

COMPARATIVE PHYTOCHEMICAL STUDY ON THE CANNABINOID COMPOSITION
OF THE GEOGRAPHICAL VARIETIES OF CANNABIS SATIVA L. UNDER THE
SAME CONDITIONS

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Abstract

Comparative phytochemical study on the cannabinoid composition of the geographical varieties of Cannabis sativa L. under the same conditions.

In our examinations the species of different locality have characteristic cannabinoide spectra and contents. On the basis of results obtained by variance-analysis, we stated that the quantity of the total cannabinoide and that of the individual cannabinoide depended on the kind of locality, on the part of the plant in which the content of cannabinoide was measured. The cannabinoide content was less influenced by the weather-conditions.

Introduction

The chemical analysis of different hems is important concerning several practical aspects. For example: in a given country a hemp cultivated excusively for industrial utilization, in spite of its excellent quality of fiber, may contain considerable quantity of tetrahydrocannabinol, responsible for the psychotomimetic effect, which caused or will cause drug dependence among the inhabitants. We traced the cannabinoide's spectra and quality in the developed plant's stems, leaves and inflorescences in 1977 and 1978. This type of investigations are completed -among others- by working groups of Small /1973/, Fairbairn /1974/, Krajci /1975/ and Gournier /1979/.

Material and methods

Our experiments included hems of Mexican/UNC 347/, Spanish/UNC 484/, Thailand/UNC 254/, Turkish and Hungarian/Kompolt/ origin, Acta Horticulturae 96, 1980
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which were cultivated at the Agricultural Research Institute of Hungarian Academy of Sciences in Martonvásár. We have developed a gaschromatographic method with a stationer phase of two different polarities for the determination of the cannabinoides. The analysis was made on the 3 % OV-17 stationer phase under isotherm conditions at 230°C /figure 1./ and on 3 % IXR stationer phase, which is less polar than OV-17 with a nine minutes isotherm period was followed by a 2°C/min scheduled period /figure 2,3,4./.

4.Results:

4.1. Comparing the cannabinoide content of stems, leaves and inflorescences.

Stems contain significantly less cannabinoides than the leaves and inflorescences. The inflorescences contain generally more cannabinoides than the leaves, but significant difference can be stated only at the Mexican and Thailand female plants and at the Kompolti hemp /table 1./ As the cannabinoid spectra is concerned there is no difference between leaves and inflorescences, but the inflorescences contain more cannabinoid of each type than the leaves /figure 2./. On the tetrahydrocannabinol content there are significant differences between leaves and inflorescences only in Mexican female plants. The Kompolti hemp male and female, the Turkish I. female and the Thailand male inflorescences contain significantly more cannabidiol than the leaves of those plants. /table 2./.

4.2. Comparing the cannabinoide content of male and female plants

The general tendency, that the female plants contain more cannabinoides than the males, valid to the total cannabinoides, tetrahydrocannabinol and cannabidiol content. The cannabichromene content, generally, higher in the male plants /table 1.2./. On the 3 figure gaschromatograms made of leaves of the Thailand's male and female hemp can be seen. As for the tetrahydrocannabinol content, the effect of the sexes especially high at the inflorescences those hems of locality containing much tetrahydrocannabinol/ Table 1./

4.3. Cannabinoides quantity of the different geographical varieties.

The quantity of the individual cannabinoids, according to our examinations, hems can be divided into two groups:

- European hems, poor in tetrahydrocannabinol /rich in cannabidiol/
- non-European hems, rich in tetrahydrocannabinol /poor in cannabidiol/

On the 4. figure the chromatograms of the Mexican /II.group/ and Spanish /I.group/ female inflorescences can be seen respectively. Hems of Mexican origin contain the most cannabinoids, the female inflorescence of this hemp has remarkably high cannabinoid content /6.125 % on average of two years/. The least cannabinoid was found in the hemp of Spanish locality. The female inflorescences of Mexican locality contain ten times more tetrahydrocannabinol than cannabidiol-rich European hems. The species is rich in tetrahydrocannabinol, contain more cannabichromene than the species rich in cannabidiol.

4.4. Comparing the cannabinoides quantity in 1977 and 1978

Cannabinoid contents in leaves and inflorescences of developed plants are presented in the table 3. and figure 5. The inflorescences /with the exception of Kompolt's hemp/ contain more cannabinoids at the commence of generative period, than at the end of vegetative period. In comparison, the effect of weather conditions with other, mentioned factors, we can say that the cannabinoid content is less influenced by the weather. As a general conclusion it can be proved that hems of Mexican, Thailand and Spanish locality are influenced similarly by the weather respectively.

References

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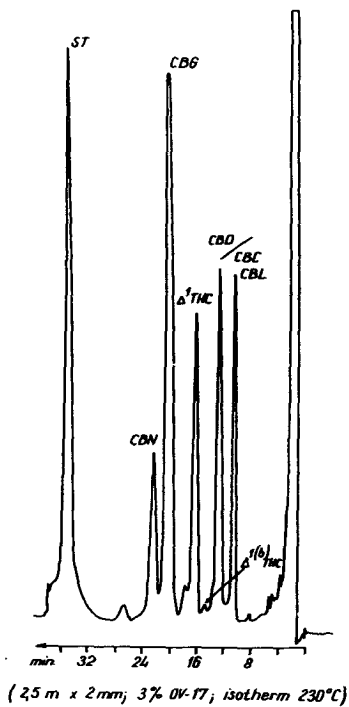


Figure 1.
Determination of the
cannabinoids in the
OV-17 stationer phase

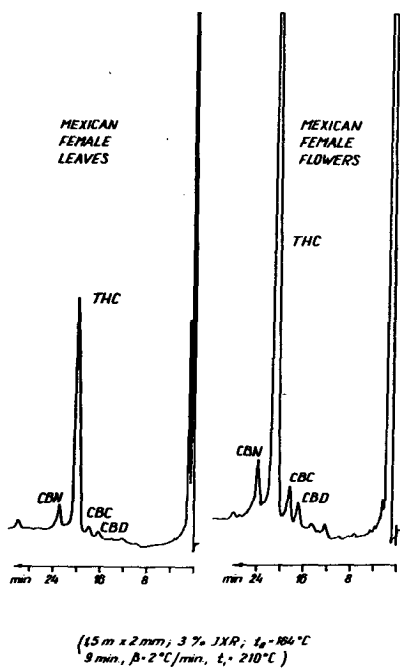
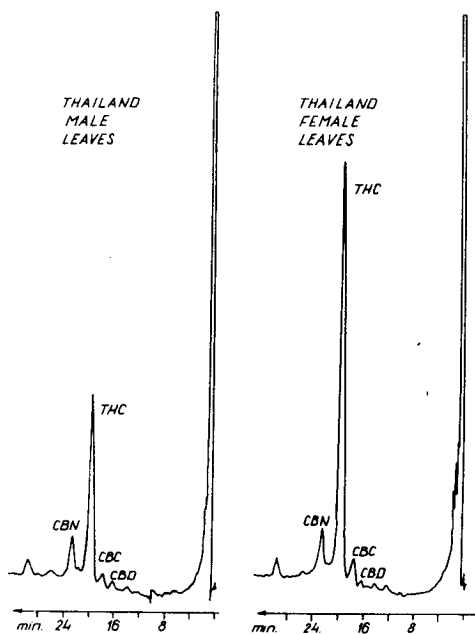
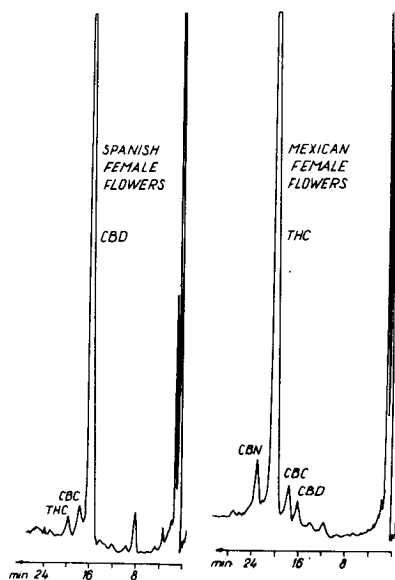


Figure 2.
Gaschromatograms of the
Mexican female hemp's
leaves and inflorescences



(15 m x 2 mm; 3 % JXR; t_g - 184°C
9 min, β - 2°C/min, t_f - 210°C)

Figure 3.
Gaschromatograms of le-
aves of the Thailand's
male and female hemp



(15 m x 2 mm; 3 % JXR; t_g - 184°C
9 min, β - 2°C/min, t_f - 210°C)

Figure 4.
Gaschromatograms of the
Spanish and Mexican
female inflorescence

Figure 5. Cannabinoid contents in inflorescences of developed plants

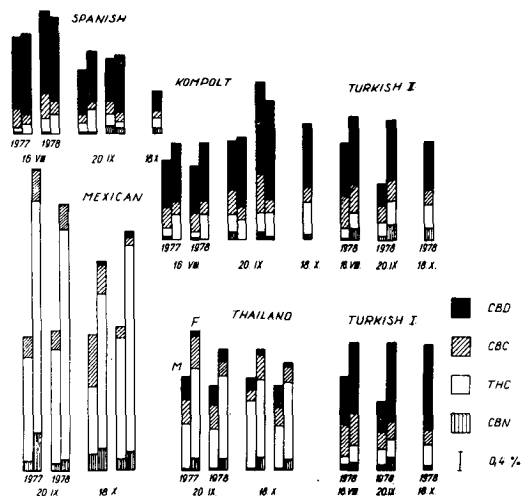


Table 3. Cannabinoid contents in leaves of developed plants

CANNABINOIDS	Y E A R S	MEXICAN		THAILAND		SPANISH		KOMPOLT		TURKISH I		TURKISH II	
		MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
TOTAL	1977	3,600	3,403	1,031	1,076	1,125	1,157	0,877	0,721				
	1978	2,490	3,086	2,283	2,500	1,192	1,316	0,805	0,690	1,307	2,110	1,143	2,487
CBD	1977	traces	traces	traces	traces	0,755	0,802	0,538	0,250				
	1978	0,010	0,105	0,265	0,171	0,781	0,683	0,300	0,250	0,718	1,073	0,422	1,232
CBC	1977	0,094	0,250	0,095	0,169	0,170	0,156	0,116	traces				
	1978	0,600	0,300	0,450	0,250	0,192	0,183	0,080	traces	0,170	0,330	0,377	0,450
THC	1977	2,850	3,049	0,817	0,817	0,113	0,340	0,191	0,450				
	1978	1,840	2,351	1,485	1,998	0,182	0,408	0,182	0,420	0,390	0,628	0,294	0,482
CBN	1977	0,256	0,104	0,119	0,090	0,087	0,059	0,032	0,021				
	1978	0,040	0,031	0,103	0,081	0,057	0,032	0,033	0,020	0,020	0,079	0,050	0,333

Table 1.

TOTAL CANNABINOID CONTENT OF DEVELOPED PLANTS

	MEXICAN		THAILAND		SPANISH		KOMPOLT	
S.	0.099	0.130	0.100	0.159	0.051	0.089	0.028	0.044
L.	3.044	3.234	1.657	1.788	1.159	1.236	0.741	1.050
I.	2.867	6.125	1.868	2.719	1.432	1.693	2.664	2.495

	TURKISH I.		TURKISH II.	
S.	0.030	0.040	0.027	0.042
L.	1.307	2.110	1.143	2.493
I.	1.440	2.680	1.160	2.480

LSD₅ % = 0.597LSD₁ % = 0.665

TETRAHYDROCANNABINOL CONTENT OF DEVELOPED PLANTS

	MEXICAN		THAILAND		SPANISH		KOMPOLT	
S.	0.073	0.103	0.058	0.100	0.010	0.039	0.008	0.018
L.	2.245	2.670	1.141	1.408	0.154	0.374	0.277	0.411
I.	2.239	4.691	0.884	1.784	0.217	0.300	0.383	0.468

	TURKISH I.		TURKISH II.	
S.	0.012	0.028	0.010	0.024
L.	0.399	0.362	0.294	0.482
I.	0.320	0.628	0.269	0.480

LSD₅ % = 0.575LSD₁ % = 0.640

S = stems L = leaves I = inflorescences

Table 2.

CANNABINOID CONTENT OF DEVELOPED PLANTS

MEXICAN		THAILAND		SPANISH		KOMPOLIT	
S.	traces 0.004	0.011	0.021	0.003	0.024	0.007	0.016
L.	0.005 0.055	0.134	0.086	0.755	0.647	0.317	0.526
I.	traces traces	0.445	0.194	0.887	1.130	1.453	1.738

TURKISH I.		TURKISH II.	
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S.	0.012 0.018	0.010	0.024
L.	0.715 1.070	0.422	1.232
I.	0.641 1.640	0.440	1.240

LSD_{5%} = 0.196LSD_{1%} = 0.219

CANNABICHROMENE CONTENT OF DEVELOPED PLANTS

MEXICAN		THAILAND		SPANISH		KOMPOLIT	
S.	0.017 0.013	0.025	0.024	0.031	0.027	0.009	0.012
L.	0.497 0.425	0.273	0.210	0.181	0.170	0.106	0.090
I.	0.434 0.570	0.514	0.491	0.252	0.174	0.649	0.293

TURKISH I.		TURKISH II.	
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S.	0.013 0.010	0.014	0.012
L.	0.170 0.330	0.377	0.450
I.	0.360 0.400	0.361	0.440

LSD_{5%} = 0.243LSD_{1%} = 0.270

S = stems

L = leaves

I = inflorescences