

**FASCICLES  
OF  
FLORA OF INDIA**

**FASCICLE 3**



**BOTANICAL SURVEY OF INDIA  
P. O. BOTANIC GARDEN  
HOWRAH-711103**

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**Date of Publication : 30th November, 1979.**

## POACEAE : TRIBE— GARNOTIEAE

VED PRAKASH AND S. K. JAIN\*

### GARNOTIEAE

Tateoka in J. Jap. Bot. 32 : 277. 1957; Bor, Grass. Bur. Ceyl. Ind. Pak. 565. 1960.

Annual or perennial erect herbs with slender to stout culms. Leaf-blades very narrow to lanceolate, acute or acuminate. Spikelets alike, 1-flowered, hermaphrodite, lanceolate, terete to dorsally compressed, pedicelled, in open to contracted panicles, falling entire at maturity; rachilla not produced beyond floret. Glumes 2, *ca.* as long as spikelet, membranous, 3-nerved, acute to awned or beaked. Lemma similar to, or thinner than glumes, membranous or hyaline, 3-5-nerved, awnless or awned from the entire or bilobed tip; awn geniculate or straight. Palea narrow, hyaline, 2-nerved. Lodicules 2, small, cuneate, stamens 3. Ovary linear; styles 2, distinct; stigmas plumose. Caryopsis linear-oblong, brown; embryo *ca.* one-third the length of the caryopsis.

2 genera and *ca.* 33 species in the tropics. 2 genera and 13 species in India.

*Notes:* It is difficult to place this tribe satisfactorily in traditional sub-divisions of Poaceae on the basis of morphological characters only. The spikelets share the characters of both the subfam. Panicoideae and Pooideae. Hooker (Fl. Brit. Ind. 7: 240, 241. 1897) placed the genera *Cyathopus* and *Garnotia* in tribe Agrostideae. Tateoka (l.c.) erected the tribe on the basis of genus *Garnotia* alone and placed it near Arundinelleae (subfam. Arundinoideae). Bor (l.c.) included *Cyathopus* also in this tribe, and placed it in subfam. Pooideae.

Evidence from number and size of chromosomes, bicellular micro-hairs and saddle-shaped or dumbbell-shaped silica cells of the epidermis, relatively large embryo, nature of starch grains, ciliate ligules and other characters of secondary importance strongly indicate and support the view of Tateoka (Bot. Gaz. 120: 101-109. 1958) that the tribes Garnotieae and Arundinelleae should be placed in the subfam. Panicoideae.

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\*Botanical Survey of India, P.O. Botanic Garden, Howrah-711103

- 1a. Spikelets glabrous at base. Glumes beaked. Lemma 5-nerved, entire at the tip, awnless ...1. **Cyathopus**
- 1b. Spikelets usually bearded at base. Glumes acute to awned. Lemma 3-nerved and mostly long-awned from the sinus of the bifid tip ...2. **Garnotia**

## 1. CYATHOPUS

Stapf in Hook. Ic. Pl. t. 2395. 1895; Hook. f. Fl. Brit. Ind. 7: 240. 1897; Bor, Grass. Bur. Ceyl. Ind. Pak. 565. 1960.

Perennial, culms slender, terete, branched, glabrous, ascending; leaf-blades flat. Spikelets borne on the slender branches of decompound panicle, geminate on unequal pedicels or solitary or in threes, 1-flowered, subterete, awnless with glabrous base, articulate on the cupular tip of the pedicels. Glumes 2, subequal, as long as spikelet, lanceolate, beaked, 3-nerved, scabrid on nerves. Lemma slightly shorter and broader than glumes, lanceolate, obtuse, 5-nerved, smooth, nerves obliterated towards apex. Palea almost equal to lemma, narrow, acute, 2-nerved, smooth. Caryopsis *ca.* 2 mm long, ovate-elliptic.

*Distrib.* : A monotypic genus; endemic in Sikkim.

**Cyathopus sikkimensis** Stapf in Hook. Ic. Pl. t. 2395. 1895; Hook. f. Fl. Brit. Ind. 7: 240. 1897; Bor, Grass. Bur. Ceyl. Ind. Pak. 565. 1960.

Culm *ca.* 1 m high, erect from a creeping, stoloniferous base. Leaf-sheaths deeply striate, glabrous; ligule elongate, scarious; blades 15-25 × 0.6-1.0 cm, linear-lanceolate, finely acuminate, glabrous; margins thickened, scaberulous. Panicle 22-34 cm long, effuse; branches up to 15 cm long, fascicled, divided above the naked base. Spikelets 2.5-2.8 mm long, scaberulous. Glumes equal to spikelet. Lemma 2.0-2.4 mm long. Palea *ca.* equal to lemma.

*Type* : India: North Sikkim, Lachoong valley in woods, 11000 ft. (Lachung, ±3350 m), *J. D. Hooker s.n.* (Photo CAL !, K).

*Fls. & Frts.* : Oct. - Dec.

*Distrib.* : Endemic in Sikkim.

*Notes*: Collected once after the type, *i.e.* Sikkim, above 6000 ft. (±1829 m), Nov.-Dec. 1943, *Bor* 330 (DD).

## 2. GARNOTIA

Brongn. in Duperrey, Voy. Coquille, Bot. 2:132. t. 21. 1832; Benth. & Hook. f. Gen. Pl. 3:1118. 1883; Hook. f. Fl. Brit. Ind. 7: 241. 1897; Bor, Grass. Bur. Ceyl. Ind. Pak. 565. 1960. *Miquelia* Arn. & Nees in Nov. Act. Acad. Caes. Leop. Nat. Cur. 19, Suppl. 1: 177. 1843, *non* Meissner 1838. *Berghausia* Endl. Gen. Pl. 3: 57. 1843.

Erect perennial or annual grasses. Culms usually caespitose with flat, involute or canaliculate leaf-blades. Ligule a ciliate membrane or fringe of hairs,  $\pm 0.5-1.5$  (-6) mm long. Spikelets geminate on unequal pedicels, rarely solitary or in threes, 1-flowered, lanceolate, dorsally compressed, usually bearded at base, disarticulating below the glumes; in simple or compound panicles. Glumes 2, equal to unequal, acute to awned, membranous, 3-nerved, nerves mostly scabrid. Lemma slightly shorter or equal to glumes, faintly 3-nerved, awned from an entire or bilobed tip or awnless; awn straight or geniculate with or without dark, twisted column. Palea equal to lemma, narrow, hyaline, 2-nerved, auricled at base.

*Distrib.* : *ca.* 32 species, distributed mainly in Asiatic and Pacific regions *viz.* SRI LANKA, INDIA, NEPAL, BURMA, S. CHINA, N. VIETNAM, PHILIPPINES, NEW GUINEA, FIJI, SOCIETY, COOK, HAWAII and SEYCHELLES ISLANDS. 12 species in India.

*Ecol.* : Occurs in variety of habitats from sea level to *ca.* 3000 m; mostly in shady places near edges of forests; some occur in open grasslands or on rocky slopes; none reported from deserts and arid habitats.

*Chr. No* :  $x=10$ .

*Leaf anatomy*: Epidermis with dumbbell-shaped, siliceous cell and bicellular microhairs; vascular bundles with double sheaths, outer well developed, inner scarcely evident, chlorenchyma not radiate (Tateoka in Bot. Gaz. 120: 101-109. 1958; Metcalf, Anat. Monocot. 1: 219-220. 1960).

*Starch grains* : Hexagonal and pentagonal in uniform size. (Tateoka in Bot. Mag. Tokyo 75: 371-383. 1961).

- 1a. Leaf-blades articulated on sheath, flaccid, junction distinct; sheaths terete, distributed along culms, margins glabrous or minutely ciliate. Very low or semi-robust grasses ...Sect. 1. **Garnotia**
- 1b. Leaf-blades not articulated on sheath, stiff, junction indistinct; sheaths broad, basal, equitant, margins woolly, at length glabrate. Very robust grasses ...Sect. 2. **Scoparia**

Section 1. **Garnotia**

- 1a. Lemma with straight awn ...1. **G. acutigluma**
- 1b. Lemma with geniculate awn:
- 2a. Awn of lemma without well-marked twisted column. Leaf-blades broadly lanceolate with long filiform tip, subcordate or rounded at base ...3. **G. arundinacea**
- 2b. Awn of lemma with well-marked twisted dark column. Leaf blades narrowly lanceolate to linear, acute-acuminate, narrowed at base:
- 3a. Lower glume shorter than upper, almost acute:
- 4a. Culms densely tufted, stiff. Axis of panicle and branches very broad, convex at back, branches very short, closely crowded at nodes ...9. **G. puchiparensis**
- 4b. Culms loosely tufted, weak. Axis of panicle and branches not so broad, branches rather long, widely spreading or reflexed ...4. **G. courtallensis**
- 3b. Lower glume longer than upper or subequal, acute-awned:
- 5a. Awn of lemma (3-) 5-12 mm long:
- 6a. Leaf-blades almost hispid with bulbous-based hairs, variable in shape; collar glabrous. Lower segment of awn well-twisted, dark-coloured, up to 2 mm long (A widespread species) ...12. **G. tenella**
- 6b. Leaf-blades glabrous, linear-lanceolate; collar densely hairy. Lower segment of awn faintly twisted and deflexed or sometimes erect. (South India and Sri Lanka) ...7. **G. fergusonii**
- 5b. Awn of lemma 13-25 mm long:
- 7a. Plants *ca.* 5-20 (-30) cm, delicate, growing with mosses on branches of trees or on roofs and rocks. Panicle lax, few-flowered; branches horizontally spreading or deflexed ...2. **G. arborum**
- 7b. Plants 20-40 (-55) cm, stiff, not growing as above. Panicle contracted, many-flowered; branches fastigate, ascending ...8. **G. polypogonoides**

Section 2. **Scoparia** Gould in Kew Bull. 27 : 555. 1972.

- 1a. Spikelets awnless. Leaf-blades oblanceolate, flat ...6. **G. exaristata**
- 1b. Spikelets awned. Leaf-blades linear, canaliculate, triangular in section:
  - 2a. Awn of lemma without well-marked twisted column, deflexed from the apex of the lemma ...11. **G. scoparia**
  - 2b. Awn of lemma with twisted, dark column, geniculate well above the base:
    - 3a. Panicles 9-25 cm long, congested. Spikelets 5.0-7.5 mm long. Awn of lemma 10-12 mm long ...10. **G. schmidii**
    - 3b. Panicles 28-70 cm long, not congested. Spikelets 3-6 mm long. Awn of lemma 4-8 mm long ...5. **G. elata**

1. **Garnotia acutigluma** (Steud.) Ohwi in Bot. Mag. Tokyo 55 : 393. 1941; Santos in Nat. Appl. Sci. Bull. 10 : 82. 1950; Gould in Kew Bull. 27 : 540. 1972. *Urachne acutigluma* Steud. Syn. Pl. Glum. 1 : 121. 1854. *Garnotia stricta* auct. non Brongn. 1832 : Hook. f. Fl. Brit. Ind. 7 : 243. 1897 *pro parte*; Bor in Fl. Assam 5 : 152. 1940 *pro parte*; Bor, Grass. Bur. Ceyl. Ind. Pak. 569. 1960 *pro parte*. **Fig. 3**

Perennial. Culms *ca.* 25-70 (-80) cm high, erect or ascending, caespitose, branched, glabrous. Leaf-sheaths usually hirsute, margins ciliate; blades *ca.* 5-25 (-40) cm long, linear or lanceolate, acuminate, hirsute with papilla-based hairs, mid-nerve prominent beneath. Spikelets 3.0-4.5 (-5) mm long with bearded base. Lower glume as long as spikelet, acuminate-awned, awn 1-4 mm long; upper glume 2.8-4.5 mm long, acuminate-awned, awn 0.5-2.0 (-5) mm long. Lemma 2.5-4.0 mm long, awn 8-18 (-22) mm long.

- 1a. Awn of lemma uniformly tapering to apex. Leaf-blades usually linear, *ca.* 0.2-0.6 cm broad ...var. **acutigluma**
- 1b. Awn of lemma in at least some spikelets with whitish, crinckled apical portion. Leaf-blades usually lanceolate, *ca.* 0.6-1.5 cm broad ...var. **longiseta**

var. **acutigluma**

*Type* : Java, *Goering* 141 [ note : Java is indicated as the locality on the label of type specimen (P) fide Chase; Japan (?) is given by Steudel ].

*Fls. & Frts.* : Aug.-Nov.

*Distrib* : Widely distributed up to 2000 m. INDIA : Sikkim, Arunachal Pradesh, Assam, Meghalaya, Nagaland, W. Bengal; BANGLADESH, BURMA, BORNEO, JAVA, HAWAII, PHILIPPINES, MALAYSIA, N. VIETNAM, S. CHINA.

*Uses* : It develops densely tufted culms, profusely branched and strong root system and thus may find use as soil binder; also grazed by cattle.

*Notes* : Santos (l.c.) divided this polymorphic species into 6 species, 12 varieties and 7 formae on the basis of minor differences. Of these 25 taxa, 5 species, 5 varieties and 2 formae were based on Indian material. We agree with Gould's view (l.c.) in reducing the taxa described by Santos.

var. *longiseta* (Hack.) Ved Prakash & Jain *comb. nov.* *Garnotia stricta* Brongn. var. *longiseta* Hack. in Allgem. Bot. Zeitschr. 15 : 141. 1909; Gould in Kew Bull. 27 : 552. 1972. *G. mindanensis* Santos var. *longiseta* (Hack.) Santos in Nat. Appl. Sci. Bull. 10 : 98. 1950.

*Type* : Philippines, Luzon, Bataan Prov. Mt. Mariveles, 12 Dec. 1908, Merrill s. n. (BM, W).

*Fls. & Frts.* : Aug.-Nov.

*Distrib.* : Widely distributed at 500-2600 m. INDIA : Arunachal Pradesh, Meghalaya; PHILIPPINES, MOLUCCAS, NEW GUINEA, AUSTRALIA.

*Notes* : Occurrence of this variety in India has been first observed by the authors. Gould (l.c.) followed Hackel (l.c.) in retaining it under *Garnotia stricta* Brongn. which has  $\pm$  awnless lemma. Due to presence of long awn and other characters also we consider that this variety is more allied to *G. acutigluma* (Steud.) Ohwi.

2. *G. arborum* Stapf in Cooke, Fl. Pres. Bomb. 2 : 1013. 1908 (Repr. ed. 2 : 534. 1958); Blatt. & McCann, Bomb. Grass. 206, t. 135. 1935; Santos in Nat. Appl. Sci. Bull. 10 : 141. 1950; Bor, Grass. Bur. Ceyl. Ind. Pak. 567. 1960; Gould in Kew Bull. 27 : 536. 1972.

Annual, short lived. Culms weak; nodes hispid. Leaf-sheaths glabrous or hispid near collar; blades 1-7 $\times$ 0.1-0.4 cm, glabrous. Panicle 1-9 cm long, lax; branches few, fascicled, up to 2 cm long. Spikelets 2-3 mm long. Glumes subequal, acuminate to awned, awn 1-9 mm long, erect, scaberulous. Lemma equal or slightly shorter and broader than glumes, long-awned between bidentate tip.

*Type* : India : Deccan, on trees at Nandgaon on the crest of the Ghats 10 miles S. of Lanoli ( $\pm$  17 km south of Lonavla) Woodrow 30 (Photo CAL !, K).

*Fls. & Frts.* : Sept.-Dec. (-April).

*Distrib.* : INDIA : Known only from Maharashtra and Karnataka upto ca. 680 m, endemic.

3. *G. arundinacea* Hook. f. Fl. Brit. Ind. 7 : 243. 1897; Fischer in Fl. Pres. Madr. 3 : 1812. 1934 (Repr. ed. 3 : 1255. 1957); Santos in Nat. Appl. Sci. Bull. 10 : 114. 1950; Bor, Grass. Bur. Ceyl. Ind. Pak. 567. 1960; Gould in Kew Bull. 27 : 532. 1972.

*Dobrai hullu* (Kan.)

Perennial. Culms up to *ca.* 1 m high, erect from trailing base; nodes pubescent. Leaf-sheaths sometimes hairy, ciliate along margin; collar villous; blades 4-19 × 0.5-2.5 cm, flat, glabrous or sparsely pubescent, margins often ciliate. Panicle 10-26 cm long, somewhat contracted with numerous, densely flowered, up to 10 cm long, fastigiate, capillary branches. Spikelets 2.5-3.5 mm long. Glumes subequal, acuminate to awned, awn up to 8 mm long. Lemma *ca.* equal to glumes, awned, awn 5-11 mm long.

*Type* : India: Nilgiri Hills, alt. 2-6000 ft. ( $\pm$ 600-2000 m), Heyne (Photo CAL !, K).

*Fls.* : Sept.-Nov. *Frts.* : Oct.-June.

*Distrib.* : INDIA : Endemic to South India at 600-2000 m, Karnataka, Kerala, Tamil Nadu.

*Chr. No.* 2n=20 (Christopher & Abraham in Cytologia 36 : 585. 1971).

4. *G. courtallensis* (Arn. & Nees) Thw. Enum. Pl. Zeyl. 363. 1864; Hook. f. Fl. Brit. Ind. 7 : 244. 1897; Fischer in Fl. Pres. Madr. 3 : 1812. 1934 (Repr. ed. 3 : 1255. 1957); Santos in Nat. Appl. Sci. Bull. 10 : 144. 1950; Bor, Grass. Bur. Ceyl. Ind. Pak. 567. 1960; Gould in Kew Bull. 27 : 531. 1972. *Miquelia courtallensis* Arn. & Nees in Nov. Act. Acad. Caes. Leop. Carol. Nat. Cur. 19, Suppl. 1 : 179. 1843. *Berghausia courtallensis* (Arn. & Nees) Endl. ex Miq. in Verh. Konink. Nederl. Inst. III. 4 : 32. 1851.

Annual. Culms 15-60 cm high, erect from decumbent base. Leaf-sheaths hispid, occasionally ciliate along margins; blades 2-10 × 0.2-0.9 cm, lanceolate, acute, thin, hispid with papilla-based hairs. Panicle 3-12 cm long, lax, few-flowered; branches few, up to 6 cm long, spreading at maturity. Spikelets 2.5-3.5 mm long. Glumes unequal, lower 2.2-3.2 mm long, upper as long as spikelet. Lemma 2.2-3.2 mm long, awn 2.5-7.0 mm long.

*Type* : India : Courtallum, Quilon, Herb. Wight 2346 (Photo CAL!, K).

*Fls. & Frts.* : Sept.-Feb.

*Distrib.* : INDIA : At 1000-2300 m in S. India, Karnataka, Tamil Nadu; SRI LANKA.

*Chr. No.* 2n=20 (Gould, l.c. : 519. 1972).

5. *G. elata* (Arn. ex Miq.) Jan. in Fedde, Rep. Sp. Nov. 17 : 86. 1921; Santos in Nat. Appl. Sci. Bull. 10 : 171. 1950; Bor, Grass. Bur. Ceyl. Ind. Pak. 567. 1960; Raizada & Jain, in Indian Forester 92 : 640. 1966; Gould in Kew Bull. 27 : 556. 1972. *Berghausia elata* Arn. ex Miq. in Verh. Konink. Nederl. Inst. III. 4 : 32. 1851. *Garnotia scoparia* Stapf ex Hook. f. Fl. Brit. Ind. 7 : 242. 1897, non Thw. 1864; Fischer in Fl. Pres. Madr. 3 : 1812, 1934 (Repr. ed. 2 : 1255, 1957). *G. tenuiglumis* Stapf ex Hook. f. l.c. 1897. **Figs. 1-2**

Perennial, ca. 40-125 cm high. Culms caespitose, erect, glabrous. Leaf-sheaths flabellate, glabrous; blades 18-60 × 0.1-0.4 cm, canaliculate on ventral side, glabrous. Panicle densely flowered with 5-10 cm long, fastigate branches. Spikelets scabrid with bearded base. Lower glume 3-6 mm long, acuminate to aristate; upper glume 2.5-4.5 mm long, acuminate. Lemma 2.0-3.5 mm long, awned from bidentate apex.

*Type* : India, Wight 2600 (E?). A note by Hubbard (Jan. 1949) on Wight 3247 (K) from 'Peninsula Indiae Orientalis', states, 'represents the same species as the type (Wight 2600) of *Berghausia elata* Arn. ex Miq.' (CAL !, E, GL).

*Fls. & Frts.* : July-Dec.

*Distrib.* : INDIA : S. India at ± 500-2200 m, Karnataka, Tamil Nadu.

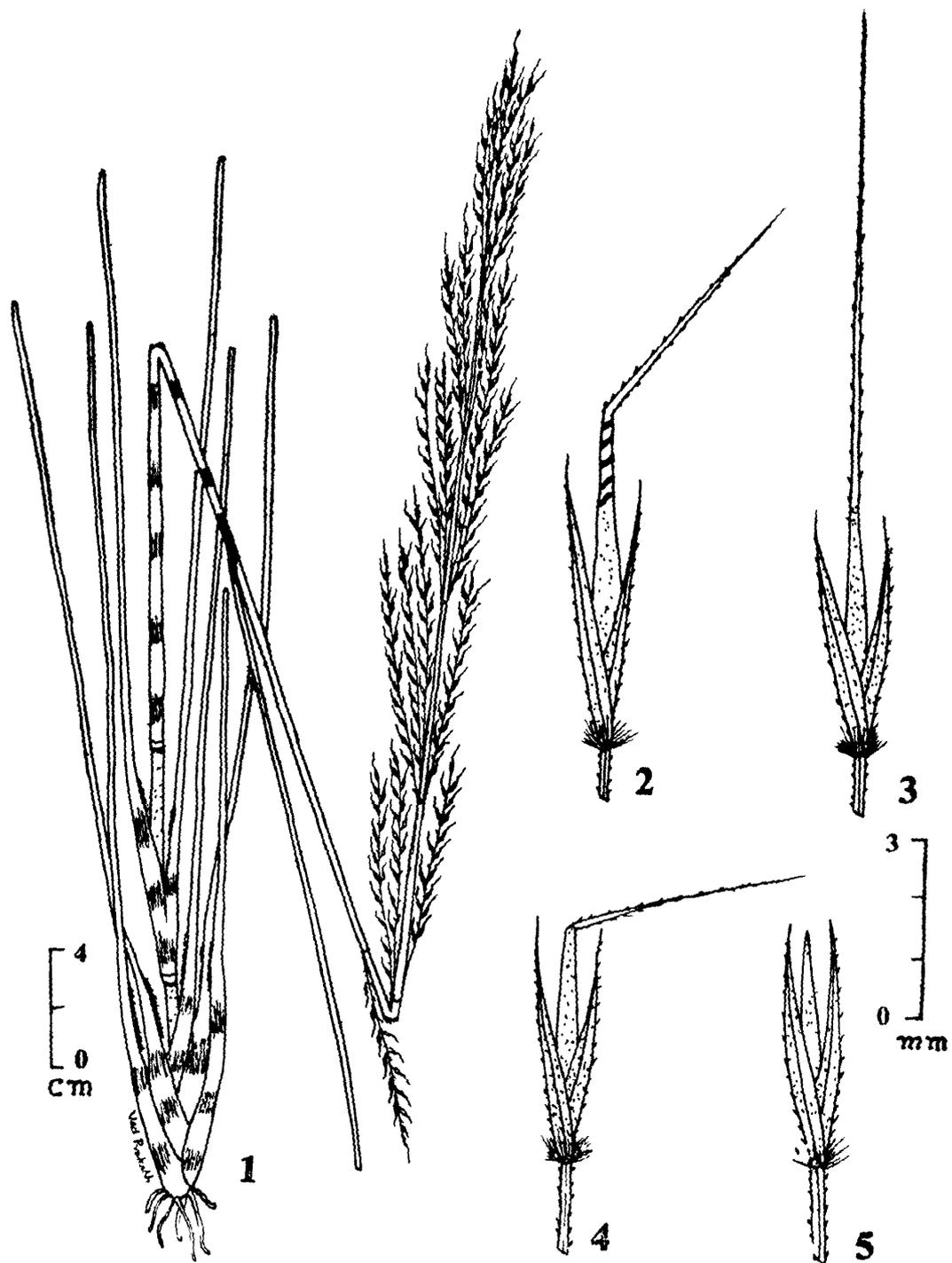
*Chr. No.* 2n=20 (Christopher & Abraham in Cytologia 36 : 585. 1971); 2n = 40 (Muniyamma in Taxon 25 : 161. 1976).

*Notes* : This species has so far been known only from South India (Bor l.c.; Gould l.c.). Recently it has been reported from Uttar Pradesh [Lucknow, Gomti Bandha, *Nanheram* 42695 (DD)].

6. *G. exaristata* Gould in Kew Bull. 27 : 558. 1972. *G. tectorum* Hook. f. Fl. Brit. Ind. 7 : 242. 1897, quoad descr. *nom. illegit.*; Fischer in Fl. Pres. Madr. 3 : 1812. 1934 (Repr. ed. 2 : 1255. 1957). *G. mutica* sensu Bor, Grass. Bur. Ceyl. Ind. Pak. 568. 1960 *pro parte*. **Fig. 5**

Perennial, ca. 50-110 (-150) cm high. Culms caespitose, stiffly erect. Leaf-sheaths flabellate, equitant; blades 15-35 (-60) × 0.8-1.5 cm, oblanceolate, acute, margins scabrid, midrib very strong. Panicle 20-40 cm long, densely flowered, with 2-8 cm long, fastigate, scabrid branches. Spikelets 4-5 mm long with bearded base. Glumes subequal, as long as spikelet, acute-acuminate. Lemma 3.8-4.8 mm long, acute-mucronate.

*Type* : Ceylon (Sri Lanka), Horton Plains, *Gould & Cooray* 13777 (holotype, K; isotypes, CANB! TAES, US); *Lazarides* 7297 (paratype, CANB!).



Figs. 1-5 : 1. Habit of *Garnotia elata* (Arn. ex Miq.) Jan.  
 2. Spikelet of *G. elata* (Arn. ex Miq. ) Jan.  
 3. Spikelet of *G. acutigluma* (Steud.) Ohwi  
 4. Spikelet of *G. scoparia* Thw.  
 5. Spikelet of *G. exaristata* Gould

*Fls. & Frts.* : Aug.-Dec.

*Distrib.* : INDIA : In S. India at elevations between 1650-2500 m, Kerala, Tamil Nadu; SRI LANKA.

*Uses* : Leaves used for thatching.

7. ***G. fergusonii*** Trim. in J. Bot. 27 : 170. 1889; Hook. f. Fl. Brit. Ind. 7 : 244. 1897; Santos in Nat. Appl. Sci. Bull. 10 : 104, 1950; Bor, Grass. Bur. Ceyl. Ind. Pak. 568. 1960; Gould in Kew Bull. 27 : 537. 1972.

Perennial. Culms *ca.* 60-120 cm high, trailing, branching freely; nodes glabrous or villous. Leaf-sheaths glabrous; ligule short, membranous with 1.5-4.0 mm long hairs; blades 5-15 × 0.3-0.7 cm, flat. Panicle up to 15 cm long with erect-spreading, up to 5 cm long branches. Spikelets *ca.* 3-5 mm long. Glumes subequal, acuminate to awned, awn up to 2.5 mm long. Lemma *ca.* equal to glumes, awned from bilobed apex; awn 5-7 mm long.

*Type* : Ceylon (Sri Lanka) summit of Knuckles Mountains, *Ferguson s. n.* (K).

*Fls. & Frts.* : Sept.-June.

*Distrib.* : INDIA : Endemic to S. India at ± 1500 m, Karnataka, Tamil Nadu ; SRI LANKA.

*Chr. No.* 2n=20 (Gould l.c. : 519. 1972).

8. ***G. polypogonoides*** Munro ex Oliver in Hook. Ic. Pl. 15 : 64. t. 1481. 1885 ; Hook. f. Fl. Brit. Ind. 7 : 243. 1897; Bor in Fl. Assam 5 : 153. 1940 *pro syn.* *G. emodii*; Santos in Nat. Appl. Sci. Bull. 10 : 139. 1950; Bor, Grass. Bur. Ceyl. Ind. Pak. 567. 1960 *pro syn.* *G. emodii*; Hara, Fl. E. Himal. 364. 1966 *pro syn.* *G. emodii*; Gould in Kew Bull. 27 : 535. 1972.

Perennial. Culms erect from decumbent base. Leaf-sheaths glabrous or sparsely hairy below, densely hispid with papilla-based hairs above; collar densely hispid, hairs up to 5 mm long; blades 4-20 × 0.1-0.7 cm, linear, acuminate, hispid on one or both surfaces with papilla-based hairs. Panicle 8-18 (-20) cm long, narrow, with up to 8 cm long branches. Spikelets ± 3.0-4.5 mm long, base conspicuously bearded. Glumes subequal, ± 2.5-4.5 mm long, awned, awn 1-16 mm long. Lemma 3.5-4.5 mm long, stipitate, long awned between apical setae.

*Type* : Nepal, 1821, *Wallich s. n.* Wall. num. list No. 8884 (Photo CAL !, K).

*Fls. & Frts.* : Sept.-Dec.

*Distrib.* : Himalayan region at  $\pm 2000-3000$  m. INDIA : Uttar Pradesh, Sikkim, Assam; NEPAL.

9. ***G. puchiparensis*** Bor in Indian For. Rec. (n.s.) Bot. II. 4 : 234-236. 1941.

Annual, up to 35 cm high. Culms at first prostrate, rooting at nodes, finally erect, profusely branched; nodes pubescent. Leaf-sheaths softly hairy; blades  $2.5 \times 0.3-1.0$  cm, lanceolate, acute, hirsute. Panicle up to 10 cm long, many-flowered; branches up to 2 cm long, rather stout, convex on back. Spikelets  $\pm 3.0-3.5$  mm long, scabrid. Glumes unequal, lower 2.5-3.0 mm long, upper as long as spikelet. Lemma 2.8-3.5 mm long, awn 4.7-6.0 mm long.

*Type* : India : Madras, Puchipara rest house, Silent Valley, alt. 3000 ft. ( $\pm 1000$  m), Bor 8443 (DD!).

*Fls. & Frts.* : Sept.-Dec.

*Distrib.* : INDIA : Endemic to S. India at  $\pm 1000$  m, Tamil Nadu.

*Notes* : Bor (Grass. Bur. Ceyl. Ind. Pak. 569. 1960) stated that *G. puchiparensis* described by him in 1941 should probably be included in *G. stricta* Brongn. The grass conceived here by Bor as *G. stricta* Brongn. was actually *G. tenella* (Arn. ex Miq.) Janowsky. Gould (Kew Bull. 27 : 531. 1972) treated *G. puchiparensis* Bor as a synonym of *G. courtallensis* (Arn. & Nees) Thw. Authors are of the view that *G. puchiparensis* is a distinct species.

10. ***G. schmidii*** Hook. f. Fl. Brit. Ind. 7 : 242. 1897; Fischer in Fl. Pres. Madr. 3 : 1812. 1934 (Repr. ed. 3 : 1254. 1957); Santos in Nat. Appl. Sci. Bull. 10 : 163. 1950; Bor, Grass. Bur. Ceyl. Ind. Pak. 568. 1960.

Perennial, ca. 28-80 cm high. Culms caespitose, stiffly erect, smooth. Leaf-sheaths flabellate, keeled, glabrous; blades (15-)  $20-55 \times 0.1-0.4$  cm, canaliculate on ventral side, glabrous. Panicle with 3-8 cm long, erect, fastigiate branches. Spikelets scabrid with densely bearded base. Lower glume 5.5-7.8 mm long, aristate; upper glume 4.2-6.0 mm long, acuminate or mucronate. Lemma 3.8-4.5 mm long, awned from the bilobed apex.

*Type* : India : Nilgiri Hills, *Schmid s. n.* (Syntype— CAL !, K.); Goodaloor Ghat, alt. 4500 ft. (Gudalur  $\pm 1372$  m), *Lawson s. n.* (Syntype-K).

*Fls. & Frts.* : Sept.-Nov.

*Distrib.* : INDIA : Endemic to S. India at  $\pm$  1500 m, Karnataka, Tamil Nadu.

*Chr. No.* :  $2n=20$  (Sindhe & Narayan in Taxon 25 : 158. 1976).

*Notes* : This species is very close to *G. elata* (Arn. ex Miq.) Jan. and is included in it by Gould (Kew Bull. 27 : 558. 1972). Authors have reinstated it. Recently Sindhe & Narayan (l.c.) have made cytological studies on their own collection [Karnataka, Bedaguli, near Biligirirangan Hills, *Sindhe & Narayan* 403 (Mysore Univ.!)] of this grass; this represents the second collection after the type.

11. *G. scoparia* Thw. Enum. Pl. Zeyl. 363. 1864; Santos in Nat. Appl. Sci. Bull. 10 : 154. 1950; Bor, Grass. Bur. Ceyl. Ind. Pak. 568. 1960; Gould in Kew Bull. 27 : 555. 1972. *G. thwaitesii* Stapf ex Hook. f. Fl. Brit. Ind. 7 : 241. 1897. **Fig. 4**

Perennial, ca. 60-120 (-150) cm high. Culms caespitose, stiffly erect, smooth. Leaf-sheaths flabellate, keeled, glabrous; blades 20-60  $\times$  0.2-0.6 cm, canaliculate on ventral side, glabrous. Panicle (30-) 36-70 cm long, with 8-20 cm long, erect branches. Spikelets 3.0-5.5 mm long. Lower glume as long as spikelet, acuminate-awned, awn up to 2 mm long; upper glume 2.5-5.0 mm long, acute-acuminate. Lemma 2.5-4.0 mm long, awn 3.5-7.0 mm long.

*Type* : Ceylon (Sri Lanka) *Thwaites* C. P. 943 (CAL !, DD !, K).

*Fls. & Frts.* : Sept.-Nov.

*Distrib.* : INDIA : S. India (?) at  $\pm$ 400-2000 m alt.; SRI LANKA.

*Chr. No.*  $2n=20$  (Gould l.c. 519. 1972),  $2n=20$  (Sindhe & Narayan in Taxon 25 : 158. 1976).

*Notes* : This species is very close to *G. elata* (Arn. ex Miq.) Jan. and can be distinguished only by the awn of lemma which is geniculate and with twisted column in *G. elata*, and with simple column, deflexed from apex of the lemma in *G. scoparia*.

The specimens available to authors have sterile spikelets and awn of lemma straight and thus do not show the characters of any of the above two entities. However these specimens do resemble in certain characters with the two specimens of type material i.e. *Thwaites* C. P. 943 (CAL !, DD!), and should reasonably be considered as representing *G. scoparia*. Recently Sindhe & Narayan (l.c.) have collected this species from Karnataka for cytological studies [Biligirirangan hills, *Sindhe & Narayan* 147 (Mysore Univ.!)].

12. *G. tenella* (Arn. ex Miq.) Jan. in Fedde, Rep. Sp. Nov. 17 : 86. 1921; Santos in Nat. Appl. Sci. Bull. 10 : 113. 1950; Gould in Kew Bull. 27 : 528. 1972. *Berghausia tenella* Arn. ex Miq. in Verh. Konink. Nederl. Inst. III. 4 : 34. 1851. *Garnotia stricta* auct. non Brongn. 1832 : Hook. f. Fl. Brit. Ind. 7 : 243. 1897 *pro parte*; Prain, Beng. Pl. 2 : 1214. 1903 (Repr. ed. 2 : 915. 1963); Cooke, Fl. Pres. Bomb. 2 : 1013. 1908 (Repr. ed. 3 : 534. 1958); Haines, Bot. Bih. & Or. 2 : 975. 1924 (Repr. ed. 3 : 1021. 1961); Fischer in Fl. Pres. Madr. 3 : 1812. 1934 (Repr. ed. 3 : 1255. 1957); Blatt. & McCann, Bomb. Grass. 207, t. 136. 1935; Bor in Fl. Assam 5 : 152. 1940 *pro parte*; Bor, Grass. Bur. Ceyl. Ind. Pak. 569. 1960 *pro parte*. **Figs. 6-13**

Annual. Culms 7-80 (-90) cm high, erect or ascending, loosely to densely tufted, branched, often rooting at lower nodes. Leaf-sheaths glabrous, occasionally ciliate on margin; blades 1-21 × 0.2-1.5 cm, lanceolate or linear-lanceolate, acute, often flat, hispid with papilla-based hairs, occasionally linear, up to 25 × 0.4 cm and glabrous. Panicle 3-28 cm long, narrowly contracted; branches up to 8 cm long in distant fascicles, scabrid. Spikelets 2-5 mm long, scabrid. Glumes usually unequal; lower as long as spikelet, awn 2-4 mm long; upper shorter, *ca.* 2-4 mm long, awn 0.5-4.0 mm long. Lemma 1.8-3.5 mm long, awn 5-12 mm long.

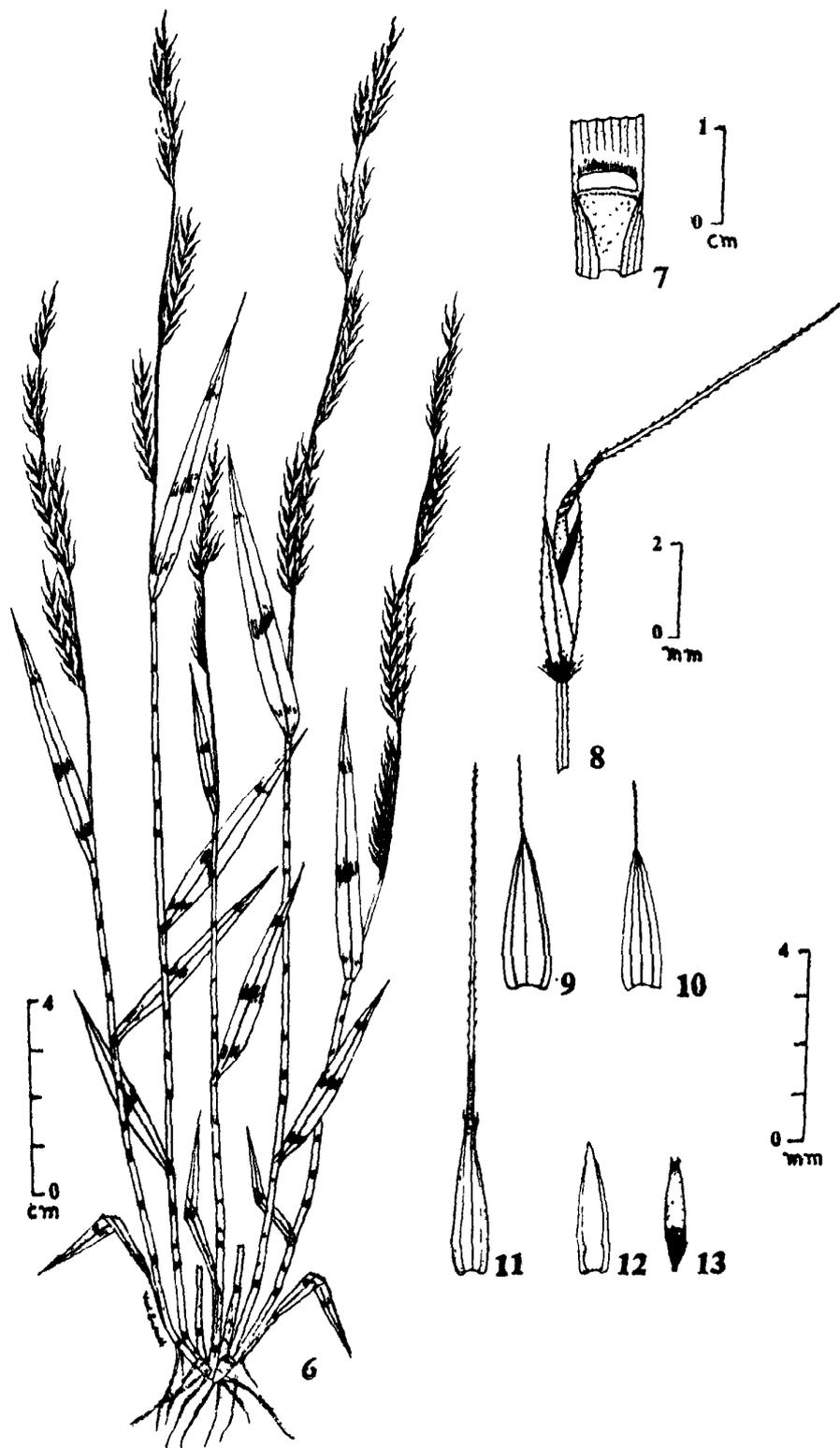
*Type* : India : Peninsula Indiae Orientalis, EIC, *Wight* 2599 (?). A note by Hubbard on *Wight* 3243 from Peninsula Indiae Orientalis, states "represents the same species as the type (*Wight* 2599)" (Photo CAL !, K).

*Fls. & Frts.* : Aug.-Dec.

*Distrib.* : Common, widely distributed at 200-2000 m. INDIA : Uttar Pradesh, Sikkim, Meghalaya, Nagaland, Bihar, Orissa, West Bengal, Gujarat, Maharashtra, Andhra Pradesh, Karnataka, Kerala, Tamil Nadu; NEPAL, BURMA, SUMATRA, JAVA, N. VIETNAM, THAILAND, W. MALAYSIA.

*Chr. No.*  $n=10$ ;  $n=20+1B$  (Mehra & Sood in *Taxon* 23 : 808. 1974).  $n=30$  (Mehra & Sharma in *Cytologia* 40 : 453-462. 1975).  $2n=20$  (Christopher & Abraham in *Cytologia* 36 : 585. 1971).  $2n=40$  (Sindhe & Narayan in *Taxon* 25 : 158. 1976).

*Notes* : This is a polymorphic species, showing qualitative and quantitative variation in characters. Santos (*l. c.*) divided this species into 10 species, 10 varieties and 5 formae on the basis of minor differences. Of these 25 taxa, 7 species, 6 varieties and 3 formae were based on Indian material. We agree with Gould's view (*l.c.*) in reducing the taxa described by Santos as above. Plants of this complex were largely referred as *G. stricta* Brongn. in Indian Herbaria and literature.



*Garnotia tenella* ( Arn. ex Miq. ) Jant.  
 Figs. 6-13 : 6. Habit. 7. Ligule. 8. Spikelet. 9. Lower glume. 10. Upper glume. 11. Lemma. 12. Palea. 13. Caryopsis.

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Arundinelleae	1	<b>G. courtallensis</b>	4, 7, 11
Arundinoideae	1	<b>G. elata</b>	5, 8, 9, 12
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var. <b>longiseta</b>	5, 6	<b>G. tenella</b>	4, 11, 13, 14
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<i>G. tenuiglumis</i>	8	Panicoideae	1
<i>G. thwaitesii</i>	12	Poaceae	1
<i>Miquelia</i>	3	Pooideae	1
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## FASCICLES OF FLORA OF INDIA

<b>Family</b>	<b>Fascicle</b>	<b>Date of Publication</b>
CORIARIACEAE	1	Oct. 1978
PAEONIACEAE	1	Oct. 1978
DILLENACEAE	2	May, 1979