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New Record of *Sarga purpureosericea* (Hochst. ex A.Rich.) Spangler (Poaceae) for the Flora of Saudi Arabia and second-step lectotypification of the name

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Abstract. During recent botanical expeditions in the northwestern Saudi Arabia, *Sarga purpureosericea* Spangler was recorded and collected for the first time in the country. This finding enriches Saudi Arabia's grass flora and highlights the importance of further botanical exploration. We formally include this species in the national flora, supported by a voucher specimen deposited at the University of Porto Herbarium (PO). This record bridges a significant biogeographical gap between eastern Africa and the Indian subcontinent. Additionally, we provide a second-step lectotypification of the name. The original lectotypification, based on specimens housed at the Kew Herbarium (K) and the Missouri Botanical Garden Herbarium (MO), constitutes a first-step designation under Article 9.17 of the ICN. We now designate a second-step lectotype that aligns more precisely with Spangler's original intent.

Keywords: Andropogoneae, lectotype, nomenclature, *Sarga, Sorghum,* taxonomy.

INTRODUCTION

Sarga purpureosericea (Hochst. ex A.Rich.) Spangler (Fig. 1) is an annual grass belonging to the tribe Andropogoneae Dumortier (1824). Its taxo-

nomic history is closely linked to the reclassification of species within the *Sorghum* complex (Spangler 2003). Initially described as *Andropogon purpureosericeus* Richard (1850), the species was later placed within *Sorghum* Moench (1794), where it remained for much of the 20th century. However, molecular and morphological studies suggested that *Sorghum*, as traditionally defined, was not monophyletic. Consequently, Spangler (2003) reinstated the genus *Sarga* Ewart (1911) to accommodate species formerly classified under *Sorghum* subgenera *Parasorghum* Snowden (1932) and *Stiposorghum* Garber (1950).

This reclassification recognized three evolutionary lineages within *Sorghum* sensu lato: *Sorghum* sensu stricto, which encompasses the cultivated *S. bicolor* and its closest wild relatives; *Sarga*, comprising species characterized by distinct inflorescence morphology; and *Vacoparis* Spangler (2003), a newly proposed genus that includes specific Australasian taxa (Spangler 2003). This reassessment highlights the need to integrate phylogenetic, morphological, and cytological data in grass taxonomy.

This study aims to (i) report the first occurrence of *Sarga purpureosericea* in Saudi Arabia and (ii) propose a second-step lectotypification to stabilize the taxonomic usage of the name, in line with the principles outlined by the International Code of Nomenclature for algae, fungi, and plants (Turland et al. 2025).

MATERIALS AND METHODS

The specimen of *Sarga purpureosericea* was collected in 2025 during a botanical field survey in the Jabal Ral Key Biodiversity Area, northwestern Saudi Arabia, as part of an ongoing biodiversity assessment supported by Red Sea Global (RSG-RSZ). Standard collection methods were applied, and the specimen was carefully preserved, photographed, and analyzed morphologically.

Although only one individual was collected in the field, it exhibited tussock-forming growth and multiple culms. This allowed the preparation of two complete herbarium sheets. One was deposited at the PO herbarium of the Natural History and Science Museum of the University of Porto (Portugal), and the other at the MUZ herbarium of King Abdulaziz City for Science and Technology (Saudi Arabia).

Morphological analyses were conducted using both fresh and preserved material, as well as *in situ* images. Comparative evaluation was performed against herbarium specimens from K and MO, as well as relevant taxonomic literature. Regional floras consulted included the Flora of Tropical East Africa, Flora of Ethiopia and Eritrea, Flora of Egypt (Boulos 2009), Flora of Pakistan (Nasir and Ali 1972–1994), and Analytical Flora of Eretz-Israel (Danin and Feinbrun-Dothan 1991), among others. These floras were used to compare macro-morphological features and distributional notes. Taxonomic decisions also considered modern phylogenetic frameworks and historical nomenclatural treatments (Garber 1950; Spangler 2003).

A detailed comparative assessment was conducted by confronting the original protologue with the available type-relevant specimens housed at the Kew Herbarium (K) and Missouri Botanical Garden (MO). This involved cross-checking diagnostic elements such as collector name, collection date, locality, and original binomial cited by the protologue to identify material that constitutes original material sensu ICN (Art. 9.4; Turland et al. 2025). This procedure allowed for the substantiated designation of a second-step lectotype that best reflects the original author's intent.

The typification was based on a comparative analysis between the protologue of *Andropogon purpureosericeus* Hochst. ex A.Rich. and original material from the *Schimper 1551* collection, examined at the Royal Botanic Gardens, Kew (K), the Missouri Botanical Garden (MO), and via online databases.

RESULTS

Taxonomic and nomenclatural background

Sarga purpureosericea (Hochst. ex A.Rich.) Spangler, Austral. Syst. Bot. 16: 291. 2003.

(≡) *Andropogon purpureosericeus* Hochst. ex A.Rich, Tent. Fl. Abyss. 2: 469. 1850.

(≡) *Sorghum purpureosericeum* (Hochst. ex A.Rich.) Schweinf. & Asch., Bei tr. Fl. Aethiop.: 310. 1867.

(=) *Andropogon purpureosericeus* var. *calomelas* Hack. in A.L.P.P. de Candolle, Monogr. Phan. 6: 525. 1889.

(=) *Andropogon purpureosericeus* var. *pallidior* Hack. in A.L.P.P. de Candolle, Monogr. Phan. 6: 525. 1889.

(=) *Andropogon pappii* Gand., Bull. Soc. France 66: 298. 1919.

(=) *Sorghum dimidiatum* Stapf in D.Oliver & auct. suc. (eds.), Fl. Trop. Afr. 9: 140. 1917.

(≡) *Sorghum purpureosericeum* subsp. *dimidiatum* (Stapf) E.D.Garber, Univ. Calif. Publ. Bot. 23: 328. 1950.

Figure 1. a) Specimen of *Sarga purpureosericea* (Hochst. ex A.Rich.) Spangler: PO-V73041 (Porto University, Natural History and Science Museum); b), c) details of the species in the natural habitat at Jabal Ral Key Biodiversity Area, Red Sea Zone, north-western Saudi Arabia; d) detail of densely bearded nodes with stiff white hairs.

(=) *Sorghum deccanense* Stapf ex Raizada, Indian Forester 80: 43. 1954.

(≡) *Sorghum purpureosericeum* subsp. *deccanense* E.D.Garber, Univ. Calif. Publ. Bot. 23: 328. 1950

Distribution and habitat

Sarga purpureosericea (A.Rich.) Spangler, has a broad but disjunct distribution extending across the northern Rift Valley system of eastern Africa and into southwestern Asia. It is recorded in Uganda, Ethiopia, Eritrea, eastern Sudan, the Deccan Plateau (India), and recently southern Arabian Peninsula (Clayton 2008; POWO 2025). The species typically occupies semi-arid to arid regions, with rocky or sandy substrates, temporary streambeds, and seasonally flooded areas (Spangler 2003). Its discovery in Saudi Arabia (Fig. 2) complements the known latitudinal distribution of the species between north-eastern Africa and the Indian subcontinent, bridging the biogeographical gap across the northern part of the Afro-Arabian region. This record may represent either a previously overlooked native population or a recent long-distance dispersal event. Historical confusion with morphologically similar taxa, such as *Sarga versicolor* (Andersson) Spangler (2003: 294), may have obscured its actual range (Garber 1950).

In Saudi Arabia, the species was recorded within the Tropical Xeric bioclimate, Antitropical Variant (Rivas-Martínez et al. 2011), specifically at the Jabal Ral Key Biodiversity Area in the Red Sea Zone (RSZ) (El-Bana et al. 2025). It inhabits a geomorphological setting characterized by a rocky drainage channel that forms ephemeral ponds and eventually feeds into a temporary streambed (wadi) (Fig. 3). This landscape reflects a dynamic hydrological regime, likely shaped by irregular and highly seasonal rainfall within the watershed (Al-Rowaily et al. 2012). The site hosts a sparse yet diverse xerophytic flora encompassing various growth forms, including shrubs (e.g. *Hibiscus micranthus* L., subshrubs (e.g.

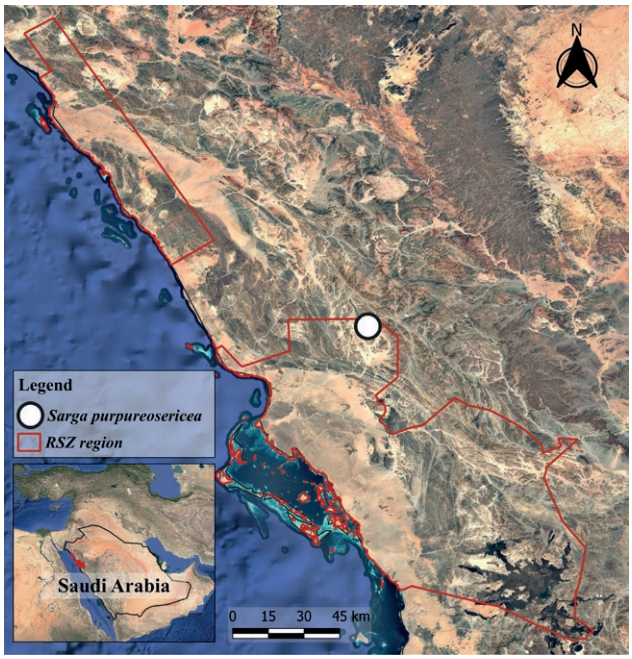

Figure 2. Study area and location of *Sarga purpureosericea* in Jabal Ral Key Biodiversity Area of Red Sea Zone.

Figure 3. Global overview of the habitat of *Sarga purpureosericea* in Jabal Ral, Red Sea Zone, northwestern Saudi Arabia.

Tephrosia purpurea (L.) Pers. subsp. *apollinea* (Delile) Hosni & El-Karemy), and herbs (e.g. *Spergularia flaccida* (Madden) I.M.Turner, *Galium setaceum* Lam., *Rumex vesicarius* L., indicating a vegetation community adapted to brief pulses of moisture within predominantly arid conditions (Figs 1–3).

Despite similar habitats in the region, only a single individual was located, suggesting that this population may be either relictual or recently established. Although only one plant was found, its tussock-forming growth allowed for the preparation of two complete herbarium specimens from different portions of the same individual, which were deposited in separate herbaria. The rarity of the species in Saudi Arabia may stem from ecological specialization or under-sampling due to cryptic morphology or phenology. The co-occurrence of taxa with wide-ranging xeric chorotypes points to underlying habitat and floristic heterogeneity, emphasizing the ecological complexity behind the elusive distribution of this species (Fig. 3).

Conservation status

Main threats include herbivory by free-ranging camels, sheep, and goats, which exert heavy grazing pressure in desert habitats (Abulfatih 1992; Moustafa 2001; Al-Rowaily et al. 2012; Al-Rowaily et al. 2015). The absence of additional individuals in ecologically comparable sites may reflect a relictual distribution or recent establishment. Alternatively, this scarcity might be linked to undetected microhabitat constraints or phenological invisibility during sampling.

Given the extremely limited area of occupancy, low number of individuals, and exposure to ongoing threats, *Sarga purpureosericea* may fall within a threatened category under IUCN Red List criteria (IUCN Standards and Petitions Committee 2022). Although the species is currently listed as Least Concern on the global IUCN Red List due to its broader range across eastern Africa and southern Asia (Contu 2013), the newly discovered Saudi Arabian population appears to be highly localized and potentially vulnerable. Further surveys are needed to confirm presence and assess population dynamics. Until then, it should be considered for future inclusion in the Saudi Arabian Red List of Vascular Plants (Thomas et al. 2021). A duplicate specimen is deposited at the King Abdulaziz City for Science and Technology herbarium (MUZ).

Typification

A first-step lectotypification of Andropogon purpureosericeus Hochst. ex A.Rich. (Richard 1850) was previously proposed by Spangler (2003), who cited original material from the Royal Botanic Gardens, Kew (K), and the Missouri Botanical Garden (MO), but without specifying a particular specimen. In accordance with Article 9.17 of the International Code of Nomenclature for algae, fungi, and plants (Turland et al. 2025), we here designate K000280777 (K) as the second-step lectotype

Figure 4. Types: a) Lectotype of *Sarga purpureosericea* (K000280777!). © The Board of Trustees of the RBG, Kew. http://specimens.kew.org/herbarium/K000280777; isolectotypes: b) (K000280778!). © The Board of Trustees of the RBG, Kew. http://specimens.kew.org/herbarium/K000280778 and c) (MO-015407!). Image courtesy of Missouri Botanical Garden Herbarium (https://tropicos.org/specimen/998943).

of Sarga purpureosericea. Among the original material cited by Spangler, specimens K000280778 (K) and MO-015407 (MO), belonging to the same Schimper 1551 gathering, are accordingly considered isolectotypes.

Digital duplicates of additional specimens from the same gathering were located through online repositories in the following herbaria: BR, FI, G, GOET, HOH, LG, M, MPU, P, PRE, S, STU, TUB, and W. Although not examined physically, these materials match the lectotype in collector, date, and locality, and therefore also qualify as isolectotypes, further supporting the typification and ensuring nomenclatural precision.

Discussion

The specimen collected from Jabal Ral was identified as *Sarga purpureosericea* based on full agreement with the protologue and comparison with original material. The plant exhibits narrow, linear-lanceolate leaves with silky-pubescent sheaths, and a contracted terminal panicle that is often partially enclosed by the uppermost leaf sheath, as typical features of the species. Its long-exserted racemes are purple-silvery and distinctly plumose, with dimorphic spikelets: lanceolate, awned sessile spikelets, and sterile, densely pilose pedicellate spikelets. These traits, in combination, distinguish *S. purpureosericea* from other *Sorghum*-like grasses occurring in the region. The Saudi Arabian material matches both the morphology and ecological preference described for the species elsewhere, confirming its identity and supporting the range extension into the Arabian Peninsula.

The discovery of *Sarga purpureosericea* in northwestern Saudi Arabia significantly enhances our understanding of the species' biogeographic range. This record not only fills a distributional gap between East Africa and the Indian subcontinent but also raises questions about the species' dispersal mechanisms and historical presence in the Arabian Peninsula. Given the region's role as a migratory corridor and its complex climatic history, the species' occurrence may reflect either a relict population or a more recent colonization event facilitated by hydrochory or zoochory.

The second-step lectotypification presented here ensures congruence with the original intent of Spangler (2003) and aligning with the ICN's provisions. The name *Sarga purpureo-sericeum* (Spangler 2003) required correction under the International Code of Nomenclature for algae, fungi, and plants (ICN). The original basionym, *Andropogon purpureo-sericeus*, includes a hyphenated compound epithet, which is not permitted under Article 60.9 of the ICN. This article mandates that hyphens in compound epithets must be deleted unless the components normally stand as independent words or when the same letter occurs on either side of the hyphen. In this case, *purpureo-sericeus* is a compound of two combining forms and does not meet the

exceptions. Therefore, the epithet was corrected to *purpureosericeus*. Upon transferring the species to the feminine genus *Sarga*, the epithet must also agree in gender, resulting in the correct name *Sarga purpureosericea*. Future phylogenomic approaches could test the genetic distinctiveness of Arabian populations relative to African and Indian lineages, potentially revealing hidden evolutionary structure.

From a conservation perspective, the apparent rarity of the species, combined with anthropogenic pressures such as grazing, warrants immediate monitoring. Although currently only a single individual has been observed, it may represent a small, overlooked population rather than an isolated occurrence. Further systematic surveys across similar habitats in the Red Sea Zone and adjacent bioregions are essential.

In summary, this new record underscores the importance of continued floristic exploration in undersurveyed arid regions, where overlooked taxa may provide critical insights into historical biogeography, taxonomy, and conservation priorities.

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