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Clay minerals and selected ecological aspects of soils on the island Veliki Brijun, Croatia

Franz OTTNER¹, Monika SIEGHARDT², Tomislav ERSTIĆ³ and Marta MILEUSNIĆ⁴

The archipelago Brijuni is located southwest of Pula, parallel to the peninsula of Istria. Veliki Brijun is the largest and most important island, where the major part of the cultural heritage and the most important new objects are situated. A well equipped arboretum with a costly infrastructure was established in 1987. The basic idea was to give a floristic overview on the Mediterranean flora as well as on trees and shrubs from completely different floristic areas from various countries as examples to document the lively diplomatic activities of the former Yugoslavian President Tito. Due to the war and abandoned care the arboretum is in a bad condition.

An ecological survey was carried out by a diploma student to proof the hypothesis whether the general idea of the initiators of the arboretum is sustainable or whether an improved concept should be developed under the present ecological conditions with less maintenance efforts. Scientific soil research seemed to be a fundamental tool to answer these ecological hypotheses and was meant to support a new concept.

The soils are generally classified as chromic Luvisols. Data on mineralogical, physical, chemical and hydrological soil properties were collected and evaluated in six soil profiles. Their ecological relevance was analyzed and served as an important deciding factor for the presented concept for the arboretum "Putevima Mira".

The arboretum was mapped in various aspects: among the maps one shows the depth of the soils and another one documents the position of a "dense clay-layer".

Mineralogical analyses show illite and kaolinite – poorly crystallized – as the main clay minerals in the soils. Vermiculite and mixed layer minerals are rare; smectite and chlorite couldn't be found. In general the soils show a decrease of illite and an increase of vermiculite in the deeper

part of the profiles caused by illitisation processes on the soil surface.

Solifluction processes are visible in profile 4, which is situated at the coast. It can be seen, that in the past the soil moved from higher parts of the island downwards to the coast. In two profiles (5 and 6) the anthropogenic influence is visible: to improve site quality for exotic plants 30 to 50 cm of a terra rossa soil was deposited onto the existing soil and buried the naturally developed A-horizon.

Technical tests show the high density of the clay layer in a depth of about 50 cm. This dense structure and the low porosity (similar to clay deposits) are unfavorable for "exotic" plants.

Woody species can hardly root in these shallow soils; they penetrate into cracks between limestones filled with fine soil. In general, a sufficient amount of water can be stored in the soils for the adapted Mediterranean vegetation. However, the water potential/water content curves for the Brijuni soil samples proof that the water is retained in the pores of the soil with such a high tension that only a small amount of the water is plant available and allows only woody species adapted to the climatic and pedologic situation to cover their water requirements without extensive care. The additionally heaped-up soil material did not improve the hydrological properties of the soil. Therefore, only trees and shrubs adapted to the respective ecological site conditions should be displayed in the arboretum. If we assume an annual precipitation of about 800 mm and an annual mean temperature of more than 14°C, the water requirements of non indigenous plants cannot be met without additional irrigation. A sustainable concept for the Arboretum "Putevima Mira" should rely on the attractive diversity of Mediterranean woody and herbaceous species.

¹ University of Natural Resources and Applied Life Sciences, Vienna, Department of Civil Engineering and Natural Hazards, Institute of Applied Geology, Peter-Jordan-straße 70, A-1180 Wien, Austria (franz.ottner@boku.ac.at)

² University of Natural Resources and Applied Life Sciences, Vienna, Department for Forest- and Soil Sciences, Institute of Forest Ecology, Peter-Jordan-straße 82, A-1190 Wien, Austria

³ wte Wassertechnik Austria GmbH, EVN Platz, A-2344 Maria Enzersdorf, Austria

⁴ University of Zagreb, Faculty of Mining, Geology and Petroleum Engineering, Pierottijeva 6, HR-10000 Zagreb, Croatia