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Taxonomic Significance of Floral morphology in Identification of South Indian *Alternanthera* Forsskal (Amaranthaceae)

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ABSTRACT

The genus *Alternanthera* popularly called 'Joy weed' was established by Forsskal in 1775, coming under the family Amaranthaceae. Amaranthaceae, popularly called 'amaranth family, is a moderately large family with 77 genera and over 840 species (Müller & Borsch, 2005). It is a pantropical family with some genera or species reaching the warmer temperate regions. Nearly one third of the genera of the family are monotypic. The genus can be distinguished from other genera of Amaranthaceae by its two-chambered anthers, pseudostaminodia alternating with fertile (and sometimes sterile) filaments; stigma capitate; inflorescence of solitary or multiple, axillary or terminal globose heads usually without subtending leafy bracts. The genus was treated with confusion in several regional floras which are devoid of updated nomenclature and citation of type specimens. A key to the taxa are provided along with illustration of Androecium and Gynoecium of 6 species to facilitate identification of the taxa.

1. Introduction

The family Amaranthaceae has been of great interest to botanists, horticulturists, agriculturists and laymen alike, since long. The brilliantly hued, everlasting floral bunches (spikes) and beautifully variegated foliage of many species make them ideal ornamentals for the tropics and subtropics of the world. While some of them like *Amaranthus* species are among the ten popular vegetables in southeast Asia (Vinning, 1995), many others provide us with other kinds of cereals, secondary chemicals, vegetables and medicines. The area of the study was South India including the states of Kerala, Tamilnadu, Karnataka, Andhra Pradesh and union territories of Pondicherry and Mahe. It covers an area of 4,67, 186 sq. km. The study is based on extensive field work and collections made from different parts of South India. Field data were properly recorded in the field book, and sufficient quantity of inflorescences was also collected for wet preservation and for further examination. The specimens were studied using stereo microscope and illustrations were made using Camera lucida. The specimens were examined thoroughly with the descriptions given in the flora of Presidency of Madras (Gamble & Fischer, 1925) and Flora of British India (Hooker, 1885). Revisions and monographs were also consulted to confirm their systematic position and nomenclature. Types and protologues were studied (either specimens, digital images, cibachromes or microfiches) in all cases where the identity of a taxon is found confusing. Illustrations were entirely based on fresh specimens. Flowering and fruiting period are mostly documented from field observations except for certain cases. The identity of six species and one variety occurring in South India was confirmed. The present work revealed that there are six species and one variety present in South India. A key to the taxa are provided along with illustration of Androecium and Gynoecium of 6 species to facilitate identification of the taxa.

Key words: Systematic position, *Alternanthera*, Herbarium specimens, updated nomenclature

2. Materials and Methods

The study is based on extensive field work and collections made from different parts of South India. The work was commenced on May 1999. Since then frequent collection trips were conducted at different parts of South India, covering the states of Andhra Pradesh, Karnataka, Tamilnadu, Pondicherry and Kerala. Each taxon was collected in sufficient numbers from different habitats to study the variation pattern. Attention has been given to gather specimens with flowering, fruiting or both the stages. Herbarium specimens were made according to standard methods (Lucas, 1989). Field data were properly recorded in the field book, and sufficient quantities of inflorescences were also collected for wet preservation and for further examination. The specimens were studied using stereo microscope and illustrations were made using Camera lucida. Detailed descriptions were made based on fresh specimens except in a few cases. The specimens were examined thoroughly with the descriptions given in the flora of Presidency of Madras (Gamble & Fischer, 1925) and Flora of British India (Hooker, 1885). Revisions and monographs were also consulted to confirm their systematic position and nomenclature. The identified specimens were mounted on the standard herbarium sheets with necessary collection data. Specimens deposited in other herbaria (CAL, CALI, BSI, MH, RHT, TBGT) are also examined to understand more on the variations pattern exhibited by different taxa. Types and protologues were studied (either specimens, digital images, cibachromes or microfiches) in all cases where the identity of a taxon is found confusing. Illustrations were entirely based on fresh specimens, except in a few cases. The most typical form is illustrated in all cases with special emphasis given to demonstrate variations. Distribution maps were prepared almost entirely based on specimens examined during the present investigation. Vernacular names and uses of plants if any are given wherever available. Vernacular names are obtained either from local people during field studies or from

herbarium labels and published works. Flowering and fruiting period are mostly documented from field observations except for certain cases. All the specimens collected during the course of the work are deposited in the herbarium of Department of Botany, University of Calicut (CALI).

3. Systematic Treatment

Alternanthera Forssk., Fl. Aeg.-Arab. 28. 1775
Type species: *Alternanthera sessilis* (L.) DC.

Annual or perennial herbs; stems prostrate, decumbent, ascending, erect, floating or clambering, often pubescent with simple, dentate, or barbed trichomes. Leaves opposite, entire, sessile or petiolate, the blades narrow to broad. Inflorescence axillary or terminal, sessile or pedunculate, globose or cylindrical, usually whitish or silvery head-like spikes; bract and bracteoles scarious, bracteoles keeled. Flower hermaphrodite. Perianth often dorsally compressed of 5, free, equal or unequal, glabrous or variously pubescent perianths, 2 more concave than the rest. Stamens usually 5, filaments shortly connate at the base, pseudostaminodia 5, subulate or reduced to small teeth or rarely absent, entire to laciniate, alternating with antheriferous filaments on the androecial tube; anthers with 2 locules and 1 line of dehiscence. Ovary globose or ovoid, compressed or not; style usually short; stigma capitate; ovule 1, pendulous. Fruit an indehiscent utricle, thin-walled or sometimes corky, falling off with the perianth. Seeds lenticular, seed coat semipellucid or coriaceous, smooth.

Distribution. *Alternanthera* has about 150 species, widely distributed in the American tropics and subtropics, from where many species have spread to several other countries. Some species are cultivated as ornamentals while many others run as weed often forming a dense mat over the ground.

Notes. Forsskal (1775) while describing the genus failed to provide any species name. It was Lamarck (Encycl. Meth. Bot. 1: 95. 1783) who first provided a species *Alternanthera triandra* Lam. for Forsskal's description and validated the genus name. However, Mears (1977) after examining Forsskal's collections concluded that all the materials belong to *Alternanthera sessilis* (L.) DC. Moreover, Forsskal's description also matches with his specimens as well as description of the basionym (*Gomphrena sessilis* L.) and hence, *A. sessilis* (L.) DC. is accepted as the type species of the genus.

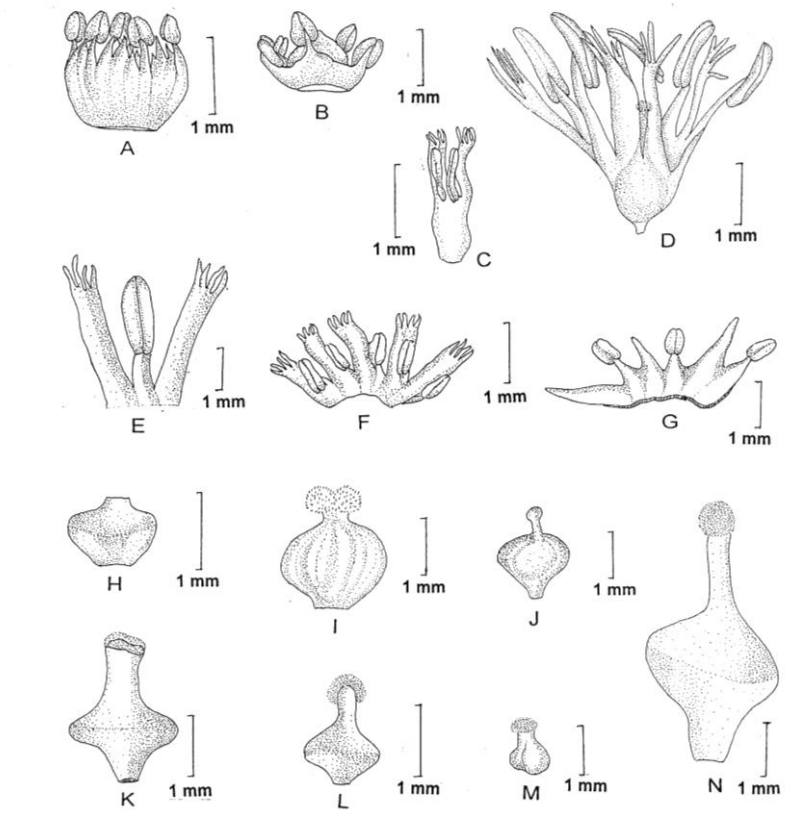

Fig. 49. Variations in androecium and gyneocium in Alternanthera. A,I . *Alternanthera paronychioides* A. St. Hil; B,H. *A. pungens* Kunth., C,M. *A. brasiliana* (L.) Kuntze, D,N. *A. philoxeroides* (Mart.) Grisch., E,K. *A. tenella* Colla var. *tenella*, F,I. *A. tenella* Colla var. *bettzickiana* (Regel) Veldk., G,J. *A. sessilis* (l.) R. Br. ex Dc.

Key to the Species

Globose inflorescence subsessile.

Bracts and bracteoles glabrous.

Tepals without glochidiate bristles; pseudostaminodes almost as long and resemble filaments ..... 5. *A. sessilis*

Tepals with a tuft of glochidiate bristles on the keel; pseudostaminodes lacerate, shorter than filaments .... 4. *A. pungens*

Bracts and bracteoles barbellate hairy:

4. Tepals hairy along the whole length, pseudostaminodes exceeding the filaments .....6.

Tepals hairy below middle, pseudostaminodes shorter than filaments .....2. *A. paronychioides*

Globose inflorescence conspicuously pedunculate.

Plants aquatic to subaquatic; leaves elliptic or oblong-lanceolate; staminal filaments as long or exceeding the pseudostaminodes .....3. *A. philoxeroides*

5. Plants not aquatic or sub aquatic; leaves broadly ovate or elliptic-lanceolate; staminal filaments much shorter than pseudostaminodes.....1.*A. brasiliana*

Alternanthera brasiliana (L.) Kuntze, Rev. Gen. Pl. 1: 537. 1891; Mears, Proc. Acad. Nat. Sci. Philadelphia 129(1): 12. 1977; Backer in Steenis, Fl. Males. Ser I, 4: 91.1949.
Type: Breyne Centuria II. t. 52. 1678.

Monoecious, erect herb; stems profusely branched upto 1m long, terete, green or red, sparsely pilose. Leves opposite, broadly ovate-elliptic, 2-15 x1-6 cm, less pilose on the adaxial side, more pilose on the abaxial side, margins entire, apex acuminate, base cuneate; petiole 0.5-2 cm long, glabrescent. Inflorescence terminal and axillary globose, dense spike, terminal spike peduncle up to 12 cm long, axillary spike, white. Flowers bisexual, white; bracts lanceolate, 4 x 1.5 mm, dense pilose, base pinkish tinged, midvein straight thickened, apiculate apex; bracteoles 2, oblanceolate, 5.5 x 0.5 mm, white, dense pilose, apex acute; tepals 5, linear-lanceolate, 4 x 0.8 mm, hyaline, 3-nerved, apex acute, lanate. Stamens 5, connate to form a tube around the pistil, filaments 0.25 mm long; anthers linear-oblong, bithecous, 1.75 mm long, yellowish; staminodes 5, fringed at apex, yellow, glabrous. Ovary globose, 0.75 mm long, green, glabrous, ovules solitary; style 0.5 mm long, glabrous; stigma capitate. Fruits not seen.]

Specimens examined. KERALA: Thiruvananthapuram Dt.: Kovalam, 25.12.2001, *Anilkumar 354* (CALI). Idukki Dt.: Kalvarimount, 3.12.2004, *Anilkumar 48* (CALI); Kurothikalam, 8.12.2004, *Anilkumar 45* (CALI). Malappuram Dt.: Vallikunnu, 24.11.2004, *Anilkumar 39* (CALI); Nilambur, Karimpuzha, 25.10.1982, *Philip Mathew 33523* (CALI). Wynad Dt.: Soojipara, 11.12.1997, *Sinitha. K. 59444* (CALI).

Alternanthera paronychioides St.-Hil., Voy. Distr. Diamans Bresil 2: 43. 1833; Sundararaj, J. Bombay Nat. Hist. Soc. 53: 525. 1956. Dutta & Misra, Ind. Forester 87: 304, 1961; Pedersen, Darwiniana 14: 437. 1967; Veldk., Blumea 19: 167. 1971; Backer in Steenis, Fl. Males. Ser. 1. 6: 916. 1972; C.J. Saldanha & Nicolson, Fl. Hassan Dist. 105. 1978; C.C. Towns. in Dassan. & Fosberg, Rev. Handb. Fl. Ceylon 1: 50. 1980; N. Rani & K.M. Matthew in K.M. Matthew, Fl. Tamilnadu Carnatic 2: 1302. 1983; Sivar. & P. Mathew, Indian J. For. 7: 51. 1984; K.M. Matthew, Fl. Central Tamilnadu 417. 1991; Chaudh. & Battach., Bull. Bot. Surv. India 36: 271. 1994; Sasidh. & Sivar., Fl. Thrissur Forests 369. 1996; Raju & Padmavathi in Pullaiah & Ali, Fl. Andhra Pradesh 2: 797. 1997; Bao Bojian *et al*., Fl. China 9: 426. 2003.

Type: Rio de Janeiro, *St. Hilaire 233* (holotype, P).

Monoecious, prostrate mat forming herb; stem profusely branched, up to 50 cm, branches rooting at the nodes, white villous when young, finally glabrescent, striate, reddish. Leaves opposite, elliptic oval or obovate, 1-3 x 0.2-1 cm, white villous-glabrescent, margins entire, apex obtuse or subacute, base narrow; petiole 0.2-0.8 mm long, villous-glabrescent. Inflorescence sessile, axillary, globose, white. Flowers bisexual, white; bract ovate-acuminate, 2.25 x 1.25 mm, mucronate with the excurrent midrib, white, glabrous; bracteoles 2, ovate acuminate, 2.25 x 1 mm, mucronate, slightly narrower than bract, falling with the fruit; tepals 5, subequal, outer 2 oblong - lanceolate, 4 x 1.75 mm, acute, 3-nerved, pilose in the lower half with patent, white, minutely barbellate hairs, inner 3 lanceolate, 3 x 1mm, middle nerve prominent, apex mucronate, thin pilose in the lower half, minutely barbellate; stamens 5, connate at the base, the filament 0.5 mm long, yellowish. Ovary globose, narrowed below, 1 x 0.75 mm, glabrous; style very short, glabrous; stigma capitate. Capsule compressed, orbicular-obcordate, 1.5 x 1 mm, glabrous. Seed discoid, 1.25 mm across, brownish, shiny.

Specimens examined. KARNATAKA: Mysore Dt.: Mysore, 28.10.2004, *Anilkumar 24* (CALI). KERALA: Idukki Dt.: Thekkady, 28.1.1995, *Jomy Augustine 14584* (CALI). TAMIL NADU: Coimbatore Dt.: Maruthamalai, 29.8.1999, *Anilkumar 327* (CALI); Agricultural Research Institute, 6.8.1943, *D. Daniel 86666*; Varapalayam, 2.8.1956, *K. Subramanyam 448* (MH, CAL); Ramanathapuram, 6.9.1984, *M. Chandrabose 28479*; Valankulam, 3.6.1968, *M. Chandrabose 29959* (MH). Dharmapuri Dt.: Hogainakkal, 11.3.1965, *E. Vajravelu 23514* (MH). Thanjavur Dt.: Pinchenkotayam, 11.8.1960, *K.M. Sebastine 10677* (MH); Thiruthurapundi, 21.5.1978, *V.J. Nair 57001* (MH, CAL); Neelankkav, 16.4.1987, *S. Ragupathy 357* (MH). Tiruchi Dt**.:** Srirangam Island, 23.2.1978, *Perianayagam 12178* (RHT).

Alternanthera philoxeroides (Mart.) Grisebach, Abh. Konigl. Ges. Wiss. Goettingen 24: 36. 1879; Backer in Steenis Fl. Males. Ser. 1, 4: 93. 1949; Maheswari, Bull. Bot. Surv. India 6: 313. 1964; C.J. Saldanha & Rao, Fl. Karnataka 165. 1984; Sivar. & P. Mathew, Indian J. For. 7: 52. 1984; V.S. Raju in Indian Bot. Reptr. 5: 207-208. 1986; Madhus. & Ajith Kumar, J. Econ. Tax. Bot. 17: 652. 1993; Chaudh. & Battach., Bull. Bot. Surv. India 36: 271. 1994; Raju & Padmavathi in Pullaiah & Ali, Fl. Andhra Pradesh, 2: 797. 1997; Bao Bojian *et al*., Fl. China 9: 427. 2003.

Type: *Sellow s.n.* (lectotype BR, M) Lectotype designated by Pedersen, 1967.

Monoecious, prostrate, aquatic herbs; stems branched, erect, fistular, terete, internode 4.5 cm long, green glabrous. Leaves opposite, elliptic lanceolate to obovate-lanceolate, 4-7 x 1-1.5 cm, glabrous, margins entire, apex acute, base narrow; petiole 2-3 mm long, glabrous. Inflorescence axillary globose head, 5.5 - 8 cm long, white. Flowers bisexual, white; bracts ovate-lanceolate, 2.25 x 1 mm, glabrous; bracteoles 2, deltoid-ovate, 2.75 x 1.5 mm, glabrous; tepals 5, membranous, lanceolate, 6.5 -7 x 2-2.5 mm, acute at apex, glabrous; fertile stamens 5, connate at the base, filaments 1.75 mm long; anthers oblong, bithecous, 1.25 mm long, yellowish, pseudostaminodes lacerate, longer than the filaments; ovary ovoid, 1.25 mm long, glabrous; ovules solitary; style 1 mm long, glabrous; stigma capitate, densely papillose; seeds not seen.

Specimens examined. ANDHRA PRADESH: Warangal Dt.: Hanamkonda, 10.10.1985, *Dr. Vatsavaya S. Raju 925* (MH). KERALA: Ernakulam Dt.: Vypin, 30.8.2005, *Anilkumar 266* (CALI).

Alternanthera pungens Kunth in H.B.K., Nov. Gen. Sp. 2: 206, 1817; Melville, Kew Bull. 12:174. 1958; Raizada, Ind. For. 76: 495. 1950; K.K.N. Nair & Nair. Bull. Bot. Sur. India 5: 220. 1963; Stewart, Ann. Cat. Vax. Pl. W. Pakistan 229. 1972; C.C.Towns. in Nasir & Ali, Fl. W. Pakistan 39. 1974; C.J. Saldanha & Nicolson, Fl. Hassan Dist. 106. 1976; C.C. Towns. in Dassan. & Fosberg, Rev. Handb. Fl. Ceylon 1: 47. 1980; N. Rani & K.M. Matthew in K.M. Matthew, Fl. Tamilnadu Carnatic 2: 1303. 1983; Sivar. & P. Mathew, Indian J. For. 7: 49. 1984; C.C. Towns.in Polhil, Fl. Trop.E. Africa 122. 1985; Ramach. & Nair, Fl. Cannanore 376. 1988; Chaudh. & Battach., Bull. Bot. Surv. India 36: 271. 1994; Raju & Padmavathi in Pullaiah & Ali, Fl. Andhra Pradesh 798. 1997; V.N. Naik, Fl. Marathwada 741. 1998; K.M. Matthew, Fl. Palni Hills 1028. 1999; Bao Bojian *et al*., Fl. China 427. 2003.

Type: Maypur Waterfull, River Orinoco, Colombia, *Humboldt & Bonpland s.n*. (isotype, P).

Monoecious, prostrate, herbs; stem branched, branches villous with brownish barbellate jointed hairs. Leaves broadly rhomboid or obovate, 1-3 x 0.5-1.5 cm, mucronate, glabrescent, margins entire, apex obtuse or subacute, base narrow; petiole 0.3-0.6 mm long, glabrescent. Inflorescence sessile, axillary, globose or shortly cylindrical, 0.5-1 cm long, white; Flowers bisexual, white; bract lanceolate with an excurrent midrib, glabrous, 5-veined, 4.25 mm long; bracteoles 2, similar, but smaller, 3.75 mm long, falling with the fruit. Tepals 5, extremely dissimilar, the outer 2 deltoid-lanceolate, 5 mm long, very rigid, 5-nerved below, outer 2 nerves meeting above to join the excurrent, pungently mucronate mid rib; inner tepal oblong, flat, 3 mm long; blunt and strongly dentate at the apex, lateral tepals 2 mm long, sinuate in side view with the two sides of the lamina connivent and denticulate above, sharply mucronate; abaxial and adaxial tepals with small tufts of glochidiate and barbellate whitish bristles about the basal angles, the lateral tepals each with a large tuft about the centre of the midrib. Stamens 5, filament 0.2 mm long, anthers oblong, 0.2 mm long; pseudostaminodes membranous, shorter than the filaments, dentate. Ovary obovoid, 4 mm; style broader than long, 0.1 mm; seed discoid, lenticular, 1 mm across, brown, shiny.

Specimens examined. ANDHRA PRADESH: Anantapur Dt.: Reddypalli farm, 15.8.1981, *N. Yesoda 304* (MH); S.K. University Campus, 23.5.2003, *Anilkumar 373* (CALI). Chittoor Dt.: Tirupathi, 25.1.1986, *D. Ranga Charyulu 107* (MH). Cuddapah Dt.: Cuddapah town, 24.8.1958, *K. Subramanyam 6436* (MH). Hyderabad Dt.: Near Moosi Riverbank, 24.6.1958, *K.M. Sebastine 5950* (MH); ICRISAT site, 17.3.1977, *L.J.G. Vander Maesen 270* (CAL). Kurnool Dt.: Bogada-Nallamalais, 19.11.1969, *J.L. Ellis 32531* (MH), Veldhurathi, 1. 12. 1983, *R.K.V. Raju 1712* (CAL).

5. Alternanthera sessilis (L.) R. Br. ex DC., Cat. Pl. Hort. Bot. Monsp. 4: 77. 1813; Wight, Ic. Pen. Ind. Or. t. 727.1843; Hook. f., Fl. Brit. India 4: 731. 1885; Backer in Steenis, Fl. Males. Ser. 1, 4: 92. 1949; C.J. Saldanha & Nicolson, Fl. Hassan Dist. 106. 1978; C.C. Towns. in Dassan. & Fosberg, Rev. Handb. Fl. Ceylon 1: 49. 1980; Manilal & Sivar., Fl. Calicut 245. 1982; K.M. Matthew, Ill. Fl. Tamilnadu Carnatic t. 584. 1982; N. Rani & K.M. Matthew in K.M. Matthew, Fl. Tamilnadu Carnatic 2: 1304. 1983; C.J. Saldanha & Rao in C.J. Saldanha, Fl. Karnataka 1: 166. 1984; Sivar. & P. Mathew, Indian J. For. 7: 47. 1984; K.K.N. Nair & M.P. Nayar, Fl. Courtallum 54. 1986; Ramach. & Nair, Fl. Cannanore 377. 1988; Vajr., Fl. Palghat Dist. 386. 1990; K.M. Matthew, Fl. Central Tamilnadu 417. 1991; Chaudh. & Battach., Bull. Bot. Surv. India 36: 271. 1994; Sivar. & P. Mathew, Fl. Nilambur 559. 1996; Raju & Padmavathi in Pullaiah & Ali, Fl. Andhra Pradesh 2: 798. 1997; K.M. Matthew, Fl. Palni Hills 2: 1028. 1999; Bao Bojian *et al*., Fl. China 9: 426. 2003.

Type: Ceylon, Hermann Herbarium 2: 78 (lectotype, BM).

Monoecious, prostrate herb; stems profusely branched, up to 35 cm long, terete, rooting at the nodes, more or less fistular, green and purplish, when floating internodes much longer with many whitish roots at the nodes. Leaves opposite, linear-lanceolate to oblong, oval or obovate-spathulate, 1.2-4.5 x 0.5 - 1.5 cm, glabrous thinly pilose, margins entire, apex acuminate, base cuneate to attenuate; petiole 2-5 mm long, thinly pilose. Inflorescence sessile, axillary clusters or subglobose up to 0.5 mm in diameter, slightly elongate in fruit. Flowers bisexual, white; bracts deltoid ovate, 0.75 x 0.5 mm long, scarious, white glabrous; bracteoles 2, deltoid-ovate or falcate, 1 x 0.25 mm, scarious, white, glabrous, persistent; tepals 5, equal, oval elliptic, 1.5 x 0.5 mm, apex acute to rather blunt, white, glabrous. Stamens 3, alternating with staminodes, the filament 0.2 mm long, glabrous; anthers oblong, bithecous, 0.5 mm long, glabrous, yellow; pseudostaminodes 2, resembling the filaments but usually some what shorter. Ovary strongly compressed, roundish, 0.75 mm long, glabrous, green; style very short; stigma capitate. Capsule obcordate or cordate-orbicular, 2 x 2 mm, strongly compressed with a narrow, pale green, somewhat thickened margin. Seed discoid, 1 x 1 mm, brown, shiny.

Specimens examined. ANDHRA PRADESH: Anantapur Dt.: Garudukona, 21.12.1982., *T. Pullaiah 945* (MH). Chittoor Dt.: Horseny hills, 7.1.1988, *D. Ranga Charyulu 1985;* Mammandur Valley, 12.10.1958, *K. Subramanyam 6916* (MH,

CAL); Nerabylu, 6.1.1976, *G.V. Subba Rao 46983* (MH). Cuddapah Dt.: Cuddapah town, 24.8.1988, *K. Subramanyam 6440*; Balapalle, 25.2.1963, *J.L. Ellis 15787* (MH). East Godavari Dt.: Addatigala, 26.9.1980, *G.V. Subba Rao 68576,* Maredumilli, 21.6.1965, *G.V. Subba Rao 24231* (MH). Hyderabad Dt.: Moosi River Bank, 24.6.1958, *K.M. Sebastine 5937* (MH). *Anilkumar 346* (CALI).

6. Alternanthera tenella Colla, Mem. R. Acad. Sci. Torino 33: 131, t. 9. 1828; Mears, Acad. Nat. Sci. Philadelphia 129. 19. 1977; Sivar. & P. Mathew, Indian J. For. 7: 49. 1984; Chaudh. & Battach., Bull. Bot. Surv. India 36: 271. 1994; K.M. Matthew, Fl. Palni hills, 2: 1028. 1999.

(See under varieties for further synonyms and types).

Monoecious, prostrate or erect herb; stem branched, white villous or glabrescent. Leaves opposite, elliptic oblong, narrowly or more broadly elliptic to oblanceolate or rhomboid, serecious or glabrous, margins entire, apex acute or acuminate, base narrow or attenuate. Inflorescence axillary, ovoid, heads, white. Flowers bisexual, white; bracts elliptic lanceolate or ovate-lanceolate, glabrous or rigid hairy; tepals 5, unequal; stamens 5, connate at the base; staminodes 5, alternate with fertile stamens, as long as the filaments, laciniate at the apex. Ovary globose to obovoid, ovules solitary, style short, stigma capitate. Capsule ovate, globose. Seeds discoid, brownish black, shiny.

Key to the Varieties

1. Bracts and bracteoles glabrous; tepals acute-mucronate at apex .....
.....

1. Bracts and bracteoles rigid hairy; tepals spinous tipped ..... var. *tenella*

Alternanthera tenella Colla in Mem. R. Acad. Sci. Torino 33: 131, t. 9. 1828; Sivar. & Mathew, Indian J. For. 7: 49. 1984; K.M. Matthew, Fl. Palni hills 2: 1028. 1999. var. **tenella.**

Type: *Colla s.n.* (lectotype, P). Lectotype designated by Mears (1977)

Monoecious, prostrate herb; stem profusely branched, terete, up to 40 cm, white villous especially in the younger parts, hairs minutely barbellate, distinctly jointed. Leaves opposite, elliptic-oblong, 1.5-7x 0.5-2.5 cm, serecious on the upper surface, margins entire, apex subacute, base narrow; petiole 1-5 mm long, indistinct, glabrescent. Inflorescence axillary, ovoid heads, white. Flowers bisexual, white; bracts elliptic lanceolate, spinescent, one-nerved, excurrently keeled; tepals 5, unequal, outer 3 larger, lanceolate, 3.9 x 1 mm, 3-nerved from the base, veins visible only in the lower half where they run parallel to the keeled midrib with barbellate hairs on both sides of the nerves throughout the length, the inner 2 tepals smaller, lanceolate, 2.25 x 1 mm, apex mucronate, barbellate hairy; stamens 5, connate at the base, the filament 1 mm long, glabrous; anthers 0.75 - 1 mm, linear oblong, one-celled, yellow; staminodes 5, alternate with fertile stamens, strap shaped, pale, glabrous, margins entire, tip irregular, 3-4 toothed, the segments linear; ovary obovoid, 0.75 mm long, green, glabrous, ovules solitary; style short, stout 0.25 mm long, glabrous, stigma capitate papillose. Capsule ovate, globose, 1x 0.75 mm, glabrous. Seed discoid 0.75 mm across, brownish black, shiny.

Specimens examined. KARNATAKA: Mysore Dt.: Bandipur, 28.10.2004, *Anilkumar 20* (CALI). KERALA: *Ernakulam Dt.*: Tripunithara, 1.1.1991. *M.S. Swaminathan 95705* (MH). Idukki Dt.: Kuruthikalam, 3.12.2004, *Anilkumar 44* (CALI). Malappuram Dt.: Calicut, 13.5.1999, *Anilkumar 313*; Vallikunnu, 24.11.2004, *Anilkumar 41* (CALI); Kadalundi, 6.9.1985, *A. Babu 4256* (CAL). Wynad Dt.: Pookode, 11.12. 1997, *Soniya 60425* (CALI). TAMIL NADU: Thirunelveli Dt.: Manpetti, 22.12.2004, *Anilkumar 87* (CALI).

Alternanthera tenella Colla in Mem. R. Acad. Sc. Torino 33: 131, t. 9. 1828, var. **bettzickiana** (Regel) Veld. in Taxon 27: 313, 1978; C.C. Towns. in Polhil, Fl. Trop. E. Africa, 125. 1985

Type: Cultivated material from St. Petersburg Botanic Garden (holotype, LE).

Monoecious, erect herb; stems branched, up to 40 cm, villous when young, glabrescent. Leaves opposite, narrowly or more broadly elliptic to oblanceolate or rhomboid, ovate, 2-5 x 0.5-2 cm, purplish suffused, variegated, glabrous, margins entire, apex acute or acuminate, base attenuate; petiole indistinctly demarcated, 0.5-1 cm, glabrous. Inflorescence sessile, axillary, solitary, globose, ovoid, 0.5-1 cm diameter, white. Flowrs bisexual, white; bracts ovate-lanceolate, 3.5 x 0.75 mm, glabrous, *acuminate*; bracteoles 2, ovate-lanceolate, 3.25 x 1 mm, apex acuminate glabrous; tepals 5, outer 3 lanceolate, 3.2 x 1 mm, prominently 3-nerved below, darker in the nerved area, with a line of minutely barbellate white hairs, acute, mucronate with the excurrent midrib,the hairs becoming denser towards the base of the tepal, inner two tepals shorter, 3 x 0.75 mm, one-nerved, pubescent with minutely barbellate hairs; stamens 5, connate at the base, alternating the fertile stamens pseudostaminode, as long as the filaments, laciniate at the apex, the filaments 1-2 mm long, glabrous; anthers long, linear, 0.75 mm, yellow. Ovary globose, 1 x 0.5 mm, glabrous, ovules solitary; style short, indistinct, glabrous; stigma capitate. Capsule undeveloped.

Notes. The taxon currently treated as *Alternanthera tenella* Colla var. *bettzickiana* (Regel) Veldk. has a tortous nomenclatural history. Some authors (Mears, 1977; Townsend, 1974b, 1980b; Sivarajan & Mathew, 1984; Chaudhury & Battacharyya 1994) preferred to keep this taxon as a distinct species, *A. bettzickiana* (Regel) Voss., while several others (Backer, 1949; Veldkamp, 1971; Saldanha & Rao, 1984) considered it as a variety (var. *bettzickiana*) of *Alternanthera ficoidea* (L.) Beauv. However, Veldkamp (1978), after examining the type (*van Royen,s.n.* L) specimen of *A. ficoidea* (L.) Beauv., has shown that it belongs to the taxon currently known as *Alternantera paronychioides* St.-Hil. It is incorrect to regard LINN 290. 23 as the type of *A. ficoidea* (L.) Beauv, although it represent the basionym, *Gomphrena ficoidea* L. as it is accepted today. However, all evidences is in favour of van Royen specimen to have been used by van Royen, Linnaeus and Burman as the base for their diagnoses, and therefore it

represent the irrefutable type of the Linnaean combination. Consequently, the name *A. ficoidea* (L.) Beauv. is inadmissible in accordance with Article 52 of the ICBN (Grueter *et al*., 2000).

The next available oldest name for the taxon is *Alternanthera tenella* Colla (1828). In this context, Veldkamp's (1978) combination *A. tenella* Colla var. *bettzichiana* (Regel) Veldk. is accepted in the present treatment as has been done by Townsend (1985).

Specimens examined. KARNATAKA: Mysore Dt.: Mysore, 28.10.2004, *Anilkumar 78* (CALI). KERALA: Thiruvananthapuram Dt.: Vazhuthacaud, 23.5.2000, *Anilkumar 345* (CALI).

4. Conclusion

The study provides an insight into the floral morphology of Alternanthera, illustration of variations in androecium and gynoecium , dichotomous key clearly reveals the identification of species without much confusion.

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