



Piptatherum nandadeviense (Poaceae, Stipeae), a new grass species from India

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ABSTRACT: The ricegrass species *Piptatherum nandadeviense* sp. nov. is described and illustrated from Kedarnath Wildlife Sanctuary and Valley of Flowers National Park, Western Himalaya, India. The new species is morphologically similar to *P. munroi* in having spreading panicle branches but is clearly distinguished from the latter in its characteristic features of leaf sheath, ligules, panicle, and spikelet. In addition, data on distribution, habitat, associated species, flowering and fruiting, and taxonomic notes are provided, along with photo plates and a distribution map.

KEY WORDS: Nanda Devi Biosphere Reserve, *Oryzopsis*, *Piptatherum grandispiculum*, *Piptatherum munroi*, Pooideae.

INTRODUCTION

Piptatherum P.Beauv., a grass genus in the tribe Stipeae Dumort (Poaceae, Pooideae), was established by Palisot de Beauvois (1812). Subsequently, it was synonymized under *Oryzopsis* Michx. by Hooker (1896), Bor (1960), and Clayton and Renvoize (1986). However, Freitag (1975) treated *Piptatherum* as a separate genus from *Oryzopsis* in a revisionary study from Southwest Asia. Based on phylogenetic and micro-morphological evidence, Romaschenko *et al.* (2011) reinstated *Piptatherum* as a distinct monophyletic genus, a treatment further supported by Hamasha *et al.* (2012) and accepted by Kellogg (2015). The comprehensive review of *Piptatherum* and related genera, including infraspecific classification, was provided by Romaschenko *et al.* (2011) and Hamasha *et al.* (2012).

Piptatherum s. str. consists of about 32 species, commonly found in temperate forests, scrublands, and mountain steppes across Eurasia, North Africa, and temperate Asia to the Himalaya (Romaschenko *et al.*, 2011, 2012; Soreng *et al.*, 2022; POWO, 2025). It is characterized by having a transverse-elliptic or linear disarticulation scar that lacks grooves, a flattened and glabrous callus (non-protruding), an exposed palea except at the apex, and free lemma margins (Romaschenko *et al.*, 2011). These morphological characters segregate *Piptatherum* from related genera, *Oryzopsis*, *Patis* Ohwi and *Piptatheropsis* Romasch., P.M. Peterson & Soreng, that have circular or elliptic disarticulation scars, often grooved, glabrous callus which is frequently protruding and conical, palea completely concealed (in *Oryzopsis*) or partially exposed distally (in *Patis* and *Piptatheropsis*), and basally fused lemma margins which occasionally form small fleshy warts at the junction (Freitag, 1975;

Barkworth, 2007; Romaschenko *et al.*, 2011; Kellogg, 2015; Nobis *et al.*, 2019). Furthermore, *Piptatherum* also shares specific morphological characteristics with the American genus *Piptochaetium* J. Presl, notably a protruding palea from the lemma and glumes that are longer than the lemma (Cialdella *et al.*, 2007). However, it is distinguished by its terete nodes, scabrous leaf blades, non-involute lemma margins with apex not fused into a crown, consistently blunt callus, and non-grooved palea (Cialdella *et al.*, 2007). *Piptatherum* has recently been revised from its native ranges, such as Nepal, by Nobis *et al.* (2019), and from Bosnia and Herzegovina by Maslo and Šarić (2022). In addition, two new species have also been described, *P. denaense* Hamzehee & Assadi from Iran, and *P. fumeauxii* F.M.Vázquez, Chamboul. & C.Chatel. from Algeria (Hamzeh'ee and Assadi, 2015; Vázquez-Pardo *et al.*, 2022).

In India, the genus *Piptatherum* is represented by seven species: *P. aequiglume* (Duthie ex Hook.f.) Munro ex Roshev., *P. gracile* Mez, *P. hilariae* Pazij, *P. laterale* (Regel) Roshev., *P. microcarpum* (Pilg.) Tzvelev, *P. munroi* (Stapf) Mez, and *P. songaricum* (Trin. & Rupr.) Roshev. (Kellogg *et al.*, 2020; Sharma *et al.*, 2026). While all of them are reported in the Western Himalayas, there species, namely *P. aequiglume*, *P. gracile*, and *P. munroi* are also distributionally expended to the Eastern Himalayas (Bor, 1960; Shukla, 1996). In regional Floras of Western Himalayas, however, these species were recognized under the genus *Oryzopsis* (e.g., Stewart, 1945; Chowdhery and Wadhwa, 1984; Aswal and Mehrotra, 1999). However, an exception is found in the Flora of Gangotri National Park, where Pushalkar and Singh (2012) followed Romaschenko *et al.* (2011) by treating *Piptatherum* s. str. separately from *Oryzopsis*.

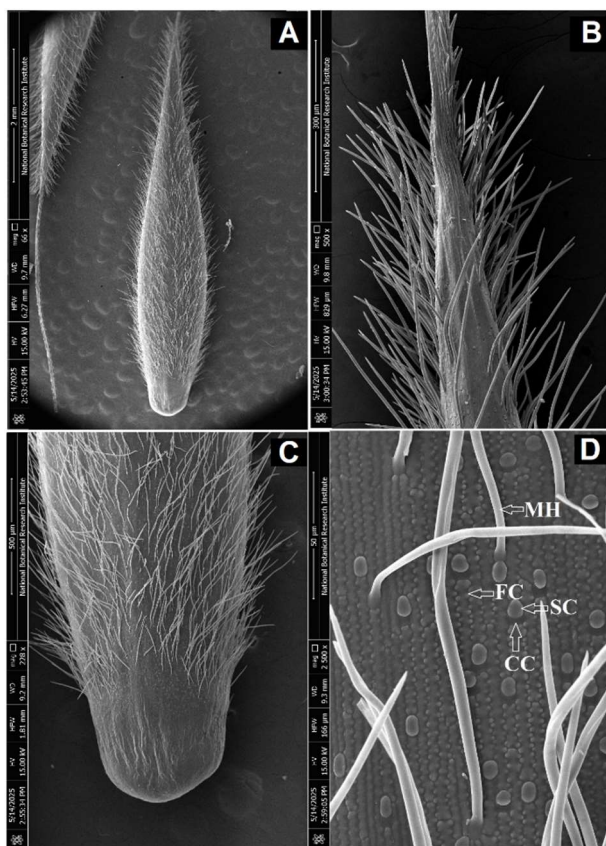


Fig. 1. Lemma micromorphology of *Piptatherum nandadeviense* sp. nov.: **A.** Anthecium, **B.** Apex showing hairs, long fundamental cells (FC) and Silica cell (SC), **C.** Callus, **D.** Lemma surface showing “saw-like” LEP, long and sinuous fundamental cells, SC/Cork cell (CC) pairs not abundant, silica bodies rounded to slightly elongated sometimes with shallow constriction, not regularly paired with crescent- to square-shaped cork cells, prickles not found. Photographed from the holotype.

During several botanical tours in the Western Himalaya, India, from 2019 to 2024, unique voucher specimens of *Piptatherum* and related genera were collected from Kedarnath Wildlife Sanctuary and Valley of Flowers National Park in Uttarakhand. Subsequent micro-morphological studies, along with the perusal of relevant literature (e.g., Hooker, 1896; Bor, 1960; Naithani, 1985; Noltie, 2000), consultation of national (in person) and international herbaria (online) suggested that the specimens, *S. Tiwari & M. Singh* 346608, 346621, 346634 & 346659 (LWG) and *P. Agnihotri et al.* 261754 (LWG!), were quite distinct from other known species of *Piptatherum*. Therefore, the new species, *P. nandadeviense* sp. nov., is described below, along with a comprehensive taxonomic description and notes on its habitat and distributional range.

MATERIALS AND METHODS

Several botanical trips were undertaken in Western Himalaya, India, for the collection of grass specimens

between 2019 and 2024. During the trips, photos of habitat, habit, and panicle were taken using a Canon EOS 1500D camera. The voucher specimens were processed to prepare herbarium sheets using standard herbarium techniques (Jain and Rao, 1977) and deposited at the LWG herbarium. The relevant national herbaria (BSD, CAL, DD, and LWG) and international herbaria (BM and K) were consulted to examine the specimens associated with *Piptatherum* and other allied genera (Appendix I). The morphological characters were observed and recorded using a Leica S8 APO stereozoom microscope, equipped with an MC 120HD camera.

For micro-morphological studies of the lemma surface of the new species, samples were taken from *S. Tiwari & M. Singh* 346608 (LWG). All the samples were fixed in formalin-acetic alcohol (ratio 1:3:1) solution for 48 hrs. The samples were then dehydrated with increasing strengths of ethyl alcohol solutions. Thereafter, the dried material was coated with gold and then photographed and examined under various magnifications using a FEI QUANTA 250F scanning electron microscope (SEM) in low-vacuum mode (Doğan 1988) at the CSIR-National Botanical Research Institute, Lucknow, India.

The morphological characters of similar species, including *P. munroi*, were obtained from herbarium specimens (Appendix I) and the taxonomic literature (e.g., Hooker, 1896; Bor, 1960; Aswal and Mehrotra, 1994; Naithani, 1985; Noltie, 2000; Wu and Phillips, 2006; Romaschenko *et al.*, 2011; Pushalkar and Singh, 2012; Nobis *et al.*, 2019). We prepared a distribution map by using the DIVA-GIS computational program (Hijmans *et al.*, 2001).

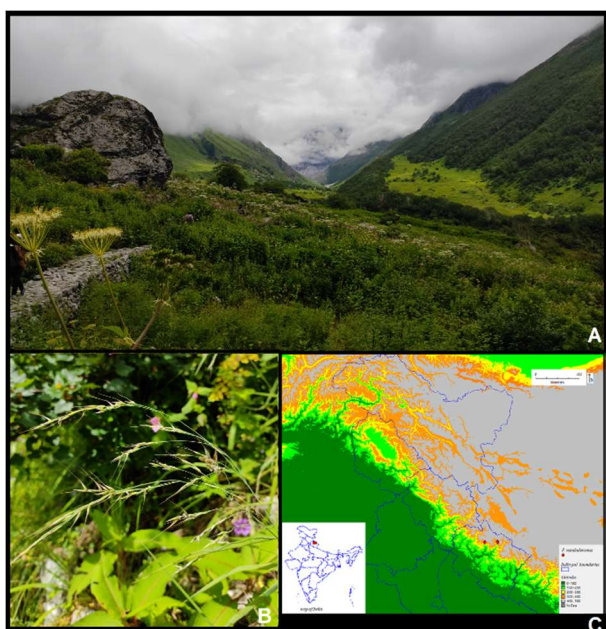
RESULTS AND DISCUSSION

The new species exhibits a “saw-like” epidermal pattern on the lemma surface (LEP), characterized by long fundamental cells with sinuous sidewalls, rounded to slightly elongated silica bodies, crescent-shaped cork cells not regularly paired with silica bodies, and the absence of prickles (Fig. 1), similar to those of *Piptatherum* s. str. However, in contrast, the allied genera *Patis* and *Piptatheropsis* have square-shaped cork cells (Romaschenko *et al.*, 2011). Along with these, in *Patis*, silica bodies are rectangular or square-rounded, occasionally with one to three shallow constrictions, and prickles are often present. In contrast, in *Piptatheropsis*, silica bodies are rounded to oval, sometimes with a single shallow to deep constriction (Romaschenko *et al.*, 2011). The new species is also distinguished from *Piptochaetium* by the absence of prickles on its lemma surface, a feature present in all species of the latter genus (Barkworth, 1987, 1993, 2007; Cialdella and Giussani, 2002; Romaschenko *et al.*, 2011).

Within *Piptatherum*, the new species is morphologically similar to *P. munroi* in its habit and

**Table 1.** Morphological differences between *Piptatherum grandispiculum*, *P. munroi* and *P. nandadeviense*.

Character	<i>P. grandispiculum</i>	<i>P. munroi</i>	<i>P. nandadeviense</i>
Nodes	3–4, glabrous below node	2–3, glabrous below node	3–4, scaberulous below node
Leaves (2 nd topmost leaf)	4–15 cm long	6–13 cm long	15–20 cm long
Leaf surface	Adaxial or abaxial surface smooth	Adaxial surface scaberulous and abaxial surface scabrous	Adaxial surface shortly pilose and abaxial surface scabrous
Ligule	4–5 mm long, lanceolate	2–5 mm long, apex rounded or lacerated	6.12–7.51(–8) mm long, truncate
Panicles	10–25 cm long	(7–)15–20 cm long	20–28 cm long
Panicle branches	2–6, smooth	2, scabrid	2, smooth
Lower glume	8–9 mm long	4–5.2(–7) mm long	7.31–8.47(–8.9) mm long
Lower glume nerves	3-nerved	3-nerved	5-nerved
Upper glume nerves	3–5-nerved	3–5-nerved	5–7(–9) nerved
Glume margin	scabrid up to 1/3 from apex	scabrid up to 1/3 from apex	scabrid up to 2/3 from the apex
Anthesis length	5.2–6.2 mm long	(3.8)4.2–6.1(6.8) mm long	5.7–6.39(–6.62) mm long
Lemmas	5–6 mm long, narrowly lanceolate, pubescent, glabrescent at maturity	(3.4)4–6(–6.5) mm long, oblong-lanceolate, lower part glabrous, glabrescent along midline at maturity	5.41–5.92(–6.1) mm long, lanceolate, lower part hairy, pubescent along midline at maturity
Awns	4–7 mm long, erect, deciduous, without constriction	6–13 mm long, straight or slightly flexuous, deciduous, with distinct constriction	10–18(–22) mm long, flexuous, subsistent, without constriction
Paleas	4–5.8 mm long	(3.4)4–5.6(6.2) mm long	5.61–6.05(–6.31) mm long
Anthers	About 3.5 mm long	1.0–2.5 mm long	2.61–3.56 (–3.8) mm long

**Fig. 2.** *Piptatherum nandadeviense* sp. nov. **A.** Habitat, **B.** Habit, Leaf blade and panicle. photo by Smita Tiwari, **C.** Distribution map of *P. nandadeviense* sp. nov. in Western Himalaya. Drawn by Dileshwar Prasad.

branching pattern of the panicle (Figs. 2–3); however, it can be easily separated by the characters stated in the diagnosis, Table 1, and illustrated in Figures 3. The plant height, length of the glumes and lemmas of the new species (Fig. 3) are also quite similar to *P. aequiglume*, but the new species markedly differs in having ligule 6.12–7.51(–8) mm long and obtuse at the apex (vs. 2–5(–6) mm long and rounded at the apex), glume margins scabrid along the upper two-thirds (vs. upper one-third), lanceolate and pubescent lemma (vs. linear-lanceolate and glabrescent along the midline at maturity), and awn 10–18(–22) mm

long (vs. 6–13 mm long). The new species has spreading panicle branches, smooth and obtuse ligule, unlobed lemma apex, and anthers with a tuft of hairs, which differentiate it from *P. hilariae*, whereas the latter has loosely contracted to linear panicles, scabrid and lanceolate ligule, lobed lemma apex, and anthers without a tuft of hairs. *Piptatherum nandadeviense* is morphologically allied to *P. grandispiculum* (P.C.Kuo & Z.L.Wu) S.M.Phillips & Z.L.Wu, a species known from Tibet, in sharing a perennial habit with short rhizomes, an open panicle, relatively large spikelets, pubescent lemmas, and bearded anthers. However, the new species differs from *P. grandispiculum* by its longer and persistent awn (10–22 mm vs. 4–7 mm, caducous), panicle branches usually 2 per node and up to 15 cm long (vs. 2–6 per node and up to 10 cm long), longer ligules [6–8 mm vs. 4–5 mm], and densely hairy lanceolate to broadly lanceolate lemmas (vs. narrowly lanceolate, sparsely pubescent lemmas becoming glabrescent at maturity) (Wu and Zhou, 1981; Wu and Phillips, 2006).

TAXONOMIC TREATMENT

Piptatherum nandadeviense P.Agnihotri & Sangam Sharma, *sp. nov.* **Figs. 1–3**

Type: India: Uttarakhand, Chamoli, 1 km from Valley of Flowers National Park Zero Point, 30°42'46.0584" N, 79°35'43.62" E, 3,450 m a.s.l., 8 August 2024, *S Tiwari & M Singh 346608* (holotype: LWG123653!; isotype: LWG123654!; 123655!).

Diagnosis: The new species differs from *P. munroi* by its ligules of the second uppermost leaves of flowering shoots 6.12–7.51(–8) mm long, truncate to obtuse at apex (vs 2–5 mm long, rounded at apex), panicle 20–28 cm long (vs 7–20 cm long), glumes margin scabrid 2/3rd from the above (1/3rd from the above), lower glume 7.3–8.4(–



Fig. 3. *Piptatherum nandadeviense* sp. nov.: **A.** Leaf blade abaxial view, **B.** Leaf blade adaxial view, **C.** Ligule of the second uppermost leaf of a flowering shoot, **D.** Ligule of vegetative shoot, **E.** Spikelet with removed floret, **F.** Glumes, **G.** Lemma, **H.** Palea, **I.** Stamens and pistil, **J.** Lodicules, Ovary, and feathery stigma. Photographs by Sangam Sharma from the holotype.

8.9) mm long, 5-veined (vs. 4–5.2(–7 mm) long, 3-veined), upper glume 7.5–8.6(–9) mm long, 5–7(9)-veined (vs 4–5(–6.8) mm long, 3–5-veined), palea longer than lemma (vs equal or smaller than lemma), awn 10–18(–22) mm long, flexuous, tardily deciduous (vs 6–13 mm long, straight or slightly flexuous, deciduous) and anthers 2.6–3.5(–3.8) mm long, (vs 1.0–2.5 mm long). (Figs. 3 & S2)

Description. Herbs 70–130 cm tall, perennial, short-rhizomatous or tufted, with a few to numerous vegetative shoots; shoots extravaginal. **Culms** 55–100 cm tall, terete, somewhat geniculate at base, smooth, with 2–4 glabrous nodes. **Leaves of vegetative shoots (2nd topmost leaf):** sheaths scabrid on veins, greenish-white; ligules 1.9–2.9(–3) mm long, membranous, the apex obtuse; blades 7–12 cm long, 3–4 mm wide, flat, green, ribbed, adaxial surface covered with short hairs, abaxial surface minutely

scabrous on veins (Fig. 3D). **Leaves of flowering shoot (2nd topmost leaf):** sheaths smooth; ligules 6.1–7.5(–8) mm long, at the apex truncate to obtuse; blades 15–20 cm long, 2.5–5.5 mm wide, convolute, green, adaxial surface shortly pilose and abaxial surface scabrous on veins (Fig. 3C). **Panicles** 20–28 cm long, lax or spreading or open, linear, two lower panicle branches per node, with single spikelets, lower 1/3 bare; lower branches erect, setulose, up to 15 cm. Spikelets 7.5–8.6(–9) mm long, gray-green or green. **Glumes** subequal or unequal, green, lanceolate; margin scabrid up to 2/3 from apex; apex acuminate; base rounded, glabrous (Fig. 3F). **Lower glumes** 7.3–8.5(–8.9) mm long, 1.7–2.3(–2.6) mm wide, 5(–7)-veined. **Upper glumes** 7.5–8.6(–9) mm long, 1.9–2.4(–2.6) mm wide, 5–7(–9)-veined (Fig. 3G). **Antheiums** 5.7–6.3(–6.6) mm long, 0.9–1.2 mm wide, dorsally compressed. **Callus** 0.41–0.48 mm long, glabrous; disarticulation scars 0.11–



0.14 mm, narrow oblate. **Lemmas** 5.4–5.9(–6.1) mm long, 1.2–2 mm wide, dark brown at maturity, 3-veined, dorsal surface covered with 0.2–0.7 mm long stiff hairs, slightly dorsally flattened, lanceolate to broadly lanceolate, coriaceous; margin not fused at base; apex tapered, hairy; base rounded. **Awns** 1.0–1.8(–2.2) cm long, tawny, persistent, scabrid, straight or flexuous (Fig. 3G). **Paleas** 5.6–6.0(–6.31) mm long, 0.7–1.4 mm wide, narrowly lanceolate, similar to lemma, dorsal surface hairy at middle, margin glabrous; apex lobed, acuminate; base rounded (Fig. 3H). **Lodicules** 3, membranous; lateral lodicules 0.9–1.3 mm long, ovate, apex acute; central lodicule 0.9–1.2 mm long, lanceolate, apex acute (Fig. 3J). **Anthers** 2.6–3.5(–3.8) mm long, yellow, tuft of rigid hair on apex (Fig. 3I). **Ovary** with 2 styles (Fig. 3J). **Caryopsis** 5.2–5.8 mm long, ovoid, slightly compressed, embryo 0.8–1.1 mm long, hilum almost reaching the apex.

Distribution, Habitat & species association.

Piptatherum nandadeviense was collected from two different localities in Western Himalaya, the Valley of Flowers National Park and along the trail from Bheembali to Lincholi Top, Kedarnath Wildlife Sanctuary in Uttarakhand (Figs. 2C & 1S). It inhabits alpine meadows, primarily on mountain slopes and in moist, rocky areas, at elevations of 3200–3450 m. *Piptatherum nandadeviense* is typically found in association with the following species: *Bupleurum rupestre* Edgew., *Geranium rectum* Trautv., *Hypericum perforatum* L., *Impatiens graciliflora* Hook.f., *Silene vulgaris* (Moench) Garcke, *Briza minor* L., *Piptatherum munroi* (Stapf ex Hook.f.) Mez and *Poa stapfiana* Bor.

Phenology. *Piptatherum nandadeviense* flowers and bears caryopses in July to August.

Etymology. This specific epithet “*nandadeviense*” is derived from the Nanda Devi Mountain range, located in the Kumaon Himalaya, Uttarakhand. These mountain ranges are a major part of the Nanda Devi Biosphere Reserve, which includes the Valley of Flowers National Park as its core area.

Additional specimens examined (Paratypes): India.

Uttarakhand, Chamoli district, 2 km to Valley of Flowers National Park, 30°42'45.864" N, 79°35'34.4256" E, 3450 m, 8 August 2024, *S Tiwari & M Singh 346631* (LWG); 4 km to Valley of Flowers National Park, 30°42'37.656" N, 79°35'44.5776" E, 3400 m, 8 August 2024, *S Tiwari 346659* (LWG); 6 km to Valley of Flowers National Park, 30°42'32.9148" N, 79°35'45.078" E, 3394 m, 8 August 2024, *S Tiwari & M Singh 346634* (LWG); 2 km to Lincholi top on the way to Kedarnath, 30°42'10.8108" N, 79°35'51.9156" E, 3204 m, 15 July 2021, *P Agnihotri, D Prasad & P Rajput 261754* (LWG!).

Key to the Indian species of *Piptatherum*

- 1a. Panicle contracted to narrowly linear; branches erect or ascending, usually less than one-third of panicle length 2
- 1b. Panicle open, lax or spreading; branches ascending to spreading, usually one-half or more of panicle length 4
- 2a. Lemma apex distinctly 2-lobed above awn insertion, lobes bearing tufts of hairs; anthers glabrous or nearly so *P. hilariae*
- 2b. Lemma apex entire or minutely lobed, without tufts of hairs; anthers bearded 3
- 3a. Panicle narrowly linear; awn caducous, bent at insertion ... *P. gracile*

- 3b. Panicle loosely contracted; awn persistent or tardily deciduous, straight at insertion *P. laterale*
- 4a. Lemma glabrous *P. microcarpum*
- 4b. Lemma pubescent over at least the upper part of dorsal surface 5
- 5a. Plants densely tufted; lemma pubescent only above middle, glabrous below except for basal tufts of hairs *P. songaricum*
- 5b. Plants loosely tufted or short-rhizomatous; lemma pubescent throughout 6
- 6a. Panicle branches 3–5 per node; lemma equalling or nearly equalling glumes; awn not constricted at insertion *P. aequiglume*
- 6b. Panicle branches 1–3 per node; lemma distinctly shorter than glumes 7
- 7a. Awn 6–9 mm long, caducous; lemma 2.5–4.5(–5) mm long; palea shorter than lemma *P. munroi*
- 7b. Awn 10–22 mm long, persistent; lemma 5.4–6.1 mm long; palea longer than lemma *P. nandadeviense*

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