

Comparative study of drought response in eleven alfalfa collections

M. Rokebul Anower¹, Arvid Boe², Donald Auger¹, Ivan W. Mott³, Michael D. Peel³, Lan Xu⁴, Praveena Kanchupati¹, Yajun Wu¹

¹ Biology & Microbiology Department, South Dakota State University, Brookings, SD 57007

² Department of Plant Science, South Dakota State University, Brookings, SD 57007

³ USDA, Forage & Range Research Lab, Utah State University, Logan, UT 84322

⁴ Department of Natural Resources Management, South Dakota State University, Brookings, SD 57007

Abstract

Alfalfa (*Medicago sativa* L.) production is negatively affected by drought stress. This is particularly true for alfalfa that is cultivated on dry rangeland. Thus, the development of drought-tolerant alfalfa cultivars would provide significant value. A greenhouse study was conducted to evaluate drought performance of 11 alfalfa genotypes, including several collections that are adapted to rangeland conditions and a commercial cultivar. Water supply was adjusted based on the transpiration rate of individual plants to compensate 100, 75, 50, or 25% of transpirational water loss. We found that RS, a naturalized alfalfa that was collected from the Grand River National Grassland in South Dakota showed the best response to these water deficit conditions. It showed the smallest reductions in stem elongation, relative growth rate, and shoot dry mass production during three weeks of water deficit treatment. Associated with the stress resistance or less sensitivity to water deficit, RS was able to maintain root growth, shoot relative water content, and leaf chlorophyll content. In addition, RS exhibited the greatest water use efficiency among the 11 genotypes. We believe that RS is a valuable genetic resource that can be used to elucidate physiological and molecular mechanisms that determine drought-resistance in alfalfa and to develop alfalfa with improved water use efficiency.