Impact of UV-B light intensity on *Cannabis sativa* leaf metabolite content

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Cannabis sativa is an annual herbaceous species, which has been used for centuries and has recently seen a resurgence of interest due to its multi-purpose applications, including valuable medicinal opportunities. Light is a major factor controlling plant metabolism including growth and phytochemical potential.

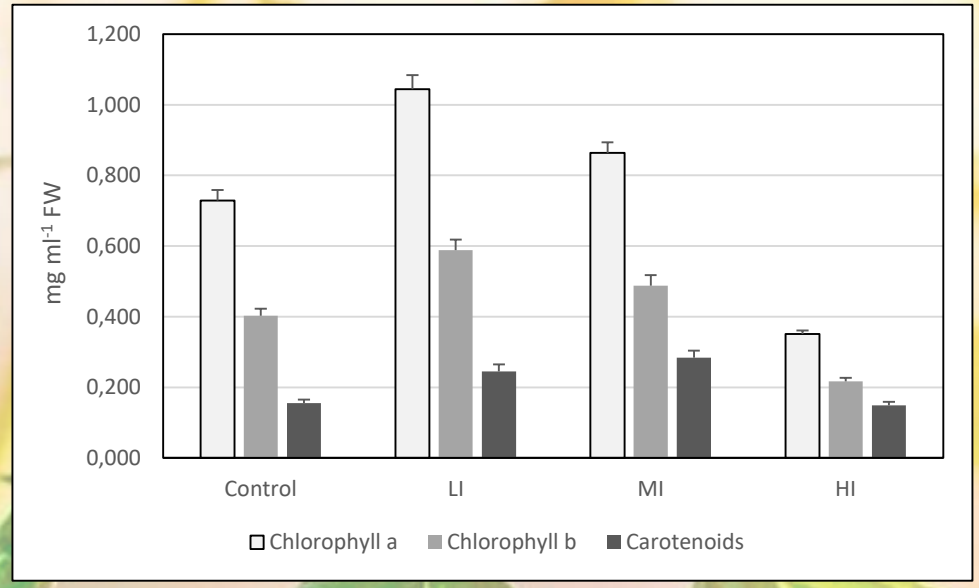
The present study aimed at investigating the effect of UV-B treatment, a high-energetic component of the solar radiation, on the plant performance.

Materials and Methods

Cannabis sativa L. subsp. *indica* seedlings were grown in a phytochamber under white light as a control and white light with three variants of additional UV-B irradiation: low intensity (LI; 0,7 W/m^2 UV-B); medium intensity (MI; 1,4 W/m^2 UV-B) and high intensity (HI; 2,1 W/m^2 UV-B). Plant height, leaf pigments and sugars content, phenolics and flavonoids content in flowering phase fan leaves were estimated.

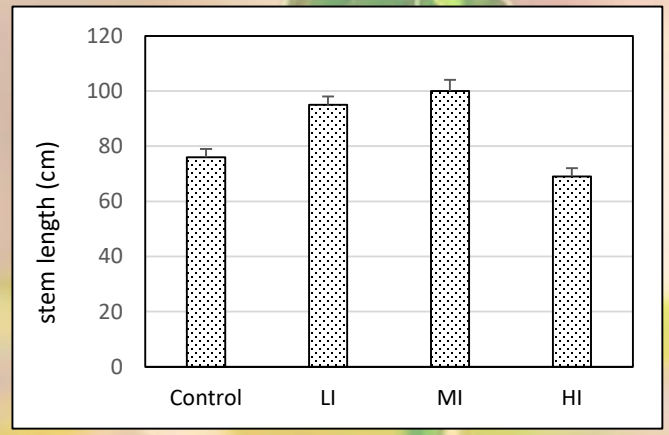
Results

Plastid pigments changes

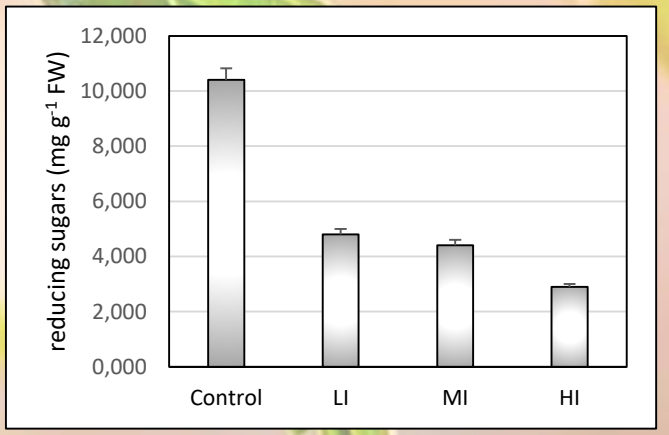


Plants treated with LI and MI had shown enhanced pigments content in leaves compared to the control group. Chlorophyll *a* and chlorophyll *b* levels were highly increased, 43% and 46% respectively, in the LI variant. Maximum carotenoids content - 83% above the control, was measured under MI irradiation. Further, all plastid pigments were significantly decreased under the highest UV-B treatment.

Morphological changes



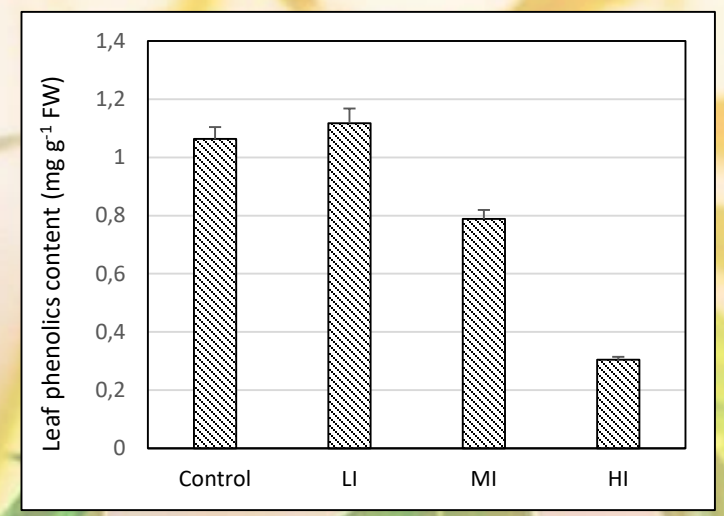
Reducing sugars content

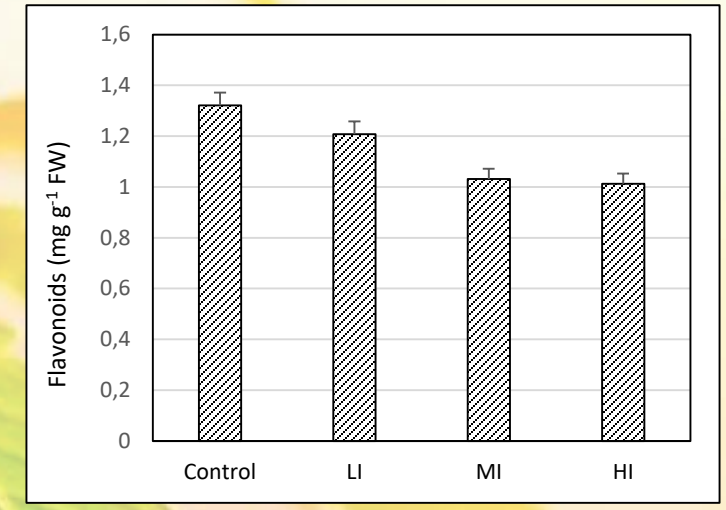


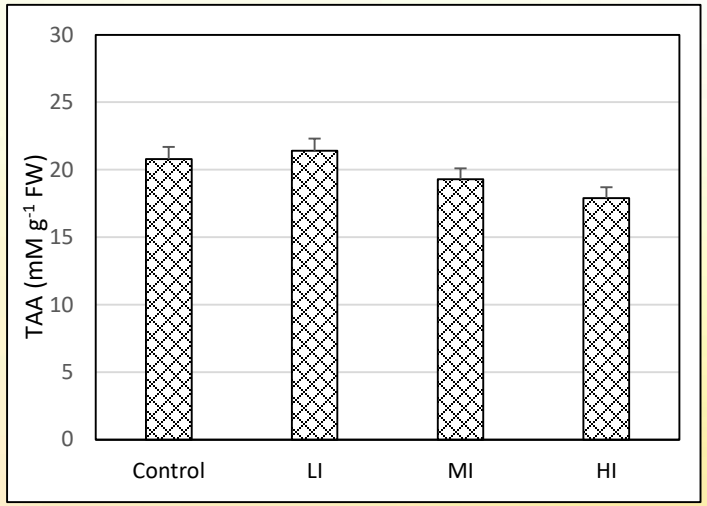
The *C. sativa* treated with Low and Medium intensity had showed improved growth characteristics, pigments and phenolics content compared to the control group. The level of reducing sugars in leaves did not follow the same tendency and their concentration remained significantly lower than the control, regardless of the light intensity

Results

Changes in metabolite content and total antioxidant capacity







Total leaf phenolic content and corresponding antioxidant activity were slightly increased under LI and decreased in the MI and HI variants. The UV-B treatment did not lead to significant changes in the overall flavonoid content.

Conclusion

Investigating the effect of high-energetic UV-B light on *C. sativa* demonstrated that LI additional UV-B treatment might be beneficial for its growth and metabolic performance, while the plant seems sensitive to higher doses of this radiation. The defence mechanism of *C. sativa* against UV-B light seems to involve sugar transport from the leaves towards the stem, as well as accumulation of non-enzymatic antioxidants such as the phenolic compounds.

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