Determination of oleanolic acid and ursolic acid content in 
*Epilobium* spp. using HPLC

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Graphical Abstract

Abstract

triterpenoids delimits *E. parviflorum* and *E. hirsutum* from other species. This distinction is not connected to climatic factors since the samples from different collection sites were tested for both species. The triterpenoid presence/absence criteria might be one of the marker in chemotaxonomic study of genus *Epilobium*. In the aerial part of other eight studied species ursolic acid was contained in moderate quantity (20.27±0.49 mg/100g - 74.84±2.24 mg/100g) and dominated the oleanolic acid (2.03±0.05 – 32.09±0.73 mg/100g). Aerial part of *E. roseum* had a lowest ursolic acid content (20.27±0.49 mg/100g) and oleanolic acid was not detected in this sample. Both identified triterpenoids can contribute to anti-proliferative effect of ethanolic and nonpolar extracts of *Epilobium* herbs on prostate cancer cells.

**Introduction**

Oleanolic (OA) and ursolic (UA) acids, naturally occurring pentacyclic triterpenoids, were reported inhibiting cell survival and proliferation of human prostate cancer cells (Meng et al. 2015; Li et al. 2016). These compounds, along with other biologically active substances such as the ellagitannins, flavonoids, phenolic acids, steroids contribute to anti-proliferative effect of *Epilobium* plant raw materials (Granica et al. 2014; European Medicines Agency 2016; Yoshida et al. 2018). OA and UA were only identified in herb and leaves of *Ch. angustifolium* (L.) Holub (formerly *E. angustifolium* L.) among *Epilobium* species (Granica et al. 2014). Consequently, the aim of this study was identification and quantification of triterpenoids in *Epilobium* plant raw materials.

**Materials and Methods**


**Results and Discussion**

HPLC screening of triterpenoids of *Epilobium* species showed presence of OA and UA in aerial part of *E. palustre*, *E. collinum*, *E. montanum*, *E. tetragonum*, *E. obscurum*, *E. nervosum*, *E. nutans*. UA were contained in range from 20.36±0.55 mg/100g to 74.84±2.24 mg/100g and dominated OA (2.03±0,05 – 32.09±0.73 mg/100g) in all samples Aerial part of *E. roseum* had a lowest UA content (20.27±0.49 mg/100g) and OA was not detected in this species. OA and UA inhibit cell growth and induct apoptosis...
in human prostatic cancer cell lines through modulation of the PI3K/Akt/mTOR and PI3K/Akt pathways respectively (Meng et al. 2015; Li et al. 2016). Therefore, these triterpenoids can potentiate anti-proliferative effect of ellagitannins in *Epilobium* preparations.

**Conclusions**

*The oleanolic and ursolic acids were first identified in plant raw materials of* E. palustre, E. collinum, E. montanum, E. tetragonum, E. obscurum, E. nervosum, E. nutans. Aerial part of E. roseum differed from previous seven species by the lowest UA content (20.27±0.49 mg/100g) and absence of OA. The study results revealed that plant raw materials E. parviflorum and E. hirsutum differed from other samples according to absence of such triterpenoid group. The separation of species on this basis makes possible to use ursolic and oleanolic acid as markers in further chemotaxonomic studies of genus *Epilobium* L.

**References**


