Exploring the Effects of Soil Acidity on Root Nodulation in Chickpeas

Jose A1, Mathesius U1, Ryan PR1, Delhaize E1, Raman H2, Raman R2

*alex.jose@anu.edu.au*

1Research School of Biology, Australian National University, Canberra, Australia

2Wagga Wagga Agricultural Institute, NSW Department of Primary Industries, Wagga Wagga, Australia

Chickpea (*Cicer arietinum*) is a major legume crop. The optimum soil pH range for chickpea growth is between 6.0 – 8.0. Soil acidity (pH<5.5) negatively impacts plant growth and causes nutrient deficiencies and toxicities. Previous studies hypothesize that, in legumes, soil acidity may disrupt the chemical signaling between host plants and rhizobia and reduce rhizobial colonisation, leading to reduced nodulation[1]. However, such studies are lacking in chickpeas. This project aims to evaluate the nodulation and nitrogen fixation of various cultivated chickpea varieties under acid soil conditions. Furthermore, it will identify the nodulation stages that are affected by soil acidity and the factors contributing to reduced nodulation. Around 75 cultivated chickpea varieties will be grown in river sand in glasshouses under two different pH ranges (4.5 - 5.0 and 6.0 - 6.5). Initially, a general screening will be performed in this setup to identify varieties that are nodulating better under acid soil. Two varieties with contrasting nodulation ability under low pH conditions would be used to perform detailed nodulation time-course experiments to identify the nodulation stages that are affected by soil acidity and to observe the changes in nodule anatomy, flavonoid production, and *nod* gene induction in rhizobial symbiont, under acid soil conditions. Overall, this study will identify the chickpea cultivars best suited to low pH conditions and provide breeders with options for improving chickpea nodulation and yields on acid soils.

***References:***

[2] Ferguson, B. J. et al., 2013, Plant signaling & Behavior, 8(3), e23426.