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Mr Jean-Jacques Jaffrelot
Head of Unit
European Commission
DG AGRI
Unit of Direct Support
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cc. Mr Major, AGRI-DIRECT-SUPPORT@ec.europa.eu

Reference Article 39 of Regulation (EC) 73/2009, Article 10 of Regulation (EC) 1120/2009 and Article 17 of Council Directive 2002/57/EC

Subject APPLICATION CONCERNING THE APPROVAL OF THE HEMP VARIETY
FINOLA TO THE LIST OF VARIETIES ELIGIBLE FOR DIRECT EU PAYMENTS

Dear Mr Jaffrelot,

Finland proposes that the hemp variety Finola be approved as eligible for direct EU payments. Finola is the only hemp variety which produces a harvestable seed crop in the Finnish conditions.

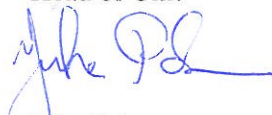
Attached to the application we submit a research report which shows the trends in the THC content of Finola during the growing season in two different years and test locations. The studies were conducted by the Agrifood Research Finland MTT in 2009 and 2010. Methods laid down in Article 40(1) of Commission Regulation (EC) No 1122/2010 were used in the analyses.

We shall be pleased to provide any further information you may need.

Yours sincerely,



Arja-Leena Kirvesniemi
Head of Unit



Juha Palonen
Ministerial Adviser

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THC CONTENT OF FINOLA HEMP

RESEARCH REPORT
YLISTARO 2010

Arjo Kangas

*MTT Agrifood Research Finland
4 November 2010*

SUMMARY

The Agrifood Research Finland MTT studied the tetrahydrocannabinol content of Finola hemp in a total of four field experiments in Jokioinen and Ylistaro in 2009-2010. In the experiments samples were taken every two weeks starting in early July. The Commission Regulation concerning the follow-up of the THC content was complied with in the sampling and analysis of samples.

The mean THC content of Finola in all samples was 0.14%. In the reference varieties Epsilon and Felina the mean THC content was 0.05%. The THC content of all varieties increased as the growing season progressed, but in the Epsilon and Felina varieties the THC content did not rise above 0.1%.

Finola develops much faster than the reference varieties, which can be seen from both the earlier ending of the height growth and earlier start of flowering than in the case of the reference varieties. The THC content of Finola also rose more rapidly than in the other varieties. When the effective temperature sum from the sowing to sampling is less than 1 000 degree days, the THC content of Finola always remains below 0.2%, but when the effective temperature sum exceeds 1 000 degree days there is more variation in the THC content and levels exceeding 0.2% are also found.

Observations of the flowering of Finola show that timing the sampling for THC in accordance with the Commission Regulation (796/2004, Annex 1) means that the sampling takes place, on average, between the effective temperature sum values of 790 to 980 degree days. In these experiments the THC content of Finola in the samples taken during the sampling period laid down by the Commission rules was always less than 0.2%.

1. Background and purpose of the study

The Finola hemp variety was approved to Finland's National List of Plant Varieties in 2003 (Plant Variety Board 2008a). Finola is an exceptionally early hemp variety as it produces a seed crop which can be harvested even in the Finnish conditions. Hemp varieties cultivated in Central Europe do not produce seeds in Finland. At its best the average yield of Finola has been higher than 1 600 kg/ha. The oil content of the seed has been more than 30% (Järvenranta & Virkajärvi 2002, Callaway & Laakkonen 1996). The oil has a highly valuable fatty acid composition (Callaway et al. 1997), which makes it possible to refine the oil and seed crop into various special products (Callaway et al. 2005). The stem crop can also be utilised as fibre or for fuel.

In the European Union the cultivation of hemp varieties where the tetrahydrocannabinol (THC) content is less than 0.2% may be eligible for support. Direct payments for hemp are subject to the condition that the THC content of the plants must be determined and the results must be reported annually to the Commission. This takes place as laid down in Article 33 of Commission Regulation 796/2004. The Commission takes the results of these determinations into account when deciding on the eligible hemp varieties.

In the determinations made on the Finola variety in 2006 the THC content exceeded 0.2%, which is why the variety was excluded from the list of eligible varieties. Some critique has been presented as regards the results of the determination and the methods used. The results depend on the time when the sample is taken: the THC content rises towards the end of the growing season. According to the rules, from dioecious hemp varieties the sample must be taken after ten days from the end of flowering. Samplers in different countries may not have fully taken account of the clearly different, more rapid development rhythm of the Finola variety (Callaway 2008). In samples taken in Maaninka in North Savo 2000- 2001 the THC content of Finola was 0.16- 0.17% (Järvenranta and Virkajärvi 2002).

The risk that any of the fibre and oil hemp varieties would be used as drug does not exist. In these varieties the THC content always remains clearly below 1%, while in the varieties raised for drug use the THC levels are usually ten-fold, typically 5 to 10% (Callaway 2008).

2. Experiments and sampling

The THC content of Finola hemp was studied in four field experiments by the Agrifood Research Finland MTT in Jokioinen and Ylistaro in 2009-2010. The experiments were conducted using a completely randomised plot design in four replications. Each square was 1.5*10 metres in size.

In addition to Finola, 2 to 4 reference varieties were tested in the experiment. The hemp varieties were sown at the density of 300 sprouting seeds per square metre. The varieties included in the experiment are presented in the table below:

	Jokioinen 2009	Ylistaro 2009	Jokioinen 2010	Ylistaro 2010
Finola	+	+	+	+
Felina		+	+	+
Epsilon	+	+	+	+
Tiborzallasi	+	+		
Comply Hybrid		+		

Besides Finola, this report presents the results for Felina and Epsilon. The table below shows the sowing dates and fertilisation data:

	Jokioinen 2009	Ylistaro 2009	Jokioinen 2010	Ylistaro 2010
Sowing date	29 May 2009	28 May 2009	21 May 2010	3 June 2010
N kg/ha	102	100	96	100
P kg/ha	22	10	22	10
K kg/ha	78	60	73	60

No plant protection treatments were made on the plants.

In the experiments samples were collected by squares for the determination of the THC levels. The samples were taken starting in early July about every two weeks on the following dates:

Sampling no	Jokioinen 2009	Ylistaro 2009	Jokioinen 2010	Ylistaro 2010
1	10 July 2009	13 July 2009	6 July 2010	8 July 2010
2	24 July 2009	28 July 2009	20 July 2010	21 July 2010
3	7 Aug 2009	11 Aug 2009	3 Aug 2010	5 Aug 2010
4	20 Aug 2009	24 Aug 2009	17 Aug 2010	19 Aug 2010
5	3 Sept 2009	7 Sept 2009	31 Aug 2010	2 Sept 2010
6	17 Sept 2009	21 Sept 2009	20 Sept 2010*	16 Sept 2010*
7	1 Oct 2009	6 Oct 2009		
8	15 Oct 2009			

The analysis data of samples indicated by asterisk (*) were not available for this report.

Sampling was conducted following sampling practice A described in Annex 1 of Commission Regulation (EC) No 796/2004 of 21 April 2004.

The ten sample plants were selected randomly from the whole surface area of each square. In the case of Finola two samples of ten plants were taken (Finola a and b). For the other varieties one sample of ten plants was taken from each square. Thus the total sample size at each time was 40 plants.

For the Finola sample both staminate and pistillate (male and female) plants were taken randomly just before flowering. After the start of flowering only pistillate (female) plants were sampled. Of the Epsilon and Felina varieties (monoecious varieties) one sample was taken randomly. The plants were cut at the soil surface and plants from each square were taken in for measuring. The height of the plants was measured, the pairs of leaves were counted and the degree of flowering was examined. The top of the plant (30 cm) was cut and put in a paper bag. The samples were dried in a drying cabinet at the temperature of 50-51 °C in open paper bags placed on wire shelves in upright position. The samples were dried for 48 hours and then they were stored in plastic containers at room temperature in the dark. Before the analysis stems and seeds more than 2mm long were removed and the samples from different squares were combined into one test sample.

The samples were analysed as laid down in the Regulation referred to above at the Chemistry and Toxicology Research Unit of the Finnish Food Safety Authority Evira.

3. Height growth of the varieties

The effective temperature sum (> 5 °C) accumulated from the sowing to each sampling date was calculated from the weather data of the Jokioinen Observatory and Ylistaro Climate Station of the Finnish Meteorological Institute.

The height of the plants was measured in connection with each sampling. The more rapid development rhythm of Finola compared to the reference varieties was reflected in the height growth. The height growth of Finola ends after 650-700 degree days from the sowing, while

Epsilon and Felina continue to grow in height until the effective temperature sum of 900-1 000 degree days (Figures 1-3).

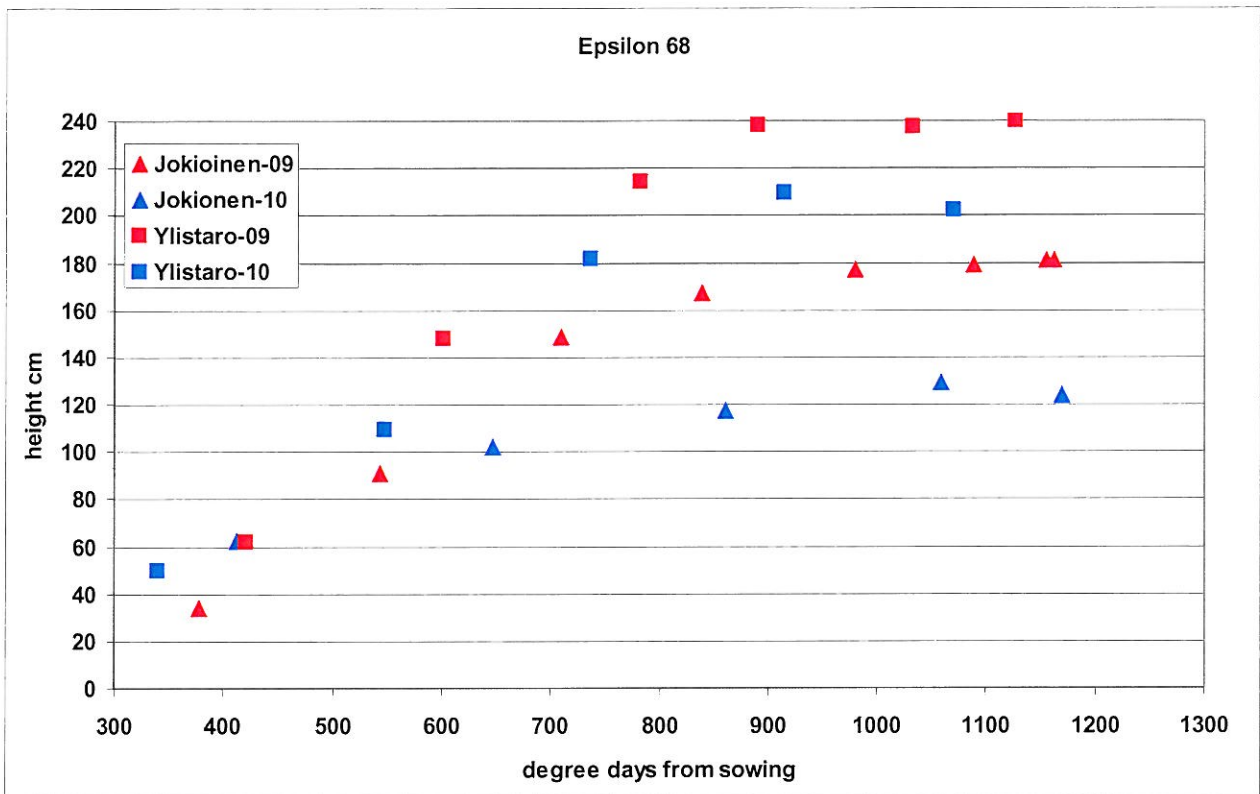


Figure 1. Height growth of the hemp variety Epsilon.

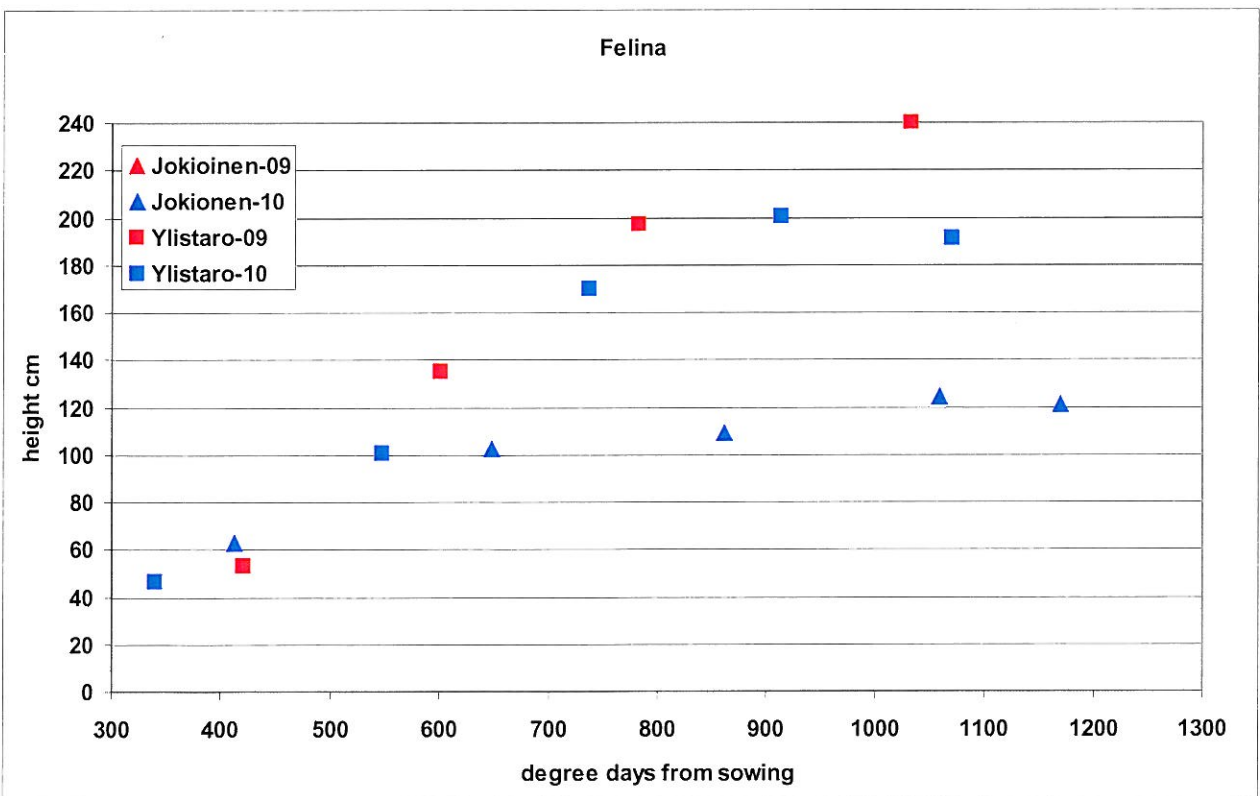


Figure 2. Height growth of the hemp variety Felina.

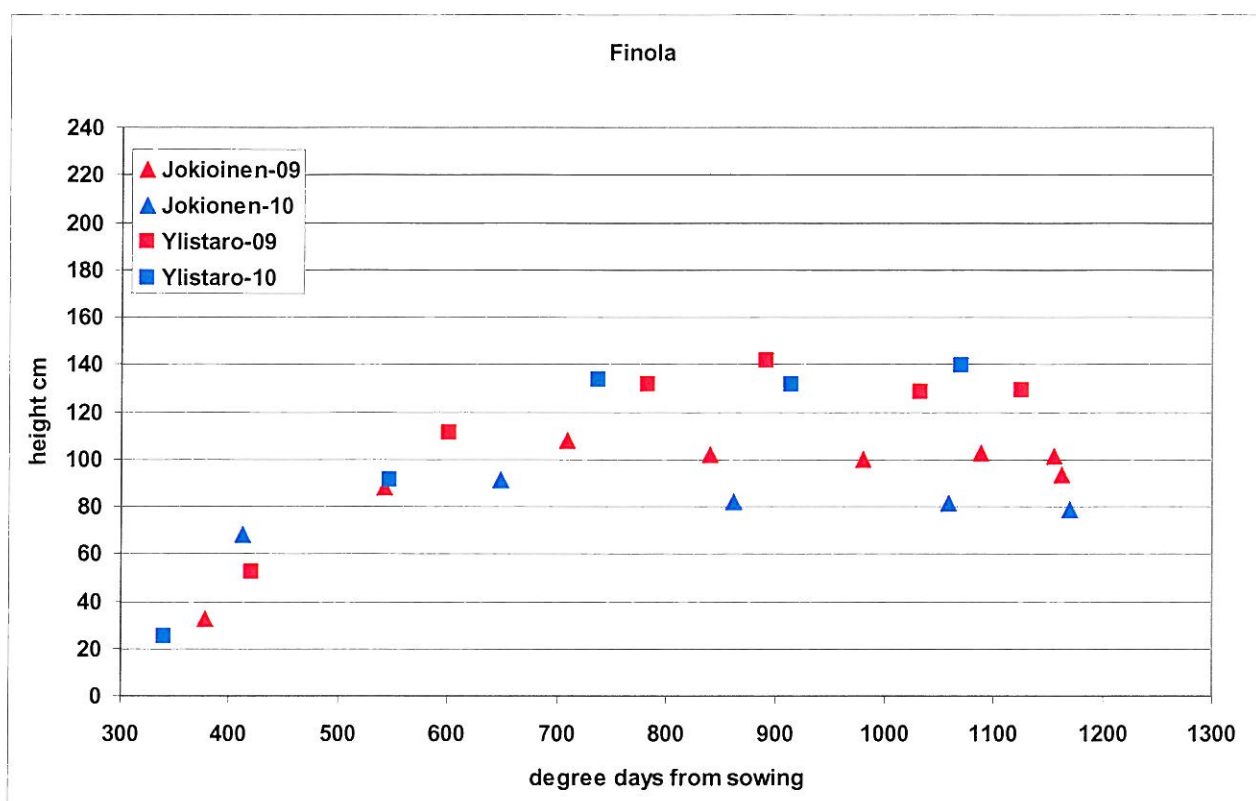


Figure 3. Height growth of the hemp variety Finola.

4. THC content of the varieties

The mean THC content in the whole data was 0.14%. Correspondingly, the mean result for Epsilon and Felina was 0.05%. The mean results of the varieties according to test sites in 2009 and 2010 are presented in the table below:

Variety	Data	Jokioinen 2009	Ylistaro 2009	Jokioinen 2010	Ylistaro 2010	Total
Epsilon	Number of samples	8	7	5	5	25
	Mean	0.05	0.04	0.07	0.05	0.05
	<i>Standard deviation</i>	<i>0.02</i>	<i>0.03</i>	<i>0.02</i>	<i>0.02</i>	<i>0.02</i>
Felina	Number of samples		7	5	5	17
	Mean		0.03	0.07	0.05	0.05
	<i>Standard deviation</i>		<i>0.01</i>	<i>0.02</i>	<i>0.02</i>	<i>0.02</i>
Finola A	Number of samples	8	7	5	5	25
	Mean	0.16	0.12	0.15	0.08	0.13
	<i>Standard deviation</i>	<i>0.14</i>	<i>0.07</i>	<i>0.08</i>	<i>0.05</i>	<i>0.09</i>
Finola B	Number of samples	8	7	5	5	25

Mean	0.19	0.12	0.18	0.10	0.15
Standard deviation	0.14	0.07	0.11	0.05	0.10

As the growing season progresses, slight increase can be observed in the THC levels of Epsilon (Figure 4) and Felina (Figure 5). In the samples taken before 500 degree days, in particular, the THC values are very low. In both varieties, however, the THC content does not rise above 0.1% even at the end of the growing season.

The THC content of Finola rises steadily as the growing season progresses (Figure 6), which also indicates the more rapid development of the variety. The TCH level is less than 0.2% when the effective temperature sum is less than 1 000 degree days. The variation in THC levels increases when the effective temperature sum accumulated since sowing exceeds 1 000 degree days.

At the effective temperature sum of less than 1 000 degree days the mean THC value of the Finola samples was 0.09%. The mean value of the samples taken after this was 0.22%.

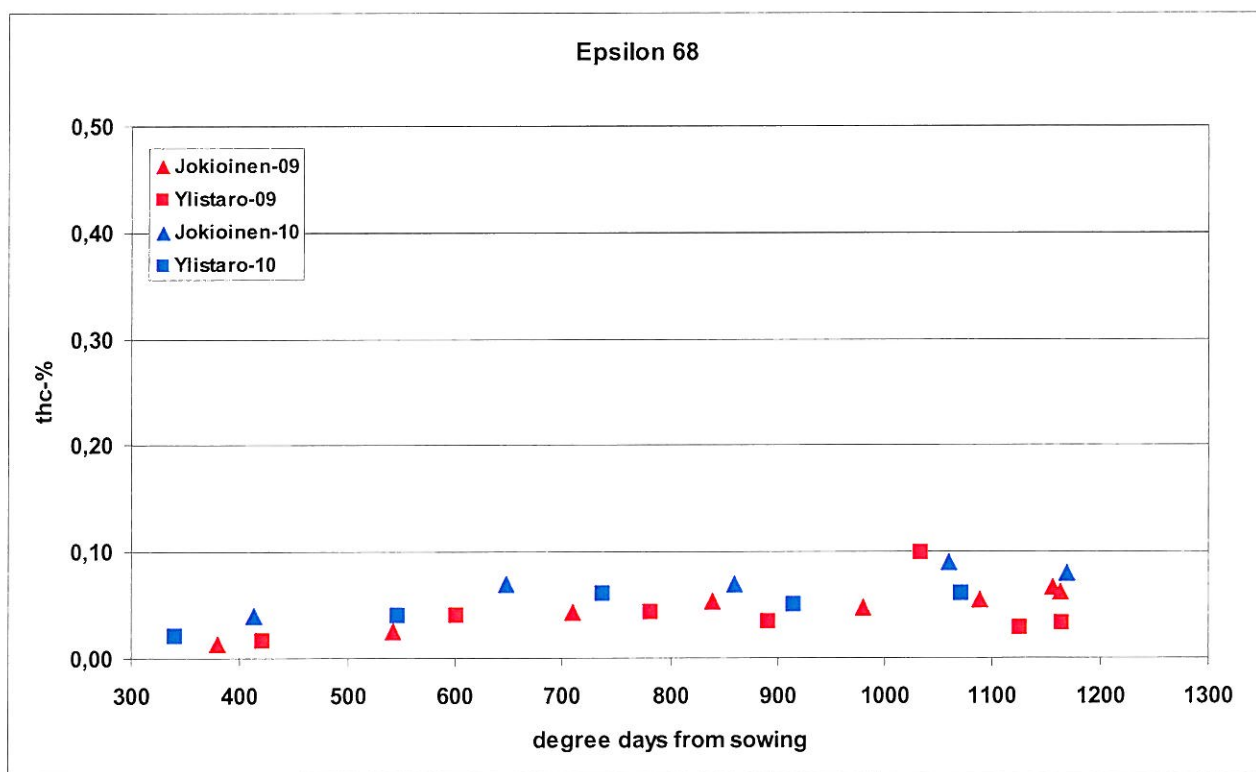


Figure 4. THC content of the hemp variety Epsilon at different effective temperature sum values.

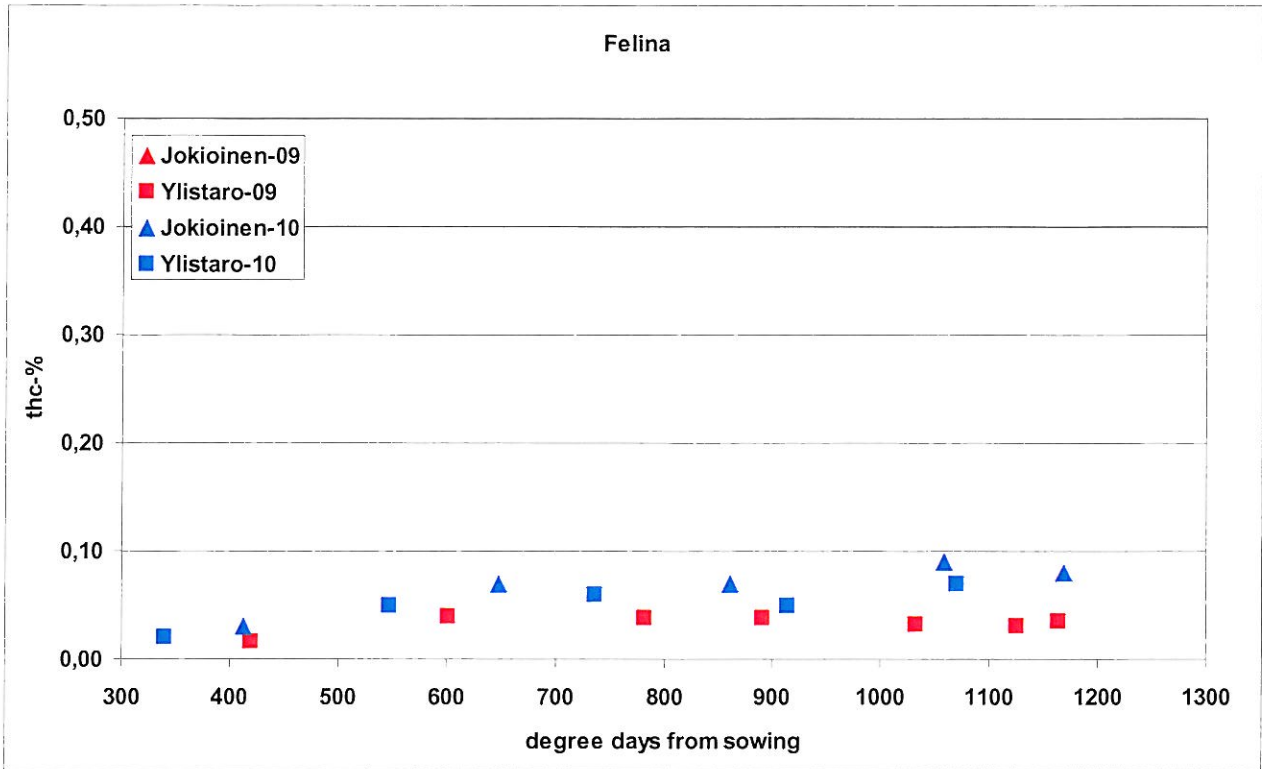


Figure 5. THC content of the hemp variety Felina at different effective temperature sum values.

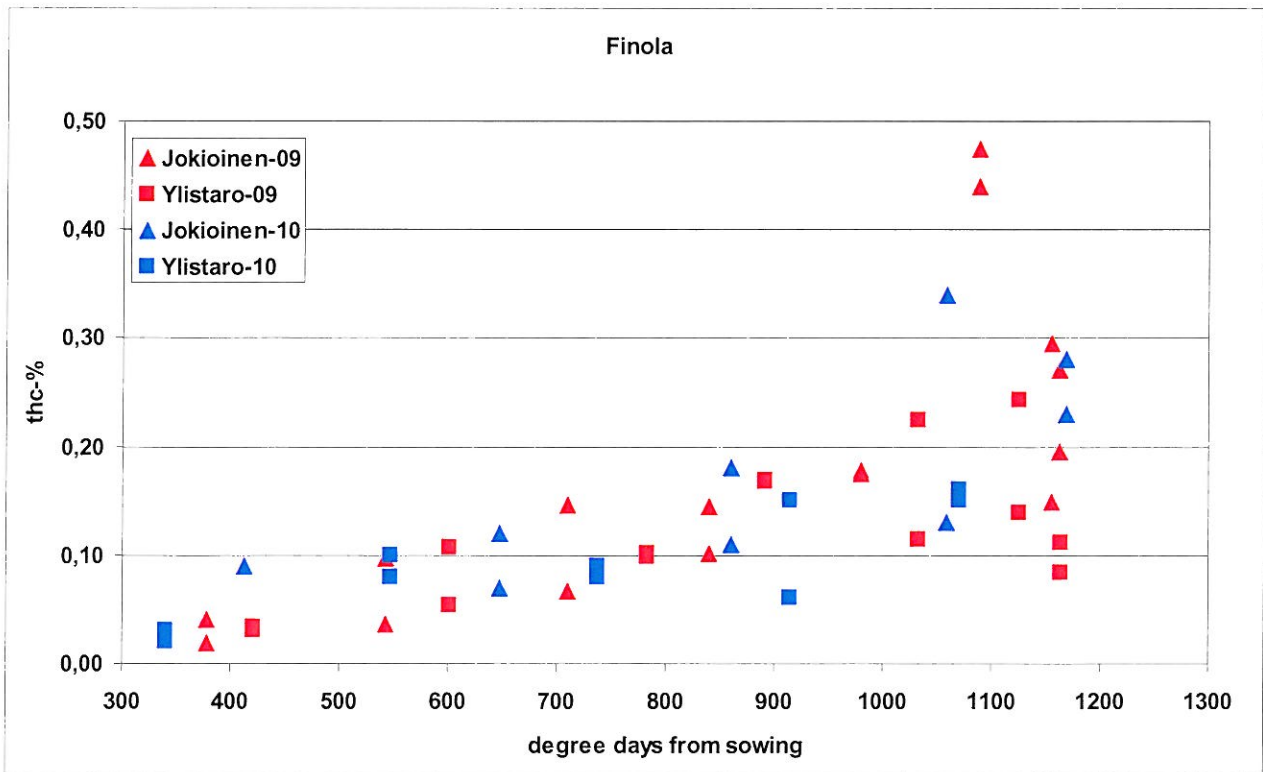


Figure 6. THC content of the hemp variety Finola at different effective temperature sum values.

5. THC content of the varieties at different sampling times

The following figures show the THC content of the varieties at different sampling times according to the dates of sampling. Relatively high values ($>0.2\%$) occur mostly in September. In 2010 the cumulative effective temperature sum in Jokioinen was exceptionally high in August, which is why in this test the content is above 0.2% already in the sample taken after mid-August (Figures 7-10).

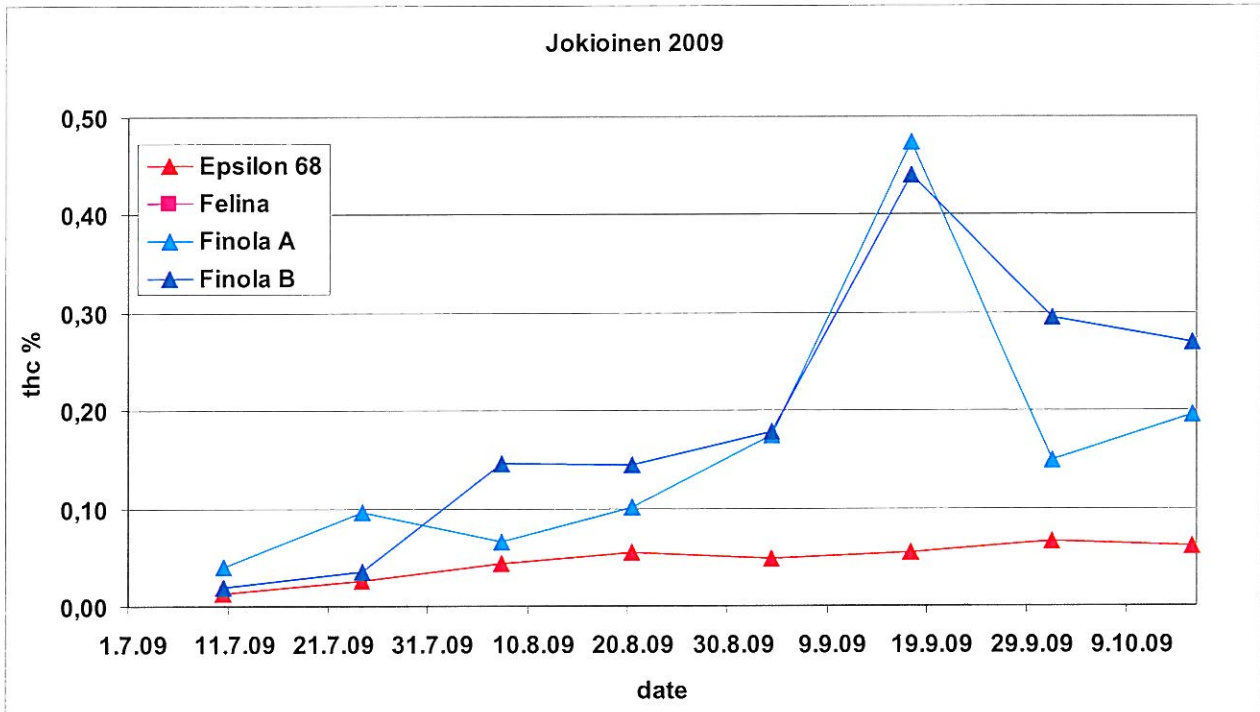


Figure 7. THC content of varieties at different sampling times in Jokioinen in 2009.

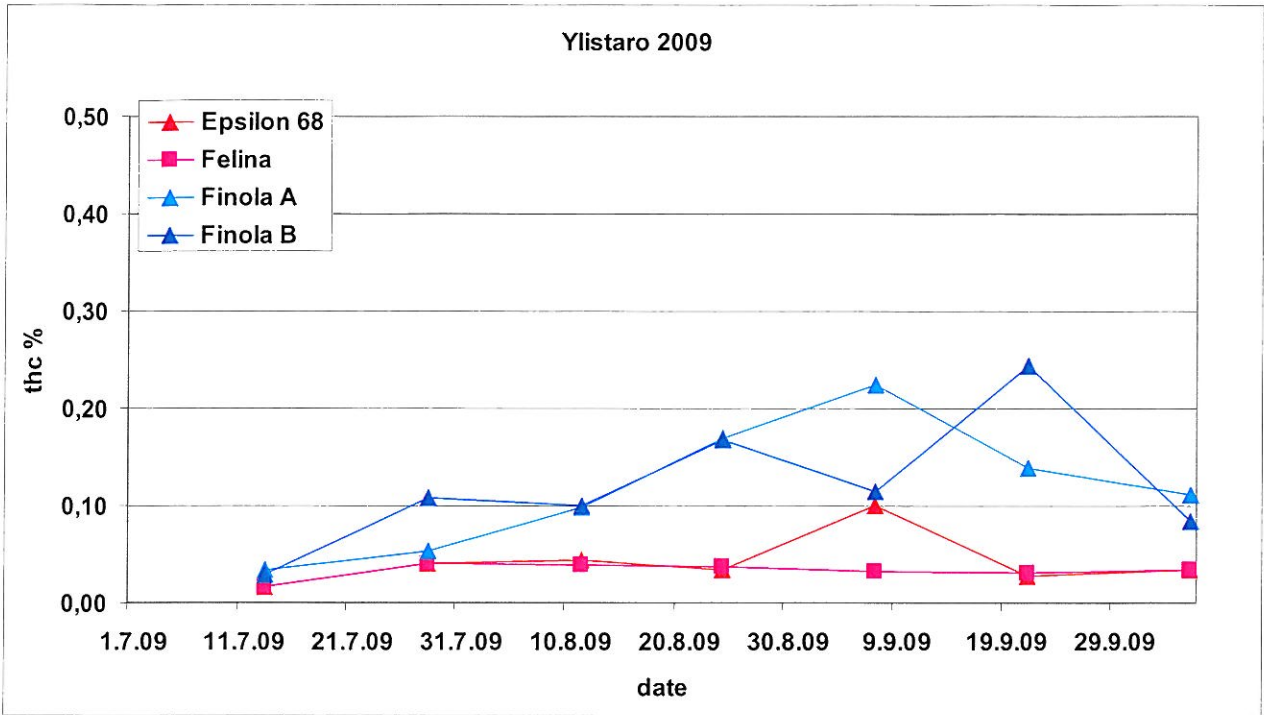


Figure 8. THC content of varieties at different sampling times in Ylistaro in 2009.

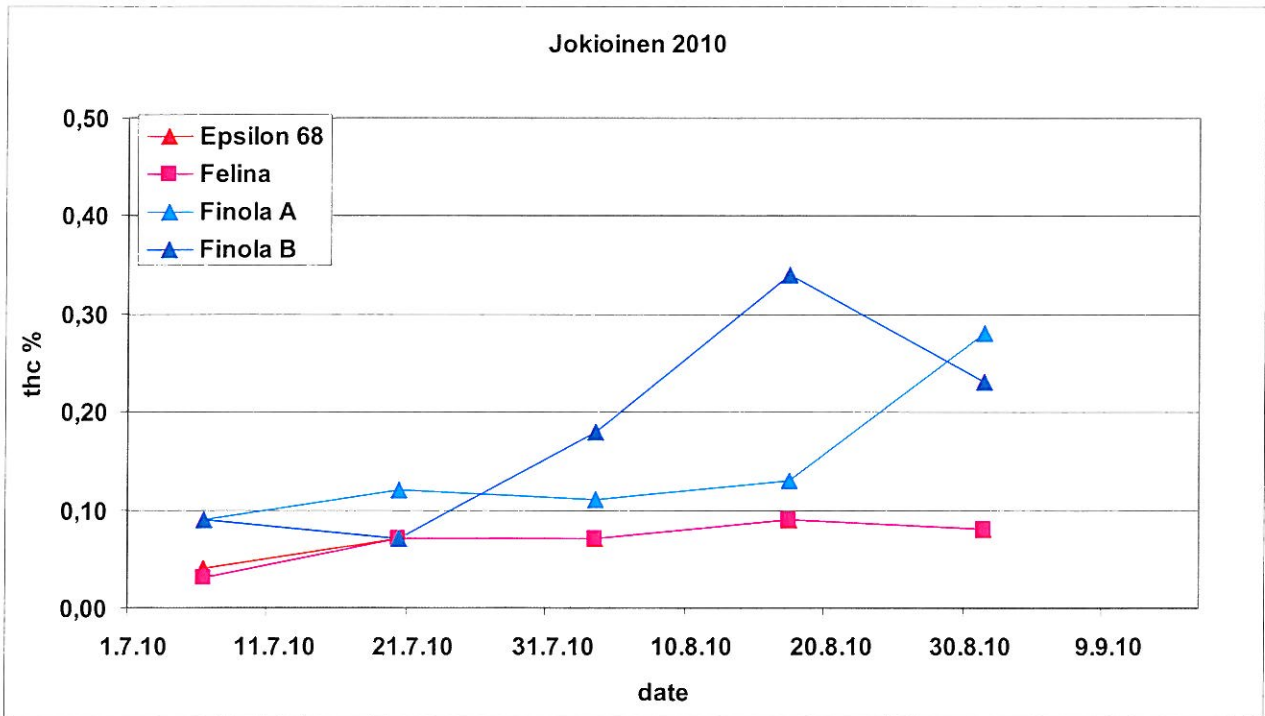


Figure 9. THC content of varieties at different sampling times in Jokioinen in 2010.

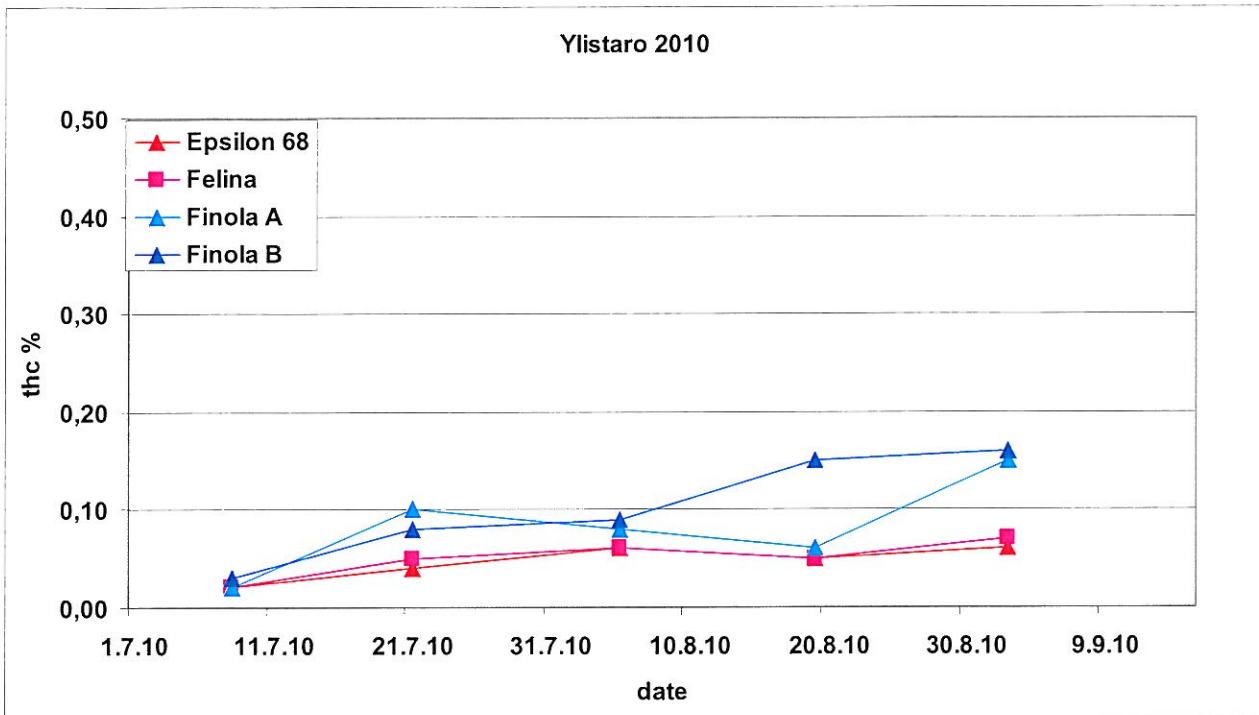


Figure10. THC content of varieties at different sampling times in Ylistaro in 2010.

6. Flowering and sampling time of Finola

According to the EU legislation (Annex 1 of Commission Regulation 796/2004), sampling for THC must be carried out during the day during the period running from 20 days after the start of the flowering to 10 days after the end of the flowering.

The dates when the flowering started and ended and the sampling dates calculated from this in the different experiments are given in the table below:

Experiment	Start of flowering	End of flowering	Sampling dates	Start of sampling, effective temperature sum	End of sampling, effective temperature sum
Jokioinen 2009	24 July	17 Aug	13 Aug-27 Aug	781	906
Jokioinen 2010	6 July	3 Aug	26 July-13 Aug	738	997
Ylistaro 2009	28 July	24 Aug	17 Aug-3 Sept	830	996
Ylistaro 2010	21 July	19 Aug	10 Aug-29 Aug	809	981

In Jokioinen the Finola hemp remained 30 to 50 cm shorter than in Ylistaro, i.e. in Ylistaro the height growth continued a little longer (Figure 3). This is why flowering also took place a little later than the average in Ylistaro than in Jokioinen, when comparing the effective temperature sum values. Following the Commission Regulation as regards the timing of the sampling means that, on average, the samples were taken between the effective temperature sum values of 790 to 980 degree days.

In this test series the THC content of samples taken at the time laid down by the Regulation was less than 0.2% (Figures 11-13).

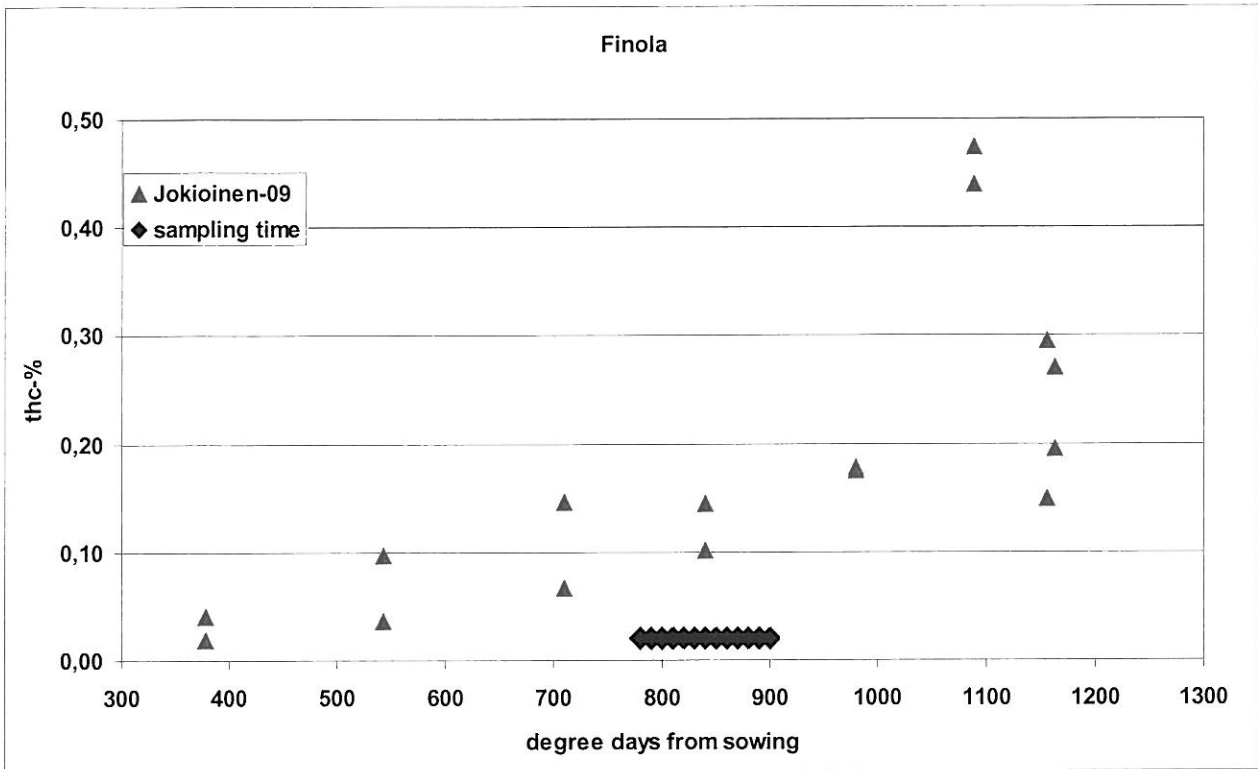


Figure 91. Sampling time in accordance with the Regulation in Jokioinen in 2009.

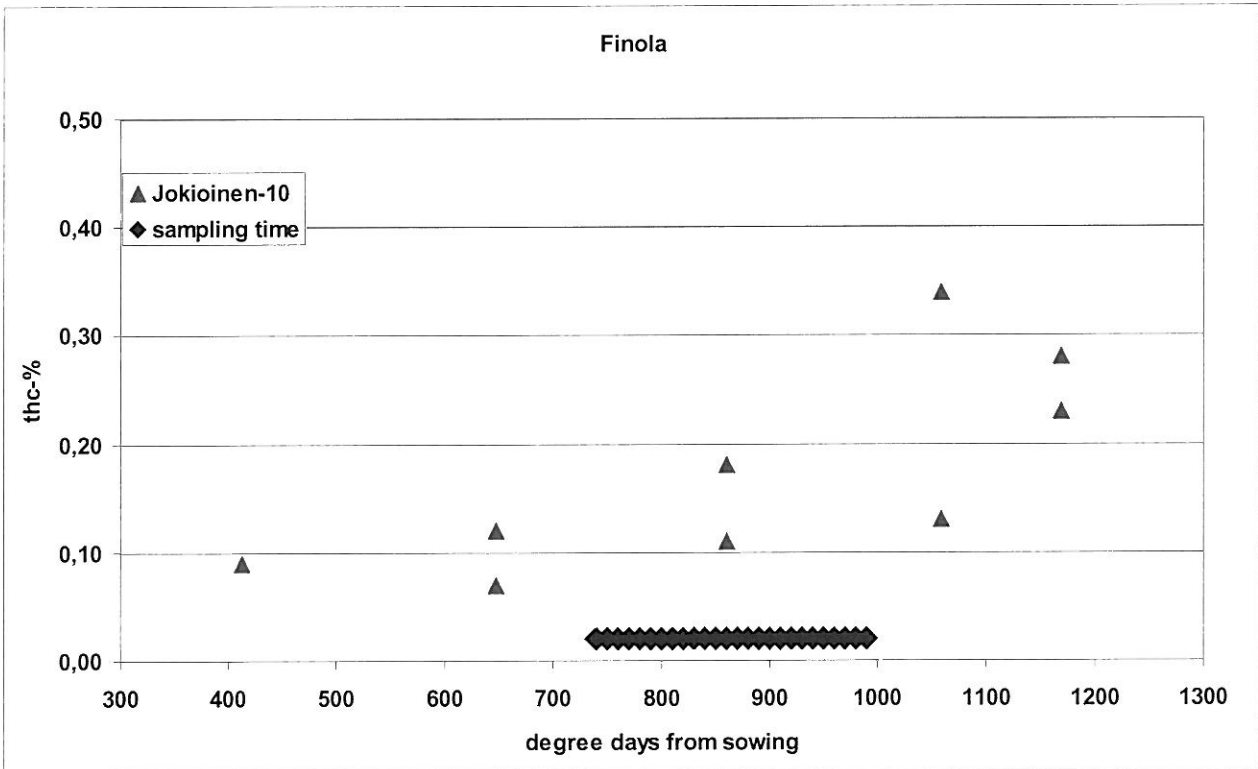


Figure 102. Sampling time in accordance with the Regulation in Jokioinen in 2010.

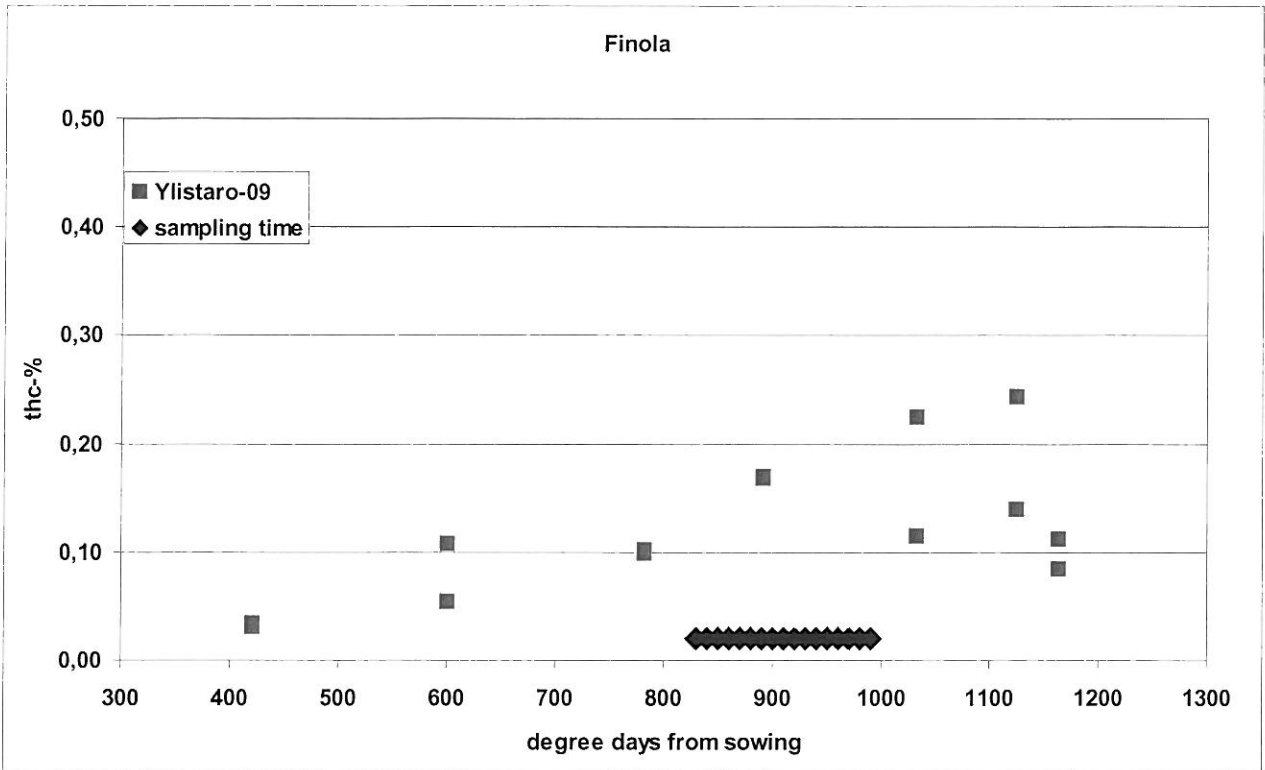


Figure 113. Sampling time in accordance with the Regulation in Ylistaro in 2009.

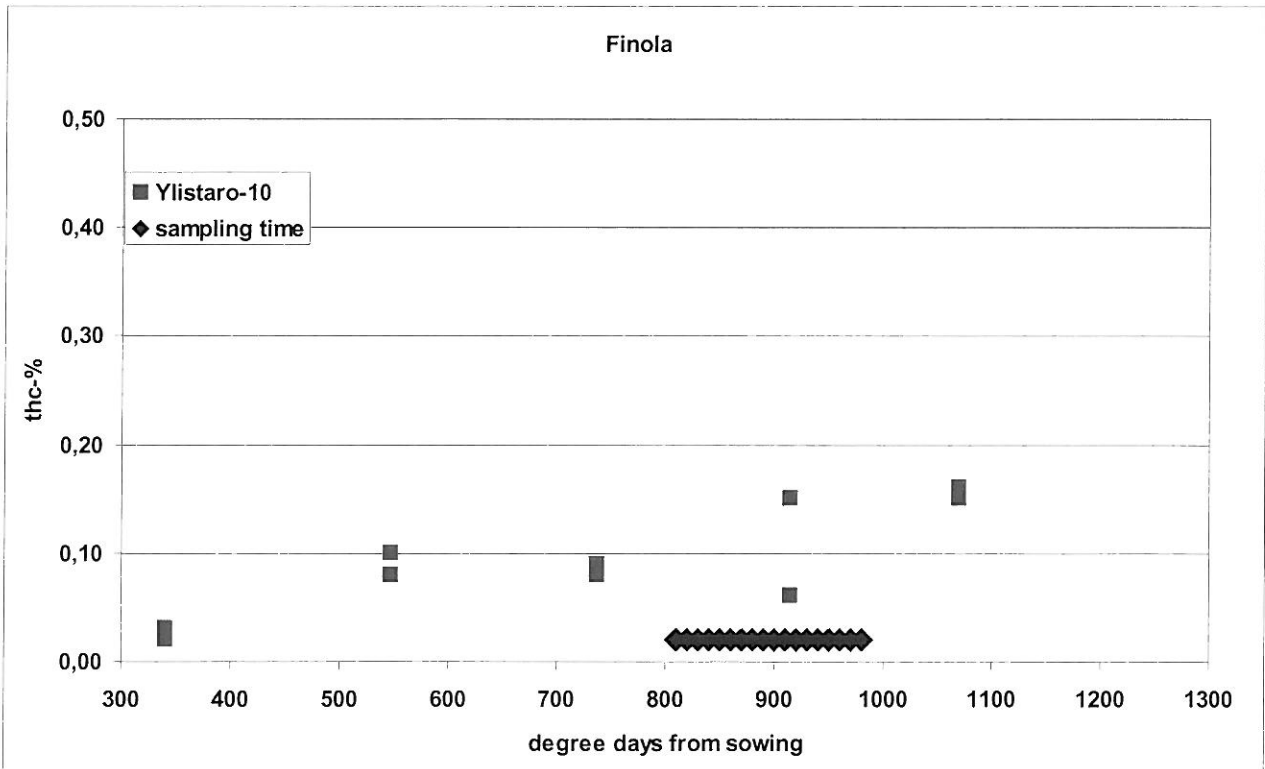


Figure 124. Sampling time in accordance with the Regulation in Ylistaro in 2010.

LITERATURE

Callaway, J. & Laakkonen, T. 1996. Cultivation of Cannabis oil seed varieties in Finland. *Journal of the International Hemp Association* 3,1: 32-34.

Callaway, J., Tennilä, T. & Pale, D. 1997. Occurance of "omega-3" stearidonic acid (cis-6,9,12,15-octadecatetraenonic acid) in hemp (*Cannabis sativa* L.) seed. *Journal of International Hemp Association* 3,2:

Callaway J. Schwab, U., Harvima, I., Halonen, P., Mykkänen, O., Hyvönen, P. & Järvinen, T. 2005. Efficacy of dietary hempseed oil in patients with dermatitis. *Journal of Dermatological Treatment* 16:87-94.

Callaway, J. 2008. A More Reliable Evaluation of Hemp THC Levels is Necessary and Possible. *Journal of Industrial Hemp* 13: 117-144.

Järvenranta, K. & Virkajärvi, P. 2002. Tutkimustuloksia Finola-siemenhampun (Fin-314) viljelykokeesta MTT:n Pohjois-Savon tutkimusasemalla. Tutkimusraportti 3.6.2002. 7 s. Saatavissa <http://www.finola.com/loppuraportti.pdf>