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ORIGINAL ARTICLE

Taxonomic revision of the genus *Alternanthera* (Amaranthaceae) in Italy

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Abstract

A taxonomic revision of the genus *Alternanthera* (Amaranthaceae) in Italy is here presented. Field surveys were carried out during the period 2007–2013. Thirty-six herbaria (both European and American) were consulted as well as extensive literature was analyzed. Four taxa are recognized, all of them to be considered aliens native to South America. Information about nomenclature (accepted names, main synonyms, and types), morphology, chromosome number, alien status (at national and regional levels), occurrence in Italy (at regional and provincial scale), ecology (preferential habitat, phenology, and elevation), taxonomical notes, and Italian vernacular names were provided for each taxon. A diagnostic key was given. For the nomenclatural purposes the generic name *Alternanthera* and its type was discussed, and the names *A. paronychioides* and *A. pungens* were studied and typified (lecto- and neotype, respectively) on specimens preserved at PH and P.

Keywords: *Alternanthera*, biological invasion, ecological impact, naturalized species, typification

Alternanthera Forssk. is a Neotropical genus of 80–200 species with main center of diversity in South America (Mears 1977; Robertson 1981; Eliasson 1988, 2004; Pedersen 1997, 2000; Sánchez-del Pino et al. 2012). Few taxa are native to Africa, Asia, and Australia (Robertson 1981), while some are introduced in central-northern America and Europe (e.g., Clemants 2003; Iamónico et al. 2010; Iamónico & Sánchez-del Pino 2012) and colonize mainly wetlands and water bodies, that are one of the most vulnerable and threatened ecosystems in the world (Ervin et al. 2006; Iberite et al. 2011; Azzella et al. 2013; Brundu et al. 2013; Gomarasca et al. 2013; Liendo et al. 2013).

This genus is critical from the taxonomical point of view due to its high phenotypic variability that was a consequence of nomenclatural disorders, and misapplications of names (see e.g., Pedersen 1967, 1990, 1997, 2000). Recent phylogenetic studies (Sánchez-del Pino et al. 2012) established the monophyly of *Alternanthera* within the Gomphrenoidae Kostel., and identified several main lineages of which one (the “*Jamesbondia*” clade) was proposed at

subgenus level (Sánchez-del Pino & Iamónico *in press*).

As part of the revision of the family *Amaranthaceae* s.l. in the new Flora of Italy (e.g., Iamónico 2010a, 2010b, 2011a, 2012a, 2012b, 2013a, 2013b, 2014a, 2014b, 2014c; Iamónico & Jarvis 2012; Iamónico & Sánchez-del Pino 2012), the Euro + Med PlantBase project (e.g., Iamónico 2013c, 2014a; Iamónico & Verloove 2013; Raab-Straube et al. 2013; Iamónico & Sánchez-del Pino 2014a, 2014b, 2014c), the CABI Compendium Programme (Iamónico 2013d, 2013e), the Critical Flora of Italy (e.g., Iamónico & Domina 2015), and within the initiative *Italian Loci Classici Census* (e.g., Domina et al. 2012; Iamónico 2012a; Iamónico & Managlia 2015; Iberite et al. 2015), we present a taxonomic revision of the genus *Alternanthera* in Italy.

Material and methods

The study was carried out by field investigations during the period 2007–2013 (specimens collected by D. Iamónico are preserved in the *Herbarium*

Iamónico, now at HFLA), checking and examination of exsiccata kept in European herbaria (AO, APP, B, BI, BM, BOLO, BOZ, C, CAME, CAT, CLU, FI, G, K, LEC, LINN, P, PAL, PERU, PESA, PI, RO, ROV, S-LINN, TSB, URT, W, WU), some Americans (CICY, F, GH, MEXU, NY, PH, UADY, US) (acronyms according to Thiers 2011), and in the personal herbarium of M. Iberite. Extensive literature was also analysed. The nomenclatural articles cited follow the *International Code of Nomenclature for algae, fungi, and plants* (ICN – McNeill et al. 2012).

The following data are reported for each taxon:

- Accepted name follows Clemants (2003), and (*A. tenella*) Mears (1977).
- Synonyms according to Mears (1977). We considered the names cited in the comprehensive Italian Floras/Checklists (Bertoloni 1854; Arcangeli 1882, 1884; Cesati et al. 1884; Caruel 1893; Fiori & Paoletti 1903–1904; Saccardo 1909; Fiori 1923; Zangheri 1976; Pignatti 1982; Conti et al. 2005, 2007; Celesti-Grapow et al. 2009a, 2009b, 2010).
- Types.
- Description are based on personal observations [fruits and seeds have never seen, and their descriptions came from Clemants (2003) and Sánchez-del Pino et al. (2013)].
- Iconography (literature data).
- Photo [original (living populations or specimens)],
- Phenology,
- Habitat,
- Elevation,
- Chromosome number (literature data),
- Alien status in Italy is given according to Pyšek et al. (2004) and Richardson and Pyšek (2006): residence time (archaeophyte/neophyte), native range, *status* of naturalization, and impact type (for invasive and naturalized taxa). The *status* of naturalization is indicated at national and regional levels, and was assigned on the basis of the highest stage in the invasion process documented, so the taxa were considered naturalized for Italy if they are naturalized in at least one region (similarly for the invasive status).
- Occurrence in Italy was reported at regional, and provincial levels [region names abbreviations follow Conti et al. (2005)]. The regional occurrences are based on Celesti-Grapow et al. (2010); subsequent or contemporary records are also indicated. Acronyms and region names are:
 - VDA (Valle d'Aosta),
 - PIE (Pedimont),
 - LOM (Lombardy),
 - TAA (Trentino-Alto Adige),
 - VEN (Veneto),

- FVG (Friuli-Venezia Giulia),
- LIG (Liguria),
- EMR (Emilia-Romagna),
- TOS (Tuscany),
- MAR (Marche),
- UMB (Umbria),
- LAZ (Lazio),
- ABR (Abruzzo),
- MOL (Molise),
- CAM (Campania),
- BAS (Basilicata),
- PUG (Apulia),
- CAL (Calabria),
- SIC (Sicily),
- SAR (Sardinia).

Taxonomic treatment

Alternanthera Forssk., Fl. Aegypt.-Arab.: 28. 1775 – *Type* (lectotype designated by Melville 1958, p. 172): *Alternanthera sessilis* (L.) DC., Cat. Pl. Horti Monsp.: 77. 1813.

Bas.: *Gomphrena sessilis* L., Sp. Pl. 1: 225. 1753 – *Type* (lectotype designated by Mears 1980, p. 89): Herbarium Hermann 2: 9, no. 116 (BM-000621528!) = *Illecebrum sessile* (L.) L., Sp. Pl., ed. 2, 1: 300. 1762 = *A. "achyranth."* Forssk., Fl. Aegypt.-Arab. 1: LIX. 1775.

= *A. triandra* Lam., Encycl. Bot. 1: 95. 1783, *nom. superfl.*, *nom. illeg.* (Arts. 52.1 and 52.2. of the ICN).

= *Achyranthes triandra* Roxb., Hort. Bengal.: 19. 1814 – *Type* (lectotype designated by Turner 2013, p. 153): [Icon] Rheede, Hort. Malab. 10: t. 11. 1690 = *A. achyranthoides* Forssk. apud Hiern in Cat. Afr. Pl. 1: 896. 1900.

= *A. achyranthes* Forssk. apud Christensen in Dansk Bot. Ark. 4(3): 13. 1922.

Description: Bisexual perennial herbs or shrubs. *Stems* prostrate-ascending, ascending or reptant, branched, glabrous to pubescent with trichomes whitish or yellowish 0.5–2.0 mm long (especially in young individuals). *Leaves* opposite, ovate, lanceolate to lanceolate-linear, sometimes elliptic, membranous to slightly succulent, sessile or nearly so (some other species petiolate), glabrous to pubescent (trichomes whitish or yellowish 0.5–2.0 mm long), green or reddish, apex acute, obtuse or rounded, sometimes mucronate, margin entire or slightly dentate, base attenuate. *Synflorescence* subglobose usually dense flowered, axillary and sessile or terminal and pedunculate. *Bracts and bracteoles* ovate to lanceolate, the bracteoles shorter or subequal than the perianth. *Flowers* bisexual, usually sessile with five tepals, free, lanceolate, chartaceous, margin usually entire, glabrous to pubescent, with apex acute to rounded; *stamens* three to five, *anthers* three to five, globose,

bisporangiate with one line of dehiscence, *filaments* basally fused in a staminal cup; *pseudostaminodia* present, margin entire to laciniate; *stigma* capitate; *fruit* utricle indehiscent, ellipsoidal; *seed* one per fruit, brown.

Notes: Forsskål (1775, p. 28) described the genus *Alternanthera* providing a detailed diagnosis, the provenance (“*Rosettae*”) and the Arabic vernacular name (“*Hámel*”, see Provençal 2010). Although any name is directly associated to the original description (at page 28), the author provided a list of names (Linnaeus’ classification) including the name “*ALTERNANTHERA achyranth.*” within the group “*Triandria*” (Forsskål 1775, p. LIX); the word “*Hámel*” (vernacular name) and “*Rs.*” (that means “*Rosettae spontaneae*” – see page L) were also reported. Therefore, the name *Alternanthera* can be considered validly published. The epithet “*achyranth.*” was treated as “*achyranthoides*” by Hiern (1900, p. 896) and as “*achyranthes*” by Christensen (1922, p. 13) and Sánchez-del Pino et al. (2012). Forsskål seems to have used stops rather indiscriminately at the end of epithets, sometimes indicating an abbreviation and sometimes not. According to the discussions by Melville (1958), Hepper and Friis (1994), and Turner (2013), and in the absence of further evidence, we assume that the epithet was unabbreviated. Vahl (1790, p. 22) first synonymized the Forsskål’s name with *Illecebrum sessile* (L.) L., and this choice was accepted by subsequent authors (see Mears 1977). Melville (1958, pp. 171–172) discussed in detail the typification of *Alternanthera* confirming that *A. sessilis* (L.) DC. [based on *Gomphrena sessilis* L. ≡ *Illecebrum sessile* (L.) L.] can be considered its lectotype. Mears (1977, p. 3) agrees with Melville (l.c.). We found three specimens [two preserved at C (barcodes 10001627–28, images, respectively, available at <http://plants.jstor.org/specimen/c10001627?s=t>, and <http://plants.jstor.org/specimen/c10001628?s=t>), the third one at S (No. G-S-7068, image available at <http://plants.jstor.org/specimen/s-g-7068>)] each bearing one piece of plant (branch) collected at “*Rosettae*” in 1762. This Egyptian locality (now known as Rashid, a city located on the west area of the Nile river delta) was reported in the *Flora Aegyptio-Arabica* after the generic diagnosis, so the exsiccata can be considered part of the original material as reported by Hepper and Friis (1994). According to Melville (1958) and Mears (1977), the plant collected by Forsskål is identifiable as *G. sessilis* [lectotype at BM (barcode 000621528), Herb. Hermann 2: 9, no. 116, designated by Mears (1980, p. 89); image available at <http://www.nhm.ac.uk/resources/research-curation/projects/hermann-herbarium/lgimages/BM000621528.JPG>]. The first available name in *Alternanthera* for the Linnaean’s *G. sessilis* was

published by de Candolle (1813, p. 77). However, 30 years earlier de Lamarck (1783, p. 95) published the name *Alternanthera triandra* providing a diagnosis obtained directly from Forsskål (1775, p. 28). Mears (1977, p. 3) stated that the publication by Lamarck “constitutes validation of the genus as first adequate designation of a species name in *Alternanthera*” and he considered invalid the Forsskål’s name (Mears 1977, p. 1). Mears (l.c.) accepted *A. sessilis* as the name to be adopted, and consequently, as generic type of *Alternanthera*. Melville (1958) has not cited the name *A. triandra*. The Forsskål’s name “*Alternanthera achyranth*” is validly published (see also Melville 1958; Hepper & Friis 1994; Turner 2013), and *A. triandra* Lam. has to be considered a superfluous and illegitimate name (Arts. 52.1 and 52.2 of the ICN). Since the Linnaean’s name *Gomphrena sessilis* was published earlier than *A. achyranth* (1753 vs. 1775), it has priority (Art. 11.4 of the ICN) so it is the first available name (basionym). In this way, the name *A. sessilis* is considered to be the type of the *Alternanthera*.

Historical background: The Italian first quotation of the genus *Alternanthera* was by Fiori (1923, p. 435) who reported:

A. repens Steud... trovata avventizia pr. Genova nell'alveo della Polcevera a Fegino... *A. scopo ornamentale* si col. spesso: *Alternanthera amoena* Voss... *A. paronychioides* St. Hil... *A. versicolor* Hort. ex Reg... (*A. repens* Steud... founded as casual near Genova in the river Polcevera in Fegino locality... *Alternanthera amoena* Voss... *A. paronychioides* St. Hil... *A. versicolor* Hort. ex Reg. were often cultivated for ornamental uses”).

Pignatti (1982, p. 182) indicated *A. pungens* as casual, which has not been recently recorded in Liguria region, near Genova city (... *avv. pr. Genova e da ricercare*), and he also highlighted that *A. nodiflora* is ... *in forte espansione... in Spagna e non è impossibile possa trovarsi anche da noi* (“... widespread... in Spain and it is not impossible that it can also be found in our country”). The first certain record in Italy of an *Alternanthera* species was given by Garbari and Pedullà (2001) who reported *A. philoxeroides* (Mart.) Griseb. along the duct Oncinetto near Pisa (Tuscany, central Italy). Conti et al. (2005) listed two species: *A. pungens* Kunth (without regional records – see note no. 77 at page 399) and *A. philoxeroides* in Tuscany. One year later, Ceschin et al. (2006) recorded *A. philoxeroides* in Lazio (central Italy) in Rome along the river Tevere and in Latina Province (Borgo Grappa locality) along the channel Rio Martino. Celesti-Grapow et al. (2009a, 2009b, 2010) reported only *A. philoxeroides* as casual for Tuscany and as naturalized for Lazio.

During field surveys in the Province of Florence (Tuscany region), Iamónico et al. (2010) found extensive populations of *A. philoxeroides* along the river Arno, between the city of Florence and the locality Signa: the species was considered invasive. Anzalone et al. (2010) indicated *A. philoxeroides* in the same locality previously indicated by Ceschin et al. (2006), but the taxon was recorded as casual (not naturalized as in Celesti-Grapow et al. 2010). New herbaria investigations allowed to further record two taxa: *A. sessilis* in Tuscany (Iamónico 2011b) and *A. paronychioides* in Liguria (Iamónico & Sánchez-del Pino 2012). Three years later Iamónico and Sánchez-del Pino (2014b, 2014c) revised the identification by Iamónico (2011b) (*A. sessilis* was excluded from the flora of Italy and *A. tenella* was included). More recently, Iamónico and Iberite (2014) stated that *A. philoxeroides* along the river Tevere is to be considered invasive.

All things here mentioned stated, four species are recorded in Italy, all allochthonous. A diagnostic key for the species occurring in Italy is provided:

- 1 Floral glomerules pedunculate; tepals glabrous 1. **A. philoxeroides**
 1 Floral glomerules sessile; tepals pubescent 2
 2 Pseudostaminodia longer or subequal than stamens, and margins fimbriate ... 2. **A. tenella**
 2 Pseudostaminodia shorter than the stamens or nearly so, and margins lacinate, dentate or entire 3
 3 Tepals with barbed hairs 3. **A. pungens**
 2 Tepals without barbed hairs 4. **A. paronychioides**

1. *Alternanthera philoxeroides* (Mart.) Griseb., Abh. Königl. Gen. Wiss. Göttingen 24: 36. 1879.

Bas.: *Bucholzia philoxeroides* Mart., Nov. Actorum Acad. Caes. Leop.-Carol. Nat. Cur. 13(1): 315–316. 1826 – Lectotype (designated by Pedersen 1967, p. 440): Brazil, *sine die*, F. Sellow s.n. (BR).

≡ *Telanthra philoxeroides* (Mart.) Moq., Prodr. 13 (2): 362–363. 1849.

≡ *Achyranthes philoxeroides* (Mart.) Standl., J. Wash. Acad. Sci. 5(3): 74. 1915.

Description: Herbs 2–10 (–20) dm tall, perennial aquatic (radicant hydrophyte) or semiterrestrial (hemicryptophyte diffuse, or chamephyte). *Stems* prostrate to prostrate-ascending (semi-aquatic forms) or diffuse (terrestrial forms), sparsely pubescent to glabrous, hollow, often rooting at nodes, green to brownish. *Leaves* green to reddish, lanceolate or elliptic (2.5–10 × 0.3–2.0 cm), apex acute to obtuse, mucronate, usually glabrous, membranaceous, sessile (the lower leaves), or shortly petiolated (the upper ones). *Synflorescences* arranged in sessile globose glomerules (1.5–2.2 × 1.3–

1.8 cm) terminal and axillary, all pedunculate, white. *Floral bracts and bracteoles* yellowish or greenish, ovate to lanceolate (2.0–2.5 × 1.0–1.2 mm), not carinate, apex acute, sometimes mucronate, margin entire, glabrous, shorter than the tepals. *Flowers* with five tepals, lanceolate (5.5–6.0 × 1.5–2.5 mm), apex often acute, sometimes rounded, margin entire, glabrous. *Pseudostaminodia* oblong (1.5–1.8 mm long), ligulate. *Fruit* indehiscent, subellipsoidal (1.0 × 0.8 mm), shorter than the perianth, yellow-brownish. *Seed* lenticular (0.7–1.0 mm in diameter).

Iconography: Correll and Johnston (1970, p. 867), Garbari and Pedullà (2001, p. 141), and Bojian et al. (2003, figure 342(1–4)).

Photo: Figure 1.

Phenology: June–October.

Habitat: Rivers, banks channels, and ducts.

Elevation: 5–45 m a.s.l. (minimum altitude at locality Borgo Grappa, maximum altitude at Florence).

Chromosome number: 66, 100 (Xu et al. 1992; Sosa et al. 2007).

Alien status in Italy: Neophyte native to South America (Clemants 2003), it can be considered invasive in Italy. It is invasive in Florence and Rome provinces (Tuscany, and Lazio regions, respectively), while it is naturalized in Latina province (Lazio), and Empoli city (Tuscany), and casual in Pisa province

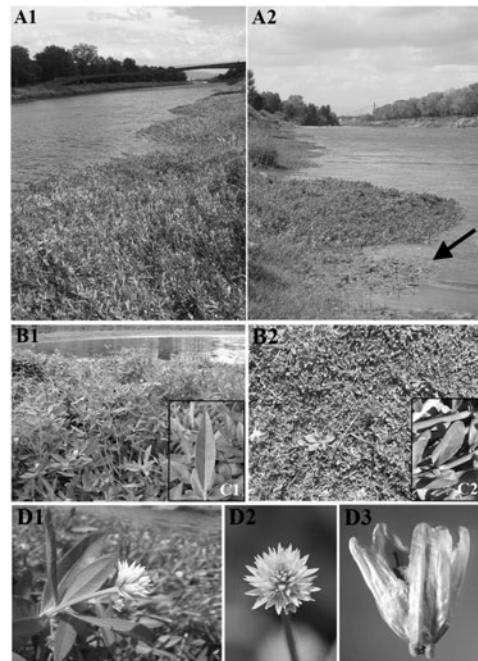


Figure 1. *Alternanthera philoxeroides* (Mart.) Griseb.: (A1, A2) population along the river Arno, city of Florence, Tuscany region, central Italy (arrow indicates a damaged population of the autochthonous *Potamogeton nodosus* Poir.); (B) habitus (B1, prostrate-ascending semi-aquatic forms; B2, diffuse terrestrial forms); (C) leaves (C1, var. *acutifolia*; C2, var. *obtusifolia*); (D) synflorescence (D1, D2, glomerules; D3, flower).

(Tuscany). *A. philoxeroides* occurs in plants communities both semi-terrestrial [Phragmito-Magnocaricetea Klika in Klika & V. Novák, 1941, Molinio-Arrhenatheretea Tüxen, 1937 (Crypsio-Paspalealia distichi Br.-Bl. in Br.-Bl., Roussine & Nègre, 1952 and Plantaginetales majoris Tüxen & Preising in Tüxen, 1950), Isoëto-Nanojuncetea Br.-Bl. & Tüxen ex Westhoff, Dijk & Passchier, 1946 (Nanocyperetalia Klika, 1935), Bidentetea tripartitae Tüxen, Lohmeyer & Preising ex von Rochow, Artemisietea vulgaris Lohmeyer, Preising & Tüxen ex von Rochow, 1951], and aquatic [Potametea Klika in Klika & V. Novák, 1941 (Potametea Koch, 1926)]. Along the Arno and Tevere rivers (Florence and Rome, respectively) *A. philoxeroides* forms dense populations colonizing very large areas (hundred meters in Florence city – Figure 1(A),(B)). Since the fruit was never observed, we can assume that the species spreads using vegetative reproduction.

Occurrence in Italy: Central Italy (TOS; Garbari & Pedullà 2001; Iamónico et al. 2010; Gestri & Peruzzi 2013, pp. 184, 186), and LAZ (Ceschin et al. 2006, Iamónico & Iberite 2014).]

Italian vernacular name: Erba coccodrillo (translation from Clemants 2003).

Similar taxa: Among the *Alternanthera* taxa with pedunculate synflorescence, two (*A. brasiliana* Kuntze and *A. flavescens* Kunth) are related to *A. philoxeroides* (Clemants 2003; Sánchez-del Pino et al. 2013). The floral bracteoles are not carinate in *A. philoxeroides*, keeled in *A. brasiliana*, while the tepals are glabrous in *A. philoxeroides*, pubescent/villous in *A. brasiliana*, and *A. flavescens*.

Specimina visa selecta: See Supplementary Materials.

2. ***Alternanthera tenella*** Colla, Mem. Reale Accad. Sci. Torino 33: 131–132. 1829. – Lectotype (designated by Mears 1977, p. 19): America, Colla s. n. (P).

Description: Herbs 6.0–1.5 dm tall, annual (therophyte). **Stems** erect, glabrous or slightly pubescent, branched, usually green. **Leaves** dark-green, ovate or lanceolate (2.6–9.0 × 0.9–4.1 cm), apex acute or mucronate, glabrous or sparsely pubescent, chartaceous, sessile. **Synflorescences** arranged in globose glomerules (0.5–0.7 × 0.4–0.8 cm), axillary, sessile, and whitish. **Floral bracts and bracteoles** yellowish or whitish, ovate (2.9–3.4 × 0.9–1.0 mm), carinate or not, apex acuminate or aristate, margin entire, glabrous or pubescent, shorter than tepals. **Flowers** with five tepals, ovate or lanceolate (3.0–4.5 × 0.5–1.4 mm), apex mucronate to aristate, margin entire, pubescent. **Pseudostaminodia** oblong (1.7 mm long), lacinate. **Fruit** indehiscent, ellipsoidal (1.1 × 0.7 mm), yellow-brownish. **Seed** lenticular (0.7–1.0 mm in diameter).

Photo: Figure 2.



Figure 2. *Alternanthera tenella* Colla: exsiccatum from Florence city (Toscana region) preserved at FI.

Phenology: October–November.

Habitat: Urbanized areas.

Elevation: 40–60 m a.s.l. [since Adr. Fiori roughly indicated “Firenze” in the label (see Supplementary Materials), we prefer to indicate a range for the elevation (Florence has an average elevation of about 50 m)].

Chromosome number: Unknown.

Alien status in Italy: Neophyte native to the tropics of America (Sánchez-del Pino et al. 2013), it is casual for Italy.

Occurrence in Italy: Old recorded in Central Italy (TOS) in Florence city (Iamónico & Sánchez-del Pino 2014b).

Italian vernacular name: Alternanthera delicata.

Notes: Mears (1977, p. 19) treated *Alternanthera tenella* and *A. ficoidea* as separate species, while recent authors disagree, e.g., Clemants (2003) synonymized *A. tenella* with *A. ficoidea* (L.) Smith, while Sánchez-del Pino et al. (2013) recognized *A. tenella* as good species. In our opinion, the two names refer to different taxa [Mears (1977, pp. 6–7, 19) considered *A. ficoidea* synonym of *A. paronychioides*].

Similar taxa: *A. tenella* is similar to *A. littoralis* Beauv. var. *maritima* (Mart.) Pedersen and it is distinct by the leaves not succulent, and the tepals not rigid, pubescent or hispid, with margins chartaceous (*A. maritima* has leaves succulent, and tepals rigid, glabrous, with margins coriaceous; Clemants 2003).

Specimina visa: see Supplementary Materials.

3. *Alternanthera pungens* Kunth, Nov. Gen. Sp. (quarto) 2(7): 206. 1818 – Neotype (here designated): Venezuela, Crescit in ripa Orinoci prope nobilem cataractam Maypurensium, *sine die*, *A. Bonpland s.n.* (P!, image of the neotype available at <http://science.mnhn.fr/institution/mnhn/collection/p/item/p00136008>).

= *Achyranthes repens* L., Sp. Pl. 1: 205. 1753 – Type (lectotype designated by Iamónico 2014b, p. 407): [Icon] *Achyranthes repens, foliū Bliti palidi* (Dillenius 1732: T. VII, F. 7).

= *Alternanthera repens* (L.) Link, Enum. Hort. Berol. Alt. 1: 154. 1821, *nom. illeg. non* Gmelin, 1791.

= *Illecebrum achyranthum* L. (as “*Achyrantha*”), Sp. Pl., ed. 2, 1: 299–300. 1762, *nom. superfl. et illeg.* (Art. 52.1 of the ICN).

= *Alternanthera achyrantha* (L.) Sweet, Hort. Suburb. Lond.: 48. 1818.

– *Alternanthera achyrantha* (L.) R.Br., Prodr.: 417. 1810, *comb. inval.* (Art. 35.2 of the ICN).

= *Illecebrum pungens* (Kunth) Spreng., Syst. Veg. 1: 820. 1824.

= *Telanthera pungens* (Kunth) Moq., Prodr. (DC.) 13(2): 371. 1849.

Description: Herbs 3–8 dm tall, annual (therophyte). *Stems* prostrate, pubescent, branched, brownish to reddish. *Leaves* green, ovate to obovate (1.3–3.5 × 1.0–1.7 cm), apex obtuse to rounded, glabrous or pubescent, membranaceous sessile. *Synflorescences* arranged in globose to ellipsoidal glomerules (0.5–1.0 × 0.6–0.7 cm), axillary, sessile, white. *Floral bracts and bracteoles* white, lanceolate to ovate-lanceolate (3.5–6.0 × 1.4–2.8 mm), usually carinate, apex acute (sometimes awned), margin entire, glabrous. *Flowers* with five tepals, lanceolate (5.0–7.0 × 1.5–2.5 mm), apex acuminate, awned, margin entire, pubescent. *Pseudostaminodia* triangular (up to 0.5 mm long), entire to dentate. *Fruit* indehiscent, ellipsoidal (1.5–1.8 × 1.5–1.6 mm), brown. *Seed* lenticular (0.7–1.0 mm in diameter).

Iconography: Eliasson (1987, p. 65).

Photo: Figure 3.

Phenology: September–November.

Habitat: Uncultivated lands in urbanized areas, and river banks.

Elevation: 20–40 m a.s.l. [minimum altitude at locality Fegino (Liguria region), maximum altitude at Peretola (Tuscany region)].



Figure 3. *Alternanthera pungens* Kunth: exsiccatum from Peretola locality (Toscana region) preserved at BI.

Chromosome number: Unknown.

Alien status in Italy: Neophyte native to South America (Clemants 2003), it is casual in Italy.

Occurrence in Italy: *Alternanthera pungens* is known to be alien in Europe in Belgium (Verloove 2006), and Spain (Carretero 1990). Concerning Italy, the recent checklists (Conti et al. 2005, 2007; Celesti-Grappow et al. 2009a, 2009b, 2010) listed only *A. philoxeroides* (Mart.) Griseb. The name *A. pungens* was previously mentioned by Zangheri (1976) and Pignatti (1982), but the subsequent Italian botanists did not consider this datum. The cited specimens (see Supplementary Materials) were early identified as *A. achyrantha* (L.) R.Br. [plants from Tuscany (at FI) were revised by T.M. Pedersen (year 1973)]. We here confirm the identifications by Pedersen and revise the others specimens (from Tuscany at FI and from Liguria at BI). Since no recent gathering of *A. pungens* from Italy is known, the specimen cited in the present paper represents old records [northern (Liguria), and central (Tuscany) Italy].

Italian vernacular name: Alternanthera strisciante (Pignatti 1982, p. 43).

Notes: Kunth (1818, p. 206) provided a detailed diagnosis and description of *A. pungens*, also giving the provenance (“*Crescit in ripa Orinoci prope nobilem cataractam Maypurensium*”). Mears (1977, p. 9) indicated an holotype, but Kunth (l.c.) did not indicate any specimen, so the lectotypification is necessary. Unfortunately, since the date of collection is lacking, we cannot propose the exsiccatum indicated by Mears (l.c.) as the lectotype. We are not been able to trace any specimen that is part of the original material, so the neotypification is necessary (art. 9.7). The exsiccatum at P indicated by Mears (l.c.) is here designated as the neotype of the name *A. pungens*.

Similar taxa: *Alternanthera caracasana* Kunth differs from *A. pungens* in having the leaves longer than broad, the tepals densely pubescent, 3–5 mm long, and the pseudostaminodia with margins usually entire (Clemants 2003).

Specimina visa: See Supplementary Materials.

4. *Alternanthera paronychioides* A. St.-Hil., Voy. Distr. Diam. 2: 439–441. 1833 – Lectotype (here designated): Brazil, Rio de Janeiro, Voyage d’Auguste de Saint-Hilare, de 1816 à 1821, *A. Saint-Hilare* 223 (PH-00002154!) – Isolectotypes (here designated): Brazil, Rio de Janeiro, Voyage d’Auguste de Saint-Hilare, de 1816 à 1821, *A. Saint-Hilare s.n.* (PH-00002153!); Brazil, Rio de Janeiro, Voyage d’Auguste de Saint-Hilare, de 1816 à 1821, *A. Saint-Hilare* 223 (F-1435178!).

Description: Herbs 1.5–8.0 dm tall, annual (therophyte) or perennial (hemicryptophyte). Stems prostrate, sparsely pubescent to glabrous, branched, green to brownish. Leaves green to dark-green, ovate to obovate (2.0–3.4 × 0.8–2.8 cm), apex obtuse or acute, glabrous to sparsely pubescent, chartaceous, sessile. Synflorescences arranged in globose glomerules (0.2–1.9 cm × 0.2–0.9 cm), axillary, sessile, yellowish or whitish. Floral bracts and bracteoles yellowish, ovate (1.5–2.3 mm × 0.5–1.0 mm), carinate or not, apex acute or mucronate, margin entire, glabrous. Flowers with five tepals, lanceolate (1.5–3.8 × 0.8–1.3 mm), apex acute or acuminate, margin entire or crenulate, pubescent. Pseudostaminodia triangular (0.2–0.3 mm long), crenate. Fruit indehiscent, obcordate (1.4–1.5 × 1.5–1.6 mm), brown. Seed lenticular (0.9–1.1 mm in diameter).

Photo: Figure 4.

Phenology: October–December.

Habitat: Uncultivated land near roadsides.

Elevation: 10–20 m a.s.l. [since the site indicated on the labels of the Italian specimens (see Supplementary Materials) cannot be located with certainty, we prefer to indicate the altitudinal range of the town Alassio].

Chromosome number: 100 (Bojian et al. 2003).

Alien status in Italy: Neophyte native to tropical and subtropical regions of America, Africa, Asia, and



Figure 4. *Alternanthera paronychioides* A. St.-Hil.: exsiccatum from Alassio city (Liguria region) preserved at FI.

the Pacific (Sánchez-del Pino et al. 2013), it is casual in Italy.

Occurrence in Italy: Old recorded in northern Italy (Liguria region) in locality Alassio (Iamónico & Sánchez-del Pino 2012).

Italian vernacular name: Alternantera a fiori di Paronichia.

Notes: Saint-Hilaire (1833, pp. 439–441) provided a long and detailed diagnosis, the habitat and provenance (*Ad vias maritimas propé Sebastianopolim frequentissima necnon in benemultis Americae calidioris regionibus*), and he cited a doubtful synonym (with a question mark: *Illecebrum ficoideum* Jacq. Amer. 88, t. 60, f. 4?). Three specimens useful for typification purposes were found in two herbaria [two preserved at PH (images available at http://ph.ansp.org/image_viewer.php?barcode=2153, and http://ph.ansp.org/image_viewer.php?barcode=2154), one at F (image available at <http://emuweb.fieldmuseum.org/web/pages/common/imagedisplay.php?irn=46448&reftable=efmnh&refirn=249852>)]. All these exsiccata were collected by Saint-Hilaire in Rio de Janeiro (years 1816–1821) and can be considered part of the original material. Pedersen (1967) widely discussed the nomenclature of *A. paronychioides* and indicated that

Three sheets of the type material are in (P), all very similar, and if not actually part of the same plant, at least part of the same population. They are marked “Cat. A n°12B”... agree very well with the published description.

Therefore, the author was unable to distinguish, which exsiccatum is the type. Mears (1977) reported an holotype for *A. paronychioides*, but Saint-Hilaire (l.c.) did not indicate any specimen. All things stated that, the lectotypification appears to be necessary. Among the elements selected (specimens from F, and PH) we designate PH (barcode 00002154) as the lectotype for the name *Alternanthera paronychioides* since it is the better preserved. The remaining exsiccata are isolectotypes.

Alternanthera paronychioides shows a high morphological variability, especially for: shape of the leaves apex, hairiness, shape and apex of the tepals, and length of the anthers. Pedersen (1967) recognized six varieties and two forms, one of which [var. *pilosa* (Moq.) Süssenguth f. *pilosa*] occurs in Italy. This taxon is characterized by the presence of tepals glabrous, with apex obtuse, and the anthers 0.5 mm long, lanceolate, with apex acute, and not mucronate.

Similar taxa: Specimens of *A. paronychioides* can be easily misidentified as *A. sessilis* or *A. caracasana*. Common characteristics are overall size, prostrate habit, axillary and sessile inflorescences, and leaf shape. However, *A. sessilis* can be easily distinguished by its characteristically exerted fruit, and *A. caracasana* by having barbed trichomes. *A. paronychioides* is either glabrous or has simple trichomes, and the fruit does not protrude beyond the tepals.

Specimina visa: See Supplementary Materials.

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