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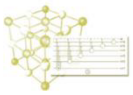

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How Bad Volcano-Clastic Badlands Actually Are?

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Badlands, often described as natural field laboratories, are landscapes of limited vegetation, with reduced or not existing human activity that are exposed to a wide range of geomorphological processes [1]. These areas are made of mostly soft and poorly consolidated terrigenous, lacustrine or marine sediments of different age that were developed under different climatic conditions due to specific combination of sediments physico-chemical properties that depend on their mineralogical composition.

However, badlands can also form in volcano-clastic materials. One of the most well-known landscapes of this type is Cappadocia in Turkey. Compared to Cappadocia, less known ones are Đavolja Varoš in Serbia and Kazár badlands in Hungary. Even though these two sites are geographically close and of the same, volcanic sediments origin, Đavolja varoš is in a form of the reddish earth pyramids built of erodible materials that are protected by the cap rock, while Kazár badlands are greyish white cliffs and white barren patches are not protected with the cap rock.

For these potential similarities and differences, eight sediments samples, four from Đavolja varoš and four from Kazár badland have been compared from the perspective of mineralogical composition, petrographic characterization, particle size distribution, pH, electrical conductivity (EC), and the sodium adsorption ratio (SAR).

Observing mineralogical composition, it is seen that both of these sediments are acidic to intermediate acidic volcano-clastic sediments, composed mainly of quartz, in case of Đavolja varoš, while in Kazár badlands feldspar, quartz and biotite dominate in its composition. As expected, that type of composition was confirmed by thin section of these samples, but more interestingly a difference in terms of porosity, compering these two locations was noticed. These samples share similarity in grain size distribution with already well-known badlands that are mainly silty, and both these volcano-clastics are actually sandy silt or silty sand sediments. Connecting particle size distribution to the previously mentioned porosity, noticed porosity pattern could be explained by secondary silification processes.

Observing pH, Đavolja varoš samples are acidic, while Kazár badlands are slightly alkaline with similar EC values that fall in the 35-80 μS/cm range and both sites. According to the SAR, present potentially dispersive to dispersive material.

In conclusion, comparing Đavolja varoš and Kazár badlands, not only between each other, but to badlands generally, we can say that: grain size distribution is making both of these sediments erodible; different porosity and mineralogical composition as well as different origin are accelerating erosion processes in Kazár badlands; and the absence of real sedimentary minerals and presence of organic material is marking the difference to already, in the literature better known badlands.

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[1] Martínez-Murillo JF, Nadal-Romero E. 2018. Perspectives on Badland Studies in the Context of Global Change. In: Badlands Dynamics in a Context of Global Change. Elsevier Inc. p. 1–25.