

Challenges to domesticating native forage legumes

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Introduction

If ruminant production from cultivated and natural grasslands is to depend less on petroleum-based products, forage legumes must serve as protein sources. Commercially available legumes for warm-dry climate grasslands are, however, very limited and resources available for developing such legumes are inadequate. Indeterminate flowering and dehiscent seed pods combined with the need for specialized seed harvesting equipment are major impediments (Butler and Muir 2012). In warm climates, challenges to legume establishment and persistence include poor rainfall distribution, extended dry seasons, temperature extremes and aggressive grass species (Muir et al. 2011). Erosion of indigenous knowledge and replacement with inappropriate land management approaches from moist-temperate regions compound the challenges.

Limited efforts to commercialize local native legumes have addressed this opportunity. The few current programs are regional and limited to locations with support from wealthy segments of the population. South Texas Natives (Smith et al. 2010), a success story in North America, receives support from ranchers interested in wildlife restoration, government agencies under pressure to use other than exotic germplasm for rangeland restoration and roadside revegetation, energy companies obligated to restore disturbed grasslands with natives and interested local commercial seed companies. Such broad-based support, including involvement of grazing managers, is rare, especially where the need is greatest.

Germplasm for native area restoration is sought from the target ecosystem, but such local seed is often

expensive and may not be available. Some herbaceous grassland legumes, however, are found across wide ranges of latitude, longitude, soil, climate and ecosystems. Examples in North America include *Desmanthus illinoensis*, found from southern Canada to northern Mexico, and *Desmodium paniculatum*, native from the Rio Grande to the Atlantic coast (Diggs et al. 1999). Specific ecotypes of these species are rarely suitable everywhere the species is endemic. To provide varieties with broad adaptation for use on a commercial scale, groups such as South Texas Natives are forced to work within plant adaptation regions (Vogel et al. 2005) with genetically diverse populations.

Current Status

Past and current research topics

Research on local herbaceous legumes in warm-dry climates has been ongoing for decades and brief details on some projects are provided in Table 1. With few exceptions, insufficient germplasm has been collected for thorough evaluation. Hardseededness is widespread and scarification is required for rapid stand establishment. A broad range in growth form among species and wide genetic variation within some promising species provide opportunities. Forage nutritive value and palatability differences among legume species and between legumes and grasses require consideration if resulting stands are to be sustainable, and growth form of the grass is important, as bunch grasses are more compatible with most legumes than sod-forming grasses.

Future research needs

Future research is needed on seed harvest technology (especially how to overcome pod dehiscing), seedling vigor, grazing/browsing tolerance, persistence under

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natural conditions, and long-term population dynamics. An alternative approach from the typical trial will be needed for a successful outcome.

Conclusions

Results of efforts to domesticate native legumes for warm-dry climates have had little adoption in grasslands. While some progress has occurred, seed cost of even the

most successful varieties limits extensive use. Further research and marketing are required if native legumes are to contribute to productive and sustainable natural and cultivated grasslands. A commercially viable seed industry to support widespread use of native legumes will require acceptance by end users of broadly adapted, genetically diverse, and superior genotypes rather than only local ecotypes. Discerning and wealthy clientele are also a prerequisite for success.

Table 1. Examples of published research focusing on domestication of native herbaceous grassland legumes.

Topic	Genera	Location	Results	Citation
Diversity/collection	Multiple	Southern Africa, USA, Brazil	Variable	Maposse et al. (2003) Smith et al. (2010) Trytsman et al. (2011)
Germination	Multiple	USA	Scarification	Multiple
Seed yield	<i>Neptunia</i> , others	USA	Variable	Muir et al. (2005)
Agronomy	<i>Desmodium</i> <i>Dalea</i> , <i>Rhynchosia</i>	USA	Determinate, upright	McGraw et al. (2004) Muir et al. (2005)
Quality	<i>Strophostyles</i>	USA	High	Foster et al. (2007)
Mixes	<i>Desmanthus</i> <i>Lespedeza</i>	USA	Bunch grasses	Springer et al. (2001) Muir and Pitman (2004)
Persistence	<i>Dalea</i>	USA	Relative palatability	Berg (1995)
Genetic variability	<i>Desmanthus</i> <i>Acacia</i>	USA	Wide	Kulakow (1999) Noah et al. (2012)
Releases	Multiple	USA	Universities, NRCS	Muir et al. (2011)

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