

Influence of hexanoic acid application on cannabinoid and terpenoid content in *Cannabis sativa* L.

Jeffrey J. Jones, Thomas Bless & Christian Ulrichs*



Humboldt-Universität zu Berlin, Faculty of Life Sciences, Division Urban Plant Ecophysiology, Lentzeallee 55-57, D-14195 Berlin, Germany
*christian.ulrichs@hu-berlin.de

1 Introduction

The aim of the study was to confirm the increase of cannabinoid content due to hexanoic acid (Hx) application. Hx is a naturally occurring compound and a precursor of the cannabinoid pathway. A Priming effect was already indicated, also in other plants (Llorens et al., 2016; Djami – Tchatchou et al., 2017).

2 Methods

Plant material: rooted cuttings of *Cannabis sativa* var. Fedora were grown 4 weeks in Conviron plant growth chambers with a photoperiod of 20h, 4h dark for vegetative growth. Light intensity of 100 $\mu\text{mol}/\text{m}^2/\text{s}$ at canopy level was provided by Fluorescent lamps and a grow temperature of 26 / 21°C at day/ night. Followed for 8 weeks of generative period (12h / 12h light / dark) with 200 $\mu\text{mol}/\text{m}^2/\text{s}$ and 23°C.

Application: 6 different treatments with 3 different concentrations of hexanoic acid (0.6, 1 and 6 mM) were applied 7 and 2 days before harvest and compared to a none treated control. Each variety had 5 plants (total plant amount: 35). Analysed plant material for cannabinoid and terpenoid level were the top 10 cm inflorescences of the main stem.

3 Results

Increase of cannabinoid and terpenoid content depends on application time and hx concentration. An application 2 days before harvest (b. h.) showed highest increase of total CBD and THC with almost 38 % at 0.6 mM (CBD) and 49 % at 1 mM (THC) compared to control (Fig.1). The impact of treatment on CBD content is more significant, than in contrast to total THC content of dry weight (DW). The terpenoid content has almost no significant difference with exception of caryophyllene at 2d b.h. 1 mM and linalool at 7d b.h. with 0.6 mM. Timepoint and application concentration affects individual terpenoids differently. Treatments with more than 8 $\mu\text{g}/\text{g}$ DW of total terpenoid concentration are at 6 mM of day 7 and 0.6 mM of day 2 and 7. High concentration of 6 mM has a negative effect on total terpenoid content compared to control. Application 2d b.h. tend to increase the total CBD and total terpenoid content with decreasing Hx application concentration.

Table 1: Mean of terpenoid level ($\mu\text{g}/\text{g}$ DW) and standard deviation of two different application timepoints before harvest (2 and 7 days) and 3 different concentrations of hexanoic acid (0.6; 1 and 6 Mm). (n = 5 plants/ treatment) Plant material: top 10 cm inflorescences of the main stem.

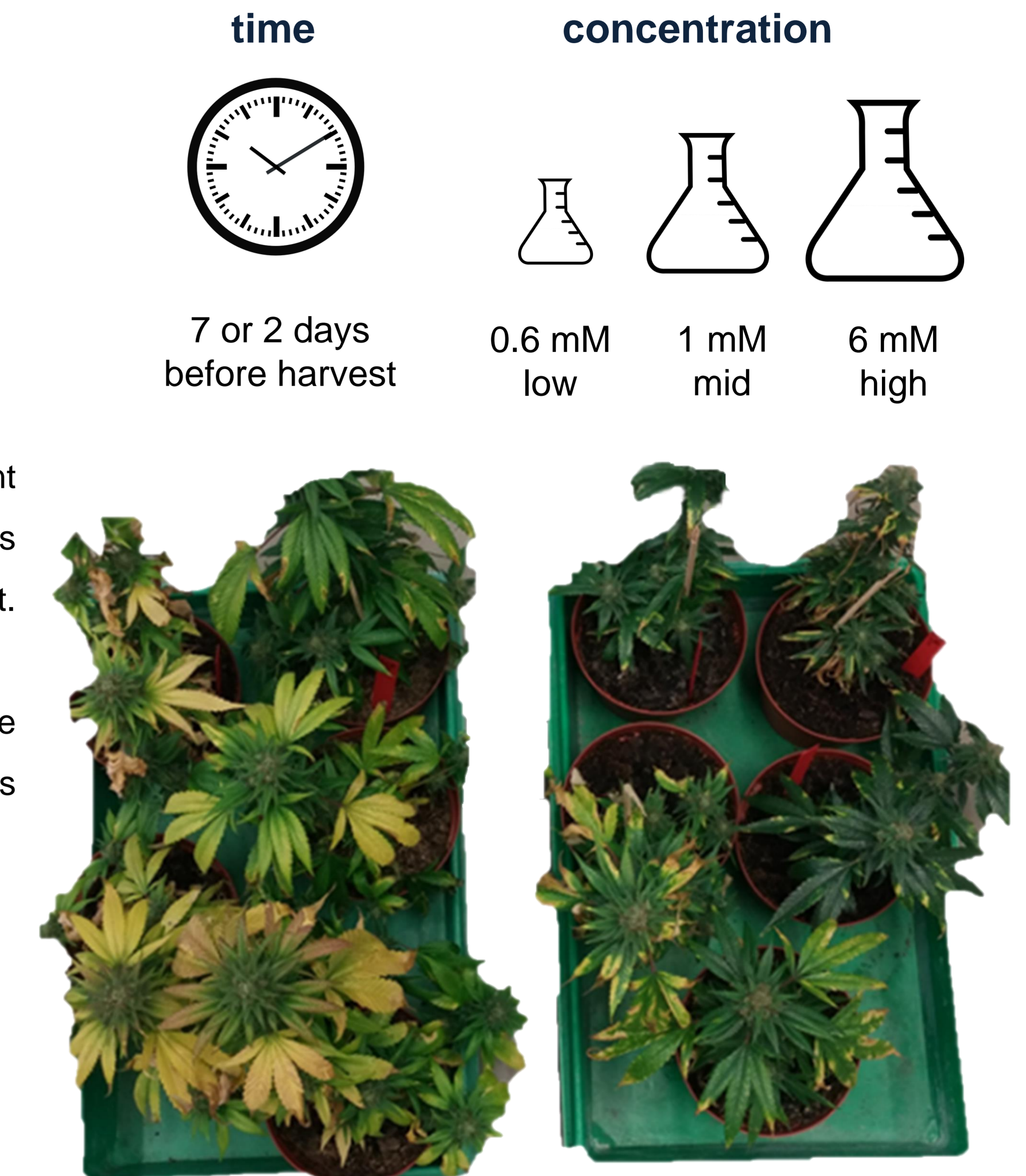
treatment	pinene	myrcene	limonene	linalool	caryophyllene
control	1.04 \pm 0.72	4.72 \pm 4.88	0.14 \pm 0.11	0.09 \pm 0.02	0.71 \pm 0.38
7d 6 mM	1.53 \pm 0.50	6.54 \pm 2.58	0.19 \pm 0.07	0.14 \pm 0.03	1.31 \pm 0.23
7d 1 mM	1.32 \pm 0.54	4.73 \pm 2.51	0.15 \pm 0.08	0.11 \pm 0.04	1.04 \pm 0.35
7d 0.6 mM	1.65 \pm 0.68	6.67 \pm 2.77	0.20 \pm 0.08	0.16 a \pm 0.06	1.43 \pm 0.64
2d 6 mM	0.96 \pm 0.23	3.11 \pm 1.60	0.09 \pm 0.05	0.11 \pm 0.01	1.12 \pm 0.24
2d 1 mM	1.24 \pm 0.36	4.15 \pm 2.14	0.12 \pm 0.06	0.12 \pm 0.02	1.51a \pm 0.31
2d 0.6 mM	1.43 \pm 0.76	6.43 \pm 4.67	0.18 \pm 0.12	0.11 \pm 0.03	1.05 \pm 0.24

a = significant differences to control $p < 0.1$ HSD Tukey test

4 Conclusions

It is possible to influence cannabinoid and terpenoid level by hexanoic acid application. Most efficient treatment compared to control were applications 2 days before harvest with concentrations of 0.6 mM for increased total CBD content and 1.0 mM for increased total THC content. Hx application 2 days before harvest had a more significant impact on cannabinoid content than on terpenoids. Influence on individual terpenoids might be related to treatment time and application concentration.

Application of hexanoic acid - evaluation of 2 factors



Picture1 : 6 mM hexanoic acid application (high concentration) 7 (left) and 2 days (right) before harvest

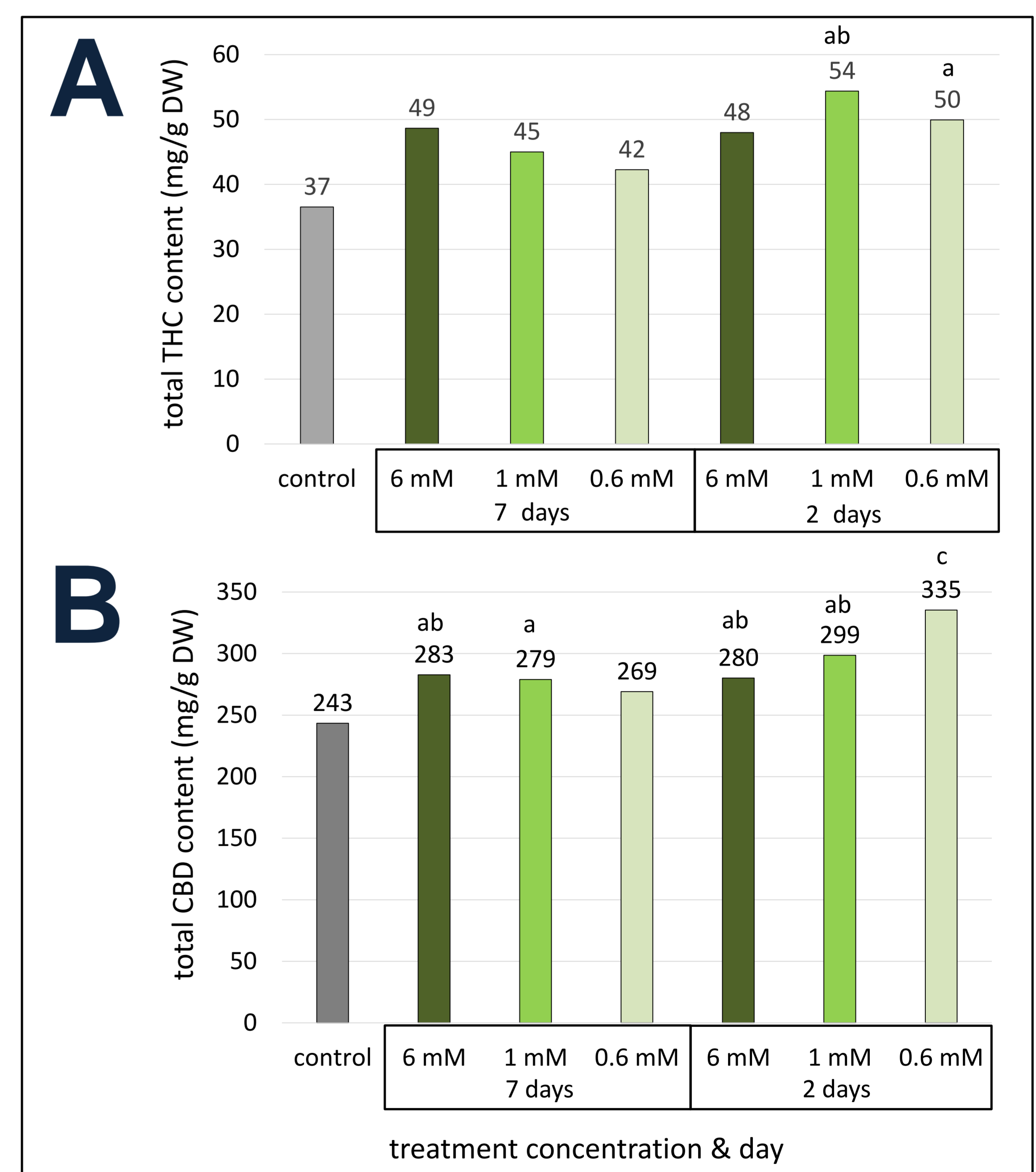


Fig. 1: Mean total cannabinoid level (mg/g DW) of THC (A) and CBD (B) with two different application timepoints before harvest (2 & 7) and 3 different concentrations of hexanoic acid (0.6; 1 and 6 Mm). (n = 5 plants/ treatment) Plant material: top 10 cm of inflorescences of the main stem. (Letters indicate significant differences $p < 0.05$ HSD Tukey test)