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### 利用光谱反射技术监测不同地力和施肥条件下小麦生长和产量的变化

### Monitoring Growth and Grain Yield of Wheat in Fields with Different Soil Fertility Levels and Different Fertilizer Application Using Spectral Reflectance Technique

DOI:

中文关键词: [小麦](#) [变量施肥](#) [光谱反射](#) [产量](#)

英文关键词: [Wheat](#) [Variable rate fertilizer application](#) [Spectral reflectance](#) [Grain yield](#)

基金项目:国家重点基础研究发展计划项目(No. 2009CB118505); 国家自然科学基金项目(30671451、30571125); 农业部公益性行业(农业)科研专项(200803028)。

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中文摘要:

通过不同地力条件下的田间试验, 利用光谱分析技术动态监测了变量施肥和传统施肥条件下小麦不同生育期的冠层光谱反射率的变化, 并根据由冠层光谱反射率计算的植被指数分析了不同施肥条件对小麦长势、色素含量、水分含量和产量的影响。结果表明, 变量施肥和传统施肥对小麦的增产效果基本相同, 但变量施肥显著降低了肥料施用量, 在三块不同地力的小区, 变量施肥比传统施肥分别节约施肥量15.7%、68.0%和85.6%; 施用拔节肥后, 通过对植被指数(NDVI、OSAVI、WI、mSR705)的分析表明, 变量施肥和传统施肥处理小麦的冠层结构、叶绿素含量和水分含量均优于对照, 但两种不同施肥处理之间并没有明显差别。另外, 对不同施肥处理后的小麦产量和不同植被指数的相关分析表明, 在挑旗期和孕穗期, 冠层光谱反射的植被指数与小麦产量呈显著正相关。因此, 在显著节约肥料的情况下, 变量施肥与传统施肥一样可以通过改善群体结构、冠层的叶绿素含量和水分含量促进小麦的生长, 达到增产的效果, 并且利用反射光谱技术可以快速、有效地对小麦长势和营养状况进行动态监测。

英文摘要:

The changes of spectral reflectance of wheat canopy were studied in different soil fertility fields using spectral reflectance technique, and the effects of different fertilizer application on the grain yield, pigment content, water content and the structure of canopy of wheat were analyzed according to the vegetation indexes derived from the spectral reflectance of wheat canopy. The result showed that both the variable rate and traditional fertilizer application increased the grain yield of wheat in the three different soil fertility fields. However, compared to the traditional fertilizer application, the variable rate fertilizer application reduced fertilizer amount by 15.7%, 68.0% and 85.6% in the three different soil fertility fields, respectively. The growth, water and chlorophyll content of wheat canopy indicated by the vegetation indexes (NDVI, OSAVI, WI, mSR705) were improved by the both variable rate and traditional fertilizer application, but there were no differences between the both treatments. A significantly correlation was observed between the vegetation indexes at the jointing or filling stage and grain yield of the wheat. In conclusion, like traditional fertilizer application, variable rate fertilizer application enhanced grain yield via improving canopy structure, chlorophyll and water content of canopy as well as growth, but it significantly reduced the cost. It was also demonstrated that spectral reflectance technology can be effectively used to monitor growth and nutrition status of wheat.

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