

ABSTRACT

M. Sc. Thesis

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New technologies have been developed as alternatives to determine the soil properties, which affect the plant growth accurately and economically. Visible and Near-Infrared Spectroscopy (NIRS, 760-2500 nm), which was developed for that aim, is one of these techniques for obtaining cheap and rapid soil data for agricultural and environmental usage.

Objectives of this research includes : 1) develop a new methodology for characterization of the moisture capacity of the soil moisture contents at different tension levels at Yuvaca location in Söke Plain in Aydın province using NIRS method, 2) use this technique to compare traditional laboratory analysis results with NIRS measurement carried out both in the field and laboratory.

Totally 117 soil samples were used in order to determine moisture capacity of the soils soil moisture contents at different tension levels, and also CaCO₃, pH, organic matter, sand, silt, clay contents of the experimental area. Soil sampling was carried out according to 100x100 grid system in the sampling area covering 1 km². The Partial Least Square regression analysis method (PLS) was used for some obtained soil sample properties in order to compare the calibration equalities by using the traditional and the reflection laboratory methods. The results showed that the CaCO₃ (r^2 : 0.73), soil organic material (r^2 : 0.79) and clay (r^2 : 0.72) soil properties were obtained with success at the Yuvaca study area.

In order to compare the calibration equalities from the obtained traditional method of the reflection values and the the soil moisture contents in laboratory, there was used Excel and the Partial Least Square (PLS) regression analysis as two different statistical methods. The highest relationship by Excel was obtained at the 0, 2.54 and 4.2 pF levels and by including the air-dried soil samples at a 1450 nm and 1940 nm wave length the r^2 results were 0.71 and 0.75 respectively. By using the PLS method there was obtained between the measured and the estimated soil moisture contents at different tension levels higher r^2 values (0.93) in contrast to the Excel statistical method. The results showed that the PLS analysis method was more effectively however using the Excel statistical method was reliable too. Moreover the NIRS reflection technique can be used for determining many soil properties since it is a rapid and cheap method but there is a need for more detailed studies in the future.

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Keywords

Clay, Loam, Moisture content, Near-Infrared Spectrophotometre, Organic carbon soil, pH, Sand,
