



Aristida surperuanensis (Poaceae, Aristidoideae), a new species from a desert valley in southern Peru

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Abstract

Aristida surperuanensis **sp. nov.** is described and illustrated. The new species, from southern Moquegua (Peru), differs from *A. flaccida* in having contracted panicles, spikelets to 1–1.1 cm long and lemmas 5.5–6.5 mm long. The central awn is straight, ascending, 3–6 mm long and lacking a column, the lateral awns are ascending, 1–2.5 mm long and 1/3 as long as the central awns, and the caryopses are fusiform and 4–4.5 (–6) mm long. A key to the species of *Aristida* in Peru is included and the conservation status of the new species is evaluated.

Keywords: Biodiversity, grasses, Moquegua, South America, taxonomy

Resumen

Aristida surperuanensis **sp. nov.** es descrita e ilustrada. La especie nueva procedente del sur de Moquegua (Perú) difiere de *A. flaccida* por tener las panículas contraídas, espiguillas de 1–1.1 cm de largo y lemas de 5.5–6.5 mm de largo. La arista central es recta, ascendente de 3–6 mm de largo y no presenta columna. Las aristas laterales son ascendentes de 1–2.5 mm de largo y 1/3 más cortas que la arista central, y la cariopsis es fusiforme de 4–4.5 (–6) mm de largo. Se incluye una clave para las especies de *Aristida* en el Perú y se evalúa el estado de conservación de la especie nueva.

Palabras clave: Biodiversidad, gramíneas, Moquegua, Sudamérica, taxonomía

Introduction

Aristida Linnaeus (1753: 82) is a cosmopolitan genus with approximately 305 species (Kellogg 2015, Soreng *et al.* 2017). *Aristida* diversified in the Old and New World ca. 7 Ma (Cerros-Tlatilpa *et al.* 2011). The species of *Aristida* are dominant in semi-arid pastures or desert zones. The genus comprises annual or perennial plants that are easily recognized by the three-awned lemmas and 1-3-veined glumes, although sometimes the lateral awns of the lemma are reduced or suppressed (Gutiérrez *et al.* 2018). In South America the genus occurs in semi-arid and arid areas, although some unusual species are found in forest margins (Cerros-Tlatilpa *et al.* 2011). Only a few species of *Aristida* are considered good forage; most species lose their nutritional value immediately after flowering (Burkart 1969).

While reviewing *Aristida* specimens deposited in Sur Peruano Herbarium (HSP), we found specimens from the department of Moquegua that we could not determine using existing taxonomic keys for Peru (Tovar 1993, Gutiérrez & La Torre 2016, Gutiérrez *et al.* 2018). We then decided to prepare a morphological description of the specimen. To confirm our hypothesis that the material represents a new species, we conducted a review of the *Aristida* literature and reviewed the morphology of additional material. We here describe the specimen as a new species. With the new taxon included the number of *Aristida* species in Peru increases to 18, including four species endemic to the country: *A. chichlayensis* Tovar (1984: 11), *A. pseudochichlayensis* Harol Gutiérrez & Rox. Castañeda (2016: 83), *A. tovariana* Harol Gutiérrez (2018: 106), and the novelty here described.

Material & Methods

The new species was found during 2019, when more than 50 specimens of undetermined *Aristida* were examined by the first author at Peruvian herbaria (HSP, HUSA and HUT). Digitized specimens of morphologically similar species were reviewed using online herbarium catalogs (<http://tropicos.org> and <http://fm1.fieldmuseum.org/vrrc/>) and Global Plants on JSTOR (2019). All morphological characters were studied under a stereomicroscope MOD SB-1903-P EUROMEX 0.7X-4.5X and a composite optical microscope CX23-LED-REFS1 40-1000X. Assessments of the conservation status of the new species were made on the basis of IUCN (2017) criteria. For the selection of diagnostic characters (length of the lemma, presence of column, length of palea, size of awns, size of caryopsis) we consulted Sulekic (2003), Gutiérrez *et al.* (2018) and Henrard (1927, 1932). A distribution map of the new species was generated using the program ArcGis 9.3.1 (Esri Inc. 2009).

Taxonomy

Aristida surperuanensis Gut. Peralta & P.M.Peterson, *sp. nov.* (Figs. 1–3)

Aristida surperuanensis differs from *A. flaccida* in having a smaller lemma 5.5–6.5 mm long, a central awn 3–6 mm long, lateral awns 1–2.5 mm long, and contracted panicles.

Type—PERU. Moquegua: General Sánchez Cerro, Omate, Road to Quinistaquillas, desert area, 16°45'0.37"S, 70°59'59.38"W, 1467 m, 22 March 2008, *V. Quipuscoa* 3688 (holotype HSP-002528!, isotype MOL!, isotype USM!).

Caespitose annuals. Culms 6–10 cm tall, erect unbranched or weakly branched near the base. Leaves usually all basal; leaf sheaths glabrous; ligules 0.4–0.5 (–0.6) mm long, a fringe of hairs; collar glabrous; leaf blades 3–5 cm long, 0.6–0.8 mm wide, tightly involute, glabrous adaxially, scaberulous abaxially, curling when dry, apically acute. Inflorescence 3.5–4 × 0.3–0.4 cm with 6–8 spikelets, a panicle, contracted. Spikelets 1–1.1 cm long, disarticulating above the glumes, greenish when young, 1-flowered; glumes 4–7 mm long, lanceolate, unequal, membranous, 1-veined, keeled, glabrous, the keels scabrous; lower glumes 4–4.5 mm long, apex entire, acute; upper glumes 6–7 mm long, mucronate up to 1 mm long; floret as long as the spikelet, terete; callus 0.4–0.5 mm long, obtuse, hairy, the hairs 0.1–0.2 mm long; lemma margins convolute; lemma 5.5–6.5 × 0.4–0.5 mm, cartilaginous, terete, 3-awned; central lemma awn 3–6 mm long, straight, ascending, simple at base, without a column. Lateral lemma awns (1–) 1.2–2.5 mm long, ascending; paleas 0.8–1 × 0.2 mm long, 2-veined, apex entire, membranous, hyaline; lodicules 0.25–0.3 mm long, 2, membranous, hyaline; stamens 3, anthers 0.4–0.5 mm long. Caryopsis 4–4.5 (–6) × 0.4–0.5 mm, fusiform without a ventral groove, the embryo 1/3–1/2 the length of the caryopsis.

Ecology and distribution—Desert areas, in the transitional Coastal-Andean valleys at 1467 m on road to Quinistaquillas.

Etymology—The specific epithet refers to southern Peru, where the species is known only from the department of Moquegua. Additionally, it refers to the holotype being deposited in the Sur Peruano Herbarium (HSP).

Discussion—*Aristida surperuanensis* is morphologically similar to *A. flaccida* Trinius & Ruprecht (1842: 117) in having a contracted, spiciform panicle with appressed spikelets and a lemma without a column. The new species differs from *A. flaccida* in having smaller spikelets (1–1.1 cm vs. 3.8–5 cm), smaller panicles (3.5–4 × 0.3–0.4 cm vs. 16–20 × 0.2–0.3 cm), and smaller lemmas (5.5–6.5 mm vs. 19–25 mm long). The awns in both species are unequal, filiform, straight, more or less divergent, and scabrous. However, *A. surperuanensis* has shorter central and lateral awns. The central awns are 19–25 mm long in *A. flaccida* and 3–6 mm long in *A. surperuanensis* while the lateral awns are (4–)7–8(–9) mm long in *A. flaccida* and 1–2.5 mm long in *A. surperuanensis*. The anthers of *A. flaccida* are 1.8–2 mm long and the anthers of *A. surperuanensis* are 0.5 mm long. Another species similar to *A. surperuanensis* is *A. victoriana* Sulekic (2003: 184), which differs in having a longer lemma (8–10 mm long vs. 5.5–6.5 mm long), shorter glumes (4–4.5 mm long vs. 5.5–8.5 mm), and a column 1.5–2.8 mm long (vs. no column).

Conservation status—Considering the IUCN (2017) criteria it is proposed that the assigned conservation status should be Vulnerable (VU) under criteria D2, with an area of occupancy (AOO) <20 km² and number of localities ≤ 5.



HERBARIO SUR PERUANO (HSP)
Instituto Científico Michael Owen Dillon (IMOD)

Poaceae **HOLOTIPO**
Aristida surperuanensis Gut.Peralta & P.M. Peterson

PERÚ; Dpto. Moquegua; Prov. General Sánchez Cerro;
 Dist. Omate; Abajo de Omate carretera a Quinistaquillas.
 Zona desértica. 1467 m
 S 16° 45' 0.37" O 70° 59' 59.38"

Hierba de 0,1 m de alto. Inflorescencias verdosas. 22-Marzo-2008
 V. Quipuscoa S. No. 3688
 3 dupl. HSP, USM
 Lugar de origen de la Lima de olor de Omate.

FIGURE 1. *Aristida surperuanensis* (holotype HSP!)

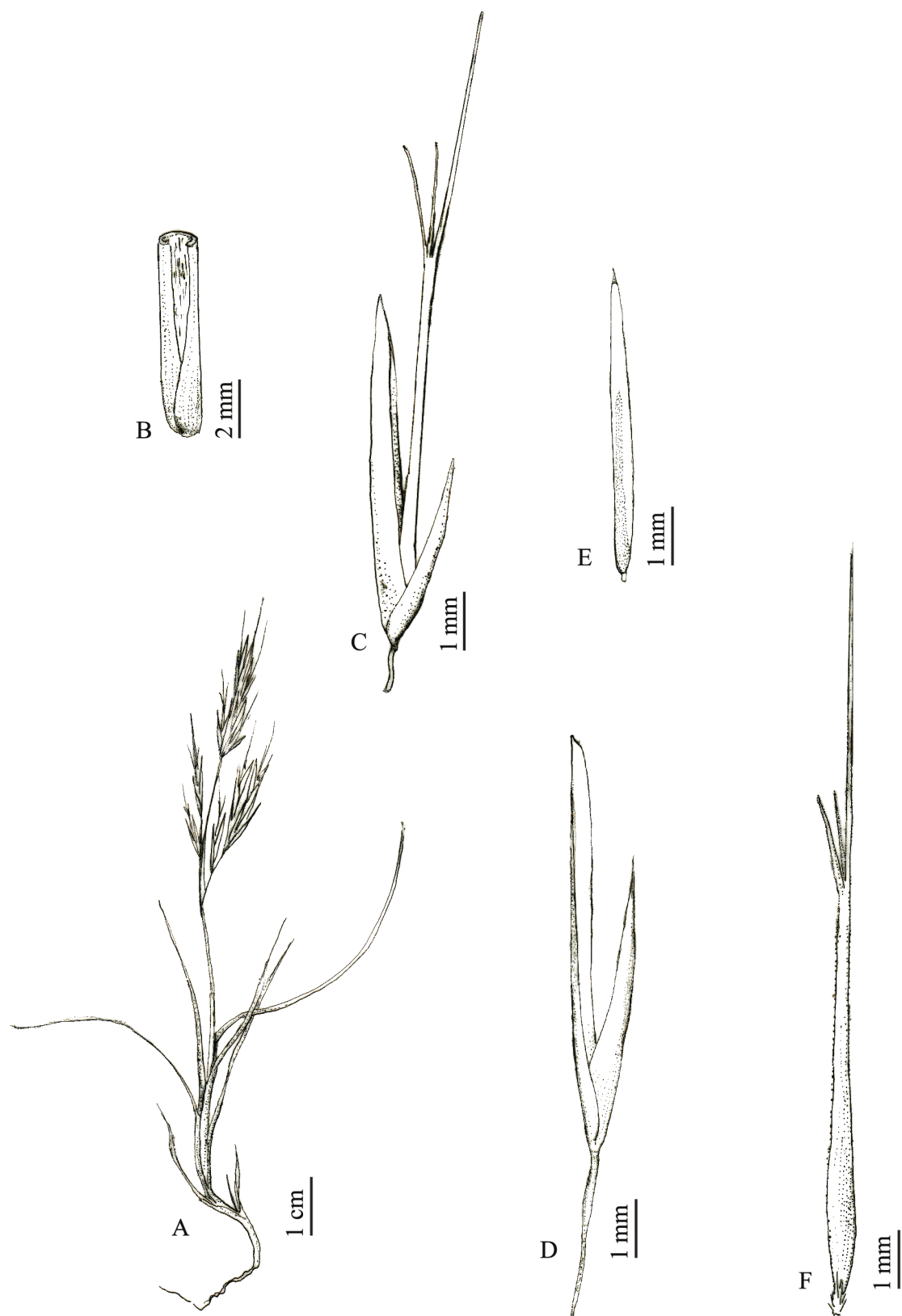


FIGURE 2. *Aristida surperuanensis* (drawn from the holotype). A. Habit, B. Portion of leaf blade, C. Spikelet, D. Glumes (lower and upper), E. Caryopsis, F. Lemma and awns. Illustration by M. Ocrospoma.

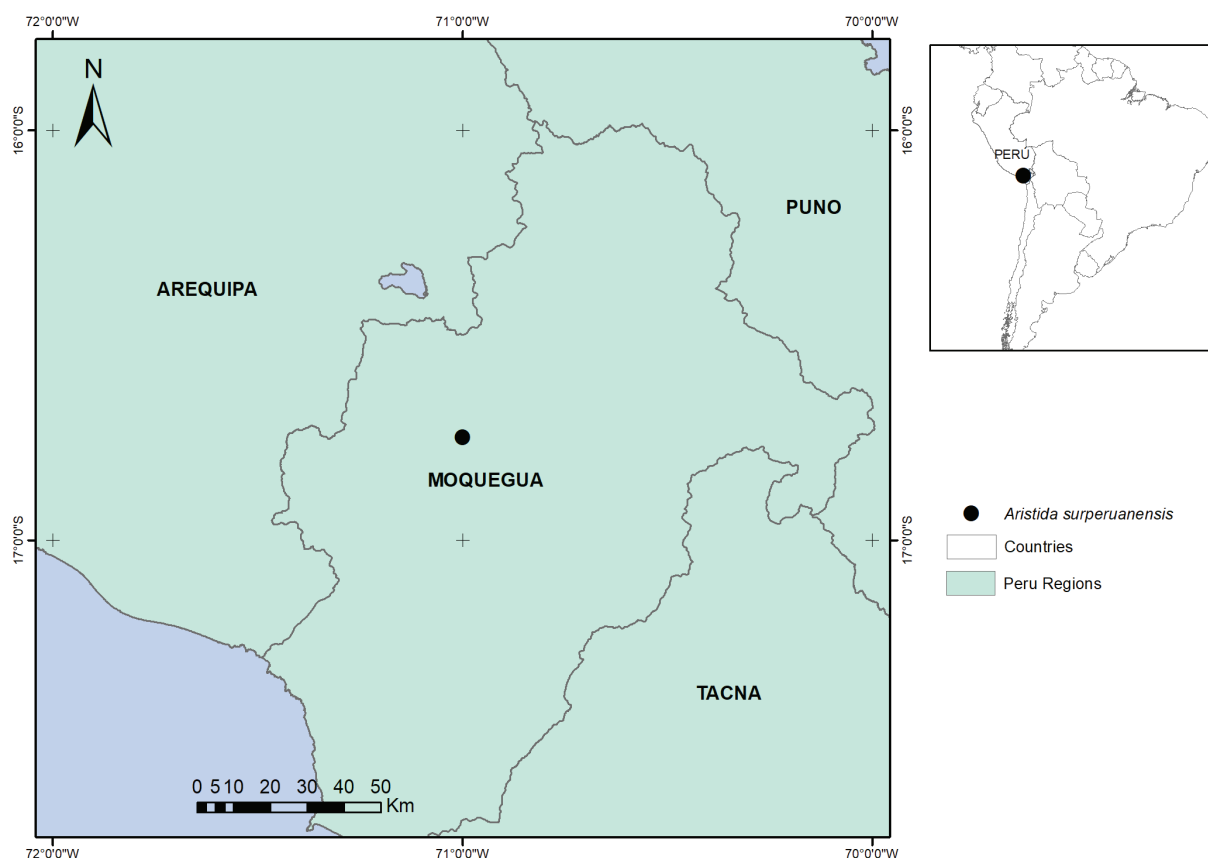


FIGURE 3. Type locality of *Aristida surperuanensis* in Moquegua, Peru.

Key to *Aristida* species in Peru (adapted from Gutiérrez *et al.* 2018):

1. Column of lemma present2
- Column of lemma absent.....11
2. Lemmas 2.3–3 mm long; all awns 5–6 mm long *A. capillacea* Lamarck (1791: 156).
- Lemmas more than 3 mm long; all awns more than 6 mm long3
3. Plants annual.....4
- Plants perennial5
4. Column 4.5–6 mm long; all awns 27–40 mm long *A. chichlayensis*
- Column 7.5–8 mm long; all awns 18–20 mm long *A. pseudochichlayensis*
5. Column twisted 2–3 times6
- Column not twisted.....7
6. Column (6–)14–24(–52) mm long *A. riparia* Trinius (1836: 48)
- Column 1.5–2.5 mm long9
7. Panicle lax; the branches divergent or appressed; not spiciform *A. laxa* Cavanilles (1799: 44)
- Panicle linear to linear oblong, dense, spiciform8
8. Lateral awns poorly developed (≤ 0.5 mm long) *A. schiedeana* Trinius & Ruprecht (1842: 120)
- Lateral awns well-developed (≥ 0.5 mm long) *A. megapotamica* Sprengel (1827: 31)
9. Panicle spiciform, branches appressed; culms erect; anthers 0.9–1 mm long *A. tovariana*
- Panicle open, branches spreading; culms geniculate; anthers > 1.0 mm long10
10. Panicle branches rigid, exserted, or embraced at base by subtending leaf, 7–8 cm long *A. asplundii* Henrard (1926: 42)
- Panicle branches flexuous, open, lanceolate, 10–20 cm long *A. ecuadoriensis* Henrard (1932: 307)
11. Lemmas dorsally compressed.....12
- Lemmas not dorsally compressed13
12. Plants annual; lemma 5–10(–11) mm long *A. adscensionis* Linnaeus (1753: 82).
- Plants perennial; lemma 13–15(–17) mm long *A. murina* Cavanilles (1799: 44)
13. Lemma with longitudinal groove *A. circinalis* Lindman (1900: 13)
- Lemma without longitudinal groove14

14. Leaf blades convolute; central awn recurved *A. torta* (Nees 1829: 386) Kunth (1833: 190)
 - Leaf blades involute; central awn straight 15
15. Leaf blades flexuous; culms without nodes *A. antoniana* Steudel ex Döll (1878: 19)
 - Leaf blades rigid (setiform); culm with nodes 16
16. Awns unequal (lateral awns ca. 1/3 as long as the central awns); inarticulate to lemma *A. surperuanensis*
 - Awns equal, articulated to lemma 17
17. Lemmas 4–5 mm long; glumes 6–8 mm long *A. setifolia* Kunth (1816: 122)
 - Lemmas 8.5–10 mm long; glumes 10–12 mm long *A. tarapotana* Mez (1921: 151)

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References

- Burkart, A. (1969) Gramineae. In: Burkart, A. (Ed.) *Flora ilustrada de Entre Ríos (Argentina)*. Parte II. Colección Científica del Instituto Nacional de Tecnología Agropecuaria, Buenos Aires, 551 pp.
- Cavanilles, A.J. (1799) *Icones et descriptiones plantarum* 5. Typographia regia, Madrid, 74 pp.
- Cerros-Tlatilpa, R., Travis, J. & Barker, N.P. (2011) Phylogenetic relationships of *Aristida* and relatives (Poaceae, Aristidoideae) based on noncoding chloroplast (*trnL-F*, *rpl16*) and nuclear (ITS) DNA sequences. *American Journal of Botany* 98 (11): 1868–1886. <https://doi.org/10.3732/ajb.1100103>
- Döll, J.C. (1878) Gramineae II: Stipaceae, Agrostideae, Arundinaceae, Pappophoreae, Chlorideae, Avenaceae, Festucaceae. In: Martius, C.F.P. & Eichler, A.G. (Eds.) *Flora Brasiliensis Enumeratio Plantarum*, vol. 2, pt. 3. F. Fleischer, Monachii, 342 pp. <https://doi.org/10.5962/bhl.title.454>
- Esri Inc. (2009) ArcGIS 9.3. Redlands, CA: *Environmental Systems Research Institute*. Available from: <http://www.esri.com> (accessed 15 April 2019)
- Gutiérrez, H., Castañeda, R. & Montesinos-Tubée, D.B. (2018) *Aristida tovariana* (Poaceae, Aristidoideae), a new species from the Andes of Southern Peru. *Phytotaxa* 362 (1): 105–111. <https://doi.org/10.11646/phytotaxa.362.1.9>
- Gutiérrez, H. & Castañeda, R. (2016) *Aristida pseudochi clayensis* (Poaceae), una especie nueva del norte de Perú. *Darwiniana, nueva serie* 4 (1): 83–87. <https://doi.org/10.14522/darwiniana.2016.41.682>
- Gutiérrez, H. & La Torre, M.I. (2016) *Aristida asplundii* (Poaceae: Aristidoideae) un nuevo registro para la flora peruana. *Revista Peruana de Biología* 23 (3): 343–346. <https://doi.org/10.15381/rpb.v23i3.12874>
- Henrard, J.Th. (1926) A critical revision of the genus *Aristida*, being a preliminary study and an introduction to the monograph. I. *Mededeelingen van 's Rijks Herbarium* 54: 1–220
- Henrard, J.Th. (1927) A critical revision of the genus *Aristida*. *Mededeelingen van 's Rijks Herbarium* 54 (A): 221–64.
- Henrard, J.Th. (1932) A monograph of the genus *Aristida*. *Mededeelingen van 's Rijks Herbarium* 58 (A): 157–325.
- IUCN (2017) *The IUCN red list of threatened species*, version 13 (March 2017). IUCN Red List Unit, Cambridge U.K. Available from: <https://www.iucnredlist.org/resources/redlistguidelines> (accessed 18 April 2019).
- JSTOR (2019) *JSTOR Plant Science*. Available from: <http://plants.jstor.org/> (accessed 19 April 2019)
- Kellogg, E.A. (2015) Poaceae. In: Kubitzki, K. (Ed.) *The Families and Genera of Vascular Plants*, vol. XIII. Springer, New York, 416 pp. <https://doi.org/10.1111/boj.12458>
- Kunth, C.S. (1816) Nova genera et species plantarum. In: Humboldt, F.W.H.A., Bonpland, A.J.A. & Kunth, C.S. (Eds.) *Voyage de Humboldt et Bonpland*, vol 6, Botanique. Sumtibus Librariae Graeco-Latino-Germanicae, Paris, 377 pp.
- Kunth, C.S. (1833) *Enumeratio Plantarum Omnium Hucusque Cognitarum*. Vol. 1. Sumtibus J. G. Cottae, Stutgardiae, 606 pp. <https://doi.org/10.5962/bhl.title.67381>

- Lamarck, J.B.A.P.M. (1791) *Tableau encyclopedique et methodique des trois reines de la nature: Botanique* 1 (1). Panckoucke, Paris, 496 pp.
<https://doi.org/10.5962/bhl.title.70544>
- Lindman, C.A.M. (1900) Beiträge zur gramineenflora südamerikas. *Kongliga Svenska Vetenskaps Akademiens Handlingar* 34 (6): 3–52.
- Linnaeus, C. (1753) *Species Plantarum*, ed. 1, 1. L. Salvius, Stockholm, 560 pp.
<https://doi.org/10.5962/bhl.title.669>
- Mez, C. (1921) Gramineae novae vel minus cognitae. IV Stipeae. *Repertorium Specierum Novarum Regni Vegetabilis* 17 (8–12): 146–153.
<https://doi.org/10.1002/fedr.19210170408>
- Nees, C.G. (1829) Agrostologia brasiliensis. In: Martius, C.F.P. (ed.) *Flora Brasiliensis seu Enumeratio Plantarum* 2. J.G. Cotta, Stuttgart & Tübingen, pp. 1–608.
- Soreng, R.J., Peterson, P.M., Romaschenko, K., Davidse, G., Teisher, J.K., Clark, L.G., Barberá, P., Gillespie, L.J. & Zuloaga, F.O. (2017) A worldwide phylogenetic classification of the Poaceae (Gramineae) II: An update and a comparison of two 2015 classifications. *Journal of Systematics and Evolution* 55: 259–290.
<https://doi.org/10.1111/jse.12262>
- Sprengel, C. (1827) *Systema vegetabilium. Editio decima sexta, voluminis IV, pars II*. Dieterich, Göttingen, 410 pp.
<https://doi.org/10.5962/bhl.title.822>
- Sulekic, A.A. (2003) Revisión de las especies del género *Aristida* (Poaceae, Aristideae) del Noroeste de la Argentina. *Darwiniana* 41 (1–4): 155–188.
<https://doi.org/10.14522/darwiniana.2014.411-4.213>
- Tovar, O. (1984) Seis especies nuevas de Gramineae del Perú. *Publicaciones del Museo de Historia Natural Javier Prado, Serie B. Botánica* 32: 1–12.
- Tovar, O. (1993) Las Gramíneas (Poaceae) del Perú. *Ruizia: Monografías del Real Jardín Botánico, Consejo Superior de Investigaciones Científicas* 13: 1–482.
- Trinius, C.B. & Ruprecht F.J. (1842) *Species Graminum Stipaceorum*. Academiae imperialis scientiarum, St. Petersburg, 189 pp.
- Trinius, C.B. (1836) Graminum in hisce actis a se editorum generibus ac speciebus supplementa addit. *Mémoires de l'Académie Impériale des Sciences de Saint-Petersbourg. Sixième Serie. Sciences Mathématiques, Physiques et Naturelles. Seconde Partie: Sciences Naturelles* 4 2 (1): 1–69.
- Watson, L. & Dallwitz, M.J. (1992) *The Grass Genera of the World*. Wallingford: CAB International, 1024 pp.