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# Stomatal Responses in Rainfed Lowland Rice to Partial Soil Drying ; Evidence for Root Signals

Joel DLC. Siopongco[1)], Kazumi Sekiya[2)], Akira Yamauchi[2)], James Egdane[1)], Abdelbagi M. Ismail[1)] and Len J. Wade[3)]

1) International Rice Research Institute
2) Graduate School of Bioagricultural Sciences, Nagoya University
3) School of Plant Biology M084, The University of Western Australia

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**Abstract:** The role of root signals in water deficit responses of rice (*Oryza sativa* L.) is important in the alternate flooding and drying conditions encountered in the rainfed lowlands, where the abundant roots in shallow soil layers may generate signals when droughted, with consequent reduction in stomatal conductance ($g_s$) and growth, despite the likelihood of additional water in deeper soil layers. This study was conducted to confirm the presence of root signals, explore their nature and plant responses, consider the suitability of the methods, and discuss implications for adaptation under rainfed lowland drought. A split-root technique was used in greenhouse studies, whereby roots were divided into two sections: flooded and droughted. The decrease in $g_s$ and transpiration rate (Tr) due to drying of a portion of the roots, and their apparent recovery upon severing of this root portion, were consistent with the role for signals. The field study confirmed the evidence for root signals during progressive soil drying, whereby $g_s$ and Tr decreased before leaf water potential ($\Psi_L$) started to decline. The increase in leaf ABA concentration under field drought, and its strong association with soil moisture tension and $g_s$, suggested its involvement in mediating stomatal responses during early drought in rice. The recovery in $\Psi_L$ after severing of droughted roots in the greenhouse could be attributed to increased hydraulic conductance.

These responses imply a role for both chemical and hydraulic signals in rice, which have important implications for adaptation and crop performance in contrasting rice ecosystems.

**Keywords:** Drought, Rainfed lowland, Rice, Root signals, Stomatal conductance, Water deficit



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