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Insertion mutagenesis of *Medicago truncatula* and its utilization to identify novel sources of resistance against Asian soybean rust

Retrotransposons, retrovirus-like elements which encode proteins required for their own replication and transposition, can be used for insertional mutagenesis. Retrotransposons can be activated by tissue culture and preferentially insert in gene-rich regions of the genome. The absence of excision during transposition makes retrotransposons ideal for saturation mutagenesis with stable tags. Tobacco retrotransposon, *Tnt1,* has been used to mutagenize and tag the whole genome of a model legume, *Medicago truncatula*. Tnt1 is very active and transpose into, on average, 25 different locations during *M. truncatula* tissue culture. Mutations induced by *Tnt1* insertion are stable during seed to seed generation. We have generated over 20,000 independent *Tnt1*-containing lines encompassing approximately 500,000 insertion events. Over 300,000 Tnt1 flanking sequence tags (FSTs) have been recovered and a database has been established. We have pooled genomic DNA from all the lines for customized reverse-genetic screening, and the frequency of insert identification in this pool for average-sized-gene is approximately 85% percent. The range and diversity of mutant phenotypes obtained to date suggest that *M. truncatula* offers a great opportunity to dissect symbiotic and developmental pathways for comprehensive understanding of legume biology. A forward genetics approach using Tnt1 tagged M. truncatula lines has been established (Fig. 1) to identify genes that confer nonhost resistance to Asian Soybean Rust pathogen, *Phakopsora pachyrhizi*. Several *M. truncatula Tnt1* mutants with altered response to *P. pachyrhizi* have been identified and being characterized. irg1 (inhibitor of rust germ-tube differentation1) mutant inhibited pre-infection structure differentiation of *P. pachyrhizi* and several other biotrophic pathogens. *IRG1* encodes a Cys(2) His(2) zinc finger transcription factor, *PALM1* that also controls dissected leaf morphology in *M. truncatula*. Characterization of other mutants will also be presented.

Biography

Kirankumar S Mysore is a Professor at the Noble Research Institute. He joined the Noble in 2002. He also holds Adjunct Professorship at the Department of Entomology and Plant Pathology, Oklahoma State University. He received his Bachelor's degree in Agriculture at the University of Agricultural Sciences, Bangalore (India), Master's degree in Horticulture at Clemson University and PhD in Genetics at Purdue University in 1999. He did his postdoctoral training at the Boyce Thompson Institute for Plant Research, Cornell University. His main research interests center on molecular plant-microbe interactions. Research approaches in his group include genetics and genomics to better understand how plants defend against pathogens. In addition, he has developed genetic resources (*Tnt1* insertion lines) in *Medicago truncatula* that is now widely used by the legume community. He has published over 150 papers and book chapters in international journals.

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