SOILS FOR FUTURE UNDER GLOBAL CHALLENGES

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SOIL STRUCTURE OF CALCOMELANOSOLS FROM THE RTANJ MOUNTAIN, SERBIA

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INTRODUCTION

Soil structure pertains to the size, shape and arrangement of solids and voids, continuity of pores and voids, their capacity to retain and transmit fluids and organic and inorganic substances, and ability to support vigorous root growth and development (Lal, 1991). Structural development and aggregation of soil occur as part of natural pedogenetic processes and anthropogenic activities.

The **aim** of this study is to: 1) to perform quantitative assessment of soil structure after dry and wet sieving, 2) to compute different indices of soil aggregation in order to assess stability of soil structure, 3) to find relation of agronomically valuable fractions (0.25–10 mm) with the following soil parameters: soil organic matter (SOM), pH, and base saturation (%V) and 3) to find relation of structure indices with SOM, pH and %V.

MATERIALS AND METHODS

The study was carried out on the Mountain Rtanj, located in eastern Serbia (Zaječar district), about 22km north of Sokobanja. The area belongs to Carpathian-Balkan mountain system, the main bedrock is limestone (Figure 1).

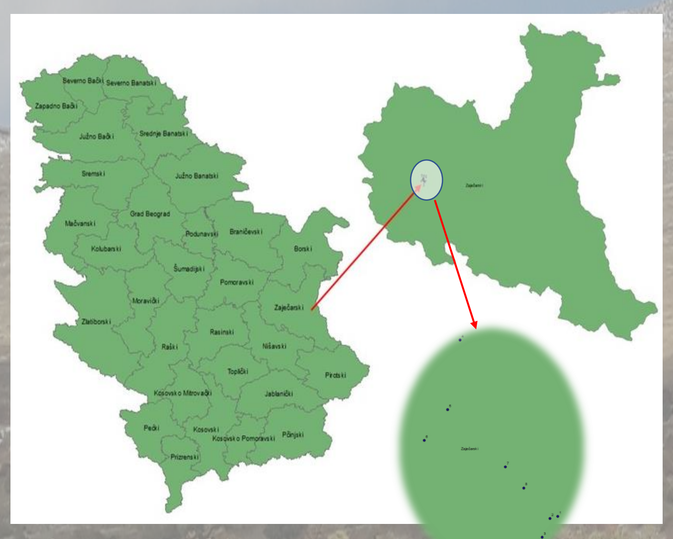

Figure 1. Study area

The soil study was executed on soil profiles and soil samples. Field researches were conducted in 2020. Eight profiles were opened and described (Figure 2). Disturbed soil samples were collected from the horizon A. A total number of 10 soil samples were analysed in the laboratory.

Figure 2. Soil profiles

Laboratory analyses of main physical and chemical characteristics were performed by common methods. Dry aggregate size distribution (ASD) and soil aggregate stability to water (WAS) were determined by Savinov's method (Savinov, 1936). The following soil structure indices were calculated: dry mean weight diameter (dMWD), wet mean weight diameter (wMWD), dry geometric mean diameter (dGMD), wet geometric mean diameter (wGMD) and structural stability index (SI).

RESULTS AND DISCUSSION

The obtained results after dry sieving indicate an extremely favorable structure of the examined Calcomelanosols. Favourable soil aggregate distribution is best illustrated by the fact that the average content of agronomically valuable fractions (0.25–10 mm) is 90.47% (±3.57), in all analysed soil profiles exceeds 80%. Among these aggregates, very fine, fine and medium size aggregates dominate. The quantity of agronomically most valuable aggregates (0.25–10 mm) is highly correlated (p>0.01) with SOM content (r = 0.73), pH (r = 0.76), %V (r = 0.78) (Figure 3).

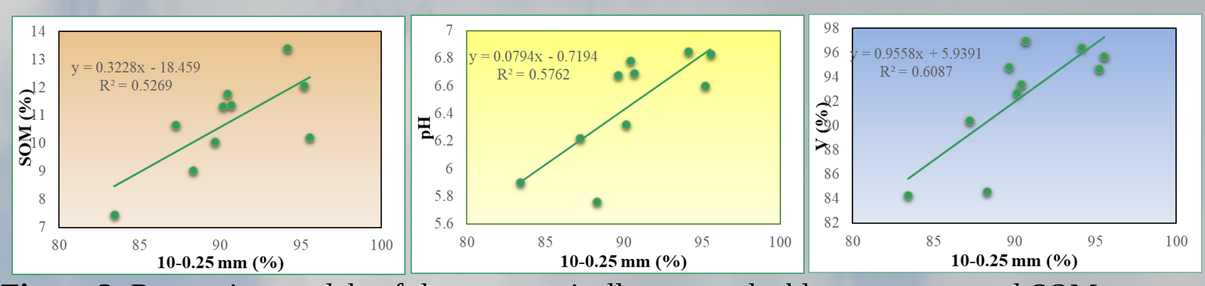

Figure 3. Regression models of the agronomically most valuable aggregates and SOM content, pH, V (%)

Mean weight diameters were calculated for dry (dMWD) and wet (wMWD) sieving. Dry MWD showed values ranging from 3.02–5.53 mm, whereas wMWD ranges from 1.92–3.34 mm. The wMWD and dMWD ratio is an indicator of the stability of structural aggregates. A small change in the aggregate size after wet sieving was found, 0.67±0.11 mm on average. Soil aggregate stability may also be expressed by dry and wet geometric mean dimeters (GMD). These structural indices show a strong negative correlation with SOM, pH and %V (Figure 4).

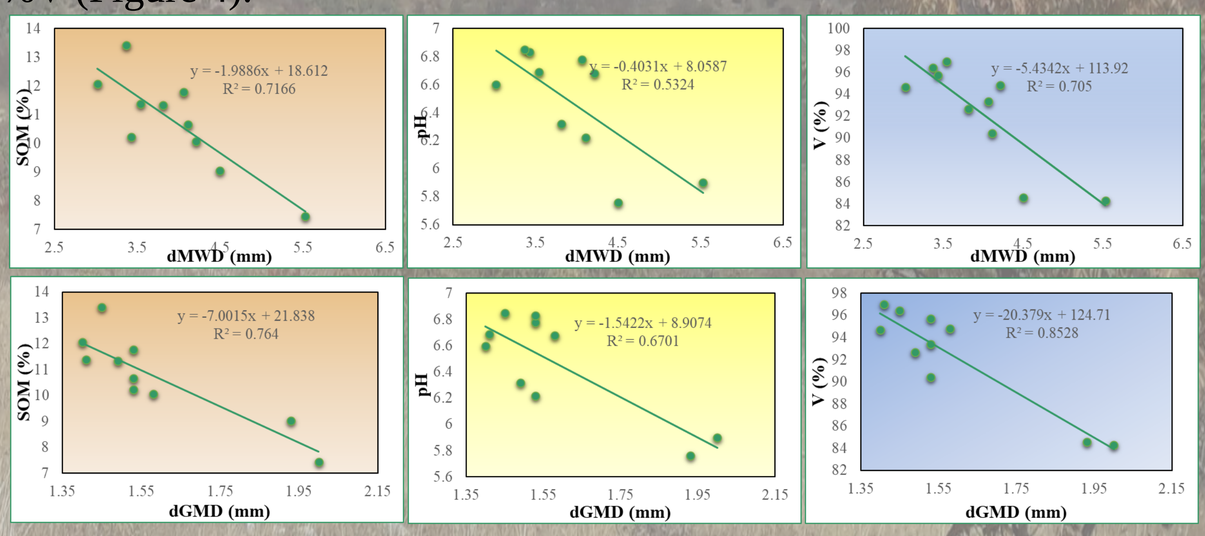

Figure 4. Regression models of the dMWD, dGMD and SOM content, pH, V (%)

In all examined soil profiles SI is higher than 19% (32.91±7.05% on average), which indicates an extremely stable structure, without risk of the structural degradation of soil. There is a strong positive correlation between SI and pH, and SI with %V (Figure 5).

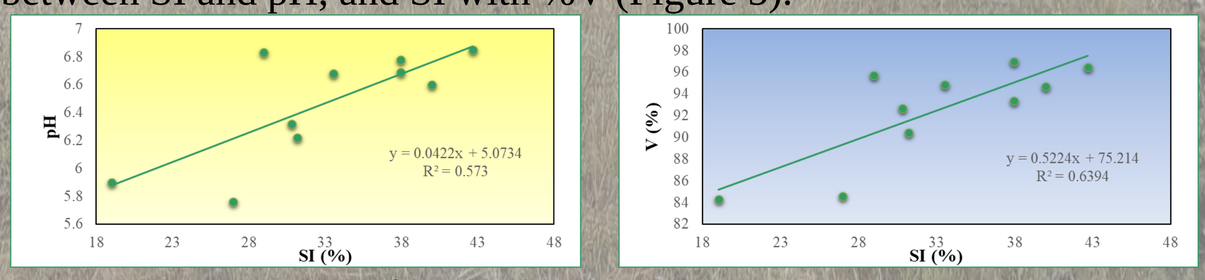

Figure 5. Regression models of the SI and pH, V (%)

CONCLUSION

All analysed soil profiles have favourable soil structure and water stable soil aggregates with low risk of soil structure degradation. This is of extreme importance because Calcomelanosols cover the steep and sloping land which is naturally more prone to water erosion and soil degradation.