Improving cowpea development and physiology for growth in phosphorus-deficient African soils

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Cowpea is a staple crop in tropical and subtropical regions of the world. However, yields for subsistence farmers in Africa are often poor due to low soil phosphorus (P). We tested soils from Nigerian savannah and found that the soils are extremely depleted of P in all forms. An immediate approach for yield improvement will therefore require affordable external P inputs and cowpea varieties with high Phosphorus Uptake Efficiency and Phosphorus Use Efficiency (PupE and PUE). In the longer term, soil nutrients must be managed (particularly P). Whilst Sokoto rock phosphate is cheap and accessible in Nigeria, the P therein is not bioavailable. To address this limitation, we are identifying cowpea cultivars that can mobilise fixed P and exploring the potential of P-solubilising rhizobacteria (PSR). We have grown 52 cowpea genotypes under low and high P conditions and have identified high PupE and PUE genotypes. We have also isolated rhizobacteria and are screening for PSRs able to solubilise Sokoto rock phosphate. As field-grown cowpeas are nodulated, we have isolated N2 fixing *Bradyrhizobia.* These resources will be used to identify combinations of cowpea genotypes and PSRs that can grow well, and maintain effective rhizobia N2 fixation, in low P soils amended with Sokoto rock phosphate. Currently, we are applying transcriptomic and metabolomic analysis to understand the molecular pathways responsible for cowpea variation in the PupE and PUE genotypes and, we will assess the root system architecture to identify genotypes with deep tap roots for uptake of groundwater.