

Identification of Nitrogen Efficient Indica Rice (*Oryza sativa* L.) Genotypes: A physiological and Multivariate statistical approach

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Abstract

Nitrogen efficiency (NE) is an important approach to develop nitrogen use efficient (NUE) genotypes in rice growing regions globally. Identification of nitrogen (N) tolerant genotype is the foremost step to develop Nitrogen Use Efficient (NUE) genotypes. In order to identify the N tolerant genotypes in popular indica rice a hydroponic experiment was conducted in glass house with various concentrations of N and 26 genotypes were screened by measuring growth dynamics, biomass accumulation and NE traits. The data revealed that growth dynamics viz., morphological (TNL, RL and SL), biomass (RFW, SFW, RDW, SDW and TDM) and NE traits showed high genotypic variation for N treatments. Of which root and shoot traits were significantly influenced the nitrogen efficiency trait of genotypes. Based on NE; genotypes were categorized as High Efficient; Medium efficient and Low efficient genotypes. Growth dynamics and NE traits were higher in DRRH3 at low N condition; while BPT5204 responds very poor under low N which confirmed that DRRH3 as most N-efficient and BPT5204 as most N-inefficient genotypes. Further experimental data was subjected to multivariate statistical analysis by means of Pearson correlation, PCA and hierarchical clustering of heatmap analysis. The statistical data is in tune with the experimental data and strongly supported that root and shoot traits are most contributing traits for NE of genotypes. The data

generated in the present study is very useful for the selection of genotypes as parents for the development of NUE genotypes of rice.

Key words: Rice genotypes, N treatments, growth dynamics, Nitrogen efficiency, Multivariate statistical analysis, N-efficient and N-inefficient genotypes.

Introduction

Rice is a staple food crop of the world; sixty percent of the global population depends on it for more than 22% of their daily calories (20). Ninety percent of the global rice is produced especially from Asian countries i.e., China, India, Indonesia, Bangladesh, Vietnam, Thailand, Myanmar, Pakistan, Philippines, Korea and Japan. Among the rice growing countries India occupies largest place with 44.8 million hectares of cultivation followed by China and Indonesia. Over the past half-century a marked increase in rice production attributed due to high yielding genotypes, usage of more folds of N-chemical fertilizers and modern agricultural techniques (25).

To steady the food demands; increased use of N- fertilizer content in the world from 3.5 million metric tons in 1960 to projected 187.7 million metric tons in 2015 and 223.1 million metric tons by 2030 (37). A major portion of global N-fertilizer would be used for the production of the rice (42). Rice based cropping system is one the most