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Proceeding Paper

Content of Sterols in In Vitro Propagated *Chamerion angustifolium* (L.) Holub Plants †

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Abstract: *Chamerion angustifolium* (L.) Holub (syn. *Epilobium angustifolium* L., Onagraceae family) is a medicinal plant used as a component of drugs, nutraceuticals and cosmetic products. *Ch. angustifolium* extracts have shown anti-androgenic, anti-tumor, anti-inflammatory, analgesic, antioxidant and antimicrobial activities. *C. angustifolium* herb contains ellagitannins, flavonoids and phenolic acids, triterpenes and fatty acids. Campesterol, cholesterol, stigmasterol and *β*-sitosterol and its derivatives have been identified in plants. Phytosterols are synthesized and accumulated in plant in vitro cultures; in this way, in vitro cultures could be an alternative source for the production of phytosterols. The aim of this study was to determine the content of campesterol, *β*-sitosterol and stigmasterol in *Ch. angustifolium* plants cultivated in vitro. The plants (shoots) grown in vitro were subjected to the high performance liquid chromatography with diode array detector (HPLC-DAD) analysis. The mean content of campesterol, stigmasterol and *β*-sitosterol was: 216.06 ± 82.74 mg/100 g, 464.93 ± 69.56 mg/100 g, 156.08 ± 49.13 mg/100 g, respectively. The investigated genotypes differed in sterol content, particularly in *β*-sitosterol content: 69.79–222.49 mg/100 g DW. In this study, the effect of genotype on sterol accumulation under in vitro conditions was demonstrated.

Keywords: *Epilobium angustifolium*; HPLC-DAD; in vitro cultures; campesterol; *β*-sitosterol; stigmasterol

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Chamerion angustifolium (L.) Holub (syn. *Epilobium angustifolium* L., Onagraceae family) plants are utilized as a component of drugs, nutraceuticals and cosmetic products. The European Medicines Agency [1] approved *E. angustifolium* in traditional herbal medicinal products for treatment and alleviating symptoms related to Benign Prostatic Hyperplasia (BPH). Plants are a rich source of ellagitannins, flavonoids and phenolic acids; the herb also contains steroids, triterpenes and fatty acids [2]. Campesterol, cholesterol, stigmasterol and *β*-sitosterol and its derivatives have been identified in plants. Considering, the growing demand for a raw material rich in these compounds, a new alternative source of phytosterols such as in vitro cultures should be considered.

The aim of this study was to determine the content of campesterol, *β*-sitosterol and stigmasterol in *Ch. angustifolium* plants cultivated in vitro. The plants after five weeks of culture on half strength Murashige and Skoog medium (1/2 MS) [3] medium supplemented with indole-3-acetic acid indoleacetic acid (IAA; 0.5 mg/L), vitamin C (0.1 g/L), sucrose (15 g/L) and agar (8.5 g/L) were subjected to the HPLC-DAD analysis. Additionally, the analysis of phytosterols in the plants regenerated under in vitro conditions and planted in field was performed.

Plants harvested from field cultivation significantly differ in the composition and in the content of sterols. Results of HPLC-DAD analysis have shown that stigmasterol was a dominant compound (382.60–577.77 mg/100 DW) in the plants grown in vitro. Among the

tested genotypes, significant variation in the sterol content was found. In contrast to in vitro cultures, plants harvested from the field synthesized mainly β-sitosterol (103.05 mg/100 g DW), whereas campesterol and stigmasterol were less abundant. Plants cultivated under in vitro conditions contained more sterols than plants grown in the field. Therefore, it can be concluded that:

(1) in vitro cultures of *Ch. angustifolium* are a rich source of phytosterols; and
(2) genotype had a significant influence on the accumulation of phytosterols under in vitro conditions.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/IECPS2021-12005/s1.

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