ABSTRACT

While much information exists on the quantitative relationships between phosphorus (P) sorption and soil properties, comparatively less attention has been given to the influence of soil properties and P forms on the kinetics of P desorption, and to the relationships between desorbable and sorbed P. The aim of this study was to rationalize the P desorption properties of a group of 29 acid soils representative of agricultural areas of Portugal. The soils differed widely in basic properties, total P concentration (91–1730 mg kg^{-1}), Olsen P (2.5–116 mg kg^{-1}), and relative contents of the 'P fractions' —defined operationally in accordance with the seven-step fractionation scheme of Ruiz et al. (1997). P sorption capacity was accurately predicted from the concentrations of oxalate-extractable Al and Fe, as is generally the case with acid soils. Desorption of sorbed P to an anion exchange resin could be described by a combination of two kinetic equations of the Michaelis–Menten type for fast and slowly desorbable P pools. Although the concentrations of both pools were correlated with those of various P fractions, they could not be unambiguously assigned to specific chemical P species. The high correlation found between fast desorbable P and Olsen P testifies to the usefulness of this agricultural P test for acid soils; however, Olsen P tended to overestimate and underestimate fast desorbable P for Olsen P values below and above ~80 mg kg^{-1}, respectively. The average ratio of fast desorbable P to sorbed P was 0.21 and that of total desorbable P to sorbed P 0.60; both ratios increased with increasing degree of P saturation in the soil.