

Paper presented at the International Rice Congress 2023 from October 16-19 in Manila, Philippines.

Root anatomy and adaptations of rice (*Oryza sativa* L.) and barnyard grass (*Echinochloa crus-galli* (L.) P.Beauv.) across diverse agro-ecological regions in Sri Lanka

Buddhika S. Chamara¹, Bhagirath Chauhan², Buddhi Marambe³, Dhanushka Udayanga¹, Raju Bheemanahalli⁴, Virender Kumar⁵

1 Department of Biosystems Technology, Faculty of Technology, University of Sri Jayewardenepura, Nugegoda, Sri Lanka. 2 Queensland Alliance for Agriculture and Food Innovation (QAAFI), School of Agriculture and Food Sciences (SAFS), The University of Queensland, Queensland, Australia. 3 Department of Crop Science, Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka. 4 Department of Plant and Soil Sciences, Mississippi State University, Mississippi, USA. 5 International Rice Research Institute

Rice cultivation in Sri Lanka faces a significant challenge from weeds, which have proven their adaptability to changing environmental conditions and their ability to compete with rice plants for vital resources. Climate change has further exacerbated this problem by altering weed distribution and population densities across various agroecological regions. Weeds often possess unique anatomical and morphological traits that enable efficient water and nutrient absorption, promoting rapid growth and enhancing their competitiveness against rice plants. Conversely, rice plants struggle to obtain sufficient nutrients for basic cellular processes, as plant growth and development depend on soil mineral composition and successful root absorption. This study investigates the root anatomy and adaptive traits that influence the growth of rice and a dominant weed species in rice ecosystems within different agroecological regions of Sri Lanka. Root samples from rice and barnyard grass (*Echinochloa crus-galli* (L.) P.Beauv.) were collected at the flowering stage from wet-direct-seeded-rice (WDSR) ecosystems in four agroecological regions (DL1b, DL1c, IL1a, and IL3). The root cross-section diameter of barnyard grass was significantly higher (1453.3 μm) than that of rice (945.6 μm) in DL1b and IL3. However, no significant difference in root cross-section diameter was observed between rice and barnyard grass in DL1c and IL1a. In terms of the stele diameter, barnyard grass exhibited a significantly higher value (309.3 μm) across all agroecological regions, compared to rice (173.3 μm). Moreover, barnyard grass had a significantly higher mean number of metaxylem (6.8) than rice (4.3). Additionally, barnyard grass displayed a larger metaxylem diameter (37.3 μm) than rice (33.7 μm), unaffected by the agroecological region. These findings shed light on the root anatomical differences between rice and barnyard grass, potentially contributing to the weed's superior competitive abilities in rice ecosystems. Understanding these traits can guide the development of targeted strategies to mitigate weed infestation and enhance rice productivity. Moving forward, our research will continue to explore additional factors influencing weed-rice competition, such as soil nutrient composition.

© By the *International Rice Research Institute (IRRI)* and is licensed for use under *Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0)*