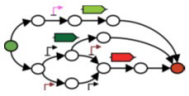
Engineering Conditional Synthetic Signalling Between Plant And Rhizosphere Bacteria

Principal Investigator
Dr. Ponraj
Associate Professor
School of Bio Sciences and Technology (SBST)

Graphical Abstract/Layout



"Synthetic genetic circuits as a means for programming root specific, nitrogen starvation inducible rhizopine signalling to deliver nitrogen to crops"

1. Nat Commun. 2019, 10(1): 3430 & 2. Proc Natl Acad Sci U S A. 2022, 119(16): e2117465119

Project Description:

Rhizospheric microbiomes significantly influence host plant health and agricultural productivity. Interkingdom signalling between plants and microbes plays an important role in shaping root microbial communities. I have been involved in engineering synthetic plant-microbe signalling in cereals and demonstrating control of beneficial traits in rhizobacteria to achieve desirable rhizosphere effects (1 & 2). The constitutive overexpression of transgenes across the whole plant affects its growth patterns as well as constitutive cross-kingdom signalling can be detrimental to fitness of rhizobacteria engineered to deliver useful functions to host plant.

Synthetic gene circuits are a promising approach for programmable control of transgene expression to engineer new biotechnology applications in plants. I propose to develop new synthetic gene circuits and logic gates capable of reversibly controlling transgene expression in specific transcriptional patterns in response to multiple customizable input signals in any part of the whole plant analogous to natural gene regulatory systems and engineer conditional transkingdom signalling to control diverse metabolism in bacteria colonizing cereal rhizosphere.

***

Name of the Funding Agency
Department of Biotechnology (DBT)

Name of the Scheme
DBT-Ramalingaswami Re-entry Fellowship (RRF)

Sanctioned Amount (in Rupees)
Rs. 83,16,000

Duration of the Project (years)
3