Pan-genomics and -transcriptomics of symbiotic nitrogen fixation in mungbean

Grundy E1,2, Mens C1, Udvardi M1,\*

*\** *m.udvardi@uq.edu.au*

1. Queensland Alliance for Agriculture and Food Innovation, The University of Queensland, St Lucia QLD 4072, Australia
2. Integrative Legume Research Group, School of Agriculture and Food Sustainability, The University of Queensland, St Lucia QLD 4072, Australia

Legumes can thrive in low nitrogen environments due to their ability to utilize atmospheric di-nitrogen via symbiotic nitrogen fixation (SNF) by rhizobia housed in legume root nodules. SNF is a complex plant trait with over 200 genes found to contribute substantially in a few model species. However, SNF varies between and within a species meaning the goal of improving SNF in legumes will require work on collections of diverse genotypes, to understand the genetic potential for improvement within each target species. To facilitate this for the tropical legume, mungbean, we have begun to characterize the pan-genome and transcriptome from the point of view of nodulation and SNF. Mungbean’s short life cycle makes it an ideal, high value component of existing cropping systems that provides soil N enrichment amongst other benefits. To begin to explore the natural variation of SNF in mungbean, eight diverse genotypes were selected to compare SNF-related traits, including biomass, nodulation phenotypes, N derived from the atmosphere (Ndfa) and gene expression. 15N isotope analysis allows us to determine %Ndfa and total Ndfa providing an estimate for SNF effectiveness. Comparative transcriptome analysis is being undertaken to investigate SNF gene expression in these different genotypes. Together, these results will provide a foundation to understand the SNF capabilities of diverse mungbean accessions. This, coupled with Genome Wide Association Studies in hundreds of diverse mungbean genotypes, will advance our understanding of the genetic basis of SNF and its improvement via predictive plant breeding and genome editing in mungbean.