this is dependent on the strain that you choose. Pure Sativa can run anywhere into the 6 - 9 month bracket. Indica can flower in 6 weeks. As you can image a Sativa/Indica plant will fall into the 2 - 4 month flowering period.

Figure 2.17 - Seeded bud picture by Shecky Greene.

Figure 2.18 - Great bushy plant picture by X3n0.

Chapter 3

PROPAGATION

What is propagation?

Propagation: 1 The action of breeding or multiplying by natural processes; procreation, generation, reproduction. 2 The action of spreading an idea, practice, etc., from place to place. 3 Increase in amount or extent; enlargement; extension in space or time.

Propagation is 'The Grow'. However most people treat propagation as the actual events occurring between the planting of the seed and the transplant of that seedling to the main grow environment. Here we will treat propagation as the entire process of growing from seed to harvest. Propagation also includes the logistics of the grow.

So what are you going to do? Are you going to buy a batch of 10 seeds and grow them all in one go? Are you going to then kill the males and just smoke the females? Are you going to keep the males and produce more seeds from the females? How many seeds can a female plant produce? Should I plant my 10 seeds in one go? What should I do to guarantee that all my seeds will grow? These are the questions that you should be asking before you begin to grow and this is where propagation logistics comes into play. The answers depend largely on the size of your grow area and what your budget is.

Let’s say we have about $200/£180 to spend on seeds. We can

buy an expensive strain like a G13 cross and then we can grow the G13 and produce more seeds from it. We can get anything between 100 and 2000 seeds depending on plant size and grow conditions. If we grow this season for 4 months and at the end produce a lot of seeds then we may never need to buy seeds for this strain again.

There is something else we can do called - CLONING.

Figure 3.1 - Here are some clones by Slowhand.

This is a technique whereby we can grow a number of plants and select a good female. Then we can take cuttings from that female mother plant and grow these cuttings into new plants. Clones always keep the same sex and vigor of the mother plant. It is also possible to

create a garden of plants that will last for decades through cloning from a single female mother plant. Cloning is discussed in detail in a later chapter

For the new grower it is advised that you buy 10 seeds and only germinate 3 the first time followed by another 3 the following week followed by the last 4 in two weeks after that. This will allow you some degree of experimentation as you may fail on your first attempt to germinate the seeds because of lack of any previous cannabis growing experience.

For people who have germinated seeds once before in the past, it is advised that you germinate 5 followed by another 5 the next week. If you are a long time grower with a good amount of growing experience then you can germinate all 10 in one go. Again you do not have to do it this way. It just helps reduce the risk of failing all the seeds because of bad germination methods.

During your plants growth you may decide that you want to pollinate ONLY ONE of your females. This means that you need to have two grow areas. One for growing all your female plants and another for growing a single or more females mixed in with some males. As we said before this depends on how much grow space you have and how much money you want to spend. It is important that your pollination room is kept well away from your female grow room. Pollen can travel by air and it is advised that the two areas are kept well apart. Also bees and other insects can spread pollen. Not only that but you can too. Always wash your hands and face after handling a male plant. This saves problems of pollen from a male plant getting

onto a female that you wish to keep for sinsemilla.

Figure 3.2 - Pollen from the male plant can be collected by shaking it over a clean surface such as a sheet of glass. The pollen can then be swept up by using a credit card. If you gather it in a piece of paper like this then you can.....

Figure 3.3 - .....Store male pollen in a test tube like this. If kept out of the light pollen can keep for a long time. You can use this pollen to make seeds from a female plant by sprinkling some of the pollen onto the female flowers. Photography film canisters also make great pollen storage units. Both picture by Slowhand.

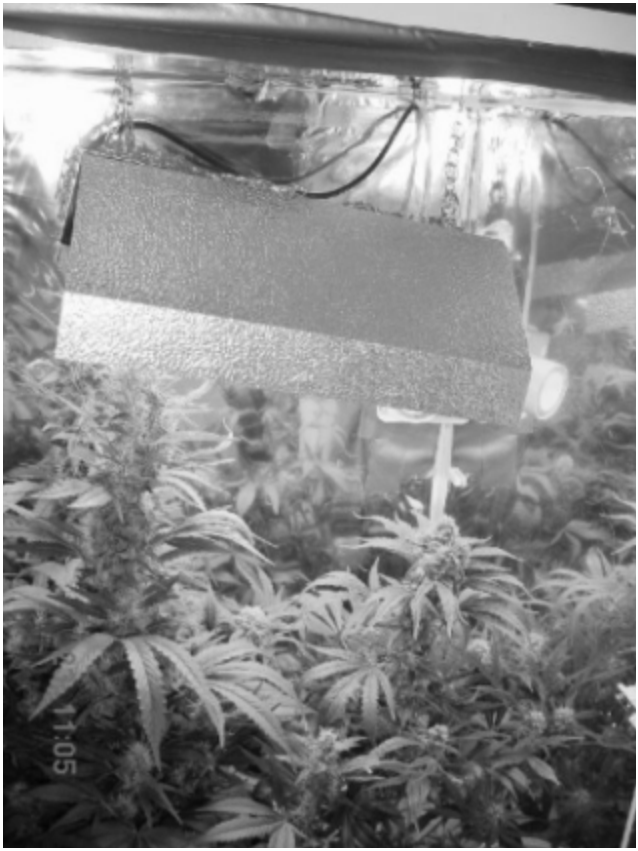


Figure 3.4 - This is a great picture of an indoor grow room by GIYO. The light hanging down over the plants is a HPS light. It gives off an orange glow to the grow room.

So being logical we can see that we have paid a bit of money for 10 seeds and that we want to get 100% germination results. The following passages will tell you how to achieve that success rate.

WAYS TO GERMINATE YOUR SEEDS

Seeds can be germinated in a number of ways. Some ways guarantee more success than others. It is recommended that you consider the 'rockwool SBS propagation tray' method.

Figure 3.5 - Germination picture by BushyOlderGrower.

Seed soil propagation:

This is a method whereby the seeds are placed down in moist soil about 3mm or the length of the seed from the surface. The soil is kept moist (Not soaking wet) by sprinkling water over it once a day. This has a moderate success rate. Out of 10 seeds only 7 - 8 may germinate.

Seed towel propagation:

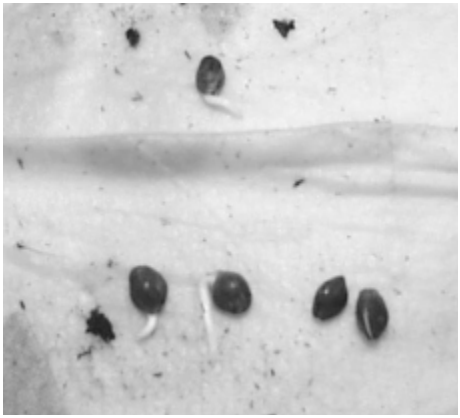


Figure 3.6 - This is an example of some seeds that have germinated. This method is the towel germination method. Picture by Kryptonite.

This is a method whereby the seeds are placed either on a damp towel or on a damp piece of cotton wool. Cheesecloth may also

be used. The seed is then covered with more damp wool or a damp towel. The towel/wool must be kept moist at all times. If the material dries out it may damage the seeds. Everyday check to see if the seeds have started to produce any roots. If they have then immediately transfer the seedling to a grow medium (such as soil) using a pair of tweezers. Do not touch the root. This has a moderate to high success rate. Out of 10 seeds 8 - 9 may germinate. The problem with this method is that sometimes the transplant can cause the seedling to go into shock. This can kill the germination process leaving you with nothing. With practice you can get all your seeds to germinate.

Propagation kits:

This is a method whereby the seeds are placed in small unit, called a seed or clone propagator, which is designed to help plants germinate. One such kit is called a rockwool SBS Propagation Tray. Some of these kits can be heated and look like a miniature greenhouse. At the bottom of the tray is a small area where water, or even better ‘some germination hormone’ is poured. Small grow cubes called rockwool cubes are placed into slots in the tray, which automatically dips the rockwool into the solution (Figure 3.8). The seeds are placed into tiny holes in the cubes and the cover is then put back on the unit.

Figure 3.7 - Propagation kit and Clones by Strawdog.

This has a very high success rate. All the seeds can sometimes germinate and in most cases often do. The disadvantage to this method is that you need to spend money on the tray, rockwool and grow fertilizers. The price of the tray is about $10/£10, the rockwool cubes $5/£5, the grow fertilizers $5/£5. If you have spent $50/£50 on seeds then why not spend the extra $20/£20 on getting a small kit together like this. The other advantage is that you can use this same tray to help root your clones.

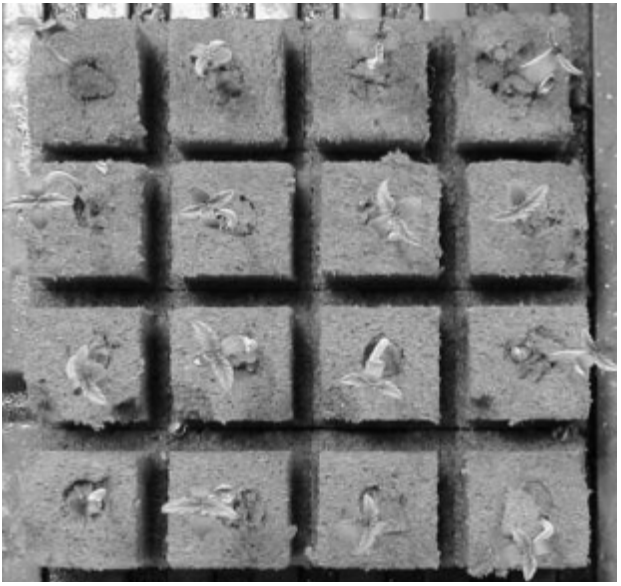


Figure 3.8 - Overhead shot of some seedlings germinating in rockwool. Picture by Shecky Greene.

DANGERS WHEN PROPAGATING SEEDS

Drafts are a killer and will stunt germination. Always make sure that you keep your germinating seeds away from any open windows or fans. Also make sure that the room is kept warm. A cold room can inhibit your germination rates. The other thing to look out for when using germination fertilizers is to make sure that your mixture is correct. Do not use high doses of fertilizers with seedlings.

In fact water is all seedlings should need. You do not need to add anything. Some people do use germination solutions though, but make sure that you keep these solution strengths down low. An incorrect mixture can burn your seedlings and cause them to fail. Another thing to do is to leave your seeds alone to grow. Do not go fiddling with them, hence the term ‘digging up your seeds’. Some people tend to disturb the soil to see how their seeds are doing. This is a bad move and can break or even damage the seed and root. The other thing to keep in mind is that some strains produce seedlings that have weak stems. This means that the seedling may tend to lean, sometime more than 90 degrees, to the left or right. If you find that your seedlings need support then use a small stick to hold your seedling up. Tie the stem to the stick using a piece of thread. Never tie the thread above a growing shoot or the seedling will push up against the thread and rip itself. You may continue to use a stick to support your plant as it grows. If your plant still has a weak stem during vegetative growth it is recommended that you give the base of the stem a little shake every morning and evening. This will help the plant to develop a more solid stem. Outdoors the wind shakes a plant and causes it to develop this solid stem. You can fake the wind by doing this mildly every morning for two or three seconds. However if you read on you will find that indoor fans help do this. (Note: Never bring a stick from outdoors indoors for support as the stick may have some bugs on it. Some bugs such as spider mites can go undetected in their incubation nests inside the wood.)

Seeds must also be viable if they are going to germinate. Never use white seeds. These are immature. Find seeds that have white and grey markings or another color apart from white.

Crushed seeds will also not germinate. Old seeds may have trouble germinating. Always try to use the best seeds you can find.

TRANSPLANTING

During the stages between germination and vegetative growth the grower may find that he/she needs a bigger pot. Transplanting is done nearly always as early as possible. One example of a transplant is when the seedlings are ready in their rockwool SBS tray. The seedling is lifted from the tray along with the rockwool cube and placed in another grow medium such as soil, or maybe even a hydroponics set-up (more about hydroponics later). That is called a transplant. There is not much of problem when transferring the cube and seedling to the soil. Just dig a small hole in the soil for the cube and place it in. Cover the cube with soil. The cube will not effect your plant's growth and will add support if anything.

If you have started your seedlings in soil then you may want to transplant the plant to a bigger pot. The problem with transplanting is that people like to move the soil and roots along with the plant from one pot to another. This means that the plant must be lifted out with the soil in place. How is this done? Well there are two ways. The first way is that one does not need to remove the plant from the smaller pot at all. All you have to do is cut away the base of the small pot and

place this pot into the bigger pot of soil. The roots will grow down through the bottom hole of the old pot and into the new one. The roots will always find their way down. The other way is too make sure that the soil is very dry. Delay watering your plant for a couple of days and let the soil settle hard. Then you can use a clean knife to cut around the inside of the pot. Cut deep, but do not damage the roots. When you have done this push your fingers down into the side and lift the plant and soil out. You will have some breakaway soil but this does not matter as long there is not too much of it lost. Quickly place the plant into the larger pot and fill with soil. Give your plant some water so that it will take to the new soil. Never ever try to lift your plant by the stem. Even though the stem may look safe and strong this nearly always causes problems down the line. You should always have a firm grip of the soil when transplanting. Some people like to clean the roots, but I would not recommend it for cannabis. If your soil is very compact you may be able to turn the pot upside down and tap the whole medium out as one solid mass.

During some transplants the cannabis plant may go into shock, even if your transplant was clean and perfect. If you have kept your plant well it should survive. If the plant has not been looked after it may fail quickly. A good grower always takes care of his/her plants. Transplant shock is caused by a disturbance of the roots. If the roots are cut or fall down, the plant does not respond well to this. This is why you must always make sure that you keep a firm hold of the soil during transplants. Also refrain from feeding them for 1 week if you can. There are some transplant feeding products that work as

hormones out there and you may wish to have a look at those.

GERMINATION SOIL

There are many soils out there that advertise themselves as germination soils. They basically are the same as any other soil except they contain micronutrients and are kept somewhat 'clean' (the soil is sifted and no compost is added). Ordinary loam soil with a pH of 7 and an NPK of higher or equal amounts of N than P or K is good for starting seeds in. Even the ratios of NPK @ 5:1:1 or 8:4:4 are good. Just make sure that the N is equal too or higher than the P and K factors on the label. More about soil later.

INDOOR AND OUTDOOR GROWING

We are now coming to the first core divide in growing marijuana. At this stage you should now know something about the History of Cannabis, How it is smoked, Cannabis Species, The Cannabis High, Seeds, How to choose and obtain seeds, Grow factors, The life cycle of the plant, Propagation, Germination and Transplanting. Now all these things are generally pre-production methods except for Transplanting. You are about to take your seedling and put it into your main grow area. This means that for the next 3 - 9 months your plant is going to be located in a certain environment. That environment is either indoors or outdoors. So let us talk about

each in brief for a moment.

GENERAL INDOOR GROWING

Figure 3.9 - Indoor Grow room picture by Shipperke.

Light is the most important factor next to choosing your strain that you must consider. There are two main ways to light your plants indoors - Natural light and artificial light. Both ways have advantages and disadvantages.

The first thing you should know is that indoor lights produce bigger flowers (more bud) than natural window light. This means you get more THC quantity with artificial lights than you will with natural sunlight indoors. Even in countries that have hot sun for 6 months of

the year you can still find it hard to produce big buds indoors under natural light. Some people have grown plants under an attic window that they open during the dry days. This will grow you bud but not as much as you would get using an artificial light system. The other side of the coin is that natural light is free, electricity is not and grow lights are a little bit expensive to buy and use. They are definitely not as expensive as it is to run an electric cooker 24 hours a day but they are little expensive to use all the same.

Figure 3.10 - The Sun. Picture by Inf3cted.

When using a window grow try to place your plant near a window that gets the most sunlight. Sun comes up in east and sets in the west. It travels more north or south depending on which side of the equator you are. Think about it for awhile. Also remember that you have the seasons to think about. If you plan on a window grow try to establish when you want your plant to receive most of its light. You want your plant to get most of its light during flowering. If July is the best month for sunlight then you may consider producing your seedling back in April or May or even as early as late March. Try to guess when you will get the best weather. Coordinate this with the flowering times directed by the breeder and you will be able to foresee your harvest time.

Also remember that people can look up and see your plant if they are sitting near the window. Do people come to wash your windows? Also remember that if you have a Sativa plant then they will get big. Take all these factors into consideration when you are growing your plants with natural sunlight indoors.

If you are growing indoors then you may have a room or part of a room that you wish to use such as an attic, closet, basement, spare bathroom or hot press. These locations nearly always need artificial light. You may even decide to build a cabinet yourself. There are many ways to set-up an indoor grow room. We will discuss this later in detail.

Figure 3.11 - Indoor Grow room. Picture by Kryptonite.

GENERAL OUTDOOR GROWING AND GUERRILLA FARMING

Outdoor growing is growing on your own property outdoors. Guerrilla farming is growing away from your property in public areas or on someone else's property. For this part we will talk a bit about both.

Figure 3.12 - Outdoor Grow. Picture by Mullummadman.

The biggest problem with outdoor growing is keeping your grow area secure and private. Some people will rip-off your plant in a second if they see what you have (Figures 3.13 and 3.14). Others will just create trouble for you. Security is vital. I once heard about a small hippy community who lived near a forest here and grew their marijuana near a stream. They eventually had to stop growing as their plants where being ripped-off by the locals in the town nearby. It also must be understood that the thieves where not just teenagers either. Adults will do this too. In some cases where the cannabis industry is booming, rippers are professionals and this is their main source of financial income.

Figure 3.13 - This is a picture of an Outdoor grow that has been ripped off. The smaller image shows a picture of the plant before it was ripped off. Picture by Slowhand.

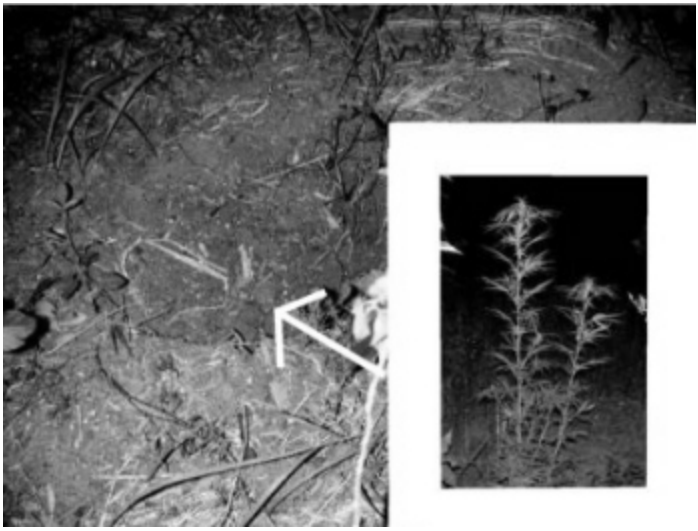


Figure 3.14 - This is another shot of a grow area that has been ripped off. As you can see rippers are without mercy. They would not even leave a little bit of branching so that the grower could take cuttings from his plant. Picture by Slowhand.

The best way to conceal an outdoor garden is to grow the Cannabis plants among other plants that will mask the cannabis. The other way is too grow the plants is inside a brick cubicle with a sheet of glass on top. Some of you may have the advantage of living out of town and have gardens in which this kind of stuff can be constructed. Hide your crop well. Everybody does not easily spot marijuana but someone who is trained to watch out for this plant will see it right away for what it is. If you feel that unwanted people may see your grow area then you might want to invest in some form of a greenhouse that has the windows painted white but the top glass left clear. The white walls will help reflect the direct sunlight coming down around your plants.

Guerrilla growing is hard work and most often prone to rip-offs. By planting in a forest or in someone else's field you are not in any danger of being caught with the plants ON YOUR PROPERTY. Having said that the person's property that you planted on is at risk. Be a nice grower and do NOT plant on someone else's property. It is not a nice thing to do and looks bad on the cannabis growing community. Find a public area such as a forest or a hill slope. Look for an area that is away from the public eye. Look for an area that will receive plenty of light. There are lots of places for this sort of thing. You have just got to spend time finding them. This is the key to guerrilla growing. Find a good patch and you will have good bud.

Figure 3.15 - Photograph by Mullummadman.

Your grow patch, whether on your own property or public property, must be treated. Leaving seeds in the soil and coming back four months later is generally not going to get you good results. Two main things must be done to the patch to begin the grow - weeding and digging.

Figure 3.16 - A night shot of an outdoor grow by Slowhand.

Some guerrilla farmers keep it simple. What they do is start their seedlings in small plastic pots indoors. When the seedlings have developed the grower cuts the bottom of the pot away. A small piece of cardboard is taped to the bottom of the pot. The plants, in their pots, are then taken to the grow patch. A hole is dug in the ground and the pot and plant is placed in the earth. The cardboard is removed and the hole is filled in with soil. That way you have germinated your plant and only need to worry about secondary factors such as light, security and pests. The roots will find their way out of the bottom of the pot and into the soil below. Don't worry about the roots not finding a way

out of the pot. They always do, that is their job.

Figure 3.17 - Picture by Slowhand.

Most outdoor growers favor this method. A patch near a river is ideal. Easy access to water helps if there is a short draught.

Figure 3.18 - This is another picture of some great colas by MullumMadman.

GARDENING TOOLS

Here is a list of the basic items that are used to grow cannabis plants indoors and out.

- Seeds.
- Soil.
- Propagation tray.
- Rockwool cubes.
- Pots.
- Support sticks.
- Thread.
- Watering can.
- Water spray bottle.
- Spider Mite spray.
- Other bug sprays.
- A pair of scissors.
- A sharp knife.
- Grow nutrients.
- Rooting gels.
- Growth enhancing fertilizers.
- Large pitchfork.
- Small shovel.

As we advance to the latter stages of this book we will see that

the grower can equip himself/herself with much more items that can help them on their quest for bigger buds!

MALE POTENCY

The male plant is not a good smoke (Figure 3.19). This however may not always be the case. Some strains have male plants that produce more THC than other males of a different strain. Sometimes the male can be stronger than a female from another weak strain. Most male plants from good genetics are stronger than the Ruderalis female. Males can be smoked or made into hash oil. Simply wait until the plant is flowering and then clip the top 6 to 12 inches of the plant away and remove the leaves. Throwaway any stems and branches. Cure these leaves and then find out for yourself if the male is any good or not. You may be in for a surprise.

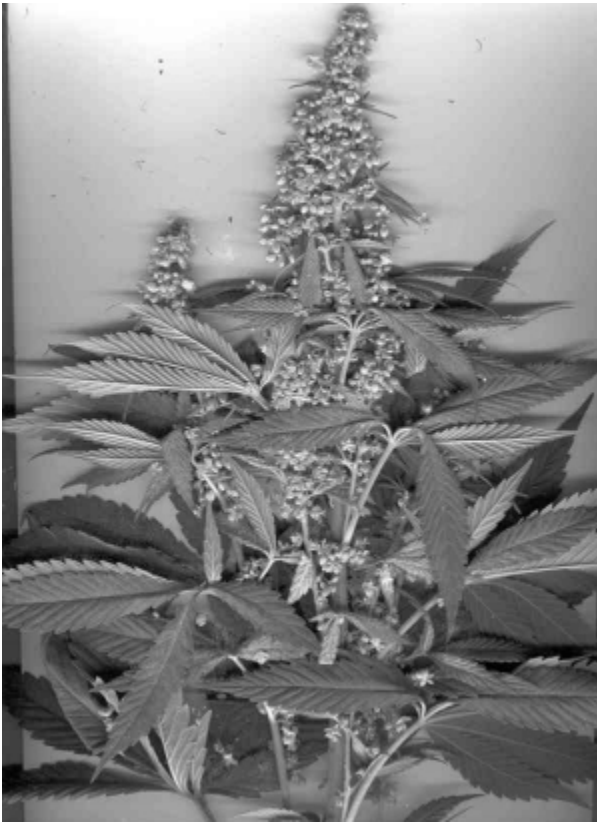


Figure 3.19 - This is a good example of what a male plant looks like. Instead of pistils we have small round pollen sacks. The picture is from The Penguin.

SCUFFING SEEDS

Most seeds that fail to start germinating do so because their shell is too hard to break open and allow water to seep in. At the end of your germination period you may have found that 25% or more of your seeds have not managed to pop out. You can help these seeds to grow by using a method known as Scuffing.

Simply get a small box, like a matchbox. Line the inside of the box with sandpaper. Place the seeds into the box. Cover the seeds with more sandpaper. Close the box and shake the seeds in the box for a few minutes. Now the seeds are scuffed and their outer shell should be easier to pop open. Plant these seeds in soil and they should be able to germinate.

Chapter 4

SECURITY

Before we go any further we should really address this topic because it crops up so often. Security is always an issue whether you are an outdoor or indoor grower. We have learned before that the best way to secure your grow area is too prepare yourself fully for any event that may occur in the foreseeable future.

Pre-production security arrangements are very important. A sudden peak in your electricity bill may attract unwanted attention from certain authorities that look for these things. This may seem odd to you, but it does happen.

It is now common practice that most countries who still have prohibition on cannabis plants set up special task squads to track down growers. The most often used technique by these agencies is tracking purchasing orders. Many agencies keep a tab on certain grow shops and look through the items that are being sold to outside customers. This tracking requires a special court order but the police can obtain this with ease. If someone has been identified as buying suspicious grow products, then the agency will also try to find out what other things have been bought using the same credit card or another electronic money transfer medium. Many a grower have been caught out this way. The best way to avoid this system is to PAY CASH.

Seed-banks are also sometimes tracked by certain agencies that watch for incoming mail with certain stamps and envelope

headers. Sometimes it is not the agency that do the tracking but people themselves in the post office who want to rip you off. IT DOES HAPPEN, and quite a bit as well. To get around this most seed-banks do not head their mail anymore. If your seed-bank does head their mail with their company address it is best to keep away from that seed-bank in the future.

If you have done the right thing then you should have all your growing tools and kits bought via cash and your seeds purchased from a good seed-bank that has good seeds and a safe secure way of sending you their product. Many seed-banks use great stealth to get you your seeds. It is advised that you never have seeds sent to your grow area.

INDOOR SECURITY

When growing indoors try to consider certain factors cropping up in the near future. Like visits from repairmen or gasmen. Some growers have a grow room which they can sweep clean in under 1 minute. This means that they have a closet near by where they can quickly move their plants too, if any visitors do pop up.

Always keep your security closet near your grow area. It is no good walking around your house with five or more plants in your arms. It is a bad idea to use your toilet for the backup security area unless you have another one that the guest can use.

Apart from this backup area the other thing you must consider with indoor security is the smell. Now Super Skunk and Skunk#1 are very smelly plants. When the plant is in flowering she

begins to stink.....Hence the name ‘Skunk’. If you live in an apartment complex then there is no way you will be able to hide the smell unless you have some form of an EXTRACTOR FAN or an OZONE GENERATOR (Figure 4.1).

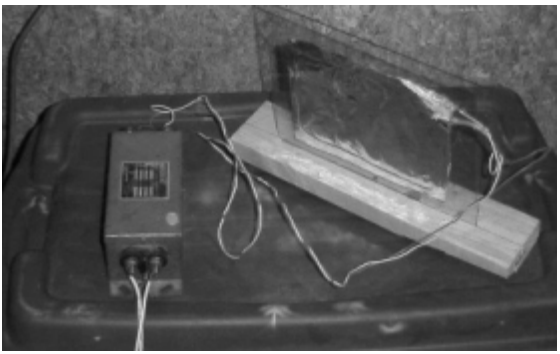


Figure 4.1 - This is a home made Ozone Generator. Picture by Shipperke.

In some indoor set-ups a fan can be used to extract any unwanted smell away from the corridor outside. It can be pumped through a window or filter to another area where the smell will not be noticed. Not only that but plants love fresh air and wind, so the fan can do two things at once for you. An ‘Ozone Generator’ is a device that can be purchased from most grow shops. It helps to get rid of cannabis odor problems.

Apart from the smell problem the other problem you will have is with fires. Now this is a very important thing to know about. Some people growing indoors tend to use very shoddy lights with even shoddier fixtures.

NEVER EVER USE ANY LIGHTING KIT AND FIXTURES THAT ARE DAMAGED OR NOT SUITABLE FOR INDOOR GROWING.

Many people have lost their homes because of this problem. Taking short cuts with lighting and electricity is a big no no. I have heard off and met many people who have come home only to find a fire brigade outside who have just finished putting out the fire which engulfed part of the house. The same thing happens in every case. The grower gets closer and sees a number of police officers looking around the room. The fire officer points to the cause of the fire - a half melted light fixture with burnt out sockets. The officer looks around and sees the plants all crispy and black. They both know what this is all about. Why do they know? Because they have seen it a hundred times before.

New Marijuana growers nearly always make the mistake of creating inferior lighting set-ups. Needless to say that this is because of three things. (1) They don't have the right information because of government censorship laws. (2) They do not have the money to invest in a proper lighting system. (3) They just want to grow their pot quick and fast and cheaply. We will discuss proper lighting systems in

another chapter.

OUTDOOR SECURITY

As we have said before the best way to secure your outdoor garden plants is via a shelter. One must also remember that some outdoor plants do smell and this can carry over a short distance given the right wind and the right climate. Most people would not know what the smell is but some DO! Many growers get around this problem by growing cannabis plants that have very little smell during flowering. These types of strains are listed by most seed-banks. Again you should ask about strains that have low smell levels. All Cannabis plants smell to some degree during flowering.

Figure 4.2 - Nice Bud picture from RealHigh.

Figure 4.3 - An outdoor Haze plant by Slowhand.

The other thing to do is to make sure that during harvest time you have harvested as quickly and as privately as possible. Standing

over a small shelter putting cuttings of cannabis into a big black bag is not exactly the most secure way to go about this. Some people go out to their garden with black plastic bags and drop the bag over the plant before pulling it up. This way you will not expose your crop to anyone. Some people do their harvesting at night. This is not recommended though as it can draw unwanted attention to you.

If you are growing your plant outdoors in the open without a shelter and away from the general public then you may want to create a pen for your plants. A pen made from chicken wire will prevent any unwanted predators such as deer or rodents from eating your plants. Predators are a big problem with outdoor growing. We will talk about pests later.

GUERRILLA GROWING SECURITY

Tracks left behind from your ventures too and from your grow area are the worst give-away for any guerrilla farmer. People just love to walk through the woods and say "oh look a nice track, I wonder what is down there?". Try not to create a track when you go to your grow area. Even by visiting the same spot once every two weeks you will leave a trail that some hikers might see and use. Try to access your grow through several different routes if you can.

Figure 4.4 - This is a picture of a guerrilla grow deep in the woods. The cannabis is hidden low down in the foreground of this picture by Mullummadman.

As a guerrilla grower you should try to keep away from hacking through 100 feet of brambles to get to your grow site. When choosing a spot find an area that is not too dense but not too sparse either. Some Guerrilla growers have even created small grow baskets

that they hang from trees away from the public eye. If the baskets are well camouflaged then you can get away with loads!

As a guerrilla grower you should always wear gloves when handling your work. If you have buckets near by do not leave fingerprints on any of these. Also you will want to consider having a good reason for being in your grow area. Imagine that you are walking back from your path, with no crop on you, and someone jumps out of the bush. He says - “What are you doing here?”. Of course you know that there is a river near by so you show him your fishing rod or your binoculars and bird spotting book. There are many things you can take with you on your trip to make you look more like somebody else other than a cannabis grower. Many grow sites have been staked-out by people you would not like to meet. Always check the area around your grow site for any people who may look suspicious.

The worst security time for any guerrilla grower is during harvest time. This is when you must go from your grow area to your home with your growing rewards. Always do this as early as possible in the morning just as the sun rises. Always double-check the area for any suspicious looking people. Pack your buds and plants into black plastic bags (brown paper bags are better) and then put these into a backpack. Walk towards the edge of the forest /woods/clearing and quickly drop your bag down against a bush and cover it up. Walk towards your car and look around again. Drive your car for about five minutes and look around to see if you can see anything. If you see anything suspicious, or anything following you leave the bag and go to

town (not home - leave that until the situation is under control again). If things look okay, drive back to where you left your bag. Pick up your bag and put it in the boot or trunk of the car. Drive home carefully.

Some people can get away with guerrilla farming lots of pot. This is commercial growing on a risky scale but can still be found in various parts of the world where cannabis is still banned. The growers usually live deep in the forest miles away from the nearest town. They may spend up to 7 months out there on their own, cultivating the crop. Recent grow busts by the police have identified some several tons of bud being grown by as little as 3 people living squat in some unknown region of British Colombia.

There is not much more to outdoor growing than this. Most of the elements that you need to complete your outdoor grow are in the indoor growing chapter of this book. Read through this and it should give you ideas about how to treat your outdoor grow patch.

Chapter 5

THE INDOOR GROWING OF CANNABIS

There are many ways to grow your cannabis plant indoors. The two core methods of indoor growing are soil growing and hydroponics. There is a separate chapter for hydroponics, and so this chapter will deal with soil growing.

Figure 5.1 - Indoor Grow room. Picture by RealHigh.

There are many ways to grow an indoor soil garden. The most common indoor set-ups are:

1. Bench growing,
2. SOG growing,
3. ScrOG growing
4. Cabinet growing.

We will discuss these methods in a moment but let us first see what they all have in common.

LIGHTS

Lights come in all shapes, sizes, wattage and type. A full indoor grow lighting kit should contain the following items. Bulb, reflector, ballast, timer and electrical inputs/outputs.

Figure 5.2 - Regular HID Bulbs.

Figure 5.3 - A reflector with bulb and ballast.

Figure 5.4 - This is a picture of a timer.

Most lighting kits are open, meaning that no hood or glass will cover the bulb. It hangs directly under the reflector. The bulb is fixed into a socket that is attached to the inside of the reflector. That socket is connected to the ballast. The ballast can be internal or external. If external there will be a cord leading to the ballast from the

bulb's socket. The ballast plugs into a domestic light socket like the one you have in your home. Some ballast types even have a built-in timer.

When buying a lighting system it is recommend that you buy a complete system and an extra bulb. Check to make sure that the lighting system meets safety regulations and has some sort of guarantee with it.

Figure 5.5 - This is an example of what an external ballast looks like. You might be able to see the timer on top of it.

LIGHT BANDS

Light can be separated into a spectrum, which form the colors of the rainbow. Red, Orange, Yellow, Green, Blue, Indigo, Violet. Each of these lights mix down to give white light. Artificial lights, because of their nature, tend to lean towards a tint of one of these colors when they mix down to form white light.

The electro-magnetic spectrum is a term used in lighting to

describe the distribution of electro-magnetic radiation by reference to energy. This table roughly gives wavelengths, frequencies and energies for parts of the spectrum. There is also the color part of the spectrum that is very important for plants.

Plants are green, which means that Plants absorb light at the middle of the spectrum (Orange to Indigo). Cannabis plants need this part of the light spectrum to reach full growing potential. The intensity of the light is also important. A light that feeds the full bandwidth with all light spectrums will work very well - like sunlight. When dealing with artificial lights it is better to choose a light that concentrates its intensity on the top part of the spectrum. The most common indoor light systems are called HID lights. We will discuss the full range of lights that you may come across in some grow rooms.

POOR LIGHTING SYSTEMS

Domestic Lights:

Figure 5.6 - A domestic bulb. Also called an incandescent light source.

These are the lights you find in use around your house. These lights come in all sizes and wattage - 15 watts to 150 watt. These lights are not suitable for growing because of their low light intensity and bad color spectrum.

AVERAGE LIGHTING SYSTEMS

Fluorescent Tube Lights:

Figure 5.7 and 5.8 - These are examples of some fluro fixtures and bulbs that can be bought in most hardware stores.

These lights are the long industrial lights that are found in many a school and work place. These lights come in nearly all lengths and sizes. 2 to 10 feet are the main sizes that are out there. They also run between 10 watts and 300 watts. These lights are okay for growing but they provide little light and are hard to set up properly. They also are not in best light spectrum for Cannabis plants to grow in.

Halogen Lights:

Figure 5.9 - A Halogen light.

Halogen lights are the small lights that can be seen on the outside of factories for flood lighting the grounds during the night. They are usually small and black. These lights can range anywhere

between 75watts and 4000watts.

Halogens get extremely hot and can provide an unsuitable condition for growing Cannabis under. They are not recommended because they are dangerous to use indoors for growing. They are also not in the best light spectrum for growing Cannabis.

Fluorescent White Tube Lights:

These are not in use much and are very similar to the Fluorescent lights except they are in the correct growing spectrum. These lights are not very strong and do not range much above 100watts. They are only recommend for growers who do not want to grow full flowering cannabis plants.

Figure 5.10 - White Tube Light.

BEST LIGHTING SYSTEMS

Horticultural Lights:

These lights are professional horticultural lights. They are developed by horticultural lighting companies and are tested to suit growing plants indoors. These lights are commonly called HID (High Intensity Discharge). Like the former lights these also come in kits with bulb, reflector, ballast and timer. They also come in different wattage and different shapes and sizes. If you want to grow good bud then you need a HID. A HID is the second most important purchase you will make next to choosing your strain.

Metal Halide (MH) and Mercury Vapor (MV):

The lights are HID lights and are used for the seedling and vegetative growth stages of your plant. They can also be used for flowering and are quite good too. They come in all shapes and sizes and range from 75W - 4000watts. These lights are very common and are a good kit for the indoor Cannabis grower.

Mercury Vapor is not as common as it used to be. It has almost been replaced by Metal Halide now. If you have a choice between the two it is best to stay with the new MH kits. MV also has a tendency to be slightly out of the optimal spectrum range.

High Pressure Sodium (HPS):

This is the lighting choice of many a Cannabis Cultivator. These lights come in all shapes and sizes and have a range of 75watts - 4000watts. These lights are in the perfect spectrum for growing cannabis and come highly recommended.

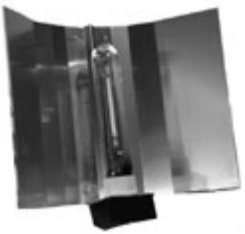


Figure 5.11 - This is an example of a HPS and also a MH Light system. There is nothing at face value to Indicate that the light is a HPS or a MH. To check this out we need to look at the ballast and the bulb and read what is says about the type of light system that it is. MH lights tend to give off a blue tone, while HPS tend to give off an orange tone.

WHAT TO LOOK FOR WHEN BUYING A LIGHT

The first thing to say is that some growers have a MH set-up for seedlings and vegetative growth and a HPS for flowering. The HPS is a better flowering lamp, while the MH is a better veg lamp. If we can only afford one we should get a HPS. Both MH and HPS can be used for vegetative growth and flowering. However since we are growing for bud, we should try to get the best HPS we can.

The next thing they look for is the light kit itself. Check to see that the light is certified and is in good shape. Then check to see if the light is air-cooled. Some of these lights have a fan built in which keeps the light cool. If you see this then you know that you are going to need somewhere to vent your air. This may mean that you need to adjust a wall in your grow area so that the air is extracted from the light.

Figure 5.12 - This picture shows two air-cooled hoods attached to their respective air ducts. This photograph is by Chimera.

Lights that are air-cooled (Figure 5.12) tend to last longer and do not heat up your grow area that much. Most expert growers like to keep a room at a stable controllable temperature and use these air-cooled lights to achieve that. If your light is not air-cooled then you will have to build an air vent and fan in your grow room wall to keep the temperatures under control. Cannabis leaves will burn if placed too close to a HID light.

Figure 5.13 - This is a water-cooled light system. These inventions have been around for awhile but have not caught on that much because they require a good bit of work. A constant pump of cool water must be circulated into and out of the light system.

The next thing to check is how the light is supported. Does it require a light stand or does it require to be hung from the ceiling. In most cases you will be able to make your own stand if you feel that you are not willing to fasten a few hooks and chains to your ceiling. Also check to see if the electrical fittings suit your needs. Will they plug straight into your system at home or do you need an adapter? Maybe you might require an extension cord with your purchase. Most HID kits can only take a specific wattage of bulb and a certain type of bulb. If you have a 600W HPS system, then you should only use 600W HPS bulbs. Some lighting kits have something called a 'switchable ballast' (Figure 5.14). This means that you use both MH and HPS lights with the system. Check your kit for further details.

Figure 5.14 - This is a picture of what the switch looks like on a ballast that can take 2 HID types.

The next thing to look for is the guarantee. Check to see what the manufacturer has said about this light and how long the guarantee is for. Last but not least is the most important part of your light. The wattage and lumens.

WATTAGE AND LUMENS

HID Lights can range anywhere between 75W and 4000W. In general the stronger the wattage the more light that bulb will produce. However we must also consider another factor and that factor is called Lumens. Lumens are the correct way of measuring how much light per square foot a bulb emits. Lumens and wattage do go hand in hand but can vary a large amount between systems. The better the lighting kit, the better the lumens it will cast. Lumens have more to do with the design of the light than the wattage of the light itself. Some 600W lights may give the same lumens as a 400W light. Have a look at this

chart:

LAMP TYPE	WATTS	LUMENS
M.V	175	8000
M.H	400	36000
H.P.S	600	45000
H.P.S	600	36000

This is interesting because we have two types of HPS lights using the same bulb wattage and one of the types is casting more Lumens than the other. The reason for this is that the higher lumens kit is better quality than the other. So we now know that some lighting kits produce better Lumens than others. Check through HID lighting kits and look at how many lumens they cast. This is a good Indicator of how professional that light is. Also a 4000W HID is too much for any grow room. A 1K (1000W) bulb is the maximum light wattage you should purchase. Use several 1K bulbs if you need more light. A 4K bulb will bleach Cannabis and is very hot.

LUMENS AND MARIJUANA GROWING

Now for the big question. How many Lumens do I need? Well this depends on three things. (1) How much do you want to spend? (2) How many plants do you have? (3) How big is your grow area?

You do not want to go less than 2500 Lumens, even for one plant. You want to get the best so you need to hit the 45000 mark or more. In general one light that casts 45000 lumens is enough to cover a workspace of about 3 feet by 3 feet. This is quite an average space and you will probably get anything between 6 - 9 plants in that area. Again we must keep in mind the strain that we are growing. One large Sativa plant can cover a 9 square foot grow area in no time. Short Indica plants are different. You can get maybe 12 plants into a 9 square foot grow area. If you really want to pump up your plants then you may consider a lamp that casts 100,000 Lumens or more. If you want a bigger grow area then you may consider 2 lamps that cast 100,000 Lumens each. All is relative to how much you want to grow and the size of your grow room.

Let's say for the record that we would like to grow 4 plants. Then what we should aim for is a light that casts 45000 Lumens. This means we should buy a 600-Watt HID system. Let's say we want to pump up our available light to around 60,000 Lumens. This means we should buy a 1000-Watt HID system. If our area is bigger we might need 2 or more 1000-watt HID lights to achieve this. It is all very respective to the 3 elements we mentioned above.

There is nothing wrong if you want to use a 1000-watt HID light on 2 plants. They will grow bigger and better. The only thing is, do we really want to spend all that money on the light and the electricity bill? HID lights range anywhere between $220/£200 and $700/£670 for a full kit. You may be able to buy the parts and build your own, but this is only recommended if you have some experience

with lights first. A 600W HPS kit should cost about $250/£230. This is money well spent if you want great plants with big buds.

Over time you will understand more about grow rooms and how to light them properly. With experience you should be able to tell what light suits your needs. As a general rule, when in doubt buy a 400W HPS or better. Even a 250W HPS can get you good-sized buds but go below that mark and you will only end up with less than average results.

LIGHTING FACTORS AND HOW TO GET THE MOST FROM YOUR LIGHT

The reflector part of the lighting kit can also cause a difference in lumens cast between two different systems using the same bulb. The reflector does it exactly what is says. It reflects light. The other thing to consider is that when the light bounces off the reflector it is going to fall down on your plant. When it does your plants will absorb this light. Not all of the available light is picked up by the plant and some of the light will escape and reflect off your workbench. Your bench may even absorb some of the light. This is your light that you are spending money on so why not try and do something about saving this escaping light. Some reflectors are very good and some are very poor. Reflectors should not be any color other than white or polished metal. Some reflectors may have a small green film of plastic covering their insides. Remove this if you can. It should just pull off like a piece

of tape.

Many people get mirrors or tin foil and line their grow area with it. This is **NOT** good. **MIRRORS ABSORB LIGHT.** This means that only a small amount of your light is reflected back towards your plant. What you need is something white. White is the best color for reflecting light, period. Not shiny glossy white, just plain 'flat' white. A white wall will reflect more light than a mirror will. Many growers like to paint the walls of their grow 'flat' white. This helps a lot. Other people like to line their grow area with the back end of tin foil wrapping (the white side). This is okay, but make sure that you use the white side and not the shiny side.

A substance which looks like a tin foil sheet, called Mylar (Fig. 5.15), is very popular in cannabis grow rooms. Instead of using white walls you can use this reflective alternative. Most DIY and hardware stores will sell it in roles.

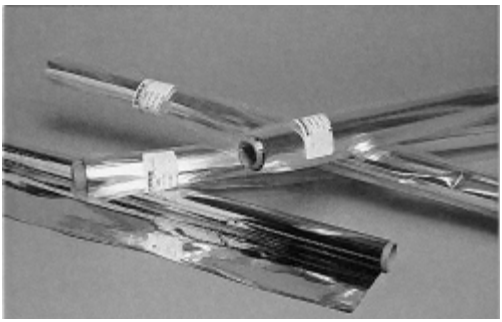


Figure 5.15 - Mylar comes in roles like this.

Figure 5.16 - Mylar in the grow room by Shipperke

It is also recommend that you keep a spare bulb at all times in case your other bulb dies. It is no good going down to the local hardware store only to find that they are out of the bulb type that you need. This could leave your plants without light for along time.

It is also wise to remember that plants need water and lights use electricity. Both these factors when mixed are extremely dangerous. Be safe and wise and keep all electrical outlets away from your plants and any liquids that you use.

Okay so you have your grow area set-up with all your security arrangements met. You have your lights set up and hanging down over

your grow area. You also have some form of light reflection around your plants to help conserve your light. Your seed-bank has sent you your seeds and you have germinated them. They are on a tray next to you and you are preparing to transplant them into larger pots. The larger pot will stay with the plant throughout its life cycle and you need to provide the best medium possible in which your plant will grow.

Figure 5.17 - Nice Indica/Sativa plant from BushyOlderGrower.

SOIL

Soil comes in many types and varieties. What you will find as you go along is that you will add various ingredients to your soil to improve plant growth.

The Cannabis plant will grow long and winding roots into the soil. These roots absorb water and other minerals from the soil to help it grow. The soil also goes through dry periods when you do not water your plant or when the plant has absorbed most of the water. During these dry periods air is allowed to creep in between the soil particles, allowing the roots to breathe.

There are 3 main factors to look at when buying soil. (1) pH, (2) Nutrients and (3) Structure.

pH

pH is a way of measuring how much acid and alkaline is in the soil. The pH scale runs from 1 - 14. 7 is neutral, 0 is very acidic and 14 is very alkaline. Cannabis plants in soil like a pH of 7. When choosing your soil you should be looking for a pH of 7. It should tell you this on the bag. Going above or below this mark can cause your plant problems during growth. Small pH meters (Figure 5.18) can be bought in most gardening shops and can be used to measure the overall pH of your soil.

Figure 5.18 - This is a picture of two cheap pH meters that can be purchased from most grow shops.

NUTRIENTS

The three major nutrients that are found in soil are Nitrogen, Phosphorous and Potassium or NPK for short. NPK can come in two forms - with the soil or as a stand-alone fertilizer (usually in a bottle). When you look at the bag you will see that the % of each part is stated. Such as 20:20:20. This means 20% N, 20% P, 20% K. The remaining 40% is just other elements that make-up the soil. In liquid it would usually be water. This ratio can change between different types of nutrient and soil brands so we need to understand what Cannabis likes.

Cannabis plants like good levels of N and a normal level of P and K during vegetative growth. You need to pick a bag that has all three, not just 10:20:0. When looking at chemical fertilizers you need a mixture that has the first number higher or equal to the rest. 12-12-

12 is fine, 20-20-20 is fine, 12-6-6 is fine and 18-4-5 is fine. The 12-12-12 and 20-20-20 are the best ones to find. Something like 8-20-20 is not suitable for vegetative growth. Bags with higher P are for flowering plants. As a grower we do not transplant to new soil for flowering. We simply use plant feeds to bring up the P levels during flowering.

STRUCTURE

Try to find a soil that is not too moist. In other words try to find a soil that dries out well and does not hold water like mud. It should say on the packet whether the soil is a wet or dry one. Try to find a balance between the two. Wet soil will sometimes cause plant damage because your roots need air to breathe. Dry soil may also dry out too quickly and needs to be watered more often. Try to find a soil that is loose and feels fine but slightly heavy in your hands.

Basically the soil structure is up to you. Do not buy anything that is hard and bulky or too soft and weightless. Medium Soft and heavy is what you want.

SOME COMMON SOIL TYPES

There are many more types of soil mediums out there and here we will briefly go through a few. Marijuana can be grown in most of these soil types but you will see that there may be some problems

with a few of them.

(Also there is a type of artificial medium on the market called Perlite. It is a good medium but does not come with any nutrients and generally needs to be mixed with another soil type. Vermiculite is another product like Perlite which should be treated the same way. Mix them well with soil if it is your first time using them. With a bit of experience you should be able to control the mixture ratios better.)

Sand and Silts:

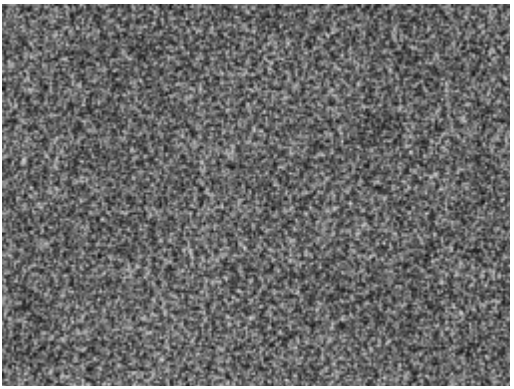


Figure 5.19 - Sand.

Sand soils can be pure sand or a mixture of sand and soil. The problem with sandy soil is that it drains water and minerals out too quickly. This means that it is a very dry soil and not suitable for our needs. These soils can waste our time and money.

Silt soils are nearly the same as sand soil except they are more clay-like and of a darker color. Silts hold nutrients well but do not hold water very well. Like sands they are prone to quick drainage. Sands and Silts are rarely used on their own to grow cannabis. Mostly it is mixed with other soil types.

Clay:

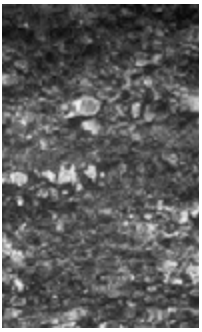


Figure 5.20 - Clay

Is a stiff tenacious fine-grained earth consisting of hydrated aluminosilicates that become flexible when water is added. Marijuana roots do not really like clay. Clay can rarely be used on its own to grow Cannabis. Mostly it is mixed with other soil types.

Loam:

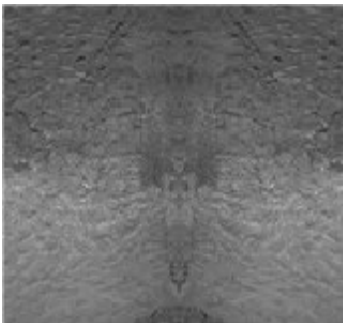


Figure 5.21 - Loam

Loams tend to be a mix of all of the above. The combination of the mix is always stated on the bag. In fact, in most cases normal soil that you buy in the shops has sand, silt and clay mixed in with it. When you encounter a bag of soil it is nearly always going to be a Loam. Loams are very fertile soil composed chiefly of clay, sand, and humus. They are highly recommended. It must be noted at this point that you do not want to bring natural outdoor soil in. This is because the soil may not be sterile and it may contain bugs and pests. Always buy soil from a gardening shop. Soil is the cheapest part of your grow.

Humus:

Figure 5.21 - Humus

Is the organic constituent of soil, formed by the decomposition of plant materials and can be bought in bags at the local gardening shop. Most of these products try to eliminate bugs and other living matter from the soil but sometimes this is not 100% successful. Don't be too surprised if you find a worm or green fly in the package. Humus is also sometimes known as compost, but compost is the final mixture of manure (which is of organic origin), loam soil and some other mediums with added organic matter. Humus is that added organic matter stuff.

POTS

Figure 5.22 - Plant in three gallon pots by BushyOlderGrower

Basically pots come in all shapes and sizes. Marijuana plants are best kept in pots that are somewhat large (1.5 - 3 gallon pots) because cannabis does grow long roots.

Also you are better off buying a pot that has some form of perforations (holes) at the bottom. The perforated pot sits on a small dish (you should be able to buy these at the same time you buy your pots). When you water your plant some of the water may drain down through the soil and come out through the perforations and into the dish. The dish should be emptied if this happens to avoid water spills.

More advanced growers use pots that do not contain perforations at the bottom. This is because advanced growers never water or feed their plants too much. If you over-water your plant, these perforated pots will drain some of the water through to the dish. What happens is that the water may also leech down some of the nutrients that you have added to your soil. Over-watering can cost you time, wasted nutrients and even kill your plant.

Before you use a pot make sure that you clean it thoroughly before use to get rid of any unwanted chemicals or dust that may have gathered in the shop or factory.

Pots are very cheap to buy. It is always best that you only use one pot per plant. If there is a problem with the soil, watering or nutrients then only one plant will feel the effects.

Figure 5.23 - Picture by Chrisesq.

Figure 5.24 - This is a great picture of a method known as double-potting which helps create a thicker stem. During vegetative growth the bottom of the top pot is cut away and is placed on top of a new pot with fresh soil. The roots grow down into the next pot. Look at the size of the cola in this picture by GIYO.

CONTINUING YOUR INDOOR SOIL GROWING

So at this stage you now have the best soil that you can get your hands on. You take the seedling and make the transplant. You fill in the empty areas of the new pot with more soil. You pat down the top of soil lightly and you apply the stake if needed to support your plant. You also add a small amount of water to your pot and you place the pot on the bench under the light. You will leave the light on 24 hours a day and watch as your plant grows over the weeks from its seedling cycle to its vegetative state.

Figure 5.25 - A Picture of seedlings finishing their seedling stage and going into vegetative growth. By Vic High.

Figure 5.26 - Top shot of an Indica plant in veg by Ralpheme.

INDOOR VEGETATIVE GROWTH

During your plants vegetative cycle it will begin to grow quickly and produce more leaves and new branches. The stem will also grow thicker. This is when your plant begins to look like a marijuana plant.

WATERING

Water your plant ever second or third day or better still when they dry out. Never let the soil dry out completely for long periods of time. The following method works best with good size pots.

Day A - watering, Day B - let dry, Day C - let dry, Day D - check soil

and water if needed.

This really does depend on the size of your pots though. If you pick up your pot when it is dry and pick up the same pot when it is has been watered, you can tell the difference in weight. This is a good way to judge if your pots need water or not.

It is easy to see signs of over-watering. Watch your plants after you have watered them for the next 2 - 3 days. Do the fan leaves point outwards to receive more light? Or do they wilt downwards and look like claws. If they wilt then you may be under-watering or over-watering. Check the soil. Is it dry? If it is then add more water. If it's wet, then leave the soil dry out for more time until your leaves pick up again. You will eventually understand more about your plants needs as it grows along. What you need to do is form a pattern or relationship with your plants watering needs.

Over-watering does kill plants if the watering continues. If this happens let it dry out and hope for the best. Use a fan near the surface of the soil if you can. You may find that you need to water everyday because your light may be discharging a lot of heat and your soil might be a quick draining type.

Your plant needs all the light it can get in vegetative growth. Leave your light on 24 hours a day and enjoy watching your plant as it grows.

ADJUSTING YOUR LIGHTS

If you have a good stand or light support you will be able to

lower or heighten your light. This is great because the closer your light is to the plant the more light it will receive. However make sure it is not too close or it will burn your leaves. If you can keep your hand at a certain area under the light and not feel discomfort then your plants should do okay too. If you feel discomfort, so will your plants. Use common sense and adjust your lights accordingly.

Some Cannabis plants can grow as fast as an inch a day! So you need to watch out that your plant does not push up against the light. Be safe and know your plants grow rate before attempting to place your light very close to the plant.

If you do suffer a burn use a pair of clippers to remove the burnt areas. This is only advised for light burns and not for soil or nutrients burns.

Chapter 6

THE BASICS OF INDOOR ENVIRONMENT CONTROL

By now you have managed to set up the basic environment in which your indoor plant will grow. As a gardener you have total control over that environment and need to make sure that it meets your plant's needs.

SOIL CONTROL

As your plant grows through its life cycle it begins to absorb some of the minerals from the soil. When it does remove minerals it adds some waste material of its own. We have said before that Cannabis plants like a steady pH of around 7. The removal of nutrients and addition of waste material on top of other factors may cause this pH to increase or decrease.

pH CONTROL

It is always good to check the pH at least once every week for plants that grow in soil. It is also good to check the soil's pH a day or two after you feed your plant. A pH test kit can be purchased in most grow shops. The electronic test kits can be a bit expensive though. If

you find that your soil's pH has shifted out of the 6 - 8 range you may want to try and bring the pH back to 7. Again, below 7 is acidic and above 7 is alkaline. There are two ways to do adjust the ph of the soil. The first is called a soil flush and is not recommended but may be needed under certain circumstances such as serious pH fluctuations and chemical burns.

SOIL FLUSH

A soil flush is a last resort 'time to save our dying plant' maneuver. You only resort to a soil flush when all else has failed. Let us pretend for a moment that you have a soil that holds a lot of water and you want to feed your plant. You take out your favorite feeding bottle and you decide that you want to add it straight to your plant and then pour water in after.

This is never recommended! Always mix your food with water in a container and then use the container on your plant, such as a jug or watering can. Try following the guidelines on the feeding bottle along with the recommendations in the book. If not the following story may happen!

So you open the cap and bend it over towards the soil. You flinch, the bottle spills. The next thing you know half of your raw feeding liquid has managed to find it's way into the soil. You curse yourself that you did not follow the instructions. You grab your hair,

‘What to do?’ you say. You pick up this book and turn to this chapter. You read about the soil flush and see that your plant now has a small chance of survival. You know that all the raw chemicals will kill your plant. All hope is lost. This is your last resort. Here is how to flush your soil.

STEP A.

(1) Take the plant to a sink.

(2) Turn the plant on its side making sure that you do not break the stem!

(3) If you think the stem will break then quickly find a long stick and place it in the soil.

(4) Use a piece of sowing thread to tie the plant to the stick at several points.

(5) Tape the stick to the pot.

(6) Tilt the plant on its side so that the top of the pot with the soil is facing at an angle towards the sink.

(7) Watch the color of the liquid that runs out.

(8) Do this until all the liquid has poured through.

STEP B.

IF YOU HAVE HOLES AT THE BOTTOM OF THE POT USE THIS METHOD OTHERWISE USE STEP C.

(1) Pull your plant back up and sit it in the sink. Pour lots of water on top of the soil.

(2) Wait until the water flows out the bottom of the pot. Look at the

color of the flow.

(3) Repeat this process until the color of the water becomes clearer. (The soil should get very muddy when you do this and some of the mud will pass out with the water.)

(4) Once the water is clear tilt your plant on its side again and wait for all the water to drain out. You may repeat this process several times. If your feeding solution does not have a color then you should keep an eye on the texture and smell of the solution that you are flushing out. When this changes your flush has worked.

(5) Quickly take your plant to a warm dry area and wait for the soil to dry out.

(6) Use a pH meter to test the pH of your soil.

(7) Follow step D.

STEP C.

IF YOU DO NOT HAVE HOLES AT THE BOTTOM OF YOUR POT

(1) You can use a screwdriver to make holes in your pot if it is light and the plastic is not tough. You can always use thick masking tape later to patch the holes closed. If you can do this then do and follow step B.

(2) If you can not then you need to do an emergency transplant.

(3) Quickly set up a new pot and put in new soil leaving a large gap in the middle where your plant will go in.

(4) Take your plant and use a knife to cut around the edge of the soil as close to the rim of the pot as possible. Go as deep as you can.

(5) Put you fingers in down around the inside of the rim and pull the

plant out of the pot. Try not to rip the roots.

(6) Hold the soil over the sink and place it down near the drain holding it together with your hands. If your root mass is big you may need help doing this.

(7) Turn on the water and let it run slowly down over the soil.

(8) Keep holding the plant for a number of minutes until you see a change in the water that is coming out from the soil. Do not crush the soil just hold it. It will get muddy and it will break up a bit, but this is to be expected.

(9) When the water changes quickly place the plant into the new pot.

(10) Fill up the spaces with new soil and use a stick to prop up your plant if needed.

(11) Quickly take your plant to a warm dry area and wait for the soil to dry out.

STEP D.

(1) Every day measure the pH of the soil. If you have flushed your plant properly it should return to the near 7 mark (given that the water you use is a neutral pH of 7). In the meantime you can be reading about how to change your plant's pH as directed on the next pages.

It is sad to say but very few plants do survive such an emergency soil flush. The soil flush is, in its essence, over-watering your plant to the point of removing most of the minerals and ingredients in the soil. If your plant manages to pull through you have done well. If your plant does not then you will know better next time.

A soil flush causes the plant a great deal of shock and should only be attempted as a last resort if your plant is dying and can not be cured by any other means.

If your plant makes it, the plant may have sustained some damage. If any of the leaves are burnt or look dead you can remove them from the plant by clipping them away. Plants usually take about 2 weeks to get back to full health.

pH - bringing back to neutral from acidic:

If the pH of your soil is too acidic then you may want to bring it back to a natural 7. What you need is Lime. Lime can be bought in small containers from any grow shops. Just simply add some lime to your soil the next time you water your plant. Only add small amounts each time and then the next day use the pH meter to study the effects. What you will find is that you will get to know your soil better than I could describe here and know what it needs. Advanced growers know how much lime they need to bump their acidic soil back to 7. They know this by trial and error. This is one thing about cannabis growing. The best cannabis growers grow good cannabis because they have made many mistakes in the past. Learning is an experience and that is why people enjoy growing. They like to learn more and experience more. Don't let a bad growing encounter put you off.

pH - bringing back to neutral from Alkaline:

If the pH of your soil is too alkaline then you may want to bring it back to a natural 7. To correct this you need to make your soil more acidic. Here is a list of ingredients that can each be used to return your plants PH to 7.

-Cottonseed meal
-Lemon peels
-Ground coffee
-Some Fertilizers also are very acidic and can bring the pH down to 7.

When using this method always moderately apply the substance and check the pH. Over time you will know what measures to use. This is best left up to the grower as he/she will know how big their pot is and how much should be added. Experiment a bit and learn as you go along.

pH up / pH down:

These products are available in most grow shops. They actually act as a pH agent for adjusting your soil pH. They only come in two forms - pH up and pH down. More and more people are using these chemicals to adjust their soil pH.

NUTRIENT CONTROL

Remember NPK? Well, NPK are the primary ingredients that are needed in soil for marijuana to grow well. NPK stands for Nitrogen, Phosphorus and Potassium. In addition to these there is something called secondary supplements. Secondary supplements are found within the soil but sometimes not all of them are there. The secondary supplements are as follows. Ca (calcium), Mg (magnesium), and S (sulphur). CaMgS for short. There are also seven more micronutrients. These are as follows: iron, boron, chlorine, manganese, copper, zinc, and molybdenum.

These micronutrients are not extremely important for good plant health, but the secondary nutrients and Primary nutrients are. Check your bag to see if it has some secondary nutrients.

Sometimes a Ca, Mg, or S deficiency in the soil may cause growing problems for your plant. If the soil is lacking one of these factors your plant may start to display a nutrient deficiency. Mg problems are common. To correct this feed your plant a 1/3 of a spoon full of Epsom salts per 3 gallons of water every 3 - 4 weeks.

If your soil does not have these properties and you feel that you are going to have future problems then simply find a feeding product that contains these elements. Next time you feed your plant you will be able to supplement it with these missing secondary nutrients.

Micronutrient problems rarely show themselves unless there is a problem with lockout. Lockout is a chemical reaction that takes

place among the nutrients in the soil. It can occur if a large amount of one single nutrient is added. This can lockout the other nutrients, preventing your plant from using them. If lockout does occur then you need to flush your soil.

FEEDING

Feeding is the process of adding to your soil what the plant has taken out. You will only need 3 types of feeding solutions throughout your plants growth. You will need a bottle of feed where the NPK has equal or higher levels of N than P and K and you will also need a bottle that has higher levels of P than N and K. The first one is to be used during vegetative growth and the second is for flowering. You will also need a third bottle of secondary nutrients. Keeping a 4th bottle of micronutrients is also handy just in case.

You should only feed your plants when they need it. The amount of feeds that you will use is relative to your growing conditions and strain. Most plants only need to be fed every fortnight at 50% or less than what it says on the label. Marijuana plants burn easily. So never mix your solution at 100%. If it says use 1 cap full of feed per 3 gallons of water, then use 1 cap full per 6 gallons of water. Sometimes you might even end up burning them using these low levels. This goes for both flowering, secondary nutrients and veg feeds. You should never have to feed cannabis plants once a day. During flowering simply switch the feeding bottle over to the one with the NPK where P

has higher levels than N and K. You may want to add secondary nutrients once every 3 weeks to your grow. Epsom salts is a great way of giving your plant Mg, which is probably the most important secondary nutrient.

AIR

During vegetative growth and flowering, cannabis plants love to get fresh air. Always keep a window open and let your grow room refresh itself every day. The fresher the air the better. Also during the dry periods, in between watering, the roots like to breathe. Fresh air is always the best air. During winter you may want to reduce the time you leave the windows open as the cold may stunt growth. Just refresh the air in your room for 15 - 20 minutes during winter and close it again.

If your grow is enclosed then use fans to extract the old air and another fan intake to refresh the system.

HUMIDITY

Cannabis plants work best in the 40 - 80 percent relative humidity area. rH (relative humidity) is the amount of water in the air. Fresh air always is the best way to control humidity. If you have a rH measuring kit you can judge for yourself how much fresh air you need before hitting the optimum 60% level.

There are some expensive devices called De-humidifiers that control humidity in the room. This is not recommended unless you have a very large grow area underway. Just use fresh air and you can't go wrong.

TEMPERATURE

Temperature is controlled by any heating unit or natural sunlight that your room receives. Normal households have suitable temperatures for growing cannabis in. The best meter for temperature control is the human body. If you find it is too cold in your grow room then so will your plants. 75 degrees is what you should aim for. Slightly warmer rooms do help plants to grow a bit quicker. Use a thermometer to analyze your room's temperature. If too cold, turn on the heating. If too hot, open a window and maybe even use a fan. During the dark periods of the flowering phase the temperature is allowed to drop down as far as 55.

C02 (CARBON DIOXIDE)

Plants enjoy C02 and release O2 during a process called photosynthesis, but more 02 is released than C02. Since our plants would like more C02, the grower can use a C02 generator to help the plant's growth. C02 also helps grow bigger buds! Since room C02 levels in general are low the plants can use a bit more. You can buy

C02 systems in some grow shops.

FANS

Figure 5.27 - This is a regular squirrel cage fan. These fans come in all sizes and can be bought in most hardware stores.

Fans can be placed quite close to mature marijuana plants. Cannabis plants like the wind if it is a slight breeze because it helps them to develop stronger stems and branches. Also fans circulate the air around your plants.

Fans help create an environment which makes the plant think that it is outdoors. Get a fan if you can. It is worth it and will help you grow a better plant!

Chapter 7

PRE-FLOWERING AND FLOWERING

THE END OF VEGETATIVE GROWTH

By now you have managed to set up the basic environment in which your indoor plant will grow. You have your plants in some pots under a grow light with some white surfaces nearby and some fresh air in the room. You have also been watering your plant properly and you have been adjusting the pH and nutrients in the soil.

Everyone makes mistakes on their first time growing. Very few get to this stage without problems, so don't feel too bad if you did not get it right. Growing marijuana is like riding a bike. Once you get it, it is hard to forget.

You have been adjusting your lights and watching your plants grow. If you have not had any problems your plants should have a number of nodes and a small leaf mass at the top of your plant which you know is going to form the next set of leaves and branches.

Your leaves should be flat and stretched out. If they are, then your plant is enjoying its environment. If not then maybe you should consider turning to our problem solver chapter to see what has gone wrong.

You have been watching the height of your plant every week and now the plant is becoming more like the picture of the strain that you viewed in the seed-bank brochures. Then one day you notice that the plant is not growing much taller anymore. It seems to have stopped. You take a closer look and see that there appears to be small new growths at most of the nodes between the stem and the branch. This is new to you. These have not developed before so you ask yourself, “what are they?”

Your plant is now reaching the end of its vegetative stage. These small new growths are going to produce more leaf, branches and FLOWERS. The plant is now entering its Pre-flowering stage.

PRE-FLOWERING

Now is the time when you should be hoping for as many females as possible and that all your work has not been in vain. You closely look at the new growths (Calyx) to see if you can identify your plant’s sex, but it is still too early to tell.

The early stages all look the same you say? What should you do now? You do not know? You will have to wait and see.

There are three things that can reveal your plant’s sex early on but these are not 100% accurate. They are more of an educated guess. So remember these methods can fail to be accurate but most of the time they are a good indicator.

First Early Sexing Method:

If you have been growing the same strain and all the seeds at the same time, then you may notice that some plants are taller than others. This is a sign that the smaller plants are female and the taller ones are male.

If you want too, you can separate your plants into two sections in order to see how good your guesswork was when you do finally identify sex. The other thing to know is that male plants in general start to pre-flower before females. If you have taller plants that are producing new growths before the smaller ones, then the taller plants are probably male.

Second Early Sexing Method.

A good way to identify plant sex at early date is to look at the calyx with the aid of a very fine magnifying glass. (See last page of this book for pre-flowering/calyx illustration)

If the calyx is raised on a small short stem then it is probably a male. If the calyx is not raised on a small short stem then it is probably a female.

Third Early Sexing Method.

Force-flowering a cutting is probably the best early sexing method out there. Simply take a cutting from the plant that you want to sex and place the cutting in a cup of water or into a cloning medium such as rockwool. Give the cutting 12 hours light and 12 hours total darkness. The cutting will flower and display its sex. Clones will carry the exact same genetic make-up as the plant it came from, including sex.

These methods are NOT 100% accurate but will help you to understand more about the visible differences between male and female plants. In a moment we will explain how to identify sex properly and completely.

THE PRE-FLOWERING TIME

Your plant will Pre-flower between 1 and 2 weeks and during this period the new growth regions begin to change shape depending on whether the plant is male or female. It is during this shape change that you can properly detect your plant's sex.

WHEN TO FLOWER?

Pre-flowering is a sign that your plant is mature enough to start flowering. As a grower you have a simple choice to make. Do you want to flower now? Or do you want to continue vegetative growth? Here are a few facts before you make that choice.

- Some cannabis plants can be kept alive for up to 10 years by simply keeping a light on the plant at all times. These plants will grow to a certain height and then form into a bush. It will then eventually stop producing branches and will spend the rest of its life growing new leaves to replace the old ones.

- Bud production is not equal to the height of your plant. Bud production is equal to your growing environment, your strain's genetic make-up and the amount of nodes that the plant has. All nodes are potential bud areas, but every strain has a genetic threshold for bud production.

- It is possible to get more bud with lots of plants which are flowered as soon as they are mature (which also keeps them shorter and smaller), than extending vegetative growth with less plants until they reach their maximum height and size. The time frame for the shorter option may also produce more bud turnover per annum.

Figure 7.1 - A Picture of a large indoor grow by Vic High.

Keeping these things in mind, you can either choose to flower now or choose to keep your plant growing until it reaches its size threshold before you start flowering. If you take the longer route then prepare to have the space for it, because when you flower most cannabis strains they can sometimes more than double in height and width.

If you have pre-flowers and want to flower you only have to do one thing. You must put your plants under a 12/12 schedule.

Figure 7.2 - A Picture of an indoor grow by Mia Stoner.

THE ALL-IMPORTANT 12/12!

Most people never get good results or bud quantities from cannabis plants because they have never heard of 12/12.

12/12 is easy to explain. Cannabis plants grow outdoors naturally between the months of April to October/November. This means that towards the Sept/Oct/Nov dates the plants will be in

flowering. During this time the days get shorter and the nights get longer. When this occurs the plant is under 12 hours of light and 12 hours of darkness. When this 12/12 PHOTOPERIOD occurs the plant is naturally stimulated to flower. If the 12/12 continues then the plant will produce its flowers. As long as 12/12 continues the flowers will grow larger and more plentiful. This is part of the cannabis plants evolution and how it has taught itself when to flower. Naturally as a grower we want lots of flowers so we need to put the plant through a light cycle of 12/12. This means that we must turn our lights on and off at these given ratios.

During pre-flowering you will either manually turn on your lights for 12 hours and turn off your light for 12 hours everyday or you will use an automatic timer. If your light comes with a timer set the timer to do this. Throughout the 12 hours of darkness it is best to keep your grow area as dark a possible. A small desk light at the other side of your room will cause your plant not to react properly to 12/12 which will result in continued vegetative growth. In fact any light that penetrates the darkness will stop your plants from flowering properly. That means that your grow room must be sealed to the point where it is completely light proof. If you want to learn how to do this perfectly then I suggest that you read up on 'Photography Dark Rooms', either on the Internet or in your local library. Photographers use common items that can be bought in most hardware shops to make their film-processing rooms light tight. If you can replicate their ideas (basically a thick black screening around the doorframes or any open light points) then you will have a great system for flowering plants in. I

think most of you would have done this by now anyway if you listened and took the advice on covering your grow with either Mylar or white walls/boards. If you have prevented any light from leaking out, then you have prevented light from leaking in!

Problems with 12/12

If you switch to 12/12 before pre-flowers have shown then you may encounter the following problems.

- Stress related sex problems (Hermaphrodites).
- Abnormal bud growth.

Stress related sex problems MIGHT produce hermaphrodite plants. The stress of what is sometimes called "early flowering" (it is not really early flowering, there is no such thing as early flowering. We will explain this in a moment) triggers the plant into a situation where it thinks that its chances of reproduction are slim to none. That situation is a condition called - '**self-pollination**'. It does this by producing both male and female flowers on the same plant. The male flowers then pollinate the female flowers which will eventually produce seeds. The reason for this is that the plant notices that the photoperiod is irregular and that it should no longer be in the vegetative cycle but in flowering. This shocks the plant into a last ditch effort to receive pollen because it feels that it has missed its chance to receive pollen already (in the wild males release their pollen

just around the time that females begin to flower and sometimes even before that).

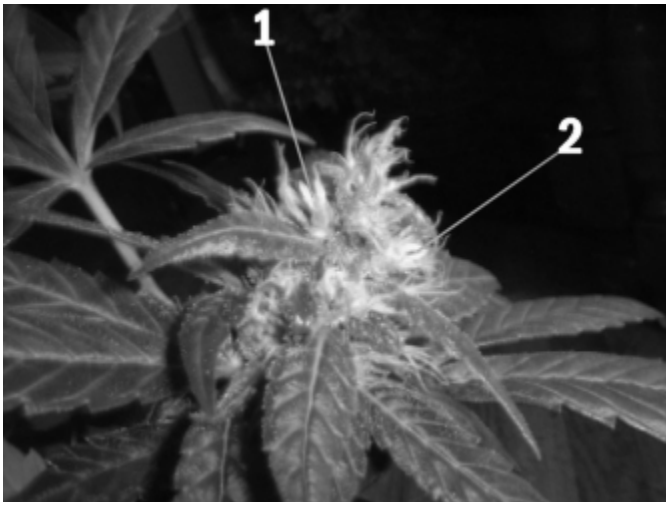


Figure 7.3 - This is what hermies look like. Notice that both male pollen pods and female pistils are present on the plant. They are hard to see and you should check your female buds every week for signs of any male flowers. 1 and 2 indicate the hidden male flowers. You should be able to see their lumps in this photograph if you look close enough. Picture by Rasta Linus.

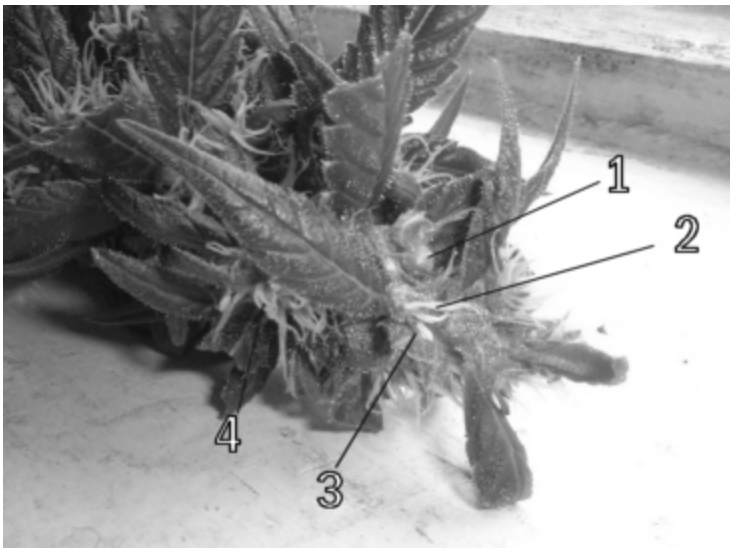


Figure 7.4 - Here is another shot of the hermie condition. The male pods are not clearly visible when they first develop and this is why checking for them is a must. Picture by Rasta Linus.

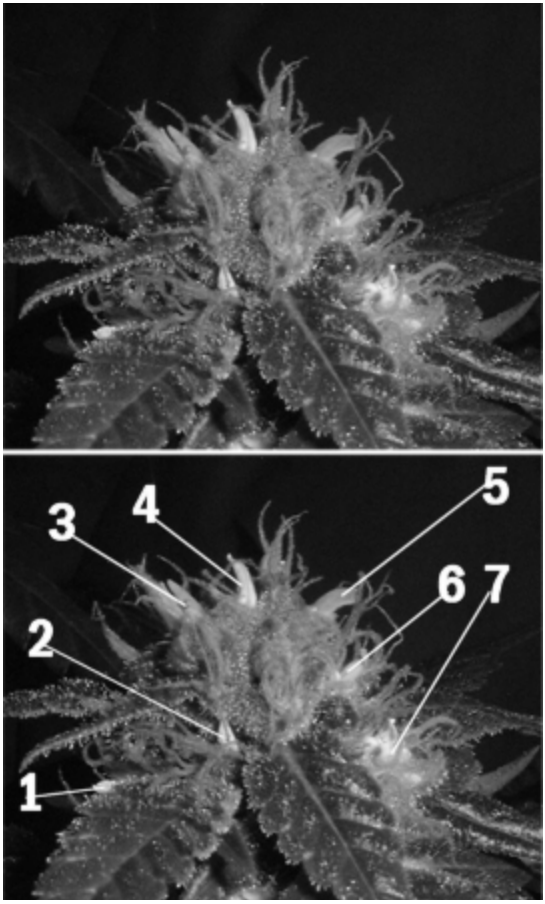


Figure 7.6 - These series of shots also show

the hermie condition clearly. Picture by Rasrta Linus.

Hermies cause problems because they may carry the hermie trait with their offspring. In fact, genetically the hermie will only produce female seeds and hermaphrodite seeds. It will never produce a male seed. If you have ever seen all female seeds been advertised by seed-banks then you should have the right to know that these seeds come from female plants which are stressed into producing male flowers. The plants then self-pollinate themselves and the results are female and hermaphrodite seeds. In a special case a female known as an XX female will produce more female seeds than hermaphrodite seeds. That is how female seeds are created. In general growers try to keep away from any hermie plants because they will spoil a Sinsemilla crop. Also having pollen floating around in your grow room from a hermie plant will spoil everything else including breeding projects.

Abnormal bud growth is a side effect of this. Because the plant produces male pollen sacks in with female flowers you may notice that the bud looks different. Also the quantity of female bud produced is decreased because of pollination.

Early induced flowering is not technically forcing your plant to flower. If you force flower on one strain that has not pre-flowered it will flower at roughly the same time as an exact copy of the same strain which has been flowered only when the pre-flowers appear naturally. Force flowering simply acts by stressing the plant into a crisis condition.

Get the best out of your plant and wait until your plant starts pre-flowering before switching to 12/12.

Keep feeding and watering your plant as normal. Pay attention to the flowering areas as they begin to grow. At this stage you may want to switch to your flowering feeds. Soon you will be able to see your plant's sex.

THE MALE/FEMALE THING or HOW TO SEX YOUR PLANTS

You now have spent time and money on your plants. You have grown a small selection in the hope that you will get some females out of them in the end. If you end up with no female plants out of 15 seeds then send the seed-bank a letter explaining how out of the 15 seeds 15 where male. If you are lucky and sincere in your writing then the seed-bank may send you some free seeds or give you a discount on your next order. Seed-Banks or breeders are not responsible for male/female ratios. It simply is not under their control. People get 100% females and others get 100% males, but it is rare that such a thing will happen. To get 5 or more females in a pack of 15 is a good thing.

Here are some pictures of male and female plants.

Figure 7.6 - This is a picture of a male plant. You can see the male pod clusters clearly. The picture is by the 'Chronic Couple'.

Figure 7.7 - This is a female plant by BigIslandBud.

Notice how the female produces little white hairs and the male produces little ball like shapes. This is the definitive male/female telltale factor. Do not kill away any plants before you see these flowers. It is the only time that you can really say for sure if the plant is male or female.

FLOWERING

If all things have gone well and you have taken good care of your plants, you will now enter the flowering stage of the plant's life cycle. You have removed and maybe killed off the males. You now have a number of females to work with. This is going to be the most important time you will spend taking care of your plant.

The male plant produces pollen sacks which, when ripe, burst and scatter pollen to the female plants. The female plant produces white hairs at the internodes and top cola (head) of the plant during flowering. These hairs (pistils) begin to curl slightly and grow longer and thicker. The top cola should carry the most pistils. These pistils are sticky too touch (do not touch them too much! they also contain your much wanted THC) and begin to cover in resin over the flowering period. The reason for the stickiness is that it is used by the female to catch falling pollen. If the female plant is not pollinated she will try to grow more sticky areas. Hence the results of a sinsemilla crop.....Bigger and Better Buds!

Figure 7.8 - Picture by BushyOlderGrower.

During the strict cycle of 12/12 she will eventually reach a peak period of flowering. Along with the flowering cycle the plant will also fill out more. More leaves, more branches and more flowers. Your plant will start to almost take the shape of a Christmas tree. The lower fan leaves will be stretched out to the max in order to receive the most light. Running upward in a cone shape she will get tighter

with floral and leaf development.

During the peak period of flowering the female pistils on the flower's tips will swell up. When the swelling takes place the pistils will begin to change in color. They will generally change from a white to an orange tint to a red tint to a brown tint. All strains are different but in general it is a white to red or a white to brown color change (It is best to use the breeder's recommended flowering times for harvest guidelines though). When she does this you are ready to harvest her and sample your favorite herb.

Each strain does have their own flowering times and each strain also may have a different color tint when they reach a flowering peak.

We will talk more about harvesting in another chapter.

Chapter 8

ADVANCED INDOOR SOIL BASED GROW METHODS

New ways of improving your plants yield have crept up over the years or so and some of them have become quite popular. The three most common new types of indoor growing are SOG, ScrOG and Cabinet growing. These are basically ways to grow seriously large top colas.

These methods do not have to be soil based, one can use hydroponics instead but soil is generally the most widely used medium with these set-ups.

The idea behind these methods is that the bottom branches of indoor cannabis plants do not catch much of the light cast from the HID and are not that good to smoke either because they are fan leaves. So why not create an
apparatus that concentrates on the top part of the plant. In most cases the cola is going to produce the most bud so why not try to get that part of the plant to grow really big. So along came the idea of SOG, which is also called Sea of Green.

SOG

A SOG set-up can be any size but must maintain a certain overall shape. First of all you need to grow some plants normally first. Wait until you see flowers and then select the nicest female you can

find. Take cuttings from this female mother plant and grow the cuttings out until they have roots. When you do take multiple cuttings try to create as many plants as you can fit into your grow set-up. In SOG grows we are looking a 1 plant per square foot or even one plant per 0.10 square feet. So that should be a good estimate as to how many clones you will need. Now, we want to look at pots here first. What we really need are tube shaped pots or pots that have a longer depth than width. You can make these yourself or buy these pots in the store. All we want to do is pack in as many pots with plants as we can into the SOG grow chamber. It is just a big cluster of pots with clones. The clones are planted all at the same time. No more new plants are introduced into the SOG grow room. When they have reached your desired height (keep it small), they should be flowered. Because the clones have been taken from a mother plant, the clones will carry the age of the mother plant with them. Since we took them from a flowering mother they will start to flower as soon as we start 12/12.

The final harvest result will be a full canopy of bud, hence the name Sea Of Green. Because you are using clones you only have to grow the clones out for the remainder of their flowering times. This means you can have a large bud quantity turnover ever 2 months.

Figure 8.1 - An example of a ScrOG by 'A Merry Caner'.

ScrOG

This is like a SOG (Sea of Green) grow except fewer plants are used in conjunction with a screen to fill the grow area out with heavy top colas, hence its name - ScrOG (Screen of Green).

This screen is simply a large wire mesh put between your light and the plants (Figures 8.1 and 8.2). Again clones from a female plant are used like in the SOG method, but we allow at least 1 square foot per flowering plant in the ScrOG method.

The plants are not flowered until as such time as they have covered the entire mesh with green. As the plants grow up through the wire mesh they are trained and worked around the netting to form a very even canopy. The top colas and side branches are all trained under the screen.

Figure 8.2 - Another basic ScrOG grow. Picture by Rattdog.

There are many variations of the above two methods. They all still contain the same principles. SOG and ScrOG's were originally set-up to get the most out of poor quality fluorescent lights. Today's growers (since HID's came along) with a 600 watt HID bulb have literally taken these set-ups to a new level.

The veteran fluorescent user would line the roof of the shelf or the box with fluorescent tubes to try and get the most out of their grow with this method. Now with HID lights they can really push their buds to the limit. Some people even grow top colas that are the size of soda bottles or large corncobs!

Figure 8.3 - This picture shows a ScrOG variation. It is a small ScrOG set-up for a cabinet grow. This picture also contains a Homemade Octagonal Vented Hood for a 250W HPS light. Picture by Foz

SCROG GROWING
By REALHIGH

RealHigh is a ScrOG lover and has been growing ScrOG style for some years. He has added a bit to the ScrOG method through his experience with the process. This should help you understand more about the ScrOG method and what people have learned with this new technique.

This is like a SOG (Sea of Green) grow, but a screen is used to train the plant to grow horizontally creating a canopy of buds beneath the light. The screen is simply 2" chicken wire, or 2" nylon poultry fencing, or one can use hooks and 20 lb. fishing line to make their net.

The screen is at a set height above the plant medium. This height varies from 8" to 24" depending on the light type you are using. The light should be hung by chains and adjustable so that one can raise it if needed.

Clones are used again like in SOG style, because we do not want a hole in the canopy were a male was removed. This is why we use female clones for SOG and ScrOG grows. It does not take as many plants for ScrOG growing as compared to SOG. One should allow at least 1 square foot per flowering plant in a ScrOG grow.

This method also takes anywhere from 1 to 3 weeks longer

per grow because we will be in a vegetative stage longer than a SOG grow.

The plants are trained to grow horizontally under the screen until they are 2 weeks into the flowering cycle. At this point you let the tops grow vertically through the screen. One should always train the main growing tops to the outside of the screen. They always grow the tallest, and we want the tallest to be on the perimeter of the screen. As the tops grow vertically, push the large fan leaves down under the screen, allowing the light to get to all the developing bud sites. If leaf growth is excessive, one should first cut the finger in half making a shorter leaf and allowing light to get to the bud site. Leaving half the leaf on the plant still allows it to make energy for the plant to grow. Taking a whole fan leaf away in one go can stunt growth.

In a week take off the rest of it. Some do not remove leaf at all, but I do it to help with air movement, reduce chance of mould or fungus, and to allow light to penetrate the bud sites. Just remember to remove a little at a time if you do remove leaf.

At this point flowers are forming and growing vertically creating a carpet of bud above the screen. Now we go below the screen and remove all the lateral branches and stray bud sites. The canopy has thickened up enough now that light is blocked from reaching this lower growth. It is only sucking away your plant's energy from the buds under the light. Remove all branches that have not made it to the screen and the stray bud sites. We want the plant to concentrate all its grow energy on the developing flowers above the canopy.

The main 3 differences between a SOG and ScrOG grow is the number of plants grown, the screen, and the slightly longer grow cycle of the ScrOG. Both methods can be done under the same light and in soil or with hydroponics. There are many variations of the ScrOG grow, but they all contain the same principles. There are the V-ScrOG, Stadium ScrOG, Flat ScrOG, and the Cylinder ScrOG grows in today's homes. I think you can picture what these look like. They work the same way but just have a different shape.

One of today's strains has earned a place in the ScrOG garden and this is C99. One will find a pure Indica or Indica dominant cross will produce the best in a ScrOG grow. A good ScrOG grow will average 2 ounces of bud per square foot of screen, but one can not expect this the first few grows, for it takes proper timing and the correct strain to accomplish this.

ScrOG was originally designed for grow area's limited in height and fluorescent lights were used to light the grow area. Today's growers are using HID (High Intensity Discharge) lights for growing ScrOG. They have taken it to the next level with these lights and are generating great results.

Today's grower is always trying some thing new to better the production of their favorite plant.

So there we have RealHigh explaining to us how he has worked with the ScrOG system. As you can see he has added much more to the basic ScrOG than we have mentioned. All this comes with experience, practice and experimentation.

CABINET GROWING

To define this is going to be no easy task. A cabinet can be your hot press, small closet, an old refrigerator, a box, a press, or a simple cupboard will do. The grow area is usually small and can accommodate 1 to 4 plants at a time. The idea behind a cabinet grow (Figure 8.4) is to keep a cycle of plants growing at all times. There are three things a cabinet needs to get started, and these are:

-The Cabinet
-A Light
-An air vent with fan.

Most people simply set up their lights so that it is adjustable.

Figure 8.4 - A simple cabinet grow by X3n0.

They do this by using adjustable chains or a spring-type cord. A large hole is made in the unit to allow some air to get in. Another hole is made to allow air to escape. A fan is placed in one of the holes

that will extract the hot air which is being generated by the heat from the bulb. This vent and fan would be near the top of the cabinet near the light. Hot air rises and that is why it is placed there up top. The intake hole is on the opposite side of grow area and can have a fan in it also. This fan is generally moving a bit quicker than the extractor fan to allow a fresh supply of air to circulate before leaving the grow room.

The walls are painted flat white or Mylar is hung for reflective purposes. The plants are usually placed in separate pots and go through their entire life cycle within the cabinet environment. Clones are taken from the plants and placed either on a second shelf in the cabinet or near a window in your house. Some people have made a small compartment in their cabinet for clones and germination. This can be any size, but is kept small because you only want to just keep the clones alive. This small compartment will probably have one or two fluorescent lights in it for the clones. It would be best to keep the compartment at the top of the grow chamber near the exhaust fan. You do not need an intake fan for these clones unless it is a big set-up. A simple hole in the side will allow the plants to breathe. After the harvest, these clones are put into the grow room and the process is repeated. It is a Perpetual Grow. The legal term is a Marijuana Factory. You can harvest bud every 30 days if you have the right strains.

Your light can be air-cooled in a few ways. The most common way is to mount a 4" dryer flange on the hood and link from the hood flange to the exhaust fan flange with a 4" dryer hose. A fan can be mounted on the hood also.

Figure 8.5 - This is a picture of a typical air-cooled system that can be purchased in most grow shops that sell grow lights.

Figure 8.6 - Nice Frosty Bud by 'A Merry Caner'.

ADVANCED SET-UPS

As you can guess all of the above grow methods can be shaped to suit the grow room. Many a cannabis cultivator have turned entire rooms into a ScrOG or SOG grow. Size is totally up to the grower. For those who are happy with 4 ounces of dried bud every month a small SOG or Cabinet grow is the way to go. For those who want a bigger yield to last all year then a large ScrOG grow may be considered. Many a 5-ft. x 5-ft. ScrOG grower have delivered 30 to 50 ounces of Marijuana every 2 months. When conditions are at their optimum level this can be achieved.

An expert's indoor grow room would look something like this. 14-ft. x 24-ft. area x 9-ft height. Several vertically suspended HPS lights would hang from the ceiling. The roof, walls, and floor would be covered in reflective material like flat white paint and Mylar. All lighting fixtures would be met at a junction box on the wall. Ballasts would also be attached to the wall. The plants would be placed on the ground in large container buckets inter spread between the lights hanging down. The room would also be completely light proof.

Multiple air ducts and extraction fans would take the hot air out and pull the fresh air in. An Ozone generator would be in place to kill the smell and cannabis odor. Other items may be in place such as a CO2 generator, electrical generator, and even a light mover like a Light Rail III. A Light Rail is a horizontal light mover and there is a ‘Sun Circle’ that the lights suspend from that move the lights in a circular pattern. This allows fewer lights to be used in covering a large

grow area like this one.

Figure 8.7 - This is a picture of a Sun Circle light mover.

That is about the bones of what a professional grow room would look like.

PERPETUAL GROW CYCLES

The objective of the perpetual grow is to keep most of the room flowering at all times. This means that while your plants are flowering you will have an equal amount of plants in the vegetative growth stage. So in essence, half the grow is in its vegetative stage and the other half is in its flowering cycle.

As with most grow rooms, the grower will learn to make the best use of his/her grow space. The room will become an intense hobby area and a most rewarding one too. In time the grower may even begin

to learn more about plant genetics and start to develop some strains of their own breed and stock. Soon the grower may find himself or herself entering competitions or even producing some of the finest seeds available on the market. As you know seeds sell between $20.00 to $150.00 for 15 seeds. A breeder could soon find their hobby turned into a nice little income maker. In countries like Holland, Switzerland and Belgium seed production is already well underway. Canada is establishing a business and even trade

Chapter 9

HYDROPONICS

THE GROWER AND THE GROWING MEDIUM

As the grower begins to experiment with soil types and mixing them they may begin to look at alternative growing mediums such as rockwool or clay pebbles. These are mostly artificial grow mediums designed to contain all the plant's mineral needs and allow air to get the roots to promote good growth.

Figure 9.1 - This is a picture of rockwool in various forms. You can see slabs and cubes in this picture. 'Grow Dan' is a popular brand of rockwool.

In the early days of experimenting with artificial grow mediums inventors found that plants just needed a suitable material that holds minerals, performs some form of drainage and allows air to

get to the roots. If they could invent a non-toxic medium then the plant would surely grow as well as it would in soil. During most investigations they found that the roots did not respond too well to the mediums, but that the plant was receiving nutrition in every aspect when the nutrients were added to the artificial medium by hand. To solve this problem the inventors looked back into the history of growing. They found that many Ancient Civilizations where growing their plants directly in running streams. A light reed or bush was used to keep the plants stems above the rushing water. Of course the inventors knew that only certain types of plants could be grown this way. Then someone had the bright idea of creating a small unit that held water and had the medium and plant set-up in such away that the medium would support the plant above the tank that would feed water to the roots once they grew out from the medium.

Figure 9.2 - Rockwool cubes are excellent for cloning.

Figure 9.3 - This is the underside of a hydroponics system. Notice the root masses hanging down like fine clear strands. Root masses can really grow long in hydroponics systems. This image is by Shipperke.

The method is called hydroponics and is a very successful way of growing marijuana if you are looking for large bud quantities, or bud all year long.

Hydroponics is the technique of growing plants without soil, but rather in beds of sand, gravel, or artificial mediums that are flooded with a nutrient solution.

Basically a simple hydroponics system consists of a pot, a reservoir, a grow medium, a pump and a set of growth nutrients. The system itself has a top layer and a lower layer. The top layer holds the grow medium and the bottom layer holds the water with added

nutrients. The plant is grown in the medium where it will develop a stem and a set of roots. The roots will grow through the medium and down into the nutrient solution. Water and nutrients are pumped into the lower portion of the tank through a reservoir at certain timed intervals. The plants drink the solution down and thus expose their roots to the air more. If this it timed correctly and the growing solution is maintained the plants will flourish! This is because the plant can devote more of its energy into upper-body growth rather than putting that energy into roots searching for water and air. Now having said this, hydroponics produce massive root clusters and I mean a big mass of roots. One can easily pick up a 2-gallon bucket full of root growth from a single plant! This is because roots thrive in hydroponics systems.

Hydroponics has become a fast growing trend in cannabis cultivation. It does require a certain degree of maintenance, but the results are sometimes incredible. On the other hand if a hydroponics system is not well maintained the whole unit may fail and kill your plants very quickly. This is the biggest problem that the hydroponics grower has to contend with.

Hydroponics, when done correctly, can produce a flowering plant up to 3/4 the normal time that it would take with a soil grow. That is right! Hydroponics can grow bigger and better buds in 3/4 the time it takes to grow the same strain in soil.

HYDROPONICS SYSTEMS

There are many hydroponics systems out there but here are ones that are most commonly used.

- Nutrient Film Technique - NFT
- Flood & Drain - Ebb & Flow
- Drip Irrigation System
- Aeroponics
- Automatic hydroponics Pots
- Manual hydroponics Pots

NFT

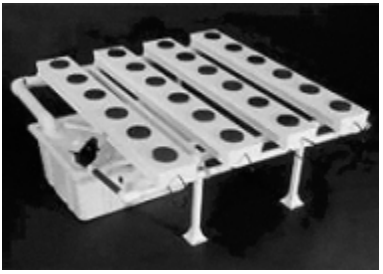


Figure 9.4 - This is a picture of an NFT system.

An NFT system is an all-in-one system. In other words the reservoir which holds the pumps and nutrient solution is contained in the same system. These systems are generally very flat and long. There

is a constant flow of nutrients to the roots and back to the reservoir.

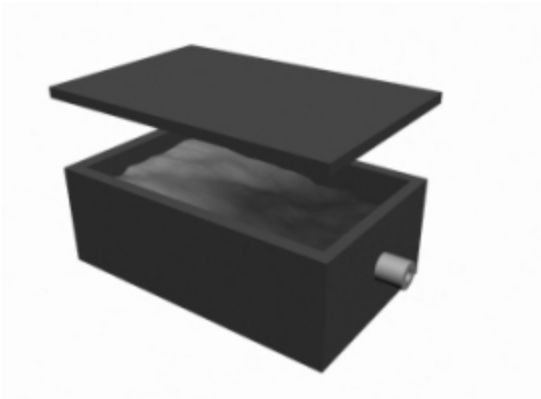


Figure 9.5 - This is a professional reservoir unit. It is light tight and contains perforations for pump attachments.

FLOOD & DRAIN - EBB & FLOW

Figure 9.6 - This is a popular Ebb and Flow system on the market today. All hydroponics systems can be used to grow cannabis.

An Ebb and Flow is another all in one system that is recognized by its depth. The grow medium is located above the reservoir which pumps the nutrients and water to the roots at a set time and rate. This means that during the day the plant will go through spells of dryness. The nutrient solution is pumped into the medium and is slowly drained back into the reservoir again. The whole unit recycles the nutrient solution at timed intervals.

DRIP IRRIGATION SYSTEMS

The Drip Irrigation System is another all in one system that feeds the plants individually. The plants are located in separate chambers and the nutrients are fed to the medium by a small dripper. The solution is drained through much like an Ebb/Flow system.

AEROPONICS

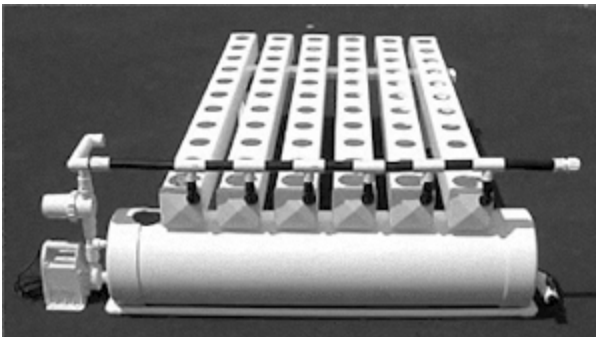


Figure 9.7- This is an example of an aeroponics system.

Figure 9.8 - Aeroponics can be classified as a branch of hydroponics, but in recent years it has become something of a method in a field of its own.

These systems are generally expensive and are used by professional growers. The unit itself can be recognized straight away by its design. The plants are grown in a medium that is placed into slots along a lengthy tube. The tubes can run anywhere from 1 meter to 20 meters in length. Inside the tube are nozzles which mist down the roots of each plant with grow nutrients. The reservoir, which contains nutrients, is kept outside of the tube in a tank. The nutrients are pumped from the tank to the nozzles and then the remaining solution that drips from the plants is drained into another tank that is normally checked before being reused again.

Figure 9.9 - An Aeroponics unit in use by Taffy Lewis.

Figure 9.10 - This is a complete aerokit with over 20 plants. Picture by Taffy Lewis.

AUTOMATIC HYDROPONICS POTS AND MANUAL HYDROPONICS POTS

Figure 9.11 - This is an example of an automatic and manual pot system.

These are pots that are used for growing one plant at a time. In each pot a pump delivers the nutrients (or they are manually fed by hand), into the bottom of the pot until the nutrients reach the roots. The roots then suck up as much as they can until they are dry. Once the roots are exposed the pot is fed with more nutrient solution again. These units are good for the grower who wishes to grow big bushy cannabis plants in a simple stand-alone unit.

HYDROPONICS NUTRIENTS

This is the most important part of your hydroponics set-up. Your mix and the choice of nutrients will depend on whether your plant will die, grow, grow big, or grow very very big.

Nutrient solutions basically come in a number of different forms. It is vital to check that the solution you use is the best for your type of plant. Some solutions are for soil and can only be used with soil. They contain the wrong elements for hydroponics use. There are soil-based supplements/fertilizers and then there are hydroponics nutrients.

Most hydroponics nutrient solutions are complete nutrient solutions. They provide every element and compound needed for proper plant growth. Because of this hydroponics nutrients are a bit steep in price. Always spend your money on the correct nutrients because any short cuts will lead to failure and kill your plant.

Single Packs:

If all the nutrients are contained in a single pack there is a chance that the elements may combine and precipitate in the pack. This may cause the solution to become unbalanced and is then rendered useless to you and your plants. Keeping this in mind, get a complete nutrient solution that is contained in several bottles called ‘Twin’ or ‘Triple packs’.

One brand name called Formulex has managed to hold all the elements in a single pack using certain chemicals to prevent precipitation. This pack is very good for starting clones or seeds in a rockwool SBS tray. Formulex can be used in soil grows also.

Figure 9.12 - Formulex

Twin / Triple Packs:

Figure 9.13 - This is an example of triple pack nutrients.

For best results the hydroponics grower should consider a Twin or even a Triple pack. Basically the chemicals are held in different packs to prevent precipitation. Optimum, Power Gro, Ionic, and General hydroponics Flora Series are the most common multi part nutrient solutions. The most popular one with cannabis cultivation is the G.H. Flora Series, a 3-part system - Gro, Micro, and Bloom. An experienced grower can adjust these nutrients to get optimum performance from their plants.

These packs have instructions on the bottles explaining how to mix down the nutrients into water, and can be broken down and mixed weaker or stronger to the grower's needs.

MONITORING RECYCLE SYSTEMS

Depending on what set-up you are using, you may find that your solution goes through a system that uses the nutrients in the reservoir over and over. As the plant extracts the nutrients and minerals from the solution it will become depleted of its resources over time. For this reason we must understand how to monitor our nutrients. In today's world monitoring systems are a bit expensive. If you have a ppm reader (TDS meter, Total Dissolved Solids) you can understand how much of your nutrients have been used up and how much more you need to add to reach the optimal nutrient level. All reservoirs will become unbalanced and need replenishing. As a general rule, an initial amount is used to fill the reservoir. As the plants use up the solution, we top up the reservoir to maintain the initial level.

If you start with 10 gallons of solution then we need to top up to that total of 10 gallons every few days.

Figure 9.14 - Ppm reader (TDS meter).

If you do not have a reader you can still grow a good crop, but it takes practice to get it right. If a cannabis hydroponics grower does not have a ppm reader, then they tend to replace the reservoir more often instead of topping it up. That way the grower is certain that the new solution will contain everything the plant needs. If you have a ppm reader then you only need to top off the reservoir as needed. PPM (parts per millionth) readers can be expensive, but over time they will help you save money on the cost of hydroponics nutrients.

HYDROPONICS GROWING MEDIUMS

There are many hydroponics mediums to use that your plant will take root in. Rockwool appears to be the most popular and comes in either slabs or cubes. These cubes vary in sizes from 1" to 6" cubes. The slabs can be cut to suite the shape of your pot or container.

Rockwool:

Many growers like to use the cubes for seed germination and for rooting cuttings. This seems to be the easiest to use. Many growers claim that rockwool should be pre soaked for 24 hrs in water with a pH level of 5.6 (7.0 for soil grows). This is to stabilize the pH level of the rockwool.

How to make up nutrient solutions:

Always follow the very simple instructions on the products. All you need is a container to make up the nutrients in and the nutrients themselves. Each of the packs should have A, B, and C written on them. The mixture is usually 3.5mls of A and B and C per liter of water. This is called a 100% strength mixture if you follow the guidelines as stated exactly on the label.

Hydroponics pH:

After you have mixed up your nutrient solution you will want to take a pH reading of it. If you have any problems, just like in soil growing, you will need to adjust your pH level. Now, you do not use the same method to adjust pH levels as described in the soil chapter. For hydroponics you need to buy a pH Up and pH Down adjusting

solutions. These are cheap and can be added to your solution to balance the pH level.

NOTE:

Cannabis plants in a soil system like a pH of 7, but in hydroponics systems they like a pH of 5.2 to 6.3. You will discover it is easier to maintain a pH range and not a set level.

Figure 9.15 pH up and pH down products for hydroponics use.

Always check your hydroponics pH level as often as you can. pH can slip up and down very quickly in hydroponics systems.

Alga:

Alga is part of a large group of non-vascular mainly aquatic cryptogams capable of photosynthesis.

Always keep your container away from exposure to direct light, as alga will grow in the container if you do not. This seems to be something of a problem because we grow plants under lights and we may have a system that has to be sitting near the light so the plants can grow properly. Most hydroponics systems have been manufactured 'light tight' to eliminate this problem. If you built your own system then you may want to keep your solution sealed from the light by using thick black PVC tape to cover the lid and the entire reservoir. This will help prevent alga from growing in your system.

If you do have alga growth then you need to clean your system out. Wash the unit and replace the nutrient solution with a fresh mix. Also try to find the source of the light leak and patch it up. Using a thick black garbage bag works well to keep the light out.

Grow and Bloom:

Some of the double packs come in two different sets - Grow and Bloom. Basically the Grow solution is used during the plants vegetative stage and the Bloom is used during the flowering stage. The Bloom formulas contain more Phosphorus and Potassium and less

Nitrogen.

Other packs have a complete all in one function, but they are lacking some additional extras.

Cannabis may find a lot of the nutrients that are mixed full strength to be too strong and it will burn them. It is recommended that when using any hydroponics formulations with cannabis that you do so in MODERATION for your first grow. Many cannabis growers have bought these products with anticipation of producing great buds only to get great plant burns instead. It is best to start off with 30% strength at first and then increase if needed.

Strengths:

Marijuana cultivators have found that full strength nutrient solutions are not a good thing. In fact even medium strength formulas have the power to burn your plants. Consult the information on the packs, but in general 3.5 mls of A and B and C per liter is usually called 100% strength. The same amount mixed with 2 liters of water is 50% strength. Marijuana can grow very well between 30% and 50%. Never go full strength with your nutrients if this is your first time. Try 30% for the first attempt and see how your plants do. You will be surprised at how rich a bud content you will produce with this amount of nutrients. The most common problem associated with hydroponics is plant burns. I have rarely heard of someone under-feeding his or her plants in a hydro system. I have heard plenty of reports about

overfeeding plants in hydro systems. Over time you will get to know your strain and what it likes. The better you know your strain the better you will be able to control your feeding amounts.

HARD WATER PROBLEMS

If you have scales in your bucket or what looks like kettle rust then you have not been maintaining your pH level. Scale is caused by very acidic pH levels. Your local water company will provide you with a read out of your water. You can buy nutrient products to use with hard water. If this problem persists just drain and clean your reservoir and mix a new batch of nutrients to the correct pH level. Some use a Reverse Osmosis water filtering system to clean their tap water. Distilled water has a stable pH level of 7.0.

HOW TO KNOW WHEN TO ADD MORE NUTRIENTS

This is easy and not so easy. Beginners rely on a ppm meter, but a veteran grower learns to read the plant. The plant will tell you if is getting enough or too much or too little. It takes a few grows to learn to read the plant but you can do it with experience. The plant may have drunk all the nutrients up or just some of them. Some nutrients are taken up by the plant and stored within the plant until it needs more. A top up can be done if you do not want to change the reservoir totally. If you do not have a PPM meter to calculate this accurately,

simply write down your nutrients mix ratio from day 1. Let’s say we used 3.5 ml of A and B and C in a 1 liter drum. Now the plant has drunk 1/2 a liter, now all you need to do is make another liter of 3.5ml mix in another container and add 1/2 of it to the reservoir. This is one simple way of doing it, but you are left with a half liter of solution, so do your math and make a mixing chart so you can mix up different amounts as needed. Local grow shops will help you most of the time with any questions that you might have about their products.

CANNABIS AND HYDROPONICS

Growing in hydroponics is not rocket science. It is a simple process which can vary from system to system depending on what kind of a set-up you choose. Most of the nutrient mixes are explained extremely well on the packs. If you follow their instructions and remember that Cannabis only needs 30%-50% strength nutrients then you will do just fine.

Over the years Cannabis cultivators have decided to try and beat the system by building their own systems. There are over 100 different types of systems that can be made by hand at home. Out of these 100, 15 have proven to be useful for cannabis. One of the more famous simplest systems is DWC, Deep Water Culture, a.k.a "The Bubbler". This system is very cheap to put together and yet still provides excellent growth rates. There is nothing like it for the price. The bubbler is a rewarding way to grow.

THE BUBBLER

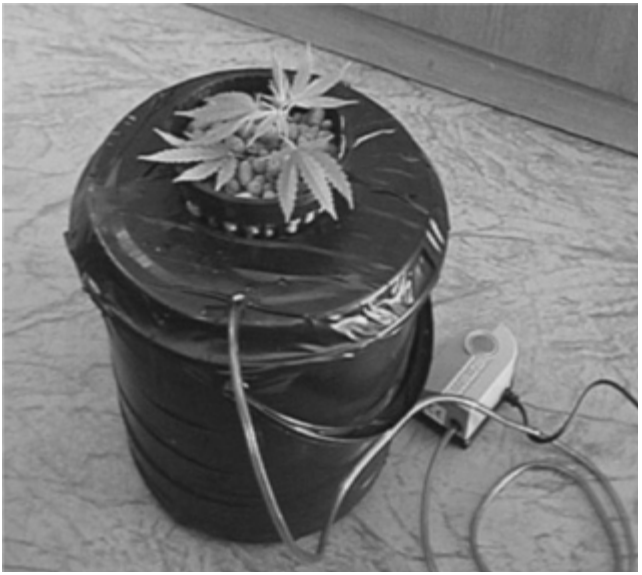


Figure 9.16 - A picture of a Bubbler with a young clone, by Strawdog.

Basically the bubbler is just a bucket with a lid and pump. But the set-up is so extraordinary that it simply zings the plant into life. This method can grow a plant from 5 ft. to 8 ft. (if not more), with plenty of fresh buds as long as it maintained and managed well by you, the grower.

Here is a list of what to you need to build the bubbler.

The Bubble Bucket:

(1) Get two 5-Gallon buckets with lids. (Wash it out with bleach)
(2) Get a 6" Net pot.
(3) Cut a hole in lid of bucket so the net pot sits in neatly all the way down.
(4) Cut a hole in the lid about 2cm in diameter near the rim (the pump hose goes in here).
(5) Use Black gaffer tape to wrap the pot so it is light proof. (If light gets in alga will
develop in the water. This is not good.) Wrap the lid as well.
(6) Get a fish-tank pump and air-stone.
(7) Get your medium together - rockwool, clay pebbles etc.
(8) Get the Nutrients and Mixes together.

Figure 9.17 - A close-up of the net pot and lid by Strawdog.

Simply mix your nutrients together in the second bucket. Set the air-stone in the center on the bottom of the first bucket and hang the air pump somewhere above the water level on the wall of your grow room. Use the hole in the lid to feed the airline through. Fill the bucket up with the nutrients to a level were the net pot just touches the solution. Turn on your air pump for 24 hours a day. That is it. The pump will send air through the tube to the air-stone and it is released into the water. The air bubbles the solution causing it to splash at the surface wetting the roots and feeding the plant. Check the bubbler everyday to see how much your plant has drunk. Let your roots get air everyday by letting a root zone form. Let the solution level drop an inch below the net pot. The net pot holds the cutting in rockwool and

the rockwool is surrounded by the clay pebbles. Do not constantly top up your reservoir, it is sometimes better to let the water level drop 1 gallon and then replace that gallon. Once a root mass has develop the plant will grow like no other.

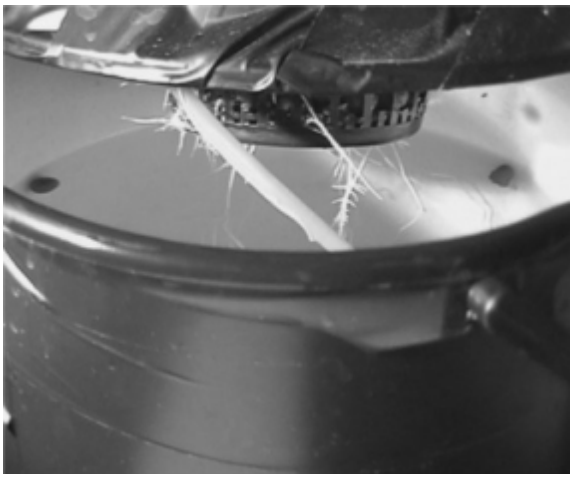


Figure 9.18 - A close-up of some early roots and underside of the net-pot. Picture by Strawdog.

Basically this set-up is just bubbling the nutrients solution with the pump. The pump sucks in air from the room and this air contains Oxygen that the roots need. As the unit bubbles the roots get air, nutrients and water. The plant loves this and thrives.

When you want to change your mix you may have a spare bucket that is the same shape and size. Simply swap the lid over with

the plant, root-mass and air-stone into the new bucket. This is a great little system that comes highly commended.

Chapter 10

OUTDOOR GROWING

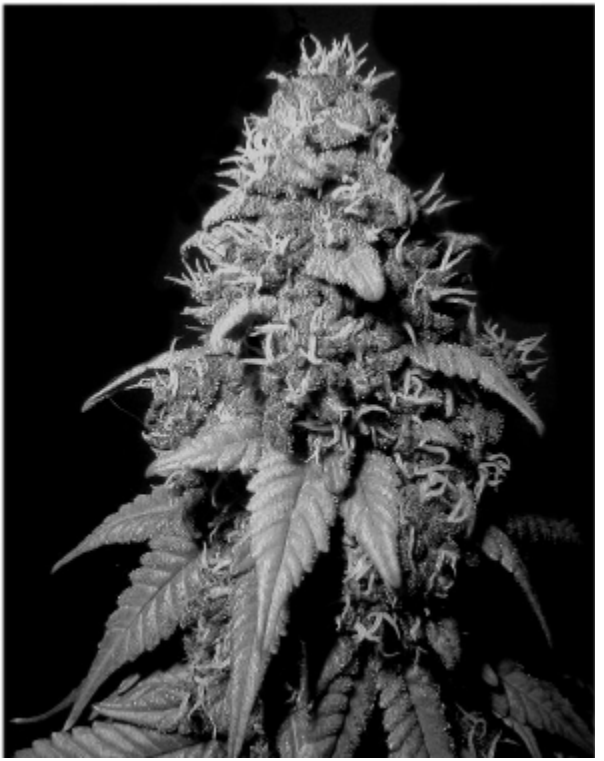


Figure 10.1 - Outdoor night shot of a flowering Cream Sodica Cannabis Plant. Picture by X3n0. Plant by Breeder Steve.

Many a smoker will say that the best cannabis *they ever smoked was* outdoor cannabis. This says a lot about natural sunlight and the outdoor environment. If you live in a climate that is warm enough for tomatoes to grow outdoors then you have the climate to grow some good weed. As an outdoor grower you may either choose your own back yard or a guerrilla grow in a woods or field. We have discussed this in a previous chapter before, so we will not go into what the two types are here.

When you have found a plot that suits your needs you can then start to prepare your plot. Seeds that are planted in untreated ground will have a low germination rate. Also you need to think about when to grow. The months of March and April are very good times to start your plants because when your plants are mature and begin to flower it should be about August to September which is just about the time daylight hours start to decrease. So in April you want to find your grow spot. Try to remove as many weeds as possible during your grow plots preparation and do not leave heaps of earth around for people to notice. Carry the earth away in bags if you have too. You can then simply sow your seeds in the ground. Do not burry them too deep, a 1/2" to 1" is fine. You may choose to add some pre-made soil to the patch which you have bought from the store. Again, find a soil with a NPK value where N is higher than P and K values. This is helpful because you will find that bag soil does not contain living masses or potential living masses such as weeds. Even though you may have treated your outdoor soil patch it may still contain seeds or spores from

weeds and other plants. You will most certainly have to weed your outdoor area nearly every week during the initial stages of the grow.

Figure 10.2 - Notice how in this picture that the area has been cleared of major weeds. This plant has little to no competition. Picture by Slowhand.

After you have sown your seeds simply sprinkle some water over them. That is all you need to do. It is that easy. You do not need to adjust the soil pH yet or feed the soil. What you have done should be fine for starting seedlings.

If Mother Nature does not provide water for your plants then you need to draw water and feed your plants when they need it.

Some outdoor growers have got some cute ideas. Some growers germinate their seedlings indoors and place them into pots. They cut away the base of a pot and hold the bottom in using a piece of cardboard and sticky tape. They then go to their grow area and clear away the weeds. They then dig small holes and place the pots into the hole, removing the piece of cardboard before doing so. They then cover the edge of the pot so the pot can not be seen anymore. The roots will grow down through the hole in the bottom of the pot and into the surrounding outdoor soil. This method has the advantage that the seeds have already germinated. If you are a really cute grower then you will consider cloning all females and growing these in pots before transplanting the pot and plant to the hole in the ground outdoors. Amazing or what! You will have all female outdoor plants!

It is also a good idea around the second week of vegetative growth to spray the area with some pesticide.

Cannabis growing is really fun because the more you know, the more tricks you will invent by yourself to get the most out of your yields. Some of the best cannabis growers are very exotic with their grow methods. A number of people have even tried outdoor

hydroponics to get their plants to grow bigger and better.

When growing outdoors you need to keep your plants in good shape and free from any unwanted predators that may find your top cola and leaves to be quite tasty. We will talk about this in the chapter about pests.

CARING FOR OUTDOOR PLANTS

Weeding:

The best way to weed is buy hand. Do not attempt to add any weed killer to your grow area unless you know more about the weed killer you are using and how it reacts with cannabis. Some weed killers say that they will protect your plant and only kill the weeds around but this is not very agreeable with marijuana plants. If you want to test weed killers then it is suggested that you may create a small patch with one clone to see how the weed killer reacts with it. For now, do your weeding by hand.

When you have weeded a grow area your plant will grow much better without having to worry about competition for light. Generally throughout the plants grow cycle you will have to weed the patch every week for the first 2 - 3 weeks and then once every month until as such time as the competition has been left truly and well behind. Some grow areas may be weed free in March, but come June the area may not seem like it has been weeded at all because of the

speed of weed growth. Whenever you visit your plants make sure you pull up a few weeds as it does help.

If you feel that your area is very dense with weeds then you may consider a ground cover. A ground cover is basically a cover that is placed on the ground with holes in it that the marijuana plant grows up through. Covers can be anything from plastic bin liners to sheets of paper. Of course this does not look good if you want to create a stealth grow area, but it does keep the weeds down.

Figure 10.3 - Some outdoor seedlings by GrowerManiac.

Watering:

This is Mother Nature's job most of the time. All your water should come from the heavens. If you find that you have a drought or a long warm spell during summer then you may wish to carry some water to your grow area. If you have to trek over long distances then it is suggested that you fill a sack with plastic bottles of water.

Some garden growers use sprinkler systems during dry spells. This is great but again may attract unwanted attention that you do not need.

How much water your plant needs depends on how big your plant is. Some larger plants will require a minimum of a gallon of water per day.

Natural loam soil will be able to hold water for anywhere between 4 - 6 weeks before becoming extremely dry under the sun.

Deep pockets of water may be held below the surface that would not be noticed by the grower on the surface. The best way to judge whether your plants need water or not is by the way they look. If they are wilting badly, then they need water. If not, then they may be okay. In general outdoor plants tend to wilt a small bit anyway during the summer months. If you want to really make sure that your plant has a water source underneath it, simply dig a small hole about a foot deep to the side of your plant but keep an eye out that you do not hit any major roots. Put your hand down inside the hole, does it feel dry? Or does it feel cool and moist? If it is cold and moist then the soil has stored some water below the surface. Your plants can drink this

without problems.

Figure 10.4 - Outdoor rooftop grow by Inf3cted.

Nutrients can be added to the soil during the grow. Switching to a P feed during the flowering weeks will also help. Outdoor soil treatment is much like indoor soil treatment bar the weeding. For further information on feeding check the indoor grow chapters.

If you have good sunlight and enough water then your plants will grow throughout the full cycle quite well. During the end of the flowering season you will be ready to harvest your plant and reap your bounty.

Figure 10.5 - Another Outdoor rooftop grow by Inf3cted. These plants are not flowering yet because it is too early. This Sativa will start flowering in a few months time though. The gaps will fill up with bud and make the plant look full overall. Also this plant has been shaped by careful pruning.

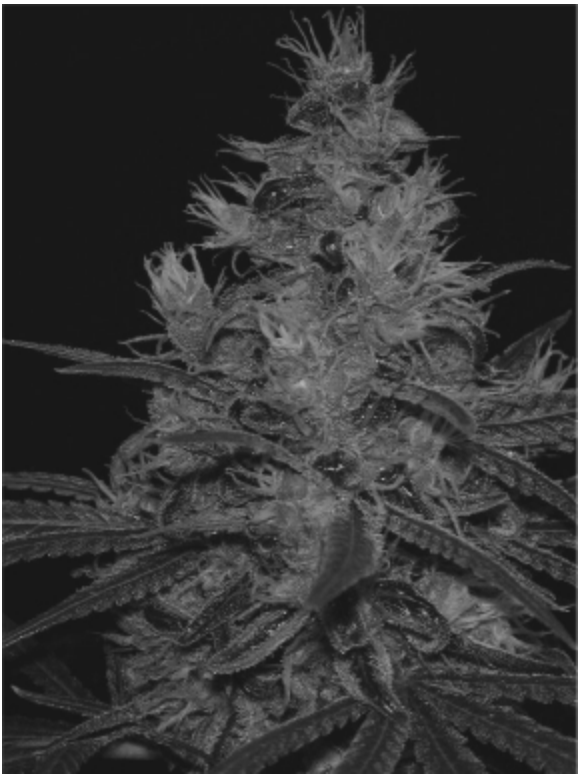


Figure 10.6 - Outdoor bud shot by BigIslandBud. Look at the frost and crystals on that cola. This plant is nearly ready for harvest.

Figure 10.6 - This outdoor cola is ready for harvest. Picture by NebuchadnezzaR.

Chapter 11

THE BASICS OF PLANT CARE

Cannabis plants will grow like most other plants and will eventually fill out into a Christmas tree shape towards the end of their flowering cycle.

From its vegetative cycle to its flowering cycle the cannabis plant develops in three most noticeable sections. The top cola, the mid-section and the base. The top cola will develop a large amount of bud and generally is a very flower-full part of the plant. The mid-section contains bud and stems along with old and new leaves. This section will fill with buds that grow in between the nodes near the stem. Although these buds will generally be smaller in size to the main cola they should be just as potent. The bottom section of your plant will contain the large fan leaves and a small amount of bud. Also towards the bottom of the plant you will see some very small leaves that are about to fall away and may look yellow.

Once a grower knows about the plant's different sections they can treat each section to get the most out of their plant. The bottom fan leaves are generally not smoked and are used only to gather light for your plant. If your plant is growing under an artificial light source and you do not think that these fan leaves are receiving much light then you may think about cutting them away. This is NOT a good idea. Fan leaves produce sugar that is used in bud production. If you cut away the fan leaves you may cause your bud growth to stunt causing you to

finish up with a smaller harvest. Leave fan leaves alone where and when you can.

The only times when you should remove a fan leave is when it is either dying, badly burnt or covering a large bud mass. In a SOG or a ScrOG set-up you may want to remove a fan leaf or two because it is covering the bud mass of another plant. Light is the probably the most important factor in bud development and if the fan leaf is preventing light from reaching the bud, then you may want to remove it. Read the ScrOG section again about clipping leaves.

You should remove any dead leaves from the bottom of your plant and throw them away. Never leave the dead leaves on your soil as a fertilizer. These dead leaves tend to attract unwanted pests.

Thinning:

This really only applies to outdoor growers, but some indoor set-ups such as ScrOG, SOG and BOG may need to be thinned.

Growers like to grow their plants in a uniform condition. That is - growers like all their plants to be the same height. That way we can perfectly arrange our light so that it is not too far away or close to the tops. If one plant is racy then we would have to adjust the light to suite that plant. This means that we may end up with light gaps like the following.

-Distance from Plant A to light is 1 meter.
-Distance from Plant B to light is 0.5 meters.
-Distance from plant C to light is 8 inches.

In this case you could imagine the plants in a slope shape in there grow environment. Obviously we are going to be wasting light, not to mention space on this set-up so we need to prevent this slope from happening. That is where thinning comes into play.

The reason for the slope or curve is because some plants might tend to be a bit racy. Some of the plants will try to grow quicker than others to try and receive more light. If this happens the racy plant will cause the smaller ones beside it to receive less light. To control racy plants we use a process called thinning.

If you discover a few racy plants then just cut them down to the same level as the others (called pruning) or remove them all together. Once you have done this you will see all your plants growing nicely along at the same level. Now, do not throw away the cuttings from the thinning before you read the next line. **You can clone these cuttings into new plants!**

By the time you have finished your thinning you will have an even grow area with some clones that you can use to grow more bud.

Now the other thing to remember is that some people may tend to thin the other way round. That is - leaving the taller ones and remove the smaller ones. Again in Cannabis growing the taller plants are generally male and the smaller ones are female if you have started

from seed. Do you want a garden full of possible males?

During the thinning process you may want to tackle some dead leaves or leaves that have some mould build up on them. Mould looks like a rust or fluff on the leaves and will most of the time spread to other parts of the plant. So why not cut these away too while you thin your grow area.

Thinning your grow makes it look nicer and tidier and helps to improve your overall yield.

Light Bending:

Light bending occurs when a plant tries to grow at an angle towards the light. You may have seen some of the outside plants in your grow area bending towards the light to try and get their share. If your plants bend too much they will eventually grow towards (or even into) another plant. This is not good as they will cover other plants. Also during flowering the buds can get heavy and may cause your plant and pot to fall over. To avoid light bending simply switch your plants around from day to day. If a plant leans too much one way, then take it towards the middle of the pack or turn the plant around. It only takes a day or two for the plant to bend back straight again. If your plants can not be moved, such as in the case of hydroponics in conjunction with a ScrOG grow, then you may have to tie your plants up so that they do not bend.

Figure 11.1 - Here is an example of some tied up buds.

If you are outdoors and you have a massive problem with this then you may have to cut away some surrounding foliage to allow more light to get in at your plants. If you can not do this then try to use a small stake and thread, such as bamboo, to keep your plant upright. Remember that if your plants are bending then they are trying to tell you something. They need more direct light!

Pruning:

Many a marijuana cultivator have taken a pair of clippers to the top of their plant just above the last branch formation during the 3rd or 4th week of vegetative growth. The top is removed by shearing it away at the stem. This can also be done during the thinning stages.

What happens next is that the main stem may split off in two or more directions. This creates a V shape at the top of your plant. The end results after flowering are two or more top colas instead of one. Now, many a cannabis grower will tell you that this is a great thing to do and sometimes it is. Two top colas instead of one does sound appealing but alas it must be said that this TOPPING method of pruning does not always work out the way you think it will.

Figure 11.2 - The results of Pruning by Chrisesq.

Figure 11.3 - Single cola picture by anonymous.

Figure 11.4 - This is a good example of what a young topped plant looks like. As you can see the main stem has been clipped to produce 2 new stems. Picture by Strawdog.

Sometimes the plant will produce two small top colas instead of two big ones. This really depends on the strain and the environment. Many a grower have managed to bring a plant into growing more than six top colas by this method. Each strain will have a threshold for bud production, which can not be improved on. Some plants when grown fully without pruning do not reach their threshold. The strain Blueberry is a good example of this. If you grow blueberry without topping you will not achieve maximum bud production from that plant, but if you do top the blueberry you will. Other strains are not so flexible and by topping you will not increase bud production. The two top colas will simply be sharing the same volume of bud that a single cola would have produced on the same strain. So pruning for production is strain related and grow related. You need to find a strain

that responds well to topping.

It is advised that you experiment with this pruning method. Do this with 2 out of 10 females with every grow you do. You will find in time that during this vegetative prune you will be able to shape your plant. Plants are generally pruned 3 - 4 weeks into their vegetative cycle but can be pruned sooner or later or more than once. Pruning during flowering will cause problems with bud production because the plant will divert its energy from bud production into branch and leaf production. The results will be a slower rate of Bud growth.

Remember how we spoke about Indica plants being small and Sativa plants being tall. Well if you learn to prune your plant right you can generate small bushy Sativa plants that grow in tiny spaces. Without pruning the Sativa plant it will probably stretch to five feet and more.

For every stem or branch you prune, the cut area will develop two more branches. Look outside at any tree. See how the stem divides into branches which sub-divide into more branches which divide into new shoots and leaves. Well some marijuana plant only grow a main branch out from the stem and this may stay that way throughout its entire grow. Any filling out usually occurs when new leaves and branches develop at the nodes. Some lateral branches may develop new shoots but these are somewhat small and thin and do not support much bud growth. If we prune our plant we can make it more like the tree that we see in the garden. There is also a limit to how much we can

prune. Let us follow a prune path for a moment.

If we prune the stem, it will split into two. We can prune both these two new stems and end up with four stems. We may try to prune each of these four stems to try and create eight stems, but this depends on the strain and its branching limit which is genetically based. We may be able to prune some of the lateral branches but again if the plant has reached it threshold it will not produce more new branches. All strains are different in this respect.

Prune cuts are made using clippers at a 45-degree angle to the shoot being cut.

Bushes:

Some people like to keep their plants small and wide. Cannabis plants are great for making bushes with. It is a simple process. During the 3rd week of vegetative growth prune half the plant's branches and leave the other half. Never remove all the branches. Cannabis plants need at least 50% of the leaves to continue growing without fatal stunting problems. If you go less that 50% you may end up killing them. Do not prune just one side of the plant. Prune per side to achieve the 50%. You may also prune the main top cola if you wish the cola to split into two or more parts.

Wait until the 4th or 5th week of vegetative growth and prune the other half. (Only do this if the prune cuts you previously made have grown new branches and leaves.)

During the seventh week of vegetative growth you will notice

that your plant has become more concerned with growing outwards than with growing upwards.

Let us pretend that we have a plant with 8 shoots. That means it is 4 nodes high. We perform our pruning as described and we end up with 16 shoots, but our plant is still 4 nodes high. Now this does not mean that we can keep doubling our shoots forever. Pruning just pushes the plant to grow all its shoots early. If you keep pruning up until the eighth week of vegetative growth with a plant that is 4 nodes high, the most amount of shoots you will get will be about 32. They do not really go beyond this factor much, but again this is strain dependent. Now each new shoot has a junction point or a node that it grew out from. Each node should produce some bud during the flowering stages. It is more than possible to create a marijuana plant that droops down over the sides hiding the pot. Not only that but different strains grow in different sizes. It is more than possible, with the right strain, to have a single plant cover an entire desk using this method.

Training:

This has been discussed before in the indoor growing set-ups with ScrOG and SOG. Training is simply the art of tying down your plant's main stem so that it grows in a 'S' shape pattern. Mainly this is used to prevent plants from reaching their natural height without pruning (although you can also prune trained plants without a problem).

Training is done by simply attaching a piece of thread to the stem and bending the plant over. The thread is then locked down to either another part of the stem or a piece of the grow room frame. People have managed to grow all kinds of shaped plants using this method - from corkscrew shapes to complete full circles. Some growers even like to grow their plants horizontally across during the vegetative stage of growth. During the flowering cycle the light is moved above the plant to encourage thicker bud growth along the main stem. Sometimes this method does not work so well, but when it does the overall bud production can be excellent.

If during your training a stem should break simply hold it in place again using a stake/stick support and bind it with cheese cloth or a cloth bandage wrap with pours. Applying honey to the wound also has its benefits. If you rub honey into the wound the plant should be able to heal itself a bit quicker. Watch out for any new growth at the break area and try to trim these away should any be produced because they will try to break away the upper part of the stem, effectively TOPPING your plant.

Figure 11.5 - Picture of a Stem Break by Slowhand.

Increasing Yield:

The yield is the amount of smokables that your plant will produce at the end of its grow. Now at this stage you should have a fair idea of the following.

The history of Cannabis, how it is used, different species and strains, THC, types of seeds and where to get them. The life cycle of the marijuana plant, how to germinate seeds, propagation, transplanting, male/female sexing, basic indoor/outdoor/guerrilla growing, security, Lights, light spectrum, HID, Lumens, soil types pH,

soil nutrients, pots, watering, environmental control, soil flushing, Air, 12/12, flowering, SOG, ScrOG, Cabinet growing, hydroponics, hydroponics nutrients, the bubbler, outdoor growing and plant care.

With this amount of information you should be armed to the teeth and ready to tackle any ideas about where you want to grow, how much you want to grow and what you need. So the question may still be in your mind - "Can I actually grow marijuana?"

Many people can grow it without a problem. How many people can grow good thick potent bud? Now that is the question!

You see this is what Marijuana cultivation is all about. How much you know and the more you know the better the results will be. This hobby is so interesting that it is more addictive than the substance produced at the end of the day (marijuana has no physical additive properties but growing it is so rewarding that you may become addicted to growing!). I know plenty of growers who gave up smoking pot and yet continue to sit at home and develop new strains. It is a very addictive hobby.

The more you grow the more you will learn about what your plant needs. The two most fundamental factors in high yield growth are - Strains (good genetics) and Light.

Optimal light along with good strains will lead to great yields and bud plentiful plants. Of course high yields may not mean highly potent bud. Potency depends on the strain and how your plant is grown, remember.

Many a grower have found that some of the grow bloomers

and advanced feeding products actually produce greater amounts of bud but reduce the potency and produce a different taste. To understand which feeding products are better to use than others requires a degree of experimentation on your part, but experimentation is what growing is all about. To discover new methods of growing the marijuana cultivator MUST experiment and through FAILURE learn MORE!

Cloning:

Cloning is a simple method of replicating your plants. In most cases a clone is taken from a mother plant and grown out into a whole new plant. The clone will contain the exact same genetic code as its mother plant.

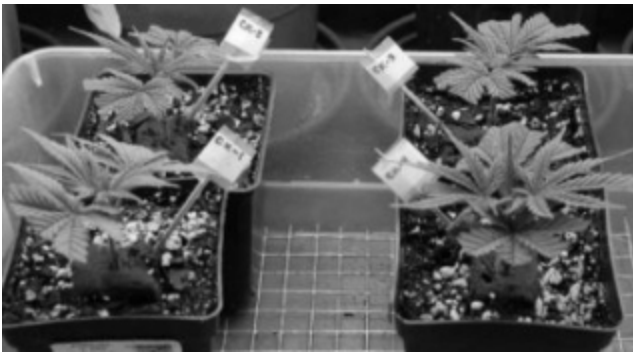


Figure 11.6 - Picture of some clones in soil by Slowhand.

Figure 11.7 - Picture of some clones in a hydroponics starter kit by Mia Stoner.

In a selection of 30 seeds you may find a nice mother plant that you wish to keep. You can keep here genetic profile indefinitely by cloning her.

Figure 11.8 - Picture of a clone that has just been cut from a mother plant by Slowhand.

Any cannabis plant can be cloned once it has been grown to a certain height. The best place to take a cutting for cloning is above a node which has at least 2 nodes above it. The smallest cuttings on average are 3" in length.

Once the cutting has been taken it is placed in the growing medium and should form new roots over the next week to three weeks depending.

Cloning straight to soil has a low success rate. Leaving clones in water also has a low success rate. The best medium for cloning is rockwool cubes or Oasis foam bricks.

Not only that but in order to increase your success rates with cloning you may wish to purchase some rooting solutions such as Clonex ($3) which can be bought from most grow shops.

Figure 11.9 - Picture of homemade clone chamber by Tick.

Make sure that you use a clean instrument, or even better a sterile instrument, when you make your cut. Take the cutting and dip the cut area into the rooting solution before placing it in the medium. Clones do not need much light to root. Try to avoid using the bigger grow bulbs for cloning. A simple window with some outdoor light is all that you will need for that clone to root. Many people use Fluro lights for clones.

Figures 11.10 - Clones can be kept in small places, by Tick.

When the clone takes root in the rockwool you will see the roots jut out from the sides of the cube. When this happens the clone is best transferred to its new grow medium, which can be soil, hydroponics or aeroponics.

This is the most successful way of producing clones on the market today. You may even live in a country where the trade of cannabis clones is legal. The great thing about cloning is that you can create 100's of female plants from one single female.

Here is another method of cloning called Air Layering written by Strawdog.

How to air-layer a clone.

ITEMS NEEDED:

PLANT!
Match sticks or toothpick
Tape
Razor blade
Rooting hormone (Clonex)
Tweezers
Plastic wrap
Scissors

(1) Sterilize all your cutting tools before using them.
(2) Find a branch that is at least 1/8 inch thick with a minimum of two nodes.
(3) Use the Razor Blade to split the branch vertically / lengthwise.
(4) Use tweezers to open the slit. Do not break the branch totally.
(5) Get 'clonex' and apply it to the open wound. Tape a matchstick parallel to the stem for support.
(6) Pack the open wound carefully with any grow medium, or use a rockwool cube to cover the area (just split the cube down one side and slide over the branch).
(7) Wrap the area with the small plastic bag. The effect of this should be a funnel shaped plastic wrap enclosure.
(8) Pack the bag with grow medium before closing with tape.
(9) Use a pin to create holes around bag. This will allow the soil/medium to receive air.
(10) Use an eyedropper to keep the soil wet. Do this everyday. After 2 weeks your cutting will have developed roots and you can cut away the branch below the roots. Now you have a clone with roots ready for growth. You can choose to remove the plastic bag if you feel that it is too tight to allow all the roots to pass through it.

Chapter 12

PREDATORS AND PESTS

Predators and pests will always be a problem. Here are some Predators and Pests that you may encounter during your grow. Along with their names we have also explained how to get rid of the unwanted pest.

Also it must be said that a cat for a garden grow is the #1 defense system against most small predators, but an indoor cat will bring unwanted pests into the house! You can not have the best of both worlds. Cats also like to play with indoor plants so be very careful with your plants and pets!

ATTENTION - READ THIS

Only use repellents and pesticides that are clearly marked for FOOD PRODUCTS USE on the label. If it is NOT FOR FOOD PRODUCT USE then DO NOT USE IT WITH YOUR PLANTS!!! You are going to be smoking your plants later. You do not want to end up in a hospital because of smoking poisoned bud. If it is safe for FOOD PRODUCT USE then it will be safe to smoke. Read the products instructions clearly and carefully. Do not take short cuts. Do exactly as it says on the label.

WOODCHUCKS

Figure 12.1 - Woodchuck.

Woodchucks will nibble your stems and collapse the plant. The way to solve this is by using predator urine (Also see Deer) or by building a very small mesh fence around the bottom of your outdoor plants. This will keep the chucks from eating your stems and branches. Use more than one rap of mesh and make sure that you keep it tight. Also planting Marigolds near your grow will help keep the chucks away.

POWDER BUGS

Like to lay their eggs in your bud and stem. They can reduce your plant to nothing in weeks. You need a pyrethrum-based insecticide to keep them away. Ask your local grow shop for information on this product. It will also help keep away other insects such as mites.

RABBITS

Figure 12.2 - Rabbit

Rabbits can reduce a crop to nothing in a couple of days and will continue to feed from the same patch until they are stopped or the patch is destroyed. For more details See Woodchucks.

GROUNDHOG

Figure 12.3 - Groundhog.

(Also see Woodchucks.) Dry chlorine helps keep Groundhogs away from your plants. Find any Groundhog holes near your grow area and apply the dry chlorine around the hole.

WILT FUNGUS

Fusarium Oxysprum is rare, but still a problem in some parts of the world. This fungus wilts your plants and will eventually kill them. You actually need to get a fungicide from your grow shop. If they don't have it, then you need to order it over the Internet.

DEER

Figure 12.4 - Deer.

Deer are so very curious that even electric fences will not stop them over time. In order to solve deer problems you need to get hold of predator urine from hunting shops. Find out which urine works best with deer to keep them away. However find predator urine which does not attract plant-eating animals. Simply spray the urine on your patch and this will help keep the deer away.

LEAF HOPPER

Figure 12.5 - Grasshopper

Harmless unless in large numbers. (Also see Powder Bugs).

CUTWORMS, CATERPILLARS AND LARVAE

Figure 12.6 - Caterpillar

The only sure way to get rid of cutworms is to use a cutworm repellent. Try to find a product that works on cutworms and cutworms only. All of these cutworm products work very well and can be bought in most grow shops.

WHITEFLY

Figure 12.7 - Whitefly

Deadly. Can reduce your plant to trash in days. Safer's soap helps to kill Whitefly. This can be bought in most grow shops. (Also see Powder Bugs).

SLUGS AND SNAILS

Figure 12.8 - Snail

Make a circle of table salt about 4 feet away from base of your plant. Then make another circle a foot in from that. Salt is deadly to snails and slugs and will keep them out.

MITES

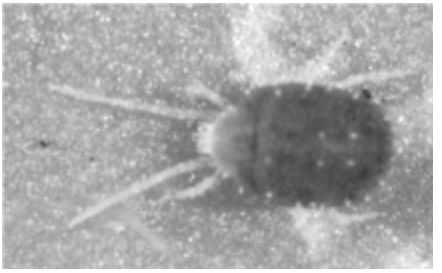


Figure 12.9 - Mites

Deadly. Can reduce your plant to trash in 2 - 3 days. (See Powder Bugs).

GNATS

See Powder Bugs.

TERMITES

They don't like water. If you over-water the soil around your plant they will leave. (See Powder Bugs).

ANTS

Figure 12.10 - Ant

Will make a home out of your grow for their nests. (See Powder Bugs). They are also a sign of Aphids - ants farm aphids!!! Ants can be removed using Boric Acid, or any popular 'colony killer' pesticide.

APHIDS

Figure 11.11 - Aphids, picture by Vic High.

See Powder Bugs.

SCALE

See powder Bugs

MEALY BUGS

See powder Bugs.

CLEANING THE GROW ROOM

It does happen that sometimes the bugs win. No matter how much you might spray them or try to kill them, they keep coming back to your grow room. To solve this you will have to create a clean room, which means a total and complete cull of your harvest.

First set-up another grow room of smaller size enough to support some cuttings and clones. Take cuttings from what plants you have and move the cuttings to that room. You will use the cuttings again eventually in your clean grow room if you want to continue those strains.

Next up take all the grow equipment, bar electrical equipment, to the bathroom. Clean down the entire equipment with bleach. Fill a tub with water and bleach and let the grow equipment rest there for a day.

Back to the grow room. First start with the walls. Clean the walls down with bleach if you can. You will maybe have to paint them again after. Do the corners, up high and clean out any holes, extraction holes, fittings, pipes, etc. Then clean around the rim of the room. If your floor can be lifted up then you can also do this to get in at the

corners a bit better.

After this cleaning has been done you can consider smoking the room. Various pest killing smoke bombs can be bought in most grow stores. Follow the instructions carefully and smoke bomb the room. This will guarantee the demise of any bugs, eggs or larvae but remember eggs are usually safe from these sprays, that is why they recommend a reapplication 7-10 days after initial treatment- MAKE SURE TO READ THE LABELS!!!!!

Once this is done, clean the room again like you did the first time. Now you should have a clean room, free off pests. Repeat the process if needed. The more you clean it, the better it will be.

Electrical items should be dusted down before returning them to the grow room. Dry down your other grow equipment which was bleached and return this to the grow room.

Your cuttings need to be checked for bugs. Also you do not move the cuttings back to the grow room until you have taken cuttings from these cuttings. Grow the cuttings out for a week or two and check them everyday for bugs. If you find any then you may have to use a pesticide on the cuttings. When you are sure that your cuttings are clean, take new cuttings and place them in new soil and clean pots. Take these to your grow room and watch their progress and look out for any signs of pests and bugs.

If you have done this correctly then you should have eliminated all signs of pest infestation in your grow room.

Mites and other small pests can lay their eggs in cuttings and these can be missed when you look for pests because they are not

obvious. The pesticides should have killed them, but some pests like the powder bugs lay their eggs inside the stems and seem to always come back. If you can't get rid of bugs like this then you may have to toss your genetics away and get new ones. For breeders this can be a difficult task. A long term project can be terminated by a few bugs wreaking havoc in the grow room. Breeders should pay strict attention to keeping their grow rooms clean at all times. And remember - Never take anything that has been outside into your grow room.

Chapter 13

!PROBLEM SOLVER!

Got a problem that you need to identify? If common sense does not solve it then it sounds like you have a feeding problem and want to know how to sort it out. Well this is what this chapter is all about.

PLANT NUTRIENT / CHEMICAL PROBLEMS AND HOW TO SOLVE THEM.

Before we begin we should tell you what a chemical burn is. A chemical burn is what the plant suffers because of over-feeding. A chemical burn can be compared to a half-smoked joint. At the tip of the joint you have this shriveled gray ash, in the middle you have the burn creeping towards new paper which leaves a pattern behind it, and then you have the part you have not smoked yet. A plant burn looks like this almost. The plant sucks up the water and the food. It distributes these elements to the leaves at the bottom first and then works its way up the plant. This process takes days to work as you know FROM WATERING and WHEN TO WATER! The damage starts at the tips of the leaf and slowly moves to the center of the leaf, leaving behind it some crispy matter that flakes away between your fingers. This is what a chemical burn looks like. A nutrient problem does not look burnt. A nutrient problem looks like a cell collapse with discoloration. The part may wither and die, but it should not look burnt. That is major difference between a chemical burn and a nutrient problem. In time you should be able to tell the difference for yourself.

Also check your pH. If your pH is not right, then solve the pH problem before you go and do anything else.

A) Look at your problem and quickly search for any bugs. When you have completed this search, eliminate any bug problems by using the advice in the bug chapter. Also note the type of attack to make sure that it is not a bug problem AND is a nutrient problem, which can happen. Do your leaves look sucked and dry? Do you have any black dots on them like bugs? Try to tell the difference between a bug attack and a nutrient problem. Nutrient problems damage the plant on a somewhat consistent level. Bug attacks are less consistent in the damaged generated. They leave damaged patches everywhere on your plant.

If the problem seems to affects only the lower portion of your plant and or a bit of the middle then read B). If it is only effects the top of your plant and the tips then you should go to J). If the plant is covered with the problem then go to F).

B) If your plant is in vegetative growth and the leaves are going very yellow, then you need more Nitrogen. If your plant is in flowering and you have stunted growth, yellow leaves and it looks to be dying then you need more Nitrogen. If your plant is in flowering and does not look like it is dying but looks red or dark green/yellow then you need to treat it with more P, which is Phosphorus. If these do not help then go to C.

C) If your plant has leaves that are curling up, twisting and are going yellow then check to see if your light is burning them or if the grow chamber has enough air circulation. If this is fine then you need to consider adding more Mg which is Magnesium to your plants. Epsom salts are good for this. Add 1/4 - 1/3 table spoon of Epsom salts to 3 gallons of water is fine. If you still have a problem go to D).

D) If the tips of the leaves turn brown and curl slightly then you are looking at a K problem which is a Potassium problem. If not, move onto E.

E) Does your plant look wilted? Maybe you over-watered? If not, go to F.

F) The veins are green, but the leaves are yellow. This is an Iron problem, Fe. If not, move on to G:)

G) Leaves are not twisted but are yellow at the base. The tips are fine. This is a Manganese problem, which is (Mn). If not, move on to H).

H) Still haven't solved it? Then flush your soil and find another type of plant food that has all of these. N, P, K, Ca, Mg and S. Get Epsom Salts and get a small canister of micronutrient. Iron, boron, chlorine, manganese, copper, zinc, and molybdenum. Try using a nutrient mixture that we have already mentioned before in the indoor feeding section. If this doesn't solve your problem, then maybe you have one of the following:

POT BOUND (ROOT BOUND)

Your plant has outgrown the pot. The entire root mass would have grown to its maximum capacity. This causes stress and a variety of problems. The only cure for this is a bigger pot.

NUTRIENT LOCKOUT

Well...what can we say causes this..Hmm there are a number of things. If you followed H) right then you should not have this but we will explain it anyway. Lockout occurs when the plant can not get access to a nutrient or a group of nutrients. This could be caused by the absence of nutrients (a deficiency) or 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. As you can see this is really a very open subject matter. pH problems can lockout nutrients,

your soil type can lockout nutrients, your water can even lockout nutrients. But these lockout causes are rare and more than likely something other than what cannabis needs has been added to the solution causing this reaction. When in doubt, transplant into fresh soil or a fresh hydroponics solution.

BAD GENETICS

Yep, there is a lot of garbage out in the market. Crap genetics do exist and people still buy them. The genetics may have mutations, warping, flowering problems, a weakness in them or poor germination rates that will sometimes cause nutrient symptoms to appear even though your nutrient problem does not exist. The only solution is to get some new genetics.

Chapter 14

HARVESTING AND CURING YOUR BUD

Harvesting is the act of reaping your rewards and is without a doubt the most fun you will have with your garden. First of all you should know that harvesting smells. It stinks up the place really quickly, so keep this in mind. Now you will have followed the guidelines that the breeder set forth with his or her seeds about the flowering times. At the end of the flowering time examine your bud. Keep what you see in mind because now you will be able to judge other plants to know if they are finished or not. You do not really need to know the breeder's flowering time if you have been able to understand and identify a bud that has reached maturity. Here are some things that help identify when to harvest. Some of these things do not appear on every strain though.

- 50% to 70% of the pistils change color.
- Your plant stops producing crystals.
- Your plant stops producing resin.
- The fan leaves and lower leaves have turned yellow and are starting to drop off.
- The smell has reached a peak.
- Bud mass has not increased in the past few days.

These are good Indicators that your plant is now ready for

harvest. There is only one sure way to harvest your plant and anything else is pretty much a variation of it. Also we must add that harvesting an Indica plant and a Sativa plant have slight differences.

INDICA HARVEST

Your 1 foot - 4 foot plant should he hacked at the base. The plant should then be hung upside down in a cool room, with no light and fresh air. Take a pair of clippers out and remove as much of the fan leaves as possible. Then remove the secondary leaves and put these into a separate pile. Last but not least gather some trim from the bud. “Trim” is the small leaves that are covered in resin. Now you have 4 different qualities of weed to choose from. The fan leaf will only be an okay smoke, the middle leaves a little better and the trim will be very good. The BUD is the PRIME stuff though and this will give you your best quality high!

Leave the plant like this until a branch can break easily between your fingers. When it does you are ready to cure the Bud. This harvesting process takes about two to three weeks to properly finish.

SATIVA HARVEST

This is much like the Indica except the harvest itself may be quite labor intensive. Outdoor growers like to grow Sativa plants which sometimes grow up as far as 12 feet carrying over 20 oz of bud

sometimes. These plants are not harvested easily. You need a canvas spread or another medium that you can use to carry the bud in. The plant should be chopped at the base and spread out on the canvas. The canvas is then rolled up and tied down tight for transport. Obviously if you have more than one plant then you might need more than one canvas sheet.

The plant should then be hung upside down in a cool room, with no light and fresh air. Because of the plant's size and bushiness you may have to cut the branches and hang these up separately. Take a pair of clippers out and remove leaves and trim as suggested in the Indica Harvest section.

It must be pointed out here that light degrades THC quantities. Your room does not have to be as light- proof as your grow room does during 12/12. Just don't expose your harvest to any direct light.

FAN LEAVES, LEAVES AND TRIM

These are cured by leaving them dry on a flat surface, away from direct light and with plenty of fresh air. The leaves will dry up after 3 weeks and are easily smokable at that stage. Test them out to see what you liked and what you did not like. Another thing you could do with the trim is to make some hash from it. We will talk about this in another chapter. Do not try to speed up your drying process with ovens or microwaves or heat. Let them dry out normally and you will

cure yourself a much better smoke from the leaves.

CURING

As soon as the branches are brittle you should consider canning your bud. Canning is a great way to get the most from your bud. Find a can with a removable lid. The more cans you have the better. Using a pair of scissors, clip your bud from the branch and put it into the can. The branches and stem are not much good to you. They do contain THC, but only in small quantities. Most stem and branches go in the bin.

Now take the can and place it a room or cupboard that is dark. Everyday open the lid for a few hours (6 hours is good) and then close the lid again. Also shake the bud around a bit every couple of days. This is the most common curing technique out there and it does do its job well. Bud that is cured well smokes the best! I would give the canning process between 3 - 4 weeks before you should really sample your goods. 8 weeks old bud can smoke extremely well and year old bud is vintage stuff but can loose potency. Fresh bud (8 weeks canned curing) is the pinnacle point of cured bud. After that some of the THC cannabinoids change composition and become different cannabinoid compounds. Fresh bud is far better than aged bud. You may find other curing processes out there, but canning does work wonders and is cheap to do.

If you have dried your plants for three weeks while hanging upside down you can subtract that time from the canning time to know

when you should be in for a bit of smoke. Although you can have good bud to smoke two weeks after you harvest it is better to wait for four weeks or more.

Chapter 15

BREEDING

Before we begin breeding we will keep it simple for those who want to learn how to perform simple breeding procedures and then we will make it a bit more advanced.

Let's go the simple route first. We may want to produce seeds from our crop to continue a strain that we purchased or obtained. By breeding two plants we can produce seeds. You are breeding to continue a strain here but you will not completely replicate the plants again unless they are IBL (To be explained later), but you will generate seeds that contain most of the parents' features but maybe not all. Some of your offspring should be like the parents but other offspring will show different traits such as potency, color and taste.

MAKING SEEDS

How easy is it to make seeds? Well it is easy if you have healthy plants and a stable-growing environment. When your male plants burst their pollen in your grow room they will pollinate the female flowers. At the end of flowering the bud will contain seeds. The seeds should be grayish in color. If they are white, then they are not viable and you harvested them too early. Wait until the end of flowering to get your seeds. Your seeds will be in with the bud. It takes quite a bit of time to sort them out from the bud. If you want to use the

seeds in more than 2 years time store them in a freezer. Before that time storing them in a small film canister will work well enough.

POLLEN

Film canisters are a great place to store pollen in. You can save pollen in a canister for the next harvest. Pollen can be stored in the freezer for around 18 months. The odds of having pollen keep though are slim. Pollen is best used up to 6 months. The pollen can be extracted from the male flower as soon as the flowers are ready to open. You will see the male flower open out from its pod. It is best to gather pollen after it falls from the pod onto the leaves. Simply shake the pollen onto the female flowers to pollinate them.

SIMPLE BREEDING

Want to breed your plants to make more seeds? Well this depends on what you want to do. Do you want to create a new strain? Then move onto the basics of genetics section. Do you want to create some seeds that are similar to the parents or do you want to create a cross of two plants to create a Simple Hybrid strain? Then read on.

HOW TO CONTINUE A STRAIN THROUGH SEEDS

So you bought $120 Silver Haze seeds and you want to make more seeds without any interference from another strain? That is easy.

Just make sure that the male plants and the female plants are together from only the same strain batch. Do not introduce another strain into the pack. If you only have Silver Haze in your grow room, then all you need are some males and females. By letting the males pollinate the females you will get Silver Haze seeds. But you will loose some of the features that the original parent plants had in the selection of offspring, unless the strain you got was an IBL.

HOW TO MAKE A SIMPLE HYBRID

It is easy, just take a male plant from one strain and a female from the other. Say Big Bud and Skunk. The result will be BIG BUD X Skunk, but there will be differences in the pack. Some of the plants will lean more in the BIG BUD direction and some in the Skunk direction. Some variations that where not present in the parents may also appear (if the parents where not both IBL). If you want to concentrate on creating more seeds so that they ONLY go in one direction (creating uniform plants) then you need to read more in this chapter.

AN INTRODUCTION INTO BASIC GENETICS

Genetics are somewhat difficult to understand at first so it is best if we give you a grounding in some of the breeding concepts mentioned in this chapter.

We will start by first explaining what a couple of words mean. These words will appear throughout this chapter so it is best to define them at this point.

Genes:

Each of the units of heredity which are transmitted from parent to offspring in gametes, usually as part of a chromosome, and control or determine a single characteristic in the offspring.
[There are genes responsible for each feature of your plant to be inherited, for leaf color, stem structure, texture, smell, potency, etc.]

Alleles:

Any of a number of alternative forms of one gene.
[For example the Gene for purple bud color may have 2 forms, one for purple and one for dark red.]

Homozygous:

An individual that has identical alleles at one or more genetic loci, which is not a heterozygote and so breeds true.
[Your plant is to be said homozygous for one feature when it carries in its responsible gene pair the same gene twice, which means both genes of the gene pair are equal.]

Heterozygous:

An individual having different alleles at one or more genetic loci.
[Your plant is said to be heterozygous for one feature when the genes of the responsible gene pair are unequal.]

Phenotype:

An organism distinguishable from others by observable features.
[How your plant looks is the phenotype. It is the summary of all the features you can see on the outside of your plant. It can also be smell and taste.]

Genotype:

The genetic constitution of an individual, esp. as distinguished from the phenotype; the whole of the genes in an individual or group.
[How your plant looks like inside, which features it can possibly inherit - you can't see those - is called the genotype. It is the summary of all genetic information which your plant carries and can inherit to its offspring.]

Dominant:

Of a gene or allele: expressed even when inherited from only one parent. Of a hereditary trait: controlled by such a gene; appearing in an individual to the exclusion of its allelic counterpart, when alleles for both are present.
[A gene is said to be dominant when its effect can be seen in the phenotype of your plant. Only one dominant allele in the gene pair must be present to be seen in the phenotype of your plant].

Recessive:

Of a gene, allele, or hereditary trait: perceptibly expressed only in homozygotes, being masked in heterozygotes by a dominant allele or

trait.
[A gene is called recessive when its effect can not be seen in the phenotype of your plant, when only one allele is present. The same allele must be present twice in the gene pair if you can see its expression in the phenotype of your plant.]

Locus:

A position on a chromosome at which a particular gene is located.

Chromosome:

A threadlike structure of nucleic acids and protein which carries a set of linked genes and occurs singly in prokaryotes and in characteristic numbers, usu. paired, in the cell nuclei of higher organisms.

GENE PAIRS

All of life is made up of a pattern of genes. This pattern is similar to the two sides of the zip on your jacket. One side is from the mother, the other is from the father. Each "gene locus", a particular space on that chain, controls one bit of information about the eventual appearance of the plant.

Each gene locus contains 2 genes, one from the mother, one from the father. A pair of letters such as BB, Bb, Pp, pp, etc generally notates these. Capital refers to dominant genes while lower case refers to recessive. B can Big bud while b can be smaller bud. This is just an example. The letters refer to a human beings imaginary reference for what a specific gene locus controls. Any letter can be assigned to it.

Dominant and Recessive:

Individual genes within a locus are said to be either dominant or recessive. This is noted by a capital letter for a dominant gene and a lower case letter for a recessive gene. Dominant genes have a stronger effect and if only one is present, will win over the recessive gene in that locus.

For example the B gene means the plant will produce big bud, while the b gene means the plant will produce small bud. Since B is dominant a plant with a Bb genotype will produce Big Bud. The B is dominant over the b. In order for a recessive gene to have an effect, both genes must be recessive, so BB is Big Bud, and Bb is Big Bud, but bb will be small bud.

Modifying Genes:

By breeding we can determine.. Let's say... what the color of the plant's bud will be, or more importantly, what color the offspring of two plants is going to look like. The final appearance however will be the result of more than one gene locus. Plants may have several color genes for different parts of the plant. A plant's genetic structure is quite complex.

Partial Dominance:

Now that we have explained the basics of dominant and recessive, you can move on to the next step.

Some gene loci in plants have more than two possibilities. These are sometimes referred to as 'partially dominant genes' and are usually given some type of secondary marker such as B' or B".

They work just like dominant and recessives except that there are more than two options. If a gene is dominant over another gene, it will win. Just like a dominant will win a recessive.

HARDY-WEINBERG EQUILIBRIUM

Introduction:

An understanding of breeding concepts requires a basic understanding of Hardy-Weinberg's Equilibrium. Breeding depends upon the knowledge of population genetics. To understand the value of the H/W Equilibrium, you may have asked yourself a question like this before...

"If certain diseases are a dominant trait, then why haven't large sections of the population got this disease?"

The same question applies to cannabis breeding. If purple bud color is a dominant trait then how come my offspring from the purple bud strain do not have purple buds? Or, I have been selecting Indica mothers and cross breeding them with mostly Indica male plants but I have some Sativa leaves. Why does this happen? Hardy-Weinberg's Equilibrium will help you to understand these questions and there answers.

Okay, first of all these questions reflect a very common misconception. That misconception is that the dominant allele of a trait will always have the highest frequency in a population and the recessive allele will always have the lowest frequency.

There is no logic behind the idea that a dominant trait should

show a tendency to spread over a whole population. Also there is no logic behind the idea that a recessive trait should die out.

Gene frequencies can be in high ratios or low ratios no matter how the allele is expressed. The allele can also change, depending on certain conditions. It is the changes in gene frequencies over time that result in different plant characteristics.

Hardy-Weinberg Equilibrium will show us whether or not gene frequencies have changed in a population.

A population is a group of individuals of the same strain or species, [such as cannabis Indica or cannabis Sativa (species), or Skunk#1 and Master Kush (strains of a species)], in a given area whose members can interbreed with one another. This means that they share a common group of genes. This common group of genes is known as the GENE POOL.

Each gene pool contains all the alleles for all the traits of all the population.

For a step in evolution to occur some of the gene frequencies must change. That is why we have different types of cannabis plants.

The gene frequency of an allele refers to the number of times an allele for a particular trait occurs compared to the total number of alleles for that trait.

Gene frequency is calculated as follows.

The number of a specific type of allele, divided by, The total number of alleles in the gene pool.

The Hardy and Weinberg principal describes a theoretical situation in which there is no change in the gene pool. This means that there can be no evolution.

For a test example let us consider a population whose gene pool contains the alleles B and b. Assign the letter c to the frequency of the dominant allele B and the letter d to the frequency of the recessive allele b.

[In most cases you will find that c and d are actually notated as p and q by convention in science, but for this example we will use c and d.]

The sum of all the alleles must equal 100%.

So $c + d = 1$.

All the random possible combinations of the members of a population would equal $(c \times c) + 2cd + (d \times d)$. Which can also be expressed as:
$(c+d) \times (c+d)$

We will explain this in detail in moment, but it is best to know it for now.

The frequencies of B and b will remain unchanged generation after generation if:

1. The population is large enough.

2. There are no mutations.

3. There are no preferences. For example a BB male does not prefer a bb female by its nature.

4. No other outside population exchanges genes with this model.

5. Natural selection must not favor any specific individual.

Let us imagine a pool of genes. 12 are B and 18 are b. Now remember The sum of all the alleles must equal 100%. So this means that the total in this case is 12 + 18 = 30. So 30 is 100%.

If we want to find the frequencies of B and b and the genotypic frequencies of B, Bb and b then we will have to apply the standard formula that we have just been shown.

f (B) = 12/30 = 0.4 = 40%

f (b) = 18/30 = 0.6 = 60%

Both add to make 100%. Now we know their ratios.

So,

c + d = 0.4 + 0.6 = 1

We have proven that c + d must equal 1.

Very straightforward, yes.

Remember that all the random possible combinations of the members of a population would equal (c x c) + 2cd + (d x d), or (c+d) X (c+d)

Then, c + d = 0.4 + 0.6 = 1

And (c x c) + 2cd + (d x d)

= BB + Bb + bb

= .24 + .48 + .30 = 1

This means that the population can increase in size, but the frequencies of B and b will stay the same.

Now, suppose we break the 4th law about not introducing another population into this one.

Let us say that we add 4 more b.

b + b + b + b enter the pool. This brings our total up to 34 instead of 30. What will the gene and genotypic frequencies be?

f (B) = 12/34 = .35 = 35 %

f (b) = 22/34 = .65 = 65%

f (BB) = .12, f (Bb) = .23 and f (bb) = .42

Oppss, .42 does not equal 1. This means that the Equilibrium law fails if the 4th law is not met. When the new genes entered the pool it resulted in a change of the population's gene frequencies. However if

no other populations where introduced then the frequency of .42 would be maintained generation after generation.

However we would like to point out that we used a very small pool in the above example. If the pool were much larger then the number of changes, even if one or two new genes jumped in, would be insignificant. You could calculate it, but the change would be on an extremely low level 0.000000000001 of a difference in reality.

This is just as basic example to get you started. It may not make complete sense at first but if you read on then it will fall into place. Some of you may be asking the question.

How do I know if a trait, such as bud color is Homozygous Dominant (BB), or Heterozygous (Bb) or Homozygous Recessive, (bb)?

If you have been given seeds or a clone you may have been told that a trait, such potency is Homozygous Dominant, Heterozygous or Homozygous Recessive. However, you will want to prove this to yourself. Especially if you are going to use that plant in a future breeding plan. You will have to do what is called a Test Cross.

THE TEST CROSS

Determining the phenotype of a plant is fairly straightforward. You look at the plant and you see its phenotype. Determining the genotype can not be done through visible observation alone. The genes themselves are somewhat hidden except for their visible related phenotypes.

Again there are three possible genotypes that the plant can create. Let’s say golden bud is dominant and silver bud is recessive.

Here is the table.

Homozygous Dominant: BB = Golden Bud.
Heterozygous: Bb = Golden Bud
Homozygous Recessive: bb = Silver Bud.

(The Golden and Silver bud colors are the phenotype. The b and B are genotype notations.)

The reason why Bb is golden and not silver is because B dominates b.

Most phenotypes are observed characteristics but some things like bud taste are also phenotypes that can not be observed. If we look at a Mostly Sativa species like a Haze plant we will notice that it is pale green. Now in a population of Haze plants we may notice that one or two out of one hundred maybe dark green and not pale green. This suggests that the dark green color is recessive. We are not totally sure until we have completed the test but the gene frequencies suggest this. We may also notice that the bud is golden on most of the plants so this suggests that the golden bud color is a dominant trait. Some of the buds on only a few of the plants may be silver. This suggests that the silver trait is Recessive (bb in our example).

We know that the only genotype that produces the recessive trait is homozygous recessive (bb). So if a plant shows a recessive trait in its phenotype, its genotype is probably homozygous recessive.

A plant with a recessive trait always has a homozygous recessive genotype.

But this leaves us with a problem. Is the Golden bud or pale green leaf color a Homozygous Dominant (BB) or is it Heterozygous (Bb).

So now is the time to perform the Test Cross. Any test cross is a cross of an organism with an unknown dominant genotype (like in our case) with an organism that is homozygous recessive for that same trait.

To do this test we need another cannabis plant of the opposite sex that is homozygous recessive (bb) for the same trait. So we will stick with bud color as our example. Hey, we have a few silver bud plants around that we think are recessive. Let's use them and see what happens. We pollinate the female plant (Does not matter if the female is dominant or recessive one), and we get our seeds and plant them. 3 - 7 months later we see the results.

This brings us to the next important rule that we will learn.

If any of the offspring from a test cross have the recessive trait, the genotype of the parent with the dominant trait must be Heterozygous.

We will explain why in a moment and this will all make sense to you. Also we must mention that we should be talking about a large population here. 1000 plants is a good population to be sure with. 100 plants are good but 20 or less can be dodgy.

The more plants we use the more reliable our results will be.

In our example, our unknown genotype is either BB or Bb. The Silver genotype is bb.
Let's put this information into a mathematical series known as Punnett

Squares.

	b	b
B		
?		

We start by first putting in out known genotypes (above). We only do these calculations for 2 parents that will breed. We know that our recessive trait is bb and the other is either BB or Bb, so we use the term B? for the time being. Our next step is to fill in the box with what we can calculate.

	b	b
B	Bb	Bb
?	?b	?b

The first row of offspring Bb and Bb will have the dominant trait of Golden Bud. The ?b and ?b can either be Bb Bb, or bb bb. This will either lead to an offspring that will produce more golden bud (Bb), or silver bud (bb). There are 2 possible outcomes. Let us fill in the 2 possible values of ? and see that this is true.

	b	b
B	Bb	Bb
B	Bb	Bb

The first possible outcome is where ? = B. This means the all are offspring will have Golden bud.

	b	b
B	Bb	Bb
b	bb	bb

The second possible outcome is where ? = b. This means that some of our offspring will have golden bud (Bb) or Silver bud (bb).

The first possibility proves that there is no way we can produce silver bud in the offspring.

The second possibility proves that we will have some golden bud and some silver bud. Not only that but we can understand clearly what the frequency will be. Count them!

Bb + Bb = 2Bb
bb + bb = 2bb

2 out of 4 will have golden bud. 2 out of 4 will have silver bud. Half our offspring will have silver bud! The ration is 50:50.

The second possibility tells us a number of things.

(1) Both parents need at least one b trait each for the silver bud to pass on if it is a recessive trait.
(2) If any silver bud is produced in the offspring then the mystery parent B? must be Bb. It can not be BB.

Remember:

Homozygous Dominant: BB = Golden Bud.
Heterozygous: Bb = Golden Bud

Homozygous Recessive: bb = Silver Bud.

So if the golden bud parent when crossed with a silver bud parent produced only Golden Bud, then the parent must be Homozygous Dominant for that trait. If the parent produced any silver bud then it must be Heterozygous.

The rules are:

1. The plant with the dominant trait is always crossed with an organism with the recessive trait.
2. If ANY offspring show the recessive trait, the unknown genotype is heterozygous
3. If ALL the offspring have the dominant trait, the unknown genotype is homozygous dominant
4. Large numbers are needed for reliable results.

And this is your first step into the world of breeding because:

(1) When you breed plants you want to continue a trait. Something that you like to see on your plant or taste with your plant or the height of your plant.
(2) When you want to continue that trait you must know if it is Homozygous Dominant, Heterozygous or Homozygous Recessive.
(3) You can find that out by running a test cross.

So the question may arise - How do I breed for several traits, like taste, smell, vigor and color? Well that is a big question. Maybe to understand more about that we should learn more about Hardy-Weinberg Equilibrium.

Hardy-Weinberg Equilibrium Part 2

If we mate two individuals that are heterozygous (e.g., Bb) for a trait what will we find? (Let's make the Punnett square).

	B	b
B	BB	Bb
b	Bb	bb

Look at that. In this group our resulting offspring will be:

1 BB,
2 Bb,
1 bb

This means that:

25% of their offspring are homozygous for the dominant allele (BB).
50% are heterozygous like their parents (Bb) and
25% are homozygous for the recessive allele (bb).

Now look at this closely. Unlike their parents Bb Bb, 25% will express the recessive phenotype bb. So if we where given two parents that displayed golden bud but where BOTH heterozygous for that trait Bb, we would also produce offspring that have silver bud. But since Bb is dominant in both parents, neither of the parents would display the phenotype for silver bud.

This is really what breeding is all about. When we have a strain that we want to keep, how do we know that the parts we want to

keep will actually be kept in our breeding process?

This is where the test cross comes in. If we create seeds from a strain that we bought in a seed-bank how can we be sure that the offspring will have the character that we like? Well the facts are this. If the trait(s) we wish to continue are Homozygous Dominant (BB) in both the parent plants then there is no way we can produce a recessive genotype for that trait in the offspring. We already explained this in the previous section.

Let's prove this:

	B	B
B	BB	BB
B	BB	BB

Look! It is impossible for the recessive trait to appear.

And if both parents contained the recessive trait we can not produce the dominant trait. Let us see this in action too.

	b	b
b	bb	bb
b	bb	bb

There we proved that too.

So now we are starting to understand that in order to breed a trait properly we must know if it is Homozygous or Heterozygous or Homozygous Recessive before we can understand what it is we are doing and PREDICT THE RESULTS BEFORE THEY HAPPEN. And

this ladies and gentlemen is what breeding is all about - Understanding a trait's genotype, predicting the outcome of a cross and LOCKING DOWN TRAITS. So how can we lock down a trait you might ask? Well we will cover this later after we understand a bit more about this subject matter.

Gregor Mendel (1822-1884) was an Austrian monk who discovered the basic rules of inheritance by analyzing results from his plant breeding research programs.

He noticed that 2 types of Pea plants gave very uniform results when breed within their own gene pool and not with one another. The traits he noticed where:

Pea Plant #1	Pea Plant #2
Solid seed shells	Wrinkled seed shells
Green seeds	Yellow seeds
White flowers	Purple flowers
Tall plants	Short plants

(This is not a Punnett square. Just an example to show the different phenotypes seen in two different Pea plant strains.)

He noticed that the offspring all carried the same traits when they breed in with the same population or gene pool.

Now since there where no variations in with each strain he guessed that both strains where homozygous for these traits. Because the pea plants where from the same species Mendel guessed that either the Solid seed shells where recessive or the wrinkled seed shells where

recessive. So he used the genotype notations (SS for solid, ss for wrinkled). He knew that they could not be Ss, because one lot did not produce any of the other strain's phenotypes when they breed within their own gene pool.

Let's explain this via 2 basic Punnett squares where SS = Pea plant#1 for the trait of 'solid seed shells' and ss = pea plant#2 for the trait of 'Wrinkled seed shells'.

	S	S
S	SS	SS
S	SS	SS

That was Pea plant#1 results. All the offspring will be SS.

	s	s
s	ss	ss
s	ss	ss

That was Pea plant#2 results. All the offspring will be ss.

The First Hybrid Cross:

Mendel made his first hybrid cross between the 2 strains. The results where all solid seeds! Here is the chart below.

	s	s
S	Ss	Ss
S	Ss	Ss

Now up until this point he did not know which trait from which plant was recessive or dominant. But since all the seeds where solid, then he knew that Pea Plant#1 contained the dominant genotype for seed shape and that Pea Plant#2 contained the recessive genotype for wrinkled seeds. Also he knew that Pea Plant#2 contained the recessive genotype for seed shape. This means that in future TEST CROSSES with other pea strains, he could determine if a seed shape trait is Homozygous or Heterozygous because he had identified the recessive trait (ss).

Remember the rules of test crosses to determine this? Here they are again.

1. The plant with the dominant trait is always crossed with an organism with the recessive trait.
2. If ANY offspring show the recessive trait, the unknown genotype is heterozygous
3. If ALL the offspring have the dominant trait, the unknown genotype is homozygous dominant
4. Large numbers are needed for reliable results.

So the offspring from the last Punnett square where all Ss. When he crossed 2 parents from the bunch of offspring he got the following results.

	S	s
S	SS	Ss
s	Ss	ss

What he has done here is to mate 2 individuals that are heterozygous (e.g., Ss) for a seed shape trait. In this group the resulting offspring will be:

SS
Ss
ss

This means that:

25% of the offspring are homozygous for the dominant allele (BB).
50% are heterozygous like their parents (Bb) and
25% are homozygous for the recessive allele (bb).

Bingo! Remember this a few pages back?

In his first cross to create the hybrid plant Mendel ended up with NO recessive traits for seed shape. But when he crossed the offspring because they where heterozygous for that trait he ended up with some having the recessive trait, some having the homozygous trait and some continuing the heterozygous trait.

In correct breeding terms his first cross between the plants is called the F1 cross or F1 generation. The breeding out of those offspring is called the F2 cross or F2 generation.

Now since he has Ss, ss and SS to work with you can probably do the Punnett square for each to see how they will work out. It would be a good time to test your knowledge on this. Compare your results with what you have learned about ratios in this chapter and you will be able to see how it all fits together. It is really very simple once you

know a few rules.....but like most things there are exceptions to the rules.

Back to frequencies:

We know that if two heterozygous parents are crossed that the ratios will be 50/50 with regards to the allele (Remember the genotype can be Ss, SS or ss, but the allele is either S or s. Look at the table below when we cross two heterozygous parents and count the alleles.

	S	s
S	SS	Ss
s	Ss	ss

SS
Ss
Ss
ss

We can see S S S S (4 x S) and s s s s (4 x s).

If we break them apart we can see this clearly.

SS
S
S

(Snap)

s
s
ss

Again, we know that if two heterozygous parents are crossed that the ratios will be 50/50 with regards to the allele.

Now remember Equilibrium? Where we consider a population with a gene pool that has the sum of all the alleles equal to 100%, but we may have different ratios? Such as 80% have S and 20% have s or 60% have S and 40% have s. Well maybe we should look at where these laws collapse and where they fail to work as expected.

There are five reasons when the law of equilibrium fails to work. These are:

1. Mutation
2. Gene migration
3. Genetic drift
4. Non-random mating
5. Natural selection

Let us go through each one.

Mutation

A mutation is the change in genetic material, which can give rise to heritable variations in the offspring. In nature maybe exposure to radiation will do this. In this case the result will be a mutation of the plants genetic code and thus when it breeds with the same population it is effectively a ‘Migration’ of foreign genetic material. Even though nothing new has been added into the population from an outside population, the mutation of one single plant will act just like another strain that migrated into the gene pool.

Gene Migration

When we deal with a population of plants we refer to a group of plants that breed within themselves without any interference from an outside population. Over time a population will reach equilibrium and this will be maintained as long as no other population migrates to this one. When another population is introduced it will cause new genes to enter the pool. This is called ‘Introgression’. During the process of introgression many new traits will pop up in the population.

Genetic Drift:

If the population is small equilibrium may be violated. By chance alone certain members will be eliminated from the population. We will find that the frequency of an allele will DRIFT towards higher or lower values.

Non-random mating and Natural selection:

This suggests that something external may influence a population to a stage where mating is not random. If some flowers develop earlier than others then they will gather pollen earlier than the rest. If some of the males release pollen earlier than others then the mating is not random. Or maybe all males release their pollen earlier resulting in some of the later flowering females ending up as a sinsemilla crop. This means that these late flowering females will not make their contribution to the gene pool. Again equilibrium will not be maintained.

With regards to natural selection the environment may cause a problem with a section of plants. If this section does not survive then they will not be able to make a contribution to the gene pool. If this is the case and if selections are made so that other plants do not make a contribution then we know that trait frequencies can be controlled to a certain degree. And the ability to control the frequencies of a trait is what BREEDING IS ALL ABOUT.

HOW TO TRUE BREED A STRAIN

Breeding cannabis strains is all about manipulating gene frequencies. Most strains that are sold by reputable breeders through seed-banks are very uniform in growth. This means the breeder has attempted to lock certain genes down so that the genotypes of those traits are homozygous.

If we can imagine for a moment that a breeder has two strains - Master Kush and Silver haze. The breeder lists a few traits that they like. * Donates the trait that they like.

Master Kush	Silver Haze
Dark Green Leaf	Pale Green leaf *
Hashy smell *	Fruit smell
White flowers	Silver flowers *
Short plants *	Tall plants

This means that they want to create a plant with the following features and call it something like Silver Kush.

Silver Kush
Pale Green leaf *
Hashy smell *
Silver flowers *
Short plants *

Now all the genetics that they need are in both of the gene pools for Master Kush and Silver Haze. We could just mix both populations and hope for the best or we could try to save time, space and money by calculating the genotype for each trait and using the results to create a TRUE BREEDING STRAIN (An IBL).

Silver Kush
Pale Green leaf *
Hashy smell *
Silver flowers *
Short plants *

The first thing the breeder must do is to understand the genotype of every trait that is featured in his/her ‘ideal’ strain. In order to do this the genotype of each parent strain or population for that same trait must be understood. Since there are 4 traits that the breeder is trying to isolate then 4 x 2 = 8 Genotypes for these phenotype expressions must be made known to the breeder.

Let us take the Pale Green Leaf of the Silver Haze for starters. The breeder will grow out as many Silver Haze plants as they can find. They will then note down if any of the population have any other leaf color trait. If not, then the breeder will note that the trait is homozygous (We will call the trait - M). Now it can either be MM or mm. If other colored leaves appear in with the population then the breeder must assume that the trait is not homozygous, but heterozygous.

If it is heterozygous then we must lock the trait down before we can continue. This is done through selective breeding. Let is look closely at the parents for a moment.

	M	M
M	MM	MM
M	MM	MM

If both parents where MM we would not have seen the variations in the population for this trait. It is a locked down trait. We know that this trait will always breed true in its population without any variations.

	M	m
M	MM	Mm
M	MM	Mm

If one of the parents were MM and the other Mm we would have ended up with a 50/50 population of both variations. But one group is clearly homozygous (MM) and the other is heterozygous (Mm).

If both where Mm then we would have 25% MM, 50% Mm and 25% mm.

Even though we can see the frequencies we still do not know if the Pale green leaf trait is Dominant or Recessive, but we can find this out by performing A Test Cross.

Now we are not going to go through the Test Cross chapter again but we can show you how to isolate the genotype that you need, which is either MM or mm because we want to breed that trait true. We must also keep track of the parent plants being used here.

To keep parent plants alive, clone them! The exact same genetic material will be passed on from clone to clone.

	M	m
M	MM	Mm
m	Mm	mm

In this this cross do you see MM offspring and the mm offspring? Well by their very nature they can not be the same. By

running several Cross Tests we can isolate the plant that is either MM or mm and break away any Mm from the group. Whether it is MM or mm, we can still breed the trait true by breeding it with other parents that are only MM or mm respectively. So we may have to do several test crosses to find a male and female that have either MM or mm for that trait. Once we have done this we have isolated the genotype and it will breed true within the same population.

So if we ran a seed-bank company called "PALE GREEN LEAF ONLY BUT EVERYTHING ELSE IS NOT UNIFORM LTD" then the seeds that we create will ALL breed PALE GREEN LEAVES and the customer will be happy. In reality though they want the exact same plant that won the cannabis cup last year.....or at least something close to it. So we will have to isolate all the traits that helped that strain of cannabis to win the cup before people are happy with what they are buying. I think you get the point.

How many tests it takes to know the genotype is not certain. You may have to use a wide selection of plants to achieve the goal, but never the less it is still achievable and much more so than non-selective breeding in the wild. Each trait must be locked down in a population, so that the population for that trait is homozygous. The next step is to lock down other traits in that same population.

Now here is the hard part.

<u>When you are working on a trait you must keep the other traits that you are looking for in mind.</u>

By breeding alone you may accidentally lock down another trait that you do not want or even remove traits that you want to keep. If this happens then you will just have to work harder at keeping the traits that you want and exploring genotypes through multiple Cross

Tests. Eventually through selection and keeping records you will end up with a plant that is true breeding for all the features that you want. The gene pool is there but the objective is to lock down the traits of the pool. Also by keeping your own records you will be building up your own little map of cannabis genes. For instance if someone grows Blueberry from a known breeder and asks what the berry taste genotype is, you might be able to tell them a little bit about your experiences and what you found. This may help them cut corners. Maybe one day we will be able to genetically map cannabis and everything will be much easier.

Also a breeder never sits back and says “Right! I am going to be on the lookout for all 1000 traits that I want.” That is crazy. What they need to do is concentrate on the main phenotypes that will make their plant unique in some way. Once they have locked down 4 or 5 traits they can them move on. Step by step is how True breeding strains are created. If anyone says that they developed a true breeding strain in 1 or 2 years then you can be sure that the genetics they started with where somewhat true breeding in the first place. (Known true breeding strains like Skunk#1 and Afghani#1 have taken 20 years to get to the stage they are at now.)

Silver Kush
Pale Green leaf *
Hashy smell *
Silver flowers *
Short plants *

Eventually you will have your Silver Kush strain but only with the 4 genotypes that you wanted to keep. You may still have a variety of non-uniform plants in the group. Some may have purple

stems, others may have green stems, some might be very potent, and others might not be so potent. By constantly selecting new traits that you want to keep, you can manipulate the strain into a totally true breeding strain for every phenotype. However it is extremely unlikely that such a strain exists on the market that is 100% true breeding for every single phenotype. Such a strain would be called ‘A perfect IBL’. If you are able to lock down 90% of the plant’s phenotypes in a population then you can claim that your plant is an IBL. I think in today’s world that this would be an acceptable % to reach.

The core Idea behind this technique is to find what is known as a ‘Donor’ plant. A Donor plant is one that contains a true breeding trait (homozygous Dominant) for that trait. The more lock down traits are homozygous Dominant the better are your chances of developing an IBL.

IBL is short for In Breed Line. This does not mean that the line of genetics will be true breeding for every trait, but in general this terminology (IBL) used by breeders does refer to a strain as being very uniform in growth for a high % of the strain’s phenotypes.

Let us use the example of hamsters. In a litter of hamsters we may find that they all have the same phenotypes. If that population reproduces and no other phenotypes crop up then we can consider the fact that these hamsters come from an In Breed Line. If the hamsters continue to breed and all show the same traits without variation then we know for certain that the gene pool has been locked down.

There are some breeding techniques that you may like to know about. These techniques can seriously breach the law of Hardy-Weinberg’s Equilibrium. Which in our case can be a good thing

because it will reduce a trait in a population or promote a trait in a population. The strain MAY not be true breeding for the selected traits, but it will certainly help make the population more uniform for that trait.

CUBING AND BACKCROSSING

Our first cross between the Master Kush plant and the Silver Haze is known as the F1 hybrid cross. Let us pretend for the moment that both traits are homozygous for leaf color. The Haze is pale green the Kush is Dark Green. Which one is MM or mm we do not know? Until we see the offspring.

	m	m
M	Mm	Mm
M	Mm	Mm

This F1 cross will result in hybrid seeds. Now since M is dominant over m, then we will know which color is more dominant and from which parent it came from. In the example let us pretend that the overall results are pale green. This means that the pale green allele is dominant over the dark green.

M = Silver Haze pale green leaf trait is dominant.
m = Master Kush dark green leaf trait is recessive.

But we also know that because no variations occurred in the population that both parents where homozygous for that trait. However ALL the offspring are heterozygous.

Now here is where we can take a big short cut in manipulating the gene pool for that population.

By cloning the parent plant MM, we can use this clone in our cross with the Mm offspring. This is known as a BACKCROSS. Obviously if our parent is female then we will have to use males from the Mm selection in out backcross.

	M	m
M	MM	Mm
M	MM	Mm

Now our first backcross will result in 50% being homozygous for that trait (MM) and 50% of the offspring being heterozygous (Mm) for that trait!

If we did not backcross but just used the heterozygous offspring for the breeding program we would have ended up with:

	M	m
M	MM	Mm
m	Mm	mm

which is 25% Homozygous Dominant (MM), 50% Heterozygous (Mm), and 25% Homozygous Recessive (mm).

So backcrossing will seriously control the frequencies of a specific trait in the offspring.

The first backcross is simply called A BACKCROSS. Now let us see

what happens when we do our second backcross using the same PARENT that we are keeping alive through cloning. Our second backcross is referred too as SQUARING.

Since we are dealing with only 2 types of offspring Mm and MM we will either repeat our results.....

	M	m
M	MM	Mm
M	MM	Mm

Which is the same as our results from our first backcross. Or.....

	M	M
M	MM	MM
M	MM	MM

All the offspring will be MM and thus true breeding for that trait. Those offspring are the results of squaring. We have not really cubed anything here, but this is a good example to get you started because it shows how we can manipulate a population by backcrossing.

Cubing in reality is less controlled than this. Cubing is a way of increasing the frequency in a population for a certain trait. It MAY not result in true breeding but it will promote a trait in a bunch of plants. Also the actual selection process is somewhat random.

In a population we select a mother plant that we want to keep because of her features. In the same population we gather pollen from 50% of the males that have characteristics similar to the mother plant

and 50% that do not. The pollen is mixed in their respective portions. So we have two packets of pollen in the end. We must clone the female to create 2 females. We then use the 2 packets of pollen on each clone separately.

When we grow out the offspring from the two females we will select the population of the offspring that mostly resembles the mother plant traits that we are looking to promote in the population. What happens is that the best male pollen should have been selected by the female as the one that she prefers. The reason for taking the 2 sets of pollen from 2 sets of males is to create a control experiment to show how this method actually interferes with the frequencies of the gene pool. By right, your selection of poor male pollen will only bring about a poorer quality population that do not resemble the female clone.

In reality we only select pollen from the best males that most resembles the female when we use this method.

Do you remember one of the laws that breaks equilibrium? Non-random mating and Natural selection. Well that is what we are doing here.

The resulting offspring should have a high frequency for the traits that we like in the mother plant.

The problem is that we do not know which male from the bunch is the one that WON this female over, but it is quicker and less time consuming in creating a strain that is somewhat uniform for a specific trait.

By repeating the process we can help increase the mother plants trait frequency in the offspring's population but we will probably end up with some plants that are non-uniform for that trait.

The best way to achieve this process is as follows. Find a

female that you like and clone this female and her male parent. Take pollen from the male parent and pollinate the female. The offspring should contain a 50%/50% of the genes for both parents.

Take pollen from the males of that offspring and mix them together. Pollinate a clone of the mother. This step should insure that selection is no longer random and you are promoting the frequency of the mother's traits in the next offspring.

Repeat the process two more times and you will have effectively CUBED (meaning backcross x 3) this strain. This can push the mother plants traits as high as 90% in a population but we will probably get some non-uniform plants in the offspring too.

Cubing does not really help us to select for traits that we want, like in our Silver Kush experiment. It simply helps us to keep a few traits that a mother plant has. Cubing is a common procedure adopted by breeders who find a good healthy mother plant in a selection of seeds that someone has given them.

This method can also fail very quickly if your selection of males are the wrong choice.

SELFING

Selfing is the ability for a plant to produce seeds without the aid of another plant. This refers to hermaphrodite plants that self-pollinate. There is no such thing as a 'gene pool' or population with regards to hermaphrodites since the only pollen that a hermaphrodite will use is the pollen that it generates itself. Both male and female flowers are located on the same plant. There can be variations in the offspring though.

It is nearly impossible for a hermaphrodite to create any male only plants. A hermaphrodite may create female only seeds and hermaphrodite seeds. Also the female only seeds may carry the

hermaphrodite trait.

Extra Notes on Selfing by Vic High:

[These notes where taken from a commentary that took place on the Internet and are worth reading. Nothing has been changed or omitted. Notes Provided by Vic High, BCGA breeder]

Notes and Interviews by Mr XX

100% Female Seeds

Posted by TheSiliconMagician on February 13, 1999 at 05:17:41 PT:

As some of you know I have been a regular in the chat room for awhile now and I spend large amounts of time in there. Anyway, I have had the extreme pleasure of speaking to Mr. XX. over the last few nights for many hours and have gotten to know him quite well via E-mail and the chat. As it turns out he confided in me and a few others about his process for coming up with 100% Seeds.

Now, Mr. XX is a very nice guy. Funny to and its always a pleasure to speak with him. The guy does not speak English too well but his wit comes through the rough language and he's a riot to talk to. He is a pure lover of cannabis. He feels that everyone should share and share alike and help the community in general.

He simply wants to share his knowledge with the cannabis community because he has spent 15 years researching this and I spoke with him in depth about it. Done with Mr.XX's permission because he

wants everyone to be able to do this.

He stressed literally hundreds of plants with an irregular photoperiod.
What he does is put the lights on 12/12 for 10 days. Then turns the lights on 24 hours, then 12/12 again for a few days, then back to 24 hours for a day, then 12/12 again for a few weeks.

If he does this and no hermaphrodites come up. He has found a 100% XX female that cannot go hermaphrodite naturally. He says that your chances of finding a 100% XX female is vastly increased when using Indica genetics. He told me that the more Afghani or Nepalese genetics the plant has, the better the chances of finding a natural XX female. His exact words were "Where did Mother Nature give weed a home at originally?"

I tried to get him to narrow it down to a ratio, but he never specified just how many plants per are XX females his exact words are "plenty of XX girls for everybody" and that is all he will say on the subject. Only that it takes a lot of time and a lot of plants to find that one female.

He then uses Gibrellic acid. 30 centilitres of water with 2 grams of Gibrellic acid [Authors note: This is an incorrect amount please follow the directions at the end of this section next to the * mark. TSM did correct himself but not in this post. He did so later on.]

(Continued) and 2 drops of Natruim Hydroxide to liquefy the Gibrellic. Then applies as normal and creates the male flowers. He has as pud said gotten down to the 4th Generation with
NO loss of vigor, NO genetic deficiencies and NO hermaphrodites. He

claims that the plants are EXACT GENETIC CLONES of one another. Complete sisters. Basically it's clone from seed instead of from normal cloning methods.

Posted by TheSiliconMagician on February 13, 1999 at 05:17:41 PT:

Mr.XX also says that it is easy for the home grower to find an XX female. It’s a very time consuming process but a straightforward one. He says that home growers should confine themselves to ONE strain. Mr. XX used a Skunk#1 x Haze x Hawaiian Indica. He says to separate those plants from your main grow and stress the hell out of them. Do this over and over with every new crop of seeds you get of that strain until you find the XX female. While this is probably difficult it is by no means impossible.

Another anecdote "The slimmer the fingers the harder it is to find the XX girls", so if you have that Columbian Sativa.. it is going to be nearly impossible for you to find that 1 female.. he says it's possible, but very unlikely.. TSM

*** CORRECTION: 0.02g of Gibrellic, NOT 2 grams**

And this concludes the chapter on Basic Breeding. Hopefully in later editions we will be to expand on what we have mentioned here and show you some examples of some breeding projects and how they work. In the meantime you should have enough information here to start work on your own cannabis strain.

I wish to thank Vic High, Chimera and Strawdog for making a major contribution to this chapter.

Chapter 16

STRAIN INDEX

This section contains a list of cannabis strains that you will more than likely come across if you shop around.

KEY

* = A very good strain.
** = Suitable for new growers.
*** = Not suitable for new growers.
TB = Indicates an IBL strain.
OUT = Not suitable for indoors.
P = High potency.
C = No seeds available. Clone format only.

INDICA STRAINS

Afghani - *, **, TB,
Afghani #1 - *, **, TB, P
Bazooka
BC Hash Plant
Black Domina - P
Champagne - P, C

Cream Sodica
Domino
Durga Mata
G-13 -P, C
Hindu Kush - *, **, TB
KC36
Kong
Kush -*, **, TB,
M-9
Mango
Mangolian Indica
Masterkush - *, **
Mazar
Northern Lights - *, **, TB, P
Pluton 2
Purple Star
Romberry - *, P
Shishkeberry - *, P
Shiva -*, **, P
Slyder
Twilight
Williams Wonder

MOSTLY INDICA STRAINS

Aurora Borealis

Big Bud	- *, **
Big Treat	
Blueberry	- *, **
Buddha	
Chemo	-*, C
Chitral	
Chronic	-*
Early Bud	
Early Girl	-*, **
Eclipse	
El Nino	
Great White Shark	-*, P
Hawaiian Indica x Skunk #1	
Hawaiian/Skunk	
Himalayan Gold	-*
Inca Spirit	
K2	
M39	-*
Matanuska Valley ThunderFuck	-*, C
MCW (Mighty Mite x Chemo x Widow)	-*
Mister Nice	
Misty	
Northern Lights #1	-*, **, P
Northern Lights #2 (Oasis)	-*, **, P
Northern Lights #5	-*,**, P
Peak 19	

Romulan	-*
Sensi Star	
Shiva Shanti	-*, **
Sweet Tooth	-*
Texada Timewarp	-*, P
Top 44	-*, **
Yumbolt	-*

SATIVA STRAINS

Cambodian	-***, P, OUT
Durban Thai x Cinderella 99	-***, P
Haze Strains	-***, TB, P, OUT
Malawi	-***, OUT
Swazi	-***, TB, P, OUT
Thai	-***, TB, P, OUT

MOSTLY SATIVA STRAINS

B-52	
Beatrix Choice	
Cinderella 88/99	-*, **, P
Durban	

Durban Poison	-*, **, P
Durban X Skunk	
Durban/Thai	-***, P, OUT
Early Pearl	- *, **
Early Skunk	- *, **
Haze #1	-***, P, OUT
Haze #19	-***, P, OUT
Haze Skunk	-***, P, OUT
Kali Mist	-*, **, P
Lambs bread Skunk	-*, P
Mexican Sativa	-***, OUT
Mullimbimby Madness	-*, ***, P, OUT
Neville's Haze	-*, ***, P, OUT
Original Haze	-*, ***, P, OUT, TB
Power Plant	-*, **, P, OUT
Pure Haze	-***, P, OUT
Purple Haze	-*, ***, P, OUT
Purple Skunk	-*, ***, P, OUT
Sensi Skunk	-*, **, TB, P
Shaman	-*
Silver Haze	-*, ***, P, OUT
Skunk #1	-*, **, TB, P
Skunk Passion	-*
Skunk Red Hair	
Super Haze	-*, ***, P, OUT
Super Silver Haze	-*, ***, P, OUT

Swazi X Skunk	-***, OUT
Voodoo	

INDICA / SATIVA MIX STRAINS

AK-47	-*, P
Apollo 11	-*, P
Blue Heaven	
BubbleGum	-*, **, P
California Indica	
California Orange	
Dutch Dragon	- *, **, P
Early Riser	- *
Euforia	-*, P
Flo	-*
Fruit Loop	
Green Spirit	
Hawaiian Indica	-*
Holland's Hope	
Jack Flash	-*, P
Jack Herer	-*, P
Juicy Fruit	-*
KC 33	
Killer Queen	-*, P
Leda Uno	
Mighty Dutch	
Nebula	
Night Queen	
Orange Crush	-*

Orange Strains	
Plum Bud	
Pole Cat	-*
Purple #1	-*, **
Purple Power	-*, **
Rosetta Stone	-*
Shiva Skunk	-*, **, TB
Silver Pearl	-*
Skunk Indica	-*, **
Space Queen	-*
Special K	
Stonehedge	-*
Super Skunk	-*, **, TB, P
Trance	-*
White Rhino	
White Russian	-*
White Widow	-*, **, TB, P

This concludes the list of known strains on the market today. We will be updating this list with more feedback from you, the reader.

Chapter 17

HOW TO MAKE HASH

Hash is a compressed format of the cannabis drug but it is not just compressed bud. In fact compressed bud has nothing to do with Hash contrary to public belief.

Cannabinoids are the major drugs produced by the cannabis plant. We have already looked at Trichomes and we understand that these tiny stalked resin glands contain our THC and other cannabinoids. We also know that female flowers produce the majority of the little trichomes. Now this is all over the flower's surface and are correctly called "stalked capitate trichomes". Since we are on this topic we will ask you to refer to Figures 1.12 and 1.14 in chapter 1. The gland heads (the rounded tips) secrete the major cannabinoids within an oil-like substance that you can remove by rubbing your fingers over the bud. We normally refer to this substance as resin. The stalks that support the gland heads are secondary to the head in cannabinoid production amounts. The gland and the stalks may also burst. In the case of a strain like afghani#1 that is thick with resin, this sometimes-explosive action of the gland is automatic.

The reason why the cannabis plant produces resin oils is to gather fallen pollen from the male plant.

When we smoke bud we hope to covert the oil into a vapor that we can inhale. However the surface of the flowers is not the only area which produce cannabinoids. It is known that the bulbous glands on the leaves produce cannabinoids and so does the stem, but these are only in minor quantities compared to the stalked capitate trichomes.

Hash is made primarily from the collection of the stalked capitate trichomes. When the collected trichomes are compressed they form a blocky mass which we refer to as Hashish.

HOW TO GATHER THE STALKED CAPITATE TRICHOMES:

There are many ways to do this ranging from bulk hash production to small finger sized quantities. Also each method will produce different qualities or grades of hashish. Some methods will gather only the trichomes, while other methods will gather trichomes and some other subsidiary elements like leaf particles and branch shavings. Water extraction seems to be the best way of achieving trichome extraction only. Let us look at each home method. We will not discuss other methods used for mass production by some eastern countries as these are somewhat substandard to the home methods mentioned below. In fact some of these 'old eastern practices' are less common in their native homelands now because of these updated methods.

There is also a preparation process that you must go through with your dried plants before you attempt any of the methods outlined below.

SKUFF

When you harvest your bud you will have trimmed the leaves away from the bud. This trim is what we refer to as Skuff. Skuff should be sticky. So whether it is on the stem or branch or leaf or bud, if it

feels sticky then you can use it to extract the resin. Now if you really want to be a connoisseur about this then you should examine your skuff for trichomes with a microscope. If any parts of the skuff do not have trichomes then discard them.

You must take this trim and store it much the same way as you would canned bud for 3 to 6 weeks.

Also the quality of the overall result can not be much better than the genetics that you started with in the first place. If you used plants that where not very potent then don't expect to produce very potent hash from them.

BASICS OF SCREENING

Flat Silk Screening:

Screening is a process much like cheese grating but on a much finer level. A silk screen is stretched across a square wooden frame and nailed tight to it. The screen typically has a pour size between 180 to 120 microns. The smaller the microns the higher the quality but less the amount. The larger micron pours will result in larger sieved amounts but some leaf matter and branch trim will drop through. This will degrade the quality of hash that you smoke. Actually typical street hash is not nearly as fine or better in quality than the larger pour screen method.

The bud is placed over the screen and can either be manually dragged across the screen or rolled across the screen using a roller. Manually it is much easier if you are using smaller quantities of bud but for larger quantities another method should be adopted like the automatic tumbling method. A sheet of glass placed under the screen is the best way of catching the matter that falls through the screen.

After the process is finished the screen can be patted down to shake any powder that is stuck in the pours.

Flat Metal Screening:

This is done much like the flat silk screen method but before the flat silk is used the bud will go through a metal grating process. The metal grate is usually made from tough nylon or stainless steel and is of equal proportions in pour size to the silk screen. By first using the metal grate we can remove more matter from the bud than the single silk screen would do. The bud matter that passes through the metal screen can then be sieved through the silk screen by shaking the screen back and forth over a glass surface. You can end up with 2 grades of sieved bud residue this way. The silk screening should produce mostly trichomes.

Multiple Screening Method:

This is a refined version of the above two methods. Several screens can be used in this method but the average is four of five. Each screen running from start to finish should have a different micron measurement starting from the largest and running down to the smallest silk screen. The bud matter is sieved through the first screen and then down onto the second screen. The process is repeated picking up and sieving with each new screen until most of the matter has passed through. You should end up with several screens that contain bud matter running down to the finer trichomes on the last screen. This is an excellent way to achieve the best results. You should end up with several screens each with different qualities of cannabis residue.

PROPER SCREENING METHODS

Now that you have an idea of what screening is about we can look at it in better detail. This explanation will apply to all of the above screening methods.

We stated that a metal screen is used first followed by a silk screen. Nowadays steel fabrics can be bought in sizes that have much smaller pours than even the finest silk screen.

You should typically look for a metal screen that is ranged somewhere between 100 lines per inch to 140 per inch. A common screen used by most home hash makers is a screen with 120 lines. A wooden frame is constructed to hold the screen in place on one side. You can glue the screen on or nail it into place.

Take 4 small wooden blocks and place them over a sheet of glass or a mirror. Place the screen over the blocks. Have a gap of an inch or so between the mirror and the screen. Place small amounts of skuff on the screen and gently role it back and forth across the screen using a credit card or similar plastic object. Do this very gently, over and back and over and back and over and back. You may have to push the skuff over and back a hundred times before you can see the tiny resin glands gather on the mirror below. All this is done with very little pressure.

Once you have collected as much resin glands as possible use the card to sweep them off the mirror and onto another surface. Now take the ‘used’ skuff and this time apply a bit more pressure to it as you roll it back and forth across the screen. With this little bit of extra force applied you will be able to knock through any resin glands that did not fall through the first time, but you will also push through some veg material such as branch shavings and leaf particles. This second round of pressing will result in a lower quality grade of skuff.

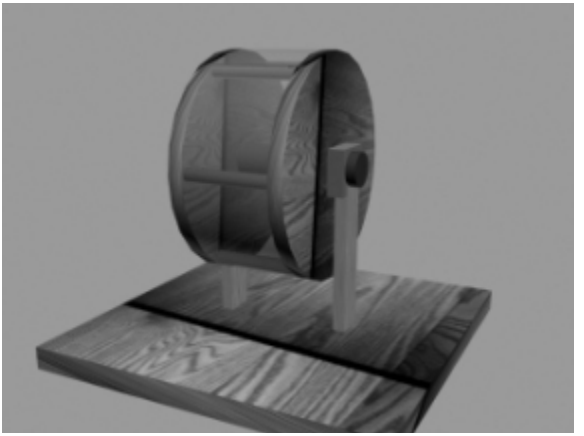
You see skuff is skuff. From when you cure your trim to the

point where you sieve it through, it is still skuff. Your objective is to try and collect as much resin from the skuff as possible. You will not end up with hash, but you will end up with different grades of skuff that can be used to make hash later.

You can smoke the different grades of skuff there and then, but you may notice that it is hard to do so. Since this powder is so fine it will typically fall from a joint easily or pass through the pours of a pipe screen. In order to solve this problem we must compress the skuff into hashish. This we will discuss later after we talk about other extraction techniques.

Drum Machines:

A drum machine is an automatic screening device. You will probably have to build one yourself but this is easy enough to do with the right materials. The size of the unit depends on how much cannabis you wish to sieve at a time. Most drum machines have a 1.5 - 2ft diameter.



This is a simple example of what a drum machine looks like. In between the two wooden cylinders is the screen. The cannabis trim is placed inside this screen and a small motor attached to the side rotates the drum. As it rotates, very slowly (2 rotations a minute), the trichomes drop through the sieve onto the surface stand between the legs of the drum. A simple mirror or sheet of glass is best used to catch the skuff. You can keep the tumbler rotating for up to 1 hour to get the most from your skuff without applying any pressure. If you want to apply more pressure to the skuff then place a small wooden cylinder in with the barrel. This will help press the skuff as it passes under the cylinder. Different sized screens can be used to extract better quality skuff.

Water Extraction:

Resin glands can be removed from the cannabis plant by agitating the trim in cold water, typically ice cold water or water that has been chilled in a fridge overnight. The trim is placed in a bucket and the cold water is poured in on top. The whole lot is swirled or mixed around using a blender. After mixing you let it sit for a few minutes before scooping out the skuff that is floating on the surface. The remaining liquid is strained through a sieve. By sieving this liquid through a coffee sieve you will be able to collect most of the trichomes, as they will not pass through with the water. Just let the coffee sieve dry and hey presto!, you got excellent grade skuff to make hash from.

The basic idea behind this is that cold water breaks the glands away from the leaf matter. The glands will eventually sink to the bottom of the bucket because they are heavier than water. The bulk leaf matter should stay afloat which can be easily scooped away.

HOW TO PRESS SKUFF INTO HASH

Again the quality of the skuff will determine the quality of hash that you will smoke. Remember on the first chapter we talked about Zero Zero?

Well this is a term used to grade the quality of hashish. The simple ratio is cannabinoids : vegetable material. Good quality hashish has a high ratio of cannabinoids to vegetable material. 00 is a term used by Moroccans to express that the hash has the highest level of cannabinoids to vegetable achieved by their extraction process. You can almost imagine that this is the finest skuff available compressed

into hashish. To compress hashish is simple.

Take your fine skuff and put into a cellophane bag. Fold it into a block shape. Tape the ends of the cellophane down to create the package.

Press it with your hands to make it more even and try to create the best square block you can with it. Use a pin to make a few holes on both side of the bag. Just scatter a few around. A hole per square inch is a good measurement to go by.

Get two or three newspaper pages and dampen it down with a cloth that has just been rinsed. Don't break the paper just dampen it down. Set an Iron to low heat and place the newspaper over the cellophane bag. Hold the iron down over the paper and press it down with medium pressure for fifteen seconds. Turn the bag over and place the newspaper on top again. Wet it down if need. Press again for the same amount of time. You should only have to do this once or trice per side.

Let the bag cool for five minutes and remove the cellophane. Voila! You have a nice block of hash like in the picture on the introduction pages to this book. Easy as pie! Also your quality of hash will be better than the street hash you find on the market. Street hash tends to be made from the less finer skuff material to make more blocks of hash at a lesser quality. If you smoke homemade hash then you will probably understand why 90% of street hash is sold at rip-off prices. Those big ounce chucks you buy probably only contain 10% of the good stuff, if any at all!

Many countries use most of these techniques to make hash. You can almost imagine that in order to achieve bulk amounts you will have to use a lot of skuff in conjunction with a lot of employees or several drum machines working around the clock.

GLOSSARY OF TERMS

Acidity: Acidity is Indicated by a pH value Below 7.
Aerate: Loosening or puncturing the soil to increase water penetration.
Afghani: A short Indica land race strain from Afghanistan. Very resinous.
Air layering: A specialized method of cloning a plant which is accomplished by growing new roots from a branch while the branch is still connected to the parent plant.
Alkaline: Having a pH value of above 7.
Alternate host: One of two kinds of plants on which a parasitic fungus must develop to complete its life cycle.
Alternate: To be "located directly across from", or it can apply to stamens when between the petals.
Annual: Completing one life cycle.

Bactericide: A chemical compound that kills or inhibits bacteria.
Bale: Any package of marijuana weighing over 10 lbs.
Ballast: A transformer used mainly with HID lighting equipment.
Bhang: An Indian and Middle Eastern drink made from cannabis.
Biennial: Completing the life cycle in two growing seasons. Cannabis is not biennial.
Biological Control: Total or partial destruction of pathogen populations by other organisms.
Blight: Rapid death of a leaf.
Blotch: A disease characterized by large irregular spots on a leaf.
Blue light: Mercury based light or a Metal Halide light.
Blunt: A joint rolled in a tobacco-leaf wrapper.

Bong: A water-cooled pipe made from glass.
Bonsai: The art of growing carefully trained plants.
Bract: A small leaf or scale-like structure associated with and subtending an inflorescence or cone.
Bud: Female flower.

Caespitose: Growing in tufts.
Calyx: Outer whorl of flowering parts; collective term for all the sepals of a flower.
Cambium: The thin membrane located just beneath the bark of a plant.
Canker: A canker is a necrotic often sunken area on a stem, trunk, or branch of a plant.
Cannabinoids: The psychoactive compound found in cannabis.
Chillum: A small fat pipe made of clay.
Chlorophyll: The green pigment in leaves. When present and healthy usually dominates all other pigments. It is important in the conversion of CO2 and H2O into glucose.
Chlorosis: Chlorosis is the yellowing of normally green tissues due to the destruction of the chlorophyll or the partial failure of the chlorophyll to develop.
Chronic: A strain of cannabis or a high-quality cannabis weed.
Clasping: Leaf partly or wholly surrounding the stem.
Clones: Rooted Cuttings. Normally considered female in the context they are spoken about unless otherwise directed.
CO2: The chemical formula for carbon dioxide.
Cola: Refers to the main branch of cannabis flowers located at the top of the stem.
Colombian: Common imported bud from Colombia. Also a strain.
Compost: An organic soil amendment resulting from the decomposition of organic matter.

Corolla: Inner whorl of floral parts; collective name for petals.
Creeping: To creep along a structure usually using the structure for support.

Dieback: Dieback is the progressive death of branches or shoots beginning at the tips and moving toward the main stem.
Dioecious: The male and female flowers are on different plants.
Disease: Any malfunctioning of host cells and tissues that results from continuous irritation by a pathogenic agent or an environmental factor/
Dividing: The process of splitting up plants into separate groups.
Doobie: A common expression for hash or weed.
Dope: A slang term for cannabis. Sometimes it is a slang term used for Heroin.
Double Digging: Preparing the soil by systematically digging an area to the depth of two shovels.

Epidermis: The outer most layer of cells of the leaf and of young stems and roots.
Evergreen: A plant that never loses all of its leaves at one time.

Fan Leaves: They are the largest leaves of the cannabis plant that gather the most available light.
Fertilizer: A plant food, which when complete should contains all three of the primary elements -N.P.K.
Floret: A Small flower.
Flower: Seed producing structure of a plant.
Foliar Feeding: Fertilizer applied in liquid form to the plant's foliage in a fine spray.

Four Twenty: (4:20), the time of day that is okay to start smoking.
Fungicide: A compound toxic to fungi.

Gall: Swelling of plant cells.
Ganja: Term for pot derived from India but associated also with pot from Jamaica.
Genotype: The genetic constitution of an individual, esp. as distinguished from the phenotype; the whole of the genes in an individual or group.
Germinate: The process of the sprouting of a seed.
Glabrous: Smooth, no hairs present.
Glands: Refers to resin producing part of the cannabis plant.
Glandular: Bearing glands.
Grafting: The uniting of a short length of stem of one plant onto the rootstock or stem of a different plant.
Grass: A very common term for cannabis.

Habitat: Natural setting where a plant grows. Usually refers to a specific plant community.
Hash/Hashish: Compressed Cannabis Resin.
Hemp: This is the stalk and stems produced from the cannabis plant that are used to make fabrics.
Herb: Another term used loosely to refer to cannabis.
Hermaphrodite: A trait of a plant where both the male and female flowers are located on the same plant.
HID: High Intensity Discharge light system.
Hookah: A large water pipe from India.
Host: A plant that is invaded by a parasite and from which the parasite obtains its nutrients.
HPS: A high Pressure Sodium Light.

Humus: The brown or black organic part of soil resulting from the partial decay of leaves and other matter.
Hybrid: The offspring of two plants of different species or varieties of those species.
Hydroponics: The science of growing plants in mineral solutions or liquid, instead of in soil.

Indica: A species of cannabis plant.
Infection: The formation of a parasite within or on a host plant.
Infectious Disease: A disease that is caused by a pathogen which can spread from a diseased to a healthy plant.
Inflorescence: The flower cluster of a plant.
Inoculum: The pathogen or its parts that can cause infection.
Internode : The distance between branches along the stem.

Joint: A cannabis cigarette.

Kief: A term from Morocco used to explain a fine grade of quality Skuff.

Lateral: Referring to side(s) of the plant structure.
Leaching: The removal or loss of excess salts or nutrients from soil.
Leaflet: Segment of a compound leaf.
Leafy: Having numerous leaves.
Lesion: An area of diseased tissue, normally with a change in color.
Linear: Resembling a line; long and narrow and of uniform width. Also refers to uniform growth.

Loam: A rich soil composed of clay, sand and organic matter.
Lobe: A major expansion or bulge-like shape, as at the margin of a leaf or petal.
Lumen: A scientific measurement for luminosity from a light source.

Manure: Organic matter, usually the excrement of an animal such a horse, which is used as a rich fertilizer.
Margin: The edge, generally of a leaf.
Marijuana: Another term for cannabis.
Mary Jane: A codeword for marijuana.
MH: Metal Halide light system.
Micronutrients: Mineral elements that are needed by some plants in very small quantities.
Mildew: A powdery growth on the plant's surface.
Mother: A selected mother plant kept for its vigor or likable characteristics by the grower. It is used for cloning and breeding.
Mottle: Refers to irregular patterns on the leaf of light and dark areas like blotches.
Mutation: A change in genetic material brought about by an abnormal influence such as radiation.

Native: A plant that occurs and grows naturally in a specific region or locality.
Necrosis: A necrosis is dead tissue on areas of the plant.
Nematicide: A chemical compound that kills nematodes.
Nematode: Microscopic, wormlike animals that live in water or soil, or as parasites of plants and animals.
Node: Position on a stem from which one or more structures (especially branches) arise.

NPK: Abbreviation for nitrogen (N), phosphate (P), and potassium (K), the three primary nutrients for plants.

Oil: Refers to cannabis resin when it is not in a solid state.
Organic: This refers to a method of gardening utilizing only materials derived from living things and not man made chemicals.
Osmosis: The process by which a solvent passes through a semi-permeable membrane into a region of greater solute concentration, so as to make the concentrations on the two sides more nearly equal.

Paraquat: A defoliant used to kill the cannabis plant around the world.
Parasite: An organism living on or in another living organism (host) and obtaining its food from the latter.
Pathogen: An entity that can incite disease.
Peat moss: The partially decomposed remains of various mosses. Used as a substrate.
Peduncle: The stalk of a flower or of a flower cluster.
Perennial: Living for more than two years or growing seasons.
Perianth: The floral envelopes; collectively the calyx and corolla, especially when they are alike.
Perlite: A form of obsidian consisting of vitreous globules expandable by heating and used for insulation but in our case it is used as a plant growing medium.
Petiole: Leaf stalk.
pH: The pH is a measure of the acidity of a solution.
Photoperiod: The timed amount of light that a plant receives.
Photosynthesis: The chemical process in plants in which carbon dioxide and water are converted into glucose by the influence of light energy.

Phototropism: The inclination, which plants have, to grow towards light.
Phyllotaxy: How leaves are arranged on a branch or stem.
Pinching: Using the thumb and forefinger to lightly crush a branch or stem which promotes further branching and causes the plant to bush more.
Pistil: The ovule-bearing organ of a flower.
Pollen: The male gametes or microspores of a seed plant, produced as a fine granular or powdery substance in the anthers of a flower or the male cone of a gymnosperm and usu. transported by wind or insects.
Pollinate: Convey pollen to or deposit pollen on a stigma, an ovule, a flower, a plant and so allow fertilization.
Pot: Another term for cannabis.
Potency: The strength of the cannabis drug. Usually measured by the THC levels in a plant.
Predator: A predator is an insect or animal that feeds off other animals, insects or plants.
Pruning: The cutting and trimming of plants to remove dead or injured wood, or to control and direct the new growth of a plant.

Red light: Usually refers to a Sodium based light (HPS).
Reefer : Another term used for dried cannabis. Specifically a cannabis cigarette.
Resistance: The ability of an organism to exclude or overcome a problem.
rH: Abbreviation for relative humidity. The relative humidity is expressed in a percentage and measured with a hygrometer.
Roach : A filter for a cannabis cigarette.
Root ball: The network of roots along with the attached soil of any given plant.

Root bound: A condition that exists when a potted plant has outgrown its container.
Roots: The colorless underground, part of a vascular plant which serves to anchor it and convey nourishment.
Rot: Rot is the disintegration, discoloration, and decomposition of plant tissue.
Rust: Rust is a plant disease that gives a "rusty" appearance to an infected surface of the plant.

Sativa: A species of cannabis plant.
Scorch: Scorch is the burning or drying and browning of leaf margins. Usually caused by overfeeding.
Senescent: The growing old and dying back of plant tissue.
Sepal: Can mean a leaf or segment of the calyx.
Serrated: Having jagged edges.
Sinsemilla: Refers to non-pollinated female cannabis plants.
Skuff: Sifted resin from the cannabis plant.
Skunk: An old strain of cannabis that has a strong smell and sour taste.
Spliff: A term used to describe a cannabis cigarette.
Staking: The practice of driving a stake into the ground next to, and as a support for, a plant.
Stamen: The male organ of the flower that bears pollen.
Stash: A personal amount of cannabis.
Stigma: The receptive part of the pistil.
Stipule: Appendage at base of leaf stalk, often leaf or scale-like.
Stoma: An organ in the leaves of plants. The stomata allow the plant to breathe.
Stout: Thick and sturdy.
Substrate: Refers to the growing medium.

Susceptible: Lacking the inherent ability to resist disease.
Symptom: The external and internal reactions or alterations of a plant as a result of a disease.

Taxa: A group of plants, defined by the scientific plant classification system.
Terminal: At the tip of a structure.
Tetrahydrocannabinol/THC: The psychoactive cannabinoid in marijuana that is responsible for the high or drug effect.
Thai stick: A cannabis sweet made by wrapping cannabis around a thin bamboo splint.
THC: See - Tetrahydrocannabinol/THC.
Thinning: Removing some plants to allow sufficient room for the remaining plants to grow.
Toke: To inhale cannabis.
Transpiration: The release of moisture through the leaves of a plant.
Transplant: The process of moving one plant from it's medium to another medium or another location.

Underground: A nasty term used to describe a movement of the people who grow and share cannabis.

Vascular: Term applied to a plant tissue or region consisting of conductive tissue.
Vegetative: The growth phase of a plant that occurs before flowering and after the seedling stage.
Vermiculite: Any of a group of hydrated silicates resulting from the alteration of biotite and ultra basic rocks; spec. a monoclinic

aluminosilicate of magnesium occurring as platy yellow or brown crystals or foliated scales. Flakes of this mineral used as a moisture-holding medium for plant growth or a protective covering for bulbs etc.
Virus: A sub microscopic obligate parasite consisting of nucleic acid and protein.

Weed: A common term used to describe cannabis.
Whorl. Group of three or more structures of the same kind (generally leaves or flower parts) at the same node.
Wilt: Wilt is what happens when the leaves of a plant droop.

Zonked: To be very stoned. Usually refers to the Indica type high.

CONCLUDING THOUGHTS

It is by practical application of this book that the journey from novice grower to guru is achievable. Never try to do more than what you can.

As a whole the following factors are the most important in achieving good results.

-Light
-Genetics
-Preventing a problem instead of solving it
-Air circulation
-Soil
-Pot/Container Size
-Fertilizers
-12/12

Light:

Without a doubt light is a very important factor in bud production and plant growth. Although results can be achieved using a 250W HID or fluorescent tubes, a 400W HID is better. A 600W HID will produce a much better crop than a 400W HID and a 1K HID is the best single light available on the market today. If you are not getting the bud sizes that this book is showing you then upgrade your light system. It still has to be said that not everyone wants to grow this

amount of bud and a 1K HID does cost a good bit of money to run. However with a 1K HID light you will improve your results.

Also conserving light is important. Use reflectors, white walls and Mylar to keep the spread of light even and contained in your grow room. Any light leaks mean that usable light is being lost. You're paying for it so try and use as much of it as you can. Your plants will love you for this.

Genetics:

It goes without saying that a plant with genetic traits for low bud production amounts and potency will not create an outstanding plant. If you start with bad genetics you will only end with bad results no matter what you do or how good a grower you are.

If you want to obtain good genetics then get your seeds from a seed-bank that advertises good strains from reputable breeders. Most of the best breeders enter competitions such as the 'Cannabis Cup' in Amsterdam. You should pay a visit to Amsterdam and sample what the breeders have to offer in the coffee shops. The coffee shop owners will sometimes tell you where you can get seeds from some bud that you liked to smoke.

Most of the cannabis plant pictures in this book come from well-known strains that breeders have produced. Most of these strains can be bought through seed-banks.

Preventing a problem instead of solving it:

Prevention is better than cure. Any problem will stunt growth to some degree. Solving the problem before it happens entails knowing what problems to expect during your grow. This book has explained some of the problems you will face. Healthy plants are rewarding plants. Take good care of your plant's health and reap the rewards for doing so.

Air circulation:

Very important. Outdoor plants do not have this problem but indoor plants can sometimes stunt or grow weakly if they do not get fresh air. Fresh air is important to replace any impurities that build up in your grow room. Also the percentage of different compounds that make up air can change or fluctuate if new air is not introduced into the grow room. This can cause problems with your grow. Also heat can build up in spaces that do not have good air ventilation. A rise in temperatures can cause a plant to stunt. Keep fresh air moving around your grow room at all times for the best results.

Dust is also a problem. In a grow room you need to use ventilation to keep dust from settling on your sticky bud. Those tiny pistils are producing the resin that you want. A big blob of dust on a pistil will only stunt its growth, not to mention reduce the overall effect that the bud has when you sample it.

Air circulation also brings a mild wind to your grow. This is important for stem and branch growth. Wind will make the plant react by stressing it a little. That reaction is thicker stem and branch growth. This is important for bud production, as the plant will be thicker, stronger and healthier overall. I have seen growers use fans in their grow rooms that can triple the width of a stem. On more than one occasion I have seen indoor stems that are 2 inches thick and the plant was only 4 foot high! That plant produced the most bud in the same strain population too. The reason for this was because it was located very near to the main fan and was directly under the light. The growing conditions where optimal for that plant. It loved it.

Soil:

This is the medium that your plant will grow in throughout its life. If the soil does not suite cannabis then cannabis will not grow well in that medium no matter how good a grower you are. You may have to experiment with soil before you find a good soil that suites cannabis. Do not ever underestimate how important soil is. Make sure the pH is right and the nutrients that your plant needs are in the soil. Soils should hold a bit or water but should also drain well. We don’t want muds or fast draining soils. Find a middle soil that does both well.

Pot/Container Size:

Also make sure that you use plenty of soil in large containers. I can tell you right now that a container that is only 4” x 4” will stunt your overall yield. You will be able to produce close to 0.5 Oz per plant (if the plant has good genetics) in a pot of this size, but a 6” x 6” will allow much more bud growth. A standard pot size for higher quantity results should be around 12” x 12” or more. I think a container that is 24” x 24” is good too, but takes up a lot of space. These larger containers are for mostly Sativa and pure Sativa species. Indica/Sativa, Mostly Indica and Indica will grow well in 12” x 12” container.

Fertilizers:

Cannabis plants like food but not too much as we said before. If you provide the food that your plant needs then it will provide you with good results. However some fertilizers can change the taste of your bud. Many people say this is a myth but you will be able to taste the difference between natural outdoor bud and indoor bud that has been chemically treated if you smoke enough varieties from various grow techniques.

Some people have complained about headaches after smoking indoor cannabis that has been burnt through overfeeding. There are many reasons for this and one big reason is that the grower has not

used a feeding solution that is for food plants but one that is for plant appearance like roses. Some of these non-food plant fertilizers contain other ingredients than just the standard primary, secondary and micronutrients. These extra ingredients can sometimes be toxic and a warning label is written on the side of the bottle to indicate this. The same goes for pest sprays that are toxic. This is another good reason why you should grow your own bud.

However if you have read this book then you know to stick to food fertilizers only and sprays that can be used on food plants. If you get your feeding mixtures right you will boost the overall performance of your plant. You will keep it healthy too.

Hormones can also increase the overall yield and vigor of your plant. In some countries hormones are banned because they might interfere with a plant's genetics.....and yours. It is best to read up more on hormones before you use them, but most people have used hormones, with a good brand name, and have achieved larger bud quantities. Hormones can sometimes be expensive.

12/12:

If you use 12/12 and keep your flowering room completely light tight, you will improve your overall yields. A 100% light tight room will increase yields by 30% than a room that is only 99% light tight. That is how important total darkness is!

If you can understand and control the above points then you will achieve the goal.

This book will expand on a yearly bases. We will be adding new tips and tricks from growers around the world to keep up with the times. We hope that this book has helped you in some way and that you will use it for future reference.

Remember - Do not break the law. Before you get seeds, clones or grow cannabis check your countries laws to make sure that you do not conflict with them. We would like you to grow cannabis but we do not want you to get into legal trouble either.
Have Fun and thanks for reading this book.

Greg Green.

- LIBERATE THE HERB -

THE GREEN PAGES

Here are some great resources for cannabis related material that you may want to check out. They come highly recommended.

A great shop to check out for the latest in pipe and pipe designs. The RayDiaTor is a new water-cooled pipe. Check it out at Yuppiepipe.com!

A great place to shop for great strains on the market today. Send an E-mail to chimera for the latest stock lists and prices!

Want to hang out and chat with fellow growers from around the world? Check out
www.overgrow.com

A great source for the latest information on cannabis news!
www.yahooka.com

SERIOUS SEEDS

Serious seeds is a great Dutch cannabis seed business that developed the critically acclaimed AK-47 strain. AK-47 is one of the most potent cannabis strains on the market today. They have also won a number of cannabis cups.

Who are we? Serious Seeds is a small firm, concentrating on the production of high quality, stable and consistent cannabis seeds for the connoisseur Cannabis smoker. First, Serious strains are bred and stabilized for many generations with quality as the highest priority. These stable strains are selected for their unique properties then crossed to produce vigorous Fl hybrid seeds.

When you grow our seeds you can be assured that the results will be consistent because every batch of seeds has been tested for good germination rates and uniformity. You will notice that we carry only five sorts of seeds and maybe you wonder why? After all, there are over a hundred types listed in some other seed banks. Instead of padding our list with seed varieties that are available elsewhere, Serious sells only our few custom developed and always prize-winning varieties. Serious Seeds are sold per 15 in a protective and airtight tube.

How do you know we're any good? In recent years there has been an explosion in the Cannabis seed business. By looking at any seeds it is impossible to tell what sort of weed will come out of them. If you go with a known Dutch breeding outfit like Serious Seeds then you can be assured that the seeds you receive are some of the highest quality genetic material available on the cannabis seed market today. One of the nice things about Serious seeds is our outlets. In Amsterdam our seeds are also sold in coffee shops along with our bud. If you visit one of these shops you will be able to try them out for yourself.

A second measure of our quality is the number of awards we have won in the High Times Cannabis Cup. The Cannabis Cup is hosted by the smoker's magazine High Times and looks for the best Cannabis strains in Amsterdam every fall, awarding several prizes in

different categories. In 1994 our 'AK-47' and 'Chronic' took awards through another company. In 1995 we grew into Serious Seeds and our 'Kali Mist' won the Cup for best Hydro strain. In 1996 we introduced ‘White Russian’, and it won the highly-valued, all-round-best award - "The Cannabis Cup"!

What's in a name? Cannabis strain names (like Serious seeds - 'AK-47') are rapidly winning over the different sectors of the coffee shop industry. Serious Seeds has registered all of its names and even fought in court over the use of those names, but for the buyer the situation can be confusing. So, BEWARE, don't buy cheap seeds sold with popular names because more than likely you will be disappointed. Look for the name of the company that made the seeds. Consider who created the strain and what prizes it has won. Serious Seeds means quality! We have a name to uphold, so only buy REAL Serious seeds in their genuine packages from us.

Indoor or outdoor? All of our strains are developed inside, under HPS lights. This means that they do very well inside. From the experiences of our customers, we know that when grown outside in the right location, the results can be even better than inside growing. That is no surprise, what is better than the sun? Even in the Netherlands, home of Serious Seeds, we have seen good results from outdoor crops of 'AK-47' and 'Chronic'.

Under natural conditions the 'AK' finishes early enough to grow it in the garden. The Chronic thrives on our balconies where it receives lots of light and stays protected from rain and strong winds. In weather conditions similar to those of Holland you need to protect cannabis flowers from the elements by picking early or sheltering the plants. Indoor or outdoor growing is really a question of "Where do you live?" and "Can you protect the plants from the elements long enough to let them finish (like maybe in a glasshouse)?"

We are always interested in photos of plants growing in extreme conditions. We invite you to tell or show us your results in extreme conditions (high latitude or extremely wet areas for example) then we can learn more about the limits of Serious Seeds genetic material.

[Please note: Serious Seeds only mails to countries where it is legal to import cannabis seeds. Our advice is to check the customs regulations before you order. We can not be held responsible for persons breaking these regulations; neither do we accept product-liability. You order at your own risk.]

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History of Serious Seeds:

The breeder behind Serious Seeds, Simon is his name, is responsible for the material sold by the seed bank. He studied biology at one of the universities in Amsterdam and was a non-smoker. He only discovered the merits of smoking pure marijuana after his study while traveling through Africa in 1986. From that moment on he started collecting seeds. Back in Holland he immediately started growing those seeds out and crossing what he thought were the best plants. Contacts with other growers gave him access to different plants from which he also selected the best ones. The genetic background of this material was not always clear but he was able to create some fantastic strains.

Simon worked for some time at Sensi Seeds and still has a good relationship with the people behind Sensi, Ben and Alan Dronkers. In 1994 an effort was made to start a seed company with some American pot refugees. That year the AK-47 as well as the Chronic won prices at the American Cannabis Cup festival in Amsterdam. That first seed company with the Americans was discontinued and in 1995 Serious Seeds was formed.

It has always been a Serious policy to have our products grown out by some of the best coffee shops in Amsterdam. The 'Greenhouse' is one of those coffee shops which carries 'Serious' products. The Greenhouse coffee shop won a Cannabis Cup in 1995 with the Kali Mist produced by us, Serious Seeds. In 1996 another famous Amsterdam coffee shop 'The Dampkring' won the Overall Cup at that years Cannabis Cup with our newest Serious strain White Russian.

Serious has always been a small company, and prefers to stay like that. We love to smoke and basically try to develop new and

interesting plants to grow and smoke for our own pleasure as well as for our clients. This means we don't work to produce something new every year for commercial reasons or to compete in the next contest. We want to put a new name out when we think we have something worth while for pot growers and smokers to try.

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AK-47

An easy-growing good producer, this strains power earned it the name. More the idea of a 'one hit wonder' than anything violent is intended by the name. 'AK' has won many awards at the Cannabis Cup and other Cannabis festivals - 6 in total! These plants have a short flowering period, producing hard compact buds that gleam with resin crystals making any farmer proud. Quality without compromise, this is some serious flower power! And floral it is - be aware that these plants do have a strong smell.

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KALI-MIST

For connoisseur stash there is nothing like the almost 100% sativa flowers from Kali Mist. A superb sativa with a high calyx-to-leaf ratio and long, running tops that produces full, fluffy, buds. Expect spiralling buds with a high resin content and a delightfully spicy scent. Kali Mist won the 1995 High Times Cannabis Cup for Best Hydro and is the personal choice smoke for many expert gardeners.

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WHITE-RUSSIAN

With great pride we now announce the availability of White Russian seeds. The big winner of the cup of all cups, the Cannabis Cup in the 1996 High Times Magazine Cannabis Cup competition. These seeds produce plants that are fantastic in both appearance, and effect. This is no surprise once you know that White Russian is a combination of the famous AK-47 and the equally well known White Widow. Since this is our most skunky variety, expect compact tops with few leaves and completely coated with white resin as well as a plant that is quite strong smelling even in the vegetative period. The quality is fantastic. Grow it and you will know it!

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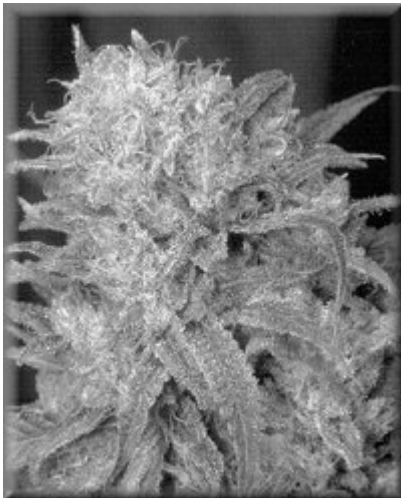
BUBBLE GUM



Originally the Bubble Gum was developed by growers in Indiana, USA. From there the genetics moved to New England and eventually Holland. Here the decision was made to bring the several different phenotypes, all named Bubble Gum down to one type of plant. It took many generations to finally produce this stable Bubble Gum, with the characteristic sweet smell and euphoric high - the original trademarks of this famous strain. The result is a short broad-leafed plant which grows a compact heavy bud with a very white, crystalline appearance. Bubble Gum has been widely admired since the mid 1990, winning 2 awards in the cannabis cups of 1994 (3rd best coffee shop) and 1995 (3rd Biocup).

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CHRONIC

Our most commercial variety, Chronic is the plant to grow when yield and quality are top concerns. With its mostly indica background Chronic can produce up to 600 g/m² without losing that connoisseur feeling. The strong high comes from the heavy resin content. Smokers that know and grow choose this plant for its combination of appearance and sweet smell. Winner of the Third place in the Hydro competition of the High Times Cannabis Cup in 1994. This is the best choice for growers tired of losing quality when increasing yield.

Please contact us if you want to find out how to get our strains. You will not be disappointed and we know that when you have

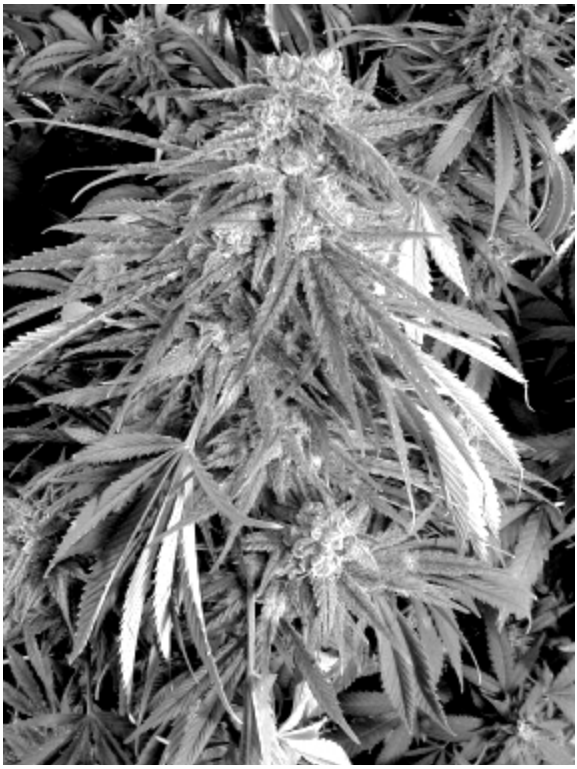
tried us you will come back for more.

www.cannabisX.com

If you want to be able to ask more questions about growing or post your own grow pictures then I suggest that you use the internet which is the best way to make contact with the growing community. http://www.cannabisx.com is the place to go. There is a whole list of articles, news, medical updates and cannabis research papers that you can read. It also happens to have a Chat feature and a Bulletin Board system (called 'X-Forums'). I post there now and again so you should be able to make contact with me if you wish. I sometimes take E-mails but can't guarantee that I will get around to answering all your questions. You can E-mail me at: greg@cannabisx.com but it would be better for you if you posted to the Bulletin Board system there instead.

Greg Green

Two weeks into flowering. This plant has very Indica dominant leaves. Picture by X3n0.



This is a mostly Sativa plant. Notice her low height and very Sativa dominant leaves. Picture by Vic High.

Inside the bud is a world of trichomes. Picture by Joop Jumas.

Nice dry and manicured bud. . Picture by ThePenguin

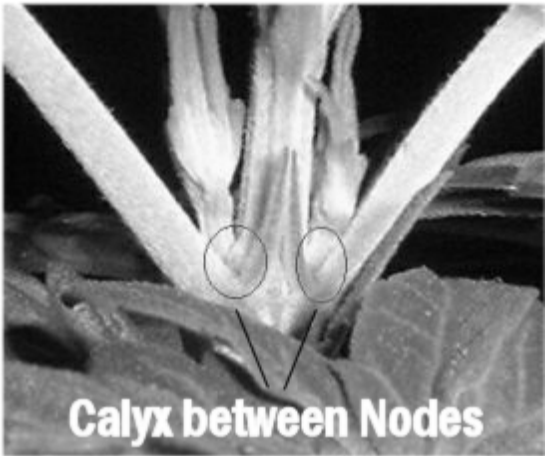
This is a well rooted clone. The clone was originally started in a rockwool cube. After roots developed and grew out from the rockwool cube the grower placed the cube and clone into some soil. You can see the rockwool cube at the base of stem. This grower will cover that surface up with soil after a bit more watering. Picture by Strawdog.

Thick pistils grow out from a host of calyx patches. The results can be quite a marvelous display. This particular plant is being flushed dry of nutrients seven days prior to harvest. You can see that the tips of the leaves are suffering. The objective here is to completely rid the plant of Nitrogen and other chemicals before harvesting. It makes the bud easier to cure and make it taste better. Picture by NebuchadnezzaR .

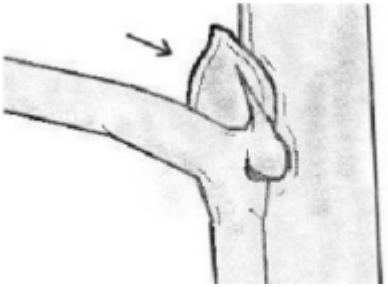
Pure hash does not need to be smoked in large amounts. Here MillumMadman has sparked up a few little hand rolled pellets of hashish. Picture by MullumMadman.

This is a hydroponics SOG grow. The entire unit holds all ten clones. Picture by Mia Stoner.

This is an elevated plan shot of a pruned cannabis plant. As you can see branching is very angular. Picture by Infected.



Calyx development. Picture by Infected.



A Calyx. The ultimate Pre-flowering Indicator. Illustration by strawdog.

BULB LUMENS CHART

BRAND/MAKE/CATEGORY/WATTS/LUMENS/PAR WATTS/CCT

Argosun Classic MH 1000 117000 581 ~3K
Hortilux Super HPS TM EN HPS 1000 145000 535 ~2K
Sunmaster Warm Deluxe MH 1100 133000 505 ~3K
Sunmaster Warm Deluxe MH 1000 117000 470 ~3K
Sunmaster Warm Deluxe MH 1000 117000 470 ~3K
Sunmaster Natural Deluxe MH 1000 117000 442 ~4K
Sunmaster Warm Deluxe MH 1000 110000 441 ~3K
Sunmaster Natural Deluxe MH 1000 110000 416 ~4K
Sunmaster Cool Deluxe MH 1000 80000 340 ~5K
Hortilux Super HPSTM EN HPS 430 58500 220 ~2K
Sunmaster Super HPS Deluxe HPS 600 85000 205 ~2K
Hortilux Super HPSTM EN HPS 400 55000 205 ~2K
Sunmaster Warm Deluxe MH 400 40000 159 ~3K
Sunmaster Natural Deluxe MH 400 40000 151 ~4K
Sunmaster Cool Deluxe MH 400 32500 138 ~5K
Sunmaster Natural Deluxe MH 400 36000 136 ~4K
Sunmaster Super HPS Deluxe HPS 400 55000 132 ~2K
Sunmaster Warm Deluxe MH 250 22000 87 ~3K
Sunmaster Natural Deluxe MH 250 23000 87 ~4K
Sunmaster Warm Deluxe MH 250 21500 85 ~3K
Sunmaster Cool Deluxe MH 250 19000 81 ~5K
Sunmaster Natural Deluxe MH 250 21000 80 ~4K

Hortilux Super HPS Deluxe HPS 250 32000 77 ~2K

Lamp Efficiency In LUMENS:

Hortilux Super HPS TM EN HPS 1000 145000 535 ~2K
GE Lucalox® Standard HPS 1000 140000 ~2.1
Sunmaster Warm Deluxe MH 1100 133000 505 ~3K
Philips Son Standard HPS 1000 130000 ~1.95K
Philips Son T HPS 1000 130000 ~1.95K
Osram Sylvania Lumalux® Standby HPS 1000 127000 ~2.1K
Sunmaster Warm Deluxe MH 1000 117000 470 ~3K
Sunmaster Warm Deluxe MH 1000 117000 470 ~3K
Sunmaster Natural Deluxe MH 1000 117000 442 ~4K
ArgoSun MS MH 1000 117000 581 ~3.2K
GE High Output (HO) MH 1000 115000 ~3.8K
Osram Sylvania Super Metalarc® MH 1000 115000 ~4K
Sunmaster Warm Deluxe MH 1000 110000 441 ~3K
Sunmaster Natural Deluxe MH 1000 110000 416 ~4K
GE High Output (HO) MH 1000 110000 ~3.4K
GE Multi-Vapor® Standard MH 1000 105000 ~4K
Philips Son T Plus HPS 600 90000 ~1.95K
Sunmaster Super HPS Deluxe HPS 600 85000 205 ~2K
Sunmaster Cool Deluxe MH 1000 80000 340 ~5K
Hortilux Super HPSTM EN HPS 430 58500 220 ~2K
Hortilux Super HPSTM EN HPS 400 55000 205 ~2K

Sunmaster Super HPS Deluxe HPS 400 55000 132 ~2K
Philips Son T Agro HPS 400 55000 ~2.05K
Philips Son T Plus HPS 400 55000 ~1.95K
Philips Son Plus HPS 400 54000 ~1.95K
GE Lucalox® Standard HPS 400 51000 ~2.2
Philips Son Standard HPS 400 48000 ~1.95K
Philips Son T HPS 400 48000 ~1.95K
Osram Sylvania Lumalux® Standby HPS 400 47500 ~2.1K
GE Extra High Output (XHO) MH 400 44000 ~4K
GE High Output (HO) MH 400 41000 ~4K
Osram Sylvania Compact Super Metalarc® MH 400 41000 ~3.8K
Sunmaster Warm Deluxe MH 400 40000 159 ~3K
Sunmaster Natural Deluxe MH 400 40000 151 ~4K
ArgoSun MS MH 400 40000 ~3.2K
Sunmaster Natural Deluxe MH 400 36000 136 ~4K
GE Multi-Vapor® Metal Halide Standard MH 400 36000 ~4K
Sunmaster Cool Deluxe MH 400 32500 138 ~5K
Hortilux Super HPS Deluxe HPS 250 32000 77 ~2K
Sunmaster Natural Deluxe MH 250 23000 87 ~4K
Sunmaster Warm Deluxe MH 250 22000 87 ~3K
Sunmaster Warm Deluxe MH 250 21500 85 ~3K
Sunmaster Natural Deluxe MH 250 21000 80 ~4K
Sunmaster Cool Deluxe MH 250 19000 81 ~5K

Lamp Efficiency for MH & HPS:

Argosun Classic MH 1000 117000 581 ~3K
Sunmaster Warm Deluxe MH 1100 133000 505 ~3K
Sunmaster Warm Deluxe MH 1000 117000 470 ~3K
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Osram Sylvania Lumalux® Standby HPS 400 47500 ~2.1K
Hortilux Super HPS Deluxe HPS 250 32000 77 ~2K

Three Things Marijuana Doesn't Do

By California NORML, 1992.

1. No brain damage seen in marijuana-exposed monkeys

Two new scientific studies have failed to find evidence of brain damage in monkeys exposed to marijuana, undercutting claims that marijuana causes brain damage in humans. The studies were conducted by two independent research groups. The first, conducted by Dr. William Slikker, Jr. and others at the National Center for Toxicological Research in Arkansas examined some 64 rhesus monkeys, half of which were exposed to daily or weekly doses of marijuana smoke for a year. The other, by Gordon T. Pryor and Charles Rebert at SRI International in Menlo Park, California, which is still unpublished, looked at over 30 rhesus monkeys that had inhaled marijuana one to three times a day over periods of 6 to 12 months. Neither study found evidence of structural or neurochemical changes in the brains of the monkeys when examined a few months after cessation of smoking.

The new results cast doubt on earlier studies purporting to show brain damage in animals. The most famous of these was a study by Dr. Robert Heath, who claimed to find brain damage in three monkeys heavily

exposed to cannabis. Heath's results failed to win general acceptance in the scientific community because of the small number of subjects, questionable controls, and heavy doses. Subsequent rat experiments by Dr. Slikker and others reported persistent structural changes in the brain cells of rats chronically exposed to THC. The studies did not show that pot kills brain cells, as alleged by some pot critics, but they did show degeneration of the nerve connections between brain cells in the hippocampus, where THC is known to be active.

Although scientists have regarded the animal evidence as inconclusive, some critics have cited it as proof that pot causes brain damage in humans. Thus Andrew Mecca, the director of California Department of Alcohol and Drug Abuse, recently stated on the Ron Reagan, Jr. talk show (Sep. 2, 1991) that marijuana "leaves a black protein substance in the synaptic cleft" of brain cells, a claim apparently based on Heath's monkeys. When asked by a NORML member for his evidence, Mecca sent a list of three references, none of which turned out to have anything to do with brain damage.

Although the new monkey studies found no physical brain damage, they did observe behavioral changes from marijuana. Slikker's group found that monkeys exposed once a day to the human equivalent of four or five joints showed persistent effects throughout the day. Slikker says

that the effects faded gradually after they were taken off marijuana, and were not detectable seven months later, when they were sacrificed. Autopsies did reveal lingering chemical changes in the immune cells in the lungs of monkeys that had inhaled THC. However, Slikker's group concluded that experimental exposure to marijuana smoke "does not compromise the general health of the rhesus monkey."

References:

William Slikker, Jr. et al, "Chronic Marijuana Smoke Exposure in the Rhesus Monkey," Fundamental and Applied Toxicology 17: 321-32 (1991)

Guy Cabral et al, "Chronic Marijuana Smoke Alters Alveolar Macrophage Morphology and Protein Expression, Pharmacology Biochemistry and Behavior 40: 643-9 (1991)

Merle Paule et al., "Chronic Marijuana Smoke Exposure in the Rhesus Monkey II: Effects on Progressive Ratio and Conditioned Position Responding," Journal of Pharmacology and Experimental Therapeutics 260: 210-22 (1992)

2. Pot found not to cause fetal alcohol syndrome

A new study of children born to marijuana-smoking mothers found no link between marijuana exposure and the birth defects of fetal alcohol syndrome (FAS). The new study, by Dr. Susan J. Astley of the University of Washington, published in the January, 1992 issue of Pediatrics, contradicted a 1982 study by Dr. Ralph Hingson, in which prenatal exposure to marijuana was found to increase the risk of FAS.

Hingson's results, which have not been replicated, have been questioned on various methodological grounds, in particular the difficulty of controlling for combined drinking and pot use.

The new study looked for facial deformities symptomatic of FAS in 40 children whose mothers had smoked marijuana heavily during pregnancy and 40 controls, It found no association between marijuana and FAS, but deformities were observed in children of women who drank 2 ounces of alcohol per day or took cocaine.

3. New study finds pot doesn't lower testosterone

A new study by Dr. Robert Block at the University of Iowa disputes the commonly held notion that marijuana alters the level of testosterone and other sex hormones.

The study contradicted a widely publicized 1974 study by Dr. R.C. Kolodony, which reported decreased testosterone levels in men who smoked marijuana chronically.

The U. of Iowa study found that chronic marijuana use had no effect on testosterone, luteinizing hormone, follicle stimulating hormone, prolactin and cortisol in men or women.

Noting that six other studies had failed to show lowered testosterone levels in men, Dr. Block concluded: "It appears that marijuana, even heavy use of the kind that's typical in the United States, doesn't alter testosterone levels." However, he cautioned that heavy use might have other adverse effects, including "possible effects on reproductive function and mild, selective cognitive impairments associated with heavy, chronic use."

Block's study is published in Drug and Alcohol Dependence, Vol. 28: 121-8 (1991).

10 Things Every Parent, Teenager & Teacher Should Know About Marijuana.

(Text of a flyer from the Family Council on Drug Awareness.)

"Prohibition...goes beyond the bounds of reason in that it attempts to control a man's appetite by legislation and makes a crime out of things that are not crimes. A prohibition law strikes a blow at the very principles upon which our government was founded."

-- Abraham Lincoln, December, 1840

This pamphlet was researched and produced as a public service by the Family Council on Drug Awareness, P.O. Box 71093, LA CA 90071-0093

1 Q. What is Marijuana?

A. "Marijuana" refers to the dried leaves and flowers of the cannabis plant [1], which contain the non-narcotic chemical THC at various potencies. It is smoked or eaten to produce the feeling of being "high." The different strains of this herb produce different sensual effects, ranging from sedative to stimulant.

2 Q. Who Uses Marijuana?

A. There is no simple profile of a typical marijuana user. It has been used for 1000s of years for medical, social, and religious reasons and for relaxation [2]. Several of our Presidents [3] are believed to have smoked it. One out of every five Americans say they have tried it. And it is still popular among artists, writers, musicians, activists, lawyers, inventors, working people, etc.

3 Q. How Long Have People Been Using Marijuana?

A. Marijuana has been used since ancient times [4]. While field hands and working people have often smoked the raw plant, aristocrats historically prefer hashish [5] made from the cured flowers of the plant. It was not seen as a problem until a calculated disinformation [sic] campaign was launched in the 1930s [6], and the first American laws against using it were passed [7].

4 Q. Is Marijuana Addictive?

A. No, it is not [8]. Most users are moderate consumers who smoke it socially to relax. We now know that 10% of our population have "addictive personalities" and they are

neither more nor less likely to overindulge in cannabis than in anything else. On a relative scale, marijuana is less habit forming than either sugar or chocolate but more so than anchovies. Sociologists report a general pattern of marijuana use that peaks in the early adult years, followed by a period of levelling off and then a gradual reduction in use [9].

5 Q. Has Anyone Ever Died From Smoking Marijuana?

A. No; not one single case, not ever. THC is one of the few chemicals for which there is no known toxic amount [10]. The federal agency NIDA says that autopsies reveal that 75 people per year are high on marijuana when they die: this does not mean that marijuana caused or was even a factor in their deaths. The chart below compares the number of deaths attributable to selected substances in a typical year:

Tobacco	340,000 - 395,000
Alcohol (excluding crime/accidents)	125,000
Drug Overdose (prescription)	24,000 - 27,000
Drug Overdose (illegal)	3,800 - 5,200
Marijuana	0

*Source: U.S. Government Bureau of Mortality Statistics, 1987

6 Q. Does Marijuana Lead to Crime and/or Hard Drugs?

A. No [11]. The only crime most marijuana users commit is that they use marijuana. And, while many people who abuse dangerous drugs also smoke marijuana, the old "stepping stone" theory is now discredited, since virtually all of them started out "using" legal drugs like sugar, coffee, cigarettes, alcohol, etc.

7 Q. Does Marijuana Make People Violent?

A. No. In fact, Federal Bureau of Narcotics director Harry Anslinger once told Congress just the opposite - that it leads to non-violence and pacifism [12]. If he was telling the truth (which he and key federal agencies have not often done regarding marijuana), then re-legalizing marijuana should be considered as one way to curb violence in our cities. The simple fact is that marijuana does not change your basic personality. The government says that over 20 million Americans still smoke it, probably including some of the nicest people you know.

8 Q. How Does Marijuana Affect Your Health?

A. Smoking anything is not healthy, but marijuana is less dangerous than tobacco and people smoke less of it at a time. This health risk can be avoided by eating the plant instead of smoking it [13], or can be reduced by smoking smaller amounts of stronger marijuana. There is no proof that marijuana causes serious health or sexual problems [14] but, like alcohol, its use by children or adolescents is discouraged. Cannabis is a medicinal herb that has hundreds of proven, valuable theraputic uses - from stress reduction to glaucoma to asthma to cancer therapy, etc. [15].

9 Q. What About All Those Scary Statistics and Studies?

A. Most were prepared as scare tactics for the government by Dr. Gabriel Nahas, and were so biased and unscientific that Nahas was fired by the National Institute of Health [16] and finally renounced his own studies as meaningless [17]. For one experiment, he suffocated monkeys for five minutes at a time, using proportionately more smoke than the average user inhales in an entire lifetime [18]. The other studies that claim sensational health risks are also suspect, since they lack controls and produce results which cannot be replicated or independently verified [19].

10 Q. What Can I Do About Marijuana?

A. No independent government panel that has studied marijuana has ever recommended jail for users [20]. Concerned persons should therefore ask their legislators to re-legalize and tax this plant, subject to age limits and regulations similar to those on alcohol and tobacco.

For More Information, Write:

Family Coucil on Drug Awareness
P.O. Box 71093, LA CA 90071-0093

Footnotes:

1. The same plant, known as hemp, has an estimated 50,000 non-drug commercial uses including paper, textiles, fuels, food and sealants, but these uses are also banned by existing laws. Sources: Encyclopedia Britannica, federal documents and historical records.

2. Coptic Christians, Rhastafarnians [sic], Shintos, Hinus, Buddhists, Sufis, Essenes, Zoroastrians, Bantus, and many other sects have traditions that consider the plant to have religious value.

3. Their personal correspondence and records reveal that U.S. Presidents Jefferson, Madison, Monroe, and others smoked hashish, as did Benjamin Franklin and Mary Todd Lincoln. President John F. Kennedy is also reported to have smoked marijuana to relieve his back pain. Many of America's greatest leaders and Founding Fathers (including George Washington) were hemp farmers. Sources: National Archives, published reports.

4. Archeologists report that cannabis was possibly the first plant cultivated by humans - about 8000 B.C. - and was used for linen, paper, and garments. Source: Columbia University, _History of the World_. It was being smoked in China and India as early as 2700 B.C.

5. Turkish smoking parlors were popular in both Europe and America. as well as the Middle and Far East, as recently as the turn of the Century.

6. The exhaustive Indian Hemp "Raj" Commission report (1986) by British authorities found no reason to restrict its use. But the notorious yellow journalist William Randolph Hearst fabricated and published horror stories about marijuana that were eventually investigated and shown to be lies, but not until long after the marijuana prohibition was enacted in 1938. Source: Larry Sloman,

Reefer Madness.

7. Laws against marijuana were passed a year after the invention of a machine to harvest and process hemp so it could compete commercially against businesses owned by Hearst, the DuPonts and other powerful families. Source: Jack Herer, _The Emporor Wears No Clothes_.

8. Marijuana does not lead to physical dependency. Costa Rican Study, 1980; Jamaican Study, 1975; Nixon Blue Ribbon Report, 1972, et. al.

9. Source: Psychology Today, Newsweek, et.al.

10. Source: All univerity medical studies: UCLA, Harvard, Temple, etc.

11. Costa Rican Study, 1980; Jamaican Study, 1975; "The legal drugs for adults, such as alcohol and tobacco...precede the use of all illicit drugs." Source: National Academy of Sciences.

12. The FBI reports that 65-75% of criminal violence is alcohol related. "Pacifist syndrome" testimony was given by Federal Bureau of Narcotics Director Harry Anslinger before Congress (1948). However, the "Siler" Study

conducted by the U.S in Panama (1931) reported "no impairment" in military personnel who smoked marijuana while off duty.

13. "The only clinically significant medical problem is that scientifically linked to marijuana is bronchitis. Like smoking tobacco, the treatment is the same: stop smoking." Source: Dr. Fred Oerther, M.D.

14. Coptic study (UCLA), 1981; "There is not yet any conclusive evidence as to whether prolonged use of marijuana causes permanent changes in the nervous system or sustained impairment of brain function and behavior in human beings." Source: National Academy of Sciences. Source: Dr. Tod Mikuriya, _Marijuana Medical Papers_. Marijuana could replace at least 10-20% of prescribed drugs now in use. Source: Dr. Raphael Mechoulam. Marijuana was a major active ingredient in 40-50% of patent medicines before its ban.

16. 1976

17. 1983

18. The U.S. Government reports that the oral dose of cannabis required to kill a mouse is about 40,000 times the

dose required to produce symptoms of intoxication in man. Source: Lowe, _Journal of Pharmacological and Experimental Therapeutics_, Oct. 1946.

19. In another famous study, Heath/Tulane (1974), wild monkeys were brutally captured, then virtually suffocated in marijuana smoke over a period of 90 days. Source: National Institute of Health.

20. Examples: the "LaGuardia" Committee Report (New York, 1944) and President Richard Nixon's Blue Ribbon "Shafer" Commission (1972).

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