

研究论文

不同氮收获指数水稻基因型的氮代谢特征

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摘要 采用土培盆栽试验, 以3个氮收获指数(NHI)有显著差异的水稻基因型4434(低NHI)、滇瑞302(中NHI)和余赤23(高NHI)为材料, 研究了灌浆期叶片、穗颈和籽粒的氮代谢特点及与NHI的关系。结果表明, 各基因型的籽粒产量、收获指数和籽粒氮积累量与NHI的变化一致, 均以余赤231最大。花后植株氮素转运量表现为4434<滇瑞302<余赤231, 基因型间差异极显著, 而氮素转运率和转运氮的贡献率差异较小。成熟期水稻茎叶和籽粒的全氮含量、蛋白氮和非蛋白氮含量均表现为4434<滇瑞302<余赤231, 全氮含量和蛋白氮含量存在显著差异, 而非蛋白氮无显著差异; 余赤231茎叶蛋白氮积累量显著低于4434和滇瑞302, 而籽粒蛋白氮积累量显著升高, 是高NHI水稻氮积累的主要特征。余赤231灌浆期叶片和籽粒谷氨酰胺合成酶(GS)和谷氨酸合成酶(GOGAT)活性显著高于4434和滇瑞302, 有利于叶片游离氨基酸合成及外运, 使得穗颈节伤流强度和游离氨基酸含量升高, 为籽粒氮素积累提供了物质基础; 同时, 较高的籽粒GS和GOGAT活性促进了籽粒蛋白质合成, 提高了NHI。逐步回归表明, 灌浆期较高的穗颈伤流游离氨基酸含量是高NHI水稻氮代谢的主要生理特征, 与较高的花后氮转运量和籽粒蛋白氮积累量可共同作为水稻氮素高效管理和遗传改良的可靠指标。

关键词 [水稻](#) [基因型](#) [氮收获指数\(NHI\)](#) [氮代谢](#)

分类号

Nitrogen Metabolic Characteristics in Rice Genotypes with Different Nitrogen Harvest Index (NHI)

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Abstract Nitrogen harvest index (NHI), defined as ratio of nitrogen accumulation in economic organs to whole plant at harvest, is an important index for evaluating nitrogen utilization efficiency, but less information is available on its physiological mechanisms and regulation methods in rice cultivation. Pot experiment was conducted using three rice genotypes including 4434 (low NHI), Dianrui 302 (medium NHI) and Yuchi 231 (high NHI) to elucidate nitrogen metabolism characteristics in leaves, panicle internodes and grains during grain filling and their relationships to NHI. The results showed that change patterns of grain yield, harvest index and nitrogen accumulation in grains were consistent with that of NHI among three rice genotypes, and all the parameters were the highest in Yuchi 231. Highly significant differences were observed in nitrogen translocation amount after anthesis in plants with the order of 4434 < Dianrui 302 < Yuchi 231, while rate of N translocation and contribution rate of translocated N to grain had no significant difference among three genotypes. At maturity, the contents of total nitrogen, protein nitrogen and non-protein nitrogen in leaf-stems and grains exhibited the order of 4434

Key words [Rice](#) [Genotype](#) [Nitrogen harvest index \(NHI\)](#) [Nitrogen metabolism](#)

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