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Effects of shade on growth and nodulation of

THREE NATIVE LEGUMES

with potential for use in agroforestry

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ABSTRACT

In the Midwest US, native legume species adapted to savanna environments may grow well under varying shade conditions. These species may be ideal for use within tree rows in alley-cropping practices and on tree plantations by providing biologically fixed nitrogen, ground cover, and wildlife food and habitat. A greenhouse experiment was conducted to evaluate the effect of 3 different light levels (100%, 45%, 20%) on the growth and nodulation of 3 *Desmodium* (Fabaceae) species: Hoary ticktrefoil (*D. canescens* (L.) DC.), Showy ticktrefoil (*D. canadense* (L.) DC.), and Illinois ticktrefoil (*D. illinoense* A. Gray). All species produced equal amounts of dry matter at 45% and 100% light, but significantly less dry matter at 20% light. All species had greater or equal concentrations of nitrogen (N) at 20% light compared with 45% or 100% light. The number of nodules per gram of plant dry weight and nodule dry weight was similar at all light levels within each species. A significant species x light interaction was found for the number of nodules per plant because nodule number decreased in both *D. canescens* and *D. canadense* but not in *D. illinoense* for plants grown at 20% in comparison with 45% light. The number of nodules per plant and the number of nodules per gram of plant dry weight were lower under all light conditions for *D. illinoense* compared with the other species. Results indicate that these native legumes grow as well at 45% light as they do at 100% light, and shade does not reduce N concentration.

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KEY WORDS
Desmodium canadense, D. canescens, D. illinoense, shade tolerance

NOMENCLATURE
Plants: USDA NRCS (2009)

Photo of *Desmodium canadense* by Thomas G Barnes

Native legumes, once integral to North American grassland ecosystems, have attracted renewed attention in recent years. Their use in prairie restoration and as livestock forages and even grain crops have been the subject of recent investigations (Kulakow 1999; Lin and others 1999; DeHaan and others 2003; Fischbach and others 2006). In Missouri, the native legume genus *Desmodium* is an important source of wildlife food and habitat (Steyermark 1963; Sudkamp and others 2008) and is included in seed mixes for some CRP practices (Figure 1). There are at least 20 *Desmodium* species in Missouri (Raveill 2005) and they are found on sites ranging from open prairies and glades to savannas and woodlands (Steyermark 1963) (Figure 2). Because of this diversity, several *Desmodium* species were evaluated by Lin and others (1999) for use in silvopastoral systems. They reported that dry matter production of *D. canescens* and panicledleaf ticktrefoil (*D. paniculatum* (L.) DC. [Fabaceae]) did not decline when light was reduced under simulated shade suggesting that some *Desmodium* species would yield well in shaded environments and possibly contribute significant amounts of nitrogen (N) to the site. Reports on the shade tolerance of tropical *Desmodium* species also suggest a range in tolerance to reduced light intensity (Ericksen and Whitney 1982; Wong and others 1985; Stür 1991; Wong 1991) with some species reaching maximum biomass yield at light intensities as low as 34 to 45% full sunlight.

Because native legumes often have greater concentrations of crude protein and neutral detergent fiber than is commonly