

Does Rhizobial Inoculation Functionality Vary with Host Plant Genotype? A Case Study of Common Bean *Phaseolus vulgaris* L. Germplasms Grown by Smallholder Farmers in Eastern Kenya.

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ABSTRACT

Rhizobia inoculants promote biological nitrogen fixation (BNF) and enhance yield in legumes. Understanding of rhizobia diversity and host genotype association can enhance crop production. To determine whether rhizobia inoculation, diversity and functionality varies with host plant genotypes, we investigated the effect of a consortium of native and commercial rhizobia inoculants on nodulation and growth of ten common bean (*Phaseolus vulgaris* L.) varieties widely cultivated in Eastern Kenya. Questionnaires were used to identify the bean varieties grown in Eastern Kenya. The native rhizobia were obtained from the root nodules of MAC 13 and MAC 64 bean varieties, which were used as trap cultures. Afterwards, a greenhouse bioassay was conducted where the obtained varieties were grown and either inoculated with a consortium of native rhizobia, exotic rhizobia (Biofix), a mix of native consortium and exotic rhizobia, or left without inoculation. The crops were sampled after four weeks, and examined for nodule number (NN), nodule dry weight (NDW), shoot dry weight (SDW), root dry weight (RDW) and shoot nutrients namely; nitrogen (N), phosphorus (P), and potassium (K). The highest significant ($p < 0.001$) SDW and N content were achieved in bean plants inoculated with a mix of native consortium and exotic rhizobia (Biofix), the highest significant NN, NDW, and P content were realized in bean plants inoculated with native rhizobia. The bean varieties responded differently in nodulation and nitrogen fixation. Kabuu produced the highest significant ($p < 0.001$) NDW, SDW, N and P content of all varieties. The consortium of native rhizobia showed a higher efficacy compared to the exotic rhizobia (Biofix) and demonstrated its potential in promoting BNF. Interestingly, increasing rhizobia isolates diversity enhanced shoot dry weight, shoot nitrogen as well as phosphorus in most common bean varieties. Therefore, further studies should explicate the performance of the diverse native rhizobia inoculants used here under field conditions.

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