(xxxx) Proposal to conserve the name *Brachypodium hybridum* against *Festuca rigida*, *Bromus pentastachyos*, *Brachypodium megastachyum*, and *Brachypodium macrostachyum* (*Gramineae*, *Pooideae*)

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(xxxx) ***Brachypodium hybridum*** Catalán & al. in Ann. Bot. (Oxford) 109: 402. 1 Jan 2012 [Angiosp.: *Gram.*], nom. cons. prop.
Typus: Portugal, Lisboa, ABR113 inbred line, from seeds cultivated at Aberystwyth University, 30 May 2011, *Langdon* (MA barcode MA 833766; isotypi: JE barcodes JE00013253 & JE00013254, K barcode K000975669, JACA No. R298983).

(=) *Festuca rigida* Roth, Catal. Bot. 1: 12. Jan–Feb 1797, nom. rej. prop.
Lectotypus (see Ferrer-Gallego & al. in Phytotaxa (in rev.) (currently available on bioRxiv available at https://doi.org/10.1101/2025.05.13.653784): *Roth* (B-W barcode B -W 02109 -02 0; probable isolectotypi: B-W barcodes B -W 02109 -01 0 & B -W 02109 -03 0).

(=) *Bromus pentastachyos* Tineo, Pl. Rar. Sicil.: 4. Aug 1817, nom. rej. prop.
Lectotypus (see Steinberg in Bot. Jahrb. Syst. 102: 421. 1981): "*Bromus pentastachyon* Nob., *Brachyp. distachium* var. *4–5stachyum* var. *minus*", *Tineo* (PAL No. 19110).

(=) *Brachypodium macrostachyum* Besser in Schultes & Schultes, Mant. 3: 651. Jul–Dec 1827, nom. rej. prop.
Lectotypus (see Schippmann in Boissiera 45: 178. 1991): [România, Bobâlna, Cluj,] "Cult. Cremen. [Cremenea]", *Besser* (K barcode K000913822).

(=) *Brachypodium megastachyum* Besser in Schultes & Schultes, Mant. 3: 651. Jul–Dec 1827, nom. rej. prop.
Lectotypus (see Schippmann in Boissiera 45: 178. 1991): [România, Bobâlna, Cluj], "Cult. Cremen. [Cremenea]", *Besser* (K barcode K000913824; isolectotypi: LE barcodes LE00009972 & LE00009971).

The *Brachypodium distachyon* (L.) P. Beauv. (Ess. Agrostogr.: 101, 155, 156. 1812; based on *Bromus distachyos* L., Fl. Palaest: 13. 1756) complex includes three annual species native to the circum-Mediterranean region that are characterized by a short life cycle, ephemeral habit and self-fertility (Catalán & al. in Ann. Bot. (Oxford) 109: 385–405. 2012; in Anales Jard. Bot. Madrid 73(1): e028. 2016a; in Genet. Genomics Brachypodium: 9–38. 2016b; Scholthof & al. in Pl. Cell. 30: 1673–1694. 2018). This complex consists of two diploids, each with a different chromosome base number [*B. distachyon* (x = 5, $2n$ = 10) and *B. stacei* (x = 10, $2n$ = 20)], and their derived allotetraploid *B. hybridum* (x = 5+10, $2n$ = 30) (Catalán & al., l.c. 2012). Preliminary phylogenetic analyses of two plastid (*ndh*F and *trn*L-F) and five nuclear (ITS, ETS, CAL, GI, and DGAT) markers indicated that the more early-diverging *B. stacei* Catalán & al. (l.c. 2012: 402) and the more recently evolved *B. distachyon* emerged from two independent lineages and confirmed their contributions as genome donors to *B. hybridum*

Catalán & al. (l.c. 2012: 402) (Catalán & al., l.c. 2012: 385–405; in Trends Pl. Sci. 19: 414–418. 2014). Further evidence from different molecular sources, like seed protein data (Hammami & al. in Pl. Syst. Evol. 297: 99–111. 2011), nuclear SSRs (Giraldo & al. in Genome 55: 523–527. 2012), DNA barcoding (López-Álvarez & al. in PLoS ONE 7: e51058. 2012), isozymes (Jaaska in Biochem. Syst. Ecol. 56: 185–190. 2014), and nuclear single-copy genes (Díaz-Pérez & al. in Molec. Phylogen. Evol. 127: 256–271. 2018; Sancho & al. in Plant J. 109: 1535–1558. 2022) also confirmed the co-occurrence of progenitor *B. distachyon* and *B. stacei* markers in the *B. hybridum* background.

Morphologically, *Brachypodium hybridum* and *B. stacei* are, overall, taller and more robust plant species than *B. distachyon*, and the allotetraploid (*B. hybridum*) shows larger measurements in several traits (leaf stomatal guard cell length, pollen grain length, and number of culm nodes) than either of its diploid parents, a likely consequence of polyploidy and heterosis (Catalán & al., l.c. 2012, 2016a).

Scientific advances in the study of the *Brachypodium distachyon* complex require a taxonomic and nomenclatural revision of the names that have traditionally been considered heterotypic synonyms of *B. distachyon*. In particular, the split of *B. distachyon* into several currently recognized species makes this revision necessary. Thus, several names predate *B. hybridum*, but their diagnoses have not been recognized nor have the types been exhaustively analysed, so they have traditionally been considered synonymous with *B. distachyon* sensu lato (Schippmann in Boissiera 45: 175–182. 1991). However, according to a comprehensive taxonomic and nomenclatural analysis (Ferrer-Gallego & al. in Phytotaxa (in rev.) [currently available on bioRxiv available at https://doi.org/10.1101/2025.05.13.653784]), four names of heterotypic synonyms (see below) are older and therefore prevail over *B. hybridum*.

Brachypodium hybridum is a species native to the circum-Mediterranean region (also recorded in SW Asia: Afghanistan, Armenia, Iran, Iraq, Kuwait), and Macaronesia (Spain: Canary Islands: Fuerteventura, Gomera, Lanzarote, and Tenerife) (Catalán & al., l.c. 2012; López-Álvarez & al. in Amer. J. Bot. 102: 1073–1088. 2015). The species has been introduced in other regions of central Europe, western North America (California), South America (Uruguay and Argentina), South Africa and Oceania (Australia and New Zealand) (Jenkins & al., Applic. Novel Cytogen. Molec. Techniq. Genet. Breed. Grasses: 77–84. 2003; Garvin & al. in Crop Sci. 48(S1): S69–S84. 2008; Bakker & al. in Molec. Ecol. 18: 2588–2601. 2009; Catalán & al., l.c. 2012) and is considered an invasive plant in California and Australia (López-Álvarez & al. in Ann. Bot. (Oxford) 119: 545–561. 2017). *Brachypodium hybridum* can grow in sympatry with (or more likely near) its *B. stacei* or *B. distachyon* progenitor species in some Mediterranean localities (Shiposha & al. in Ann. Bot. (Oxford) 125: 625–638. 2020).

The current concept and use of the name *Brachypodium hybridum* is applied to an erect or spreading annual plant up to (3.5)30–40(78) cm high, leaf blades of culms 7–8(16) cm × (0.7)2–3(4.3) mm, glabrous to pubescent abaxially, with panicle with 3(–6) spikelets, spikelets (10)18–24(41) mm, and lemmas (3)8–10(12.9) mm, with awn (6)11–12(18.9) mm (see Catalán & al., l.c. 2012: 402–403; l.c. 2016a, 2016b).

Several old names long forgotten as potential synonyms of the *Brachypodium distachyon* complex (see, e.g., Schippmann, l.c.; POWO, accessed 27 April 2025; WFO. 2025, accessed 27 April 2025) have not been sufficiently analyzed so far, and some of these names threaten the name *B. hybridum*. A taxonomic and morphological statistical discriminant analysis has shown that the type materials of the names *Festuca rigida*, *Bromus pentastachyos*, *Brachypodium megastachyum*, and *B. macrostachyum* correspond to the type material and the current concept of the name *B. hybridum*, thus resulting in all these names being conspecific for the same taxon (Ferrer-Gallego & al., l.c.).

Albrecht Wilhelm Roth (1757–1834) published in 1797 the name *Festuca rigida* Roth (in Catal. Bot. 1: 12. 1797; ≡ *Brachypodium rigidum* (Roth) Link, Enum. Hort. Berol. Alt. 1: 95. 1821), with a diagnosis “spica terminali oblonga, subcompressa, seminibus ovato-oblongis aristatis imbricatis, culmo incrassato”, a complete and extensive description in Latin, and the provenance “Habitat in *Hispania*”. The protologue also contains two comments regarding the variability of the taxon and the differences with *Brachypodium distachyon* (mentioned as *Festuca distachyo*). Recently, in our taxonomic and nomenclatural study on the annual species complex of the genus *Brachypodium* (Ferrer-Gallego & al.,

l.c.), we lectotypified this name on the sheet deposited in the B-Willdenow herbarium barcoded B -W 02109 -02 0. This specimen constitutes the most complete and informative original material; it coincides with the protologue, the traditional concept, and corresponds to the species as currently delimited.

Bromus pentastachyos was described by Tineo (in Pl. Rar. Sicil.: 4. 1817; ≡ *Brachypodium pentastachyon* (Tineo) Tineo, Cat. Pl. Hort. Panorm.: 48. 1827 '*pentastachyum*') and the protologue consists of a description in Latin, followed by the word "Annuus" (i.e., annual plant) and "*Hab. l.c.*" (i.e., "prope Agrigentum", Sicily, Italy). The lectotype was designated by Steinberg (in Bot. Jahrb. Syst. 102: 418. 1981) and supported by Schippmann (l.c.: 178).

The name *Brachypodium macrostachyum* Besser (in Schultes & Schultes, Mant. 3: 651. 1827) was published with a brief description followed by the annotation "*Besser in litt.*", and the number "n. 11b". Schippmann (l.c.: 178) indicated that the "typus" is preserved at K. We have located a specimen at K (barcode K000913822), which is part of the original material. The sheet at K bears four well-preserved and complete plants and a revision label annotated by Schippmann indicating that it is the type.

The name *Brachypodium megastachyum* Besser (l.c.) was published with a brief description, the number "n. 11a", and the comment "Forsan varietas multiflora, culturâ orta Br. *distachyi*, cujusque sub nomine quoque teneo. *Besser*.". We have found three relevant specimens: at K (barcode K000913824) and LE (barcodes LE00009971 and LE00009972), which are part of the original material used by the author to describe his species. The specimen at K was designated by Schippmann (l.c.: 178) as the type of the name.

In conclusion, since the types of *Festuca rigida*, *Bromus pentastachyos*, *Brachypodium megastachyum*, and *B. macrostachyum* can all be identified as belonging to *B. hybridum* (see Ferrer-Gallego & al., l.c.), these names should be treated as conspecific and synonyms. These names or their combinations have never been in common use, and reinstating any of them would introduce a potentially confusing name change without any positive purpose. However, since these four names take priority over *B. hybridum* it would be incorrect to treat them as the synonyms of that name. Therefore, to clarify the nomenclatural situation surrounding *Brachypodium hybridum* and in order to preserve a well-established name, we propose to conserve this name under Art. 14.1 of the *ICN* (Turland & al. in Regnum Veg. 159. 2018) against the previous ones.

If this proposal is rejected, priority would dictate that the unknown and ignored name *Brachypodium rigidum* (or any of the other three: *B. pentastachyon*, *B. megastachyum* or *B. macrostachyum*) would have to replace *B. hybridum*. This fact will undoubtedly cause considerable confusion, since the name *B. hybridum* has been accepted and used continuously in the relevant scientific literature since its publication in 2012 (see e.g., Catalán & al., l.c. 2012, 2014, 2016a, 2016b; Scholthof & al. l.c. 2018; Gordon & al. in Nat. Commun. 11: 3670. 2020; Sancho & al., l.c. 2022; among others), and is currently used in several international databases (e.g., POWO, https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:77118281-1; accessed 27 April 2025).

Furthermore, a large disparity in usage between the names *Brachypodium hybridum* and *Brachypodium rigidum*, *B. pentastachyon*, *B. megastachyum*, or *B. macrostachyum* was revealed by searches of Google Scholar and GBIF.org (all accessed 27 April 2025). These searches returned 3,200 hits for *B. hybridum* (448 results on GBIF.org), 5 hits for *B. rigidum* (Roth) Link (239 for "*F. rigida*" as the illegitimate name *F. rigida* (L.) Raspail in Ann. Sci. Nat., Bot. 5: 445. 1825, currently *Catapodium rigidum* (L.) C.E. Hubb. in Dony, Fl. Bedfordshire: 437. 1953) (31 on GBIF.org), 1 for *B. pentastachyon* (Tineo) Tineo (5 for "*B. pentastachyum*") (0 on GBIF.org; 2 on "*B. pentastachyum*"), 0 for *B. megastachyum* (0 on GBIF.org), and 0 for *B. macrostachyum* (0 on GBIF.org).

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