Soil water availability and capacity of nitrogen accumulation influence variations of intrinsic water use efficiency in rice

Leaf intrinsic water use efficiency (WUE_i) coupling maximum assimilation rate (A_{max}) and transpirable water lost via stomatal conductance (g_{sc}) has been gaining increasing concern in sustainable crop production. Factors that influence leaf A_{max} and WUE_i in rice (*Oryza sativa* L. cv Unkang) at flooding and rainfed conditions were evaluated. Positive correlations for leaf nitrogen content (N_m) and maximum carboxylation rate (V_{cmax}), for nitrogen allocation in Rubisco enzymes and mesophyll conductance (g_m) were evident independent of cropping cultures. Rainfed rice exhibited enriched canopy leaf average $N_m$resulting in higher A_{max}, partially supporting improved leaf WUE_i. Maximum WUE_i (up to 0.14 μmol $mmol^{-1}$) recorded in rainfed rice under drought conditions resulted from increasing g_m/g_{sc} ratio while at cost of significant decline in A_{max} due to hydraulically constrained g_{sc}. A_{max} sensitivity related to g_{sc} which was regulated by plant hydraulic conductance. WUE_i was tightly correlated to V_{cmax}/g_{sc} and g_m/g_{sc} ratios across the paddy and rainfed not to light environment, morphological and physiological traits, highlighting enhance capacity of N_m accumulation in rainfed rice with g_{sc} at moderately high level similar to paddy rice facilitate optimization in A_{max} and WUE_i while, is challenged by drought-vulnerable plant hydraulic conductance.