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Soil eco-physiological indicators from a coal mining area in El Bierzo District (Spain).

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The El Bierzo carboniferous basin (León, N.W. of Spain) is placed in a tenth of the surface of this district, in the area called "Bierzo Alto". Coal has been mined in El Bierzo from the late XVIII century, having been intensely exploited during the XX century. The mining activity has left a heritage of withdrawed mining structures. Nowadays some mining activity remains in the area, and new exploitations based on open pit processes, cause the burial of natural soil with overlaying mine tailings.

Characterization and study of the edaphic landscapes in the area is a necessary activity within the framework of its overall restoration planning, also providing fundamental information for the design and monitoring of waste coal recovery activities. For this work eight zones were chosen, representing the spatial variability within the upper basin of the Rodrigatos river, into the Bierzo Alto, including reference areas not affected by mining activities. In addition three mine tailings outside the area are included in this work to cover the variability of restoration processes.

After a first study, based on physical, physico-chemical and chemical characteristics of soils, we have continued the study including some eco-physiological parameters. The objective of this work is to identify potential soil disruption, its extent and causes. Soil microbial activity is influenced by a wide set of soil characteristics. Eco-physiological parameters analysed in this work are:

• Microbial Biomass carbon
• Basal Respirometry
• Maximum respiratory rate

Microbial biomass carbon was analysed according the Substrate Induced Respirometry (SIR) method. Relational parameters such as metabolic quotient (CO2-C/Cmic) and the Cmic/Corg ratio have been obtained from these variables.

Our results shown that soil microbial biomass carbon is strongly influenced by the water holding capacity (WHC) of the samples (R=0,895) as well as by organic matter (O.M.) content (R=0,801), in addition, WHC and O.M. are also strongly related (R=0,794), so O.M. seems to be the key variable in the soils studied. Recovery stage of the studied plots may be stablished with each of the mentioned parameters. All the correlations mentioned were significant at $P<0.001$ level. Maximum respiratory rate as well as Metabolic quotient data also allow to identify most stressed soils, corresponding with coal mine tailings in the Rodrigatos river basin.

Results obtained for Cmic/Corg ratio show difficulties to be interpreted in the case of mine tailings. The practice of burying soils with coal mining debris has provided this new surface with relatively high inputs of organic carbon, in excess of this provided from fresh organic matter.

In our study eco-physiological parameters are usefull tools in order to clasify the restoration level of mine tailings, specially those parameters having a high correlation with the organic matter content, Nevertheless some of those parameters then present some added difficulties to be interpreted that will be discussed in this work.

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