Macedonian pharmaceutical bulletin, 69 (Suppl 1) 249 - 250 (2023)
Online ISSN 1857 - 8969
DOI: 10.33320/maced.pharm.bull.2023.69.03.122
Short communication

Effects of temperature on THC and THCA content during storage

Iskra Davkova*, Ivana Cvetkovikj Karanfilova, Ana Trajkovska, Veronika Stoilkovska Gjorgievska, Svetlana Kulevanova, Gjoshe Stefkov, Marija Karapandzova

Institute of Pharmacognosy, Faculty of Pharmacy, Ss Cyril and Methodius University in Skopje, Mother Theresa 47, 1000 Skopje, Republic of North Macedonia

Introduction

Cannabis is one of the most attractive plants nowadays since it is being part of many herbal products, alternative medicine and street illegal use for different purposes. Stability of the herbal raw materials often determinates shelf-life of the final product. Maintaining the storage conditions of the herbal raw materials is a direct requirement for the quality of the final product. Temperature is one of the critical parameters that affect the stability of almost all herbal raw materials, especially those containing heat-sensitive compounds such as Cannabis. This plant contains more than 100 different chemicals called cannabinoids. When cannabinoids are extracted from herbal material or resin into organic solvents, both the temperature and light exposure is shown to influence their stability. It is, however, important to distinguish the degradation of neutral and acidic species (Lindholst, 2010). Different storage conditions leads to different cannabis chemical composition and content. Cannabinoids, the plant active components, are similar to the compounds the body makes and are involved in appetite, memory, movement, and pain. There are lot of certain medical conditions that require high THC content, therefore reducing it can lead to an undesirable outcome. Regarding this, the content of dried cannabis THC flowers stored at different conditions were analyzed.

Materials and methods

Plant materials: Plant material was consisted of 3 dried THC flowers. These flowers were analyzed at zero point and after 3 months, stored on long term stability conditions (T=25 °C, RH=60%) and accelerated stability conditions (T=40 °C, RH=75%).

HPLC method for cannabinoid potency determination: Determination of cannabinoid content was done according to the method described in the German pharmacopoeia monograph for Cannabis flower (DAB, 2018).

Loss on drying (LOD): Loss on drying for each sample was determined by accurately weighing 1g of each sample and further drying for 24h at 40°C in an oven under vacuum (RVT-220, Heraeus). The obtained percentage was involved in the equation for accurate calculation of cannabinoid content (DAB, 2018).

Sample preparation: 500 mg dry cannabis flower was used and extracted with 96% ethanol. The final concentration of plant material was 1 mg/mL. The obtained extract was filtered through 0.45 µm regenerate cellulose membrane filter before injection in HPLC system.

Results and discussion

According to the results obtained in this study, all Cannabis dried THC flowers showed higher THC content and lower THCA content over a period of 3 months. Moreover, flowers stored at accelerated conditions showed higher values for THC content and lower values for THCA content than those stored at long term conditions. The differences in the cannabinoid content are shown in Table 1.

In the living plant, the precursors of THC and CBD are found in their acidic forms, THCA and CBDA. Neutral (THC, CBD) and acidic (THCA, CBDA) forms have

*iskradavkova@ff.ukim.edu.mk

different stability towards temperature and light exposure. (Sannikova, 2020).

Table 1. The content of THC and THCA in the analyzed samples

Sample number	Analyzed component	Content (mg/g)		
		*	**	***
1	THC	0.28	0.36	14.48
	THCA	20.70	18.89	7.47
2	THC	0.30	0.43	14.48
	THCA	20.90	18.89	7.47
3	THC	0.36	0.53	15.53
	THCA	20.69	19.46	6.78

* zero point at 25 °C
** after 3 months at 25 °C/RH 60%
*** after 3 months at 40 °C/RH 75%

Cannabinoids which are aromatic carboxylic acids are capable of decarboxylation in dried Cannabis (Meija et al., 2020), as well as there is clear opposing trends in the decay of cannabinoid acid forms and the rise of the decarboxylated analogues. The conversion of THCA into THC over the time is an example of such a process as a function of temperature (Sannikova, 2020). According to Meija et al., neutral cannabinoids are stable in the darkness at room temperature up to two weeks. However, exposure to light can lead to a significant decrease in the THC and CBD content. Acidic forms of cannabinoids decarboxylate and turn into neutral forms in both daylight and darkness. According to several studies, this is a temperature dependent process (Sannikova, 2020).

Table 2. The content of CBN in the analyzed samples

Sample	Analyzed component	Content (mg/g)		
		*	**	***
1	CBN	BLQ	BLQ	0.10
2	CBN	BLQ	BLQ	0.10
3	CBN	BLQ	BLQ	0.09

* zero point at 25 °C
** after 3 months at 25 °C/RH 60%
*** after 3 months at 40 °C/RH 75%
BLQ - below limit of quantification

Obtained results showed minor increase in CBN content in samples stored at accelerated conditions than those stored at long term conditions. These results are shown in Table 2.

The total THC presents the amount of neutral and acidic form which is higher in the samples stored at accelerated conditions than in those stored at long term conditions (Table 3). These values are most helpful in identifying the potential potency that the product may have when consumed.

Table 3. The content of total THC in the analyzed samples

Sample	Analyzed component	Content (mg/g)		
		*	**	***
1	THC	18.43	16.93	21.03
2	THC	18.63	16.99	23.42
3	THC	18.50	17.59	21.28

* zero point at 25 °C
** after 3 months at 25 °C/RH 60%
*** after 3 months at 40 °C/RH 75%

Conclusion

The experimental results indicate clear difference between the content of acidic and neutral cannabinoids of the samples depending on storage conditions. Those samples stored on long term conditions

had higher THCA and lower THC content. On the other hand, samples stored on accelerated conditions had lower THCA and higher THC content. Obtained values for CBN were not notably, while there was significant increase in total THC content.

References

Meija, J., McRae1, Garnet., Miles, C.O., Melanson, J.E., 2020. Thermal stability of cannabinoids in dried cannabis: a kinetic study. Analytical and Bioanalytical Chemistry doi: https://doi.org/10.1007/s00216-020-03098-2

Lindholst, C., 2010). Long term stability of cannabis resin and cannabis extracts. Australian Journal of Forensic Sciences, 42(3), 181–190. doi: 10.1080/00450610903258144

Stankova, N., 2020. The effects of storage conditions on cannabinoid stability. Ascension Sciences, 138 West 6th Avenue,Unit2C, Vancouver.https://ascensionsciences.com/ newsroom/technical-articles/effects-of-storage-conditions-on-cannabinoid-conditions/