ONLINE ISSN : 1349-1008
PRINT ISSN : 1343-943X

Plant Production Science
Vol. 11 (2008) , No. 3 324-335

Genotypic Variations in Responses of Lateral Root Development to Transient Moisture Stresses in Rice Cultivars

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(Received: December 7, 2007)

Abstract: Soil water regimes under field conditions inevitably tend to fluctuate ranging from drought to waterlogging. Genotypes that adapt better to such changing hydrologic conditions are assumed to have the ability to maintain root system development under such conditions. This study aimed to evaluate the responses of root system development based on lateral root production to transient moisture stresses, and the contribution of the elongation of seminal and nodal root axes and their lateral, root branching, and aerenchyma development in the seminal root axis, to root system development. The seedlings of two aerobic genotypes (UPLRi7 and NSICRc9) and one irrigated-lowland genotype (PSBRc82), and two parental genotypes (Nipponbare and Kasalath) of chromosome segment substitution lines (CSSLs) were grown by hydroponics. The seedlings were exposed to a drought condition by adding polyethylene glycol to the solution for 7 days and then to an O_2-deficient stagnant condition for 7 days (drought-to-stagnant condition), or to reverse successive conditions (stagnant-to-drought condition). Under both conditions, the aerobic genotypes showed greater ability to produce lateral roots than the irrigated-lowland genotype. Under the transient stagnant-to-drought condition, the root traits that contributed to greater lateral root production in the aerobic genotypes were faster seminal root elongation that was closely associated with branching of lateral roots, and greater nodal root production. Under transient drought to stagnant condition; these were faster seminal root elongation mediated by higher aerenchyma formation, and greater nodal root production. Kasalath showed much greater ability to produce lateral roots under both transient moisture stress conditions than Nipponbare. This indicates the potential utility of the CSSLs for

precise identification of desirable root traits with less genetic confounding.

Keywords: Aerenchyma, Aerobic rice, Chromosome segment substitution lines, Drought, Lateral root production, O_2 deficiency

To cite this article:

Roel R. Suralta, Yoshiaki Inukai and Akira Yamauchi: “Genotypic Variations in Responses of Lateral Root Development to Transient Moisture Stresses in Rice Cultivars”. Plant Production Science, Vol. **11**, pp.324-335 (2008) .

doi:10.1626/pps.11.324

JOI JST.JSTAGE/pps/11.324