NITROGEN FIXATION AND DROUGHT TOLERANCE IN INTERSPECIFIC *PHASEOLUS* HYBRIDS

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THESIS ABSTRACT

Interspecific hybrids between the drought sensitive common bean (*Phaseolus vulgaris* L.) and the drought tolerant tepary bean (*P. acutifolius* A. Gray) have the potential to increase bean production in regions where rainfall is limited. The objective of this research was to evaluate *Rhizobium* specificity, nitrogen fixing ability, and drought tolerance in selected interspecific hybrids and their parental lines.

Growth pouch and Leonard jar experiments were conducted to determine *Rhizobium* specificity. The fast-growing rhizobia strain UMR 1899 and the slow-growing rhizobia strain UMR 3041 were used to inoculate common bean and tepary bean parental lines and their interspecific hybrids. Advanced generation hybrids nodulated with both fast and slow growing rhizobia strains; however, the fast growing UMR 1899 was more compatible with these hybrids than the slow growing UMR 3041. More than 90% of the nodules from the hybrids were occupied by UMR 1899. Host specificity of nodulation from the parental lines was apparently expressed in the advanced generation hybrids.

Hybrids and parental lines were exposed to water stress in pots containing a loamy sand soil. Leaf water potential was lowered in all genotypes in response to water stress. Nodulation and nitrogenase activity were inhibited in response to water stress; however, the common bean parents were more affected than the tepary bean parent or the hybrids. Both fast- and slow-growing rhizobia were able to infect the hybrids. In nonstressed treatments, UMR 1899

occupied the majority of the nodules in the hybrids, while water stress reduced nodule occupancy by this strain. Dry matter and nitrogen accumulation were negatively affected by water stress in all genotypes. The hybrids, however, had higher water use efficiency and nitrogenase activity than the common bean parents under dry conditions and may have value for the genetic improvement of P. vulgaris.