



Nitrogen use efficiency and yield components of rice as influenced by reducing nitrogen application under salinity conditions in a pot experiment

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ABSTRACT

Salinity and overuse of nitrogen (N) fertilizers are two major environmental concerns for rice cultivation that make improving nitrogen use efficiency (NUE) and yield under saline conditions indispensable. However, little is known about NUE during the reproductive stage or rice yield under both salt stress and low N input. This study evaluated the effects of reduced nitrogen on NUE, yield and its components for rice grown in saline soil. A pot experiment was conducted with four N and three NaCl levels using four rice cultivars. High salinity nullified the effects of N on the rice growth and grain yield (GY). By increasing N levels, N efficiency for GY was 15.09, 6.82, and 1.94 under non-saline, moderate, and high salinity levels, respectively. Under moderate salinity, most measured parameters including shoot dry weight (SDW), shoot N content at active tillering (SNC), effective panicle number (EPN) and GY increased significantly with N levels, but to a lesser extent than those of plants grown under non-saline conditions. Regardless of salinity level, increasing N levels significantly reduced agro-nomical NUE (agNUE) at active tillering, but neither at heading nor at maturity. Under saline conditions, agNUE was strongly and positively correlated with absorption NUE (0.90 and 0.97, $p < 0.001$) and with a lesser extent to physiological NUE (0.67 and 0.62, $p < 0.05$) under moderate and severe salinity, respectively during active tillering. Therefore, the improvement in N uptake during active tillering should be investigated as a way to enhance the NUE, EPN, and GY of rice grown in saline conditions.

Abbreviations: AgNUE: agronomical nitrogen use efficiency; Anue: absorption nitrogen use efficiency; EC: electrical conductivity; EPN: effective panicle number per plant; GY: grain yield per plant; N: nitrogen; NUE: nitrogen use efficiency; NUEg: nitrogen use efficiency for grain; PCA: principal component analysis; PH: plant height; pNUE: physiological nitrogen use efficiency; SDW: shoot dry weight; SNC: shoot nitrogen content; TN: tiller number; WAT: weeks after transplanting

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Introduction

Rice is a staple food for more than half of world's population. However, its cultivation faces salt intrusion in tropical river deltas (Smajgl et al. 2015; Wassmann et al. 2019) especially in Vietnam.

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