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DISPLAY UNTIL END OF MARCH 2017



A close-up photograph of a hand holding a mound of dark brown soil. Several red-skinned potatoes are visible, some partially buried in the soil. The background shows more soil and some green weeds. Overlaid on the image are several white, stylized cannabis leaves of various sizes. The text is printed in a bold, sans-serif font, with some letters in a brown color that matches the soil.

# **CANNABIS TERROIR**

**BY**

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*A terroir is the “aggregate characteristics of the environment in which a food or wine is produced; including regional and local climate, soil, and topography”, the flavor imparted to a food or wine by such characteristics” is also called terroir.<sup>1</sup>*

*Terroir is a French word that has no synonym in English; the etymology of the word comes from terra, the Latin for earth. The knowledge*

*of terroir was the catalyst in the quest for quality pursued by the wine industry before being adopted by farmers of other agricultural products like meat, lavender, lentils, honey, olives, butter and spirits. However, the recognition of terroir in France actually started with a cheese - Roquefort, which was regulated in the year 1411 by a decree from the French parliament in order to preserve its intrinsic qualities.*

## THE LAND IS THE CREATOR OF ALL DIVERSITY AND UNIQUENESS

Life was born as a unicellular organism in the depth of the planet's oceans over a billion years ago, and migrated to land approximately five hundred million years later in the form of an alga with photosynthesis<sup>2</sup> capabilities; the ancestor of the plant kingdom, and source of the environmental conditions and resources that support all life on the planet. It took the original ancestor of all plants over three hundred million years to diversify into today's higher form of plant life.

Since life on land started from this most basic living organism, the evolution of an alga into the diversity that is today's plant kingdom can be said to be a representation of the land itself; from the natural topography, the climate and the soil that defines a region. In other words: by the terroir.

The Earth is made of countless terroirs, which are the product of billions of years of geological formation of the landmass; the extraction, transformation, and consumption of the energy taken from their habitat have shaped all living organisms since the birth of the first unicellular life.

“The evolutionary histories of species have general aspects in common, even though species may differ greatly in their attributes. Each species has a beginning in some geographically defined context, all successful species spread from their focus of origin, most species undergo some geographical differentiation”<sup>3</sup>. In plain English, all existing species of plants, insects and mammals were born in one specific region of the planet, the most adaptive spread from their birthplace and transformed in function to their new habitat.

One very important aspect of adaption is the transmission of memories; of information handed from one generation to the next; plants have an epigenetic<sup>4</sup> memory spanning generations, information around stressful climatic or physical

circumstances are passed down to the next generation, the experience triggering new DNA combinations in the plant that will be inherited by all following descendants and will define an evolutionary increase in tolerance to various stresses.<sup>5</sup>

We have to assume that if plants have the ability to sense and act upon external and internal stress stimuli that they would in turn respond as well if not better to positive stimulus. This suggests an interesting angle to the co-evolution of the plant and insect kingdoms as well as to the birth of human sedentary life and agriculture.

**Jared Diamond believes that “Agriculture grew from human behaviors and from responses or changes in plants and animals, leading without conscious plan toward the domestication of plants and animals”<sup>6</sup> which could actually mean that humanity was guided by plant evolution toward sedentary life and agriculture.**

Cannabis was one of the first plants “unconsciously” domesticated by humanity; so far back in time that its putative ancestor and birthplace are unknown today due to early biological dispersal; a very rare if not unique happenstance in botany.

Cannabis was potentially born at the feet of the Himalayas with a tropical plant's physiognomy or in Central Asia with desert plant's characteristics; the simple fact that the plant's potential region of origin are so completely opposite in terroir is testimony to the plant's power of adaptation. Cannabis has in fact transformed into so many genotypes to adapt to new habitats and has become so diverse that until recently it was mistakenly classified as three different species - C. Ruderalis, C. Sativa and C. Indica, again a very rare if not unique



happenstance in the history of botany.

Cannabis is a dioecious<sup>7</sup> wind-pollinated flowering plant with the ability to become hermaphrodite and fecund itself. The plant has adapted to every climatic zone except for the polar region; can endure drought, frost and large fluctuations of temperature and rainfall; Cannabis will grow in all types of soil from fertile to rocky and at most altitudes. It is also resistant to most fungus, disease, pests and major predators: it is the ultimate survivor.

The Cannabis plant's ability to modify its genetic code into such diversity and become adapted to so many regions, climates and eco-systems is based on information that defined the evolutionary step of the next generations. Like every other species in the plant kingdom, the more information retained the higher the power of adaptation. The land's substance is the source that empowers and nourishes this evolution so that the more adaptive the plant is; the more powerfully the terroir will be expressed in its form.

As noted in the scholarly analysis Method for the Analysis of Cannabinoids and Terpenes in Cannabis, "Agricultural crops inherently have a large amount of natural variation resulting from differences in environmental conditions, genetic background, developmental stage, farming practices, and seasonal changes, which result in differences in organoleptic<sup>8</sup> properties, appearance, nutrient composition, shelf life, and crop yield."<sup>9</sup>

**Plants with little adaptive power like most agricultural crops convey the characteristics of a specific terroir; the Cannabis plant goes beyond, she becomes the terroir.**

The grapevine has the ability to capture in its fruit the essence of a region so well that it brought to my French ancestors the first insight into the relationship between a specific region and the intrinsic quality of the food grown there. Most winemakers and scientist agree that a soil's drainage, heat absorption and retention capacity affect the growth of grapevines, as well as the development and ripening of the grapes. The physical properties of a soil's ability to regulate water supply to the vines is considered to be the determining factor in a wine's quality. Interestingly enough, viticulture experts generally consider the actual chemical composition of the soil irrelevant to wine quality but recent research on the effects of minerals on plant physiology are proving them wrong<sup>10</sup>. The root system of plants attract and nurture specific microbial organisms to extract and break down mineral nutrients from the soil; a whole

eco-system is in symbiosis with the plant, and most certainly defines not only its living conditions but also the characteristics of its fruits.

I can only imagine the reaction of winemakers and farmers when confronted with the notion of a Cannabis terroir; it may be perceived as a sacrilege toward viticulture and all agricultural products whose value are defined by their terroir, however, the Cannabis plant's adaptability should be ample testimony to its ability to express like no other plant the characteristics of a place.

I have experienced Cannabis terroir at the feet of the Himalayas while collecting the live resin of Cannabis plants, at the peak of their flowering cycle, on the palms of my hands. The genetics from Nepal to Kashmir are of the Narrow Leaf Drug type cultivar (NLD) known as Sativa but the diversity in phenotypes, each expressing distinct terpene profiles changing from valley to valley was simply mind-boggling, and a sure expression of the terroir.

The Himalayas is made of three parallel mountain ranges with climates wildly contrasting from tropical and Sub-tropical at 1,650 to 3,300 ft. to more temperate in middle elevations of 6,600 to 9,800 ft. and arid at elevations over 10,000 feet<sup>11</sup>.

Cannabis growing at low elevations in a tropical climate will express very different characteristics from a plant growing at a higher altitude in harsher conditions; the different eco-system, climatic environment and altitudes trigger specific adaptations which are expressed in the terpene profile of the plant and its potency. Wild Cannabis plants capture the essence of their habitat in their terpene expression to an amazing level, mimicking, for a better word, the terpene profile of the wild strawberries, mint, and the oak or pine trees surrounding them. Cultivated Cannabis does not have the same extraordinary adaptive power as its wild cousin whose terpene profile changes considerably from one valley to the other, or from one village to the next; I have even perceived a difference between plants in neighboring fields! However, the most amazing experience of Cannabis expression and adaptation was to see over the course of seven seasons cultivated fields of totally uniform plants left intentionally unattended transform into a truly diverse range of wild Cannabis - displaying an astonishing variety of phenotypes after a few years.

The fact that Cannabis seeds enduring the rigor of a winter do not express the same phenotype as seeds planted in spring may well be the most apparent evidence of the plant's unique potential of adaptability.





The expression of the land is dramatically manifested in sun-grown Cannabis, this is apparent to anyone taking the time to study the plant. Discovering the full potential of a region's terroir is the first step toward claiming the ultimate agricultural product recognition for our farmers, the Appellation d'Origine Contrôlée (controlled designation of origin).

"The AOC designation links a product with its geographical origin and makes it subject to rules of production and manufacturing. It expresses the close relation between a product and its terroir, coupled with the decisive and enduring impact of human savoir-faire.

AOC regulations go far beyond the question of geographical delimitation itself. They encompass all aspects of the production process relating to terroir in the largest sense. These regulations embrace all of the features that characterize an AOC product – geōgraphy, pedology (the science of the soil), climate, technique and human in-put."

**"An AOC area is born of an alliance between the natural environment and human ingenuity. From that alliance comes an AOC product with unique, inimitable characteristics. A product so different that it complements rather than competes with other products, possessing a particular identity that adds further value."**<sup>12</sup>

A most fitting definition for the Cannabis plant I would say!

References:

1. <http://www.thefreedictionary.com/terroir>
2. A process by which green plants and other organisms turn carbon dioxide and water into carbohydrates and oxygen, using light energy trapped by chlorophyll
3. The Origin, Expansion and Demise of Plant Species By Donald A. Levin
4. Epigenetics studies genetic effects not encoded in the DNA sequence of an organism, hence the prefix

epi- (Greek: ἐπί- over, outside of, around). Such effects on cellular and physiological phenotypic traits may result from external or environmental factors that switch genes on and off and affect how cells express genes. <https://en.wikipedia.org/wiki/Epigenetics>

5. What a Plant Knows By Daniel Chamovitz, Chapter Six: What a Plant Remembers
6. The Third Chimpanzee by Jared Diamond
7. Characteristic of a species, meaning that it has distinct male and female individual organisms or colonies, meaning that a colony contains only either male or female individuals. Dioecious reproduction is biparental reproduction. <https://en.wikipedia.org/wiki/Dioecy>
8. Aspects of food, water or other substances that individual experiences via the senses—including taste, sight, smell, and touch. <https://en.wikipedia.org/wiki/Organoleptic>
9. Method for the Analysis of Cannabinoids and Terpenes in Cannabis, Authors: Giese, Matthew W.; Lewis, Mark A.; Giese, Laura; Smith, Kevin M. Journal of AOAC International, Volume 98, Number 6, November-December 2015, pp. 1503-1522(20) <http://www.ingentaconnect.com/content/aoac/jaoac/2015/00000098/00000006/art00005>
10. [http://www.wineanorak.com/mechanisms\\_terroir2.htm](http://www.wineanorak.com/mechanisms_terroir2.htm)
11. <http://www.pbs.org/wnet/nature/the-himalayas-himalayas-facts/6341/>
12. <http://www.champagne.fr/en/terroir-appellation/appellation/appellation-origine-controlee-aoc>

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