



Elymus magnispicatus (Poaceae), a new species from Inner Mongolia, China

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(Manuscript received 22 December 2025; Accepted 18 March 2026; Online published 26 March 2026)

ABSTRACT: *Elymus magnispicatus* (Poaceae), a new species from Inner Mongolia, China, is described and illustrated. While morphologically similar to *E. excelsus*, it can be diagnostically differentiated by a combination of characters: a taller plant, villous leaf sheaths, longer leaves and spikes, as well as longer spikelets with a greater number of florets. A detailed morphological comparison with related taxa is provided.

KEY WORDS: *Elymus*, *Elymus dahuricus*, *Elymus excelsus*, *Elymus villifer*, morphology, Inner Mongolia.

INTRODUCTION

The genus *Elymus* L. (1753: 83) (Poaceae), comprising 150–175 species, is the most widely distributed genus in the tribe Triticeae, with a range spanning South America, North America, Eurasia, and Africa (Sun, 2014; POWO, 2025). Species of *Elymus* are not only important forage grasses but also a key genetic resource for improving cereal crops such as wheat (*Triticum*), barley (*Hordeum*), and rye (*Secale*) (Dewey, 1983; Al-Saghir, 2016; Frawley *et al.*, 2020). This economic importance underscores the critical need for their precise taxonomic classification.

The genus *Elymus* (wheatgrass) is characterized by high polymorphism and taxonomic complexity, rendering its classification a long-debated subject. Compounding this issue, substantial revisions to the delimitation of related genera have resulted in persistent nomenclatural instability. The core controversies revolve around the circumscription of *Elymus* itself and the inclusion or exclusion of a suite of closely related genera. Historically, contentious genera within the *Elymus* complex have included *Pseudoroegneria* (Nevski) Á. Löve, *Roegneria* K. Koch, *Thinopyrum* Á. Löve (1980: 351), *Lophopyrum* Á. Löve, *Trichopyrum* Á. Löve (1986: 49), *Agropyron* Gaertn. (1770: 539), *Elytrigia* Desv., *Leymus* Hochst., *Kengyilia* C. Yen & J.L. Yang, *Campeiostrachys* Drobov, *Clinelymus* (Griseb.) Nevski, *Asperella* Humb., *Hystrix* Moench and *Triticum* L. (Dewey, 1984; Jensen and Chen, 1992; Salomon and Lu, 1992; Baum *et al.*, 2011; Sun, 2014; Assadi, 2017). Despite well-defined taxonomic boundaries and broad scholarly consensus for most related genera, the delineation between *Elymus* and *Roegneria* remains contentious. This persistent uncertainty has resulted in two competing classification systems: *Elymus* sensu lato (broad concept) and *Elymus* sensu stricto (narrow concept). Recent years have

witnessed significant advances in the taxonomy of *Elymus*, driven by the widespread application of new biological technologies (Gao *et al.*, 2022; Leo *et al.*, 2025; Deng *et al.*, 2025).

To date, more than 90 species of *Elymus* have been documented in China, with the description of several new taxa in recent decades (Salomon, 1990; Zhang, 1991; Cai, 1993; Lu, 2002; Chen *et al.*, 2006; Wu *et al.*, 2007, 2008; Jiang *et al.*, 2024; Zhang *et al.*, 2024). Among these, 31 species have been recorded specifically in Inner Mongolia (Zhao *et al.*, 2019).

During a floristic survey of the Xilingol Region in eastern Inner Mongolia, China, in early August 2022, we encountered an unusual population of *Elymus* that exhibited morphological characteristics distinct from all known species. After conducting a comprehensive examination of regional floras, taxonomic literature, and herbarium specimens (including types), we determined that these plants represent a previously unrecognized species, which we describe herein.

MATERIALS AND METHODS

Morphological characters of living plants (including flowering and mature individuals) were documented using an SLR camera and an Olympus stereozoom microscope (SZX10), with descriptions following the terminology of Chen *et al.* (2006). For comparative analysis, *Elymus excelsus* Turcz., *E. villosus* Muhl. ex Willd. and *E. villifer* C. P. Wang & H. L. Yang were designated as comparator taxa based on Tang (2017) and Zhao *et al.* (2019). Voucher specimens were deposited in the FGC Herbarium (acronym following Thiers, 2025). Additional specimens were consulted via JSTOR Global Plants, NSII, and NPSRC (all accessed 2025). The conservation status was evaluated following IUCN (2019) guidelines.



TAXONOMIC TREATMENT

Elymus magnispicatus Lei Liu, *sp. nov.*

Figs. 1 & 2

Type: CHINA. Inner Mongolia: Xilingol, Duolun County, 42°43'53" N, 116°52'29" E, 1524 m s.l.m., 10 August 2022, L.Liu GRI2022012 (holotype: FGC!, Fig. S1, isotype: FGC!).

Diagnosis: *Elymus magnispicatus* is similar to *E. excelsus* from which it differ in having a big leaves (47–54 cm vs. 20–30 cm length, 1.8–2.4 cm vs. 1–1.6 cm width), Leaf sheath densely villous (vs. glabrous or pubescent at base), long spike and spikelets (25–31 cm vs. 15–22 cm length and 2.5–3 cm vs. 1.2–1.5 cm length), more florets (7–11 vs. 4–5). Moreover, *Elymus magnispicatus* exhibits a series of highly pronounced morphological distinctions from *Elymus dahuricus*. Specifically, these differences are manifested in: significantly divergent plant heights (185–205 cm vs. 70–85 cm); markedly larger and pubescent leaves (leaf blade length 47–54 cm vs. 15–25 cm, width 18–24 mm vs. 5–9 mm); longer spikes (25–31 cm vs. 14–18 cm); a different number of spikelets per node (3 vs. 2); substantial differences in spikelet size and floret number per spikelet (spikelet length 25–30 mm vs. 10–15 mm, florets 7–11 vs. 3–5); and contrasting lemma surface characteristics (glabrous vs. densely hirsutulous).

Description: Herbs perennial with fibrous root. Culms robust, 185–205 cm tall, up to 6 mm in diam., glabrous, 4–6-noded, nodes pubescent. Leaf sheath densely villous; leaf blade usually flat, 47–54 × 1.8–2.4 cm, both surfaces scabrous. Ligule, ca. 1.5 mm, apex truncate. Spike spreading in the early heading stage and compact at maturity, robust, 25–31 cm long, 4.2–5.1 cm wide (including length about 2 cm); rachis with swollen nodes, densely hirsute throughout, margin narrowly winged. Internodes of spike rachis 9–36 mm. Spikelets 2 or 3 per node, 25–30 mm excluding awns, with 7–11 florets. Glumes lanceolate, subequal or lower glume slightly shorter, 12–15 mm, lower glume 5-veined, upper glume 7-veined, hirsute along veins, margin narrowly membranous, apex with awn 5.7–6 mm; Lemma oblong-lanceolate, 5-veined, glabrous, scabrous or hispidulous distally and at margin; first lemma 10–12 mm; awn reflexed, 30–34 mm, scabrous. Palea slightly shorter than or equalling lemma, ciliate along keels, slightly pubescent between keels. Seeds brown or black, ca. 6–6.5 mm.

Phenology: Flowering time June–July; fruiting time August–October.

Etymology: The specific epithet “*magnispicatus*” refers to the giant spike compared with other *Elymus* species.

Vernacular name (Chinese): 巨序披碱草 (jù xù pī jiǎn cǎo).

Distribution and habitat: *Elymus magnispicatus* is known only from Duolun County, Xilingol Region, Inner

Mongolia, China. The plants grow in forest-grassland ecotone at 1524 m a.s.l. For the time being, *E. magnispicatus* is only known from the type locality, comprising less than 20 individuals. *Elymus magnispicatus* was found only in the type locality whose populations are very small with about 20 individuals and occupies a distribution area of approximately 100 m², classifying it as an extremely small population.

Proposed IUCN conservation status: According to the IUCN Red List Criteria, it meets the thresholds for Critically Endangered (CR). Given its status as a rare and important genetic resource within the Triticeae tribe (wheat group), targeted conservation measures should be implemented.

DISCUSSION

Compared to other species in the genus *Elymus*, *Elymus magnispicatus* exhibits significantly larger morphological traits, including plant height, leaf size, inflorescence length, spikelet length, and floret number. However, *Elymus magnispicatus* can be readily distinguished from *E. excelsus* by the following diagnostic characteristics: (1) villous leaf sheaths and conspicuously swollen nodes, (2) broader leaf blades, (3) longer spikes and spikelets, and (4) a greater number of florets per spikelet. Regarding pubescence traits on leaf sheaths, *E. magnispicatus* exhibits marked distinctions from *E. villosus* and *E. villifer* across all evaluated parameters (see Table 1 for quantitative comparisons).

The species within *Elymus sensu stricto* are characterized by bearing 2–4 (occasionally up to 6) spikelets at each rachis node. *Elymus magnispicatus* is taxonomically placed within this genus, yet exhibits a distinctive morphological feature, while typical *Elymus sensu stricto* species produce spikelets containing 3–7 florets, *E. magnispicatus* develops significantly more florets per spikelet (7–11), representing a notable exception within the genus. This exceptional floret number serves as a key diagnostic characteristic distinguishing *E. magnispicatus* from congeneric species. Within *Elymus sensu lato*, taxa previously recognized under *Roegneria* C. Koch. typically develop spikelets bearing 3–10 florets, however, a limited number of species demonstrate exceptional floret numbers that exceed this range such as *Roegneria kamoji* (Ohwi) Keng & S. L. Chen (8–10 florets per spikelet) *Roegneria ciliaris* (Trin. ex Bunge) Nevski (7–12 florets per spikelet) and *Roegneria stricta* f. major (8–14 florets per spikelet). The discovery of *Elymus magnispicatus* provides complementary evidence for the phylogenetic relationship between genus of *Elymus* and *Roegneria*, particularly through its floret number per spikelet—a key taxonomic trait.

The pubescence characteristics of vegetative and reproductive organs in *Elymus* plants, such as the type, density, and distribution of hairs on leaf sheaths, blades,

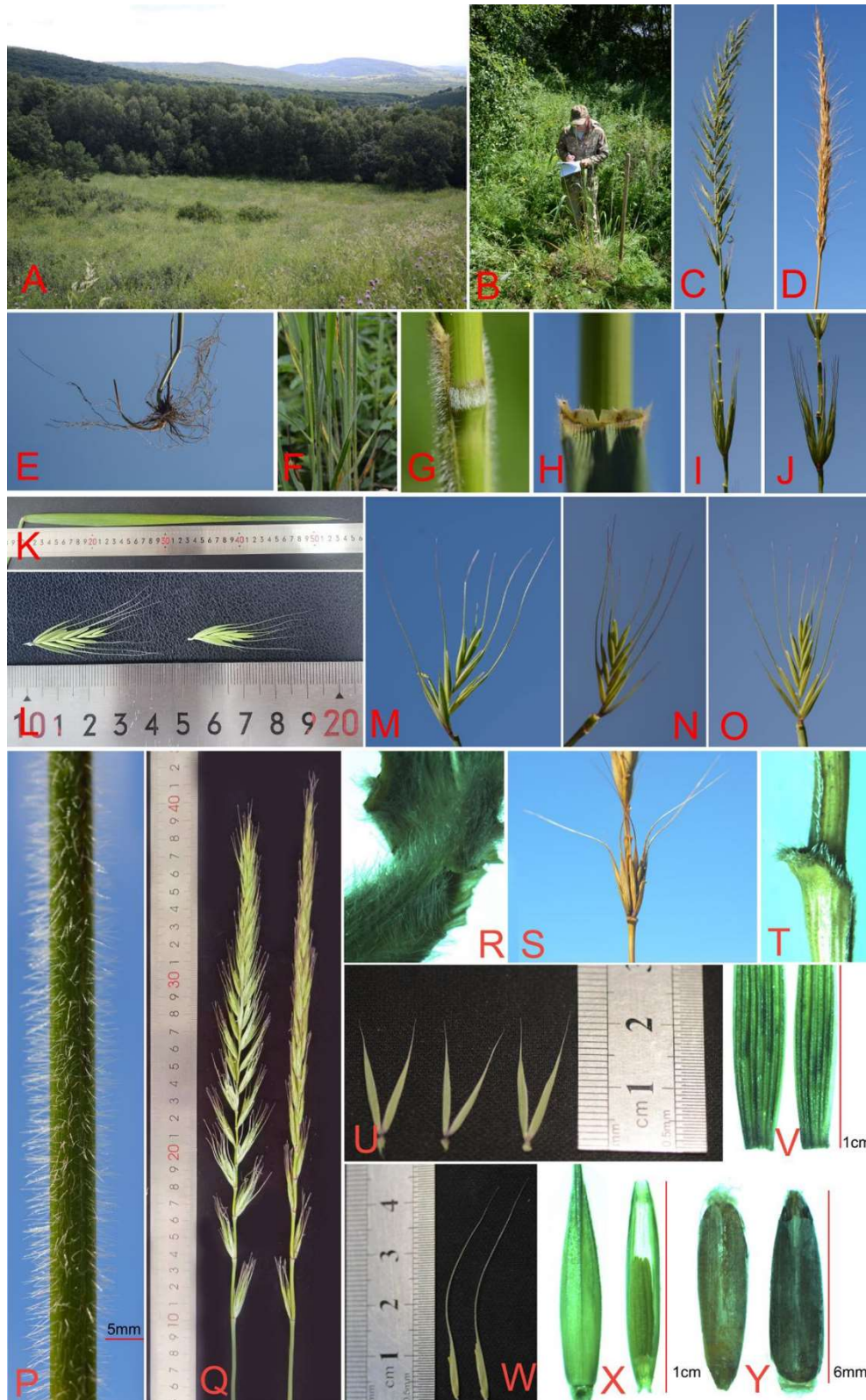


Fig. 1. *Elymus magnispicatus*. **A.** Habit; **B.** Plant; **C.** Young spike; **D.** Ripe spike; **E.** Root; **F.** Stem; **G.** Node; **H.** Ligule; **I.** Spikelet (two/node); **J.** Spikelet (three/node); **K.** Leaf Blade; **L.** Spikelet; **M.** Spikelet (7 flowers); **N.** Spikelet (9 flowers); **O.** Spikelet (11 flowers). **P.** Leaf sheath (DSLR macro observation); **Q.** Spike; **R.** Leaf sheath (stereomicroscope observation); **S.** Spikelet (reflexed awn); **T.** Spike rachis (stereomicroscope observation); **U.** Glume; **V.** Glume veins; **W.** The first floret in the spikelet; **X.** Lemma & Palea; **Y.** Seed (Abaxial side). Photographed by Lei Liu.

**Table 1.** Morphological comparison amongst *Elymus magnispicatus*, *E. excelsus*, *E. villifer*, *E. villosus* and *E. dahuricus*

Character	<i>Elymus magnispicatus</i>	<i>E. excelsus</i>	<i>E. villifer</i>	<i>E. villosus</i>	<i>E. dahuricus</i>
Plant height (cm)	185-205	65-155	60-75	37-130	70-85 (140)
Diameter of culms (mm)	up to 6	ca. 6	1.5-2.5	slender	slender
Nodes of stem	villous	glabrous	glabrous	glabrous	glabrous
Leaf blades (cm)	47-54 × 1.8-2.4	20-30 × 1.0-1.6	9-15 × 0.3-0.6	12-23 × 0.4-1.2	15-25 × 0.5-0.9
Leaf sheath	densely villous	glabrous	densely villous	densely villous	glabrous
Spike (cm)	25-31	15-22	9-12	5-15	14-18
Spikelet (mm)	25-30	12-15 (25)	6-10	7-12	10-15
Glume					
Length (mm)	12-15	10-13	4.5-7.5	7-10	8-10
Apex awn length (mm)	6	7	1.5-2.5	5-20	3-6
Veins number	5-7	5-7	3-4	3	3-5
Lemma					
Length (mm)	10-12	8-12	7-11	5-6.7 (7.5)	9-10
surface	glabrous	glabrous	glabrous	hairy	hirsutulous
Florets number	7-11	4-5 (sometimes 7)	2-3	1-3	3-5

and lemmas, serve as a key morphological basis for distinguishing closely related species (Tzvelev, 1984; Hitchcock, 1950). Although interspecific hybridization may occur within Triticeae under certain conditions, the key morphological traits of *E. magnispicatus* including broadly hairy leaves, villous nodes, glabrous lemmas, three spikelets per node, and multiple florets are unlikely to be attributable solely to hybridization. Furthermore, in its natural habitat, just *Roegneria stricta* was observed, with no other potential parental species present. Based on the combined morphological and distributional evidence, we propose that *E. magnispicatus* should be recognized as a new species within the genus *Elymus*.

It is noteworthy that, according to certain taxonomic perspectives, some species traditionally classified under *Elymus* have been reassigned to *Campeiostrachys*, though this reclassification remains a matter of ongoing debate. When determining the appropriate generic placement for this species, we conducted an extensive review of the literature, including recently described new species within the group and the taxonomic treatment adopted in the English edition of Flora of China (FOC). Our findings indicate that the name *Elymus* continues to be widely and consistently used within the floristic research tradition of East Asia, particularly in China. Given that Flora of China, a foundational taxonomic reference for the region, still follows the classification under *Elymus*, we ultimately chose to assign the new species to this genus. This decision was made to ensure the stability and practical applicability of the taxonomic framework in the context of our study, and we consider this placement to be well-justified and acceptable under the current circumstances.

ACKNOWLEDGMENTS

The work is financially supported by Conservation and Population Restoration Demonstration Study of *Elymus villifer* (C.P.Wang & X.L.Yang) (Grant 2023YFDZ0045)

and The National Key Research and Development Program of China (Grant No. 2023YFD1200300).

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