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PHYTOCHEMICAL COMPOSITION OF THE ESSENTIAL OIL AND HYDROLATES OF *Veronica officinalis* L. AND *Veronica urticifolia* Jacq.

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INTRODUCTION AND OBJECTIVE

Plants of the genus *Veronica* (family Plantaginaceae) are used in traditional medicines in countries around the world. This sparked interest in the studying these plants in terms of their chemical composition and biological activity. *Veronica officinalis* L., and *Veronica urticifolia* Jacq. which are the subject of this study, are traditionally used in the medicine of Balkan peoples. The objective of this study was to investigate free volatile compounds (FVCs) of *Veronica urticifolia* and *V. officinalis* species especially in the terms of comparing FVCs from essential oil (EO) and from water residues (hydrolates, HY) and also discussing differences and similarities in the composition considering different plant material collection locations. Hydrolates are condensed water vapors containing dissolved molecules of EOs and more water-soluble (polar) FVCs.

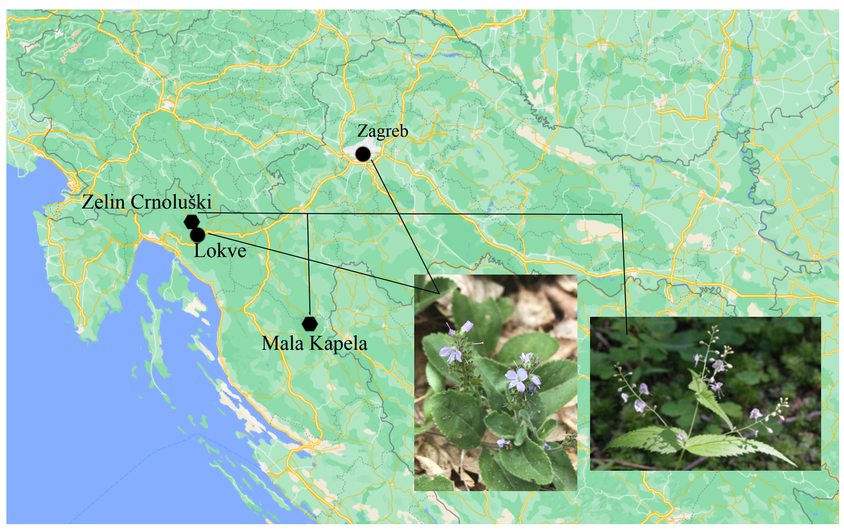


Figure 1. Map with the places of collection of *V. officinalis* (●, Picture 1) and *V. urticifolia* (⬣, Picture 2)

MATERIALS AND METHODS

- isolation of EOs and hydrolates in the Clevenger-type apparatus (Fig. 2) from the dried aerial parts of the flowering *V. officinalis* and *V. urticifolia* from two locations for each plant
- gas chromatography/mass spectrometry of the isolates
- the individual peaks for all samples were identified by comparison of their retention indices of the n - alkanes to those of authentic samples and literature

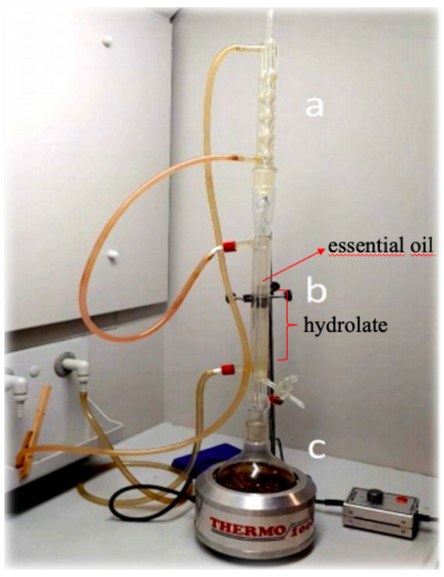
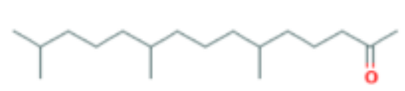
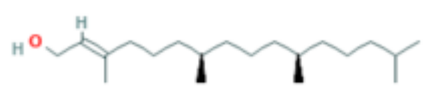


Figure 2. Clevenger-type apparatus for the isolation of essential oils and hydrosols

hexadecanoic acid



hexahydrofarnesyl acetone



phytol

RESULTS AND DISCUSSION

The most abundant compound In EO of *V. officinalis* collected in Lokve - Mali raj (Site 1) was hexadecanoic acid (49.5%) and in the material collected in Zagreb (Site 2) heptacosane (25.1%), hexahydrofarnesyl acetone (phyton) (21.8%) and phytol (17.1%) were the main components. The most common compounds in HY of *V. officinalis* from the Sites 1 and 2 were hexadecanoic acid (34.1%; 30.3%), phytol (17.3%; 23.3%) and phyton (14.5%: 18.5%), respectively. In the EO of *V. urticifolia* collected in Mala Kapela (Site 1) and Zelin Crnoluški (Site 2) the most common compounds were hexadecanoic acid (28.3%; 30.3%), phyton (20.2%; 18.5%), heptacosan (17.9%, 17.2%) and phytol (15.4%; 20.3%), respectively. The most common compounds in the HY of this species from the mentioned localities were phyton (35.9%; 40.3%), hexadecanoic acid (22.9%) and phytol (20.3%; 21.1%), respectively. It can be seen that similar compounds apear in all investigated samples but in different ratio. In our review we found just few *Veronica* species that were investigated with GC-MS method. GC-MS studies have been performed on *Veronica thymoides* subsp. *pseudocinerea* where the most abundant constituent was hexatriacontane (21%). In another research, iessential oil components of *Veronica linariifolia* Pall. ex Link, were identified, and the main constituents were cyclohexene (25.83%), *β*-pinene (11.61%), 1S-*α*-pinene (10.65%), *β*-phellandrene (10.49%), *β*-myrcene (10.42%), and germacrene D (4.99%). In our previous research in the oil of *V. spicata* the most abundant compound was phytol [4]. Phyton was previously found as the most abundant compound in the volatiles of *V. saturejoides* ssp. *saturejoides*.

CONCLUSION

The plant produces specialized metabolites in response to stressful environmental conditions and people use this products in folk medicine. It can be concluded that in these *Veronica* species the same compounds predominate in the highest percentages (hexadecanoic acid, hexahydrofarnesyl acetone and phytol) in both types of isolates (EOs and HY). We can also conclude that HYs also could have their application because there are isolated volatile compounds in them too. For both isolates further investigations of potential biological activities are needed in the future. The FVCs identified in the species *V. officinalis* and *V.urticifolia* are a contribution to the knowledge of metabolites important for adaptation to environmental conditions in the genus *Veronica* and for potential biological activity testing.