

稻麦轮作区保护性耕作条件下氮肥对水稻生长发育和产量的调控效应

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Effects of nitrogen management on rice growth and grain yield under conservation tillage in rice-wheat cropping system

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摘要

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摘要 2006~2008年在四川省广汉市开展了保护性耕作措施下水稻氮肥调控试验, 设置不同秸秆还田量(0、6000、12000 kg/hm²)、施氮量水平(0、150、210 kg/hm²)以及氮素分配比例(6:2:2、6:3:1、8:2)。结果表明, 和施N 150 kg/hm²相比, N 210 kg/hm²处理水稻分蘖力、干物质积累量、开花期的植株个体和群体质量均有升高, 花后茎鞘贮藏物质的输出及光合物质积累量增加, 子粒产量提高

7.3%。在施N 150 kg/hm²水平和基肥: 穗肥=6:2:2分配比例下, 与旋耕无麦秸还田处理相比, 免耕秸秆还田与否对水稻茎秆消长、干物质积累及子粒产量影响较小, 但花后绿叶功能期延长, 光合产物积累在产量形成中所占比例增加。在施N 210 kg/hm²水平和基肥: 穗肥=6:3:1分配比例下, 免耕还田麦秸量从6000 kg/hm²增加至12000 kg/hm², 水稻分蘖力明显增强, 干物质积累量增大, 开花期个体和群体质量提高, 单位面积穗数和穗实粒数增多, 产量增加4.1%; 将氮肥分配比例由6:3:1变为8:2, 即增加基肥用量, 减少中后期的氮素供应会导致分蘖高峰后分蘖大量死亡, 有效穗数降低, 穗粒数减少, 产量下降。以上结果说明, 氮素的充分供应是保护性耕作水稻获得高产的重要前提和基础, 适当提高麦秸还田量、增加中后期氮素供应, 能提高氮素利用率及分蘖成穗率和结实率, 利于稳产高产。

关键词: 稻麦轮作区 保护性耕作 氮肥调控 水稻 生长发育

Abstract: In rice-wheat cropping system, conservation tillage technology is widely used in wheat cultivation. Because seedling standing and high yield cultivation technology under the conservation tillage condition is not perfect, rotary tillage with no straw returning is also playing a dominant role in rice cultivation. From 2006 to 2008, the effects of nitrogen management on rice growth and grain yield under the conservation tillages were studied in Guanghan, Sichuan province. The results may be helpful to promote conservation tillage applying in rice cultivation. There were three wheat straw application rates (0, 6000 and 12000 kg/ha), three nitrogen fertilizer rates (N 0, 150 and 210 kg/ha) and different ratios of basic, tillering and spike fertilizer (6: 2: 2, 6: 3: 1, 8: 2) in the experiment. Wheat straw was returned with mulching treatment and rice seedlings were transplanted with digging-hole method. The results showed that the nitrogen fertilization is an important limiting factor for rice growth and yield improving under the conservation tillage condition. Compared with the 150 kg/ha nitrogen application during rice growth, the tillering ability, amount of dry matter accumulation, individual and population qualities at the flowering stage, and dry matter exported from stem and sheath and photosynthate accumulation after flowering are all increased under the 210 kg/ha nitrogen application and the yield are increased by 7.3%. Compared with the rotary tillage, the zero tillage has little effects on dynamics of stems and tillers, dry matter accumulation and grain yield whether wheat straw is returned under the 150 kg/ha nitrogen and application ratio of 6: 2: 2. However, the proportion of photosynthate from flowering to yielding is increased. Under the 210 kg/ha nitrogen and application ratio of 6: 3: 1, the tillering ability is enhanced, the individual and population qualities at the flowering stage and the panicles and filled grains per panicle are increased, and grain yield is increased by 4.1% when the amounts of wheat straw are applied from 6000 kg/ha to 12000 kg/ha. Increasing nitrogen application before transplanting and decreasing application at the panicle initiation stage can induce panicles, number of filled grains and yield. These results suggest that sufficient application of nitrogen is an important practice for high yielding of rice under the conservation tillage condition, and increasing wheat straw returning and nitrogen supplement at the middle and later growth stages has promoting effect on high-stable yield.

Keywords: rice-wheat cropping system conservation tillage nitrogen management rice growth and development; grain yield

Received 2009-05-25;

Fund:

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国家科技支撑计划项目（2006BAD15B08; 2006BAD15B03; 2007BAD89B15; 2007BAD89B01）资助。

引用本文:

李朝苏, 谢瑞芝, 黄钢, 吴春, 李少昆, 汤永禄. 稻麦轮作区保护性耕作条件下氮肥对水稻生长发育和产量的调控效应[J] 植物营养与肥科学报, 2010, V16(3): 528-535

LI Chao-Su, XIE Rui-Zhi, HUANG Gang, WU Chun, LI Shao-Kun, TANG Yong-Lu. Effects of nitrogen management on rice growth and grain yield under conservation tillage in rice-wheat cropping system[J] Acta Metallurgica Sinica, 2010, V16(3): 528-535

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