

Soil Macronutrients Sensing for Precision Agriculture Purpose Using Fourier Transform Infrared Spectroscopy

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Abstract : Among the nutrients needed by the plants, three elements containing nitrate, phosphorus and potassium are more important. The objective of this research was measuring these nutrient amounts in soil using Fourier transform infrared spectroscopy in range of 400- 4000 cm^{-1} . Soil samples for different soil types (sandy, clay and loam) were collected from different areas of East Azerbaijan. Three types of fertilizers in conventional farming (urea, triple superphosphate, potassium sulphate) were used for soil treatment. Each specimen was divided into two categories: The first group was used in the laboratory (direct measurement) to extract nitrate, phosphorus and potassium uptake by colorimetric method of Olsen and ammonium acetate. The second group was used to measure drug absorption spectrometry. In spectrometry, the small amount of soil samples mixed with KBr and was taken in a small pill form. For the tests, the pills were put in the center of infrared spectrometer and graphs were obtained. Analysis of data was done using MINITAB and PLSR software. The data obtained from spectrometry method were compared with amount of soil nutrients obtained from direct drug absorption using EXCEL software. There were good fitting between these two data series. For nitrate, phosphorus and potassium R^2 was 79.5%, 92.0% and 81.9%, respectively. Also, results showed that the range of MIR (mid-infrared) is appropriate for determine the amount of soil nitrate and potassium and can be used in future research to obtain detailed maps of land in agricultural use.

Keywords : nitrate, phosphorus, potassium, soil nutrients, spectroscopy

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