

**A REVISED INFRAGENERIC CLASSIFICATION OF *DIMERIA* R. BR.
(POACEAE: ANDROPOGONEAE)**

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Abstract

The four sections of the little known genus *Dimeria* R. Br. of the rather anomalous paleotropical subtribe Dimeriinae Hack. (Poaceae–Panicoideae–Andropogoneae) are revised. A key is provided. Three Peninsular Indian species, viz. *Dimeria sivarajanii*, *D. idukkiensis* and *D. borii* are treated here as subspecies of *D. bialata*, *D. kurumthotticalana* and *D. mooneyi* respectively; and five, viz. *D. chelariensis*, *D. copei*, *D. eradii*, *D. jayachandranii* and *D. kollimalayana* are reduced to synonymy.

Introduction

Dimeria R. Br. (Poaceae) is a little known genus with about 65 species (Teerawatananon *et al.*, 2014). They are adapted to arid habitats and range from India to China, Korea, Indonesia, Micronesia, and northern Australia and to Sri Lanka and Madagascar (Bor, 1953; Clayton *et al.*, 2006; Kiran Raj and Sivadasan, 2008; Kiran Raj *et al.*, 2013a, b; Kiran Raj *et al.*, 2015) (Fig. 1).

It used to be the only genus of the rather anomalous paleotropical subtribe Dimeriinae Hackel (1889) until *Nanooravia* Kiran Raj & Sivad. (Kiran Raj *et al.*, 2013a, b) was described from India. The subtribe is distinguished by espatheate inflorescences consisting of 1–11 digitate racemes with tough rachis and strongly laterally flattened solitary spikelets by which it differs from all other Andropogoneae Dumort. (Clayton, 1972). Brown (1810) placed it between *Imperata* Cirillo and *Ischaemum* L. Endlicher (1836) included it in the Andropogoneae between *Zoysia* Willd. and *Pleuroplitis* Trin. (= *Arthraxon* P. Beauv.). Steudel (1854) treated six species in Andropogoneae between *Euklaston* Steud. (= *Andropogon* L.) and *Pterygostachyum* Nees *ex* Steud., *Psilostachys* Steud. (synonyms of *Dimeria*) and *Amblyachyrum* Hochst. *ex* Steud. (= *Apocopis* Nees). Bentham (1881) included it in the subtribe Arthraxonae J. Presl together with *Apocopis* Nees and *Arthraxon* P. Beauv., but in 1883 in the Andropogoneae *s.l.* (Bentham, 1883).

Hackel (1889) had 12 species, 2 subspecies, and 10 varieties and regarded it as close to the Sacchareae Dumort., and very much to the Tristegineae Nees. For a discussion on the latter tribe see Veldkamp (2015).

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Roberty (1960) found the genus *Dimeria* so homogeneous, that in his “cohors” *Dimeriastreae* he accepted only a single species, *D. avenacea* (Retz.) C.E.C. Fisch., with not less than 22 subvarieties all with invalid names, because he did not follow the Linnean infraspecific classification.

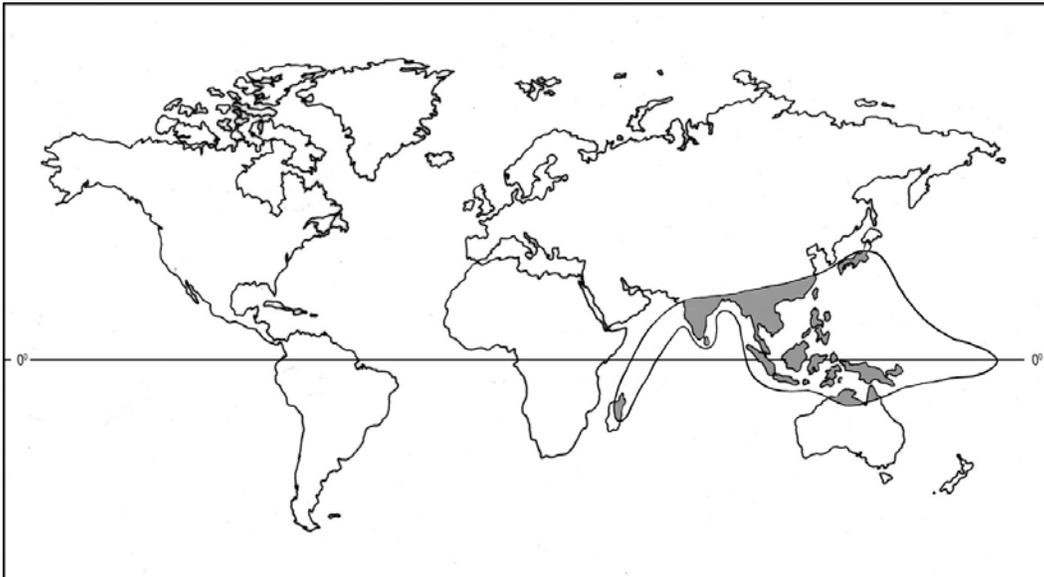


Fig. 1. Distribution of *Dimeria* R. Br.

Clayton and Renvoize (1986) regarded it as derived from the *Ischaeminae* J. Presl by suppression of the sessile spikelet. This might as well be loss of the pedicelled ones, as was observed by Miquel (1851: “rudimentary pedicels”), but by no one else. Kellogg and Watson (1993) in their phylogenetic analysis based on morphological data treated *Dimeria* as a sister group of *Cleistachne* Benth. of the subtribe *Sorghinae* Bluff *et al.* with both genera nesting in a clade. Estep *et al.* (2014) in a nuclear molecular study found *Dimeria* nested in a clade within *Ischaemum*, but with little basal support, so a reduction of *Dimeria* to *Ischaemum* seems premature.

The majority of the species (34 out of 65: Table 1) is confined to Peninsular India (Hackel, 1889; Hooker, 1896; Bor, 1953; Kiran Raj, 2008; Kiran Raj *et al.*, 2013a, b) indicating it to be at least a centre of speciation of the subtribe. In Southeast Asia, approximately 14 species have been reported for Indo-China, Malesia and China (Camus and Camus, 1922; Ridley, 1925; Jansen, 1953; Schmid, 1958; Henty, 1969; Gilliland, 1971; Lazarides, 1980; Chen and Phillips, 2006; Teerawatananon *et al.*, 2014).

Sectional classification of *Dimeria* by Bor (1953)

The first infrageneric classification of the genus was by Bor (1953), who treated the species for India, Sri Lanka (Ceylon), and Myanmar (Burma) as belonging to three sections *viz.* *Dimeria* sect. *Annulares* Bor, sect. *Capillares* Bor, and sect. *Loriformes* Bor and the sections were recognized based on rachis and pedicel characters. As the type species, *D. acinaciformis* R. Br., is from Australia, he did not mention a section *Dimeria* in his treatise.

Table 1. The sections of *Dimeria* R. Br. and their Peninsular Indian taxa.

I. <i>Dimeria</i> sect. <i>Dimeria</i>	<i>Dimeria acutipipes</i> Bor <i>D. agasthyamalayana</i> Kiran Raj & Ravi <i>D. aristata</i> (Hack.) Senaratna <i>D. avenacea</i> (Retz.) C.E.C.Fisch. <i>D. connivens</i> Hack. <i>D. copeana</i> Sreek., V.J.Nair & N.C. Nair. (= <i>D. chelariensis</i> Ravi, syn. nov.) <i>D. fuscescens</i> Trin. <i>D. kanjirapallilana</i> Jacob <i>D. lehmannii</i> Hack. (= <i>D. alata</i> Hook. f.) <i>D. orissae</i> Bor <i>D. ornithopoda</i> Trin. <i>D. trimenii</i> Hook. f.
II. <i>Dimeria</i> sect. <i>Annulares</i>	<i>D. veldkampii</i> Kiran Raj & Sivad. <i>D. woodrowii</i> Stapf
III. <i>Dimeria</i> sect. <i>Capillares</i>	<i>D. gracilis</i> Nees ex Steud. (= <i>D. laxiuscula</i> Thw. & Trimen) <i>D. hohenackeri</i> Hochst. ex Miq. <i>D. stapfiana</i> C.E. Hubb. ex Pilg. <i>D. stapfiana</i> var. <i>blatteri</i> (Bor) M.R. Almeida
IV. <i>Dimeria</i> sect. <i>Loriformes</i>	<i>D. balakrishnaniana</i> K. Ravik., Sreek. & V. Lakshm. <i>D. bialata</i> C.E.C. Fisch. <i>D. bialata</i> subsp. <i>sivarajanii</i> (N. Mohanan & Ravi) Kiran Raj & Sivad., comb. & stat. nov. (= <i>Dimeria sivarajanii</i> N. Mohanan & Ravi, <i>Rheedea</i> 6(2): 47.1996) <i>D. kalavoorensis</i> Ravi (= <i>D. copei</i> Ravi, syn. nov.) <i>D. deccanensis</i> Bor (= <i>D. kollimalayana</i> M. Mohanan & A.V.N. Rao, syn. nov. ; = <i>D. jayachandranii</i> Arisdason & P. Daniel, syn. nov.) <i>D. fischeri</i> Bor <i>D. jainii</i> Sreek., V.J. Nair & N.C. Nair <i>D. josephii</i> Ravi & N. Mohanan <i>D. kurumthotticalana</i> Jacob (= <i>D. ceylanica</i> Bor; = <i>D. sreenarayanae</i> Ravi & Anil Kumar) <i>D. kurumthotticalana</i> subsp. <i>idukkiensis</i> (Ravi & Anil Kumar) Kiran Raj & Sivad., comb. & stat. nov. (<i>Dimeria idukkiensis</i> Ravi & Anil Kumar, <i>Rheedea</i> 2(2): 104. 1992) <i>D. kurzii</i> Hook. f. <i>D. lawsonii</i> (Hook. f.) C.E.C. Fisch. <i>D. mahendragiriensis</i> Ravi, H.O. Saxena & Brahmam <i>D. mooneyi</i> Raizada <i>D. mooneyi</i> subsp. <i>borii</i> (Sreek. et al.) Kiran Raj & Sivad., comb. & stat. nov. (<i>Dimeria borii</i> Sreek., V.J. Nair & N.C. Nair, <i>J. Econ. Taxon. Bot.</i> 3(2): 657.1982) <i>D. namboodiriana</i> Ravi & N. Mohanan <i>D. pubescens</i> Hack. <i>D. raizadae</i> V.J. Nair, Sreek. & N.C. Nair (= <i>Dimeria eradii</i> Ravi, syn. nov.) <i>D. raviana</i> Kiran Raj & Sivad. <i>D. thwaitesii</i> Hack.

Bor (1953) pointed out the necessity of a further detailed study of more specimens of all species for a better understanding of diversity and extent of intraspecific variation. After 1953, a fairly large number of new species have been described, and it was found after field work and morphological examinations in the herbarium that some could not be properly assigned to a section. Also, the *Capillares* and *Loriformes* contained species with strictly triquetrous raceme-rachises, overlapping spikelets, and pedicels closely appressed to the rachis. *Dimeria acinaciformis* is characterized by the presence of triquetrous raceme-rachises and compressed pedicels.

Considering all the above aspects, a revised infrageneric classification of *Dimeria* is proposed here.

The raceme structure of the representative taxa of the sections is illustrated in Fig. 2 as an aid for easy understanding of the diagnostic characters.

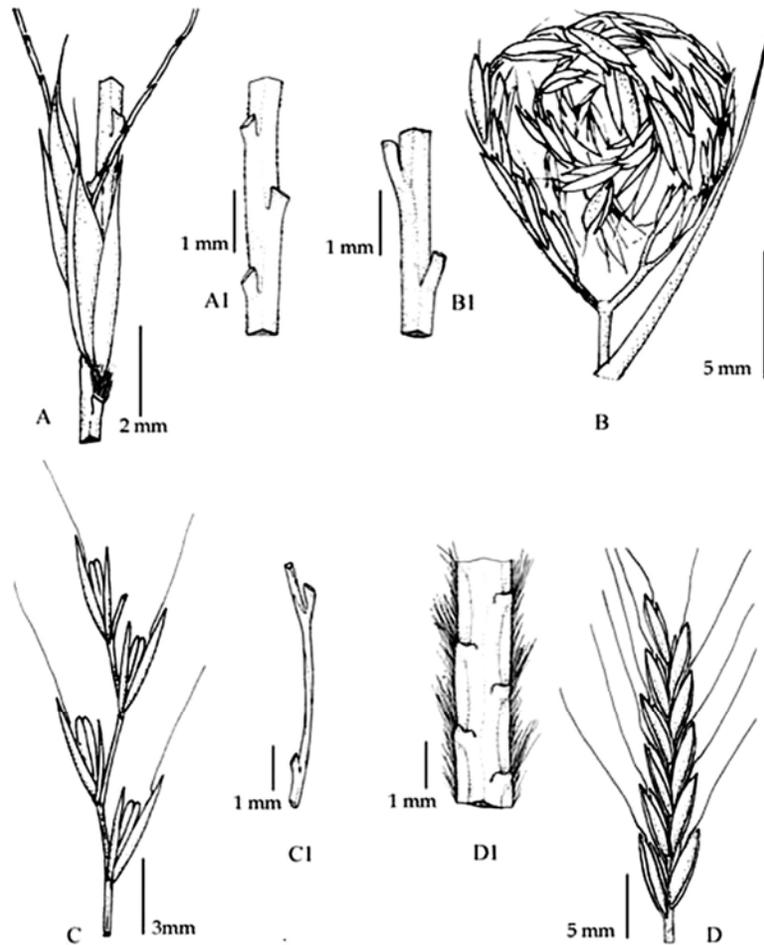


Fig. 2. Portions of racemes and rachises of representative taxa of the sections of *Dimeria*. A & A1. *Dimeria avenacea* (sect. *Dimeria*); B & B1. *D. woodrowii* (sect. *Annulares*); C & C1. *D. hohenackeri* (sect. *Capillares*); D & D1. *D. balakrishmaniana* (sect. *Loriformes*). (Drawings by M.S. Kiran Raj)

I. *Dimeria* R. Br. sect. *Dimeria*

Type: Dimeria acinaciformis R. Br.

Annuals or perennials. Racemes 2 or 3, rarely 1; rachis of raceme triquetrous, trigonous in cross section, occasionally zigzag, usually wingless, if winged, only at the internodes; spikelets closely packed on the rachis, usually overlapping; raceme internodes c. 0.5 mm long; glumes slightly diverging at anthesis; pedicels 0.3–0.5 mm long, trigonous to flat, closely appressed to the rachis.

Distribution: Widely distributed in Tropical Asia to North Australia.

Notes: There are 12 species in Peninsular India of which seven, viz. *D. acutipes* Bor, *D. avenacea* (Retz.) C.E.C. Fisch., *D. connivens* Hack., *D. lehmannii* (Nees & Steud.) Hack., *D. ornithopoda* Trin., *D. orissae* Bor and *D. trimenii* Hook. f. were included by Bor (1953) in sect. *Loriformes*. *Dimeria chelariensis* Ravi (1995) is a synonym of *D. copeana* Sreek. *et al.* (Table 1).

According to Art. 22.1. of the ICN (McNeill *et al.*, 2012), an autonym is required and the correct name is *Dimeria* sect. *Dimeria*.

II. *Dimeria* R. Br. sect. *Annulares* Bor

Type: Dimeria woodrowii Stapf

Annuals. Racemes 2 or 3, peduncle bent downwards or erect at maturity; rachis of raceme compressed, trigonous on one side and convex on the other, straight when young and curved at maturity to form a ‘globule’, or a single or double ‘ringlet’ carrying the spikelets along the inner side; raceme internodes up to 1 mm long; spikelets distantly arranged along the rachis; upper glume distinctly winged, or minutely winged, or wingless; pedicels terete, not compressed.

Distribution: Two species in Peninsular India (Table 1), and so far known only from lateritic plains of the Northern Western Ghats.

III. *Dimeria* R. Br. sect. *Capillares* Bor

Lectotype: Dimeria hohenackeri Hochst. *ex* Miq. (here designated)

Annuals or perennials. Racemes 3 to 5, rarely up to 11; rachis of raceme capillary and very thin, nearly triangular or circular in cross section, not winged; spikelets very distantly arranged along the rachis, late disarticulation from the pedicels; raceme internodes 2.5–3.5 mm long; glumes widely diverging at anthesis; pedicels 0.5–1.5 mm long, terete, not compressed.

Distribution: Restricted to Indian subcontinent (Western Ghats region of Peninsular India, Sri Lanka and Myanmar); three species in Peninsular India (Table 1).

Notes: Bor (1953) included seven species in *Dimeria* sect. *Capillares*, and the type was not designated and hence the present lectotypification. In the present classification, three species are transferred to sect. *Dimeria* (Table 1).

IV. *Dimeria* R. Br. sect. *Loriformes* Bor

Lectotype: Dimeria pubescens Hack. (here designated)

Mostly annuals. Racemes 1 or 2, rarely 3; rachis of raceme compressed; dorsally flattened in cross section, winged; spikelets compactly arranged along the rachis, early disarticulation from the pedicels; raceme internodes 0.5–1.0 mm long; pedicels 0.3–0.5 mm long, distinctly compressed, flat, appressed to the wing and axis of rachis.

Distribution: Peninsular India, Myanmar and Sri Lanka; mostly occurring in Peninsular India with 17 species.

Notes: Bor (1953) did not designate a type for the section and hence it is lectotypified here. Seven species are excluded from Bor's *Loriformes*, and here placed in *Dimeria* sect. *Dimeria*.

Three Peninsular Indian species, viz. *Dimeria sivarajanii* N. Mohanan and Ravi (1996), *D. idukkiensis* Ravi and Anil Kumar (1992) and *D. borii* Sreek. *et al.* (1982) are reduced to subspecies of *D. bialata* C.E.C. Fisch. (1933), *D. kurumthotticalana* Jacob (1947) and *D. mooneyi* Raizada (1950), respectively (Table 1); two species, viz. *D. copei* Ravi (1996) and *D. eradii* Ravi (1995) are reduced to *D. kalavoorensis* Ravi (1996) and *D. raizadae* V.J. Nair *et al.* (1983), respectively; two species, viz. *D. kollimalayana* M. Mohanan and A.V.N. Rao (1984) and *D. jayachandranii* Arisdason and P. Daniel (2009), are regarded as conspecific with *D. deccanensis* Bor (1953), and they are treated as new synonyms (Table 1).

Key to the Sections of *Dimeria* in Peninsular India

1. Racemes divergent; rachis of raceme always straight, never coiled; spikelets arranged along the outside and exposed. 2
 - Racemes non-divergent; rachis of raceme coiled to form a 'globule' or 'ringlet'; spikelets arranged along the inner side of rachis. **Dimeria** sect. **Annulares**
2. Rachis of raceme capillary and filiform, thin, wingless, angled to terete in cross section; spikelets distantly arranged on rachis, not readily disarticulating with pedicels; pedicels 1.0–1.5 mm long, terete, glabrous. **Dimeria** sect. **Capillares**
 - Rachis of raceme not capillary, stout, winged or not, trigonous or compressed in cross section; spikelets compactly arranged on rachis, easily disarticulating with pedicels; pedicels 0.5–1.0 mm long, flat, often ciliate at the outer margin. 3
3. Spikelet usually overlapping; rachis of raceme triquetrous, 0.5–0.7 mm wide, often minutely winged at the internode, scaberulous to sparsely ciliate along margin; pedicels compressed but not flat, completely appressed to the raceme-rachis. **Dimeria** sect. **Dimeria**
 - Spikelets never overlapping; rachis of raceme abaxially flat, 0.8–1.5 mm wide, distinctly winged, glabrous to ciliate along margin; pedicels flat, basal half appressed to raceme-rachis and upper half attached to wing of rachis. **Dimeria** sect. **Loriformes**

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