

Investigation of the origins, ancestors and uses of varieties of industrial hemp in Europe

1. Hemp has always been a crop for the production of textile fibres

At the beginning of the 1990s there was renewed interest in hemp as a source of cellulose fibre and seed oil in Western European countries, Australia, the United States and Canada. Interest that had been extinguished since the prohibition of cultivation in Europe, between the 50's and 60's in fact most of the states of western Europe sold off the machinery of transformation of the fiber to the Eastern Europe. Eastern European countries such as Romania, Hungary and Poland took advantage of the crisis in the sector, and when in the 1990s the crisis in the textile industry prompted Eastern European companies to return to investing in hemp, As a high-yield crop in the production of high-quality textile fibers, the interest in industrial hemp is back. Since then, a process of research and development has begun, crossing the fibre varieties in order to cultivate them at different latitudes and to increase the yield.

Efforts of agronomists and breeders have concentrated on implementing the fibre and seed yields of the plant.

In the attached Excel, in sheet 2. *Hemp Varieties Report* you will find the analysis of the characteristics of 41 varieties among those belonging to the European list (*in the Excel you can find a completely European list in sheet 1*), and a synthesis of which are the most interesting varieties for the production of extraction inflorescences, and possibly for a varietal crossing aimed at maximizing the qualitative and quantitative yield of the inflorescences.

The only varieties that are suitable for the production of inflorescences with the **appropriate protocol** are: Antal, Kompolti hibrid, Carmagnola, Tiborzllasi.

The Carmagnola among these is the least indicated for:

- high steam production which would cause harvesting problems;
- the late flowering (in the last years who has grown carmagnola per flower in Sicily has harvested not before October) which can lead to unpleasant climatic situations;
- problems related to the right of reproduction (the rights of reproduction of the carmagnola were renewed on December 9, 2019 in the Czech Republic).

The Antal characteristic:

- a longer and less bushy habitus with sticks which may cause discomfort due to the thickness;
- has less quantitative yield.

Tiborzllasi is interesting because:

- has high seed yield, which in the case of non pollination becomes a high flowering yield;
- it has a more controlled habit therefore lower with a thinner stem (excellent characteristic for the collection);
- many leaves;
- good quantity of terpenes.

Kompolti hibrid is the most interesting cultivar for the production of flowers in Europe:

- Has a high flowering yield due to parent Kompolti (which is monoic);
- Has a more controlled habitual than parent Kompolti due to Chinese parents.

Let us not forget that many farmers in the past years have grown these above-mentioned varieties for the production of flowers and without crossing them have obtained percentages of CBD close to 5% in the case of Kompolti and close to 8% in the case of Yeah, I'll take care of it.

2. Development of a plant variety right to be included in the European list

After this analysis I would propose starting a route of hybridization between permitted varieties. Which is by far the simplest and at the same time permitted solution.

I will briefly describe the idea.

- From the analysis conducted the interesting varieties for the crossing are Kompolti hibrid and Tiborzllasi, followed by Back crossing with Kompolti hibrid to develop a new variety with high yields and high amount of cannabinoids (antal could also be involved).
- For this work a third company is needed which must have a greenhouse with watertight rooms,
- Canapar provides seed and know-how for the crossing.
- The contractor signs NDA with Canapar.
- Developments are followed for about 4 months, after which we will have the first seeds of the new variety (in this first phase we try different types of crossing, the best relative to habitus and yield will be carried forward).
- From the first seeds will be born the first plants of the new genetics that will have to be crossed with one of the parentals in order to maximize the stability.
- After the second crossing, genetics is usually stable and a quantity of seeds of 2 kg can be produced to be shipped.
- From now on, the two-year trial begins in which the CPVO will come to assess the stability and uniformity of genetics.
- after the 2 years of trial the right will be granted for 20 years, so the company will have the exclusive right to produce that variety.
- It is advisable to send, at the same time as the application for a plant right, the application for registration to the European or national catalogue for which it takes 2 years of waiting.

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3. The discovery of the endocannabinoid system has recently changed the focus of industrial hemp cultivation

In 1992, **anandamide** was discovered, the first endocannabinoid that paved the way for the endocannabinoid system to neuroscientists. Prior to this discovery the therapeutic, anti-inflammatory, analgesic properties of cannabis were totally ignored, and its use until a few years ago was focused on the production of textile fiber (Romania), cellulose pulp (Spain), green building and food (France). The date of the discovery of anandamide is very important to understand why in the last 10 years has invested so much in the extraction of active ingredients from the inflorescences of industrial hemp.

These discoveries have led multinational companies of medicine, tobacco, alcohol, cosmetics, to invest in the hemp sector related to wellness. In other words, the extraction of active substances and derived products.

For this reason in recent years many companies have applied for the registration of new varieties of cannabis sativa that follow the trend of demand, that they had better characteristics relative to the extraction and therefore greater yield in flower but above all greater percentage of some cannabinoids like the CBD or the CBG.

Find the list of all new applications in the Excel file that you find attached to tab number 3. New hemp Varieties Application. From tab number 4 you will find a focus on the new applications of our competitors, you will find a card for each company. For each company I then made a focus on one of the varieties to understand the players in play.

4. Analysis of competitors

From the file Excel "hemp Varieties comparison" you can infer the hectic activity of varietal recording by our competitors that I report below in summary for greater clarity.

Enecta, based in monselice (Padua), applied for 13 varieties in March 2018,

GW Pharma, based in Cambridge, applied for 9 varieties in January 2004, all granted.

Phitoplant research based in Cordoba applied for 13 varieties, 5 in January 2016 5 in January 2017 2 in January 2018, of which 11 were granted.

MGC Pharma, based in London and Ljubljana, applied for 27 varieties of which 3 were granted and 3 lost their rights because they were submitted in 2004, the others were most recently submitted between January 2018 and January 2019.

Wayland Italia, based in Alessandria, applied for two varieties in March 2019.

CIJA preservation, based in Valencia, applied for 12 varieties, all in February 2019.

Società Agricola CBD Italian Factory based in Alessandria applied for 3 varieties in March 2019.

Vivacell biotech based in Cordoba applied for 1 variety in 2003, granted.

5. Variety registration procedure

Before starting the procedure, **the company must write a letter of intent with a research organisation or university.**

The registration procedure lasts about 3 years and includes research aimed at morphological distinction and practical agronomic value of the material presented in relation to the reference cultivars. Stability and uniformity tests will be conducted for 2 consecutive years with field tests. Once registered in a Member State, a cultivar is automatically entered in the general EU register. This implies that its cultivation should be allowed by any member and that it should be eligible for EU subsidy. However, a Member State may obstruct admission on grounds of lack of quality or of distinction with regard to local cultivars and, of course, national drug legislation may hinder effective enforcement.

There are two ways of registering a variety on the European list, the first guarantees the plant right or the exclusivity to reproduce the variety, while the inclusion in the catalogue is a necessary condition for the legality of cultivation:

- The online registration at European level from the site of the CPVO, for which **I have made registration of the user Canapar to download the forms to fill in and all the necessary info that you find in attachment.** In addition to having made direct contacts with the head of the European office. Registration to the CPVO serves to secure a plant right which, once granted, has a duration of 20-25 years and guarantees the exclusivity in reproduction for the company that can sell and use the product of the above mentioned variety (seeds, extraction biomass, wand).
- Online registration at European catalogue (if a variety is granted in one of the Member States it will be automatically included in the European list) for which I have contacted the MIPAAF official responsible for the registration of cannabis sativa varieties.

French Cultivar

Cultures from France are produced and marketed from dalla Fédération Nationale des Producteurs de Chanvre (FNPC), 20, rue Paul Ligneul, F-72000, Le Mans, Francia; Fax: +33 4377 0916. French cultivars are monoecious. In France, they are grown mainly for pulp, and are selected directly from the "Fibrimon" variety. "Fibrimon" is a monoecious cultivar with high fiber content. The parental populations of "Fibrimon" are:

- or a variety which has been the result of a selection of Central Russian origin with a high fibre content;
- high-fibre dioic selections from Germany;
- or dioic late-flowering breeds from Italy;

If all French varieties are derived from Fibrimon then they are all mostly focused on fiber production.

Fédora is the result of a cross between Russian dioecious plants. Likewise, **Féline** results from a crossing between the parent dioic Kompolti, and Fibrimon, followed by back-crossing with Fibrimon. **Fedrina** and **Futura** are both the result of a cross between the parent dioic Fibridia and Fibrimon followed by a back-crossing with Fibrimon. The higher the number added to the names of French cultivars, the later they are supposed to bloom and ripen.

Another genetic Switzerland/French matrix, monoecious, early and suitable for cultivation at any latitude, the **Fedora 17** is used by many French farmers for the production of textile material, fibrous, biomass and now also to derive inflorescences of light cannabis, particularly trendy throughout Europe. Fedora 17 is also a variety of cannabis particularly rich in terpenes and essential

oils, which in addition to giving the leaves their typical colour, determine especially the extraordinary variety of perfumes and fragrances. The companies that grow Fedora 17 devote much of their production to the textile and food industries.

Of French origin, the seeds of **Felina 32** are for more than 20 years cultivated with success also in many sub-Apennine areas of our peninsula. The cultivation of Felina 32 returns a quality product with regard to fiber and biomass for the textile industry. In Italy, experimentation with the seeds of feline 32 began at the end of the 90s, at the same time as the rediscovery of cannabis cultivation. With phenotypic characteristics comparable to another French variety, the Futura 75, feline 32 is harvested after about 130 days from sowing. Rich in terpenoids (limonene, linalol, ocimene and pinene) but poor in the psychotropic cannabinoid (THC below 0.2%).

Ferimon is particularly used in Europe for the production of fibrous biomass material. It is a plant with an early flowering, rich in terpenes that give it an aromatic bouquet of great intensity. The biological characteristic of Ferimon is to end prematurely, after about 140 days, the flowering process. Ferimon blooms early, already at the end of July. This characteristic determines the fact that this certified variety can be grown quietly from North and South Europe.

The Futura75. The productions of this seed range from northern Europe to all the central southern Europe. Particularly suitable for use as an energy material, in recent years this variety of cannabis is often cultivated to obtain material from fiber. This variety, used in the textile industry, is not suitable for seed production. The Futura 75 grows like a medium-high sized plant (about 3.5 meters), with late blooming in August.

In Santhica the long fiber is used for fabrics, ropes, furniture and curtains; the short hemp fiber is used for paper and other similar uses; the hemp (the woody internal part of the plant) is used in construction; while the seeds are collected for reuse and for extracting oil and resins. Although this variety of cannabis is almost devoid of the cannabinoid CBD, in recent months some agricultural entrepreneurs cultivate Santhica 27 to obtain inflorescences of light marijuana. **Rich in the cannabinoid CBG**.

Hungarian cultivars

The current Hungarian hemp fibre cultivars come from the Agricultural Research Institute GATE-"Rudolf fleischmann", H-3356 kompolt (heves), Hungary; Fax: +36 36 36 36 489 000. Existing GATE activities in the field of hemp are mainly limited to the maintenance of existing cultivars. Hungarian varieties are generally dioecious and used for the production of technical cords and fabrics.

The Kompolti has been selected for the high content of fibers between the hemp fleischmann or the hemp F of Italian origin.

Cannakomp is a variety of Hungarian hemp that arises from a cross between Fibrimon's parents and Tiborszallasi. This gene is able to produce finer fibers than other varieties of Hungarian hemp such as Lipko, Fibrol rather than Dora. Another difference between Cannakomp and other Hungarian genetics is the fact that Cannakomp blooms one or two weeks before the others. Cannakomp is appreciated for being a variety of hemp rich in fiber with very little THC and admitted in the European catalogue of official varieties for agricultural crops.

Fibrol finds this variety in Fibrimon a relevant genetic link. The plant of the Fibrol variety does not grow very much in height, but on the other hand it returns a dense and decidedly consistent foliage. It can be cultivated at every latitude, and the harvest takes place after about 130/140 days after sowing

The Dora KC is another of the historical varieties of hemp originating in the Hungary. Dora KC is grown in many European countries to produce material for fibres, fabrics and essential oils. Dora KC plants are planted in April/May and grubbed up in July/August. The highest specimens measure 3.5 meters, and the production of foliage is of good level. Many terpenes that make up the organic structure of this plant, and consequently is particularly intense its scent. Very perfumed terpenes for the specimens cultivated in well drained areas.

Kompolti is the best known of the hemp varieties from the Hungarian agricultural research laboratories, and is a genetics created in the laboratory after experiments and selections lasted for over 2 decades. A careful and scrupulous selection of genetics of Asian, Hungarian and Italian origin, which has resulted in this robust variety that is well suited to environmental diversity. Today, this Hungarian variety is among the best genetics on the international cannabis scene. In the 1970s, the aim of Hungarian researchers was to obtain a variety of hemp which was particularly resistant and therefore suitable for the production of fibrous, textile and biomass materials in particularly cold environments. Today Kompolti is among the hemp varieties with low THC content among the most cultivated ones to obtain excellent quality inflorescences.

Kompolti hibrid TC is a variety of Hungarian hemp, genetically derived from a triple cross in which a Hungarian variety (Kompolti dioica) and two selections of Chinese origin take part (Kinai Kétlaki dioica and Kinai Eglyaki monoica). Officially recognized in 1983,

today this variety is among the best European genetics. Unlike Kompolti, which is phenotypic monoica in nature, Kompolti hybrid TC is dioecious. It is cultivated all over Europe for the great quantity of seeds it can produce at each cycle, which if not pollinated become inflorescences. As a result, it remains the most interesting cultivar for the production of flowers in quantitative and qualitative terms.

The hemp **variety Tiborszallasi** is a Hungarian genetics cultivated throughout the Mediterranean basin up to the northernmost areas of the Scandinavian countries. It is a seed genetically developed for the production of biomass, fibre and hemp oil. From the particularly thick foliage, the Tiborszallasi is nowadays often employed in the cultivation of hemp for getting inflorescences. The contribution of the terpenes (borneol, canfene and Delta 3 hulls on all) is already appreciated at a certain distance; the plant of this species is dense and resinous, perfumed and visually lit.

Ukrainian Cultivars

Seed of monoecious variety developed in Ukrainian agrarian research centers, Use 31 is a genetics developed by Professor Virovets at the end of years of selections and crosses between different genetic. This plant is at ease to grow in temperate areas of the Mediterranean and also of Central Eastern Europe. It is a useful plant in the production of seed and biomass destined as much to the textile industry as to the food industry. The plant grows early compared to most of the best known varieties.

Polish Cultivars

The Institute for Natural Fibers (INF), wojska polskiego 71B, 60-630 Poznan, Poland; Fax: +4861 417 830, is responsible for the supply of Polish hemp seed material. The current Polish varieties Białobrzeskie and Beniko are monoecious. They are mainly intended for the production of cords, military fabrics, mixed yarns (wool and cotton hemp), fibre panels and technical petroleum products.

Beniko is a variety of industrial hemp (*Cannabis sativa* L.) whose genetics has Swiss, Austrian, Dutch and Polish matrices. Included in the list of varieties accepted at European level, this variety is now grown in many agricultural productions in northern Europe with the aim of obtaining fiber and biomass for technical use. It is a monoecious variety. Both major cannabinoids, THC and CBD, do not exceed 1%.

The **Białobrzeskie** is a hemp of monoic type developed in the late 60's to be used in the textile industry, engineering, for the production of paper and textile material. The seed production is also appreciated. The plants grow up to 2.5/3 meters high, and end the vegetative cycle in about 120 days. Polish drug addiction legislation regulates cannabis cultivation by adopting 0.2% as the maximum limit of THC (delta-9-tetrahydrocannabinol). Currently, therefore, all varieties of Polish hemp (Białobrzeskie, Beniko, Tygra, Wojko i Wielkopolskie) are cultivable freely also in Italy.

Romanian Cultivars

Romania produces high-quality hemp fabrics and yarns.

Armanca is produced in eastern Europe and in particular for the production of textile and fibrous materials. This variety expresses the best of itself in cold and well hydrated environments. The home of Armanca seeds takes place in May and the harvest in August. The distance of sowing is of 12,5 cm, and the specimens grow up even the 4 metres of height with filiform leaves.

La **Silvana** is a dioecious variety, developed by the research laboratory "statiunea de Cercetare-dezvoltare agricola Iovrin" at the end of a selective process of hybridization and genetic selection. The Silvana is characterized by a good production capacity, and an excellent yield in terms of harvest. The terpenoids present in the Silvana are multiple, ranging from limonene to mircene, from pinene to carophylline, leaving a pleasant olfactory and tactile sensation. Robust plant and particularly rich in foliage, in agriculture this variety of hemp is used for the collection of seeds, for the excellent contribution of fibrous material and especially for biomass for textile and cosmetic industries.

Italian Cultivar

The EU list includes ten Italian hemp cultivars which are commercially represented by the Experimental Institute for Industrial Crops, Via di corticella 133, 40129 Bologna; Fax: +39 51 374857

'carmagnola' is an autochthonous variety of northern Italy. 'CS' or 'selected carmagnola' is dioica and selected in the early '60s by 'carmagnola' (allavena, 1967). 'Fibranova' is a dioecious cultivar, selected in the '50s by the progeny of 'Bredemann electa' x 'carmagnola' (allavena, 1961). The parent 'Bredemann eletta' is one of the selections of fibers obtained from strains of hemp of North and/or Central Russia, which were used in the reproduction of 'Fibrimon' and 'Bialobrzeskie'.

Eletta Campana (dioica) is the result of a cross between carmagnola and the strains of high fiber of German origin, most likely Fibridia or one of the Bredemann selections.

ASSO. Seed grown in Italy especially in the areas of high Tuscany and Emilia Romagna. Plant with a late cycle, the specimens obtained from this seed reach the 3,5/4,5 metres of height, and are characterized by a good resistance to the main diseases deriving from fungi or parasites. The morphological composition of the Ace denotes the presence of numerous terpenes and upper-peduncle trichomes, these last ones also visible to the naked eye. The Ace is generally cultivated to obtain biomass from it to be sent to the textile industry for the production of fiber and other material.

From the name of the town in the province of Turin, the selected **carmagnola (CS)** is a variety of dioic hemp particularly used in the productions of Piedmont. This variety, the fruit of genetic crosses obtained by the local farmers in the early years of the year '900, when in Italy the cultivation of hemp was the pride of the national agricultural production. Robust plant that well adapts to the harsh climate typical of this region, the selected karmagnola (CS) grows luxuriant up to 4.5/5.5 meters in height. Compact and generous foliage, bright green, this variety of hemp is cultivated mainly for the production of fabrics, as thermal insulator, for use in bio-building.

Late monoecious variety, **the Carmaleonte** is little resistant and not very productive. The inflorescences become yellowish as soon as they reach the complete stage of ripening. This variety has been selected exclusively for the production of fiber for use in the textile and bio-building sector. The Carmaleonte is a variety of hemp for the production of fiber of Monoic type, whose matrix is that of the carmagnola. Few cannabinoids are present, the analyses show the presence of terpenes and trichomes not particularly active in the production of essential oils.

Genetics developed from a dioecious matrix of Germanic origin, known as superfiber. **The Codimono** is a variety whose main feature is to quickly develop a lot of fiber. Monoecious hemp selected for the production of fiber and seed. Many crops in Lombardy, Emilia Romagna and Tuscany. The percentage of fibre produced by this variety of hemp is much higher than that of traditional Italian varieties of dioic type. Monoecious variety at late germination, but very resistant and profitable in terms of biomass harvest. Suitable for seed production, the food industry extracts a delicate seed oil from Codimono.

In the 1920s, at the time when hemp production was the locomotive of our country's agricultural economy, 30% of the entire production was given by a single variety: **l'Eletta Campana**. Cultivated since ancient times in the south of our peninsula, this variety has been cultivated since 2015. The seed of Eletta Campana is among the hemp species that best adapt to the Mediterranean climate of our country. Characteristic of this genetics is a copious production of inflorescences, but also especially for the excellent yield as a sustainable material for renewable energy (biomass).

Fibranova is a type of weed hemp and characterized by a high production capacity. It's a 100% Italian variety, with very high yield of fibrous material, created in the laboratory in the first post-war period by Bredemann matrix eletta and carmagnola. In Fibranova's genetic heritage we find Russian hemp strains, the same ones used in the development of the Brademann variety. It is a dioecious variety, the main characteristic of which is to adapt well to any climatic and soil conditions. Fibranova's yield in terms of harvest is among the highest in circulation. Wide adaptability to different environments, the plant grows generous and bright. Grown in many areas of central southern Europe, most of the harvest is destined for the textile industry, construction. The colour of the flowers tends to reddish, almost violaceous, and the intense perfume is conferred by the many terpenes present in the plant.

The Fibrante is an Italian variety of dioic type hemp included in the official catalogue in 2017. Fibrante is a variety of cannabis of Italian origin. Seed with regular shape, roundish and pale brown; it is cultivated mainly in the hilly and pre-Alpine areas of northern Italy (Po Valley). Plant with medium/late cycle, prefers the spring season and the size of the largest specimens does not exceed the 4 m of height. The resistance and tolerance of the Fibrante to the main parasitic and fungal diseases is high. It does not fear weeds and the yield per square meters is good level. Numerous terpenes found during analysis. The biomass of hemp Fibrante is used in food, textiles.

Villanova is an Italian native variety of cannabis, whose seed is currently owned by EcoHemp, a company that deals with the production and processing of hemp for a variety of sectors (food, textiles, cosmetics). La Villanova is a relatively young variety of Italian hemp (registered in 2017). Good fiber, excellent resistance to atmospheric agents, Villanova is cultivated mainly in the north-eastern regions (Veneto, Friuli and Emilia Romagna). Rich in CBD and essential oils produced by the many terpenes contained in it.

Finnish Cultivars

Fennel is a variety of self-flourishing hemp (it grows inexorably even with a few hours of light) developed in Scandinavian laboratories in the mid-90s. Developed for the first time in Finland and destined for the production of oil, FINOLA reaches flowering quite quickly. This genetics is nowadays particularly appreciated by the growers of inflorescences for its precocity and for its photoindependence. Fennel is a quality of industrial hemp of the genus photo-independent, ie self-flourishing.

Spanish Cultivar

They have been cultivated for the production of pulp from the "Celulosa de Levante" until 1992, they use French cultivars for this purpose.

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