4.2 = SURVIVAL IN DIFFERENT HABITATS: EXTREME ULTRAMAFIC AND CALCAREOUS SOILS INFLUENCE ON *STACHYS RECTA* ESSENTIAL OILS COMPOSITION

ROBERTA ASCRIZZI[1], SIMONETTA MACCIONI[2], GIANNI BEDINI[3], GUIDO FLAMINI[1]
[1]Department of Pharmacy, University of Pisa, Via Bonanno 6, 56126 Pisa, Italy; [2]Museo Botanico, Sistema Museale di Ateneo, Via Luca Ghini 13, 56126 Pisa, Italy; [3]Dipartimento di Biologia, University of Pisa, Via Luca Ghini 13, 56126 Pisa, Italy

Ultramafic soils contain large amounts of magnesium and iron; they are also frequently rich in chromium, cobalt and nickel. They represent a difficult environment for plants to grow on, as they often contain toxic amounts of magnesium and nickel, whilst lacking mineral nutrients (like silicon, phosphorus, potassium and calcium); their dark colour attracts sunlight, which leads to higher temperature and drought conditions (1). On these soils, edaphic adaptation of plants is strongly evident: plants adapted to ultramafic soils exhibit morphological traits that often differ from correlated species growing on different substrates. They are often significantly smaller and show xeromorphic foliage, with reduced leaf size as the most apparent character (2).
The aim of this study was to assess the influence of edaphic adaptation to ultramafic soils on a non-morphological level, investigating its role in the composition of the essential oil produced by plants growing on these kind of soils. We investigated the composition of the essential oil (EO) of *Stachys recta* L. subsp. *subcrenata* (Vis.) Briq. collected between Nibbiaia and Gabbro (province of Livorno, Italy), grown on an ultramafic soil mainly deriving from the alteration of serpentinites. We compared the yield and the composition of this EO to the one we hydrodistilled from *Stachys recta* L. subsp. *recta* L., which had been collected in the same phenological state in La Gruzza, near Montemarcello (province of La Spezia, Italy), on calcareous substrate.
Whilst the yields of the two species were comparable, the composition profiles were very different: the EO extracted from *S. recta* subsp. *recta* was mainly rich in terpene compounds, which accounted for 93.8%; the species grown on the ultramafic soils, instead, had a volatile profile dominated by non-terpene derivatives, which accounted for 55.7%. In the species grown on the calcareous soil, the main constituents were germacrene D (18.8%), b-caryophyllene (17.7%), 1,8-cineole (15.9%) and a-pinene (14.2%). The EO from *S. recta* subsp. *subcrenata* was mainly dominated by 1-octen-3-ol (38.2%), a-cadinol (6.1%), (*E*)-3-hexen-1-ol (5.9%) and cadinene (5.6%).
Considering the extent of the differences shown by the two EOs, it is reasonable to assume that the ultramafic soil plays a central role in the plants' secondary metabolism, leading to a very different product.

1) J. Proctor (1999) Tree, 14, 334-335
2) K. U. Brady, A. R. Kruckeberg, H. D. Bradshaw Jr. (2005) Annu. Rev. Ecol. Evol. Syst., 36, 243-266