

7th Congress of Ecologists
of the Republic of North Macedonia with international participation

BOOK OF ABSTRACTS

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OF THE REPUBLIC OF NORTH MACEDONIA,
WITH INTERNATIONAL PARTICIPATION**

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Validation of a phosphovanadomolybdate UV-VIS spectrophotometric method for the determination of plant-available phosphorus in agricultural soils and evaluation of dissolved silicon interference

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Reliable determination of plant-available phosphorus is essential for soil fertility evaluation and sustainable nutrient management. In the present study, a UV–Visible spectrophotometric method based on the phosphovanadomolybdate reaction was validated for the determination of plant-available phosphorus in agricultural soils following Egner–Riehm ammonium lactate (AL) extraction. In addition, the influence of dissolved silicon on the analytical performance of the method was investigated. Validation included assessment of linearity, sensitivity, selectivity, trueness, accuracy and precision. Excellent linearity was obtained over the concentration range of 1–20 mg P L⁻¹ ($R^2 > 0.999$), while the calculated limits of detection and quantification confirmed adequate sensitivity for routine soil analysis. The influence of dissolved silicon was negligible, with a calculated matrix effect of only 0.9%, indicating no significant interference under the selected analytical conditions. Trueness was verified using a BIPEA certified reference soil material, whereas accuracy was assessed by the standard addition procedure. The obtained z-score (<2), recoveries (82.1–93.3%) and repeatability (RSD = 0.09–0.67%) confirmed satisfactory analytical performance. The validated method provides a reliable and robust analytical approach for routine determination of plant-available phosphorus in agricultural soils.

Key words: agricultural soils, plant-available phosphorus, phosphovanadomolybdate reaction, UV–Vis spectrophotometry; method validation, silicon interference; Egner–Riehm ammonium lactate extraction.