

便携式作物氮素监测仪性能水稻田间测试 Evaluation of Portable Crop Nitrogen Monitoring Instrument Based on Rice Field Experiment

刘海俊 孙传范 曹卫星 焦学磊 习志仁 徐志刚

南京农业大学

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摘要: 设计了2个品种和4个施氮水平的水稻田间试验, 采用自行研制的便携式作物氮素监测仪获取各关键生育期的水稻冠层反射光谱信息, 并实施田间协同取样和实验室氮素含量测定。通过分析水稻叶片氮含量与冠层光谱反射率及植被指数之间的相关性和定量关系, 测试并评价便携式作物氮素监测仪的工作性能。结果表明, 便携式作物氮素监测仪具有优异的氮素监测效果和优良的田间工作性能, 在其所具备的4个特征波段中, 660、710和810 nm单一波长的光谱反射率与叶片氮含量的相关性均大于0.5, 并全部通过0.01水平的极显著检验; 在各生育期中, 所有双波段光谱植被指数与叶片氮含量的拟合系数均大于0.7, 并以开花期和成熟期的拟合系数(大于0.83)为最高; 对全生育期的整体分析表明, 归一化光谱指数NDVI(810, 710)和NDVI(710, 546)与叶片氮素含量的决定系数分别达到了0.804和0.759。By using self-developed portable instrument for crop nitrogen monitoring, the information of rice canopy reflectance spectra was obtained from the field experiments with two rice varieties and four nitrogen application rates, and the rice plant was sampled from each plot for measurement of leaf nitrogen concentration (LNC) simultaneously. The correlations and the quantitative relationships between LNC and rice canopy reflectance spectra were analyzed, and the performance of portable nitrogen monitoring instrument was evaluated. Results show that its ability in monitoring nitrogen is excellent, and its performance is steady in field condition. Testing the correlations between LNC and canopy reflectance spectrum of four characteristic bands included in the instrument, the correlations in the mono-band of 660 nm, 710 nm and 810 nm are all more than 0.5 with a significance testing ($p < 0.01$). During the all growth stages, the coefficients of determination R^2 between LNC and spectral vegetation index (VI) with double-bands are more than 0.7, especially in the flowering and mature stages ($R^2 > 0.83$). In the whole growth period, the VI are significantly correlated with LNC, such as NDVI(810, 710) and NDVI(710, 546), the determination of coefficients R^2 are 0.804 and 0.759.

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