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Cannabis as Plant and Product

Marijuana is subject to numerous misconceptions and confusion. There is disagreement on some basic issues, such as how the cannabis plant grows, how it interacts with the body, where it comes from, and how long it has been in use. Before jumping into a discussion of marijuana policy, it is important to dispel these misconceptions regarding the plant and its products.

Some popular misconceptions include that marijuana is easy to grow, that it can grow under almost any conditions, and that it's pretty much the same everywhere. You grow it, pluck its flowers, dry them, wrap them in rolling paper, and smoke it, and there you have it, your weed, or pot, or Mary Jane. In reality the cannabis plant is biologically complex, and the production of marijuana is not as simple as many people believe.

In addition, marijuana has changed over time with innovations in growing, harvesting, and generating products. Marijuana is no longer something you pack into a bowl, roll in a joint, smoke in a bong, or lace into some brownies. It's now a diverse consumer product available in many forms.

The Cannabis Plant

Members of the *Cannabis* genus are leafy, flowering plants that are native to Central Asia but have been transported and grown throughout the world. The plant has been around for millions of years in some form and has been used by humans for at least 5,000 years.[1] It tends to be robust and grows effectively in both natural and controlled agricultural settings. Cannabis has been described as "a rapidly growing dioecious (male and female reproductive organs on different plants), wind pollinated, annual herb that in some plant selections can reach heights of 20 feet."[2] Historically botanists have disagreed as to the number of species in the genus *Cannabis,* but there is now general agreement that the three principal *Cannabis* species are *C. sativa, C. indica,* and *C. ruderalis*. Each has its own distinct look, chemical characteristics, and uses.

Cannabis plants grow quickly and can be harvested on accelerated timelines, particularly in controlled agricultural settings. Depending on the species and strain, cannabis has five, seven, or sometimes nine leaves that are dark green and sometimes purple-hued. The plant produces a flower at the tip of the stem and the base of the leaves. The flowers—or bud—have the most powerful concentration of the chemicals that produce an effect on the brain; they are harvested to produce the drug marijuana, particularly when it's consumed in the most traditional way: smoked. How-

ever, other parts of the plant also contain some of the same chemical components, called cannabinoids, which can be psychoactive or nonpsychoactive. So all of the plant's parts are harvested in commercial production in order to extract cannabinoids.

The drug marijuana is not the only product produced from cannabis. Hemp fibers are produced from specific cannabis plants that are low in cannabis's main psychoactive chemical, tetrahydrocannabinol (THC). Hemp stalks can produce strong, fibrous material used for clothing, lines and sails for ships, and other purposes. Its seeds are used as a protein-rich food, and from those seeds oils are extracted that can be used for cooking or other uses. Hemp can also be purposed for use as a biofuel. During certain periods of American history, hemp growth was encouraged or even required because of its versatility and usefulness, particularly in wartime.

Different cannabis varieties grow better under different conditions. Some prefer warmer climates whereas others can survive in colder conditions farther north. One of the most critical aspects of growing cannabis is the light cycle. Different varieties have different requirements for light and dark in order to maximize and facilitate growth:

> If vegetative growth conditions are favorable, the stem will increase in height by two inches per day when exposed to the long daylight of summer. While some selections of Cannabis are day-neutral (flower under any day length), most are classified as short-day plants (they need a long dark period, usually fourteen hours or more) and shift from vegetative to generative (reproductive) growth upon exposure to short daylight periods.[3]

This sensitivity to light and dark signals two important facts about cultivating cannabis. First, it's not as easy to cultivate cannabis as the moniker "weed" would suggest. Despite cannabis's robustness, it can also be sensitive to growing conditions. Second, because certain varieties of cannabis can require extended periods of darkness to maximize the growth and generative phases, the plant lends itself to indoor-grow environments in which periods of light and dark can be strictly controlled.

Water is another area where cannabis has specific requirements. The amount of water and the water's acidity levels and nutrient balances are critical. Although cannabis can grow under a variety of conditions, if a grower wishes to maximize a plant's productivity and ensure that its chemical composition is consistent and true to its strain (an important aspect of cannabis grown commercially for the production of marijuana), success requires research, care, frequent attention, and horticultural and agricultural know-how.

Cannabis Species

The two most common species of cannabis are *sativa* and *indica* and are typically used in the production of marijuana. Strains of these two species are rich in THC and are used for both medicinal and recreational marijuana. A third, lesser-known species, *ruderalis,* tends to have much lower levels of THC. Although cannabis can be grown as a "pure" species—*sativa*-only or *indica*-only—an entire cottage industry has emerged around marijuana genetics, which involves the cross-pollination or cross-breeding of different strains and even different species of cannabis to produce new hybrid strains. Much of the genetic diversifi-

cation is driven by the desire to satisfy consumer tastes, as different combinations offer the user different experiences.

For instance, it's commonly said that "*sativa* gets you high; *indica* gets you stoned." This reflects the user experience whereby *sativa* strains produce a euphoric feeling, whereas *indica* strains are more mellow and relaxing. The combinations of different species, different strains, or both create many types of chemical combinations and lead to a wide array of experiences, feelings, and responses. Strains have been developed to increase a user's energy, stimulate the appetite, relax the body, give someone the giggles, suppress the appetite, or help the user focus.

The development of new strains and thus new experiences sometimes happens by accident, but it also emerges from intensive efforts around plant genetics. Research in cannabis genetics occurs in laboratory settings—the scientific pursuit of the perfect high—and also in less formal settings. Individuals who pride themselves as experts or pioneers in this endeavor—working around the world, but particularly in Canada, California, Colorado, and the Netherlands—are producing some of the most sought-after strains.

The three species also differ physically. *Indica* plants tend to be shorter, stockier plants, whereas *sativa* plants can grow to significant heights. The stems of *sativas* are a bit more firm, so hemp is derived from these plants. *Ruderalis* plants tend to be the smallest of the cannabis group in height and girth. This species also tends to be less potent because of years of natural cross-breeding in its native Central Russia.[4] It functions more like a wild cannabis, whereas *indica*, *sativa*, and their hybrids are usually produced under very controlled environments.

The diverse characteristics of cannabis plants and their

specific needs as an agricultural product suggest how much time and thought must be committed to ensure cultivation expertise. I have provided only a glimpse of the technical requirements of growing marijuana. In "Cannabis Grow Revolution," Danny Danko details the numerous considerations that a cannabis cultivator faces.[5] He explores hydroponic growing methods, soil requirements, fertilization, pest control, and the choice between indoor and outdoor cultivation. Danko details why cultivating cannabis properly to produce high-quality marijuana is an art.

Cannabinoids

Few people are familiar with the word "cannabinoid," but every person who has used marijuana has experienced its effects. Cannabinoids are chemical compounds found in the cannabis plant that interact with the human body in ways that cause specific sets of reactions. Whatever one feels when using marijuana—excited, mellow, funny, confident, paranoid, hungry, pain-free—is caused by the effect that cannabinoids have on the brain.

Cannabis plants contain dozens of these chemicals, but just one or two are commonly known: tetrahydrocannabinol (THC) and cannabidiol (CBD). THC and CBD are prominent in commercialized marijuana: dispensaries in marijuana-legal states often list the percentages of each in a product. THC is the psychoactive component that most users want and that contributes to making the user feel high. CBD, on the other hand, is often associated with medical marijuana, especially in the treatment of conditions such as epilepsy. CBD has been found to have anticonvulsive and antispastic properties that can relax muscles and regulate the brain in ways that can prevent minor and

major seizure events. CBD has a variety of qualities, including anti-inflammatory and other properties. The precise combination of THC, CBD, and the more than sixty other identified cannabinoids work together to create the type of effect one gets from using marijuana.

The way cannabinoids interact with the human body is quite interesting and is actually a modern medical discovery. In 1988 a pharmacology researcher named William Devane and his colleagues discovered something interesting: the human body is built to smoke pot. Well, maybe not exactly. But it is built to be receptive to the effects of pot. There are receptors in the brain and elsewhere that are sensitive to cannabinoids and produce, or hinder, chemical responses in reaction to the presence of cannabinoids. This system was dubbed the endocannabinoid system. What's more, subsequent researchers identified "endogenous cannabinoids," which are molecules that the human body produces naturally and that interact with endocannabinoid receptors. When external cannabinoids such as THC or CBD from the cannabis plant are present, they work with the endogenous molecules and the body's own receptors to produce a variety of effects within the human body.[6]

It is not fully known how the human body reacts to or benefits from these chemicals. Research shows that the endocannabinoid system can produce neuroprotective responses that can assist in dealing with seizures or brain injuries. It can assist in blunting pain receptors. The chemicals have an impact on the biological processes that cause anxiety. Additional and ongoing research, which are needed now more than ever, will help the scientific community better understand cannabinoids and the responses of the endocannabinoid system. Such research will become more likely as more and more responsible, innovative en-

trepreneurs are allowed to operate within a strict regulatory environment.

Marijuana Strength

The strength or potency of marijuana is measured by how rapidly the body takes up the chemicals and how intensely the user feels their effects. The strength of marijuana is an interesting concept. Anyone who has used marijuana multiple times has likely encountered "strong stuff," which typically refers to marijuana that gets you high faster or has a stronger effect. This effect is typically measured by the level of THC, the main psychoactive chemical compound in marijuana. Higher levels of THC can cause more intense effects or speed up the desired effect.

Marijuana, particularly smoked marijuana, has a self-regulating effect because the onset of the psychoactive experience is so rapid that the smoker is quickly satisfied and is not motivated to continue to smoke. This differs from the common experience with alcohol, where large quantities can be consumed before the full effects are felt, at which point one may have drunk too much.

The rise of marijuana edibles, however, particularly in marijuana-legal states, has posed challenges for both self-regulation and the consistent experiences of users. Marijuana edibles come in many countless forms, including cookies, brownies, candies, granola, salad dressing, and even pasta sauce. Edibles on the commercial market often come with significant amounts of THC because one unit—a single candy bar or cookie—may contain multiple servings. In Colorado, for example, a standard edible serving has 10mg of THC. Some products for purchase contain five or ten servings, which amounts to 50mg or 100mg of THC.

The onset of edible marijuana's psychoactive effects is dramatically slower than that of smoked marijuana—sometimes thirty minutes to an hour or more. Because of this delay, users—especially naïve users—can overconsume, believing the edible is weak. This can cause unpleasant effects and a very intense high when all of the THC is absorbed. This has come to be called the "Maureen Dowd effect," after the *New York Times* columnist who famously and irresponsibly overconsumed marijuana edibles in Colorado, had a bad reaction, and wrote about it in her column, blaming the products rather than the consumer.[7] In this case, the product is not "stronger." Instead, the product is overconsumed.

Some argue that marijuana has gotten much stronger over time, but this claim is controversial. Dr. Mahmoud ElSohly, a researcher at the University of Mississippi and one of the nation's leading experts on the cannabis plant and the effects of marijuana, runs the only marijuana grow operation approved by the federal government. Part of his job is also to test the strength of marijuana seized by federal law enforcement agents. He notes that since 1970, the THC content of seized marijuana has increased from an average of around 3 percent to around 7 to 8 percent in the late 2000s.[8] Recent evidence suggests that this figure now averages about 13 percent THC.[9]

ElSohly's findings, however, do not tell the whole story about changes in the strength of marijuana. His research tells us only about the strength of *seized* marijuana. The reality is that as states have legalized marijuana, cannabis genetics have taken off and entrepreneurs have invested in development and become more innovative. And consumer tastes for stronger marijuana have had genuine market effects—legal marijuana varieties can be quite strong.

Street weed in 2016 may be slightly stronger than it was in 1970, but the commercial product can be quite a bit stronger. In marijuana-legal states, some strains have a THC content higher than 20 percent. The black market just has to deliver marijuana; the legal market must meet consumer demand.

Delivery Systems: The New World of Marijuana Products

If you have used marijuana from an illegal source and have never bought it in a legal medical or recreational market, your familiarity with marijuana probably extends to smoking it and eating brownies laced with pot. You may be unfamiliar with just how many different marijuana products are out there. The variety now available is a real testament to American entrepreneurialism and innovation.

Most people are introduced to marijuana by smoking it, and smoking remains the most common "delivery system," or method of consumption. By harvesting flowers from the cannabis plant, drying them, grinding them, and burning them, users can inhale the THC-rich smoke and be fast on their way to getting high. The vehicle for smoking can vary and include a joint, a blunt, a pipe, a bong, among others. The effects of marijuana are felt quite quickly, as the lungs absorb the cannabinoids in the smoke and quickly transfer them to the bloodstream and then to the brain. There the endocannabinoid system works its magic.

There are some drawbacks to smoking. First, it can cause irritation of the throat. Anyone who makes a first attempt to smoke pot or inhales their first hit in a long time can feel the smoke burning the bronchial passages. Second, smoking pot produces secondhand smoke, which may or

may not cause a contact high, but in either case may be undesirable to those affected. Third, long-term use of smoked marijuana is associated with bronchial irritation and an increased likelihood of respiratory infections (most medical evidence suggests that smoking pot does not increase the incidence of pulmonary cancer). Fourth, advocates of medical marijuana are concerned that the Food and Drug Administration will never approve smoked marijuana as a pharmaceutical because smoking itself is harmful to health.

Despite all of these issues, marijuana flower remains the most popular marijuana product and smoking remains the most widely used method.

Edibles are another common delivery vehicle for marijuana. Users who produce edibles at home infuse food products with marijuana. Typically, marijuana flower is sautéed or simmered in a fat (butter or oil, as the chemical components are fat soluble), and the infused fat is used as part of a recipe. Brownies, cookies, and other sweets are a popular way to eat marijuana, but the legal market has produced a wider variety of premade edibles, as mentioned earlier.

Essentially, a cannabis culinary professional can infuse just about anything you want to eat with THC. The market for edibles has grown dramatically. The flavor can be a delight, eating these products can be discreet (even making it possible to covertly consume them in public where public use is illegal), and there are none of the secondhand effects produced by smoking. For marijuana tourists staying in hotels that ban smoking, edibles provide an avenue to enjoy marijuana without having to hand over a cleaning fee to the clerk at the front desk.

Edibles can be misused (overconsumed), but seasoned consumers largely avoid such trouble. Another legitimate

concern with edibles is accidental ingestion by children or by adults who do not know a food product is infused with THC. Despite those risks, edible marijuana products are becoming a significant portion of the consumer market.

In addition to products designed for smoking and eating are a significant number of marijuana-based technologies that, while not invented recently, are new to a lot of American consumers. One that is rapidly growing in popularity is "vaping," which is similar to smoking but involves the ingestion of vaporized marijuana. There is no smoke and no burning of the product. It is less harsh on the lungs and has no secondhand effects. Vaping usually involves a mechanized, often battery-powered device that looks like a pen or (ironically) a Breathalyzer and that can heat either flower or oil extracts of cannabis. The contents are heated to a high enough temperature to bond with water vapor, but not high enough to combust. The burning process involved in smoking can reduce the amount of THC and other cannabinoids that can be ingested. More of the cannabinoids are preserved by avoiding combustion and using vaporization as a means of ingestion. In marijuana-legal states, vaping is growing in popularity because it remains a bit more discreet than smoking, can be ingested more slowly with reduced loss of product compared to burning, and allows the user to avoid the lingering scent in the air and on clothing that are characteristic of smoking.

Similar to smoking or vaping is "dabbing," or consuming ultra-concentrated extracts, or dabs, from marijuana. Usually a waxy resin or oil that is very high in THC content is either burned or vaporized, emitting a potent blast of inhalable product. Dabbing requires a "dab rig," which often looks like a less sophisticated bong. Using a dab rig involves heating a surface, such as a ceramic or metal plate,

and touching the dab to that heated surface (holding it with a nail or some long tweezer) while the user inhales. (The legal market has driven product innovation in all areas, including dab rigs to create sophisticated, advanced, and visually appealing devices.) The user need not consume much, and the effect is fast and powerful. The benefit, particularly for medical patients seeking pain relief, is the rapid, potent onset of the effects. However, some people report that dabs are more potent than they wish. Others, even in a recreational setting, prefer the dabbing experience to standard vaping or smoking.

Then there are tinctures of marijuana, which are typically cannabinoid-laden oils that are administered orally via a dropper. Tinctures can be used recreationally by including significant levels of THC or they can be used medicinally using THC, CBD, or some balanced combination of the two. In this case, cannabinoids such as (most commonly) CBD, THC, tetrahydrocannabolic acid (THCA), cannabinol (CBN), and others are extracted from plant parts, purified, and often bonded with oil. Many of these cannabinoids are associated with the effective treatment of multiple conditions, but the anticonvulsive properties of cannabinoids make tinctures more common in the treatment of epilepsy-related conditions, especially in children, as well as multiple sclerosis, amyotrophic lateral sclerosis (ALS, also known as Lou Gehrig's disease), and other such illnesses.

Several other vehicles of delivery are more often associated with medical uses of cannabis than recreational uses. Cannabis in capsule form is common in states where the use of medical marijuana is legal, heavily regulated, and pharmaceutical in nature and where only a limited number of products is allowed. The technique does preserve some

of the optics of medicine for patients seeking a discreet means of taking the substance their doctors recommend.

Some patients use a variety of patches that transfer cannabinoids into the system in discreet ways, including transdermal patches. In addition to discretion, transdermal patches confer the benefit of a steady time release of cannabinoids into the system.

Another delivery means is the sublingual strip, which patients place behind the lip or under the tongue. Although this method does not provide the same time release that a transdermal strip does, it provides patients an additional discreet vehicle of delivery. Transdermal patches and sublingual strips can provide relief for patients who suffer from nausea, who prefer not to smoke, and whose nausea symptoms eliminate edibles as an option.

An entire volume would be needed to cover all of the cannabis-delivery products available for sale in the states that have some form of legalized marijuana. For medical or therapeutic purposes, ointments, creams, lip balms, salves, massage oils, moisturizers, and hundreds of other products exist. The development of ever more products is driven by both producers and consumers. Producers want to make "the next big thing" in marijuana—the product that strikes gold, goes viral, and makes its inventor rich. For consumers, the goal is basic: to get cannabinoids into their system in the most desirable and effective way possible. Those forces together have created a booming corporate industry that is pumping billions of legal dollars into the U.S. economy annually.

What's in a Name?

Throughout this book, I use the terms "cannabis" and "marijuana" somewhat interchangeably. At times, I use "cannabis" to describe the plant (*Cannabis sativa* or *C. indica*) and "marijuana" to describe the harvest of the cannabis plant and the consumer products derived from it. That choice is a personal one; the distinction has no formal basis, although I have read and heard others assert that the distinction should be maintained.

Those choices, however, mask a controversy that I feel must be addressed. Many individuals, especially those in the cannabis advocacy community, refuse to use the word "marijuana" and prefer to use "cannabis" exclusively. The level of commitment to that terminology became apparent to me at a 2015 conference on the topic where a speaker said he preferred "not to spell cannabis with an *m*." At first, I didn't get what he was saying, but then I realized he meant he refused to utter the word "marijuana."

The argument made by some who are opposed to the word "marijuana" is that it is a historically racialized term that has been promoted by scholars, government officials, and the media to turn public opinion against both the substance and entire groups of people. This statement is not far-fetched. Historically in the United States, words, music, products, and behaviors have been labeled in ways that explicitly or implicitly inject race into their usage. That racialization of language has affected African Americans and immigrant groups from Mexico, the rest of Latin America, Asia, Ireland, Italy, eastern Europe, and elsewhere. This book will, in part, tell that story.

Originally, "marijuana" (also spelled "marihuana") comes from Mexican Spanish, and in the early twentieth

century it was used as a colloquial or slang term to describe cannabis. However, during and especially after the Spanish-American War, American resentment toward Mexicans and Mexican immigrants exploded. Tensions, particularly along the southern border of the United States, were quite high and the response was predictable: media stories vilified entire groups of people, negative portrayals of Mexicans appeared in entertainment venues, and race-baiting language seeped into the rhetoric of politicians and government officials. Martin Lee notes in the prologue of *Smoke Signals* that the word "marijuana . . . was popularized in the United States during the 1930s by advocates of prohibition who sought to exploit prejudice against despised minority groups, especially Mexican immigrants."[10]

As Mexican immigrants streamed across the border, Americans were increasingly uncomfortable with their new neighbors. It was easy to heap blame on the new immigrants for a variety of problems in society, including crime. And one stereotype was "Mexicans using marihuana." Media outlets began reporting crimes committed by Mexican immigrants using that image. The change in language around the term "marijuana" was so stark that a National Public Radio report noted: "This disparity between 'cannabis' mentions pre-1900 and 'marihuana' references post-1900 is wildly jarring. It's almost as though the papers are describing two different drugs."[11]

This war of words was reflected not only in the public news media but also in official language. Government officials also gladly participated. Harry Anslinger was one such government official. As head of the Federal Bureau of Narcotics, Anslinger served as the nation's top drug cop from 1930 to 1962. His passion for drug prohibition was

fundamentalist. His racism was no secret. His words were laden with fear, vilification, and xenophobia.

In speeches around the country, testimony before Congress, and articles that he published in both the popular press and more serious journals, Anslinger made it his mission to outlaw drugs, and he wholeheartedly embraced "marihuana" for its "Mexican-ness" and its ability to serve the ends he sought. In one essay, Anslinger tells readers about marijuana's entry into American society and its effects: "Marijuana was introduced into the United States from Mexico, and swept across America with incredible speed. It began with the whispering of vendors in the Southwest that marijuana would perform miracles for those who smoked it. . . . They were not told that addicts may often develop delirious rage during which they are temporarily and violently insane; that this insanity may take the form of a desire for self-destruction or a persecution complex to be satisfied only by the commission of some heinous crime."[12] Anslinger goes on to list multiple brutal crimes, attributing each to the use of the scary weed from Mexico.

In addition to Anslinger, local police chiefs and district attorneys played an important role not just in pushing the word "marijuana" into common parlance but in slathering it in a coating of racial resentment. In 1931 the district attorney of Orleans Parish in Louisiana, Eugene Stanley, published an article in the *American Journal of Political Science* about the different groups that historically had been "marihuana" users, including Mexicans, Indians, Persians (a group called Assassins), Malays, and others.[13] Stanley goes on to note, "The underworld has been quick to realize the value of this drug in subjugating the will of human derelicts to that of a master mind. Its use sweeps away all

restraint, and to its influence may be attributed many of our present day crimes. . . . It has been indulged in by criminals so as to relieve themselves from the natural restraint which might deter them from the commission of criminal acts."[14]

These efforts by government officials are clear in their intent: to link marijuana to unknown, mysterious, or feared groups from other parts of the world, and to link marijuana use to lawlessness and serious criminal offenses. In effect, marijuana—not cannabis or hemp—was a scourge on society, brought to us by all the people we fear or should fear. The race baiting is obvious, and "marijuana" became the preferred term for those spewing xenophobic rhetoric.

The advocacy community's rejection of the term "marijuana" is based on a legitimate interpretation of the history of the term's use. Other authors and speakers who prefer to use "cannabis" are perfectly within their right. I understand fully their position, continue to respect the concerns of those who despise the term, and know this note will do little to justify my position or convince some of the legitimacy of my choice. I have chosen to use "marijuana" in this book—even in the title—because of contemporary uses of the term. It is mainstream; it is standard; it is the term Americans use almost universally when discussing cannabis and its products. There may well be people who still use the term as a means of invoking racialized language, but most Americans do not.