

相对SPAD值用于不同品种夏玉米氮肥管理的研究

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Application of relative SPAD values for nitrogen fertilizer management of different cultivars of summer maize

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摘要

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摘要 采用田间试验研究了不同氮肥处理、不同玉米品种及关键生育期间的SPAD值差异和基于相对SPAD阈值的氮肥管理对氮肥用量、子粒产量、氮肥利用率和土壤氮素变化的影响。结果表明, 两品种玉米各关键生育期的SPAD值开始随施氮量的增加而显著增加, 施氮量超过N 210 kg/hm²后不再显著增加; 郑单958和冀农一号大喇叭口期的相对SPAD值与产量的关系符合线性加平台模型, 其平台相对SPAD值分别为0.976和0.981; 两玉米品种和不同生育期间的绝对SPAD值差异显著, 利用相对SPAD值可消除品种和生育期间的SPAD值差异。玉米关键生育期追肥量和总施氮量均随预设相对SPAD阈值的增加而增加, 基于相对SPAD阈值的氮肥管理能在保持高产的同时较农民习惯施肥显著降低氮肥用量、田间氮素表观损失和收获后土壤无机氮残留、提高氮肥利用率; 本试验条件下, 保持玉米高产高效的适宜相对SPAD阈值为0.95~0.98, 此阈值管理下, 郑单958和冀农一号的产量较农民习惯施肥没有降低, 而氮肥用量降低了42%, 氮肥回收利用率和农学效率分别增加了18.6、20.0个百分点和6.0、6.5 kg/kg。

关键词: 夏玉米 相对SPAD值 氮肥管理 营养诊断

Abstract: The field experiments were conducted to investigate the differences of SPAD values among different nitrogen (N) fertilizer treatments, maize cultivars and critical growth stages, the effects of N fertilizer management methods based on relative SPAD threshold values on N rates, grain yield, N use efficiency and change of soil N content. The results show that SPAD values of maize leaves at the critical growth stages were increased significantly with the increase of N rates (the N fertilizer rate is less than N 210 kg/ha), and the correlation between relative SPAD values at the flare opening and grain yield can be simulated by the linear plus plateau model, and the plateau relative SPAD values of Zhengdan958 and Jinongyihao are 0.976 and 0.981, respectively. The differences of absolute SPAD values among maize cultivars and growth stages are significant, while the differences of relative SPAD values are not significant. The rates of topdressing N and total fertilizer N are increased with the increase of relative SPAD threshold values. Compared with farmer fertilizer practices (FFP), the N fertilizer management methods based on relative SPAD threshold values could decrease N application rates, field N apparent loss and soil inorganic N residual after maize harvest, and increase N use efficiency while keeping higher grain yield. In this experiment condition, the range of feasible relative SPAD threshold values for ensuring higher grain yield and higher N use efficiency of two maize cultivars is 0.95~0.98. The grain yields of Zhengdan958 and Jinongyihao are not decreased under the N management with this threshold value range, while total N rate is decreased by 42%, and the N recovery efficiency and N agronomic efficiency are increased by 18.6, 20 percentage points and 6.0, 6.5 kg/kg, respectively.

Keywords: Summer maize relative SPAD value nitrogen fertilizer management nutrient diagnosis

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