COOPERATIVE EVALUATION OF WESTERN HEMISPHERE GRASSLAND GERMPLASM IN INNER MONGOLIA , PRC

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Abstract

Replicated studies were established jointly by Chinese and American scientists in arid and semi-arid zones of central Inner Mongolia to evaluate selected plant materials to restore steppe, shrub-steppe, saline bottomlands and open woodland sites. Both Asian and North American plant materials were included. Results of the Chinese plots show USA saline-tolerant grass species have potential to assist the Chinese with saline soil reclamation. On saline sites, USA cultivars rated the best stands and had the highest yields. Generally, Chinese desert steppe species outperformed USA upland entries with the Chinese legumes establishing the best stands and producing the most biomass.

Keywords: Inner Mongolia, desert steppe, germplasm, evaluation, saline

Introduction

The semi-arid and arid grasslands of Inner Mongolia and the western United States are ecologically similar in structure and function (Dewey, 1983). A cooperative project was initiated between the Grassland Research Institute, Inner Mongolia, People's Republic of China and the USDA Natural Resources Conservation Service, Bridger Plant Materials Center (PMC), Bridger, Montana, USA in 1988. The major objective of the cooperative program was to evaluate and select plant materials to restore steppe, shrub-steppe, saline bottomlands, and open woodland sites in the arid and semi-arid zones of the two countries.

Methods and Materials

Seven hundred five plots were planted with a single-row hand planter at four locations within the desert steppe ecosystem of Inner Mongolia in June 1991 and 1992. Each of the 85 Chinese and USA accessions and cultivars were planted in four rows, six meters (19.7 ft) long, and were replicated three times. Row-spacing widths were 30 cm (11.8 in) for grasses, 60 cm (23.6 in) for legumes, and 120 cm (47.2 in) for shrubs. All plantings were planted into dryland

cultivated plots and plants relied on the natural environmental conditions for establishment and survival. The four planting sites' environments range from sandy- to clayey-textured soils, from saline to non-saline, from 135 mm (5.3 in) to 400 mm (15.8 in) mean annual precipitation and 1039 m (3410 ft) to 1375 m (4513 ft) in elevation at 40^{o}-42^{o}N latitudes.

All the plant entries were evaluated for vigor, percent stand, and foliage height since planting. Forage yield was sampled beginning the year after establishment.

Results and Discussion

Plant performance results are based on the mean yeilds and stands of three replications evaluated during 1991-1996. Only the top ranked plant entries at each location will be discussed.

Huhehot 1991 Planting. Due to below-average 1991 growing-season precipitation, a severe weed infestation within the plots, and rodent grazing, most of the 85 plant entries did not establish good stands. Evaluations continued on the few entries that survived. *Melissitus ruthenicus* (L.) I.Y. Latsashvili, *Agropyron mongolicum* Keng, *Agropyron desertorum* (Fisch. ex Link) J.A. Schultes, *Hordeum brevisubulatum and Agropyron sibiricum* (Willd.) Beauv. maintained the highest stand rating through 1996, with greater than 30%. *Astragalus adsurgens* Pallas averaged the best production, 1703) kg ha^{-1} (1519 lbs/a) through 1995. *Agropyron mongolicum* Keng had the best average yield for the grasses at 842 kg ha^{-1} (751 lbs/a) air-dry forage.

Huhehot 1992 Planting. The replant in 1992 re-established most of the 85 plant entries. The mean yeild from 1993-96 showed *Astragalus adsurgens* Pallas, *Agropyron mongolicum* Keng, *Agropyron sibericum (Willd.) Beauv.*, *Achnatherum splendens* (Trin.) Nevsid, *Lespedeza davurica* (Laxm.) Schindler and *Melissitus ruthenicus* (L.) I.Y. Latsashvili accessions had the highest yields, more than 834 kg ha^{-1} (744 lbs/a), with *Astragalus adsurgens* Pallas yielding the most at 2308 kg ha^{-1} (2059 lbs/a). *Lespedeza davurica* (Laxm.) Schindler, *Melissitus ruthenicus (L.)* I.Y. Latsashvili and *Agropyron Mongolicum* Keng, all rated 42% or greater stands by the end of 1996.

Dalad Qi. Twenty of twenty-eight plant entries established plants on this saline site in 1991. *Achnatherum splendens* (Trin.) Nevski maintained the best stands through 1995. Evaluation of these plots were discontinued after 1995 due to to inadequate stands.

Linhe. 'Largo', 'Jose', and 'Alkar' *Thinopyrum ponticum* (Podp.) Barkworth and Dewey established the best stands on this saline site. Largo, Tyrell, Jose, and Alkar *Thinopyrum ponticum* Podp.) Barkworth and Dewey and *Hordeum brevisubulatum* had the highest yields, with Largo averaging 6037 kg ha^{-1} (5386 lbs/a) of biomass from 1993-1995.

Zhaohe. Ast*ragalus adsurgens* Pallas, *Melissitus ruthenicus* (L.) I.Y. Latsashvili, *Lespedeza potaninii* Vassillev, and *Lespedeza davurica* (Laxm.) Schindler maintained greater than 50% stand ratings on this dryland site. *Agropyron mongolicum* Keng averaged 450 kg ha^{-1} (401 lbs/a) forage production, the best yields from 1993 through 1996.

Conclusion

Since 1993 the Chinese grasses and legumes have outperformed the USA plant materials in Inner Mongolia. However, results indicate USA species/cultivars have the potential to assist the Chinese with saline soil reclamation.

These studies will be concluded after 1998. The summarization of study results at that time will validate plant performance and adaptation. Seed production studies of adapted species is planned to gain experience and to provide seed for additional large-scale plantings in Inner Mongolian. Making seed of selected plants available for revegetation of deteriorated grasslands, salinized soils and other land disturbances is the long term Chinese goal.

References

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