

## ABSTRACT

This study investigated the diversity of a number of local and exotic pigeonpea rhizobia isolates using molecular and morpho-physiological methodologies to understand their phylogenetic relationships. A selected number of isolates were evaluated for nodulation and nitrogen fixing traits in pure culture, greenhouse and field studies to investigate the influence of genotype, soil type and nitrogen level on nitrogen fixation. The results indicated diversity among the local strains in relation to the reference strains based on partial 16S rRNA gene sequence analysis. The majority of the isolates clustered with the reference strains belonging to *Bradyrhizobium elkanii* with four accessory clusters, two of which were related to *Bradyrhizobium japonicum*/*Bradyrhizobium* sp. clusters and one related to *Rhizobium galegae*. Results of the morpho-physiological studies confirmed the phylogenies based on molecular data and provided a means to further classify the isolates into lower levels of taxa. Large variations within isolates in their ability to nodulate and fix nitrogen were observed. Nodule weight was identified as a good indicator for strain selection. Genotype x isolate interaction, for a number of nitrogen fixing parameters, was also found to be significant in greenhouse soil experiments, but was not of the "crossover" type. The effectiveness of inoculation was found to be dependent on soil type, soil N and pigeonpea genotype in field studies. Strategies to improve the effectiveness of nitrogen fixation are discussed.