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A Spectrophotometric Method for Aluminum in Histosols.

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The quality of organic matter (OM), more than the mineral constituents of soil is important for the chemistry of Histosols. These soils occur in small geographic extension in Brazil, but they are economically and socially important for local farming. One of the problems reported for Histosols is their high acidity, attributed to high levels of Al. However, the analytical procedures used to measure soil acidity and Al content are usually the same applied for mineral soils, where the Al toxic forms are associated to the clay fraction, and the contribution to soil acidity from organic acids is very low. As a result large amounts of liming are recommended when farming Histosols, ever-increasing their degradation. The objective of this study was to test the efficiency of the Xilenol Orange (XO) method, compared to the routine method in soil surveys, in Histosols from different regions of Brazil. The routine method for extracting Al in most Brazilian soil laboratories (EMBRAPA, 1997) is based on the exchange of Al from the surface of soil colloids by a non-buffered solution of KCl 1 mol/L, 1:10 proportion of soil:solution. After one night, the Al is quantified by titration with NaOH 0.025 mol/L. For this study the Al in the extract was also measured using an ICP OES. In the Xilenol Orange method, 1 ml of the KCl extract was transferred to plastic flasks of 100 ml, and 25 ml of the AX solution was added to the flasks, homogenized and left to rest for 2 hours. After that the sample was analyzed in a spectrophotometer UV - Vis, at 555 nm wavelength (Coccione, 2001). The regression coefficients obtained in the study, showed no difference between the Al extracted with KCl and measured with the ICP method (Al_KCl_ICP) and the Al measured by the XO (Al_KCl_XO). The correspondence between the values for Al was high, the $r^2 = 0.98$ and a low dispersion of data. Levels of Al extracted with KCl and quantified by the different methods where: spectrophotometer with XO, varied from 1.69 to 108.50 mmolc/dm³; ICP method, 1.81 to 102.78 mmolc/dm³; and titration with NaOH, with values from 0.0 to 140 mmolc/dm³. The discrepancy between titrated Al and the other methods may be explained by the interference of organic matter in the complete neutralization of acidity produced by hydrolysis of Al, and the complexation of Al by organic fractions. This is corroborated by the significant correlation ($r^2 = 0.50$) found for OM-muffle and soluble and weakly adsorbed Al forms. Also, the difference among the Al levels from titration and ICP and XO methods were related to the organic matter fractions, fulvic acid and humic acids, suggesting that according to the quality of the organic matter in the Histosols, fibric, hemic or sapric, the soil acidity that is due to Al may vary, as should vary the recommendation of liming.

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