

土壤中总氮与总磷含量的近红外光谱实时检测方法 Real-time Analysis of Soil Total N and P with Near Infrared Reflectance Spectroscopy

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关键词: 近红外光谱 测量 土壤总氮 土壤总磷 偏最小二乘法 最小二乘支持向量机

摘要: 以浙江省潮化盐土为研究对象,用近红外光谱分析技术探测土壤氮(N)和磷(P)的含量。从试验田采集6组土样,每组取20个样品,共计120个样品。利用均值法、卷积滤波确定最终光谱数据,然后采用偏最小二乘回归法(PLS)及最小二乘支持向量机(LS-SVM)分别建立了土壤总氮和总磷的近红外光谱模型,其中采用PLS所建模型的相关系数分别为0.9454(N)、0.9327(P),预测标准误差分别为0.0321(N)、0.0089(P)。采用LS-SVM所建模型的预测相关系数分别为0.9503(N)、0.9547(P),预测标准误差为0.0378(N)、0.0101(P)。分析结果表明采用近红外分析技术可以预测土壤总氮(N)和总磷(P)的含量。The tide salt clay in Zhejiang Province was selected as research object, and the soil N and soil P were analyzed with NIR spectroscopic techniques. Six group samples were collected from a rice farm. Several kinds of nutritional water with different concentrations were added to the six groups, and then the samples were dried and rubbed. At last, 120 samples were got from six groups equably. Standard normal variate (SNV), multivariate scatter correction (MSC) and smoothing of moving average were used to process the spectral data. Different calibration models were established and the performance of these models was compared with different pretreatment methods. After comparison, smoothing of moving average was found to be the best spectral pretreatment method. 96 samples were randomly selected from 120 samples as the calibration set, and the other 24 samples were used as the validation samples. Two discriminating analysis models were developed using partial least squares (PLS) method and least squares-support vector machine (LS-SVM) method respectively. The correlation coefficients (r) between the measured data and the predicted data from PLS were 0.9454(N), 0.9327(P) respectively, and 0.0321(N), 0.9547(P) from LS-SVM, respectively. The root mean standard error of prediction (RMSEP) were 0.0321(N), 0.0089(P) from PLS, and 0.0378(N), 0.0101(P) from LS-SVM. The results showed that NIRS could be used to evaluate the soil N and soil P.

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