Seminar

Biophysics & Applied Microbiology Group

# How Plants Survive Saline Soils: Insights from Plant Physiology and Genetics

Date: 8/31/2026(Monday)10:45 -12:00
Location: TARA Center Building C
(Nomura Lab Seminar Room)
Speaker: **Dr. Noppawan NOUNJAN**
Language: English


Abstract (Version 1)
Understanding how plants survive saline soils through insights from plant physiology and genetics is critical for mitigating the severe constraints soil salinity poses on global rice productivity. This work presents a comprehensive investigation structured around three interconnected themes: (1) identifying salt-tolerance mechanisms using drought-tolerant rice chromosome segment substitution lines (CSSLs) carrying DT-QTL8; (2) enhancing tolerance via exogenous osmoprotectants and biostimulants; and (3) screening diverse rice germplasm to identify different ways plants handle salt and find useful genetic resources. Theme 1 demonstrated that CSSLs with DT-QTL8 segments exhibited pronounced cross-tolerance to salinity through superior photosynthetic performance, chlorophyll retention, osmotic adjustment, ion homeostasis, and high water-use efficiency. Co-expression network analyses identified key candidate genes (e.g., *Os08g41990*, *Os08g43230*) involved in chlorophyll biosynthesis and redox regulation, revealing overlapping drought–salt responsive networks. Theme 2 showed that exogenous proline and trehalose substantially accelerated post-stress recovery by modulating antioxidant enzyme activities and reducing $Na^+/K^+$ ratios, although they did not alleviate immediate growth inhibition. Spermidine priming effectively improved germination of deteriorated seeds and reduced membrane damage under salt stress, while field applications of spermidine and wood vinegar significantly enhanced yield and yield components in salt-sensitive cultivars. Transgenerational stress memory from maternal biostimulant treatments further boosted offspring seed vigor under saline conditions. Theme 3 uncovered genotype-specific tolerance mechanisms: the green-leaved reference Pokkali relied on root-to-shoot Na exclusion, whereas the purple-leaved ND 019 and the promising landrace ‘Surin’ employed osmotic adjustment. Collectively, integrating drought-derived QTLs, targeted exogenous interventions, and systematic phenotypic screening offers a powerful multidisciplinary framework for developing climate-resilient, salt-tolerant rice germplasm.


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