Samples seized in Israel and Czech Republic we describe for the first time, as they look as real hashish, but have nothing at all with real hashish. There were not find even traces of any compound typical for cannabis sample. Seized "hashish", as we proved, has nothing with real hashish at all even when it looks as real hashish. The main ingredients of this "hashish" samples were identified as henna powder (Lawsonia inermis) and oleoresin of pine (Pinus spp.).

Part III – Medicinal cannabis samples

The second part of this study was analyses of medicinal cannabis, distributed in Israel to the patients as plant and its products (flowering tops, oil, cookies etc.).

A scientific literary review

At present time there is almost nothing known about medicinal cannabis concerning content compounds important for treatment of different illnesses. After discovery of CB_1 and CB_2 cannabinoid receptors and endocannabinoids which bind to these receptors scientist started to understand the mechanism of effects of cannabinoid compounds on human organism [29-49]. At present time cannabis is used in Israel (and several other countries around the world) for medicinal purposes. As palliative medicine is today cannabis moreless understood. Concerning the active content compounds we know today only about medicinal properties of cannabidiol and tetrahydrocannabinol but we are not fully sure about the optimal dose for treatment. Today 10 to 15 % patients stop cannabis treatment

as it does not help them or they do not feel good after cannabis treatment and we do not know why. Real therapeutic values of medicinal cannabis are at present "in shadow" and must be studied scientifically. In the fact there are almost no studies concerning quality of medicinal cannabis. One must also understand that medicinal cannabis can be abused as sometime it is more potent than very good quality hashish which one can find on the black market.

Methodology

Procedure

200 mg of ground female flowering tops of cannabis sample were extracted with methanol and filtered through cotton in a capillary. Final concentration equals extract from 1 mg of female flowering tops sample with 50 μg internal standard (tetracosane) in 1 ml.

One μl of this sample was injected to GC/MS for analysis.

Instrumentation, Conditions of the analysis, Standards and solutions

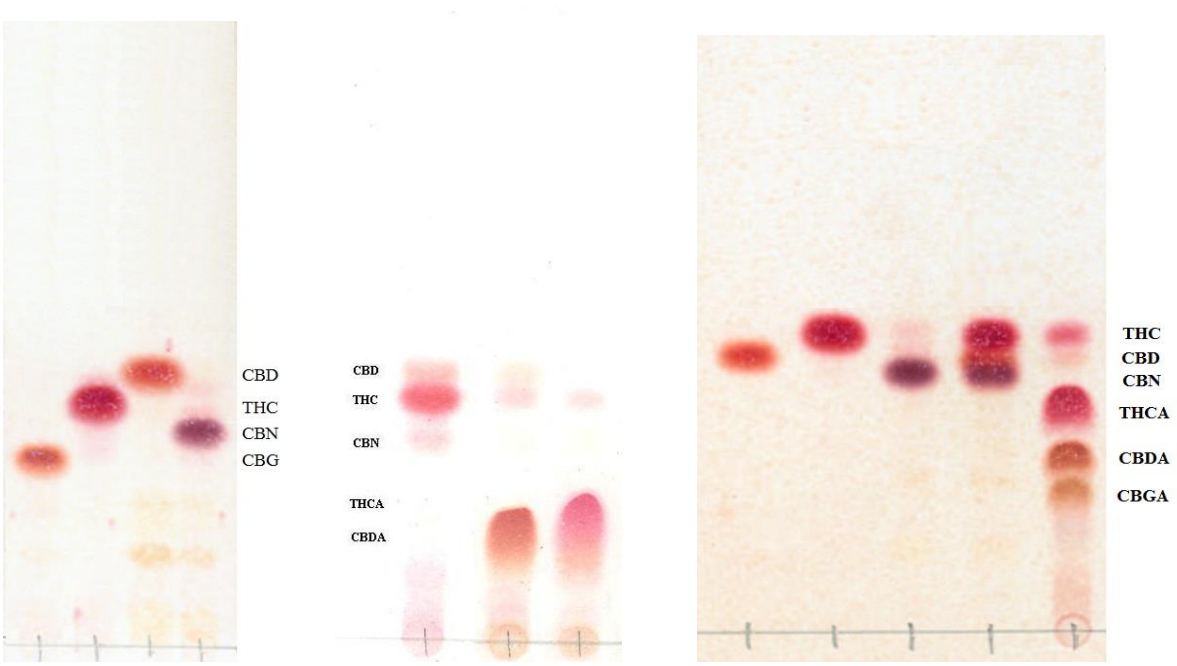
The same as with hashish (see Part I).

Thin-layer chromatography was performed with the samples prepared for quantitative analyses in solvent systems n-hexane – dioxane (4 : 1) and petroleum ether – ether (4 : 1).

Results

Samples of medicinal cannabis were analyzed qualitatively with the help of thin-layer chromatography and quantitatively by gas chromatography/mass spectrometry to evaluate quality of cannabis strains cultivated and used in Israel for medicinal purposes. The type of medicinal cannabis use and homogeneity was also studied.

Example of *thin-layer chromatograms* of the main standards and real samples:

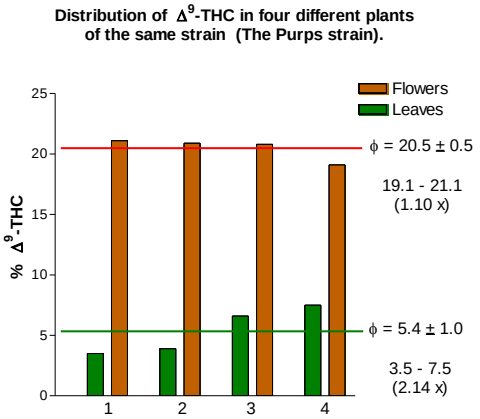


A. Homogeneity of the buds (female flowering tops without surrounding small leaves) from different plants of the same strain of cannabis and inside one cannabis plant.

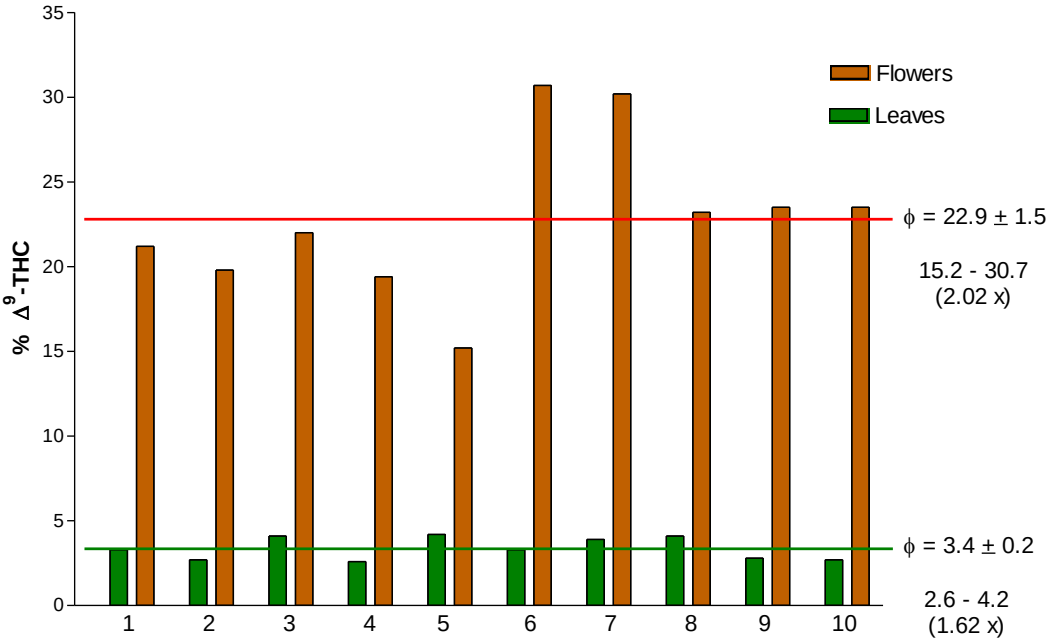
The study of homogeneity of different strain samples is very important as many patients in Israel use medicinal cannabis by smoking. It is very important that patient has for his/her treatment every time the same amount of active compounds. Larger sizes of samples (up to fifty samples from one strain of medicinal cannabis) were analyzed. Already happened that patient after use of the same amount of medicinal cannabis (by weight of the same strain) was influenced by different way. Because of that were studied differences in Δ^9-THC content in samples of the same strain. Analyzed were different samples from the same plant and from different plants of the same strain and also from different strains.

Courtesy of the **CannDoc company** were obtained cannabis samples for research purposes used in this study. Cannabis flowers and surrounding leaves were analyzed and compared inside each cannabis strain. Results, averages for the whole group of samples and differences between the lowest and the highest values inside each particular strain are in each graph.

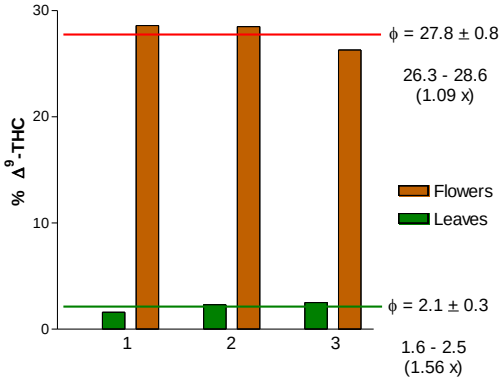
Used strains: **Purps**, **Northen Light**, and **Free Leonard**.



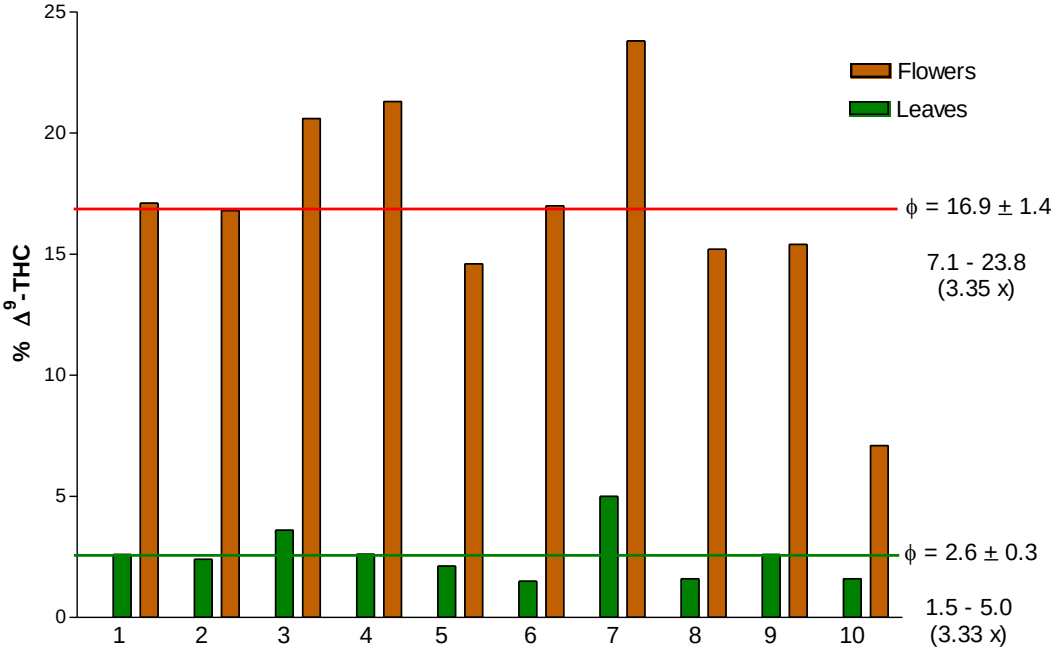
Distribution of Δ^9-THC in the samples from 10 plants collected at the height 1.5 m above ground level (Northen Light strain)



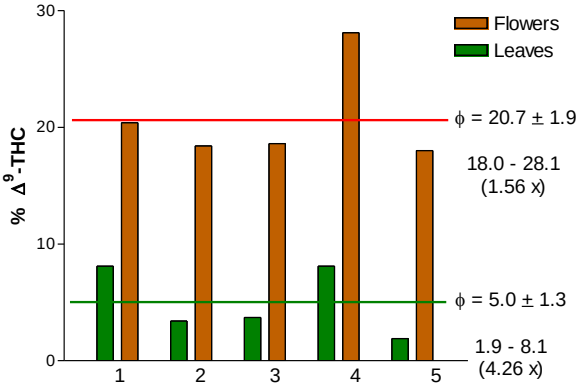
Distribution of Δ^9-THC in single plant (Northen Light strain). 1 - 3, samples from the top to the bottom of the plant.



Distribution of Δ^9-THC in the samples from 10 plants collected at the height 1.5 m above ground level (Free Leonard Cola strain)



Distribution of Δ^9-THC in single plant (Free Leonard Cola strain). 1 - 5, samples from the top to the bottom of the plant.

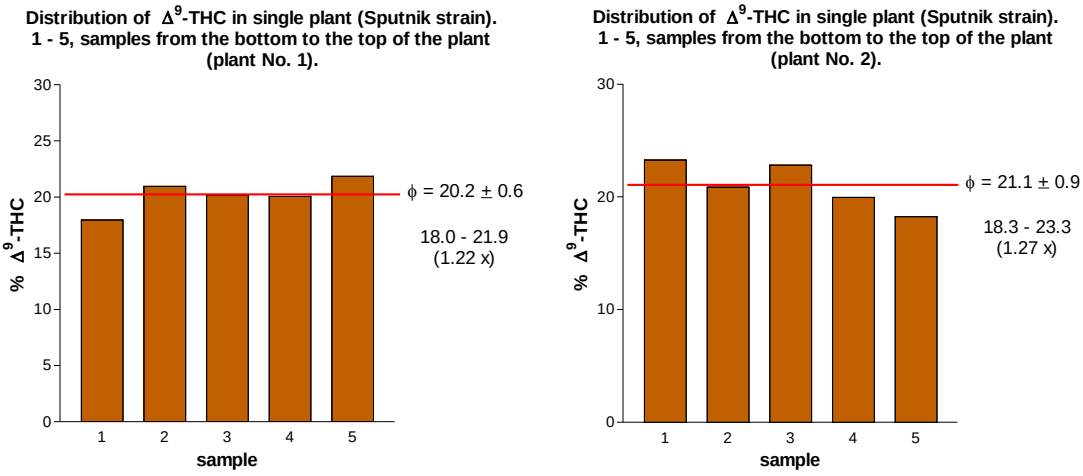


Differences in Δ^9-THC content inside one strain between different plants and inside one plant can explain why patients smoking medical cannabis sometime complain that it too much influenced their psyche. This is also one of the reasons, why I suggest using medicinal cannabis by different way (even when by smoking

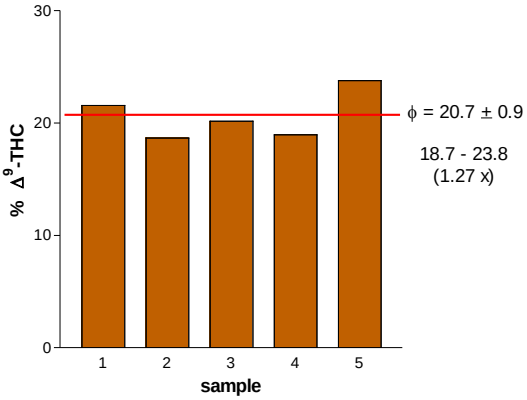
palliative influence of medicinal cannabis is the fastest) – e.g. as cakes, oil, suppository etc.

Courtesy of the **IMC Chaklaut company** were obtained cannabis samples for research purposes used in this study. Cannabis female flowering tops without surrounding small leaves and surrounding leaves were analyzed and compared inside this strain. Results, averages for the whole group of samples and differences between the lowest and the highest values inside each particular strain are in each graph.

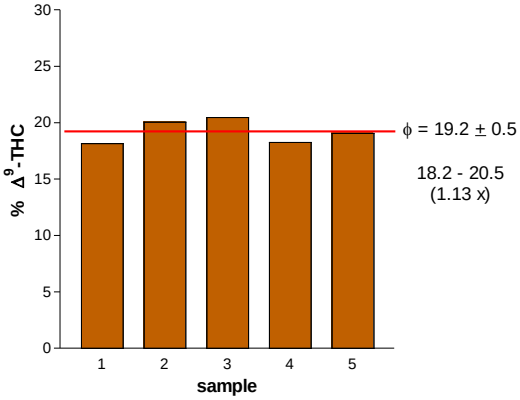
Used strain: **Sputnik strain**



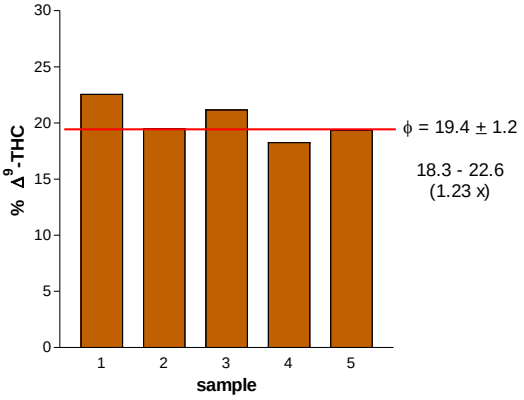
Distribution of Δ^9-THC in single plant (Sputnik strain). 1 - 5, samples from the bottom to the top of the plant (plant No. 3).



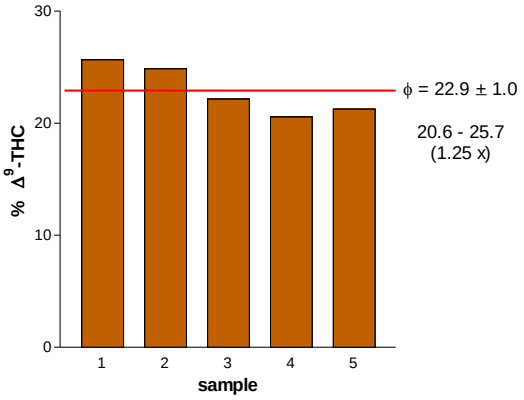
Distribution of Δ^9-THC in single plant (Sputnik strain). 1 - 5, samples from the bottom to the top of the plant (plant No. 4).



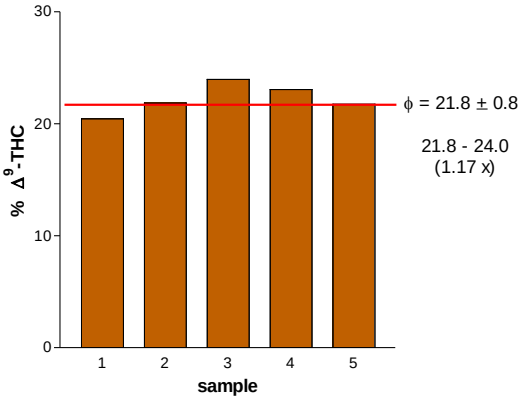
Distribution of Δ^9-THC in single plant (Sputnik strain). 1 - 5, samples from the bottom to the top of the plant (plant No. 5).



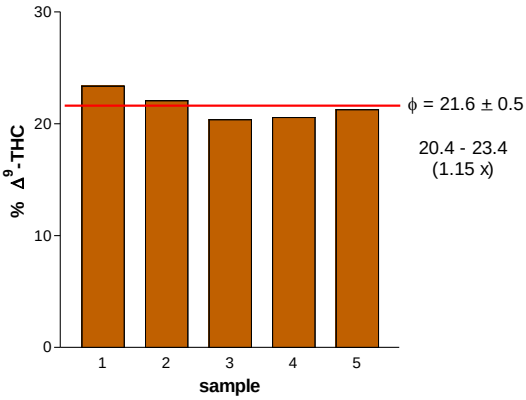
Distribution of Δ^9-THC in single plant (Sputnik strain). 1 - 5, samples from the bottom to the top of the plant (plant No. 6).



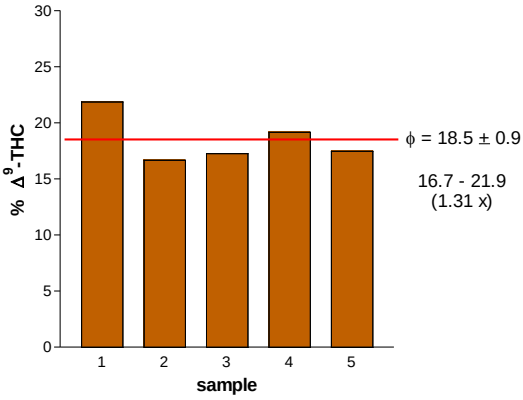
Distribution of Δ^9-THC in single plant (Sputnik strain). 1 - 5, samples from the bottom to the top of the plant (plant No. 7).



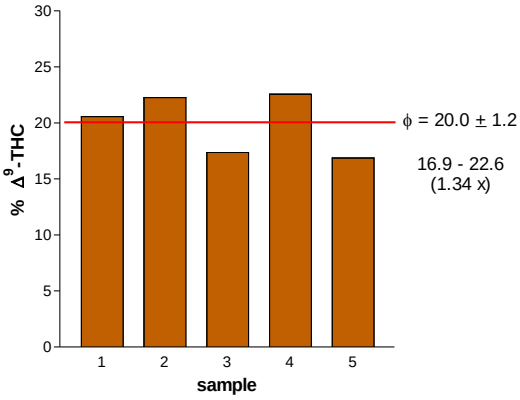
Distribution of Δ^9-THC in single plant (Sputnik strain). 1 - 5, samples from the bottom to the top of the plant (plant No. 8).



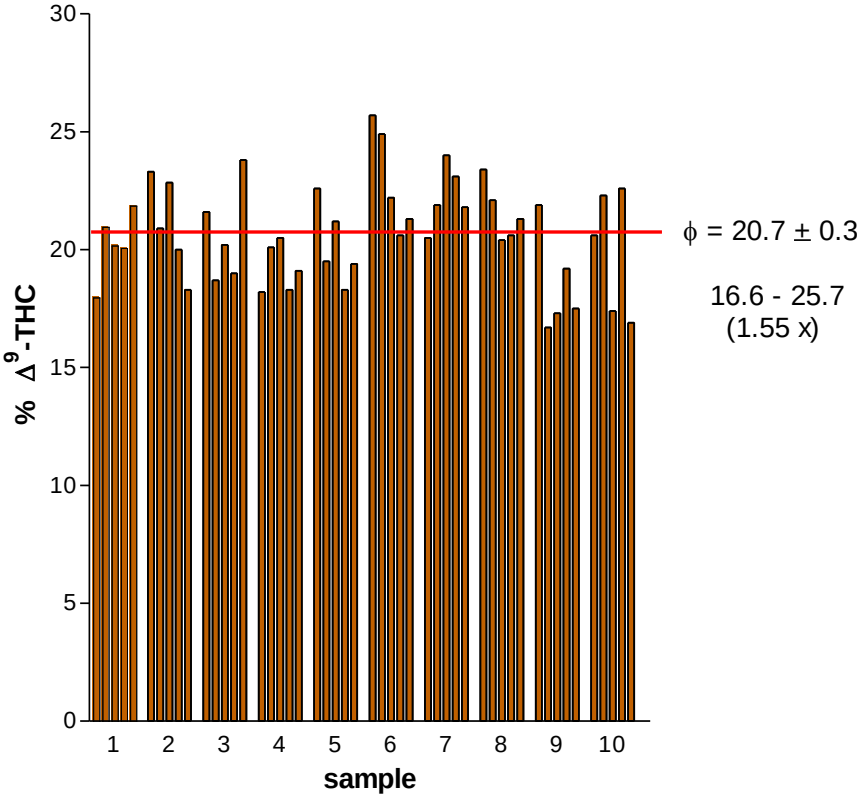
Distribution of Δ^9-THC in single plant (Sputnik strain). 1 - 5, samples from the bottom to the top of the plant (plant No. 9).



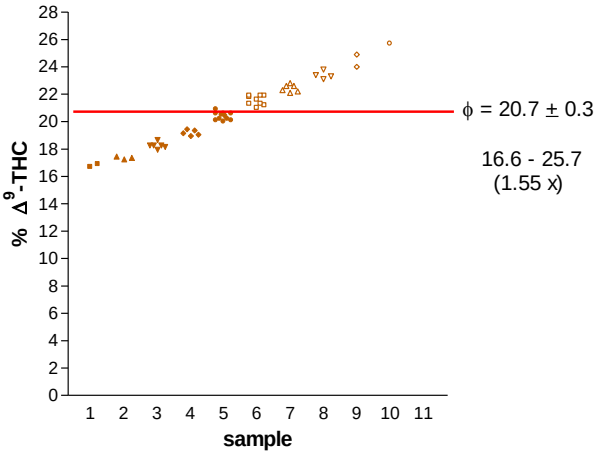
Distribution of Δ^9-THC in single plant (Sputnik strain). 1 - 5, samples from the bottom to the top of the plant (plant No. 10).

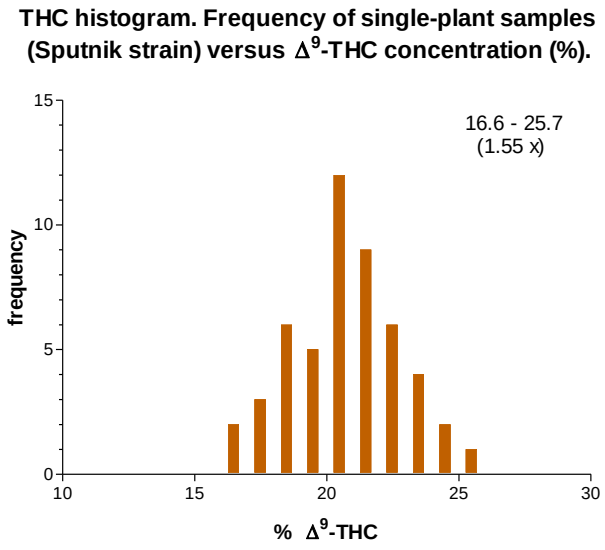


Distribution of Δ^9-THC in ten single cannabis plants of the same strain (Sputnik strain). Five samples from the bottom to the top of the each plant (from the left to the right).



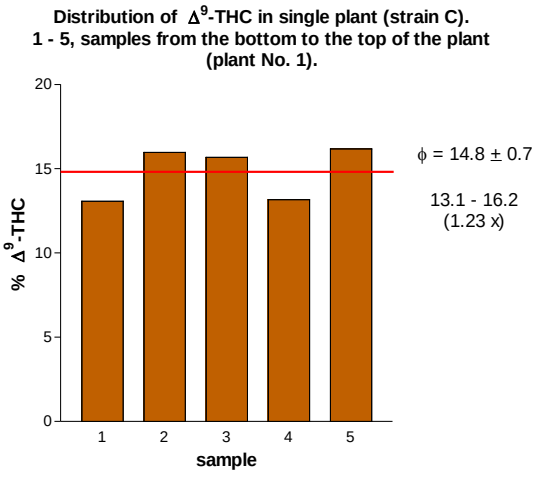
Distribution of Δ^9-THC in single cannabis plants of the same strain (Sputnik strain). Five samples from the bottom to the top of the each plant (from the left to the right).

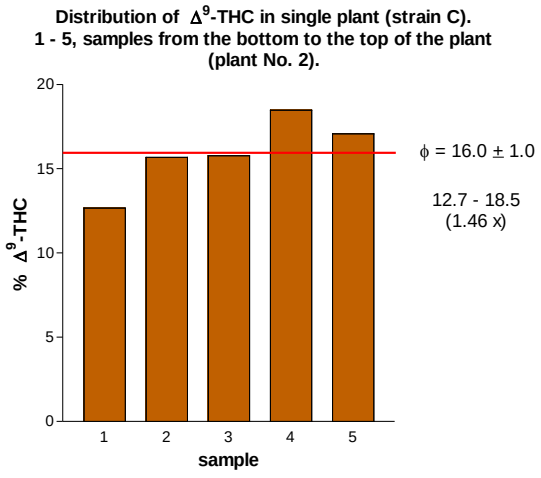


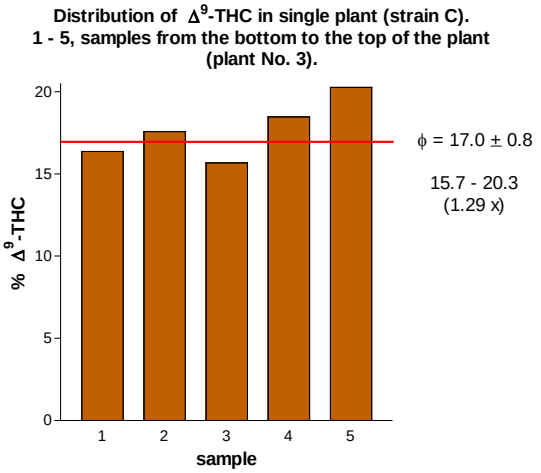


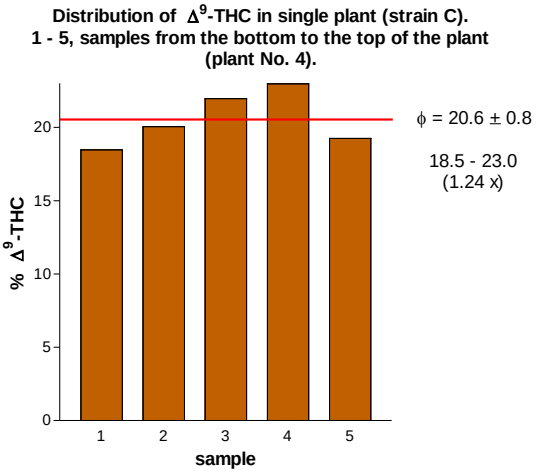
Courtesy of the **Chevrat Sijach company** were obtained cannabis samples for research purposes used in this study. Cannabis female flowering tops without surrounding small leaves and surrounding leaves were analyzed and compared inside this strain. Results, averages for the whole group of samples and differences between the lowest and the highest values inside each particular strain are in each graph.

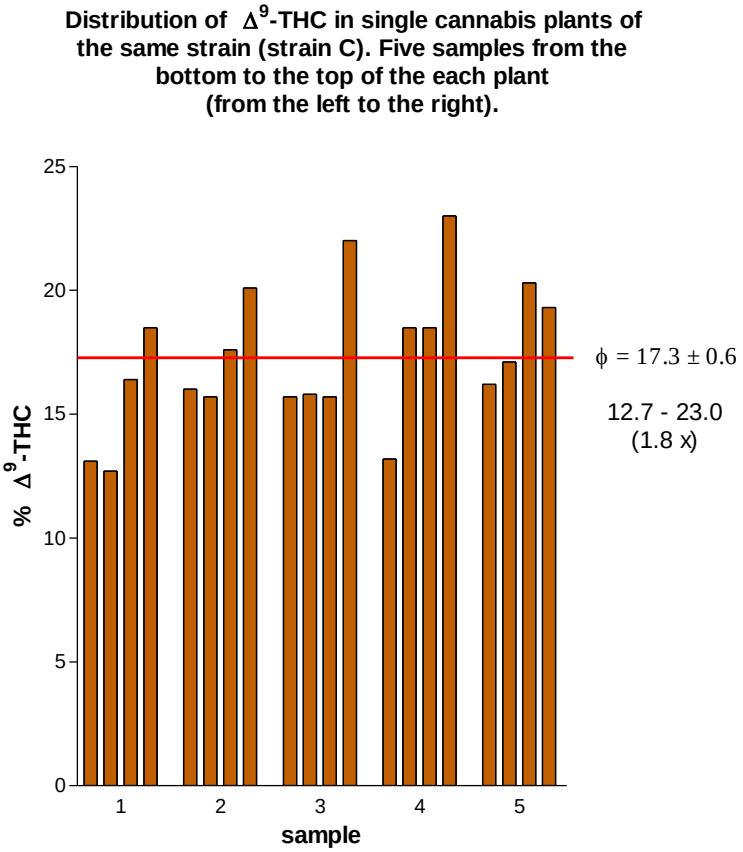
Used strain: **strain C**



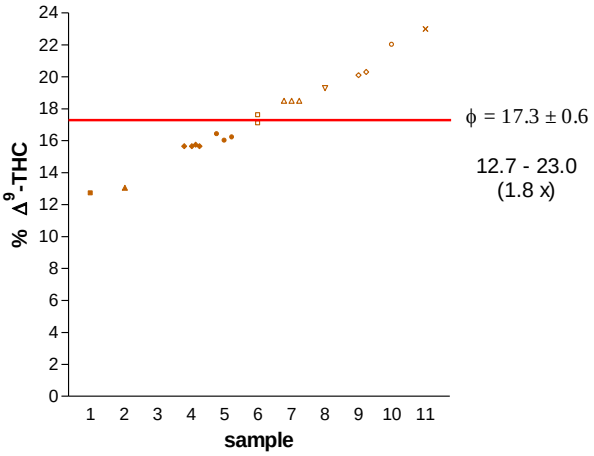



Distribution of Δ9-THC in single plant (strain C).
1 - 5, samples from the bottom to the top of the plant
(plant No. 3).
% Δ9-THC
sample
ϕ = 17.0 ± 0.8
15.7 - 20.3
(1.29 x)

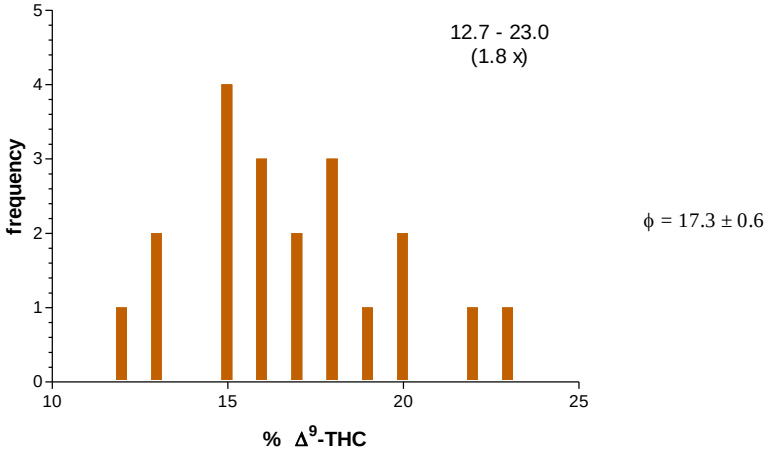

Distribution of Δ9-THC in single plant (strain C).
1 - 5, samples from the bottom to the top of the plant
(plant No. 4).
% Δ9-THC
sample
ϕ = 20.6 ± 0.8
18.5 - 23.0
(1.24 x)


Distribution of Δ9-THC in single cannabis plants of
the same strain (strain C). Five samples from the
bottom to the top of the each plant
(from the left to the right).
% Δ9-THC
sample
ϕ = 17.3 ± 0.6
12.7 - 23.0
(1.8 x)

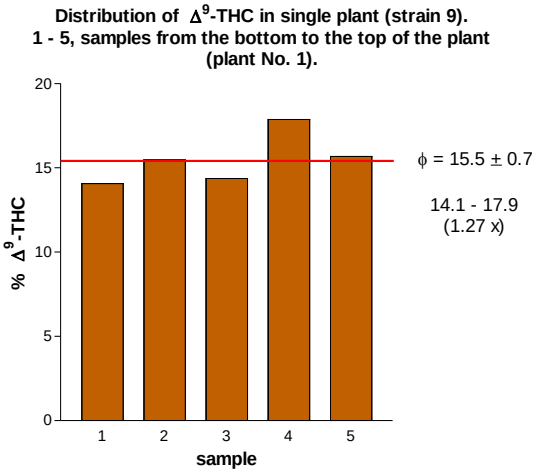
Distribution of Δ^9-THC in single cannabis plants of the same strain (strain C). Five samples from the bottom to the top of the each plant (from the left to the right).

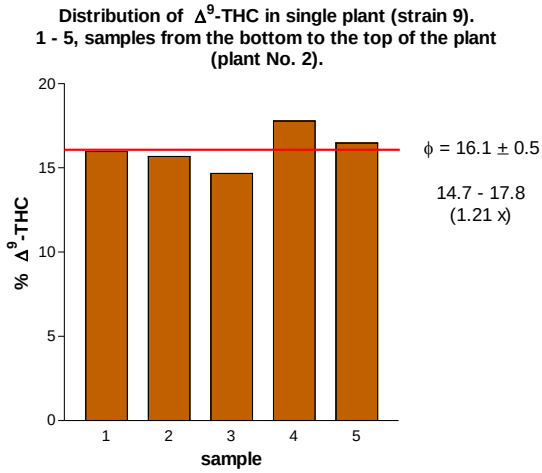


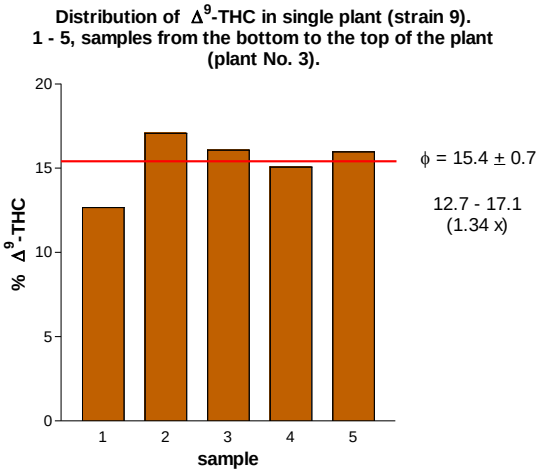
THC histogram. Frequency of different plants of the strain C versus Δ^9-THC concentration (%).

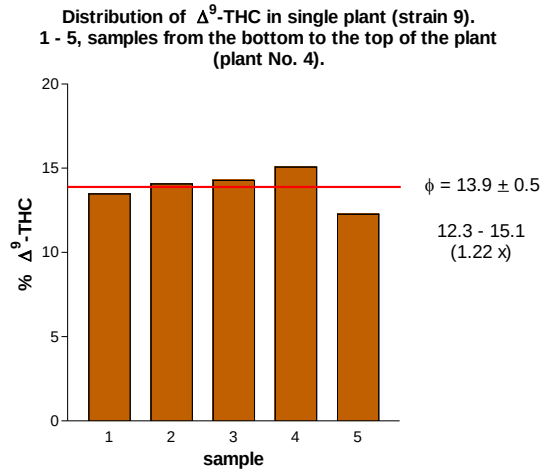


Used strain: **Strain 9**:

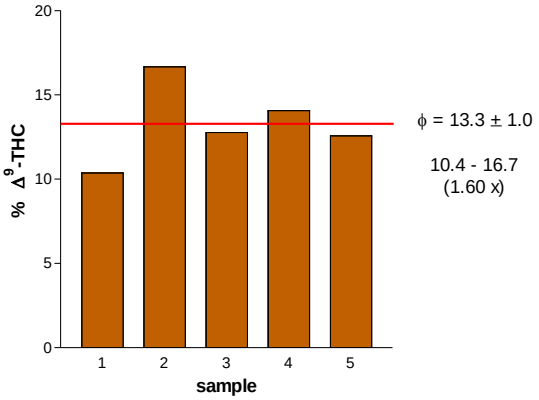








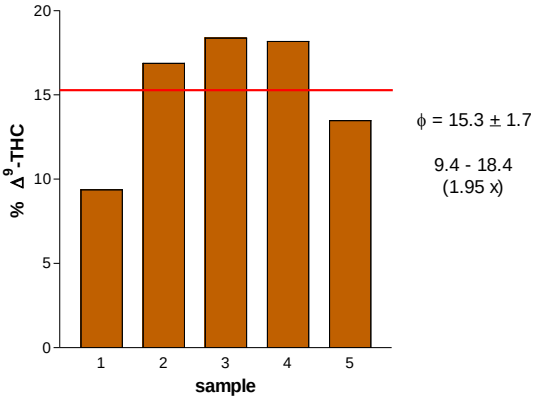
Distribution of Δ^9-THC in single plant (strain 9).
1 - 5, samples from the bottom to the top of the plant
(plant No. 5).



ϕ = 13.3 ± 1.0

10.4 - 16.7
(1.60 x)

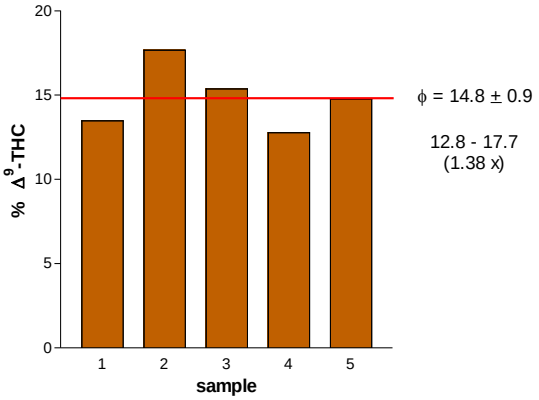
Distribution of Δ^9-THC in single plant (strain 9).
1 - 5, samples from the bottom to the top of the plant
(plant No. 6).



ϕ = 15.3 ± 1.7

9.4 - 18.4
(1.95 x)

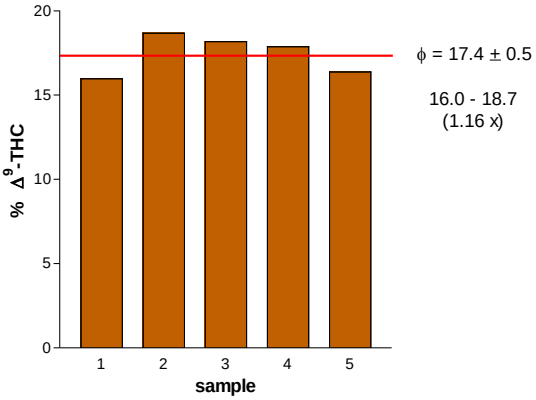
Distribution of Δ^9-THC in single plant (strain 9).
1 - 5, samples from the bottom to the top of the plant
(plant No. 7).



ϕ = 14.8 ± 0.9

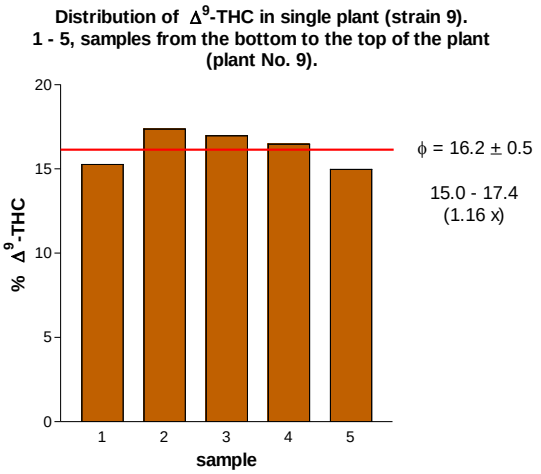
12.8 - 17.7
(1.38 x)

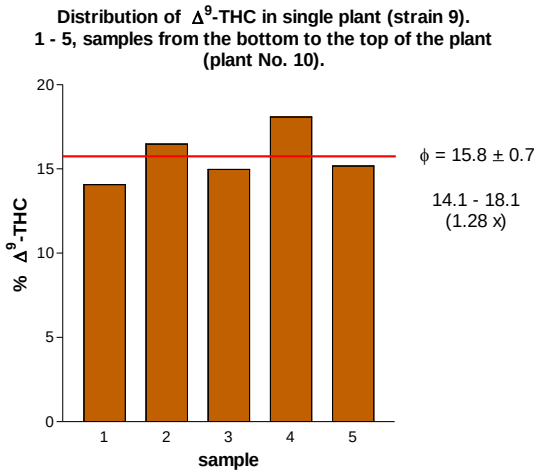
Distribution of Δ^9-THC in single plant (strain 9).
1 - 5, samples from the bottom to the top of the plant
(plant No. 8).

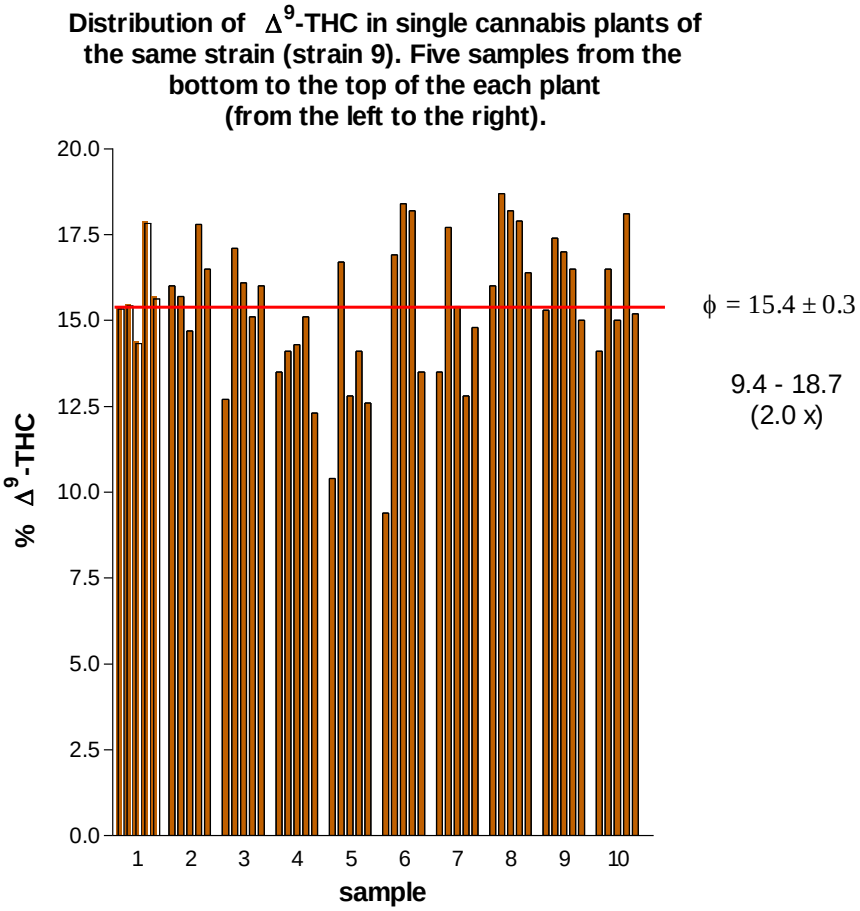


ϕ = 17.4 ± 0.5

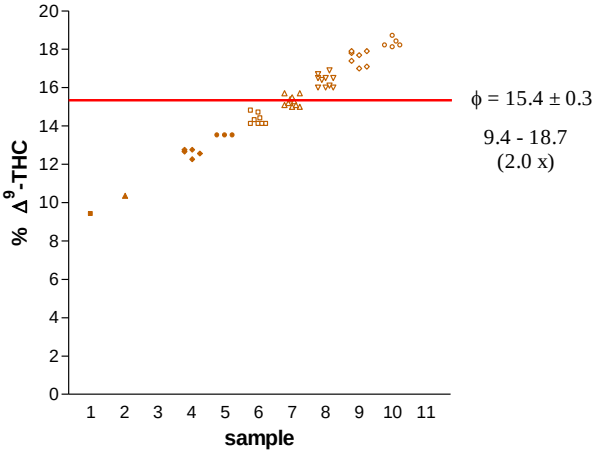
16.0 - 18.7
(1.16 x)


Distribution of Δ9-THC in single plant (strain 9).
1 - 5, samples from the bottom to the top of the plant
(plant No. 9).
% Δ9-THC
sample
ϕ = 16.2 ± 0.5
15.0 - 17.4
(1.16 x)

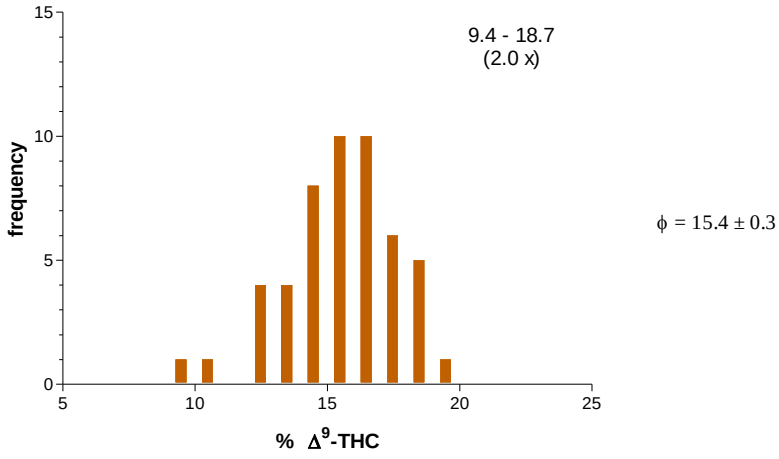

Distribution of Δ9-THC in single plant (strain 9).
1 - 5, samples from the bottom to the top of the plant
(plant No. 10).
% Δ9-THC
sample
ϕ = 15.8 ± 0.7
14.1 - 18.1
(1.28 x)


Distribution of Δ9-THC in single cannabis plants of
the same strain (strain 9). Five samples from the
bottom to the top of the each plant
(from the left to the right).
% Δ9-THC
sample
ϕ = 15.4 ± 0.3
9.4 - 18.7
(2.0 x)

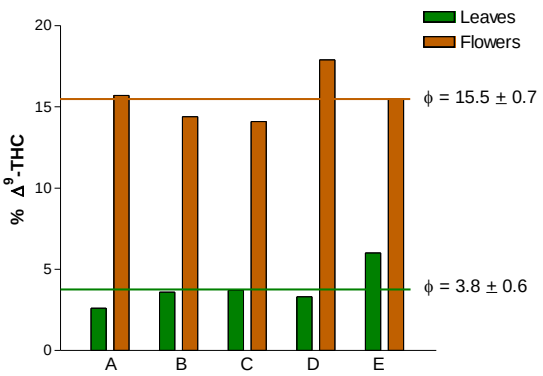
Distribution of Δ^9-THC in single cannabis plants of the same strain (strain 9). Five samples from the bottom to the top of the each plant (from the left to the right).



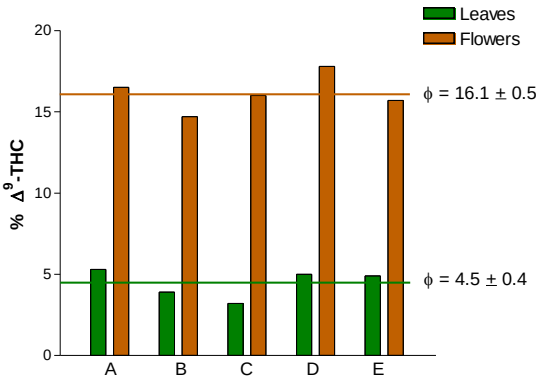
THC histogram. Frequency of different plants of the strain 9 versus Δ^9-THC concentration (%).



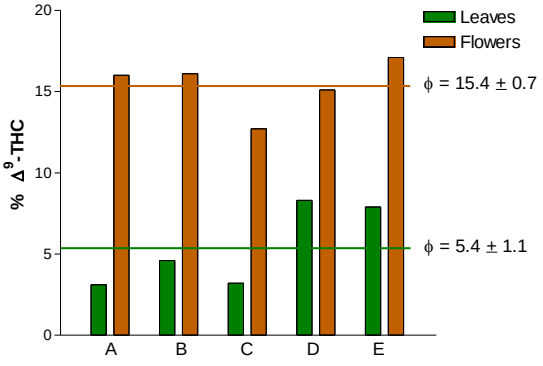
Distribution of Δ^9-THC in single plant (strain 9, plant 1). A - E, samples from the top to the bottom of the plant.



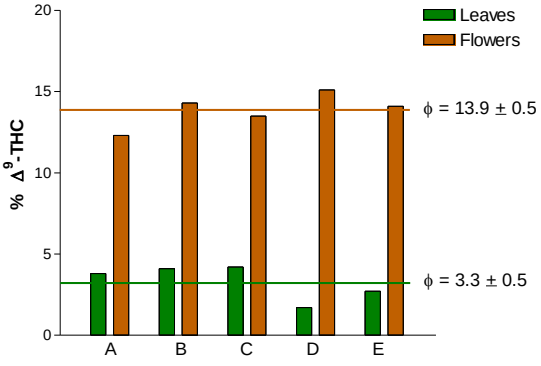
Distribution of Δ^9-THC in single plant (strain 9, plant 2). A - E, samples from the top to the bottom of the plant.



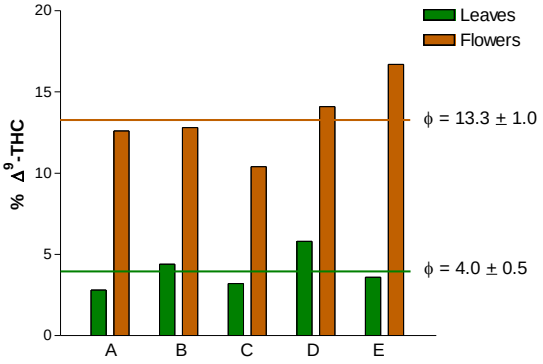
Distribution of Δ^9-THC in single plant (strain 9, plant 3). A - E, samples from the top to the bottom of the plant.



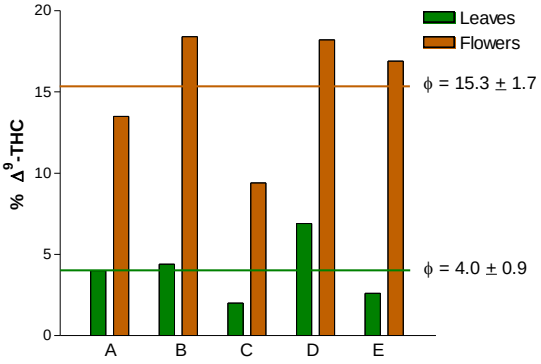
Distribution of Δ^9-THC in single plant (strain 9, plant 4). A - E, samples from the top to the bottom of the plant.



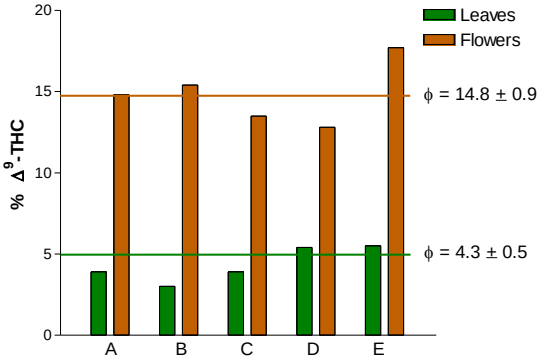
Distribution of Δ^9-THC in single plant (strain 9, plant 5). A - E, samples from the top to the bottom of the plant.



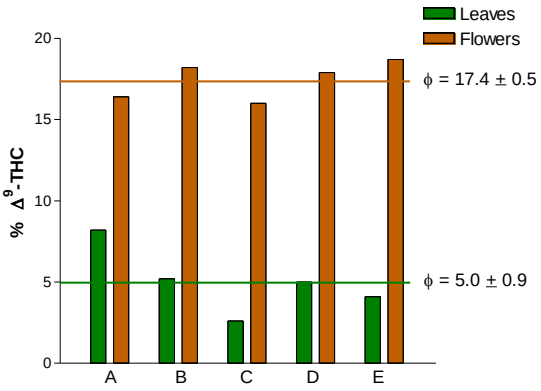
Distribution of Δ^9-THC in single plant (strain 9, plant 6). A - E, samples from the top to the bottom of the plant.

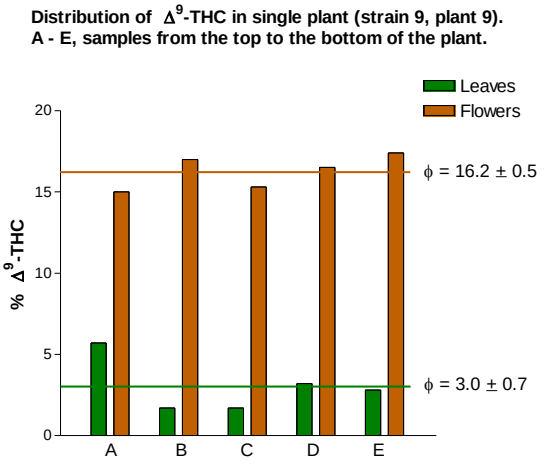


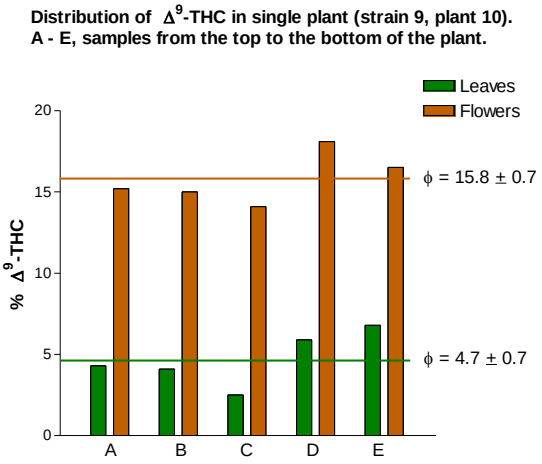
Distribution of Δ^9-THC in single plant (strain 9, plant 7). A - E, samples from the top to the bottom of the plant.

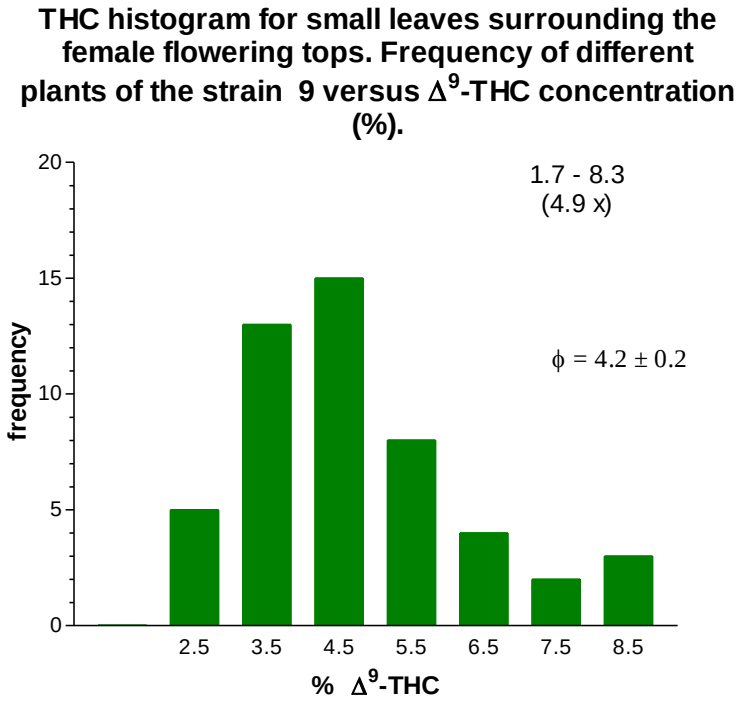


Distribution of Δ^9-THC in single plant (strain 9, plant 8). A - E, samples from the top to the bottom of the plant.









As small leaves surrounding the female flowering tops can be "contaminated" by the resin from the female flowering tops, the results of analyses of these leaves are not probably the results of just only leaves, but of leaves + more or less amount

of stuck resin on this small leaves. Because of that it does not give us real "picture" about these small leaves and differences are so big (up to 4.9 x).

Strain 9 of cannabis used in Israel for treatment – comparison of different flowering tops together with leaves surrounding these flowering tops

Female flowering tops were analyzed as were supplied, e.g. also with small leaves. This is the difference from previous analyses, as the amount of leaves can influence the content of Δ^9-THC in the flowering top.

A – sample from the top of the plant; B – sample from the middle of the plant

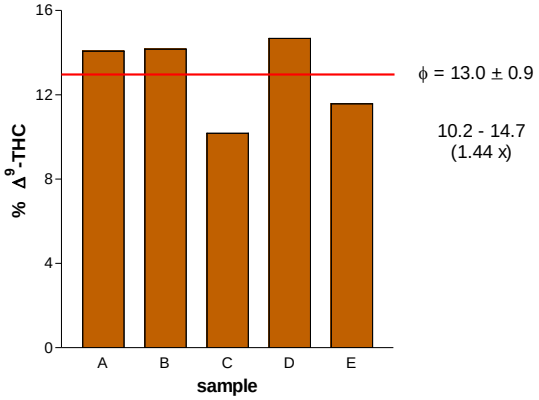
C – sample from the bottom of the plant; D – sample from the top of the plant (closer to the main stem)

E – sample from the middle of the plant (closer to the main stem)

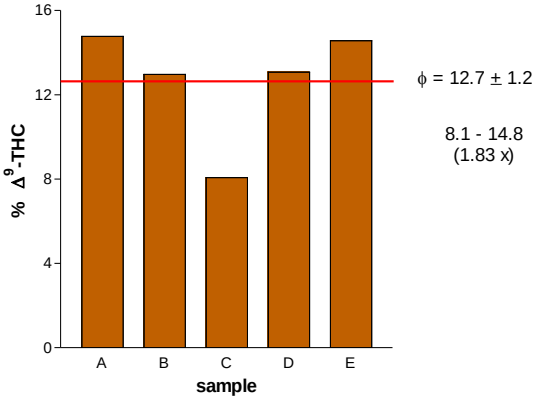
Table 2. Content of Δ^9-tetrahydrocannabinol in %.

variety **9**	A	B	C	D	E
20	14.1	14.2	10.2	14.7	11.6
21	14.8	13.0	8.1	13.1	14.6
22	15.5	14.8	9.3	13.3	12.0

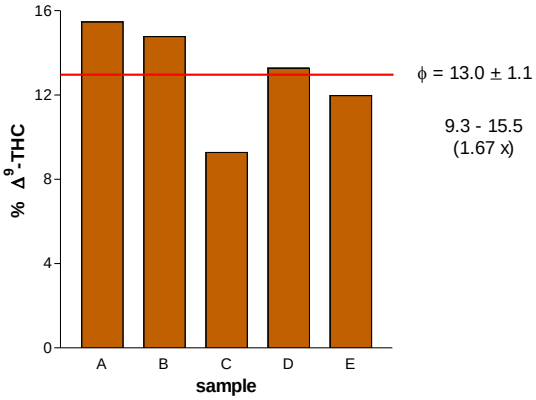
Distribution of Δ^9-THC in single plant (strain 9). A - E, samples from the single plant (plant No. 20).



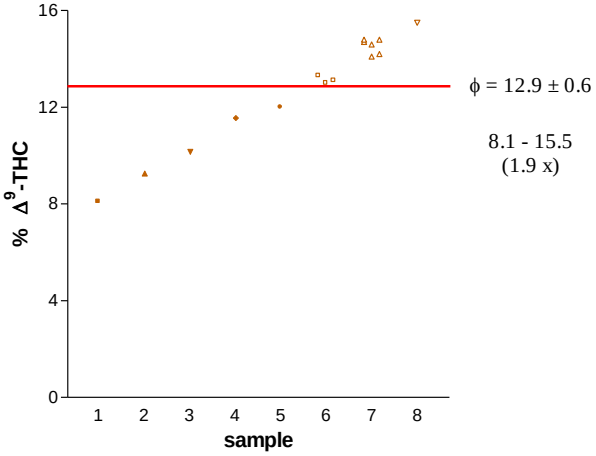
Distribution of Δ^9-THC in single plant (strain 9). A - E, samples from the single plant (plant No. 21).



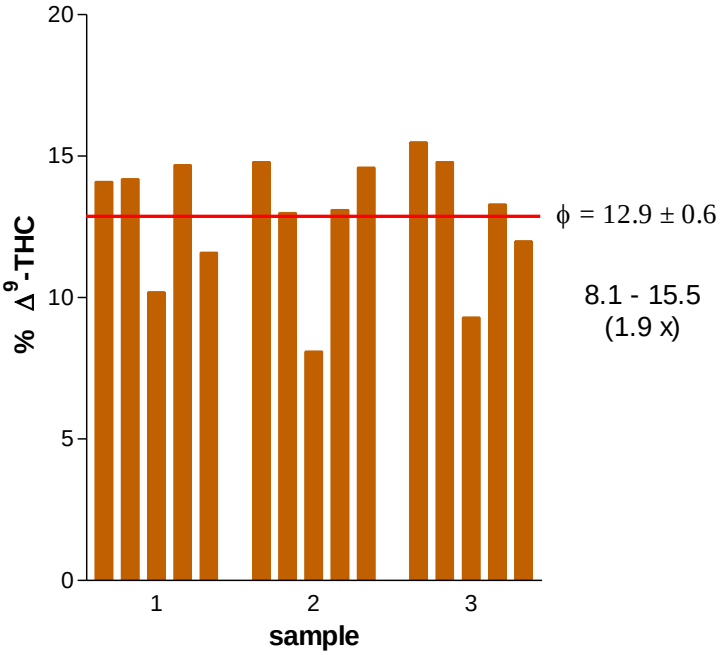
Distribution of Δ^9-THC in single plant (strain 9). A - E, samples from the single plant (plant No. 22).



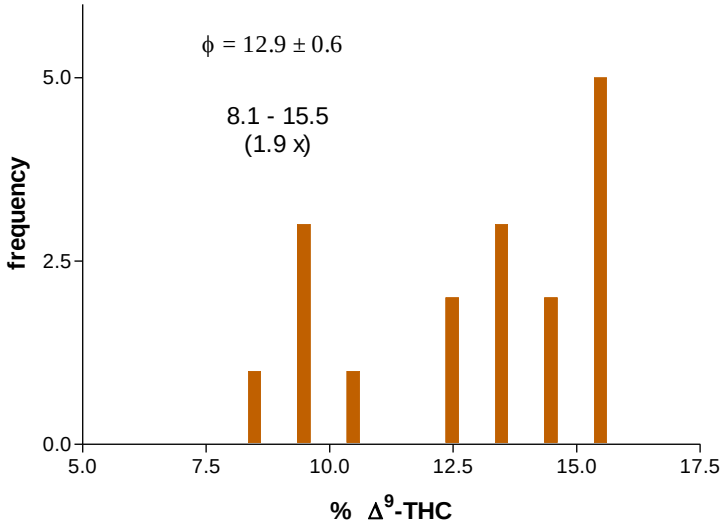
Distribution of Δ^9-THC in single cannabis plants of the same strain (strain 9). Five samples from the bottom to the top of the each plant (from the left to the right).



Distribution of Δ^9-THC in single cannabis plants of the same strain (strain 9). Five samples from the bottom to the top of the each plant (from the left to the right).



THC histogram. Frequency of different plants of the strain 9 versus Δ^9-THC concentration (%).



Results

From the above result it is justified concern that patient even when using the same strain and the same amount of medicinal cannabis can smoke different amounts of the active compound for treatment (up to double dose) what can influence his/her treatment.

B. Fermentation of medicinal cannabis

As for some patients smoking of cannabis is unpleasant, the technique of fermentation is employed similarly as for tobacco or tea to make the smoke smoother. If the fermentation is stopped early, the marihuana has a sweeter taste because of the sugars which the ferment produced.

I studied this process in comparison with the changes of THC content. The results are in the following table. As one can see from this table, decrease of THC content is not such dramatic and it is worth for patients which do not like the smoke of dried marihuana.

Cannabis strain	**CBD (%)**	**Δ^9-THC (%)**	**CBN (%)**
Pandora's Box	t	12.1	t
Pandora's Box after 1 day fermentation	t	11.9	0.3
Pandora's Box after 2 days fermentation	t	11.8	0.5
Pandora's Box after 3 days fermentation	t	11.4	0.4
Pandora's Box after 4 days fermentation	t	10.2	0.6
Pandora's Box after 5 days fermentation	t	8.1	0.5

Critical Mass	t	15.9	0.4
Critical Mass after 1 day fermentation	t	13.2	0.6
Critical Mass after 2 days fermentation	t	12.0	1.0
Critical Mass after 3 days fermentation	t	10.8	1.2
Critical Mass after 4 days fermentation	t	10.1	1.3
Critical Mass after 5 days fermentation	t	10.0	1.3

C. Inhaled Medicinal marihuana and the immunocompromised patient

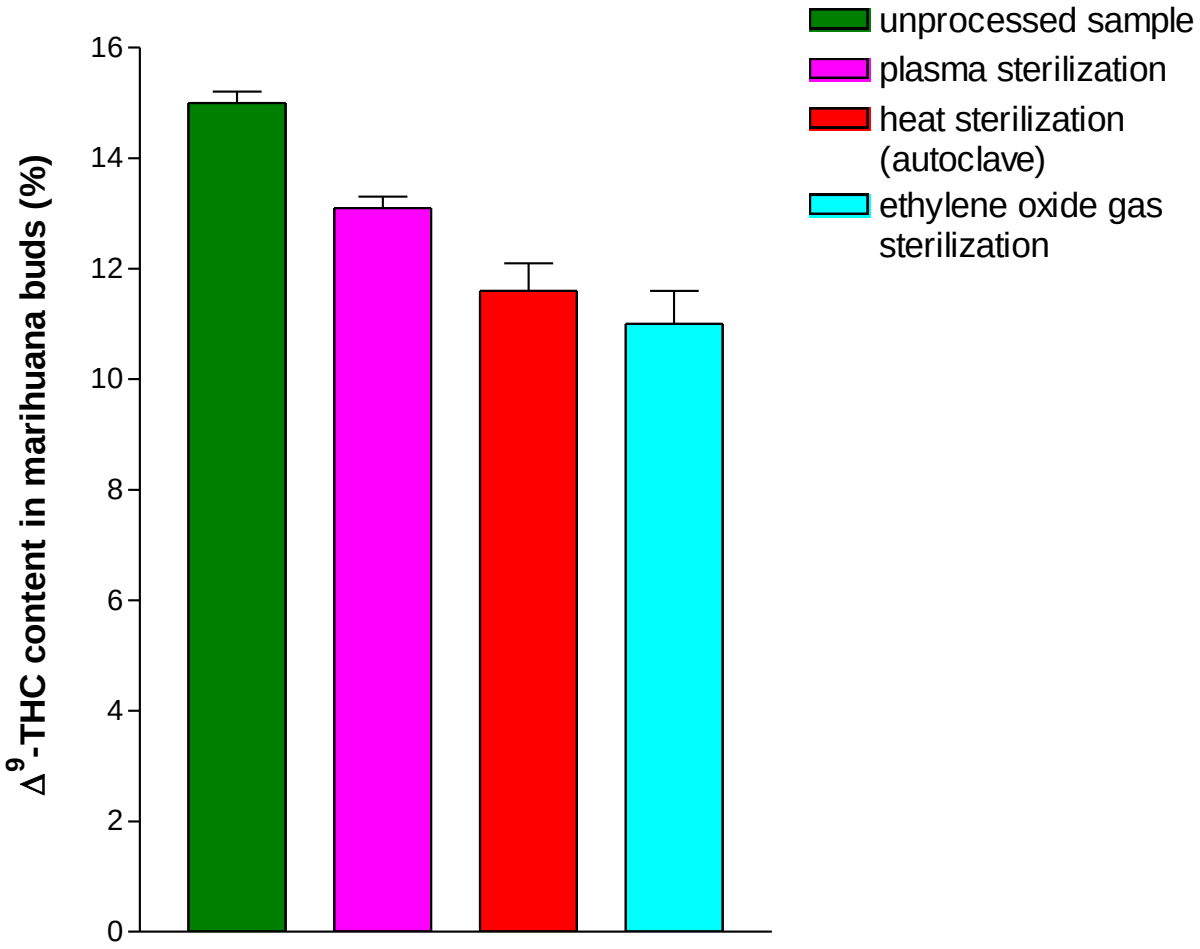
Medicinal marihuana is a valuable medication in certain specified medical conditions, mostly for immunocompromised patients. If the patient cannot tolerate the cookies or the sublingual oily drops, the remaining methods are smoking or evaporation. Evaporation produces cannabinoid molecules with minimal tar and other smoking by products. However, as every herb, various microorganisms are carried on its leaves and its flowers. Those could put the patient under the risk of opportunistic lung infections, mainly by inhaled molds.

We measured the loss of cannabinoid molecular activity under various methods of sterilization.

Under sterilization process amount of Δ^9-THC decreased between 12.6 and 26.6 % (see table and graph bellow)

sample	content of Δ^9-THC	decrease of Δ^9-THC in %
unprocessed	15.0 ± 0.2	
after plasma sterilization	13.1 ± 0.2	- 12.6
after heat sterilization	11.6 ± 0.5	- 22.6
after ethylene oxide gas sterilization	11.0 ± 0.6	- 26.6

Influence of sterilization on Δ^9-THC content in medicinal marihuana buds.



Conclusions

To sterilize a sample of medicinal marihuana it is the best to use plasma sterilization, which is the mildest one, as during our experiment the amount of Δ^9-THC decreased only by 12.6 %.

D. Efficiency of mechanical cannabinoids purification from the plant.

At present time became popular between cannabis abusers to purify cannabis resin from the flowering tops. The resulted material has higher amount of THC than the starting one. To check the efficiency of this process, this methods used by abusers were applied in research effort.

Courtesy of the company Chevrat Sijach were obtained cannabis samples for research purposes used in this study.

1. Sieved plant material

Cannabis female flowering tops were analyzed as usually for the main cannabinoid compounds and after that worked up.

Regular analysis revealed in the flowering tops of the strain Yellow C traces of CBD, 23.2% THC, and 0.2% CBN. Subsequently this sample was sieved through the sieve of different mesh with the following result.

Cannabis strain	CBD (%)	Δ^9-THC (%)	CBN (%)
Yellow C - 73 mesh	t	42.8	0.3
Yellow C - 120 mesh	t	27.7	0.2
Yellow C - 160 mesh	-	12.3	0.1

Conclusion

Just simple sieving can give material with almost twice higher amount of THC than in the flowering tops.

2. Bubble hash

Bubble hash is refined hashish that bubbles when smoked. It include a sieving system that uses ice, water and multiple levels of screening in order to remove the resin gland heads from the cannabis plant material, and to further remove any impurities from the hashish leaving a very pure resin. The use of only water and multiple levels of sieving to isolate the concentrated material is ideal for health-conscious consumers and/or medical patients for whom which chemical processing is un-desirable or possibly a health risk.

In the following experiments analyses of the flowering tops are followed by table with bubble hash analyses.

Regular analysis revealed in the flowering tops of the strain Carl 6.1% CBD, 5.4% THC, and traces of CBN.

Cannabis strain	**CBD (%)**	**Δ^9-THC (%)**	**CBN (%)**
Carl – bubble hash	17.9	16.4	0.27
Carl – flowering tops after bubble hash	t	t	-

Regular analysis revealed in the flowering tops of the strain Yellow C traces of CBD, 23.2% THC, and 0.2% CBN.

Cannabis variety	CBD (%)	Δ^9-THC (%)	CBN (%)
Yellow C	0.1	94.3	0.5
Yellow C – the rest after bubble hash preparation	-	3.1	-

Regular analysis revealed in the flowering tops of the strain 8 no CBD, 17.7% THC, and traces of CBN.

Cannabis strain	CBD (%)	Δ^9-THC (%)	CBN (%)
Bubble hash – from flowering tops - plant 8	-	88.2	t

Conclusion

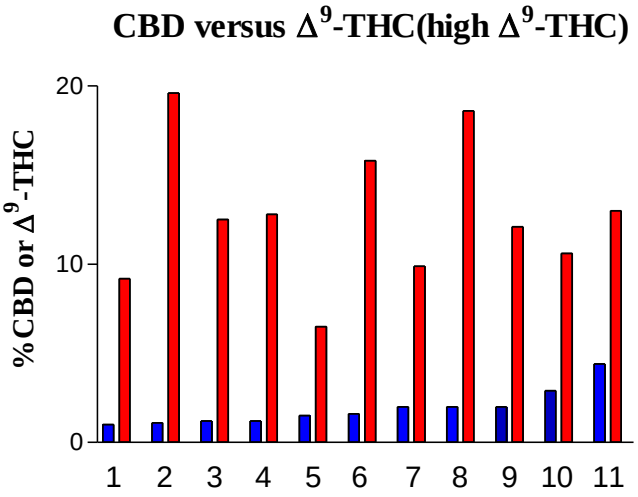
Work-up of the cannabis flowers to prepare bubble hash "isolated" present cannabinoids almost quantitatively and the concentration of THC increased approximately 3 – 4 times.

The danger of the above studied methods proved, that by this way abusers of cannabis can very simply increase activity of cannabis and also the volume of illegal samples for illicit traffic can allow them to smuggle such material more easily. At the same time it can be the way to make medical cannabis for patients more pure.

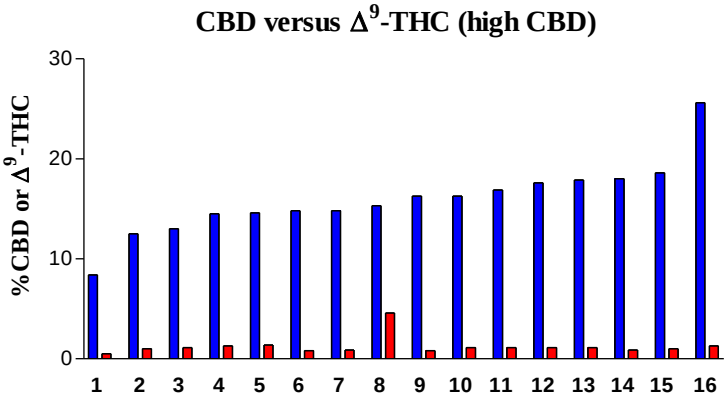
E. Strains of medicinal cannabis, cultivated in Israel with CBD content more than 1%.

It was found by analyses that the spectrum of medicinal cannabis in Israel cover all necessary ratios of CBD and THC as follows:

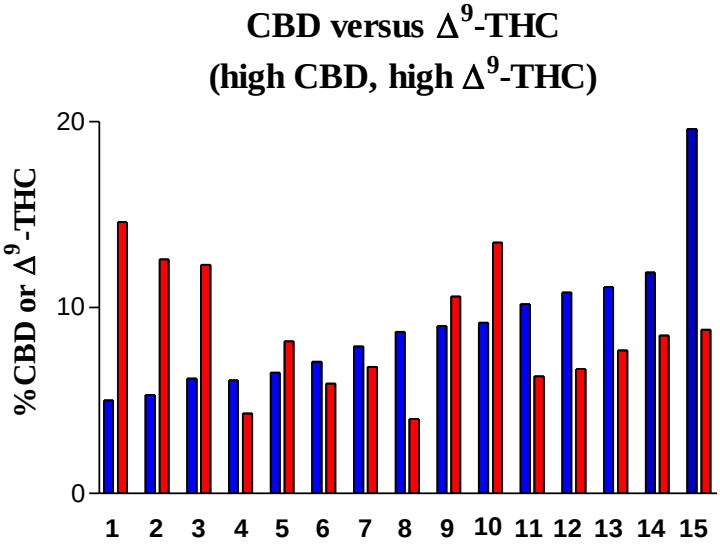
1. Strains with low CBD and high Δ^9-THC



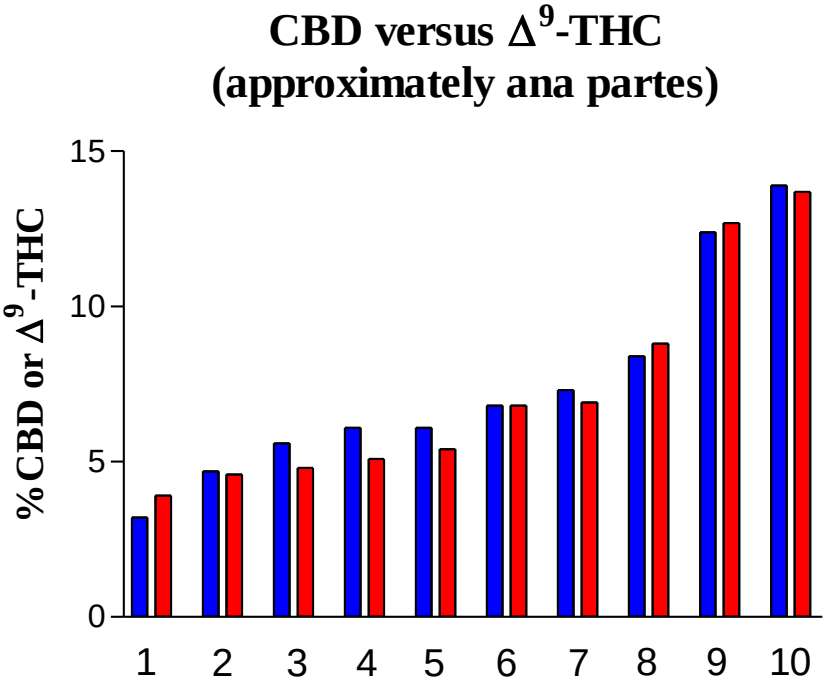
2. Strains with high CBD and low Δ^9-THC



3. Strains with high CBD and high Δ^9-THC



4. Strains with approximately the same content of CBD and Δ^9-THC (difference in content is less than 1 %) – natural "Sativex"



F. Different cannabis strains used by farmers in Israel

In Israel there are about eight companies which grow medicinal cannabis for therapeutic use. Unfortunately each of these companies uses cannabis strains and products of cannabis according to their decision or availability. Because of that not every patient has the same possibility to obtain certain cannabis product for his/her illness. From analyses of medicinal cannabis and products from medicinal cannabis which I did during the last years the result was that there is too much strains (even when we today understand that for different illnesses different cannabis strains are supposed to be used, there is necessity for limited amount of different strains).

I understand that companies in Israel, which grow cannabis, compete between them, but with health of our patients we cannot compete and because of that should be selected several different strains, which will be available for all patients and these will be the most efficient different strains for different illnesses.

From the analyses of the samples, which were supplied by legal growers in Israel, resulted that in present time I analyzed 73 well known strains (part of them is used around the world for recreational use) and another 189 strains which are under different names, numbers or letters (there is possibility that part of these are used by growers to prevent identification of their strains). This gives us altogether 262 different strains.

Below are the strains used by different farmers.

73 well known strains:

Afghan Kush - Cann Pharmaceutical

Agent Orange - IMC Chaklaut

Ak-47 (Ak-47 Marijuana Strain) - Cann Pharmaceutical, PharmoCann

Bazooka - CannDoc

BCTP (BC Bud Depot - The Purps) - CannDoc

Blueberry - PharmoCann

Buddha's sister - PharmoCann

Burmese - CannDoc

Cannatonic (MK Ultra x G-13 Haze) – IMC Chaklaut

Cannatonic 1 (MK Ultra x G-13 Haze) - IMC Chaklaut

Cannatonic 2 - IMC Chaklaut

Cannatonic x Thai - Chevrat Sijach

Cherry Berry - CannDoc

Cinderella - PharmoCann

Costa Rica - Tikun Olam

Critical - Royal Queen - PharmoCann

Critical Mass - IMC Chaklaut

Critical - Royal Queen Seeds - PharmoCann

Dairy Queen - IMC Chaklaut

Diesel Barcelona - CannDoc, Teva Adir

Double Gum Buds - Chevrat Sijach

Early durban x Double gum - Chevrat Sijach

Fabiana - CannDoc, Teva Adir

Free Leonard x Northen light (FL NL) - CannDoc, PharmoCann

Free Leonard - CannDoc, Kibutz Elifaz, Abarbanel

G13 x Haze (G13 Marijuana Strain + Haze Marijuana Strain) - Chevrat Sijach

Green Perkel - CannDoc

God Bud - CannDoc

Hawaii - CannDoc, Teva Adir

Him 136 - CannDoc

Himalaya - CannDoc, PharmoCann

Himalaya Gold - PharmoCann

Jack Herrer (JH) - CannDoc, Kibutz Elifaz

Jack's Cleaner - IMC Chaklaut

Kandy Kush - IMC Chaklaut

Kandy Kush x Skunk - IMC Chaklaut

Kush - IMC Chaklaut

Lemon - Cann Pharmaceutical

M-13 - Shaefa LeChajim

Magma – CannDoc

Maomao x Sage - CannDoc

Maomao x Choco - CannDoc

Mark-V - Cann Pharmaceutica, CannDoc

Master Kush - Chevrat Sijach

Maui Waui – Teva Adir

Northen Light (NL) - CannDoc

Pandora's Box - IMC Chaklaut

Power plant - Chevrat Sijach

Purple - Chevrat Sijach

Purple Budha – Teva Adir

Purple Kush - Cann Pharmaceutical, PharmoCann

Purps – PharmoCann

Red Horse – Teva Adir

Royal Medica – Teva Adir

Sage - CannDoc

Shark – CannDoc

Skunk – Teva Adir

Sour Tsunami - CannDoc

Sour Diesel - PharmoCann

Sour Diesel x AK-47 - Chevrat Sijach

Special Queen - PharmoCann

Sputnik - IMC Chaklaut

Star Jack - CannDoc, Teva Adir

Super Silver Haze - Tikun Olam

Super skunk - Chevrat Sijach

Swazi Safari – PharmoCann

Sweet and Saur Widdow - CannDoc

Thai - CannDoc

Thai x Free Leonard - CannDoc

Tora Bora - PharmoCann

White Russian - Cann Pharmaceutica, CannDoc, Abarbanel

White Widow - CannDoc

Zardde-2 (Sour Diesel + AK47) – Chevrat Sijach

189 strains (may be cultivars of these farms ?):

Abarbanel (5):

Choco

HIM 136

LC 286 G

L.S.K

TP 112

Ministery of Health (1):

Agro Mazor

CannDoc (32):

BCTP#2

BCTP#6 (BC Bud Depot - The Purps)

Choco

Green Toffy

FL-2

FL-3

FL NL#1

FL NL #2

FL NL #3

FLC 16/6

FLC 20/1

FLC 20/3

FLNL #2

FLNL #3

JH#3

JH#4

JH#5

JH#6

JH#8

LC#2

LC-NZ

NL6

NL10

Sage 2

Toffy 1

Toffy 2

TP 112

TP #6 19/12

WR-1

WR-2

WR-4

WR-5

Cann Pharmaceutica (5):

#7

#8

AM

LC-NZ

PK

Chevrat Sijach (34):

9 e

9 ee

186

187

(5/8) white G

AC-1

Arad#2

AT-1

Blue

BSK-1

Brown

Cannabol Placebo

Delbik#5

GPB-10

Madaf

Maya

Orange

Papy

Pink A

Red 7

Red 9

White 5

White 6

WTR-1

Yellow C

Zalman

Zan A

Zan C

Zan 6

Zan 6A

Zan 7

Zan 7B

Zan 8

Zan 9

IMC Chaklaut (28):

AF

AFF

AFG

AFL-3

AFL-6

Dina

Ela

Hadas

Jael

Lital

Lilach

PaZ

הדס

ליטל

יעל

אלה

לילך

הראל

ניצן

אלה

דינה

ניצן

ירדן

שולה

1

2

3

4

Kibutz Elifaz (2):

LC

TP

PharmoCann (6):

C3

C6

C15

Chum

Jarok

VZT

Shaefa LeChajim (21):

Adom

Cahov

DQ-IMC

Jarok

Lilach

Lavan

Sagol

Turkiz

U.Z.A.F.

Varod

אמטיסט

I אודם

II אודם

III אודם

I ענבר

II ענבר

צהוב

לבן

וורוד

אדום

ירוק

Tikun Olam (57):

1 ב"ה

2 ב"ה

3 ב"ה

4 ב"ה

A (חורץ)

B (סגול)

B0101

B0102

B0103

B0201

B0202

B0203

B0301

B0302

B0303

B0601

B102 (HELENA)

B202 (AVIDEKEL)

B301 (MIDNIGHT)

B601 (ALASKA)

Barcelona-702 (BO 702)

Barcelona-703 (BO 703)

C (סאטיבה s)

Carl

CBD9

Costa Rica

Chorec (חורץ)

D (ארז)

DO3

Dorit 0 (B12 OR)

Dorit 1

Dorit 2 (GOG&MAGOG)

Dorit 3 (LITTLE DEVIL)

Dorit 4 (JASMIN)

Eran

EREZ

Erez A (ארז)

Erez B (ארז)

Jarden

Kol HaTor

Nican

S-05

Sagol

Sativa

Shula

Vered

X

X-5

X-7

X-8

X-10

ערן אלמוג

אור

אל-נא

אלנה

מור

רפאל

Conclusion

In my aim to do the best research and to have good result it is necessary to say, that some of these companies were not ready to reveal abbreviations of their cannabis strains or how they prepared cannabis products. As it is medicine it is

important to know how this medicament was prepared and what was exactly used for the preparation. I suggest centralize it, what means to find the best procedures which will be obliged to use all companies dealing with medicinal cannabis.

There is necessary to study illnesses and their treatment with different strains of cannabis and choose certain amount of different strains, which will be used in Israel for treatment. There must be also general decision which cannabis preparations will be allowed and known way how to prepare them.

There is no place for growers to have secret strains and secret recipes for cannabis products preparation. It must be centrally organized and must be known all details concerning cannabis preparation as this is medicine for patients and not "secret pill". Any official strain of cannabis for treatment must be available for any patient in any place in Israel.

Discussion

Formerly the plant samples were high - Δ^9-THC ones, but today are cultivated also CBD-rich strains. The importance of CBD in the medical cannabis was already proved by scientific research. Medicinal cannabis was recently almost exclusively used by smoking.

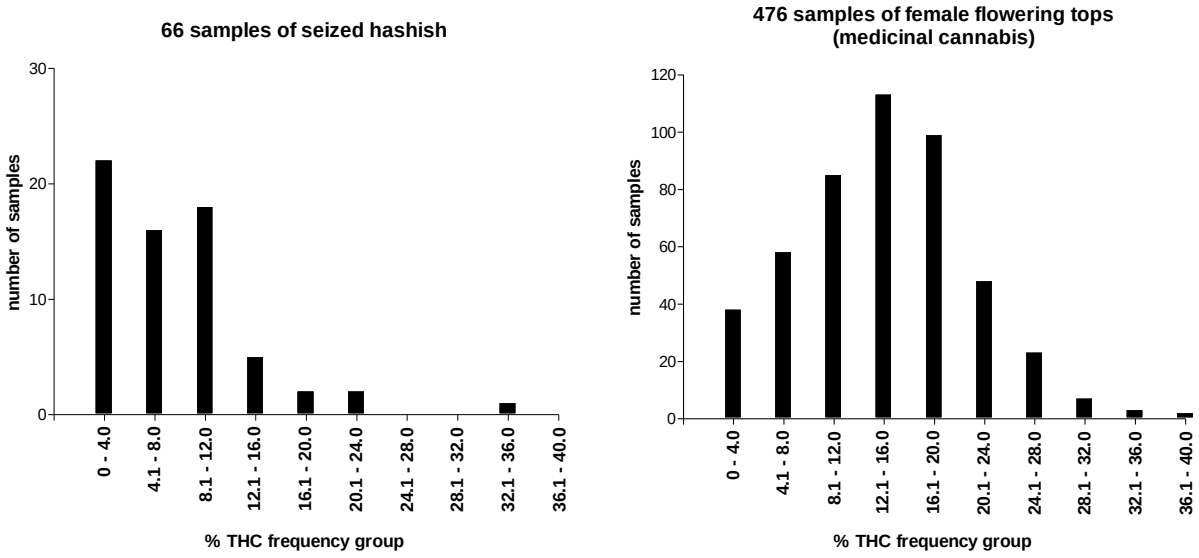
The main cannabinoids are in the plant predominately in the form of their precursors – cannabinoid acids. During smoking process these acids decarboxylate to the appropriate neutral cannabinoids and because of that it was not necessary to process these samples by any way.

All Δ^9-THC-rich samples have usually extremely high content of Δ^9-THC, so these samples are more efficient than regular hashish or marijuana.

It was proved that not only plant of the same strain, but also flowering tops from the same plant are not of the same quality, what means that patient does not use all the time the same amount of active compounds.

It looks that in spectrum of different cannabis strains, cultivated in Israel are almost all necessary ratios of the main cannabinoids, CBD and THC. The only missing strains are these with low CBD and low THC content (e.g. below 1 % of each) and such strains have also important medicinal value.

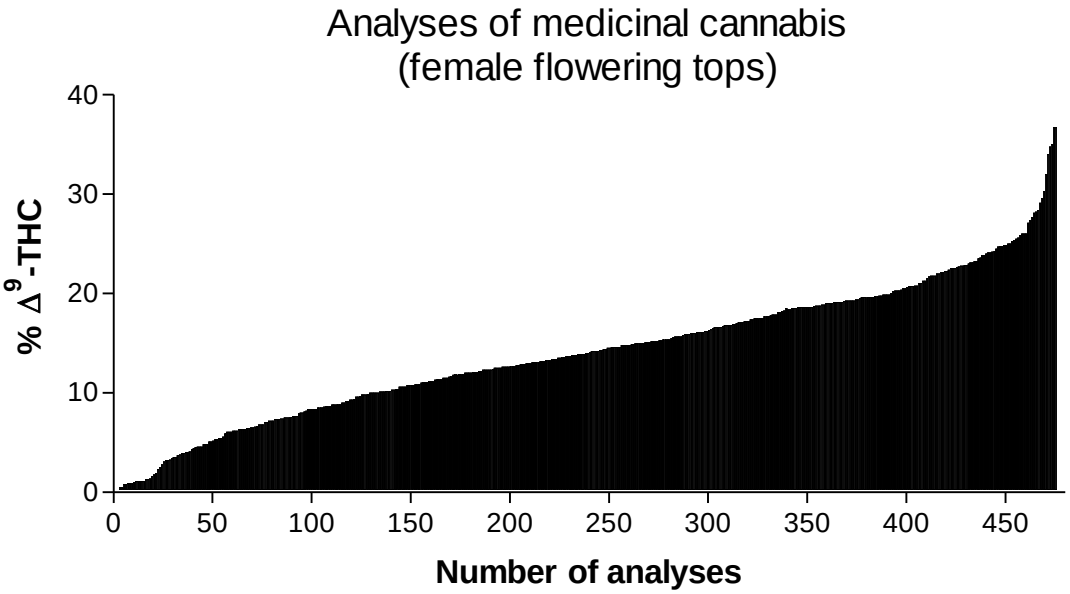
If we compare high THC samples (content between 12.1 and 20.0 % THC) of seized hashish and medicinal cannabis (female flowering tops) studied in this grant it is evident that at hashish samples are only 10.6 % of such samples contrary medical cannabis where such samples are 44.5 % (see Graph 1 and 2 below).



Graph 1 and 2. Frequency of Δ^9-THC concentrations at seized hashish samples and medical flowering tops ones.

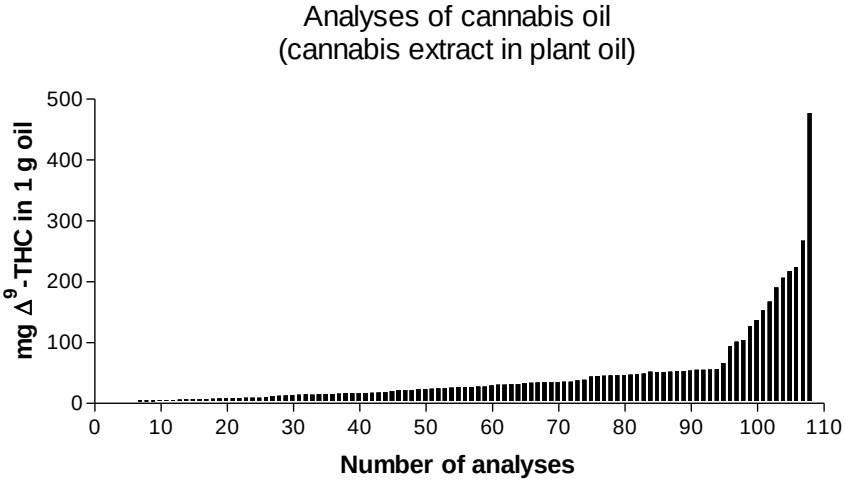
G. Results of analyses of different cannabis products for treatment from all growers

476 samples:



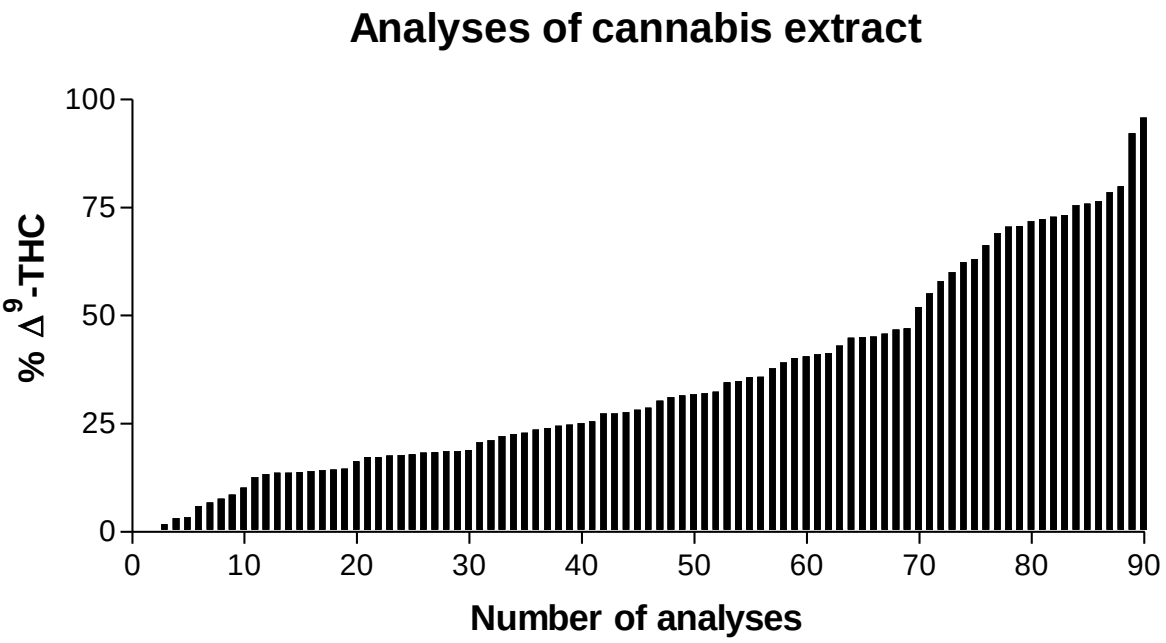
traces up to 36.7 %
ϕ = 14.10 ± 6.88 (0.32)
ϕ = mean ± SD (SEM)

108 samples:



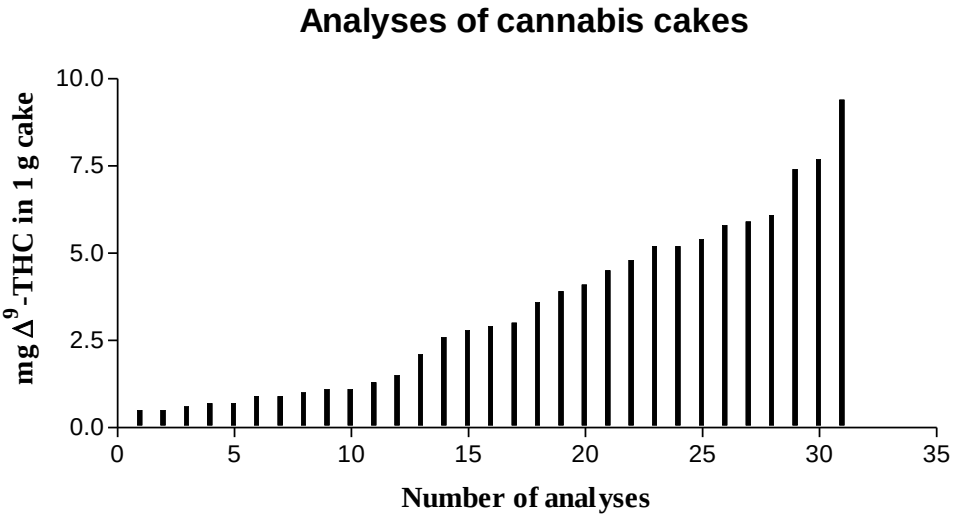
0.2 up to 476.4 mg/g oil
ϕ = 44.63 ± 65.63 (6.32)
ϕ = mean ± SD (SEM)

90 samples:



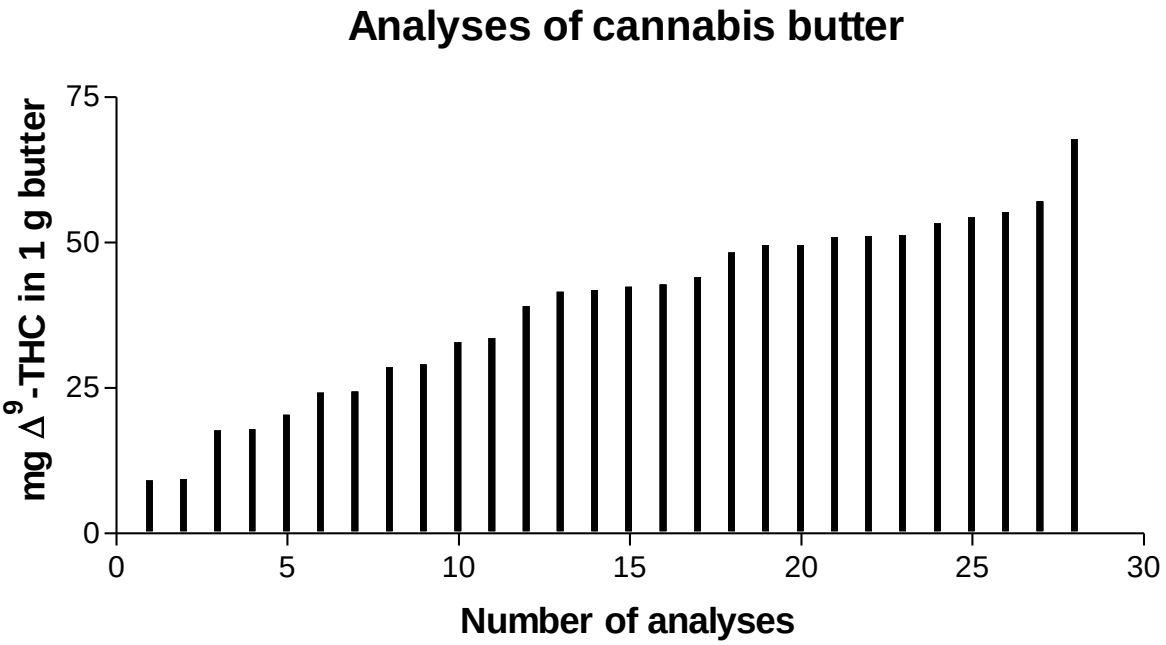
0.2 % up to 95.8 %
ϕ = 34.94 ± 23.43 (2.47)
ϕ = mean ± SD (SEM)

31 samples:



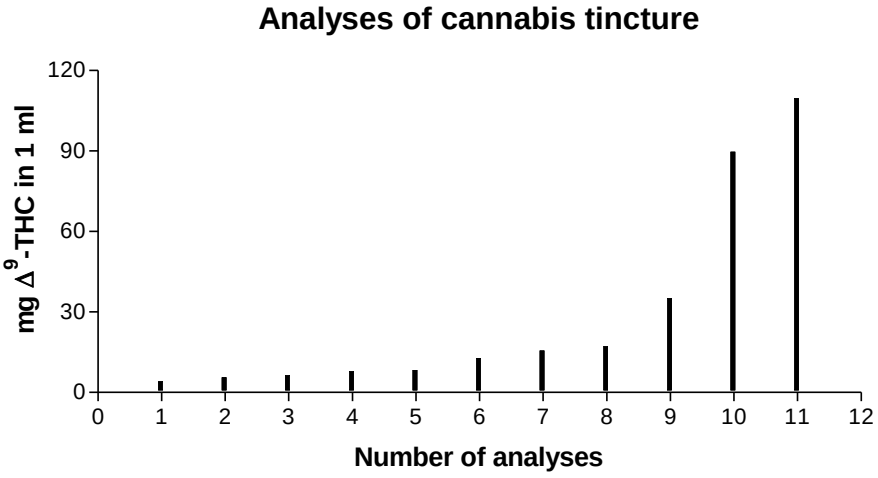
0.5 mg up to 9.4 mg/g
ϕ = 3.33 ± 2.47 (0.44)
ϕ = mean ± SD (SEM)

28 samples:



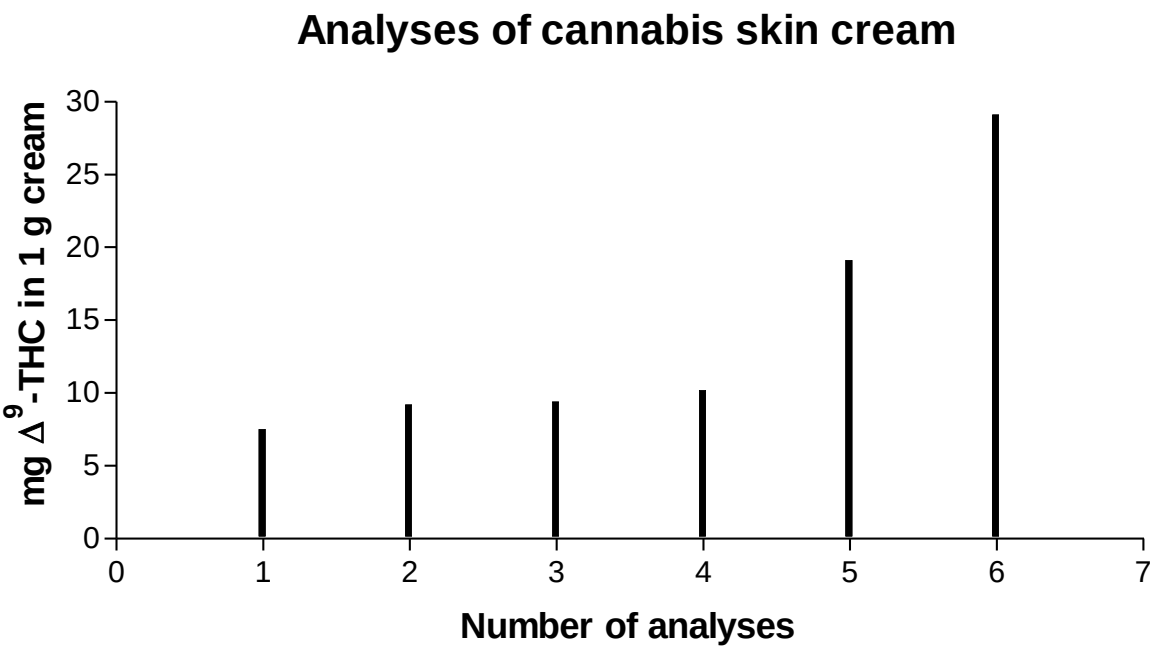
9.1 up to 67.8 mg/g butter
ϕ = 38.82 ± 15.40 (2.91)
ϕ = mean ± SD (SEM)

11 samples:



4.1 up to 109.6 mg/ml
ϕ = 28.34 ± 36.55 (11.02)
ϕ = mean ± SD (SEM)

6 samples:



7.5 up to 29.1 mg/g cream
ϕ = 14.08 ± 8.42 (3.44)
ϕ = mean ± SD (SEM)

The other food products, supplied for analysis were:

1. Juice from fresh cannabis – 33.8 (plant material after juice squeezing had 3.2 % Δ^9-THC) and 70.4 μg Δ^9-THC /ml
2. Caramel candy with cannabis - 2.0 and 6.2 mg Δ^9-THC/g
3. Chocolate with cannabis – 1.1 and 4.1 mg Δ^9-THC/g
4. Cream for filling waffles and cakes - 1.1 and 4.1 mg Δ^9-THC/g
5. Sugar with cannabis – 7.1 mg Δ^9-THC/g
6. Honey with cannabis – 0.4, 0.8 and 10.4 mg Δ^9-THC/g
7. Dry fruits with cannabis – 1.3 mg Δ^9-THC/g
8. Syrup with cannabis – 0.07 mg Δ^9-THC/g
9. Suppository with cannabis – 0.3 mg Δ^9-THC/g

Analyses of legal alcoholic beverages which appeared in the recent years on Israel market:

sample	CBD (μg/L)	Δ^9-THC (μg/L)	CBN (μg/L)
Cannabis vodka (Česká republika)	277.13	208.76	111.70
pivo Boxer Hacienda (Švýcarsko)	1229.0	83,45	333,8
pivo Boxer Hacienda (Švýcarsko)	1100.0	86.13	360.0
pivo Boxer Hacienda (Švýcarsko)	1300.0	74.53	350.0
pivo Spirit of Hemp (Rakousko)	75.6	261.6	94.4

Recommendation

From the above results it is justified concern that patient even when using the same strain and the same amount of medicinal cannabis can smoke different amounts of the active compound for treatment (up to double dose) what can influence his/her treatment. I suggest using different methods than by smoking (*per os*, *per rectum*, and creams for skin) – medicinal cannabis as extracts, cannabis in oil, cakes, creams, suppositories etc. or homogenize plant material and give to patient "average" reproducible sample of plant material (if they use it by smoking or by vaporization).

As in the plant material are cannabinoids predominantly in the form of appropriate cannabinoid acids, it is necessary to decarboxylate these acids, if the sample does not undergoes thermal decarboxylation process.

There is no place for growers to have secret strains and secret recipes for cannabis products preparation. It must be centrally organized and must be known all details concerning cannabis preparation as this is medicine for patients and not "secret pill". Any official strain of cannabis for treatment must be available for any patient in any place in Israel. As it is medicine it is important to know how this medicament was prepared and what was exactly used for the preparation. I suggest centralize it, what means to find the best procedures which will be obliged to use all companies dealing with medicinal cannabis.

It is also necessary to cultivate cannabis with low amounts of CBD and/or THC (below 1 %), as at certain illnesses it is also suitable medicine for patients.

It is truth that during smoking medicinal cannabis the active compounds cross blood/brain barrier very fast and patient may feel the influence of this medical preparation almost instantly. On the other side it is necessary to use other ways of use, as smoking of any plant material is not healthy and harms the health of patient. As patient does not use medicinal cannabis in life-threatening situations, it is recommended to use different way of use than smoking. It is truth that by different way than smoking the effect occurs more slowly, but on the other side this effect has a longer duration what is for patient advantageous.

References:

[1] E.L. Abel, Marihuana: The first twelve thousand years, Plenum Press, New York, 1980, pp. 3-35.

[2] H.-L. Li, An archaeological and historical account of Cannabis in China. Econ. Bot. 28 (1974) 437-448.

[3] C.E. Turner, M.A. Elsohly, E.G. Boeren, Constituents of Cannabis sativa L. XVII. A review of the natural constituents. J. Nat. Prod. 43 (1980) 169-234.

[4] M.A. ElSohly, D. Slade, Chemical constituents of marijuana: The complex mixture of natural cannabinoids. Life Sci. 78 (2005) 539-548.

[5] L. Grlic, A combined spectrophotometric differentiation of samples of cannabis. Bull. Narcotics 20 (1968) 25-29.

[6] P.S. Fetterman, E.S. Keith, C.W. Waller, O. Guerrero, N.J. Doorenbos, M.W. Quimby, Mississippi-grown Cannabis sativa L: preliminary observation on chemical definition of phenotype and variations in tetrahydrocannabinol content versus age, sex, and plant part. J. Pharm. Sci. 60 (1971) 1246-1249.

[7] Z. Krejčí, L. Hanuš, T. Yoshida, O.J. Braenden O.J., The effect of climatic and ecologic conditions upon the formation and the amount of cannabinoid substances in the cannabis of various provenance. Acta Univ. Olomuc., Fac. Med. 74 (1975) 147-160.

[8] L. Hanuš, Y. Krejčí, Dynamics of changes in the content of cannabinoid the vegetation period in the Cannabis sativa L. Acta Univ. Palacki. Olomuc. (Olomouc), Fac. Med. 114 (1986) 11-29.

[9] L. Hanuš, K. Dušek, D. Šubová, Z. Krejčí, Sinsemilla and its cultivation in climatic conditions of Czechoslovakia - a potential danger of abuse of marihuana of high quality. Acta Univ. Palacki. Olomuc. (Olomouc), Fac. Med. 117 (1987) 11-22.

[10] L. Hanuš, M. Dostálová, The effect of soil fertilization on the formation and the amount of cannabinoid substances in Cannabis sativa L. in the course of one vegetation period. Acta Univ. Palacki. Olomuc., Fac. Med. 138 (1994) 11-15.

[11] E. Small, H.D. Beckstead, Common cannabinoid phenotypes in 350 stocks of Cannabis. Lloydia 36 (1973) 144-165.

[12] C. Giroud, L. Rivier, Characterization of Different "Swiss" Hemp Exhibits with Regard to their Cannabinoid Content. TIAFT 26 (1996) 30-34.

[13] P.A. McDonald, T.A. Gough. Determination of the distribution of cannabinoids in cannabis resin from the Lebanon using HPLC. Part III. J. Chromatogr. Sci. 22 (1984) 282-4.

[14] R.W. Jenkins, D.A. Patterson. Relation between chemical composition and geographical origin of cannabis. Forensic Sci. 2 (1973) 59-66.

[15] J.E. Pitts, P.J. O'Neil, K.P. Leggo. Variation in the THC content of illicitly imported Cannabis products-1984-1989. J. Pharm. Pharmacol. 42 (1990) 817-20.

[16]H. Stambouli, A. El Bouri, M. A. Bellimam, T. Bouayoun, N. El Karni: Cultivation of Cannabis sativa L. in northern Morocco. Bulletin on Narcotics LVII, 79-118 (2005)

[17] B.J. Taylor, J.D. Neal, T.A. Gough, The physical and chemical features of Cannabis plants grown in the United Kingdom of Great Britain and Northern Ireland from seeds of known origin Part III: third and fourth generation studies. Bull.Narc. 37 (1985) 75-81.

[18] Mobarak Z., Bieniek D., Korte F.: Noncannabinoids of hashish. II. Approach to correlate the geographical origin of Cannabis with hydrocarbon content by chromatographic analysis. Chemosphere 3(6), 265-270 (1974)

[19] Idilbi M. M., Huvenne J. P., Fleury G., Tran Van Ky P., Muller P. H., Moschetto Y.: Hashish analysis using gas chromatography coupled to Fourier

transform infrared spectrometry. I. Origin-composition relation hypothesis. Bulletin de la Societe de Pharmacie de Lille 41(4), 27-32 (1985)

[20] Idilbi M. M., Huvenne J. P., Fleury G., Tran Van Ky P., Muller P. H., Moschetto Y.: Cannabis analysis using gas chromatography coupled to Fourier transform infrared spectrometry. I. Origin-composition relationship hypothesis. Analusis 13(3), 111-116 (1985)

[21] Brenneisen Rudolf, ElSohly Mahmoud A.: Chromatographic and spectroscopic profiles of Cannabis of different origins: Part I. Journal of Forensic Sciences 33(6), 1385-1404 (1988)

[22] K. Narayanaswami, H.C. Golani , H.L. Bami, R. D. Dua. Stability of Cannabis sativa L. samples and their extracts, on prolonged storage in Delhi. Bull. Narc. 30 (1978) 57-69.

[23] C.E. Turner, P.C. Cheng, G.S. Lewis, M.H. Russell, G.K. Sharma. Constituents of Cannabis sativa. XV: botanical and chemical profile of Indian variants. Planta Med. 37 (1979) 217-25.

[24] A. Ohlsson , C.I. Abou-Chaar , S. Agurell , I.M. Nilsson , K. Olofsson , F. Sandberg. Cannabinoid constituents of male and female Cannabis sativa. Bull. Narc. 23 (1971) 29-32.

[25] P. B. Baker, K. R. Bagon, T. A. Gough Variation in the THC content in illicitly imported Cannabis products. Bull. Narc. 32 (1980) 47-54.

[26] P. B. Baker, T. A. Gough, S. I. M. Johncock, B. J. Taylor, L. T. Wyles. Variation in the THC content in illicitly imported Cannabis products - Part II. Bull. Narc. 34 (1982) 101-108.

[27] P. B. Baker, T. A. Gough, B. J. Taylor. The physical and chemical features of Cannabis plants grown in the United Kingdom of Great Britain and Northern Ireland from seeds of known origin. Bull. Narc. 34 (1982) 27-36.

[28] P. B. Baker, T. A. Gough, B. J. Taylor. The physical and chemical features of Cannabis plants grown in the United Kingdom of Great Britain and Northern Ireland from seeds of known origin - Part II : second generation studies. Bull. Narc. 35 (1983) 51-62.

[29] Marcel O. Bonn-Miller, Kimberly A. Babson, Ryan Vandrey: Using cannabis to help you sleep: Heightened frequency of medical cannabis use among those with PTSD. Drug and Alcohol Dependence (in press 2014)

[30] Marcel O. Bonn-Miller, Matthew Tyler Boden, Meggan M. Bucossi, Kimberly A. Babson: Self-reported cannabis use characteristics, patterns and helpfulness among medical cannabis users. The American Journal of Drug and Alcohol Abuse, 40(1): 23–30 (2014)

[31] D. Mark Anderson, Daniel I. Rees: The Legalization of Recreational Marijuana: How Likely Is the Worst-Case Scenario? Journal of Policy Analysis and Management 3, 221-232 (2014)

[32] J. Michael Bostwick: The use of cannabis for management of chronic pain. General Hospital Psychiatry 36, 2–3 (2014)

[33] Medicinal Use of Marijuana. 1: J. Michael Bostwick: Recommend the Medicinal Use of Marijuana. 2: Gary M. Reisfield, Robert L. DuPont: Recommend against the Medicinal Use of Marijuana. The New England Journa l of Medicine 368(9), 866-868 (2013)

[34] Jason P. Connor, Matthew J. Gullo, Gerald F. X. Feeney, David J. Kavanagh, Ross McD. Young: The relationship between cannabis outcome expectancies and

cannabis refusal self-efficacy in a treatment population. Addiction 109, 111–119 (2013)
[35] Sunil K. Aggarwal, Gregory T. Carter, Craig Zumbrunnen, Richard Morrill, Mark Sullivan, Jonathan D. Mayer: From 32 Ounces to Zero: A Medical Geographic Study of Dispensing a Cultivated Batch of "Plum" Cannabis Flowers to Medical Marijuana Patients in Washington State. Journal of Psychoactive Drugs 45 (2), 141–155 (2013)
[36] Laura M. Borgelt, Kari L. Franson, Abraham M. Nussbaum, George S. Wang: The Pharmacologic and Clinical Effects of Medical Cannabis. Pharmacotherapy 33(2), 195-209 (2013)
[37] Arno Hazekamp, Eibert R. Heerdink: The prevalence and incidence of medicinal cannabis on prescription in The Netherlands. The European Journal of Clinical Pharmacology 69(8), 1575-1580 (2013)
[38] Elin Kondrad, Alfred Reid: Colorado Family Physicians' Attitudes Toward Medical Marijuana. J. Am. Board Fam. Med. 26, 52– 60 (2013)
[39] Franjo Grotenhermen, Kirsten Müller-Vahl: The Therapeutic Potential of Cannabis and Cannabinoids. Deutsches Ärzteblatt International 110(10), 174 (2013)
[40] M. Waldman, E. Hochhauser, M. Fishbein, D. Aravot, A. Shainberg, Y. Sarne: An ultra-low dose of tetrahydrocannabinol provides cardioprotection. Biochemical Pharmacology 85, 1626–1633 (2013)
[41] Matthew Tyler Boden, Kimberly A. Babson, Anka A. Vujanovic, Nicole A. Short, Marcel O. Bonn‐Miller: Posttraumatic Stress Disorder and Cannabis Use Characteristics among Military Veterans with Cannabis Dependence. The American Journal on Addictions, 22, 277‐284 (2013)

[42] Barth Wilsey, Thomas Marcotte, Reena Deutsch, Ben Gouaux, Staci Sakai, Haylee Donaghe: Low-Dose Vaporized Cannabis Significantly Improves Neuropathic Pain. The Journal of Pain 14, 136-148 (2013)
[43] Lutge E. E., Gray A., Siegfried N.: The medical use of cannabis for reducing morbidity and mortality in patients with HIV/AIDS (Review). Cochrane Database Systematic Reviews 30(4), (2013)
[44] Javier Fernández-Ruiz, Onintza Sagredo, M. Ruth Pazos, Concepción García, Roger Pertwee, Raphael Mechoulam, José Martínez-Orgado: Cannabidiol for neurodegenerative disorders: important new clinical applications for this phytocannabinoid? British Journal of Clinical Pharmacology 75(2), 323–333 (2012)
[45] Franjo Grotenhermen, Kirsten Müller-Vahl: The Therapeutic Potential of Cannabis and Cannabinoids. Deutsches Ärzteblatt International 109(29–30): 495–501 (2012)
[46] Elizabeth Leroux, Irina Taifas, Dominique Valade, Anne Donnet, Miguel Chagnon, Anne Ducros: Use of cannabis among 139 cluster headache sufferers. Cephalalgia 33(3), 208–213 (2012)
[47] Zerrin Atakan: Cannabis, a complex plant: different compounds and different effects on individuals. Therapeutic Advances in Psychopharmacology 2(6), 241–254 (2012)
[48] R. Mechoulam: Cannabis—A Valuable Drug That Deserves Better Treatment. Mayo Clinic Proceedings 87(2), 107-109 (2012)
[49] Wendy Swift, Peter Gates, Paul Dillon: Survey of Australians using cannabis for medical purposes. Harm Reduction Journal 2:18 (2005)

Final note

This report gives a brief overview of a three-year study of seized hashish samples analyses and evaluation of medicinal cannabis samples.