

# Plant Science

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## Nitrogen transformation characters in soil, use efficiency and rice grain yield as affected by soil aeration

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Nitrogen forms and concentration in the rice rhizosphere are the main factors that significantly affect the nitrogen absorption and utilization, while the transformation of nitrogen is mainly controlled by the oxygen content of the rhizosphere. This study evaluated the effects of calcium peroxide application (T1), micro-bubble aerated water irrigation (T2), topsoil moist irrigation (T3) and water-logging (CK) on soil redox potential, nitrogen transformation in soil and nitrogen utilization of rice. The results showed that the three aeration treatments significantly improved soil redox potential (Eh). The soil nitrification intensity and urease activity of T1, T2, and T3 were significantly higher than that of CK at tillering stage and full heading stage. In contrast, the denitrification intensity of T1, T2, and T3 were remarkably lower than that of CK. The oxygen enrichment treatments could affect the uptake of rice nitrogen differently. N accumulation amounts of the three rice cultivars were considerably higher in T1 and T2 than in CK at jointing, full heading and full ripe stage, while it was substantially lower than that of CK in T3. At full ripe stage, total N accumulation amounts of Zhongzheyu 1, IR45765-3B and Zhonghan 221 were increased by 21.2%, 13.2% and 17.0%, respectively, in T1 as compared with control, and increased by 14.3%, 6.9% and 9.1%, respectively, in T2. However, it was 11.5%, 13.4% and 13.4%, respectively, lower than that of control in T3, with considerable differences between treatments ( $P < 0.05$ ). Compared with control, the grain yield and harvest index of T1 and T2 were greatly increased. But their nitrogen grain production efficiency had no significant difference compared with CK. However, nitrogen biomass production efficiency and nitrogen grain production efficiency in T3 were considerably higher than that in control. Different aeration methods resulted in the differences of N harvest index among cultivars.

### Biography

Lianfeng Zhu conducted researches on rice high yield production and physiology with emphasis on improving nutrient use efficiency, root function and identifying the morphological traits and physiological processes that limit the advance of rice yield potential in the irrigated ecosystem at CNRRI. His group have developed an aerated water irrigation method which has obtained a national invention patent and published papers. His current researches focus on improving the nutrient use efficiency and reducing the nitrogen fertilizer input in rice production. Under the support of National Natural Science Foundation of China and Natural Science Foundation of Zhejiang Province, He conducts experiments to study the regulation mechanism of rhizosphere oxygen on nitrogen transform and nitrogen metabolism of rice. Simultaneously, try to develop a high-yielding rice cultivation technique with reduced nitrogen input and improved nitrogen use efficiency based on the regulation of rhizosphere oxygen concentration.

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