The Tetrahydroevolution of Cannabis. A reference to production, refining and current presentation of Cannabis

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Abstract

Objective: To refer the main processes of production, refinement and current presentation of cannabis. Methodology: An observation of the processes of production, refining and presentation of cannabis in crops, laboratories and clinics in California (United States) and Baja California (Mexico) was made. Findings: Three dimensions are proposed to refer to the current cannabis production, refining and presentation processes: 1) The neo-cannabis production: A cannabis production characterized by fast and higher yields, 2) The neo-refining of cannabis: An extreme use of cannabis characterized by different methods that extract its main components, and 3) The neo-presentation of cannabis: A contemporary presentation of cannabis in new and plural commercial forms. Conclusions: Cannabis has had a development in recent decades that is far superior to the development of the plant throughout its existence. The name tetrahydroevolution of cannabis is suggested for this process.

Key words: Tetrahydroevolution of cannabis, Cannabis, Cannabis Cultivation, Cannabis Extractions.

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La tetrahidroevolución del cannabis. Una referencia de la producción, refinación y presentación actual del cannabis

Resumen

Objetivo: referir los principales procesos de producción, refinación y presentación actual del cannabis. Metodología: se realizó una observación participante de los procesos de producción, refinación y presentación del cannabis en cultivos, laboratorios y dispensarios de California (EE.UU.) y Baja California (México). Resultados: se proponen tres dimensiones para referir los actuales procesos de producción, refinación y presentación del cannabis: 1) La neo-producción del cannabis: una producción del cannabis caracterizada por unos veloces y mayores rendimientos, 2) La neo-refinación del cannabis: un aprovechamiento extremo del cannabis caracterizado por diferentes métodos que extraen sus principales componentes, y 3) La neo-presentación del cannabis: una presentación contemporánea del cannabis en nuevas y plurales formas comerciales. Conclusiones: el cannabis ha tenido un desarrollo en las últimas décadas que es por mucho superior al desarrollo que ha tenido la planta durante toda su existencia. Se propone llamar a este proceso la tetrahidroevolución del cannabis.

Palabras clave: tetrahidroevolución del cannabis, cannabis, cultivo de cannabis, extracciones de cannabis.

Introduction

The research advances on the cannabis plant during the last decades that aimed at adjusting its components, its concentrations, its textures, its colors, and its uses as well as its types of cultivation, exploitation, processing, preservation and presentation are much higher than those made for the cannabis plant in these same aspects during all its existence (Escohotado & Figuera, 2016). According to different scientific disciplines, the qualitative and quantitative advances that cannabis research has made are due to large extents of research within the last 30 years. Due to these advances, some expectations have been created to possibly use therapeutic applications of its

main components (cannabinoids), the provision of scientific information to objectively analyze the phenomenon of cannabis abuse (SEIC, 2002, p. 5) and, nevertheless, the impressive and incalculable income generated by current production, refinement and presentation of this plant that is seen by many as the new green gold (Austen, 2018).

As far as the current production of cannabis is concerned, the progress of the processes that gives rise to the seeds and later to the germination, growth and harvesting of this plant (indoor or outdoor) have become huge in the United States, especially in California where the famous and widely known Emerald Triangle is located (Escohotado, 2005). From there, the cannabis crops are supported by genetic engineering, innovative irrigation and lighting systems, which has caused that the state's wine industry becomes small. It also has created an economy that represents a way out of the crisis and has met the demands of the US dispensaries and consumers. Other states have generated considerable rents for growers and large companies that manufacture the most suitable instruments and fertilizers (General Electric, Philips, Bayer, Green Planet Nutrients, etc.), among others.

Concerning the refinement and use of cannabis and all its derivatives, recent studies show that while advancing at a rapid pace, innovative and surprising mechanical and chemical strategies of extraction of the main components of the plant (with pressure, temperature, freezing, etc., or with solvents such as ethanol, butane, CO2, among others) for introducing ultrasound equipment to the extractions of its main molecules (Agarwal, Máthé, Hofmann & Csóka, 2018) are advancing in an unexpected but substantially positive manner. These advances do not only happen in the US, but also in other parts of the world. Packaging, labeling and presenting this plant is now in transition from a process in which cannabis circulates in its vegetable or edible form to a process in which the substance circulates in extremely active "extractions". There has been multi-generational ways and an almost endless number of products with colors, flavors, consistencies and concentrations. Nowadays these features reach up to 96 percent of its main psychoactive component is tetrahydrocannabinol or THC (concentrations that seemed physically and chemically impossible and that years ago were unthinkable).[1]

[1] Cannabis extractions are substances that concentrate the cannabinoids of the plant with little or no presence of plant matter. With the advance of research on cannabis, beginning in the 21st century, these substances already had percentages of THC that hashish or kif could hardly dream of: 50 and up to 80 percent of THC. Currently, there are extractions of psychoactive cannabinoids that reach up to 96 percent concentration (Clear Concentrates 'The Clear and Purity Extracts' Gorilla Glue) and extractions of non-psychoactive cannabinoids that reach up to 99.9 percent concentration (THCA: tetrahydrocannabinolic acid and CBDA: cannabidiolic acid) (Lindsey, 2018).

Summarized along the article, we will be encountering the changes that cannabis has undergone in the last decades, the advances of the processes of indoor and outdoor production of the plant, the advances of the mechanical and chemical processes of the extraction of its main components, the advances of the packaging processes, as well as labeling and presentation of these substances, among others. In addition to this, the text will be divided into three parts: a) The approach and the methodology used to study this phenomenon; b) The results of the participant observation, together with the proposal to group these findings in three dimensions (the neo-production of cannabis, the neo-refining of its raw materials and the neo-presentation of these products). Finally, c) conclusions about the advances of what this article has called the tetrahydroevolution of cannabis (tetrahydro to refer to the main psychoactive component of the plant, which is tetrahydrocannabinol).

Statement

As frequently and extensively well-described, cannabis is a genus of millenary plants native to Central Asia (Russo, 2007, p. 1614), known because it produces fibers to make textile products dating back to 4000 BC, besides its use in traditional medicine dating back to 2700 BC (Ángeles López, Brindis, Cristians Niizawa, & Ventura Martínez, 2014, p. 1). The archaeological and historical data of cannabis reveal that it has been used as food, as a source of fiber, a substance for recreational and spiritual purposes and as medicine to alleviate various diseases (Fuente, 2015, p. 21). Its main current use is recreational, but it is also used medicinally as an anti-inflammatory, analgesic, neuroprotective, neuroreparative, anticonvulsant, myorelaxant, antitumor, antiemetic, antispasmodic, anxiolytic, antipsychotic, somnolent, immunoregulatory, and antioxidant, among others (Fundación Canná).

Botanically and taxonomically, cannabis is one of the two genera of plants that make up the Cannabacea family (the other genus of the family is the Humulus). Currently, it seems that the Cannabis genus is composed of four species —different in their growth and properties— specifically, these are: Cannabis Sativa (sativa variety), Cannabis Indica (indica variety), Cannabis Ruderalis (spontanea variety) and Cannabis Afghanica (Afghani variety)[2] (Fassio et al., 2013, p. 1). Because in the

[2] It is worth mentioning that the Missouri Botanical Garden instead of recognizing four species recognizes thirteen: C. sativa, C. indica, C. americana, C. chinensis, C. erratica, C. faetens, C. generalis, C. gigantea, C. intersita, C. kafiristanica, C. lupulus, C. macrosperma and C. ruderalis. In this thesis, this is only an informative and non-argumentative data, since it is part of a current botanical debate that surpasses the interest of this work (2020).

botanical world it is massively and consensually accepted that within the Cannabis genus the most important medicinal and psychoactive species is Cannabis Sativa L. (L. for referring to the Swiss botanist Carl Linnaeus who recognized it and named it for the first time), the cannabis scene recognizes that "Cannabis Sativa" refers to this species (Duffau, Alcamán, Rojas & Fuentes, 2015, p. 11) and that the word "Cannabis" refers to what is indiscriminately referred today as Marihuana or Marijuana.

Although "Cannabis" (or Marihuana or Marijuana)[3] has extensive and long-lasting benefits (such as those described), the contemporary promotion of its recreational and extra-pharmaceutical properties was very unusual until the psychedelic reply broke out in the middle of the sixties. In those years, the use of the plant spread rapidly and massively among the youth of the US and other countries. The cultivation and production progressively developed in countries such as Mexico, Colombia and some areas of the Caribbean especially Panama and Jamaica (Escohotado, 2005, p. 1305). Although the cannabis's chemical structure and consumption became widespread in the 60s (and the CBD a year before), it was in the 90s when a real "cannabis evolution" began to be generated. During that decade, THC interaction with organisms and how the human physiology morph possesses endogenous mechanisms to adapt to plant molecules (discovery of the endocannabinoid system) were discovered. Therefore, what was once forbidden and harmful began to be medicinal and profitable in important places like California (Guzmán, 2014).[4]

Regarding the quality of cannabis, looking back in time and what used to be the top cannabis of a few decades ago, the cannabis plant has changed a lot in terms of its production and cultivation, mostly in terms of its use and presentation to consumers. This is evident because in present times, while the traders of the cannabis scene surprise everyone with the prodigious extractions of the plant, the cannabis culture magazines generate nostalgia for the consumers. As a result, the most desired buds

[3] Colloquially Marijuana -or in Spanish Marihuana- refers to the dried flowers of the cannabis plant, which are traditionally smoked. In this article the word marijuana is not used because, as mentioned, not only the flowers of the plant are consumed, but also their stems, their seeds, their leaves, etc. Therefore it is more appropriate to speak of a consumption of the plant (of cannabis) and not only of its flowers (of marijuana).

[4] The discovery of the endocannabinoid system (cloning of CB1 and CB2 receptors in 1990 and 1993, respectively), the establishment of the first contemporary system of legal regulation of medicinal cannabis (1996 California Proposition 215) and the innumerable social, scientific and economic consequences that derived to a global level during the 90s, generated a paradigmatic break and perception against cannabis, which this article presents as the starting point of the tetrahydroevolution of cannabis: the 90s.

of a few decades ago are showed. Below is an image that shows the best cannabis varieties in the 70s.

Figure 1. Main cannabis varieties in the 70s. From left to right and from top to bottom: 1 Oaxacan Red, 2 Guerrero Gold, 3 Oaxacan Sinsemilla, 4 Oaxacan Gold, 5 Acapulco Gold, 6 Thai, 7 Guerrero Gold, 8 Thai, 9 Colombian Gold, 10 Thai, 11 Oaxacan, 12 Colombian Chiba, 13 Hawaiian, 14 Hawaiian, 15 Colombian Gold, 16 Guerrero. (Image taken from the magazine The High Times, Top 40).
Source: own elaboration based on data from The High Times, 2017 (cited by Ganjagram, 2017).

This image allows us to argue against current events because the cannabis plant has had monumental changes in its presentation and physiognomy in recent years. Some authors have argued that:

> The best branches of the cannabis plant in the 70s have nothing to do with the prodigies that are now made in botanical genetic laboratories around the world. It is the difference between a shepherd who throws a stone at a goat that deviates from his flock and a scientist who launches a rocket at the moon. We have made a huge process with the plant. Marijuana and its derivatives, in 30 or 40 years, have undergone an evolution that, I dare to predict, may produce quantum leaps. It seemed chemically and physically

> impossible but if the research continues at this rate, what comes are pure surprises. Something that has nothing to do with a gradual progress of 1, 2, 3, 4 but with a continuous exponential process of $\lambda > 0$ (Escohotado and Figuera, 2016)[5]. Besides, previous arguments show that approximately 30 years ago, cannabis was different in its presentation. In fact, its differences included textures, colors and aromas. Studies like those of Gettman (2009) reinforce the approach that this process was occurring since at least the 1990s. This is because his studies in California showed that after this decade: a) The cultivation of cannabis increased substantially by 338 percent, b) The crop of the plant definitely differed between what is the crop indoor and outdoor cultivation; and c) Cannabis seizures grew by almost 20 percent but surprisingly in their indoor cultivation modality (Gettman, 2009, p. 3).

In the 70s, species of cannabis in its original state seemed to be located at specific latitudes —which required endemic consumption of the plant or import and export processes—; those also show that in the last decades the cultivation of cannabis has changed a lot. From needing specific weather or geographic conditions, to having recreated or simulated these same characteristics in indoor or indoor cultivation. It is therefore no coincidence that while in recent years botanical and genetic laboratories adjust the genotypes and phenotypes of this plant (so that growers enjoy them anywhere in the world), companies and technology companies simultaneously develop a magna, attractive and lucrative industry on account of the extraction, refinement and current presentation of cannabis (an industry that far exceeds the best processes of extraction, refinement and presentation of cannabis a few decades ago: the processes of extraction of hashish).

Thus, the current production, refinement and presentation of cannabis, or the tetrahydroevolution of cannabis as this article has called it, is that more or less the process has independently sectorized, since its merging in the 1990s, into diverse and plural technology forms. Research and the economic powers such as Canada, Israel, US and Holland have used innovation, wisdom and the experience of the old and new culti-consumers from any part of the world. Added to the advances of the indoor and outdoor production of the plant, it is important to mention the mechanical and chemical processes of the extraction of cannabinoids, the processes of packaging, labeling and presentation of products. Beyond buds, resins, hashish or kif are now extracts, concentrates, paraphernalia, seeds and other non-inhalable psychoactive

[5] Translated by author.

products such as brownies, cookies, ice cream, chocolates, butter, honey, cooking oil, bottled beverages, capsules, pills, ointments, etc.

Following these implementations, this article seeks to present, but above all, it seeks to refer to three dimensions, namely, the neo-production of cannabis, the neo-refining of raw materials and the neo-presentation of products derived from cannabis.

Methods

Methods and techniques of data collection: This article arises from a doctoral research project of qualitative-interpretative nature that used the ethnographic method and participant observation. It was carried out in the Tijuana-San Diego trans-boundary space, which is currently considered part of a regional system, which extends from Los Angeles (California, United States) to the north, crosses the border, and extends south until reaching the municipality of Ensenada (Baja California, Mexico) (Zavala, 2009, p. 25).

The principal objective of this work was to create an intimate ethnographic immersion as suggested by Sánchez (2001), it allowed to collect information in a more numerous, direct, profound and complex way; as well as to account for social phenomena based on the observation of contexts and situations in which they are produced (Sánchez,2001, p. 99). Participation was open in the processes of production, refinement and presentation of cannabis in crops, laboratories and cannabis outlets on both sides of the border. To this end, a written and formal agreement (informed consent) was established with 21 study subjects related to these processes. A direct, nuanced and contrasted observation was made of what happened to their crops (indoor and outdoor, regulated in San Diego and not regulated in Tijuana), laboratories (domestic and informal in Baja California and specialized, formal in California) and cannabis outlets (Medical Marijuana Dispensaries in California or "points of connect" in Baja California).

The project had a total duration of 45 months between September 2014 and June 2018. However, the in-depth observation was carried out during the year 2017 (and early 2018), with an approximate intensity of 3 hours a day, 3 days a week (hours and days were randomly chosen to observe possible variations in their daily actions). The theoretical relevance categories to be specifically observed and described were recorded in field notebooks, forms of indoor and outdoor cultivation, the lighting

and irrigation systems, the cannabinoid extraction techniques, the cannabis raw materials and the presentation forms of the new and traditional products derived from the plant.

Introduction to field work and approach to the subjects of study: To achieve the approach to the subjects of study and specifically to the processes of production, refinement and current presentation of cannabis, the first implementation was done to identify the Medical Marijuana Dispensaries or MMDs from San Diego (this was made through online search engines such as WeedMaps® and Leafly®). Later, these places were located in the maps of the web (with Google Maps®), and then they were visited. The first observations were made and the first informal contacts were established (in these places study subjects were cautiously approached, an initial dialogue that determined whether they were potential subjects of analysis and whether they were eligible to roll the "snowball" method was established; thus, the network of key informants was expanded and it was possible to reach more participants in San Diego and Tijuana, who worked in crops, seed banks, cannabis stores, or had crops, made extracts or were simply new cannabis users).

Analysis of the information: Considering the theoretical-methodological objective proposed from the beginning of this project (refer to the main processes of production, refining and current presentation of cannabis) and with support of the computer software ATLAS.ti, in this stage of the research, all the information and all the data collected during the whole fieldwork (65 transcribed field notes, 437 images, 33 audio files and 25 video files) was compiled, treated, systematized and analyzed. Consequently, this research began to be concluded and the final written document with which the writing of this article was carried out began to be consolidated.

Ethical Approval and Consent to participate: The ethical approval of the research was given by a committee of international professors and researchers from El Colegio de la Frontera Norte (El COLEF) located in Tijuana, Baja California, Mexico (Ph.D. Alberto Hernández Hernández, Ph.D. José Manuel Valenzuela Arce, Ph.D. Cesar Mario Fuentes Flores, Ph.D. Catalina Pérez Correa and Ph.D. José Oriol Romaní Alfonso). All the narrations, observations and photographs presented in this article have the informed consent of the participants. All signed documents are available at: https://www.colef.mx/posgrado/wp-content/uploads/2019/02/TESIS-Vinasco-Barco-Jaime-Andr%C3%A9s.pdf

Results

In the following lines, it is proposed that cannabis tetrahydroevolution be divided into three main dimensions: 1) The neo-production of cannabis, 2) The neo-refining of raw materials and, 3) The neo-presentation of products derived from cannabis.

1) The neo-production of cannabis: In order to understand the characteristics of cannabis neo-production, it is worth quoting Escohotado (2005), who points out that in California, the coordinated efforts of agronomists, chemists and biologists have led to the last 30 years of the system to maximize the production of cannabis, while suppressing the climatic and police risks of the open-pit cultivator. This system is known as the industrial and large-scale production of indoor cannabis (indoor cultivation) because, instead of offering plants that grow in mountains or uncovered lands (outdoor cultivation), it is offered in covered facilities plants that use pots or small feet of basalt -made in powder or stone wool. Periodically, these are moistened by a mixture of minerals that is different for each phase of the plant (germination, growth, maturation, etc.) (Escohotado, 2005).

Such production form, says the author, leaning on irrigation drop by drop, measured dosage of nutrients, genetic engineering, and use of artificial light, has encouraged dozens of Canadian and North American companies that are dedicated to the cultivation and growth of the plant. In the last 30 or 40 years, they have believed in amazing shrubs that mature in half the time or less, and large crops that yield double or triple weight in flowers (an unprecedented production of the plant). The ideal equipment to grow them costs approximately $ 400 US for each square meter of crop, but it allows harvesting at least six to nine plants, every two or three months, depending on the chosen light regime (Escohotado, 2005).

Under these conditions and with sophisticated equipment, this production of the plant has become huge in California, even advancing faster than the same outdoor crop (which also progresses substantially with innovative greenhouse systems, artificial lights, measured monitoring of nutrients, etc.).[6]

[6] Although indoor cultivation of cannabis evidences the most significant advances in the production of the plant, outdoor cultivation has also undergone great progress in recent decades (especially in the interest of producing industrial quantities of the plant). On the one hand, with lighting systems that force the plant to have longer photosynthesis periods (12, 16 and even 24 hours per day), on the other hand, with provision of nutrients measured through irrigation systems that are adjusted from applications and virtual machines that simulate a videogame (also monitored from any laptop or cell phone), and also with "John Deere" type harvest systems, which are machines, tractors and truck tractors created with an exclusive agricultural purpose.

The technology and knowledge of cannabis have spread to a large part of the world including places like Mexico. The growers are already venturing into indoor cultivation rather than outdoor cultivation. The cannabis industry has opened into main market cities (and throughout Latin America with products "Made in California"). Consumers in border cities such as Tijuana take substances of good quality and purity and, according to some studies, they also consume the average rates of THC ratio in the plants of this scenario (in the original state). They also advance dramatically, going from having THC levels of 4.56 percent in 1996 to having THC levels of 11.75 percent in 2008 (Burgdorf, Kilmer & Pacula, 2011).[7]

Furthermore, it is logical to suppose that in qualitative and quantitative changes of such magnitude, this type of cannabis production both indoor and outdoor has also brought both, positive and negative consequences. Greater control of these crops over the development of the plant and final products of the highest quality (achieved in the best conditions to generate products with colors, aromas and textures according to the interests and care of the growers) are among the positive consequences. In contrast, the fact that these new lighting technologies radiate a lot of heat are among the negative ones. New ventilation and air systems use a lot of electricity and new techniques of nutrient input use tremendous quantities of water and diesel oil; in short, a significant impact to the environment.[8]

Despite all these facts regarding cultivation, both systems of cannabis production continue to grow in California and in many other parts of the world. On one hand, there are the large companies that manufacture the most suitable instruments and fertilizers (General Electric, Philips, Green Planet Nutrients, Advanced Nutrients, General Hydroponics, etc.) and on the other hand, there are immense companies in Canada and the US that build the most impressive and enormous industrial, indoor and outdoor cannabis crops (Canopy Growth Corporation, GrowHealthy, Copperstate Farms, etc.). These are giant corporations that globally monopolize the

[7] Although the study entitled "Heterogeneity in the Composition of Marijuana Seized in California" analyzed the data on 5083 cannabis samples collected in California, it was determined that the average THC level in the cannabis samples had increased at the California and Baja California border with from 4.56 percent in 1996 to 11.75 percent in 2008 (Burgdorf et al., 2011). By ethnography it was found that the plants and buds that are now grown and sold in this scenario (especially in the San Diego MMDs) can have compositions of up to 35 or 40 percent THC (evidenced in the quality controls printed on the labels of the products). If we talk about concentrates, extracts or products derived from these plants, the compositions can reach up to 90 percent of psychoactive THC and up to 99.9 percent of THCA that is non-psychoactive.

[8] According to Dr. Evan Mills in 2011 in the US, the cannabis industry spent 6 billion dollars in energy, which is twice the energy used by the country's pharmaceutical companies (Cohn, 2017).

transgenic production of seeds and the sexual and asexual reproductions of the plant (Monsanto, Bayer, etc.), among others.[9] Chart 1 shows the proportion of industrial cannabis cultivation through the largest production companies.

Chart 1. List of the largest cannabis producing companies in North America, year 2017

Rank	Name of Grow Operation	Current Square Footage	Future Square Footage	Region	Location (City/State/Country)	Website
1	Canopy Growth Corporation	568,000	568,000	Canada	Smith Falls, Ontario, Canada	https://www.canopygrowth.co
2	7 Acres	304,920	304,920	Canada	Kincardine, Ontario, Canada	http://www.supreme.ca/
3	Organigram	227,500	227,500	Canada	Moncton, New Brunswick, Canada	https://www.organigram.ca/
4	Aphria	100,000	1,000,000	Canada	Leamington, Ontario, Canada	https://aphria.com/
5	Aurora MJ	55,200	855,200	Canada	Cremona, Alberta, Canada	https://auroramj.com/
6	MedReleaf	55,000	265,000	Canada	Markham, Ontario, Canada	https://medreleaf.com/
7	Maricann	44,000	217,500	Canada	Langton, Ontario, Canada	https://www.maricann.com/
8	CannTrust	40,000	40,000	Canada	Vaughan, Ontario, Canada	https://canntrust.ca/
9	WeedMD	26,000	26,000	Canada	Aylmer, Ontario, Canada	https://www.weedmd.com/
10	AB Labs	15,000	15,000	Canada	Ontario, Canada	http://www.ablabs.ca/
11	Delta 9 Biotech	15,000	85,000	Canada	Winnipeg, Manitoba, Canada	http://www.delta9.ca/
1	GrowHealthy	200,000	200,000	Eastern US	Lake Wales, Florida, USA	http://growhealthy.com/
2	Revolution Enterprises	151,040	450,000	Eastern US	Chicago, Illinois, USA	http://www.revolutionenterprises.c
3	Vireo Health NY	40,000	60,000	Eastern US	New York, New York, USA	http://vireohealthny.com/
4	Americann	0	1,000,000	Eastern US	Freetown, Massachusetts, USA	http://americann.co/
1	Copperstate Farms	217,800	435,600	Western US	Snowflake, Arizona, USA	http://copperstatefarms.com/
2	Harvest Inc.	208,800	208,800	Western US	Tempe, Arizona, USA	http://harvestinc.com/
3	West Edge LLC	187,944	187,944	Western US	Willcox, Arizona, USA	
4	Reef Dispensaries (Tryke)	165,000	665,000	Western US	Las Vegas, Nevada	http://reefdispensaries.com/
5	LivWell	162,000	162,000	Western US	Denver, Colorado, USA	http://www.livwell.com/
6	Green Man Cannabis	128,000	128,000	Western US	Denver, Colorado, USA	http://greenmancannabis.com/
7	Phat Panda Farms (Grow Op Farms)	110,000	110,000	Western US	Spokane, Washington, USA	http://www.phatpanda.com/
8	Ultra Health	92,000	501,000	Western US	New Mexico, USA	https://ultrahealth.com/
9	Colorado Harvest Company	62,000	62,000	Western US	Denver, Colorado, USA	http://coloradoharvestcompany.co
10	Essence Vegas	54,000	54,000	Western US	Las Vegas, Nevada, USA	https://essencevegas.com/
11	R. Greenleaf Organics	37,500	37,500	Western US	Albuquerque, New Mexico, USA	http://rgreenleaf.com/
12	MMAC Los Angeles Cultivation	37,000	37,000	Western US	Los Angeles, California, USA	https://triplesevenla.com/
13	Veritas Cannabis	25,000	25,000	Western US	Denver, Colorado, USA	http://veritascannabis.com/
14	Med Men	4,100	49,100	Western US	Culver City, California, USA	http://www.medmen.com/

From left to right the legends of the columns are: Ranking, company name, current square meters, future square meters, region, location (by city, state and country) and website.
Source: Compiled by author based on data from Growersnetwork (Wilson, 2017).

[9] Monsanto is a multinational company that functions as the largest bank of transgenic seeds. In 2013, this company was cataloged as "the evillest company in the world" (see: Ketler, 2018). This company is recognized because it has been pressing for control of cannabis production in Uruguay, a country that a few years ago legalized its cultivation. Rumor has that one of its aims is to genetically modify cannabis to produce a transgenic cannabis to be marketed under its own brand. The latest news about Monsanto is that it has had a merging with Bayer, another giant of the sector that has acquired it for the chilling figure of 66 billion dollars (to date the largest commercial operation in history). Information available at: https://www.tecnocultivo.es/blog/monsanto-entra-en-el-negocio-del-cannabis/

Beyond the evidence of current production of cannabis, the ethnographic account presented below demonstrates one of its greatest and unfortunate consequences: the monopoly on the production of seeds and cannabis plants.[10]

Ethnographic story No. 64 – 9/Feb/2018 (San Diego, CA, US): Since January 1, 2018, recreational cannabis has begun to be implemented in California and has begun to allow domestic and foreign people, older than 21 years, to enter to the dispensaries of San Diego. They are able to buy cannabis in multiple and various forms. With this idea in mind, I got ready to pack my things and I went to the dispensaries. Before starting this adventure I called my best friend to invite her. Unfortunately, I had receive a negative from her part. However, before hanging up the phone, my friend asked me, "Since you are going to the dispensary, please do me the favor of selecting, buying and bringing me some cannabis seeds OG sativa".

From my modest experience in cannabis fairs worldwide (Spannabis Barcelona, Expocannabis Uruguay, Expomedeweed Medellin, among others) I answered my friend that there was a possibility that the dispensaries sold those seeds. Additionally, they also get in them of the best and biggest brands that I have ever known (Sense Seeds, Marimberos, Word of Seeds, Piramidal Seeds, etc.). However, in spite of her enthusiastic attitude, I told her, "it is possible", I will try to find it, I cannot fully commit, I will simply do what I can to fulfill her request.

Sixty minutes later, after I had googled the Urbn Leaf clinic in WeedMaps and crossed the border from Tijuana to San Diego, I arrived at the clinic located in San Diego, CA, 92110. I entered its facilities and among other things, I recalled that it was very "pretty". Once inside, I begun to do some research about cannabis seeds, irrigation systems, fertilizers and the ways of giving light to the crops. In the face of my gnawing doubts, the first thing that called my attention was the shortage of seeds. The seller explained, before, he used to sell them, but not anymore. Packages of five seeds that were sold in 80 dollars were now replaced by the cuttings (fragments of the plant separated with a reproductive purpose) and that now "the stop is to buy the seedling already germinated".

[10] As has happened with grapes, tomatoes and many other fruits and vegetables, the cannabis plant has suffered in the last decades a process of genetic adjustment that has suppressed the natural generation of its seeds (hermaphroditic plants, self-blooming, feminized or of asexual reproduction). This has prevented the grower from reproducing or multiplying the plant or its crops, and instead he is forced to buy sprouted seeds, or even to buy the plant in its growth stages.

At that moment, I went to see the cuttings of the plants that were on the left side of the entrance to the dispensary. I realized that his statement was real. Before checking, I did not believe it, his prices are stipulated between 19 and 30 dollars without taxes. In addition, there is a warning that he abruptly lets know: "No returns or exchanges, all sales are final on clones".

I was very impressed, I sat down in a chair in the same dispensary and I started thinking about two things; the first one was the possibility of disappointing my friend and telling her on the phone that there was a new method of acquiring "seeds" (the cuttings that I obviously did not buy because of the high price and because it was absurd and naïve to try to cross an international border with a cannabis plant); and the second one, was to record and photograph with my cell phone the cuttings of the plant. The budtender that sold them and the cash that appears at the end, is nothing more than strict business. Some of the photographs are below the narrative (Ethnographic Report No. 64, 2018).

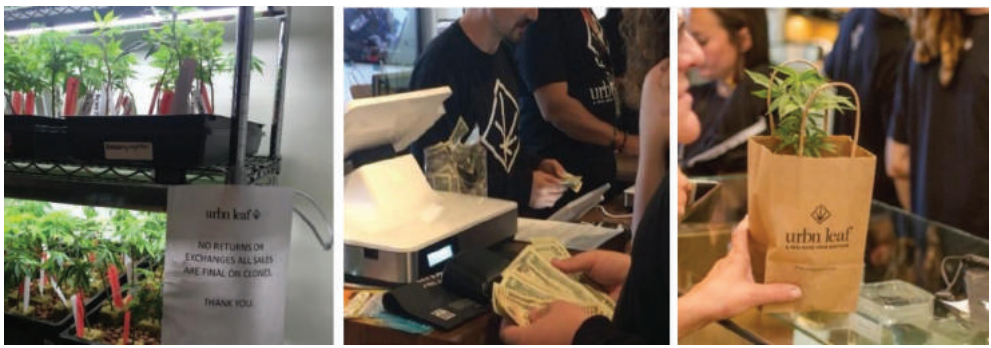


Image 1. Photographs of the interior of the medical marijuana dispensary.
Source: Own elaboration.

2) The neo-refining of cannabis raw materials: To have knowledge of the processes of neo-refining raw materials, it is relevant to know that, firstly, the cannabis plant, unlike a few decades ago, has had an expansion of its industrial uses. Including, agricultural and feeding conditions, the cannabis plant has multiplied its religious, medicinal and recreational uses (which undoubtedly are those that currently push the development of this plant, its derivatives and its processes of refinement). Chart 2 shows the current uses of the cannabis plant.

Chart 2. Current uses of the cannabis plant

MODERN USES OF THE CANNABIS PLANT					
PART OF THE PLANT	Stem	Leaves	Flowers	Seeds	Full Plant
RAW MATERIAL	Vegetable fiber	Pulp	Active ingredients	Oils, cakes and whole seeds	Cell fluid or complete plant
USE	**Paper:** printing paper, fine paper, specialized paper, filter paper, newspaper, cardboard / packaging **Industrial textures:** twine, rope, nets, canvas, tarpaulins, carpets, geo-textiles, agro fiber composites and moldable parts, brake / clutch lining, caulking **Consumer textiles:** clothing, diapers, fabrics, handbags, denim, shoes, fine cloth	**Paper:** printing paper, fine paper, specialized paper, filter paper, newspaper, cardboard / packaging **Construction material:** conglomerate, insulation, fiberglass substitute, cement, stucco and mortar, bedding for animals, fertilizer and compost **Active ingredients:** medicine, recreation, sacrament	**Active ingredients:** medicine, recreation, sacrament	**Food:** seasoning oil, margarine, food supplements, vitamins, cooking oil, grain, birdseed **Industrial products:** oil paint, varnishes, printing inks, fuel, solvents, lubricants, putty, coatings, forages **Personal hygiene:** soap, shampoo, intimate and bath gels, cosmetics, lotions, balsams	**Agriculture:** suppression of weeds, less need for pesticides than most crops, pollen isolation, soil improvement in crop rotation, deep roots oxygenate the soil **Other uses:** fuel for boiler, raw material for pyrolysis, biomass for construction, chemicals abrasive

Source: Compiled by author based on data from the Magazine Cáñamo México, July-August, 2015.

Considering the applicability mentioned, it is worth to refer now that, apart from the industrial, agricultural and food uses of cannabis, the medicinal uses and leisure-recreational uses of this plant are the rudders and incentives that in the last decades have stimulated the extraordinary processes of production, refinement and development of cannabis. The reason for this is that in the medicinal and recreational field of cannabis there has been an impressive emergence of the purest forms of refinement of this plant: "cannabis extractions". These forms of refinement have generated an industry that constantly demands so many companies that manufacture the most appropriate instruments, as well as the brightest minds that are constantly devising the most efficient ways to achieve their objectives: Perfection and excellence in the use of cannabis.

As for the refining strategies of cannabis, it is necessary to mention that they are grouped into two: Mechanical Extractions and Chemical Extractions. The Mechanical Extractions are the result of doing in a modern way the classical processes that physically separate the cannabinoids from the rest of the plant (with pressure, temperature, freezing, etc.) There are also other techniques such as dry extraction processes with sieve meshes (a very common technique for making hashish around the world). The Ice O Lator techniques (which are also dry extraction processes but that use ice); Fresh Frozen processes (which are made from the frozen plant but not dried); and Rosin-Tech techniques (which have become fashionable because they only need a hot iron and butter paper) (Hemp, 2018).

Some of the products obtained by Chemical Extractions —which are considered the most "modern"— act as solvents. This technique is differentiated by the method and materials used and because it produces purities that exceed cannabinoids to the best products of mechanical methods. Most of the processes of this strategy are carried out by disintegrating the components of the cannabis plant into a solvent, which is then boiled or evaporated under control, so that the residual cannabinoids are of interest to be rescued or are left behind. The texture, smell, color and other properties of the final product are largely achieved by factors such as the raw material, the type of solvent and the boiling or evaporation technique used.

In the chemical refining of cannabis the most commonly used solvents are ethanol, methanol, acetone, chloroform, ether, butane, propane, hexane, CO2, olive oil,

gasoline (used more artisanal than industrial), among others[11]. Besides, the most commonly used instruments for the recovery of raw materials are extractors, vaporizers, filters, decanters, thermostats, ovens, homogenizers and other state-of-the-art equipment (all patented, manufactured and sold by companies already very well established). The most recognized products derived from these processes are the Live Resin, the Shatter, the Budder, the Bubble Hash, the Crumble, the Sugar Wax, the RSO, the THCA and CBDA crystals, among others.[12]

It is worth adding that for the final products of these processes to reach textures, shapes, colors, flavors and extraordinary concentrations that was unthinkable years ago (20 to 50 percent by mechanical methods and 60 to 99 percent by chemical methods), it is necessary to merge efforts coordinated by scientists, technological developers and audacious investors to give rise to the phenomenal laboratories and extraction systems that now exist (to take to the clinics and dispensaries the prodigious products that are now traded). Proof of this are companies like Bhogart®, Geen Dot Labs® and ExtractionTek Solutions® that do not stop growing and make alliances (also to increase their capital exponentially) that small enthusiasts, like the following story do not stop enjoying, please, enrich and even venture into this medium with your own strategies.

Ethnographic story No. 2 and No. 55 – May/10/2015 and Oct/18/2017 (San Diego, CA, US): At the beginning of May 2015, when this research was just formally beginning, I went downtown in San Diego to observe, at least from the outside, the operation of the dispensaries and the venues for the sale of cannabis paraphernalia. As expected, and because I did not have a medical card that allowed me access to the MMDs, it was impossible for me to access the dispensaries. Nevertheless, it was not impossible to access the paraphernalia stores that, by that time, were operating throughout the city.

[11] Some mechanical processes are performed with water but in these processes it is not considered a solvent (therefore it is in the mechanical processes). On the contrary, some chemical processes are made with CO2, which is not a solvent, but paradoxically is considered a solvent and is in chemical processes.

[12] Some formulas, processes and products of the chemical refinement of cannabis are also patented. For example, some of the most powerful extracts on the market are Concentrate Remedies 'Bubba's Deadhead Girl (79.8% THC), Alpine Alternative's Legend OG (82% THC), Leef's Cheese Quake CO2 Oil (88% THC), Clear Concentrates' The Clear (96% THC), T-Rex Concentrates' Predator Pink BHO (92% THC), Dream City's Concentrates (93% THC), Purity Extracts' Gorilla Glue (96% THC) and Guild Extracts' THCA (crystals that do not have THC THCA in its pure state, but can be converted to THC if the proper heat is applied) (Lindsey, 2018).

Inside these stores, I could easily access information about products and even consumers that I later had the opportunity to interview. One of them is the protagonist of this story, John. John is a person whom I interviewed for the first time in his own store called Broadway Vapors California. To be more precise, Broadway Vapors was a store located between 7th and 8th Ave streets in Downtown San Diego. It offered all kinds of paraphernalia and extracts and, at that time, it was just beginning its expansion work in this area. Here are some images of the store in 2015.

Image 2. Photographs of the interior of the medical marijuana dispensary.
Source: Own elaboration.

From the first meetings I had with John, in his shop, he expressed his interest in entering the "business of cannabis". He told me that his mother was a nurse and they wanted to try the business where he was willing to invest all his capital in a project of this type. After approximately three face-to-face meetings with Jhon, in San Diego, the contact with him remained virtual and it was only through social networks (Facebook and Instagram) that we were able to continue talking. This was because of the fact that I no longer answered the telephone due to other matters that occupied me and my field work also began to take me to other types of places in Tijuana.

Almost 30 months after the first encounters with John, he shared via internet some of his most current changes. These were that Broadway Vapors had closed. Now, he lived near San Francisco and that he had finally entered the cannabis business. He was now manufacturing products for himself and others who were looking for good cannabis. I told him that I am still in Tijuana and, that I occasionally go to San Diego, and EL COLEF. Conclusively, that I was still studying the cannabis issue and delving into the phenomenon on the California side.

When we had the chance to reconnect (October, 2017), I explained to John about my other research interests, at that moment, I was writing about consumption and cannabis concentrates. Also, I was mainly interested in extractions and all the processes that were currently derived from it. Before this affirmation, John expressed to me that he found himself involved in that field.. He explained that now he has a crop (indoor), a mobile extractions laboratory and that he will be reopening his store and his own dispensary soon. Immediately, I asked him if it was possible to interview him. He answered that it was difficult at that time because he was really busy living in San Francisco; he also explained that it would be very difficult to come back to San Diego, even more to Tijuana.

Since it would be difficult to establish a new face-to-face contact with John, I asked him if he could send me some photos of his new projects. He agreed and then, via Facebook, he sent me the following images:

Image 3. Photographs of the mobile laboratory.
Source: Photographs shared by the laboratory.

I am surprised by the culture and the trailers I see in the photos he sends me, but I am even more surprised by the extraction equipment inside them. I immediately asked John about it, his answer was: "right now I have one ultrasonic homogenizer and two Bhogart® 20-liter rotating evaporators. The homogenizer cost me five hundred bucks and the evaporators ten hundred bucks each" (Ethnographic story No. 2 and No. 55, 2015 and 2017).

3) The neo-presentation of cannabis-derived products: In order to understand the neo-presentation of cannabis-derived products, it is necessary to first refer to the neo-refining of the raw material of the plant as well as its by-products. The new recreational substances have originated multiple colors, multiple flavors, multiple textures, multiple consistencies, and new medicinal substances with multi-generational characteristics that are now presented in an almost endless number of products. Therefore, the typical cannabis joint has not stopped surviving the vicissitudes of the time, statistics and field work show that the current consumer increasingly displaces his preferences to contemporary products such as vape, edibles and topical substances made from more sophisticated products such as extracts, resins or cannabis concentrates.

Accordingly, Eaze Solutions, a US company and a medical cannabis home delivery app, reported that people in 2017 used the application every 10 seconds to request "new" products derived from cannabis. This represented an increase of 200 percent over the previous year, and one of the main findings that this article intends to refer: The new products derived from cannabis. The company Eaze Solutions, a semi-virtual company based in San Francisco, included in its 2017 report the behavior of more than 350,000 consumers in California. It pointed out the consumer trends to contemporary products such as edibles, vapers and topical substances. Also, the rising of 19 percent of baby boomers of the state and up to 5 percent in the consumers of the Bay Area and the counties of San Diego (these two counties recorded the largest increase in sales that year in California) (Snibbe, 2018)[13]. This was revealed and published in many media outlets.

[13] Other interesting and particular data of this report (The Eaze Insights 2017 State of Cannabis Report) are: a) the company Eaze increased the brands of products available in its platform from 18 in 2016 to 61 in the year 2017, b) the Eaze company increased the number of products available in its platform from 101 in 2016 to 427 in 2017, and c) the company Eaze made a ranking of increase in demands in relation to special dates and, from higher demand to lower demand, this was: 1) 4/20 (April 20), 2) Green Wednesday, 3) President`s day weekend, 4) Valentine`s day, 5) Halloween, 6) July 4th, 7) Inauguration day, 8) Cinco de Mayo, 9) Memorial day, and 10) Mother`s day (Eaze, 2017).

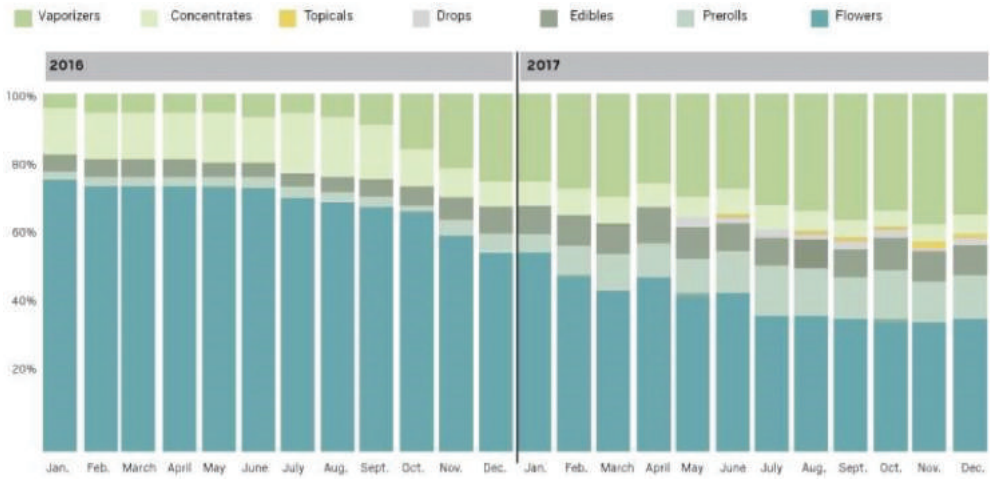
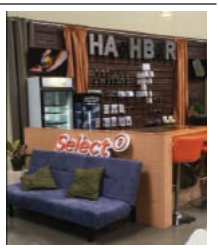


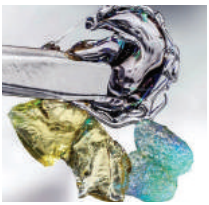
Figure 2. Trends in cannabis products sold in 2016 and 2017 by the company Eaze. From left to right the legends of the painting are: Vaporizers, Concentrates, Topical substances, Drops, Edible, Cannabis Cigars and Flowers. *Source:* Snibbe, K. (2018) based on data from Eaze Insights 2017 State of Cannabis Data Report.

While this information shows that in many cases consumers still prefer the flower, the bud or the pre-rolled cannabis joints, the graph above shows that many consumers begin to prefer the vaporizers and the concentrates, edibles, and the topical substances and cannabis drops. Undoubtedly, the neo-production of cannabis, the neo-refining of its raw materials and the neo-presentation of the products derived from the plant (processes typical of the tetrahydro-evolution of cannabis) has caused that, in the last 30 years, the consumer and substance have a new subject-object relationship. Rather than being identified by the useful, practical, therapeutic or recreational use (which of course exists), this relation is identified by being mainstream and by presenting itself as a trip, an experience or a strategy that serves to surprise, entertain, excite and dream, or as a myth to transform brands into stars.

Ethnographic story No. 65 - 9/Feb/2018 (San Diego, CA, US): At a cannabis dispensary located at 658 E San Ysidro Blvd, San Ysidro, CA 92173, US, I have made a meticulous registry of the elements that were available and traded in this place. Below are my notes and field photographs:

Chart 3. Main spaces and products found in the visit to a MMD

Main spaces and products found in the visit to a cannabis dispensary			
Space	Description	Products	Photographs
Central part of the dispensary	The place has a table, three microscopes and three monitors arranged to facilitate the knowledge of the cannabis plant	Main strains or cannabis buds sold by the dispensary. Each one of them is in front of a microscope that amplifies it in a monitor so that the user can observe it better	 
Southwest part of the dispensary	The showcase with consumer paraphernalia products	Bongs, pipes, rigs, jet lighters, torches, bowls, caps for bowls, bowls, titanium pieces, propane tanks and all the glassware necessary for the consumption of oils or extractions	
Northwest part of the dispensary	The hash Bar or showcase with products derived from physical and chemical extractions	Cartridges of CO2 (sativa and indic), Wax, Rosin, Crumble, Budder, Shatter, CBD oil, Terpenes, etc. Also cartridges for each mood or mood: calm, sleep, party, relax, relief, chill, etc.	 

Space	Description	Products	Photographs
Northern part of the dispensary	The meeting room and place where new products information is projected, new extraction processes and new forms of consumption	Virtual exhibition of new products such as those in the photograph on the right: THCa (white substance), Terpenos diamonds (blue substance) and CBDa (golden substance)	 
Central and northeast part of the dispensary	The stand and ledge with products for indoor and outdoor garden	Cuttings of cannabis sativa and indica, main indoor and outdoor strains, fungicides and bactericides, fertilizers and substrates, poly shades and UV lights, manuals and self-cultivation books, etc.	 
Northeast part of the dispensary	The showcase with products for medicinal use	Syringes and cartridges with medicinal formulas of 10, 9 and 6 parts of CBD for 1, 3 and 6 parts of THC (10: 1, 3: 1, and 1: 1 respectively). Products with CBD and THC for personal hygiene, topical substances or even treatments for dogs and cats	 

Space	Description	Products	Photographs
East and southeast part of the dispensary	The place of purchase and packaging of products. Cash registers that do not accept credit or debit cards. ATM.	Joints, sales, new products, flyers and informative flyers, airtight bags to pack products (each one is 1 dollar charged to the buyer), etc.	
Southeast part of the dispensary	The place with refrigerators and stands with cold products	Lemonades, sodas, soft drinks, desserts, energizers, butters, cakes, milkshakes, emulsions, yoghurts and other extractions that need to be refrigerated to keep consistency and efficient preservation	

Source: Compiled by author based on the empirical information collected.

Starting from everything described in the previous lines, the neo-presentation of cannabis-derived products is the dimension that, in spite of being the last in the whole tetrahydroevolution of cannabis, converges and reveals the processes derived from the previous dimensions. This happens because ultimately this dimension offers the consumer the final result of the predecessor processes in smokable, vaporizable or edible form, and because it is reflected in it and sometimes even diffuses (in packaging, labels, or containers of manufactured products). The new cannabis production processes (whether an indoor or an outdoor crop) for refining raw materials (whether a mechanical or a chemical extraction) and summarizing the new packaging, manufacturing, preserving and even consumption processes.

Discussion

While in some countries the debate over the legalization of cannabis takes place in the midst of a not small wave of corruption, drug trafficking and bloody clashes among criminal organizations, the "Tetrahydroevolution of Cannabis" as called in this article, advances to many other parts of the world and behind the scenes entails the results of a joint work that takes no less than three decades in the economic, therapeutic and scientific field of cannabis. While in places like the US the income generated by the cannabis industry far exceeds the expectations of investors, markets and most of the States, in countries like Canada (that entered integrally and forcefully in the regulation of cannabis), the scientific research of the plant does not stop and the substances derived from it reach a development that neither consumers, patients or scientists imagined a few years ago.

Furthermore, it is relevant to mention that the tetrahydroevolution of cannabis (which is still in force and in constant progress) is the process of change that started, unprecedented and specifically since the 90s, when the results of the relevant processes began to materialize in various fields such as the discovery of the endocannabinoid system and its interaction with THC. The establishment of the first legal system of access to medicinal cannabis in the world began to make the cannabis plant experts adjust its components, its concentrations, its textures, its colors and its uses, as well as its forms of cultivation, use, preservation and presentation to consumers.

Likewise, the tetrahydroevolution of cannabis is also a development process that has converged in three great dimensions: technology, research and the economy of cannabis, with the innovation, wisdom and the experience of many investors, growers and consumers in the world (the neo-production of cannabis, the neo-refining of its raw materials and the neo-presentation of these products). The development process has led the consumer and the substance to have a new subject-object relationship, characterized by a vast stock of products derived from cannabis, a complex and artificial trade of accessories to achieve an efficient consumption, and an evolution of the consumer and its classic ways of administering the substance. Finally, there has been an incalculable and indescribable income derived from the industry and the market of everything that has been mentioned in the previous lines.

In conclusion, the tetrahydroevolution of cannabis -which is in force and in constant progress- is a process that moves forward, and specifically since the cannabis neo-production advances with the creation of the largest crop plant in the US. This is a one million square foot business park and crops known as Cannabis-business Park, and a proposal that a Colorado company (AmeriCann) has been developing in the State of Massachusetts (Livni, 2016). Since the neo-refining of raw materials, the cannabis tetrahydroevolution does not decrease either, and against some estimates, it advances every day. This is due to the fact that studies such as those conducted at the University of Sopron in Hungary (Ultrasound-Assisted Extraction of Cannabinoids from Cannabis Sativa L. Optimized by Response Surface Methodology: Extraction of cannabinoids), have recently found that the introduction of ultrasound to cannabis extraction leads to better and faster results, and that ultrasound increases the yields and the speed of the extraction of the same cannabinoids (Agarwal, et al., 2018).

As for the neo-presentation of cannabis-derived products, the issue is much more striking and therapeutically of even greater interest. This is due to the presentations of tetrahydrocannabinolic acid or THCA, and cannabidiolic acid or CBDA, which are cannabinoid precursors of their pharmacologically active analogues THC and CBD, have recently been discovered. THCA and CBDA, isolated, are the purest form of concentrates currently available in the market; these substances work well orally (pills or capsules), but are more efficient through the ingestion technique known as dabbing. In terms of concentration, these substances reach levels of up to 99.9 percent and, because they are such pure substances, they are easy to dose. They do not have traces or terpenes, flavonoids, fats, lipids or any other residue of the plant in vegetable state (for that reason they are presented without flavor, color or aroma, and resemble diamonds, snowflakes or salt of crushed rock) (Bennett, 2018).

Granting all these, these crystalline compounds are considered inactive because they do not have the same properties as THC or CBD, they are considered medicinal compounds (because they have incalculable therapeutic properties) and above all, they are considered the greatest findings for modern research and the development process that this article has called: The Tetrahydroevolution of Cannabis.

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