



A new synonym and a new combination in *Stipa aliena* Keng (Poaceae: *Stipa* sect. *Regelia*)

MARCIN NOBIS^{1,3}, ARKADIUSZ NOWAK² & POLINA D. GUDKOVA³

¹Department of Plant Taxonomy, Phytogeography and Herbarium, Institute of Botany, Jagiellonian University, Kopernika 27, PL-31-501 Kraków, Poland;

²Laboratory of Geobotany and Plant Conservation, Department of Biosystematics, Opole University, Oleska 48, PL-45-052 Opole, Poland;

³Laboratory of Biodiversity and Ecology, Institute of Biology, Tomsk State University, 36 Lenin Prospekt, Tomsk, 634050, Russia
Corresponding author: m.nobis@uj.edu.pl

Abstract

Stipa section *Regelia* comprises three species occurring in mountainous areas of Central Asia. One of them, *S. smithii*, was described by Martinovský in 1970, but the taxon has been overlooked in later taxonomical studies. The species was described with two varieties, var. *smithii* and var. *macrocarpa*. As a result of our taxonomical studies, we find the typical variety of the taxon to be conspecific with *Stipa aliena*, and propose that the second one be recognized as *Stipa aliena* var. *macrocarpa* comb. nov. Remarks on species belonging to section *Regelia* and micromorphological patterns of their lemma morphologies are discussed. A key to species close to *S. aliena* is provided.

Keywords: Taxonomy, distribution, lemma micromorphology, key to species

Introduction

Stipa Linnaeus (1753: 78) is one of the largest genera in the family Poaceae in the Old World. It comprises over 150 species distributed in open grasslands and steppes, with the highest species diversity in warm temperate regions of Europe, Asia and North Africa (Nobis 2013, Nobis *et al.* 2014b). Species belonging to *Stipa* are taxonomically difficult and many are still under study (e.g. Kotukhov 1998a, 1998b, Noltie 1999, Gudkova 2012, Nobis 2010, 2011a, 2011b, 2012, 2013, 2014, Nobis *et al.* 2013, 2014a, 2014b, 2014c, Cataldo *et al.* 2012, Tzvelev 2012). In the Old World, *Stipa* is divided approximately into ten sections (Tzvelev 1974, 1993, 2012, Freitag 1985); however, the systematic position of some species in the genus is still unclear (Nobis 2013).

Stipa section *Regelia* Tzvelev (1974: 13) comprises three species, *Stipa regeliana* Hackel (1884: 130), *S. aliena* Keng (1941: 74) and *S. rohmooiana* Noltie (1999: 287), distributed in mountainous areas of Central Asia (Tian-Shan, Pamirs, Hindukush, Karakorum, Himalaya; Tzvelev 1968, 1976; Wu & Phillips 2006). The diagnostic character of this section is the awn, which is pilose in the lower part (with hairs up to 1.5 mm in length) and scabrous in the upper part (Tzvelev 1974). *Stipa regeliana* and *S. aliena* are separated by panicle, awn, antherium and ligule characters (Wu & Phillips 2006). *Stipa rohmooiana* is very close to *S. aliena* (Noltie 1999) and its distinctiveness requires further study.

Recently, Tzvelev (2012)—based on the lack of an articulate junction between the awn and antherium—transferred *Stipa regeliana* to the genus *Achnatherum* Palisot de Beauvois (1812: 19), as *A. regelianum* (Hackel) Tzvelev (2012: 22). Despite the fact that *Achnatherum* is a polyphyletic genus (Hamasha *et al.* 2012, Romaschenko *et al.* 2012), *S. regeliana* does not fall in any of the *Achnatherum* clades; it groups with other species belonging to *Stipa*. *Achnatherum* and *Stipa* differ clearly in lemma micromorphology (Barkworth & Everett 1987; Romaschenko *et al.* 2012). The most typical lemma micromorphological characters of *Stipa* are: presence of long fundamental cells longer or equal in length than width, numerous hooks and not too numerous silica bodies. Because of the presence of numerous hooks (=crown cells) on the upper surface of lemma, this pattern is called “saw-like” (Romaschenko *et al.* 2012). In *Achnatherum* species, hooks are absent at least in the middle part of the lemma, long fundamental cells are shorter or equal in length than width and silica bodies are numerous and densely distributed; this pattern is referred to as “maize-like” (Romaschenko *et al.* 2012). We have examined patterns of the lemma micromorphology of most Eurasian species

Acknowledgments

We would like to express our gratitude to the curators of E, GOET, K, KRA, KUN, LE, MOIS, MSB, NY, PE, PR, UPS for making the collections of the genus *Stipa* available for study, and Wenli Chen for help in translating a part of chinese labels. Special thanks to Jeffery M. Saarela for his valuable comments and improvements to the first version of the manuscript. The research was partially funded by the National Science Centre, project no. UMO-2013/09/B/NZ8/03287.

References

- Barkworth, M.E. (1990) *Nassella* (Graminae, Stipeae): revised interpretation and nomenclatural changes. *Taxon* 39: 597–614.
<http://dx.doi.org/10.2307/1223366>
- Cataldo, D., Giardina, S.A., Moraldo, B. & Raimondo, F.M. (2012) *Stipa valdemonensis* (Poaceae), a new species from Sicily. *Plant Biosystems* 146(3): 658–663.
<http://dx.doi.org/10.1080/11263504.2012.700961>
- Freitag, H. (1985) The genus *Stipa* (Gramineae) in southwest and south Asia. *Notes from the Royal Botanical Garden, Edinburgh* 42: 355–489.
- Grisebach, A. (1868) Ueber die Gramineen Hochasiens. *Nachrichten von der Königl. Gesellschaft der Wissenschaften und von der Georg-Augusts-Universität* 3: 61–93.
- Grisebach, A. (1852) Ptilagristis. In: Ledebour, C.F. (Ed.) *Flora Rossica sive Enumeratio Plantarum in Totius Imperii Rossici Provinciis Europaeis, Asiaticis, et Americanis Hucusque Observatarum*, 4. Stuttgartiae, Sumtibus Librariae E. Schweizerbart, pp. 447–448.
- Gudkova, P.D. (2012) Annotated list of the *Stipa* L. species (Poaceae) from South Siberia. *Sistematischeske Zametki po Materialam Gerbarya im. P.N. Krylova Tomskogo Gosudarstvennogo Universiteta* 105: 22–31.
- Hackel, E. (1884) Gramina nova vel minus nota. *Sitzungsberichte der Mathematisch-Naturwissenschaftlichen Classe der Kaiserlichen Akademie der Wissenschaften* 89: 123–136.
- Hackel, E. (1906) Gramineae novae turkestanicae. *Journal of Botanical Taxonomy and Geobotany* 26: 55–60.
- Hamasha, H.R., von Hagen, K.B. & Röser, M. (2012) *Stipa* (Poaceae) and allies in the Old World: molecular phylogenetics realigns genus circumscription and gives evidence on the origin of American and Australian lineages. *Plant Systematics and Evolution* 298: 351–367.
<http://dx.doi.org/10.1007/s00606-011-0549-5>
- Hance, H.F. (1877) Supplementary note on intoxicate grasses. *Journal of Botany* 15: 267–268.
- Handel-Mazzetti, H. (1936) Kleine Beiträge zur Kenntnis der Flora von China. *Oesterreichische Botanische Zeitschrift* 85: 226–227.
<http://dx.doi.org/10.1007/BF01255464>
- Hooker, J.D. (1896) *Flora of British India*, 7. L. Reeve & Co., London, 842 pp.
- Hitchcock, A.S. (1930a) *Stipa smithii* Hitchc., sp. nov. *Journal of the Washington Academy of Sciences* 20: 382–383.
- Hitchcock, A.S. (1930b) Fifteen new species of grasses, six from Africa, seven from China. *Proceedings of the Biological Society of Washington* 43: 89–96.
- Keng, Y.L. (1941) An enumeration of grasses of Kansu Province. *Sunyatsenia* 6(1): 52–76.
- Kotukhov, Yu. (1998a) New species of grasses (Poaceae) from south Altai, Saur and Tarbagatai. *Turczaninowia* 1(1): 7–21.
- Kotukhov, Yu. (1998b) New species of the genus *Stipa* L. (Poaceae) from western Kazakhstan. *Turczaninowia* 1(2): 9–15.
- Kuo, P.C. & Sun, Y.H. (1982) A preliminary study on the classification, distribution and ecological nature of genus *Stipa* L. of China. *Acta Phytotaxonomica Sinica* 20: 34–44.
- Kuo, P.C. & Sun, Y.H. (1984) *Stipa penicillata* var. *hirsuta*. *Bulletin of Botanical Research, Harbin* 4(4): 89.
- Kuo, P.C. & Sun, Y.H. (1987) *Stipa* Linn. In: Kuo, P.C. (Ed.) *Flora Reipublicae Popularis Sinicae* 9(3). Science Press, Beijing, pp. 268–287.
- Linnaeus, C. (1753) *Species Plantarum*, 1. L. Salvii, Holmiae (Stockholm), 560 pp.
<http://dx.doi.org/10.5962/bhl.title.669>
- Lu, S.L. & Wu, Z.L. (1996) On the geographical distribution of the genus *Stipa* L. in China. *Acta Phytotaxonomica Sinica* 34: 242–253.
- Martinovský, J.O. (1970) *Stipa smithii* Martinovský, eine neue Chinesische Federgrasart. XX. Beitrag zur Kenntnis der Federgrassippen. *Svensk Botanisk Tidskrift* 64(2): 158–164.

- Nobis, M. (2010) *Stipa adamii* sp. nov. (Poaceae) from the western Tian-Shan, and some remarks on the taxa of the section *Smirnovia* occurring in Kazakhstan. *Nordic Journal of Botany* 28: 733–738.
<http://dx.doi.org/10.1111/j.1756-1051.2010.00968.x>
- Nobis, M. (2011a) *Stipa ×brozhiana* (Poaceae) nothosp. nov. from the western Pamir Alai Mts (Middle Asia) and taxonomical notes on *Stipa ×tzvelevii*. *Nordic Journal of Botany* 29: 458–464.
<http://dx.doi.org/10.1111/j.1756-1051.2011.01127.x>
- Nobis, M. (2011b) Remarks on the taxonomy and nomenclature of the *Stipa tianschanica* complex (Poaceae), on the base of a new record for the flora of Tajikistan (central Asia). *Nordic Journal of Botany* 29: 194–199.
<http://dx.doi.org/10.1111/j.1756-1051.2010.00869.x>
- Nobis, M. (2012) *Stipa narynica* sp. nov. (Poaceae) from the western Tian-Shan Mountains. *Nordic Journal of Botany* 30: 70–76.
<http://dx.doi.org/10.1111/j.1756-1051.2011.01403.x>
- Nobis, M. (2013) Taxonomic revision of the *Stipa lipskyi* group (Poaceae: *Stipa* section *Smirnovia*) in the Pamir Alai and Tian-Shan Mountains. *Plant Systematics and Evolution* 299: 1307–1354.
<http://dx.doi.org/10.1007/s00606-013-0799-5>
- Nobis, M. (2014) Taxonomic revision of the Central Asiatic *Stipa tianschanica* complex (Poaceae) with particular reference to the epidermal micromorphology of the lemma. *Folia Geobotanica* 49: 283–308.
<http://dx.doi.org/10.1007/s12224-013-9164-2>
- Nobis, M., Ebel, A.L., Nowak, A., Turginov, O.T., Kupriyanov, A.N., Nobis, A., Olonova, M.V., Paszko, B., Piwowarczyk, R., Chen, W.L., Gudkova, P.D., Klichowska, E., Nowak, S. & Pujadas-Salvà, A.J. (2014a) Contribution to the flora of Asian and European countries: new national and regional vascular plant records, 2. *Acta Botanica Gallica: Botany Letters* 161(2): 209–221.
<http://dx.doi.org/10.1080/12538078.2014.921643>
- Nobis, M. & Nobis, A. (2013) *Ptilagrostis milleri* comb. nov. (Poaceae: Stipeae). *Nordic Journal of Botany* 31: 623–625.
<http://dx.doi.org/10.1111/j.1756-1051.2013.00115.x>
- Nobis, M., Nobis, A., Nowak, A. & Nowak, S. (2014b) *Stipa klimesii* (Poaceae), a new species from Western Himalayas (India). *Phytotaxa* 174(3): 173–180.
<http://dx.doi.org/10.11646/phytotaxa.174.3.6>
- Nobis, M., Nowak, A. & Nobis, A. (2013) *Stipa zeravshanica* sp. nov. (Poaceae), an endemic species from rocky walls of the western Pamir Alai Mountains (middle Asia). *Nordic Journal of Botany* 31: 666–675.
<http://dx.doi.org/10.1111/j.1756-1051.2013.00184.x>
- Nobis, M., Nowak, A., Nobis, A., Paszko, B., Piwowarczyk, R., Nowak, S. & Plašek, V. (2014c) Contribution to the flora of Asian and European countries: new national and regional vascular plant records. *Acta Botanica Gallica: Botany Letters* 161: 81–89.
<http://dx.doi.org/10.1080/12538078.2013.871209>
- Noltie, H.J. (1999) Notes relating to the flora of Bhutan: XXXVIII. Gramineae I, tribe Stipeae. *Edinburgh Journal of Botany* 56: 285–292.
<http://dx.doi.org/10.1017/S096042860001141>
- Ohwi, J. (1953) *Achnatherum pekinense*. *Bulletin of the National Science Museum, Tokyo* 33: 66.
- Palisot de Beauvois, A.M.F.J. (1812) *Essai d'une nouvelle Agrostographie*. Imprimerie de Fain: Paris.
- Romaschenko, K., Peterson, P.M., Soreng, R.J., Garcia-Jacas, N., Futorna, O. & Susanna, A. (2012) Systematics and evolution of the needle grasses (Poaceae: Pooideae: Stipeae) based on analysis of multiple chloroplast loci, ITS, and lemma micromorphology. *Taxon* 61: 18–44.
- Roshevitz, R.Yu. (1915) *Stipa* L. In: Fedchenko, B.A. (Ed.) Spisok ruskikh rastenii. [Suppl. 2] *Izvestiya Imperatorskago Botanicheskago Sada Petra Velikago* 14: 48–50.
- Roshevitz, R.Yu. (1920) *Stipa novae Asiae centralis*. *Botanicheskie Matreialy Gerbarya Glavnogo Botanicheskogo Sada R.S.F.S.R.* 1(6): 1–4.
- Ruprecht, F.J. (1969) *Lasiagrostis subsessiliflora* Ruprecht. In: Osten-Sacken, F. von & Ruprecht, F.J., Sertum tianschanicum: Botanische Ergebnisse einer Reise im mittleren Tian-Schan. *Memoires de l'Academie Imperiale des Sciences de Saint-Petersbourg* 14(4): 1–74.
- Smirnov, P.A. (1925) Die neuen russischen *Stipa*-Pennata-Arten. Repertorium specierum novarum regni vegetabilis. *Centralblatt für Sammlung und Veröffentlichung von Einzeldiagnosen neuer Pflanzen* 21: 231–235.
- Tzvelev, N.N. (1968) Zlaki (Gramineae). In: Grubov, V.I. (Ed.) *Rastieniya Centralnoi Azii. Po materialam Botanicheskogo Instituta im. V.L. Komarova (Plantae Asiae Centralis, secus materies Instituti botanici nomine V.L. Komarovii)*, 4. Leningrad, Nauka, pp. 1–243 + 12 maps.
- Tzvelev, N.N. (1974) Zametki o Tribe Stipae Dum. semeistva zlakov (Poaceae) v SSSR—Notulae dr tribu Stipae Dum. (fam. Poaceae) in URSS. *Novosti Sistematiki Vysshikh Rastenii* 11: 4–21.

- Tzvelev, N.N. (1993) Some notes on the grasses (Poaceae) of the Caucasus. *Botanicheskii Zhurnal* 78(10): 83–95.
- Tzvelev, N.N. (2012) Notes on the tribe Stipeae Dumort. (Poaceae). *Novosti Sistematiki Vysshikh Rastenii* 43: 20–29.
- Wu, Z.L. & Phillips, S.M. (2006) Tribe Stipae. In: Wu, Z.Y., Raven, P.H. & Hong, D.Y. (eds.) *Flora of China (Poaceae)*, 22. Beijing: Science Press and St. Louis: Missouri Botanical Garden Press, pp. 188–212.
- Wu, Y.H. & Wang, Q.J. (1999) *The grasses of Karakorum and Kunlun Mountains*. Qinghai People's Publishing House, Xining, 168 pp.