Hemp and Marijuana:
Myths & Realities

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Abstract

Surely no member of the vegetable kingdom has ever been more misunderstood than hemp. For too many years, emotion-not reason-has guided our policy toward this crop. And nowhere have emotions run hotter than in the debate over the distinction between industrial hemp and marijuana. This paper is intended to inform that debate by offering scientific evidence, so that farmers, policymakers, manufacturers, and the general public can distinguish between myth and reality.

Botanically, the genus *Cannabis* is composed of several variants. Although there has been a long-standing debate among taxonomists about how to classify these variants into species, applied plant breeders generally embrace a biochemical method to classify variants along utilitarian lines. *Cannabis* is the only plant genus that contains the unique class of molecular compounds called cannabinoids. Many cannabinoids have been identified, but two preponderate: THC, which is the psychoactive ingredient of *Cannabis,* and CBD, which is an antipsychoactive ingredient. One type of *Cannabis* is high in the psychoactive cannabinoid, THC**,** and low in the antipsychoactive cannabinoid**,** CBD. This type is popularly known as marijuana. Another type is high in CBD and low in THC. Variants of this type are called industrial hemp.

In the United States, the debate about the relationship between hemp and marijuana has been diminished by the dissemination of many statements that have little scientific support. This report examines in detail ten of the most pervasive and pernicious of these myths.

Myth: United States law has always treated hemp and marijuana the same.

Reality: The history of federal drug laws clearly shows that at one time the U.S. government understood and accepted the distinction between hemp and marijuana.

Myth**:** Smoking industrial hemp gets a person high.

Reality: The THC levels in industrial hemp are so low that no one could get high from smoking it. Moreover, hemp contains a relatively high percentage of another cannabinoid, CBD, that actually blocks the marijuana high. Hemp, it turns out, is not only not marijuana; it could be called "antimarijuana."

Myth**:** Even though THC levels are low in hemp, the THC can be extracted and concentrated to produce a powerful drug.

Reality: Extracting THC from industrial hemp and further refining it to eliminate the preponderance of CBD would require such an expensive, hazardous, and time-consuming process that it is extremely unlikely anyone would ever attempt it, rather than simply obtaining high-THC marijuana instead.

Myth: Hemp fields would be used to hide marijuana plants.

Reality: Hemp is grown quite differently from marijuana. Moreover, it is harvested at a different time than marijuana. Finally, cross-pollination between hemp plants and marijuana plants would significantly reduce the potency of the marijuana plant.

Myth: Legalizing hemp while continuing the prohibition on marijuana would burden local police forces.

Reality: In countries where hemp is grown as an agricultural crop, the police have experienced no such burdens.

Myth: Feral hemp must be eradicated because it can be sold as marijuana.

Reality: Feral hemp, or ditchweed, is a remnant of the hemp once grown on more than 400,000 acres by U.S. farmers. It contains extremely low levels of THC, as low as .05 percent. It has no drug value, but does offer important environmental benefits as a nesting habitat for birds. About 99 percent of the "marijuana" being eradicated by the federal government-at great public expense-is this harmless ditchweed. Might it be that the drug

enforcement agencies want to convince us that ditchweed is hemp in order to protect their large eradication budgets?

Myth: Those who want to legalize hemp are actually seeking a backdoor way to legalize marijuana.

Reality: It is true that many of the first hemp stores were started by industrial-hemp advocates who were also in favor of legalizing marijuana. However, as the hemp industry has matured, it has come to be dominated by those who see hemp as the agricultural and industrial crop that it is, and see hemp legalization as a different issue than marijuana legalization. In any case, should we oppose a very good idea simply because some of those who support it also support other ideas with which we disagree?

Myth: Hemp oil is a source of THC.

Reality: Hemp oil is an increasingly popular product, used for an expanding variety of purposes. The washed hemp seed contains no THC at all. The tiny amounts of THC contained in industrial hemp are in the glands of the plant itself. Sometimes, in the manufacturing process, some THC- and CBD-containing resin sticks to the seed, resulting in traces of THC in the oil that is produced. The concentration of these cannabinoids in the oil is infinitesimal. No one can get high from using hemp oil.

Myth: Legalizing hemp would send the wrong message to children.

Reality: It is the current refusal of the drug enforcement agencies to distinguish between an agricultural crop and a drug crop that is sending the wrong message to children.

Myth: Hemp is not economically viable, and should therefore be outlawed.

Reality: The market for hemp products is growing rapidly. But even if it were not, when has a crop ever been outlawed simply because government agencies thought it would be unprofitable to grow?

Hemp and Marijuana

Myths & Realities

A Botanical and Biochemical Introduction

Hemp. Has there ever been a plant so fraught with confusion and controversy? The word itself carries a confusing history. "Hemp" was for medieval Europeans a generic term used to describe any fiber [1]. With European expansion, fiber plants encountered during exploration were commonly called "hemp." Thus we have a bewildering variety of plants that carry the name hemp: Manila hemp (abacá, *Musa textilis*), sisal hemp (*Agave sisalana*), Mauritius hemp (*Furcraea gigantea*), New Zealand hemp (*Phormium tenax*), Sunn hemp (*Crotalaria juncea*), Indian hemp (jute, *Corchorus capsularis* or *C. clitorus*), Indian hemp (*Apocynum cannabinum*), bow-string hemp (*Sansevieria cylindrica*) [2].

This botanical confusion was compounded by the introduction of a new word to describe hemp-marihuana (now commonly written "marijuana"). The word was first coined in the 1890s, but was adopted by the Bureau of Narcotics in the 1930s to describe all forms of *Cannabis* and to this day U.S. drug enforcement agencies continue to call the plant marijuana without regard to botanical distinctions. Indeed, a recent conference held in

Jefferson City, Missouri and sponsored by Drug Watch International and the Drug Enforcement Administration was entitled, "Marijuana: Myths, Concerns, Facts"-yet much of the discussion concerned industrial hemp and the legal products made from it.

The conflation of the word "marijuana" and the word "hemp" has placed a heavy burden on public policymakers. Many believe that by legalizing hemp they are legalizing marijuana. Yet in more than two dozen other countries, governments have accepted the distinction between the two types of *Cannabis* and, while continuing to penalize the growing of marijuana, have legalized the growing of industrial hemp. The U.S. government remains unconvinced.

To understand the difference between hemp and marijuana, let's begin with two botanical analogies: field corn and sweet corn; breadseed poppies and opium poppies.

Field Corn and Sweet Corn

For crops less encumbered by polemic than hemp is, functional distinctions among varieties are commonly recognized. Consider the case of field corn and sweet corn. The untrained observer cannot tell the different varieties apart just by looking, Both belong to the genus *Zea mays*. But if a grocer attempted a substitution, he would hear complaints. Your average consumer will recognize the difference. And when sweet corn is planted too near field corn**,** the resulting cross-pollination reduces the sweetness of the former. Companies like Green Giant that grow huge acreages of sweet corn for canning go to great lengths to ensure that an adequate distance separates their fields from corn destined for the grain elevator, or they grow the different varieties at different times. Either way**,** pollen carrying the dominant gene for starch synthesis is kept clear of cornsilks borne on plants of the recessive (sweet) variety.

Commercial producers of planting seed of either variety are very careful to preserve the genetic integrity of their lines from contamination by other varieties. Their genetic resources are assemblages of optimized characteristics-yield, disease resistance, maturity-created through substantial research investment. Breeders of these crops rigorously ensure that their breeding stocks do not become contaminated by the other type**,** as this would result in a serious decline in the quality factors each tries to enhance.

This botanical distinction is reflected even in the academic disciplines that deal with corn. Go to a midwestern land grant university's agriculture college and ask to speak to a plant breeder about sweet corn and you will be sent to the horticulture department; for field corn you will be directed to the agronomy department.

A similar situation exists with respect to poppies, the popular garden flower of which there are dozens of variants. Recently the U. S. Drug Enforcement Administration has been cracking down on one specific poppy variety grown in backyards for many years, because it says that opium can be extracted from it. Yet the DEA still considers it legal for gardeners to continue to cultivate the many other varieties of *Papaver somniferum*, even though these are not botanically distinct from the poppy variety that has been outlawed. In similar fashion, the so-called "breadseed poppy" is also a member of the same species, yet the Controlled Substances Act specifically sets aside the poppy seed because of the culinary market [3].

With corn and poppies, we can understand the distinctions among varieties and strains. Until recently, as we shall see, the federal government also recognized the distinctions

among the different varieties of *Cannabis*.

Now let's move from analogy to the real thing by examining in more detail the genus *Cannabis*.

The Genus *Cannabis*: Taxonomy and Biochemistry

Scientists who were the first to study the genus *Cannabis* clearly discerned different species. The father of plant taxonomy, Linnaeus, officially designated the *Cannabis* genus in 1753 when he founded the binomial system of botanical nomenclature still used today [4]. Linnaeus added the "sativa" appellation (literally, "sown" or "cultivated," i.e., used in agriculture), indicating the utilitarian nature of the plant. Since his time numerous attempts have been made for a coherent taxonomy of *Cannabis*. Species designations have come and gone [5].

In 1889, botanist and plant explorer George Watt wrote about the distinction between types of *Cannabis*: "A few plants such as the potato, tomato, poppy and hemp seem to have the power of growing with equal luxuriance under almost any climatic condition, changing or modifying some important function as if to adapt themselves to the altered circumstance. As remarked, hemp is perhaps the most notable example of this; hence, it produces a valuable fibre in Europe, while showing little or no tendency to produce the narcotic principle which in Asia constitutes its chief value."[6]

Dr. Andrew Wright, an agronomist with the University of Wisconsin's Agriculture Experiment Station and steward of the Wisconsin hemp industry during the first half of the twentieth century, wrote in 1918, "There are three fairly distinct types of hemp: that grown for fiber, that for birdseed and oil, and that for drugs." [7]

Although these early analysts discerned clear differences among hemp types, taxonomists have had a difficult problem in deciding how to reflect those differences [8].

The key *Cannabis* species problem derives from the fact that there is no convenient species barrier between the varying types that would allow us to draw a clear line between them. In taxonomy, often the delineating line between species is that they cannot cross-breed. But disparate types of *Cannabis* can indeed produce fertile offspring, not sexually dysfunctional "mules."

Consequently, a debate has raged within botanical circles as to how many species the genus contains. At this time botanists generally recognize a unique family of plants they call "Cannabaceae," under which are classified the genus *Cannabis* and its closest botanical relative, *Humulus*, which contains the beer flavoring, hops [9]. The prevailing opinion currently recognizes three species*: C. sativa*, *C. indica*, and *C. ruderalis*. [10] "Industrial" types fall exclusively within *C. sativa*, although all *Cannabis* plants contain stem fiber and can have multiple uses in primitive societies where they are indigenous.

Recent analytical advances are leading many scientists to believe that a more accurate and satisfying way to differentiate the different forms of *Cannabis* would be by their biochemical composition.

Cannabis is the only plant genus in which can be found the unique class of molecules known as cannabinoids. *Cannabis* produces two major cannabinoids-THC (delta-9 tetrahydrocannabinol) and CBD (cannabidiol), and several other minor cannabinoid compounds.

THC is responsible for the psychoactive effect [11]. That was demonstrated conclusively in the 1960s. CBD, on the other hand, has recently been shown to block the effect of THC in the nervous system.

Cannabis strains of the type used for industrial purposes have relatively high levels of CBD versus THC. Drug strains are high in THC and low to intermediate in CBD [12]. Smoking hemp, high in CBD and very low in THC, actually has the effect of preventing the marijuana high [13]. Even when the amount of THC in a sample is as high as 2 percent, the psychological high is blocked by as little as 2 percent CBD [14].

Cannabis with THC below 1.0 percent and a CBD/THC ratio greater than one is therefore not capable of inducing a psychoactive effect. Hemp, it turns out, is not only not marijuana, it could be called "antimarijuana."

The balance of cannabinoids is determined by the genetics of the plant. That it is a stable characteristic of a given genotype (i.e., the individual's specific genetic complement) was demonstrated by Dr. Paul Mahlberg of Indiana University-Bloomington [15]. In other words, plants do not capriciously alter their cannabinoid profile.

Thus, using the chemotype approach, *Cannabis* variants can be classified on the basis of their THC-CBD balance. This is accepted by a growing number of scientists. Gabriel Nahas, M.D., Ph.D., writes, "One should still distinguish two principal large groups of varieties of *Cannabis sativa*, the drug type and the fiber type. In addition to this classical distinction of these two groups, botanists generally accept description consisting of three chemical types: (a) the pure drug type, high THC content (2-6 percent) and lacking CBD[cannabidiol]; (b) the "intermediate type" (predominantly THC); and (c) the fiber type (THC<0.25 percent)." [16]

Dr. Mahmoud ElSohly, Director of the National Institute on Drug Abuse Marijuana Project at the University of Mississippi-Oxford, which analyzes *Cannabis* samples sent in by law enforcement agencies, explained to the author [17] that his group is currently reevaluating the data collected since the 1960s. They are taking a new approach that classifies any sample with less than 1.0 percent THC and a CBD-to-THC ratio greater than one as "ditchweed," in order to have a proper discrimination among the samples. This was never done for the data on which the claims of great potency increase are based, from pre-1983 samples. Interestingly, this same threshold-

THC less than 1 percent and the ratio of CBD to THC greater than one

-is a prescription for industrial hemp.

Current hemp varieties grown in Canada and Europe are certified to have THC levels below 0.3 percent. The certification system originally developed in Europe to allow for the commercialization of industrial hemp considered the ratio of CBD to THC as well as the absolute percent THC. The original THC threshold was 0.8 percent. When varieties with lower levels of THC were developed by French breeders, the breeders were able to persuade the European Union to reduce the tolerance further, giving the French until recently a *de facto* monopoly of hemp seed varieties sold in the European Union.

In the United States, *Cannabis* with any detectable trace of THC is illegal. CBD is not considered at all.

Exposing the Myths

Much of the rest of the world quickly and relatively easily moved beyond the debate about hemp and marijuana to focus on how best to reintroduce a crop that at one time was the world's best selling fiber. In the United States we are still paralyzed by our belief that industrial hemp is a drug crop. This belief has been nurtured by the dissemination of much misinformation. Here we shall shed some scientific light on ten of the most widespread and dark myths about the relationship of marijuana and hemp.

Myth: U.S. law has always treated hemp and marijuana the same

Reality: U.S. drug laws offer clear evidence that the U.S. government at one time understood and accepted the distinction between marijuana and hemp.

The 1937 Marijuana Tax Act defined marijuana as: "(A)ll parts of the plant *Cannabis sativa* L., whether growing or not; the seeds thereof; the resin extracted from any such plant; and every compound, manufacture, salt, derivative, mixture, or preparation of such plant, its seeds, or resin; but shall not include the mature stalks of such plant, fiber produced from such stalks, oil or cake made from the seeds of such plant, any other compound, manufacture salt, derivative, mixture, or preparation of such mature stalks (except the resin extracted therefrom), fiber, oil, or cake, or the sterilized seed of such plant which is incapable of germination." [18]

The Marihuana Tax Act was proposed by the Treasury Department, a division of which was the Bureau of Narcotics. In support of the bill, Assistant General Council Clinton Hester testified: "The form of the bill is such . . . as not to interfere materially with any industrial, medical or scientific uses which the plant may have. Since hemp fiber and articles manufactured therefrom are obtained from the harmless mature stalk of the plant, all such products have been completely eliminated from the purview of the bill by defining the term "marijuana" in the bill, so as to exclude from its provisions the mature stalk and its compounds or manufacturers."

Hester went on to add: "There are also some dealings in marihuana seeds for planting purposes and for use in the manufacture of oil which is ultimately employed by the paint and varnish industry. As the seeds, unlike the mature stalk, contain the drug [later shown to be untrue-dpw], the same complete exemption could not be applied in this instance. But this type of transaction, as well as any transfer of completed paint or varnish products, has been exempted from transfer tax." [19]

Harry J. Anslinger, Commissioner of the Federal Bureau of Narcotics (the predecessor to the Drug Enforcement Administration (DEA)), told the Senate Committee that those in the domestic hemp industry "are not only amply protected under this act, but they can go ahead and raise hemp just as they have always done it."

After the passage of the Marihuana Tax Act, during World War II, the federal government launched an aggressive "Hemp for Victory" campaign. U.S. armed forces had relied on abacá, Manila hemp, imported from the Philippines, for rope, canvas, uniforms, and other products. After the Philippines fell to Japanese forces in 1942, the Department of Agriculture and the U.S. Army urged farmers to grow hemp. Without any change in federal law, more than 400,000 acres of hemp were cultivated in the United States between 1942 and 1945, aided by the War Hemp Industries Corporation, which built 42 hemp mills in the Midwest [20]. The last commercial hemp fields were planted in Wisconsin in 1957.

In 1961 the U.S. became a party to the United Nations Single Convention on Narcotic Drugs

[21]. That Convention expressly recognized the distinction between marijuana and industrial hemp, exempting the latter from coverage. "This Convention shall not apply to the cultivation of the *Cannabis* plant exclusively for industrial purposes (fiber and seed) or horticultural purposes." [22]

The United Nations Convention Against Illicit Traffic in Narcotic Drugs and Psychotropic Substances (1990, supplement to the UN Single Convention on Narcotic Drugs) did not concern itself with such botanical aspects of the *Cannabis* plant as THC [23]. The terms of this treaty concerned the use to which the plant is put. As such, this treaty does not constrain its signatories' freedom to allow industrial hemp agriculture. Canada, Australia, the United Kingdom, Germany, Austria-all countries with expanding hemp acreage-are signatories to this convention.

In 1970, the Comprehensive Drug Abuse Prevention and Control Act repealed the Marihuana Tax Act but incorporated verbatim that Act's definition of "marihuana."

"The term 'marihuana' means all parts of the plant *Cannabis sativa* (L.), whether growing or not, the seeds thereof, the resin extracted from any part of such plant; and every compound, manufacture, salt, derivative, mixture, or preparation of such plant, its seeds or resin; . . ." [24]

The key difference was that, while the 1937 Act used a system of taxation and disclosure that allowed the government to penalize marijuana growers without punishing industrial hemp growers, the 1970 Act abolished the taxation approach and effectively made all *Cannabis* cultivation illegal, except where the DEA issued a limited-use permit, by setting zero tolerance for THC.

There is no indication that, in the debate about the 1970 law, the implications of its passage on the future of industrial hemp were ever considered. By that time the domestic industrial hemp industry had disappeared, and there were no farmers to argue its case.

Despite the 1970 narcotics act, which resulted in the lumping together of marijuana and hemp, the federal government continues to make a distinction between the two plants. For example, in 1994, by Executive Order, the President of the United States designated hemp as a strategic crop of importance to national security [25].

Hemp is legally grown by 29 countries around the world at present, with almost half of these having made hemp cultivation legal only in the last few years. In 1996 world hemp production was about 100,000 metric tons. Four-fifths of this total was grown in China, Russia, and Korea [26]. Each year the U.S. government identifies those countries that it considers to be drug-exporting nations. None of the major hemp-growing and -exporting nations has ever been listed.

The legal history is clear. The federal government has long recognized the distinction between hemp and marijuana. This distinction is codified in numerous domestic laws and statutes and in international treaties to which we are a party. The DEA has it in its authority to recognize this history and to drop hemp from its narcotics schedule. Instead the DEA, unlike its predecessor, the Bureau of Narcotics, is aggressively trying to persuade Americans that hemp and marijuana are identical plants. We can speculate about the reasons. The results are widespread confusion and the inability of America's farmers and manufacturers to take part in the worldwide resurgence of hemp cultivation and use.

Myth: Smoking industrial hemp can get someone high. Marijuana in the 1960s contained THC levels approaching those of today's hemp.

Reality: The THC levels in industrial hemp are so low that no one can get high from smoking it. Moreover, industrial hemp, while low in THC, is high in another kind of cannabinoid, CBD, which counteracts THC's psychoactivity.

As William M. Pierce Jr., Ph.D., Associate Professor of Pharmacology and Toxicology at the University of Louisville School of Medicine notes, "Industrial hemp does in fact contain a psychoactive substance, tetrahydrocannabinol (THC) and thus the question appears at first reading to be a reasonable one. Upon closer consideration, however, using the most fundamental principles of pharmacology, it can be shown that it is absurd, in practical terms, to consider industrial hemp useful as a drug." [27]

According to Professor Pierce, to obtain a psychoactive effect with even 1 percent THC hemp (industrial hemp and feral hemp, the wild hemp the DEA aggressively harvests and burns [28], contain less than 0.5% percent THC [29]), would require the user to smoke 10-12 cigarettes containing hemp in a "very short period of time. . . . This large volume (and) high temperature inhalation of vapor, gas, and smoke would be difficult for a person to withstand, much less enjoy." Professor Pierce goes on to note that anyone who ate hemp hoping to get "high" would be consuming the fiber equivalent of several doses of a high-fiber laxative. In other words, the very unpleasant side effects would dissuade anyone from trying to use industrial hemp as a drug.

Dr. Pierce points out that beer sold as "nonalcohol" contains measurable alcohol. So does mouthwash. Even nutmeg contains a psychoactive substance. But the authorities are not aggressively concerned about the abuse of these products because the side effects are so severe as to discourage such abuse.

Critics have alleged that the marijuana of the sixties had THC levels comparable to those of industrial hemp. But when Lynn Zimmer, Ph.D., and John Morgan, M.D., examined this assertion they found it lacked substance.

When today's youth use marijuana, they are using the same drug used by youth in the 1960s and 1970s. A small number of low-THC samples seized by the Drug Enforcement Administration in the early 1970s are used to calculate a dramatic increase in potency. However, these samples were not representative of the marijuana generally available to users during this era. Potency data from the early 1980s to the present are more reliable, and they show no increase in the average THC content of marijuana. [30]

Dr. Mahmoud ElSohly, Director of the Marijuana Project at the University of Mississippi-Oxford for the National Institute on Drug Abuse, was asked by the author about his assertion, quoted in antihemp literature [31], that 0.5 percent THC could produce a high. Dr. ElSohly admitted that it might be difficult to distinguish from a placebo effect and would require a substantial amount of smoked material. He acknowledged that the CBD in industrial hemp confounds the psychoactive effect of the THC and called for more research in this area.

When industrial hemp is grown legally and where federal authorities do not call it marijuana, people do not smoke it. Industrial hemp is a crop that no informed person would smoke, and if the naive do, they do not remain naive. If they think they got "high," they are confusing the experience with anoxia or hyperventilation.

Myth: Even though THC levels are low in hemp, the THC can be extracted and concentrated to make a powerful drug.

Reality: Extracting THC from industrial hemp would require such an expensive, hazardous, and time-consuming process that it is extremely unlikely anyone would ever attempt it, rather than simply obtaining high-THC marijuana instead.

Botanist and *Cannabis* expert Robert C. Clarke, writing for the International Hemp Association to Health Canada concerning Canada's new regulations, addressed this issue as follows: "Although industrial hemp does contain trace amounts of THC, it is of no practical significance. There is also a minor percentage of precious gold dissolved in sea water, but it is no more economically feasible to extract than is THC from hemp." [32]

If industrial hemp were "cooked down" to concentrate the extract, it would also, as noted by Dr. Paul Mahlberg, Professor of Biology at Indiana University-Bloomington, contain many products other than THC, including CBD, which would counteract the effects of the THC.

Dr. Mahlberg, is one of the U.S. scientists with permission to work with *Cannabis*.. When asked by the Wisconsin Agribusiness Council about reports that someone had used feral hemp, commonly called ditchweed, to make a concentrated hallucinogen, he responded: "As I understand it, the comment was that someone had used ditchweed to prepare hallucinogenic material. The assumed conclusion drawn by some people then being that industrial hemp could be used in this way. My response to this conclusion is that industrial hemp will not be attractive to drug users. Industrial hemp, as grown in Europe, contains 0.3 percent or less THC, and is not a source of marihuana; marihuana attractive to drug users contains 5 to 20 percent THC, the higher percent being the desired material." [33]

Dr. Mahlberg went on to point out that an extraction from industrial hemp using a deceptive procedure found on the Internet will result in a sludge containing many noxious elements and very little THC. Of course the preponderant cannabinoid in this sludge will be CBD. The THC would have to be further refined from the CBD, an expensive and complicated undertaking for a paltry yield. Furthermore, Dr. Mahlberg explains, the chemicals required to attempt such an extraction are themselves restricted. Any individuals attempting this would be conspicuous and a danger only to themselves.

A number of untrue or undocumented statements have been made by the drug enforcement network regarding feral hemp and its relationship to drugs. For example, several state and local police officers have publicly testified that they know of instances in which ditchweed has been made into high-potency drugs. Yet we can find no documented case where this has occurred. [34]

A drug officer in one Wisconsin county wrote the following to the Wisconsin Agribusiness Council to discourage them from supporting industrial hemp: "Dr. Guy Gabral (sic, actually Cabral), University of Virginia, has documented the use of "drug chaw," a cancer-causing product made from 0.1 percent THC marijuana that through chemical process becomes a product containing 40 percent THC." [35] When contacted about this quote, Dr. Cabral repudiated it. He explained that he was describing an Afghani method of hashish production that employs potent *Cannabis* strains and not something that could be done with industrial hemp. [36]

Myth: Hemp fields would be used to hide marijuana plants.

Reality: Hemp is grown quite differently from marijuana. Moreover, it is harvested at a different time than marijuana. Finally, cross-pollination between hemp and marijuana plants would significantly reduce the potency of the marijuana plants.

Hemp grown for fiber is planted in narrow row spacing (4 inches apart). Branching is discouraged, and plants are not allowed to flower. The stems are kept small by the high density and foliage develops only on the top. Hemp plants crowd out weeds and other hemp plants not equal to the competition. [37]

Marijuana plants, on the contrary, are spaced widely to encourage branching, and the flower is the harvested product. Marijuana is a horticultural crop planted in wide spacing to minimize stand competition and promote flower production. It branches thickly like a Christmas tree. In contrast, hemp selected for fiber has only a few branches.

What about seed producers who space their plants widely? Where seed is the harvested product, whether as reproduction seed or oilseed, purity is critical to marketability. The mixing of off-type genotypes would be scrupulously avoided in seed production fields.

Breeders and producers of sweet corn go to great lengths to isolate their crops from the pollen of field corn. The same applies to hemp and marijuana. People who grow strains of *Cannabis* for smoking try to avoid pollination of the flowers. The superior quality material is obtained from seedless plants, the so-called "sinsemilla."

Hemp fields, in fact, could be a deterrent to marijuana growers. A strong case can be made that the best way to reduce the THC level of marijuana grown outdoors would be to grow industrial hemp near it. An experiment in Russia found that hemp pollen could travel 12 kilometers. This would mean that a hemp field would create a zone with a 12-kilometer radius within which no marijuana grower would want to establish a crop.

The reciprocal also applies. Growers of hemp seed would not want *Cannabis* of an "off type" (i.e., not the intended genetic type) mixing its pollen with their flowers. The isolation of genotypes is a common procedure used by the seed industry to preserve the genetic integrity of varieties. Valued strains are created by plant breeding, at substantial expense. Marijuana pollen would destroy this value.

There is another reason that marijuana growers would be unlikely to plant their crop in a hemp field. All countries that have recently begun to recommercialize hemp operate under a permit system whereby the farmer must let the local police know which field is being planted in hemp. Would a marijuana grower decide to plant his or her crop in an area high on the police radar screen and subject to monitoring without notice?

Ironically, another fiber crop, kenaf, grown in the South, resembles *Cannabis* in its leaf morphology so closely that it is often mistaken for marijuana. Growers report frequent incidents of kids stealing kenaf that they have taken for marijuana. Since kenaf would not cross-pollinate with *Cannabis*, and has a longer growing season, kenaf fields would actually be a better hiding place for marijuana than would hemp fields.

Myth: Legalizing hemp while continuing the prohibition on marijuana would burden local police forces.

Reality: The police in countries where hemp is grown as an agricultural crop have experienced no such burdens.

The key to a regulated hemp industry is seed certification, a common practice in the international seed industry. The burden for producing hemp varieties compliant with the prescribed THC threshold falls on the seed producer and breeding operation. As mentioned, THC content is genetically determined. Numerous low-THC varieties have been produced by European hemp breeders and these are certified by the appropriate government agency that publishes the approved list. (The protocol used in Europe to determine the average THC content of a given variety is appended to this document.)

Hawaii State Representative Cynthia Thielen reported from her investigative trip to Europe that the police forces in these countries have observed no problems with the agricultural production of industrial hemp. [38]

In countries that have recently legalized industrial hemp, individual farmers and manufacturers are licensed and registered. Field locations are recorded with local authorities. Only when there is probable cause does law enforcement need to concern itself with individual farmers.

Canadian authorities have recently issued final regulations that will allow for the first commercial hemp crop in that country in more than 50 years (A summary is appended to this document. These regulations are a workable compromise between farmers who want to minimize paperwork and regulatory delays and police authorities who want to prevent the growing of marijuana. Health Canada concludes: "This recommended regulatory framework provides the criteria to assess the suitability of an applicant to conduct a licensed activity." [39]

In contrast, the current regulations in the United States require that all live hemp seed be stored in a locked safe, and that fields be surrounded with 10-foot-high, barbed-wire-topped fencing, illuminated 24 hours a day, and guarded [40]. And even with these draconian regulations, no permit to grow hemp has been issued by the DEA.

Myth: Feral hemp must be eradicated because it can be sold as marijuana.

Reality: Feral hemp, or ditchweed, is a remnant of the hemp once grown by U.S. farmers. A study of feral hemp in Kansas showed that it contains extremely low levels of THC, from 0.5 percent to as low as 0.05 percent and less [41]. It has no drug value, but it does offer an important environmental benefit as a desirable nesting habitat for birds. Yet 99 percent of the "marijuana" being eradicated by the federal government-at great public expense-consists of this harmless ditchweed.

We have no way of knowing whether feral hemp has been sold as marijuana. What we do know is that if this were done, it would be to fatten the profits of the drug dealer, not to increase his supply of drugs. Feral hemp, like oregano, parsley, and kenaf, has been used to dilute marijuana and defraud drug customers. That is no reason to outlaw hemp nor to burn down oregano and parsley patches. We don't make sugar illegal because it is used to cut cocaine.

That kids may try smoking hemp or ditchweed is to be expected. Many farmers remember smoking cornsilk when they were young. Moreover, young people have seen the National Guard swooping down from helicopters to burn feral hemp. They have then read that the plants burned were marijuana. One would expect that, based on this misinformation, they would experiment with feral hemp.

Where hemp is grown as a common agricultural crop, it is not bothered once the

introductory period is over and the inquisitive have learned their lesson [42]. Where hemp is legal and marijuana is illegal, hemp does not suffer from misidentification or attempted misuse. This is true today in other countries, as it was once true in our own nation.

In Britain, the Drugs Branch reports that since hemp cultivation began in 1993, "there have been very few thefts of crop and diversion from licit sources has been insignificant." [43] According to Ian Low, founder of Hemcore, Ltd., and by far the largest cultivator of hemp in the United Kingdom, Hemcore has had only one incident of someone stealing hemp. That occurred in the company's first year, and it has not happened since. [44]

When hemp was legally grown in the United States, there were few if any examples of its being used for illicit purposes. In 1945, Matt Rens of the Rens Hemp Company of Wisconsin told a Senate hearing, "In the 30 years we have operated and grown large acreages we have never heard of one instance where there was an illicit use made of the leaves of this hemp plant. . . . We have never heard of anybody trying to get into the field and take the leaves for illicit purposes." Samuel H. McCrory, a senior United States Department of Agriculture official, told the Senate committee that he knew of no cases in which anyone had tried to divert industrial hemp leaves or flowers from federal or private hemp mills.

The evidence shows that there are no good reasons for authorities to be eradicating ditchweed, while there are at least two good reasons for them not to do so. The ditchweed that these agencies are pulling up represents the only germplasm remaining from the hemp bred over decades in this country to achieve high yields and other important performance characteristics. This breeding was done by the United States Department of Agriculture in a program directed by Dr. Lyster Dewey from 1912 to 1933. These plants represent a unique and invaluable genetic resource that should be preserved.

Another reason to reconsider our efforts to eradicate feral hemp is that, as Joel Vance writes in *Outdoor Life* magazine, "Conservationists who are against the use of marijuana by people nevertheless find themselves in the weed's corner because of its use by wildlife." [45] Hemp plays a role in supporting gamebird populations in Missouri and Nebraska. According to Dr. Bob Robinson, who experimented with hemp at the University of Minnesota in the 1960s, hemp was good for wildlife because its seed was held just above the snowline. The National Wildlife Federation has determined that, of 28 native bird species studied from 1966-1995, half are in decline, including Henslow's sparrow (down 93 percent), the bobolink (down 37 percent), and the Eastern meadowlark (down 53 percent). Yet feral hemp, which contains the wildbird food seed of choice, a seed that is sold (imported and sterilized) in pet stores as high-priced parrot feed, is branded a drug plant and a noxious weed.

One may wonder why, given the uselessness of feral hemp as a drug and its important benefits, drug enforcement authorities are spending so much money to eradicate it. We hesitate to ascribe motives for this waste of taxpayer money, but it is likely that drug authorities continue to miseducate the public about the relationship of ditchweed to drugs because of a natural bureaucratic desire to maintain their large and growing eradication budgets. More than 90 percent of the plants eradicated in all 50 states is not marijuana but feral hemp. The following is the data for one representative state, Wisconsin, and a summary from the DEA of the most recent national data. As the data shows, hundreds of millions of dollars a year are spent pulling up a harmless, even beneficial plant with no

drug potential.

Wisconsin Data from *Cannabis Enforcement and Suppression Effort, Annual Report 1996*

Wisconsin State Dept. of Justice, Division of Narcotics Enforcement

	1991	1992	1993	1994	1995	1996
Total Plants Eradicated	**6,042,407**	**35,873,893**	**13,850,955**	**3,059,450**	**5,030,651**	**9,564,557**
Ditchweed	**5,964,331**	**35,853,407**	**13,807,729**	**3,045,282**	**4,975,441**	**9,551,143**
Percent ditchweed	**98.7%**	**99.9%**	**99.7%**	**99.5%**	**98.9%**	**99.9%**

National Data Summary from *The Domestic Cannabis Eradication/Suppression Program*,

U. S. Dept. of Justice, Drug Enforcement Admin.

	1990	1991	1992
Total Plants Eradicated	**125,876,752**	**139,326453**	**272,046,333**
Ditchweed	**118,547,983**	**133,786,059**	**264,206,672**
Percent ditchweed	**94%**	**96%**	**97%**

Myth: Those who want to legalize hemp are using it as a backdoor way to legalize marijuana.

Reality: It is true that many of the first hemp stores were started by industrial-hemp advocates who also favored legalizing marijuana. However, as the hemp industry has matured, it has come to be dominated by those who see hemp as the agricultural and industrial crop that it is, and who see it as a different issue than marijuana legalization. In any case, it makes no sense to oppose a very good idea simply because some of those who propose it also support another policy with which one disagrees.

Given that the federal authorities consistently call hemp marijuana, treat both materials in the same way, and have outlawed both, an overlap between those who promote the legalization of both is to be expected. But to outlaw an innocent plant because some people in favor of legalizing it are also in favor of legalizing another less innocent plant is unreasonable.

The fact that there is an overlap between those who favor less stringent penalties for possession of marijuana and those who want to legalize hemp is less a justification for continuing to outlaw hemp than it is a justification for ending the 60 year old policy of the federal government of confusing these functionally distinct plants.

The debate about legalizing hemp has been distorted by the fact that, in this country, hemp legalization is under the jurisdiction of the drug enforcement agencies. In other countries, jurisdiction falls to the health agencies, and agricultural agencies have had a significant role in the movement to commercialize hemp. In Canada, for example, Health Canada gave the initial permission to raise hemp for research purposes and as soon as questions arose from farmers and the general public about this crop, Canada's agricultural department issued a substantive bulletin containing agronomic and economic data [46].

Myth: Hemp oil is a source of THC.

Reality: Washed hempseed contains no THC at all. The tiny amounts of THC in industrial hemp is contained in the glands of the plant itself, and sometimes in the manufacturing

process some of that sticks to the seed. The very high sensitivity of drug-testing urinalysis procedures has detected THC in some people who consume hemp oils [47]. But this is no more a reason to outlaw hemp oil than is the fact that people can test positive for opioids after eating bagels or poppyseed cake a reason to outlaw these kinds of foods.

Hemp oil is an increasingly popular product, used for a growing variety of purposes. To allow for its sale while respecting the potential problems of positive drug test results, Canada recently issued drug regulations with a tolerance level of 10 milligrams of THC per kilogram of hemp oil [48]. While the hemp industry opposes the imposition of tolerance limits, it is confident that it can consistently produce high-quality hemp oil with THC levels below the Canadian maximum.

Myth: Legalizing hemp would send the wrong message to children.

Reality: It is the current refusal of the drug enforcement agencies to distinguish between an agricultural crop and a drug crop that is sending the wrong message to children.

When young people realize that the government has been misinforming them about the psychoactive potential of industrial hemp, they may assume that the government is also misinforming them about the addictive potential of real drugs. When they discover that many of our Founding Fathers, such as George Washington, Thomas Jefferson, and Benjamin Franklin, grew or processed hemp, and that hemp was grown as part of a patriotic war effort during World War II, they will begin to wonder what else they may not have been told about hemp. This could have the unfortunate effect of causing them to wonder if the government has also been "crying wolf" about real drugs. By condemning teachers who try to educate their students about industrial hemp, as has occurred in several parts of the country, drug enforcement agencies are undermining their credibility with these youngsters when they try to teach them about the real dangers of crack cocaine.

Myth: Hemp is not economically viable, and should therefore be outlawed.

Reality: The market for hemp products is growing rapidly. But even if it were not, when has a crop ever been outlawed simply because it was thought to be unprofitable to raise?

Retired General Barry McCaffrey of the White House Office of National Drug Control Policy has said that one of the reasons that he continues to support the criminalization of hemp cultivation is because hemp is not an economical crop. It is an odd argument. There is no record in U.S. history of a crop being outlawed because it was uneconomical. Moreover, General McCaffrey has made no indication that he would allow hemp to be grown even if he were persuaded that it could dramatically boost farmers' income.

The USDA has aggressively supported the introduction of many crops in the last 20 years that, when initially supported, were marginally economical and had small potential markets (e.g., jojoba, meadowfoam, kenaf). The Department rightly argued that, with breeding and the introduction of more effective cultivation and storage technologies, these crops could indeed be profitable for farmers.

Hemp is a multipurpose crop. New markets for its oils, protein, long fibers, and inner hurds are constantly opening up. Hemp production is increasing worldwide, as are hemp sales. Innovations in processing and in cultivation promise to lower costs and open up still more markets. The production increase is most dramatic in Europe, where hemp, like other crops such as rapeseed and flax, is subsidized. Hemp commercialization has begun in Canada, where as many as 10,000 acres could be planted in 1998, even though our

northern neighbors receive no government incentives to grow the crop.

Preliminary evidence also indicates that hemp may be a very significant rotation crop with an ability to reduce pests and weed growth and to boost yields of the primary crop.

The North American Industrial Hemp Council soon will publish an in-depth report on hemp's economics and markets. Here we would only argue that in a free enterprise system, government should not and cannot make the *a priori* decision to outlaw a crop simply because it believes farmers would lose money by growing it.

Conclusion

Hemp is making a comeback around the world. Whether it will be a miracle crop, as some of its enthusiasts claim, or simply another important addition to world agriculture, is yet unknown. Much research and development remains to be done. Sadly, the drug enforcement agencies, by disseminating false information, have created a mythology about *Cannabis sativa* that ill serves the nation, its farmers, and its industry.

We are one of the few countries in the world that continues to insist that we should outlaw a crop simply because one of its botanical cousins can be used inappropriately. Thomas Jefferson, who experimented with different hemp varieties and invented a brake for separating out the fiber from hemp, once wrote that the greatest contribution a person could make to his country would be to introduce a new crop. If Jefferson could see the roadblocks amassed against hemp today, how would he judge us?

Appendix

COMMERCIAL PRODUCTION OF INDUSTRIAL HEMP IN CANADA

Industrial hemp can now be grown in Canada effective March 12 , 1998, under authorization from Health Canada.

Industrial Hemp is defined as the plants and plant parts of the *Cannabis* plant, whose leaves and flowering heads do not contain more than 0.3 percent THC. It includes derivatives of the seeds such as oil and seedcake. It does not include non-viable *Cannabis* seed, but it includes its derivatives. It also does not include the mature stalks or the fibres derived from those stalks. This means that such fibres or the products made from the mature cannabis stalk may be imported, treated and sold in Canada.

The Regulations issue by Health Canada consist of the following components:

_Importers and exporters of industrial hemp, in the form of seed or viable grain, will be licensed. In addition to holding a licence they will also be required to obtain a permit for each shipment.

_The importer must ensure that shipments of live seed ("viable grain") are accompanied by foreign certification. A list will be published by Health Canada indicating which countries are designated as having equivalent controls on the production of viable grain. Viable grain may only be imported from listed countries. This will ensure that viable grain imported will not produce a plant containing more than 0.3% THC.

_Seed growers will be restricted to a 0.4 hectare (1.0 acre) minimum plot size and will be required to demonstrate current membership in the Canadian Seed Growers Association as part of their licence application. Seed growers will be required to provide the number of hectares grown in the previous two years as part of their licence application.

_Plant breeders will not be restricted to minimum plot sizes. Persons applying for a licence as a plant breeder must be registered with the Canadian Seed Growers Association and may only cultivate industrial hemp under this regulatory framework. The pedigreed seed restriction (i.e., seed

of proven lineage) which applies to growers in the year 2000 does not apply to plant breeders nor does the limitation to the List of Approved Cultivars. (Breeders can employ a broader selection of germplasm in their effort to develop new cultivars for Canadian growing conditions.)

_Growers for fibre or viable grain will require a licence before they can purchase seeds from a distributor or cultivate industrial hemp. Growers will be required to provide the number of hectares grown in the previous two years as part of their licence application.

_Only approved varieties of industrial hemp seeds, as listed on Health Canada's List of Approved Cultivars may be planted. Commencing January 1, 2000, only pedigreed seeds of approved varieties may be planted. Growers will be required to identify their fields, and maintain records of production and distribution.

_Licences and audit trails will also be required for processing activities such as pressing seeds into oil. All parties licensed or authorized will be required to identify a person resident in Canada who will be responsible for the licensed activities.

_To obtain a licence for the importation, exportation, production or sale of industrial hemp, applicants will be required to produce a police security check issued by a Canadian police force setting out for the previous 10 years the applicant's criminal record in respect of any designated drug offences, or indicating that the person has no such record.

_Derivatives of seed or viable grain, such as oil and seed cake, will be exempted from the Regulations if there is evidence that the derivatives contain no more than 10 micrograms of delta-9-tetrahydrocannabinol per gram and carry appropriate labelling statements. Products made from derivatives of seed or viable grain will be exempted if there is evidence that each lot or batch contains no more than 10 micrograms of delta-9-tetrahydrocannabinol per gram.

_Importers and exporters of derivatives will be required to provide proof with each shipment that the shipment contains no more than 10 micrograms of delta-9-tetrahydrocannabinol per gram for each lot to ensure that the product is within the limit. Similarly products made from the derivatives of seed or viable grain must be accompanied with evidence that each shipment contains no more than 10 micrograms of delta-9-tetrahydrocannabinol per gram.

_No person will be permitted to import or sell whole plants, including sprouts or the leaves, flowers or bracts of industrial hemp; or import, sell, or produce any derivative or any product made from a derivative of the above.

_Authorizations will be required for transportation, when products are transported outside the direction or control of a licence holder, or for possession for the purpose of testing for viability.

_No person shall advertise to imply that a derivative or product is psychoactive.

_Testing for the level of THC in leaves or in derivatives must be done by a competent laboratory according to standards defined by Health Canada.

_Health Canada will continue to issue licenses for approved research studies related to the cultivation of hemp for industrial purposes.

_Application Forms and relevant Guidance Documents, aimed at expediting the review of licences and authorizations for the commercial cultivation of industrial hemp and also for research licences, are available.

Additional information can be found at:

Internet: http://www.hc-sc.gc.ca/hpb-dgps/therapeut/drhtmeng/hemp.html

or Jean Peart, Manager, Hemp Project

Bureau of Drug Surveillance

Therapeutic Products Directorate

Address Locator 4103A, 122 Bank Street, 3rd Floor

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Copies of the Controlled Drugs and Substances Act are available from:

Internet: canada.justice.gc.ca/FTP/EN/Laws/

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Appendix

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ANNEX C

COMMUNITY METHOD FOR THE QUANTITATIVE DETERMINATION OF DELTA-9 THC (TETRAHYDROCANNABINOL) IN CERTAIN VARIETIES OF HEMP

1. Purpose and scope

This method permits quantitative determination of delta-9 tetrahydrocannabinol (delta-9 THC) in certain varieties of hemp *Cannabis sativa* L.) for the purpose of checking that the conditions laid down in Article 3 (1) of Regulation (EEC) No. 619/71 are fulfilled.

2. Principle

Quantitative determination of delta-9 THC by gas chromatography (GC) after extraction with a suitable solvent.

3. Apparatus.

- gas chromatography equipment with a flame ionization detector,

-glass column 2,50 m long and 3,2 mm in diameter (1,8") packed with a suitable support impregnated with a stationary phase phenyl-methyl-silicon (e.g. OV 17 at 3 %).

4. Sampling and reduction of sample

Sampling

In a standing crop of a given variety of hemp, take not less than 500 plants, preferably at different points but not from the edges of the crop. Samples should be taken during the day after flowering has finished.

The pooled samples should be representative of the lot.

The plant material is then left to dry at ambient air temperature.

Reduction

Reduce the sample, obtained as described, to 500 stalks; the reduced sample should be representative of the original sample. Divide the reduced sample into two portions.

Send one portion to the laboratory which is to determine the delta-9 THC content. Keep the other portion for counter-analysis if necessary.

5. Reagents

- petroleum ether (40)/65°), or a solvent of comparable polarity,

- tetrahydrocannabinol (delta-9 THC), pure for chromatographic purposes,

- solution of 0,1% (w/v) androstene-3-17-dione in ethanol, pure for

chromatographic purposes.

6. Preparation of test sample

For the purposes of delta-9 THC determination, retain the upper third of the plants in the portion of sample received. Stems and seeds must be removed from the plant material retained.

Dry the material in an oven, without exceeding 40°C, to obtain a constant weight.

7. Extraction

Reduce the material obtained as described in point 6 to a semi-fine powder (sieve of 1000 meshes per cm^2.

Take 2,0 g of well-mixed powder and extract with 30-40 ml petroleum ether (40-65°C). Leave for 24 hours, then shake in a mechanical shaker for one hour, and then filter. The extraction process is carried out twice under the

same conditions. Evaporate the petroleum ether solutions to dryness. Dissolve the residue in 10.0 ml of petroleum ether. The prepared extract is used for quantitative analysis by gas chromatography.

8. Quantitative analysis by gas chromatography

(a) Preparation of assay solutions

The extraction residue dissolved in 10.0 ml of petroleum ether is subjected to quantitative analysis to determine the delta-9 THC content. This is performed with the aid of an internal standard and calculation of the peak areas.

Evaporate to dryness 1,0 ml of the petroleum ether solution. Dissolve the residue in 2,0 ml of a solution of 0,1% androstene-3-l7-dione in ethanol (internal standard with a retention time distinctly higher than that of other cannabinoids, and in particular twice that of delta-9 THC).

calibration ranges:

0,10, 0.25, 0,50, 1,0 and I,5 mg of delta-9 THC in 1 ml of a

solution of 0,1% androstene-3-l7-dione in ethanol.

(b) Experimental conditions

Oven temperature: 240°C.

Injector temperature: 280°C.

Detector temperature: 270°C.

Nitrogen flow rate: 25 ml/min,

Hydrogen flow rate: 25 ml/min,

Air flow rate: 300 ml/min,

Volume injected: 1 ml of the final ethanol solution.

The relative retention time of delta-9 THC is calculated in relation to the andostene.

9. Expression of the results

The result is expressed in g of delta-9 THC per 100 g of the laboratory sample dried to constant weight. The result is subject to a tolerance of 0,03g per 100g.

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