



# THC and the Finola Variety of Hemp

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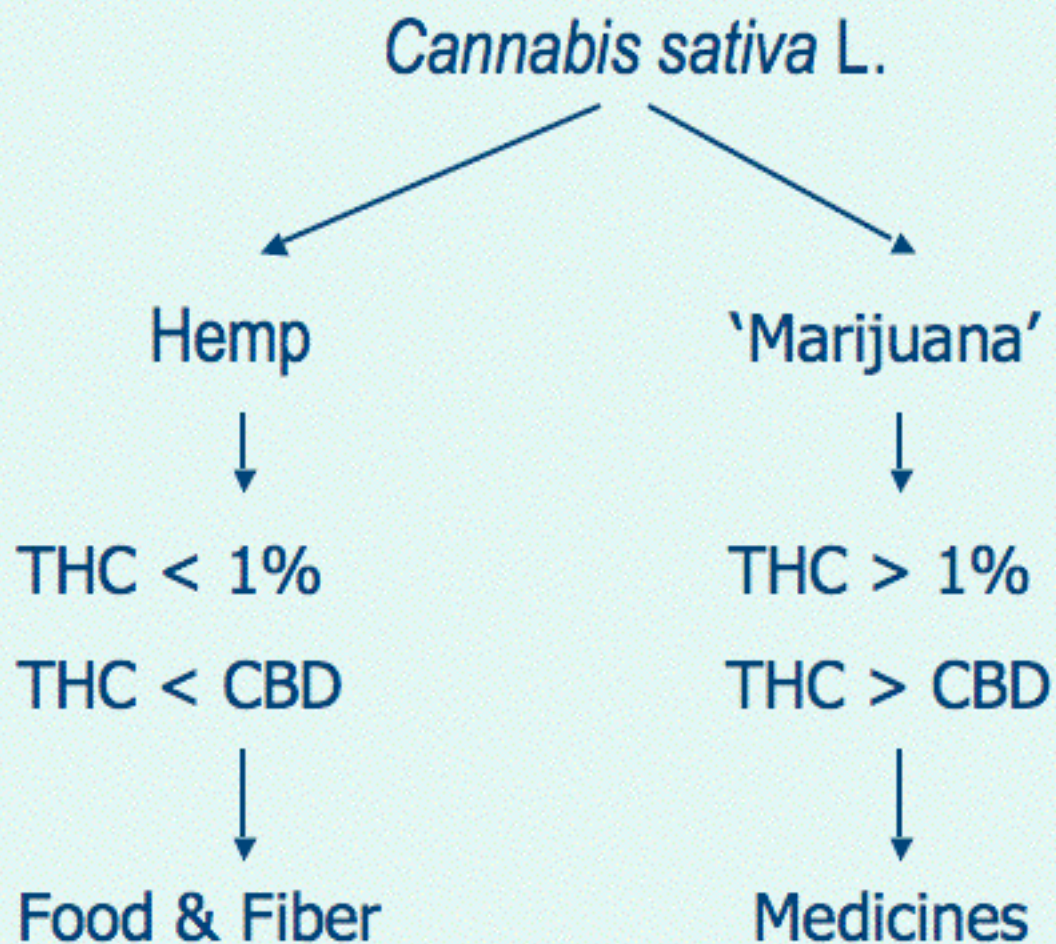
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**Updated 25 July 2008**

## Basic differences between hemp and drug-cannabis



**THC= *delta*-9-Tetrahydrocannabinol**  
**CBD= Cannabidiol**

## EU Regulation EC no 796/2004 Annex 1 Section 2

### Field sampling methodologies

#### Procedure A

Monoecious  
50 plants/field

...30 cm part containing at  
least one inflorescent....

...20 days after the  
start of flowering  
to 10 days after the  
end of flowering...\*

\*(also)...from the start of flowering to  
20 days after the start of flowering...

#### Procedure B

Dioecious  
200 plants/field

...upper third of  
each plant selected...

...only females  
shall be taken...

...during the 10 days  
following the end of  
flowering...

**Notice** how Procedure A allows for an earlier sampling time of the monoecious hemp, and also the possibility for sampling a single inflorescent on the end of a 30 cm stem, which contains very little THC. Both conditions give much lower THC.

**Improvement suggestion;** implement a simple sampling method that can be equally applied to both dioecious and monoecious forms of hemp. For example, sampling at “... 20 days after the start of flowering...”, as stated in Procedure A, which is clear and easy point for both the farmer and the official sampling agent to recognize.

# Hemp Cultivation in Finland above Latitude 62° N

MTT North Savo Agricultural Research Station, 2000-2003



**Finola flowering time is independent of day length, and mature seed is typically harvested in Finland at 135-140 days after sowing**

**Fedora does not reach end of flowering at high latitudes**

**How is the sampling time determined at high latitudes, according to EU regulations,, where some hemp varieties do not even flower?**

## **EU THC Sampling and Analytical Methodologies for Hemp Crops**

## ‘...end of flowering...’

When asked for a definition of the phrase

‘...end of flowering...’ in Annex I of Regulation 796/2004, the EU Commission responde on 30.11.2007 with the following:

“The Commission is not in the position to establish detailed rules for the determination of the period of flowering”.

So far, no Agricultural Ministry in the EU has defined this phrase, and it is difficult to imagine how it might be interpreted uniformly, and over such a wide geography, by those who are supposedly trained and responsible for sampling throughout the 27 Member States.

## Typical Developmental Morphology of Finola (according to days after sowing)

- First male flowers opening 33 days
- First pollen released 44
- Main end of flowering 55
- End of all flowering completed 60
- ca. 50% seed maturation 100
- Seed harvest 135-145

Note: Morphological development, in pictures, is detailed in the PDF entitled [Finola Development.pdf](#)

## Sampling Applied to Finola According to EU Regulation 796/2004

20 days ‘...after the start of flowering...’:

(flowering starts by 35 days) + 20 = **55 days**

10 days after ‘...end of flowering...’ (flowering ends near 55 days after sowing) + 10 = **65 days**

**Thus, 55-65 days after sowing for Finola**

Note: unusually hot and dry weather in 2006, both EU and Canada, decreased the number of days until the proper sampling time was manifest by rapid crop development, maturation and decreased yields under these stressful conditions



Appendix 1 of EC No 796/2004, L141/54  
Section 3.0 **Determination of THC content**

- *3.2 Reagents and extraction solution:*
  - $\Delta^9$ -tetrahydrocannabinol, **pure for chromatographic purposes...**
  - **Improvement suggestion:** The true concentration of the stock THC standard, which is typically some number less than the labeled value, must be verified before analysis of hemp samples, and on a periodic basis, due to the inherent instability of THC in solution. Such a systematic bias will give artificially high THC values in the quantitative analytical method, and must be accounted for to determine this bias before sample analysis (AJ Poortman-van der Meer & H Huizer, 1999 Forensic Science International vol 101, pp. 1-8).

## Section 3.4. *Gas Chromatography*

### (a) Apparatus

- gas chromatograph with flame ionisation detector and a split/splitless injector.
- column allowing good separation of cannabinoids...

### (b) Calibration ranges

At least three points for procedure A and five points for procedure B, including points 0.04 and 0.50 mg/ml THC.

#### **Why should procedure A have fewer concentration points than procedure B?**

To improve both accuracy and precision in the analysis of samples that are assumed to have lower levels of THC (i.e. monoecious varieties), more concentration points should be included in the analytical method, not fewer points. Also, this method relies on flame ionization detection (FID) to identify THC, while most labs now use mass spectrometric detection (MS), which is much more accurate and precise.

## **Application of Results in the EU**

- Analysis of dried plant samples for THC by national crime labs.
- These labs may or may not have much experience in measuring low THC levels in plant material with both accuracy and precision (crime lab Cannabis samples have higher THC, where the standard test is normally only positive or negative for THC).
- Hemp THC results are reported to the state level agricultural ministry.
- Individual state ministries report results to the EU Commission, supposedly only from those crops eligible for subsidy, by the end of the sampling year.
- EU Commission meets and makes decisions on subsidized crops in February.
- Some countries (like Sweden) use the EU list of subsidized hemp varieties to serve as their own national list of allowed hemp varieties, and may not allow Finola,
- Finland and most other countries keep their own list of nationally recognized crops, and Finola remains on the national list of recognized plant cultivars in both Finland and in the EU Common Catalogue of agricultural crops, but as of 2007 Finola was removed from the EU list of subsidized hemp cultivars, due to “high” THC values reported from some countries in 2006, which were apparently due to late sampling.

## Worldwide Reported Finola THC values for 2006

	Number of countries	Number of samples	Sampling day(s) after sowing	THC Average % +/- standard deviation	% THC Range
EU	5	24	74-128	0.24% +/- 0.16%	0.05-0.58
Canada	1	170	80+	0.14 % +/- 0.06%	0.01-0.73
New Zealand	1	7	65	0.04% +/- 0.02%	0.03-0.08

## Finola EU THC Results for 2006

Country	Sampling date	Days after sowing	THC Average %	Number of samples
Finland	29.9.06	93	0.32	1
Sweden	20.7-20.9	74-128	0.40	15
UK	31.7	80-85	0.36	6
Estonia	14.8	70	0.09	1
France	?	?	0.05	1

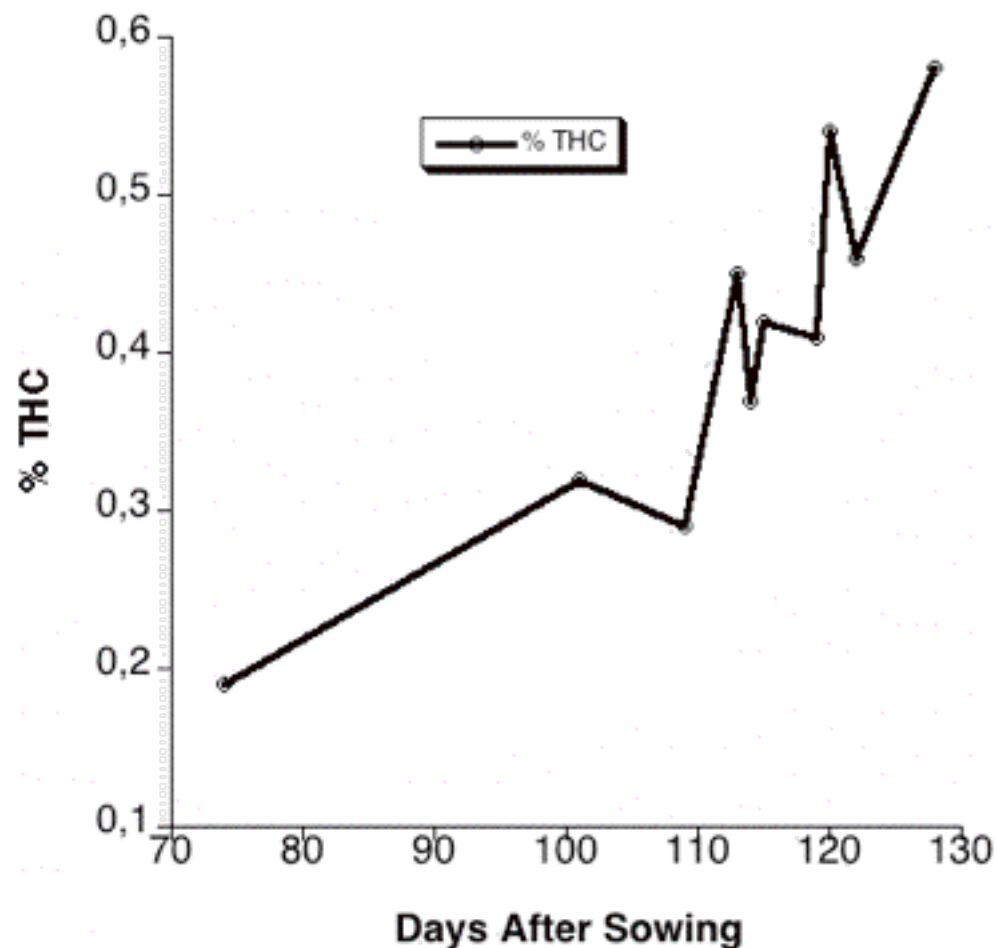
## Finola THC Results from Sweden 2006

Sampling procedure	Sampling date	Days after sowing	THC, %
B	20.7.2006	74	0,19
B	24.8.2006	101	0,32
<b>B</b>	<b>1.9.2006</b>	<b>109</b>	<b>0,29</b>
<b>A</b>	<b>1.9.2006</b>	<b>109</b>	<b>0,09</b>
B	5.9.2006	113	0,40
B	5.9.2006	113	0,50
B	6.9.2006	114	0,36
B	6.9.2006	114	0,37
B	7.9.2006	115	0,42
B	11.9.2006	119	0,41
B	12.9.2006	120	0,58
B	12.9.2006	120	0,50
B	14.9.2006	122	0,54
B	14.9.2006	122	0,38
B	20.9.2006	128	0,58

Note the considerable difference in THC results from the Finola samples on 1 September 2006, according to procedure A and procedure B.

Also, by this time 109 days after sowing), Finola is well past its end of flowering.

## 2006 Finola THC data from Sweden



**Note: THC levels increase during seed formation. The first sample might have been collected by the end of 10 days after the end of flowering, while all others are certainly late. Also, the regulations state that the reported samples are to be taken within a 10 day period, yet these Swedish results were reported to the EU over a 54 day period in 2006.**

## Concluding Remarks and Suggestions

- There must be proper checks and accountings to insure that national Agriculture Ministries are properly coordinating, sampling, testing and reporting eligible hemp THC values to the EU Commission.
- A fair, comprehensible field sampling method is needed to ensure that evaluations of all varieties throughout the EU are made fairly and with both accuracy and precision.
- A uniform understanding and application of **EU Regulation EC no 796/2004** might only be possible with a simple sampling protocol that treats all varieties equally.
- A updated analytical methodology is needed. This must include an appropriate method for validating the THC standard stock sample, which can be universally applied by other laboratories, throughout the EU, in compliance with Good Laboratory Practice (GLP). The use of flame ionization detection (FID) should be replaced by mass spectrometric detection (MS), to insure that THC is identified correctly, without the possibility of contaminating interference.