International Grassland Congress Proceedings | 22nd International Grassland Congress

# Comprehensive Evaluation of Wild *Elymus* L. Germplasm in Inner Mongolia

Juan Qi
*Gansu Agricultural University, China*

Wen-xia Cao
*Gansu Agricultural University, China*

Ting Jiao
*Gansu Agricultural University, China*

Xiao-peng Pu
*Gansu Agricultural University, China*

Wei-hong Yan
*Grassland Research Institute, China*



**The 22nd International Grassland Congress (Revitalising Grasslands to Sustain Our Communities) took place in Sydney, Australia from September 15 through September 19, 2013.**

Proceedings Editors: David L. Michalk, Geoffrey D. Millar, Warwick B. Badgery, and Kim M. Broadfoot

Publisher: New South Wales Department of Primary Industry, Kite St., Orange New South Wales, Australia

# Comprehensive evaluation of wild *Elymus* L. germplasm in Inner Mongolia

*Qi Juan*[ABCD]*, Cao Wen-xia*[ABCD]*, Jiao Ting*[ABCD]*, Pu Xiao-peng*[ABCD] *and Yan Wei-hong*[E]

[A] College of Grassland Science, Gansu Agricultural University, Lanzhou, Gansu Province, People's Republic of China
[B] Key Laboratory of Grassland Ecosystem of Ministry of Education, Lanzhou, Gansu Province, People's Republic of China
[C] Sino-US Centers for Grazingland Ecosystem Sustainability, Lanzhou, Gansu Province, People's Republic of China
[D] Grassland Engineering Laboratory of Gansu Province, Lanzhou, Gansu Province, People's Republic of China
[E] Grassland Research Institute, CAAS, Huhhot, Inner Mongolia, People's Republic of China

Contact email: qijuan0622@163.com

**Keywords:** *Elymus* L., germplasm, production, grey analysis.

## Introduction

Grassland degradation is increasing in severity and is an important global issue in the 21st century. Increasing research is being conducted on how to solve these problems (Niu and Jiang 2004). Restoration and revegetation of degraded grassland and the establishment of artificial pastures are important in addressing degradation. Successful restoration requires the identification of species and seed sources that are adapted to the ecological conditions of the restoration site. *Elymus* L. is a large genus that contains about 150 species distributed across a wide range of ecological sites across temperate and subtropical regions of the world (Dewey 1984; Love 1984). There are at least 12 species in China (Guo1987). *Elymus* includes many economically important forage grasses as well as species that possess useful genes for disease resistance, stress tolerance and adaptation, which can potentially be transferred to cereal crops through gene introgression. Species within *Elymus* have the potential for playing an important role in artificial pasture construction, grassland and animal husbandry development and ecological restoration. However, research is lacking on Chinese *Elymus* species, which can provide critical information for selecting suitable *Elymus* varieties and extending their use in China.

## Materials and methods

In this study, seed of six species of *Elymus* were collected from wild populations at sites throughout China in July and August of 2003 and 2006. All the seed collections were deposited at the gene bank of Grassland Research Institute of the Chinese Academy of Agricultural Science (CAAS) in waterproof packages at -4ºC. All accessions were grown in field plots at the CAAS Taipusiqi Experiment Station in June 2007. Taipusi Banner is located in the east portion of the Inner Mongolia Autonomous Region (41°35'–42°10'N, 114°51'–115°49'E), south of Xilingoleague, within the vast arid and semi-arid grassland region of Eurasia. The experiment was a randomized complete block design with three replications. Plots consisted of five rows spaced 40 cm apart, each area was 2 m × 5 m, with 80-cm spacing between plots. No irrigation or fertilizer was applied during the experiment. Statistical analyses were conducted using SPSS13.0 and Microsoft Excel.

## Results and discussion

All *Elymus* accessions survived the winter and initiated growth in middle- to late-April. Plant height increased rapidly from jointing to the heading stage, while leaf area

**Table 1. Composite correlation analysis among all accessions.**

| Species | Relatedness | Order | Species | Relatedness | Order | Species | Relatedness | Order |
|---|---|---|---|---|---|---|---|---|
| BJD38 | 0.526 | 32 | XJT7 | 0.688 | 16 | NMS29 | 0.691 | 14 |
| BJT37 | 0.753 | 10 | XJD11 | 0.87 | 2 | NMS34 | 0.58 | 29 |
| GSC20 | 0.668 | 18 | XJD14 | 0.63 | 26 | QHD19 | 1.276 | 1 |
| GSN21 | 0.658 | 21 | XJD15 | 0.785 | 6 | QHS18 | 0.522 | 34 |
| GSN23 | 0.547 | 31 | XJD16 | 0.722 | 12 | SXD36 | 0.847 | 4 |
| GSS22 | 0.526 | 33 | XJD5 | 0.772 | 8 | SXS35 | 0.722 | 13 |
| NMC31 | 0.663 | 19 | XJD6 | 0.632 | 25 | XJT2 | 0.863 | 3 |
| NMC32 | 0.776 | 7 | XJE13 | 0.758 | 9 | XJT24 | 0.662 | 20 |
| NMD28 | 0.512 | 35 | XJS17 | 0.623 | 27 | XJT3 | 0.551 | 30 |
| NMD30 | 0.733 | 11 | XJS8 | 0.816 | 5 | XJT4 | 0.511 | 36 |
| NMD33 | 0.68 | 17 | XJT1 | 0.452 | 38 | XJT9 | 0.615 | 28 |
| NMS26 | 0.641 | 23 | XJT10 | 0.688 | 15 | XZC25 | 0.638 | 24 |
| NMS27 | 0.47 | 37 | XJT12 | 0.648 | 22 | | | |

increased rapidly from the tillering to jointing stage. Dry matter (DM) yield differed among the 38 accessions. The DM yield of XJS8 was the highest among the accessions, which was 29.9 and 70.8% greater than that of NMD33and NMS34, respectively. The leaf-stem ratio of most accessions ranged from 1.5 to 2.0, and NMS27, GSN21, BJD38, GSS22 and NMS29 had ratios greater than 2.0. The seed yields of QHD19, GSS22, NMS27 and SXS35 were higher than that of the other accessions. Grey system theory hasbeen widely used in various types of comprehensive evaluations (Zhao *et al.* 2011; Yang *et al.* 2012). According to Mu (1995) all the accessions were divided into three categories grades by grey correlation analysis. Thirteen accessions performed very well, 23 accessions had moderate performance and two accessions had very poor performance.

## Conclusions

Grey correlation analysis showed that accessions NMC32, BJT37, QHD19, SXD36, XJD11, XJD15, XJS8, XJT2, XJE13 and XJD5 were the top 10 accessions. These accessions had high performances and should be used in future breeding and production programs.

## References

Dewey DR (1984) The genomic system of classification as a guide to intergeneric hybridization with the perennial Triticeae. In ‚Gene manipulation in plant improvement'. (Ed JP Gustafson) pp. 209-280. (Plenum Publishing: New York)

Guo BZ (1987) The Flora of China. *Science Press (Beijing)* **9**, 6-15.

Love A (1984) Conspectus of the Triticeae. *Feddes Repertorium* **95,** 425-521.

Mu XD (1995) Grassland system engineering. pp. 85-89. (China Agricultural Press: Beijing)

Niu SL, Jiang GM (2004) Function of artificial grassland in restoration of degraded natural grassland and its research advances. *Chinese Journal of Applied Ecology* **15**, 1662-1666.

Yang XF, Chen LL, Wu YH (2012) A comprehensive evaluation of the growth performance of 26 silage maize genotypes using grey correlative degree analysis. *Pratacultural Science* **29,** 105-111.

Zhao N, Zhao GQ, Hu KJ (2011) Production performance and nutritive value comparison among red clover with different growth different growth years. *Acta Agrestia Sinica* **19,** 468-472.