Mineralogy of vertisol in the south Serbia region

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In Serbia, soil type Vertisol, is spreading in about 780.000 ha. It is present mostly in central Serbia region – Sumadija, eastern Serbia – Negotin region and in south Serbia – Vranje valley. This type of soil is not much explored, specially in the region of south Serbia, as in physical and chemical characteristics, and in its mineralogy.

Subject of this paper is mineralogy of Vertisol, in the region of south Serbia. Based on ectomorphology and endomorphology was done identification of soil type that was explored, and soil samples for laboratory research is taken. Method used in laboratory work for mineralogy research is roentgen difractometric method.

Vertisol, in this region is formed at neogen structures, which are present in three separate locations – Krivoreka valley, Gnjilane valley and Vranje tectonic trench. Today's look of this terrain is formed by later tectonic movements. Vranjan tectonic trench is typical representative of this soil type – formed at Miocene and Pliocene accumulation, with grey – greenish formations, and dark clays presence, as benthonic clays and grey sands also. Depth of this accumulation is up to 200 m.

This soil type originated at this kind of substrate, is mainly composed of 14 Å minerals (smectite, chlorite, vermiculite), quarc and muscovite, present in equal share. Also present, but in smaller amount, are caolinite, pheldspite, amphibolites and accessory minerals.

Accessory minerals – apatite, sphenite, cyrkon, granite and metallic minerals are present mainly in send fraction, up to 0.5%.

Smectite is dominant and reach 33.0% participation in surface layer, and 38.3% in layer 25 – 45 cm deep.

Liscunic mineral muscovite has equal participation in total – 25.0 to 28.9%. Quarc amount is same as smectite. Quarc is present in superficial layer with 30.5% and 20.0% in deepest layer (65 – 95 cm).

Alkali pheldspats, such as orthoclase, was detected in the soil. It`s value reaches higher level in the superficial layer – 7.1%, and its decreasing in layer under to 4.8%, and again increasing in layer 45 – 65 cm deep.

Plagioclase albeit is also present. Amphiboly mineral hornblende is present mostly. It`s value is highest in deepest layer, decreasing to above layers, excluding layer 25 – 45 cm deep, where its value is lower.

Caolinite is equally present at all depths in the soil. It is originated at orthoclase and albeit.

Chlorite has a rising tendency, from deepest layer to the superficial one, where its total value decreases.

Mineralogy of clay fraction is somewhat different. Phylosilicates, as 10 Å and 14 Å minerals, are in majority present, which can be seen at difractograme of air dry sample. Highest amount of smectite is in deepest layer, and reaching surface decreases. This is understandable, considering process in progress where portion of smectite present in the soil reacts with chlorites, creating mixed layer silicate complex. It is characteristic for layer at 65 – 45 cm depth. It is intensive process in the layer above (45 - 25 cm deep), what is seen in MLS value. Drastic reduction of smectite value is detected in superficial

layer. Caolinite incrision (to 6.3%) in layer 45 – 65 cm deep indicate process of primary mineral transformation. Specially transformation of pheldspates to caolinite.

Chlorite value increases from deepest level to 25 to 45 cm depth. Reason is reaction of chlorites and smectites in order to create MLS.

Interstratifications in ilite and smectite also result in creating MLS, at depth 25 to 45 cm. In this process value of MLS increases and smectite value decreases in superficial horizon.

MLS are least present in this soil type, but their presence is of high importance.

Ilite value increases from deepest horizon to the superficial one, and increseone is most expressed in superficial horizon. At depth 25 – 45 cm, open ilite is mainly present and has tendency creating MLS type: ilite – smectite or ilite – vermiculite, that is shown in higher amount of MLS. Ilite origin is in muscovite. Ilite is distributed reversely to smectite. New amounts of ilite creates in superficial layer. In this layer both of the minerals – ilite and smectite, are equally present. Smectite somewhat more. Smaller quantities of ilite in lower layers is consequence of transformation to other minerals with expanding structure, or to MLS.

Results of laboratory research are showing that in mineralogy of vertisol, quarc, liskunes and pheldspates in send fraction are mainly present. While in silt fraction value of primary minerals decreases and philosilicates value incrises. In clay fraction smectite, ilite, caolinite and MLS are dominant.