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Critical Nitrogen Dilution Curve for Rice Nitrogen Status Diagnosis in Northeast China

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ABSTRACT

In-season diagnosis of crop nitrogen (N) status is crucial for precision N management. Critical N dilution curve and N nutrition index (NNI) have been proposed as effective methods for diagnosing N status of different crops. Critical N dilution curves have been developed for Indica rice in the tropical and temperate zones and Japonica rice in the subtropical-temperate zone, but they have not been evaluated for short-season Japonica rice in Northeast China. The objective of this study was to evaluate the previously developed critical N dilution curves for rice in Northeast China, and develop a more suitable critical N dilution curve in this region. A total of 17 N rate experiments were conducted in Jiansanjiang, Heilongjiang province in Northeast China from 2008 to 2013. The results indicated that none of the two previously developed critical N dilution curves was suitable for diagnosing N status of the short season Japonica rice in Northeast China. A new critical N dilution curve was developed and can be described by the equation $N_c = 27.7W^{-0.34}$ (aboveground biomass ≥ 1 Mg DM ha^{-1}) or N_c = 27.7 g kg^{-1} DM (aboveground biomass < 1 Mg DM ha^{-1}). This new curve was lower than those previous curves. It was validated using a separate dataset, and it could discriminate non-limiting and limiting N nutritional conditions. More studies are needed to further evaluate it for diagnosing N status of different rice cultivars in Northeast China and develop efficient non-destructive methods to estimate NNI for practical applications.

Key Words: Nitrogen nutrition index, Japonica rice, Precision nitrogen management, Nitrogen use efficiency, Plant nitrogen concentration