

## ABSTRACT

Agriculture in the Midwestern USA is increasingly characterized by fewer annual crops in the landscape that has led to growing efforts seeking for more sustainable land uses. The inclusion of nitrogen-fixing legumes in agroecosystems can provide environmentally friendly supply of this nutrient, mitigating agriculture-related environmental degradation. Illinois bundleflower [*Desmanthus illinoensis* (Michx.) MacMillan], a perennial herb native to the central and Southeastern USA, has proven potential as both forage and grain crop. However, in 2002 inoculant-quality rhizobial strains were not available for this plant. We identified inoculant-quality strains from among those trapped from 64 sites within the native range of Illinois bundleflower and determined the effect of inoculation with these strains on plant dry matter and plant total N in growth chamber, greenhouse, and field. We also studied nodule occupancy in the field. The microsymbiont genetic diversity within the geographic range of the host was studied using rep-PCR. Host range, cultural characteristics, and 16s rRNA gene-sequence analysis was performed in selected strains. Three plant accessions showed responses to inoculation averaging 170% in plant dry matter production at Salina (Kansas) and Becker (Minnesota) in the seeding year. At Becker, only a Minnesotan adapted ecotype overwintered and inoculation was a requirement for plant persistence. Rhizobial isolates studied using rep-PCR grouped in ten major clusters without apparent relation to geographic proximity. The four inoculant-quality strains selected clustered with *Rhizobium giardinii*—a rhizobial species originally described in France. This research shows the importance of selection of inoculant-quality rhizobial strains if the use of native legumes is to be increased, while at the same time poses new questions on the biogeography of rhizobia.