

## What about cannabis taxonomy?

Problemática de la taxonomía del género cannabis

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### RESUMEN

Se considera el cáñamo como una de las plantas más extendidas, sin embargo existe hoy un consenso entre los botánicos que están de acuerdo con una sola especie *Cannabis sativa* L. Hay que reconocer qué variedades de otros epítetos específicos están todavía usadas por algunos autores, especialmente *C. ruderalis* Janisch. y *C. indica* Lam.

**Palabras clave:** Cáñamo, *Cannabis sativa* L., Epítetos.

### ABSTRACT

Hemp is considered as one of the widespread plants. Although a consensus of botanists today agree that only one species, *Cannabis sativa* L. It should be reconized, that a variety of other specific epithets, specially *C. ruderalis* Janisch. and *C. indica* Lam., are still used by some authors.

**Key words:** Hemp, *Cannabis sativa* L., epithets.

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“The hemp is a green plant, a very abundant and ubiquitous plant, an unusually valuable economic plant, possibly a dangerous plant, certainly in many ways a mysterious plant”.

*Schultes* (1970)

It was nominated the sad star by Miege (1) and the cheat hemp by Nahas (2). It was at the page one for many centuries. In africa, it caused l'Amok, this furious madness of the malians and the death of Malik in 1092 and Raymond of Tripoli in 1152; wasn't it the cause of the misfortune of Conrad de Monserrat, who was stabbed the very day he was to be crowned as the king of Jerusalem in 1192?

The Balouba of Kasai vowed it veritable cult after a religious political revolution. According to the crusaders, the old man of the mountains, the Chiite Hassan Sabbah, creator of the Ismailite sect in 1090 made drunk his disciples by means of a mixture based on hashish and obtained from them unlimited devotion. Don't we say the word assassin is derived only from the word hashashines (consumer of hashish in arabic)?

The meeting of the humanity with this plant goes back to the very first time and its domestication to 6.000 years.

Its culture is thought to be one of the oldest that has ever been discovered by the Man; the oldest document that deals with hemp goes back to 15 centuries B. C.; it is treating about Rhy-Ya, treatise of the chinese botanic. Herodotus, 450 years B.C., reported that the Scythians Aral lake people of the Caspian sea were driving themselves mad inhaling the smoke evolved from the seeds of hemp thrown in the fire. The hemp plant was cultivated in Palestine and Mesopotamia at the time of Christ, but the earliest Roman mention of it was made about 100 B. C. The "Vedas", sacred book of the "Indians" reported hemp and the priests used it during the religious ceremonies to excite the fanaticism of the women priests in order to impress the faithfuls.

According to arabo-islamic manuscripts, hashish was introduced in Persia in the 650<sup>th</sup> year of the Hegir, then in minor Asia and in Egypt; the arabic invasions had probably introduced it in the north of africa and Spain. In the treatise of the "simples" of Ibn al Baytar (3), the author made of it an extraordinary compilation of the bibliographical data dealing with hemp, starting, in a chronological order, by Discorides, Galen, Avicenne, Razes and Ishak ibn Amran before achieving by his own description. It was of a remarkable precision; in fact, he described the botanical characters, the pharmacological properties and the relationship between the Man and Hemp plant. Finally, he distinguished two varieties, the wild type and the cultivated one, and used the binomial denomination "Al Kanab al Hindi" which corresponds to *cannabis indica* described by Lamarck, five centuries later. The moslem treatises became abundant concerning Kannab (cannabis) between the 11<sup>th</sup> and the 15<sup>th</sup> century (41).

Cannabis was cultivated for the fibre of its stems, the oil of its seeds and its resin which provides hallucinogenous and medicinal properties. In fact, cannabis presents an important source of cellulose, its fibres are composed of 70% of cellulose and are used for the production of cords and resistant clothes. The numerous seeds of the plant provide 30% of fatty materials and constitute, for many years, an important nutritional source for people and animals. Nowadays, the hemp seeds are exploited to extract oils which serve to the elaboration of painting and varnish. The narcotics properties of the cannabis were not introduced to Europe till the 16<sup>th</sup> century (4); the preparations rich in resin (Kaf, Kif, Hashish, marihuana, Bangi, Dacka, Malasch, Bhang,.....) are the main purpose of the most important world trade. The different uses of the plant gave rise to

a considerable interest for the specialists as well as for the profanes. There are more than 7.000 publications dealing with botany, pharmacology, chemistry, agriculture and others.

The cannabis that concerns the pharmacologist in many ways: its active principles are originals, the cannabinoids are unique in plant kingdom; an important review of its products has been published by Turner *et al.* (5). The biosynthetic processes that lead to the formation of its derivatives are of great interest. Moreover this point, ultrastructural studies succeeded to establish the different stages of the formation of the structure responsible of the cannabis derivatives secretion (6, 7, 8, 9).

On the other hand, to admit or not the monotypic genus of the cannabis, we observe that the plants rich in resin are poor in cellulose and in the contrary those which are rich in cellulose are narcotics active principles lacking.

Apart from the scientific interest, the learnings acquired in these different areas invest with a particular importance since they would allow to influence the biological processes managing the fibres in order to increase their production in the plant and so to obtain a cheaper source of cellulose. The editorial 2001 of Frankfurt has just published a book printed on sheet of cannabis and entitled "the discovery of cannabis as a useful plant". It seems that the paper pulp obtained from five hectares of forest wood may be extracted from only one hectare of cannabis culture. the improvement of the selection of hemp fibre variety will promote the differentiation of the resin variety and therefore will prevent any illegal and fraudulent use of the cannabis. The diversity of the plant utilisation is according to Schultes (10), the cause of the great diversity in the size and aspect of the plant. This diversity of utilization would be a consequence of its domestication all over the world with sometimes a step back to the wild type.

The question remains in the identification of the cannabis from the plants grown from Afghanistan to Africa and from Mandshuria to Mexico, from Nepal to Norway, and from Europe to American continent.

## IS THE GENUS CANNABIS MONOTYPIC OR NOT?

The systematists sets here a complicated problem: Must we join the specie *C.sativa* of Linné to *C. indica* of Lamarck for the specie resin rich and the *C. ruderalis* of Janischewski corresponding to the wild types.

## ARE THESE TAXONS SPECIFICS OR SUBSPECIFICS?

According to Dewey (11), hemp which was cultivated for the fibres of its stems, the oil of its seeds and the resin extracted from its flowers, formed

progressively 3 types or groups of fairly different forms. It has been reported (11), that the most typed extreme forms of each group composed different species, however the existence of the intermediary ones and their instability, once cultivated in other conditions, make impossible to confirm this hypothesis. The faculty of adaptation of hemp plant to very different climates complicate its systematic classification.

The study of the plasticity of the genus cannabis goes back to the last century (12). Many authors have demonstrated that the plants resulting from seeds originals from India, cultivated in Europe produce no more inebriant resin in the future generations.

The seeds resulted from the European varieties producing fibres of high quality are exported to Egypt in order to manufacture ships ropes. Some generations later, the quality of the fibres decreased under arid climate while the plant started to produce more resin.

Many authors (13, 14) are inclined to the unicity of the cannabis genus. however, in 1970, some authors supported the polytypicity of the genus and Schultes *et al.* (15), as experts distinguish between *C. sativa* considered as a resin variety and *C. indica* as a fibre one.

Several botanic denominations proposed in the scientific litterature to designe hemp are shown in the following table 1, (39).

Table 1.—Botanic denominations of Cannabis.

<i>Cannabis sativa</i>	BAUHIN et LINNE	1623 et 1753
<i>Cannabis mas</i>	D'ALECHAMPS, DODOENS, BAUHIN	1587
<i>Cannabis foemina</i>	D'ALECHAMPS, DODOENS, BAUHIN	1587
<i>Cannabis erratica</i>	D'ALECHAMPS, DODOENS, BAUHIN, SIEV	1587
<i>Cannabis rupulus</i>	SCOP.	1623
<i>Cannabis sterilis</i>	D'ALECHAMPS, DODOENS, BAUHIN	1623
<i>Cannabis foliis digitalis</i>	LINNE	1738
<i>Cannabis indica</i>	LAMARCK	1785
<i>Cannabis foetens</i>	GILIBERT	1792
<i>Cannabis macrosperma</i>	STOKES	1812
<i>Cannabis chinensis</i>	DELILE	1849
<i>Cannabis generalis</i>	KRAUSE	1905
<i>Cannabis americana</i>	Pharm. ex WEHMER	1911
<i>Cannabis gigantea</i>	CREVOST	1917
<i>Cannabis ruderalis</i>	JANISCHEVSKY	1924
<i>Cannabis interstitia</i>	SOJAK	(hybride)

In this way, the terms *C. sativa* and *C. mas*, used by D'Alechamps, Dodens and Bauhin are refered to the female plants and the denominations *C. erratice*, *C. foemina* and *C. sterilis* to the male plants.

Linne (16), in his *Hortus cliffortianus* of 1738 used the following denominations: *C. foliis digitalis*, *C. erratica*, *C. mas* and *C. foemina* as synonymes and regroupes them in 1735 in his *species plantarum* under the name of denomination of *C. sativa*, followed by the first plant detailed description as well as of two specimens.

Lamarck (17), has observed that *C. indica* is different from *C. sativa* of Linne based on a specimen imported from india and which described in 1785. Many botanists have supported Lamarck description as being the one of the resin specie, however, this thesis has been debated by numerous authors.

Small (18) said that Lamarck has found in *C. indica* a distinct specie as a result of a superficial study and nowadays, we consider fairly obscure his conception of an original specie.

In 1792, Gilibert (15), introduced le *C. foetens* which constituted indeed a synonyme of *C. sativa*, then Stokes (15), described in 1812 the *C. macrosperma* distinguishing it from *C. sativa* by its oblongs seeds. In 1849, the *C. chinensis* appeared in the catalogue of the botanical garden seeds of Montpellier. De Candolle (13), in 1869 described many cannabis varieties (*Kif*, *Vulgaris*, *Pedemontana* and *Chinensis* already reported by Delile in 1849. In 1905, Krause (15), described a hemp originating from Asia and which he called *C. generalis* and in 1908, Houghton & Hamilton (19), and Hamilton (20), refered to the cannabis grown in America as *C. americana*. In 1917, Crevost (15), utilized the binomial *C. gigantea* for the hemp grown in Indochina.

The most recent taxonomy investigation of the cannabis genus is that of the Russian botanist Janischevsky (21), in 1924. He described carefully the differences between a wild specie of the south east of Russia and the cultivated specimens. he used the denomination of *C. ruderalis* for the wild specimen.

The cannabis genus polytypicity supporters dont accept among the numerous proposed denominations only the binomials *C. sativa* and *C. indica* and *C. ruderalis*. Serebriakova and Sivov (22) singles out in a detailed study two species: the *C. sativa* and *C. indica*.

Some botanists as Stearn (23), express themselves with a lot of aloofness and extol a detailed study in order to eliminate any doubts concerning the nomenclature. Small (24), on the contrary, disagrees with the idea of existence of many hemp species. In 1972, he demonstrated that the genus is completely diploide ( $n=10$ ). The existence of polyploides is artificial, the pollen is easily transported by the wind along hundreds of kilometers and the hybridation has no barriers, he finally concluded in the uniqueness of the specie (25, 26, 27, 28) with subspecies, the *C. sativa ssp sativa* growing in the temperate regions, rich in fibres, poor in THC (Tetrahydrocannabinol) (<0.3%) and relatively rich in CBD (Cannabidiol) and the *ssp indica* in the warm regions, rich in resin (THC>0.3%) but poor in fibres and in CBD.

The classification of hemp based on its chemical composition was proposed

in the first time by Grlic in 1968 (38), he proposed a system based on ripening stages of cannabis plant. Turner *et al.* (5), concluded from the cannabinoides components that the results, of this classification, must be discussed with precaution. The chemical classification would be difficult because of the high plasticity of hemp plant. Fetterman *et al.* (29), used (THC)+(CBN)/(CBD) ratio in order to characterize the phenotype of a variety or a population. If the ratio exceeded 1, the variety is classified as “drug phenotype”, otherwise, it is considered as a “fibre phenotype”.

Small and Beckstead (26), proposed 3 phenotypes, drug, intermediate and fibre according to the richness of hemp plant in THC and CBD in both sexes, (tab. 2).

Table 2.—Characterization of Phenotypes by THC and CBD percentage.

<i>Phenotype</i>	<i>THC %</i>	<i>CBD %</i>
1. Drug	>0.3 (in both sexes)	<0.5 (in both sexes)
2. Intermediate	>0.3 (in females)	<0.5 (in both sexes)
3. Fibre (non drug)	<0.3 (in females)	>0.5 (in both sexes)

Fournier and Paris (30), moved this limit to 0.5% of THC for fibrous varieties and so they distinguish two phenotypes, fibre and drug, (tab. 3).

Table 3.—Characterization of Cannabis phenotypes by THC/CBD ratio.

<i>Phenotypes</i>	<i>THC %</i>	<i>CBD %</i>	<i>THC/CBD</i>
Fibre	<0.5	>0.5	<1
Drug	>0.5	<0.5	>1

For the Russian varieties, Virovets reported by Meijer *et al.* (31), considered 0.2% of THC as a maximum for the fibrous variety.

Many authors agree with the opinion of Small and Cronquist; they consider the specie as instable and presents a great morphological and genetical plasticity (5, 15, 27, 28).

In fact, in this plant, the taxonomy is not the unique aspect of discrepancy, but other aspects as resin are matters of debats. The resin resulting from female plants has been considered for a long time as the unique active one, but Valle *et al.* (32), has demonstrated that the resin of the male plants may also be active. The analysis of cannabinoides leads to the conclusion of the similarity of the chemical components of both male and female (29, 33 ,34).

Another aspect more frequently studied is the influence of the climate and the environmental conditions on the Cannabis composition (35). It is obvious that the cultivated plants in the warm regions, rich in resin lose this capacity once cultivated in a temperate region, this phenomenon takes place after 2 or 3 generations. However, the fibrous varieties of the temperate regions when transported to warm regions, Egypt or Morocco, produce worse fibre quality and high quantities of resin (36, 37).

Schultes *et al.* (15), known as a defender of hemp polytypicity, distinguishes a great difference in the chemical composition, not only at cannabinoides levels but also at essential oils and flavonoides and others secondary metabolites.

Lewig-Berger (39), proposed a chemiotaxonomical approach based on a study of the chemical composition of hemp akene (enzymes, proteins, fatty acids, phenols and cannabinoides) in order to distinguish between resin and fibre varieties. Coupled with a morphological study of the akene, the author concluded that it's fairly difficult to distinguish from Cannabis plant the chemical varieties.

According to Takhtajan (42), the Urticales order is connected with Hamamelidales and perhaps derived directly from them. The botanists in general agree with the following classification (27, 28, 42) :

**Division:** Magnoliophyta  
**Class:** Magnoliopsida  
**Subclass:** Hamamelididae  
**Superorder:** Hamamelidanae  
**Order:** Urticales  
**Family:** Cannabaceae  
**Genus:** Cannabis

At the present, the most common used denomination is that of Linne (40), *Cannabis sativa* L.. According to Cronquist (28), The *Cannabaceae* family consist of only two genera, *Humulus* with two species native to North temperate regions and Cannabis with a single highly variable species *C. sativa* L. which has diversified under cultivation into a more northern subspecies *sativa*, cultivated principally for fiber (hemp), and a more tropical subspecies *indica* (Lam.) Small & Cronq., cultivated principally for psychotropic drugs (Marijuana, Hashish).

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