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## NOMENCLATURAL SURVEY OF THE GENUS *AMARANTHUS* (AMARANTHACEAE). 11. DIOECIOUS *AMARANTHUS* SPECIES BELONGING TO THE SECT. SAUERANTHUS

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**Abstract.** Iamónico, D. 2020. Nomenclatural survey of the genus *Amaranthus* (Amaranthaceae). 11. Dioecious *Amaranthus* species belonging to the sect. Saueranthus. *Darwiniana*, nueva serie 8(2): 567-575.

A nomenclatural study of *Amaranthus* names, linked to the dioecious taxa belonging to the sect. Saueranthus (subgen. Acnida), was carried out. All studied names are validly published but in need of nomenclatural clarifications. Lectotypes are designated for *A. greggii* var. *muelleri* (NY), whereas for *A. ambigens*, *A. annectens*, *A. arenicola*, *A. myrianthus*, and *A. watsonii* holotypes were cited (deposited at US, BM, GH, and US). Isotypes were found for *A. ambigens* (one specimen at NY), *A. myrianthus* (five specimens at GH, M, MO, RM, and US), and *A. arenicola* (three specimens at KSC, MO, and US), whereas for *A. watsonii* two isotypes were traced at US. A new synonymy, *A. arenicola* = *A. myrianthus*, is proposed, the latter name having nomenclatural priority to the former one. Based on preliminary taxonomic observations, two varieties are recognized under *A. greggii*, var. *greggii* and var. *muelleri*, which differ from each other on the ratio tepals/fruit (about 2/3 in var. *muelleri* vs. about 1 in var. *greggii*).

**Keywords.** Acnida; Mexico; synonymy; typification; U.S.A.

**Resumen.** Iamónico, D. 2020. Estudio de nomenclatura del género *Amaranthus* (Amaranthaceae). 11. Especies dioicas de *Amaranthus* pertenecientes a la sección Saueranthus. *Darwiniana*, nueva serie 8(2): 567-575.

Se lleva a cabo un estudio nomenclatural sobre los nombres de las especies dioicas de *Amaranthus*, pertenecientes a la sección Saueranthus (subgénero Acnida). Todos los nombres estudiados están válidamente publicados pero necesitan aclaraciones nomenclaturales. Se designan lectotipos para *A. greggii* var. *muelleri* (NY). Se indica la existencia de holotipos para *A. ambigens*, *A. annectens*, *A. arenicola*, *A. myrianthus* y *A. watsonii* (depositados en US, BM, GH y US). Se localizan isotipos para *A. ambigens* (un espécimen en NY), *A. myrianthus* (cinco especímenes en GH, M, MO, RM y US) y *A. arenicola* (tres especímenes en KSC, MO y US), mientras que para *A. watsonii* fueron localizados dos isotipos en US. Se establece una nueva sinonimia: *A. arenicola* = *A. myrianthus*, proponiéndose que el segundo nombre tenga prioridad nomenclatural sobre el primero. Con base en observaciones taxonómicas preliminares, se reconocen dos variedades de *A. greggii*, var. *greggii* y var. *muelleri*, que difieren entre sí en la relación entre la longitud de los tépalos y del fruto (aproximadamente 2/3 en la var. *muelleri* vs. aproximadamente 1 en la var. *greggii*).

**Palabras claves.** Acnida; Estados Unidos de América; México; sinonimia; tipificación.

## INTRODUCTION

*Amaranthus* L. (Amaranthaceae Juss.) is a genus comprising 70-75 species, of which approximately half of them are native to the Americas (Costea et al., 2001; Iamónico, 2015). This genus is critical from the taxonomical point of view, due to its high phenotypic variability, which led to nomenclatural disorders and misapplication of names (Mosyakin & Robertson, 1996; Costea et al., 2001; Bayón, 2015; Hernández-Ledesma et al., 2015; Iamónico, 2015; Das, 2016]. The more recently proposed classification was published by Mosyakin & Robertson (1996) who recognized three subgenera based on morphological and chorological data [subgenus *Acnida* (L.) Aellen ex K.R. Robertson, subgenus *Albersia* (Kunth) Gren. & Godr., and subgenus *Amaranthus*]. Subgenus *Acnida* is classified three sections according to Mosyakin & Robertson (1996), i.e. sect. *Acnida* (L.) Mosyakin & K.R. Robertson, sect. *Sauernanthus* Mosyakin & K.R. Robertson, and sect. *Acanthochiton* (Torr.) Mosyakin & K.R. Robertson, the latter two sections including taxa characterized by having flowers with five well developed tepals, whereas species of sect. *Acnida* have flowers without tepals or, when occurring, the tepals are up to 2 but often reduced in size. A recent molecular study by Waselkov et al. (2018) highlighted that the classification of Mosyakin & Robertson (1996) does not match the groups as identified in the phylogenetic trees and that it does not appear to be natural. However, Waselkov et al. (2018) stated that further studies need to clarify the infrageneric classification in *Amaranthus*. In addition to the taxonomic issues, nomenclature of the genus is highly complicate especially including misinterpretations of the names which were applied during the centuries in different ways: from the use of different names for a same taxon [e.g., *A. chlorostachys* and *A. patulus* Bertol. were often treated as a separate species, but they actually refer to *A. hybridus* L. (Iamónico, 2016a), or the various names in the *A. tricolor* group which have to be synonymized (see Iamónico 2014a, 2020a)], to the use of a single name for a wrong taxon (e.g., the name

*A. gracilis sensu auct. non* Desfontaines which is to be referred to *A. viridis* L.) and the occurrence of ambiguous names [e.g., *A. gangeticus* L. (Iamónico, 2014b) or *A. commutatus* A. Kern (Iamónico, 2020b)].

As part of the ongoing nomenclatural research on all *Amaranthus* names (I clarified over than 200 names), I here present the eleventh contribution which concerns the dioecious *Amaranthus* taxa, belonging to sect. *Sauernanthus* (sensu Mosyakin & Robertson, 1996). Previous papers on the genus treated Linnean names (Iamónico, 2014a; 2014b), names linked to the Italian flora (Iamónico, 2016a), *Amaranthus gracilis* Desf. and related species (Iamónico, 2016b), Moquin-Tandon's names (Iamónico, 2016c), names linked to the Australian flora (Iamónico & Palmer, 2020), Willdenow's names (Iamónico, 2020a), *Amaranthus polygonoides* L. s.l. (Iamónico, 2020c), *Amaranthus commutatus* A. Kern (Iamónico, 2020b), and Roxburgh's names (Iamónico, 2020d). The study of nomenclature, which can be defined as the system of scientific names for taxa and their ranks (species, genus, family, etc.) and the rules and conventions for the formation, treatment, and use of those names, is very important in taxonomy (especially for critical groups such as *Amaranthus*) since, through the designation of the types, nomenclature regulates how names are used to communicate taxonomic hypotheses. Nomenclature has been providing classification systems of biodiversity for centuries and has been continuing to accommodate new knowledge in botany (see Thomson et al., 2018).

## MATERIAL AND METHODS

This work is based on analysis of relevant literature (including protologues), and examination of specimens (digital images) preserved in the herbaria BM, FER, FI, GH, HFLA, IS, M, MO, NECB, NY, P, PESA, RM, RO, and US (codes according to Thiers, 2020) and the personal herbaria (not listed in Index Herbariorum) of Dr. Carlo Argenti (Belluno, Veneto Region, N-Italy) and Dr. Andrea Truzzi (Mantova, Lombardia Region, N-Italy).

Specimens for comparisons, which were useful for the identification of the original material of the names studied, were examined during the last 15 years as part of the taxonomic investigation of the genus *Amaranthus* (for a complete list of most of the Herbaria consulted see Iamónico, 2015: 4, 2016c: 81-82, 2020b: 2, and Iamónico & Palmer, 2020: 169).

The Articles of the *International Code of Nomenclature for algae, fungi, and plants* cited throughout the text (e.g. “Art. 38.1”) follow the current edition, i.e. the *Shenzhen Code*, hereafter abbreviated as ICN (Turland et al., 2018).

## NOTES ON TYPIFICATIONS

### *Amaranthus ambigens*

Standley (1917: 106) validly published *Amaranthus ambigens* providing a detailed description and the following statement: “Type collected near Fountaindale, Illinois, by M. S. Bebb (U. S. Nat. Herb. no. 48297)”. Two specimens collected by M. S. Bebb in Illinois were found at US (barcode US00106229), and NY (barcode NY01043148). Both these specimens bear branches of two plants, one male and the other one female. Since the species is dioecious, despite the occurrence in the protologue of the word “Type” as well as the indication of the herbarium and the number of collections (Standley, 1917: 106), these specimens cannot be considered as holotype and isotype of the name *Amaranthus ambigens* (see Art. 9.1 of ICN and the considerations by McNeill, 2014) and a lectotypification is necessary according to the Art. 9.3 of ICN. I here designated the female individual of the US specimen (plant on the left of the sheet) as the lectotype of the name *Amaranthus ambigens*, whereas plant on the left of the sheet of NY01043148 (female individual) is the isolectotype.

Note that a printed label by D. Pratt, dated 2002, occurs near the right-corner of the US00106229 and reports different identifications of the female plant (which would correspond to *Amaranthus ambigens* according to the label data) and the male plant (which would correspond to *A. tuberculatus* according to

the label data). However, I disagree. The male plant perfectly matches the Standley’s original description concerning the staminate flowers (see the discussion below).

Concerning the identity of the Standley’s name, note that it was often considered as a heterotypic synonym of *Amaranthus tuberculatus* (Moq.) Sauer (see e.g., Ferren, 2011; Assad et al., 2017; GBIF, 2019; The Plant List, 2010a; POWO, 2020a-onward), whereas in few cases it was accepted as a distinct species (see e.g., Mohlenbrock, 2001; 2014; Das, 2016). According to the protologue and study of the lectotype held at US (US00106229), *A. ambigens* displays pistillate flowers with five well developed tepals. As a consequence, it cannot be synonymized with *A. tuberculatus*, which is a species with flower with 1-2 reduced tepals (as displayed by all the members of *Amaranthus* subgen. *Acnida* sect. *Acnida*). On the basis of the classification proposed by Mosyakin & Robertson (1996), *A. ambigens* would belong to *Amaranthus* subgen. *Acnida* sect. *Saueranthus* that includes taxa characterized in having pistillate flowers with five tepals. Given that the bracts of *A. ambigens* are not deltate and do not enfold the flowers, it cannot be considered as part of the sect. *Acanthochiton* (which includes the single species *A. acanthochiton*). Bracts at the lectotype of Standley’s species are ovate-lanceolate and ½ times as long as the sepals, so it cannot be identified neither with *A. palmeri* S. Watson nor with *A. watsonii* Standl., both having bracts longer than the perianth. Fruit of US00106229 is indehiscent, 2-3 mm long and, therefore, it is not identifiable as *A. arenicola* I.M. Johnston which shows fruits dehiscent. All in all, *A. ambigens* resembles *A. greggii* S. Watson. However, morphological differences between these two latter mentioned species occur concerning the ratio length tepals/bracts (about 2 in *A. ambigens* vs. 1.2-1.4 in *A. greggii*) and the diameter of the seed (1-1.1 mm *A. ambigens* vs. 1.2-1.7 in *A. greggii*). Since the sexual characters have high taxonomic value in *Amaranthus* (see e.g., Sauer, 1955; 1967; Bojian et al., 2003; Mosyakin & Robertson, 2003; Iamónico, 2015; Iamónico & Das, 2014; Iamónico & El Mokni, 2018), I here propose

to consider *A. ambigens* as a separate species among the dioecious amaranths belonging to the sect. *Saueranthus* according to Mosyakin & Robertson (1996). However, further taxonomic studies need to give a final decision about the taxonomic value of this taxon.

### *Amaranthus annectens*

This species was validly described by Blake (1915: 103) through a detailed description, the provenance and the habitat, as well as by citing a specimen (“Yucatan: seashore, Celstun, May 12th 1868, *A. Schott*, 360 (type in Brit. Mus.)” [= British Museum, which Herbarium is currently coded as BM]). A specimen bearing various parts of a single plant collected by H. W. Schott in May 12, 1865 in Yucatan and numbered with “360” is found at BM (barcode BM000993090). Given that Blake (l.c.) reported a complete reference to the specimen, including the collection number and the Herbarium, I here consider the BM specimen as the holotype of the name *Amaranthus annectens*.

According to the current concept in *Amaranthus* (see e.g., Mosyakin & Robertson, 2003), the holotype of *A. annectens* is identifiable as *A. greggii* based on the following characters: plants dioecious, bracts ovate and shorter than the tepals, pistillate flowers with 5 tepals, fruits about 3 mm long and as long as the perianth. *A. greggii* has nomenclatural priority on *A. annectens* (1877 vs. 1915). Note that Sauer (1955: 42) reported *A. annectens* in the synonymy of *A. greggii* although no type was indicated.

### *Amaranthus greggii* var. *greggii*

Sauer (1955: 42-43) proposed to lectotypify the name *Amaranthus greggii* on a specimen deposited at GH (barcode GH00036997). This typification can be considered as correct since Watson (1877: 274-275) did not report in the protologue neither the Herbarium nor a sheet number. Note that, despite Watson (1877: 274-275) indicated, in the protologue, 1848 as the year of collection whereas Sauer (1955: 43) reported “December 17, 1847”, he referred to a hand overwritten date which was originally “1848-49” (printed). Note moreover that a Watson’s annotation reports “*Amaranthus*

*greggii*, n. sp. Wats.”. Sauer (1955: 42-43) also indicated a MO collection (“also MO!”). I traced two specimens at MO (barcodes MO101651 and MO101652) bearing plants collected by J. Gregg at Rio Grande. MO101651 includes the same printed label with correction of the year as in GH00036997, while MO101652 has an original handwritten label. Finally, there is also a specimen at US (barcode US00106246) which bears the terminal part of one plant and the following original label (left corner of the sheet): “PLANTS OF MEXICO | *Amaranthus greggii* S. Wats | Dr. J. Gregg #2 | 1848-49”. There is also, just below the plant and directly on the sheet, an original annotation by S. Watson, i.e. “*Amaranthus Greggii*, n. sp. Wats.”.

All the above mentioned specimens (one at GH, two at MO, one at US) can be considered as duplicates of a same gathering. As a consequence, being GH00036997 the lectotype (Sauer, 1955: 42-43), MO101651, MO101652, and US00106246 are isolectotypes.

### *Amaranthus greggii* var. *muelleri*

This variety was validly published by Uline & Bray (1894: 272) based on a collection by F. Mueller “near Vera Cruz in 1853”. The author intended to describe forms of *Amaranthus greggii* with stems more branched, leaves longer and narrower, synflorescence simple, sepals spreading and shorter than the fruit, and larger seeds. I found a specimen lodged at NY (barcode NY00324456) which bears two pieces of two plants (same gathering) and the original label “*Vera Cruz. | 1853. legit Müller | 1855*”. This NY specimen constitutes original material for the name *Amaranthus greggii* var. *muelleri*, it matches the protologue and the diagnosis, and it is here designated as the lectotype of *Amaranthus greggii* var. *muelleri*.

According to the current concept in *Amaranthus* (see e.g., Sauer, 1955; Mosyakin & Robertson, 2003), most of the characters given as diagnostic by Uline & Bray (1894: 272) for the var. *muelleri* (i.e. branchness, leaves, synflorescence, and sepals) can be considered as included in the variability of *A. greggii*. Concerning the ratio length tepals/fruit, it seems to separate the var. *muelleri* from the typical forms being 2/3 according to the diagnosis

provided by Uline & Bray (l.c.) and by the examination of the lectotype NY00324456 (tepals about 2 mm long, fruit about 3 mm long). On the other hand, *A. greggii* s.s. displays ratio tepals/fruit about 1 (see e.g., Mosyakin & Robertson, 2003). I think that this difference could be considered to separate the Uline & Bray's taxon at subspecies rank. However, further investigations are necessary to verify the real separation between the two taxa and I prefer to maintain the variety rank for the moment.

### *Amaranthus myrianthus*

Standley (1914: 506-507) validly published the name *Amaranthus myrianthus* providing a detailed description and the reference to specimens ("Type in the U. S. National Herbarium, 463205, collected in the vicinity of La Barra, 8 kilometres east of Tampico, Tamaulipas, Mexico, at sea level, February 1-8, 1910, by Dr. Edward Palmer (266). Additional material of the same collection is mounted on sheet 463206"). According to the Art. 9.1 of ICN, these citations refer, respectively, to the holotype (US no. 463205) and isotype (US no. 463206). These specimens were coded as US00106252 and US00106253. Furthermore, I also traced other specimens at GH (barcode GH00037026), M (barcode M0241406), and MO (barcode MO101653), all bearing labels whose data match the protologue: these three specimens are also isotypes for the name *A. myrianthus*. All the above cited specimens (two at US, one at GH, M, and MO) bear plants that morphologically match the Standley's description and correspond to the current concept of *A. arenicola* based on the following characters: plants dioecious, bracts ovate and shorter or equal than the tepals, pistillate flowers with 5 tepals, fruits about 2 mm long and shorter than the perianth (see e.g., Johnston, 1948; Sauer, 1955; Mosyakin & Robertson, 2003).

All things above discussed, the name *Amaranthus myrianthus* is considered as a heterotypic synonym of *A. arenicola*. Since *A. myrianthus* has nomenclatural priority over *A. arenicola* (years of publications 1914 vs. 1948, respectively) the correct name to be used is the former. No works in which these two names

are synonymized appear to be published, and my proposed synonymization is new. In fact, the Standley's name was sometimes listed as heterotypic synonym of *A. greggii* (see e.g., The Plant List, 2010b; POWO, 2020b-onward). Finally, Sauer (1972: 433-434) supposed the existence of hybrids between *A. greggii* and *A. arenicola* "including the types of *A. myrianthus* Standl., collected at the mouth of the Rio Panuco in 1910 (*E. Palmer* 266, 511, CAS, GH, K, MO, US, WIS)". Based on the discussion given above, I disagree with Sauer's hypothesis.

### *Amaranthus watsonii*

In describing *Amaranthus watsonii*, Standley (1914: 505-506) provided a detailed description and the following citation: "Type in the U. S. National, 692084, collected in the vicinity of Guaymas, Sonora, Mexico, in 1887, by Dr. Edward Palmer (312)". I found one specimen at US (barcode US00106268) collected by E. Palmer in Guaymas in 1887 and numbered with "312" and marked with US Catalog No. 692084. All these data totally match the Standley's protologue and US00106268 is to be considered as the holotype of the name *Amaranthus watsonii*. Further two specimens (US01013502 and US01013512) are isotypes. Note that Sauer (1955: 38) stated "...*A. Watsonii* (syntypes: *Edward Palmer* 312, on sand spit near Guaymas, Sonora, October, 1887, ♀ US!, here designated as lectotype; ...". However, based on the above discussion, a lectotypification is not necessary and the proposal by Sauer (l.c.) is not correct according to the *Shenzhen Code*.

## SYNOPSIS OF NAMES

***Amaranthus ambigens*** Standl., N. Amer. Fl. 21(2): 106. 1917. TYPE: U.S.A., Illinois, Fountaindale, s.d., *M. S. Bebb* s.n. [lectotype US00106229! (plant on the left), here designated, image of the holotype available at <http://sweetgum.nybg.org/science/vh/specimen-details/?irn=1187933>; isolectotype NY01043148! (plant on the left), image available at <http://sweetgum.nybg.org/science/vh/specimen-details/?irn=1187933>].

**Amaranthus greggii** S. Watson var. **greggii**, Proc. Amer. Acad. Arts 12: 274-275. 1877. TYPE: Mexico, Tamaulipas, Mouth of the Rio Grande, 1848-1849, *J. Gregg s.n.* (lectotype GH00036997! designated by Sauer 1955: 42-43; image of the lectotype available at <https://s3.amazonaws.com/huhwebimages/308CA3DB8C2040B/type/full/36997.jpg>); isolectotypes at MO101651 (<http://legacy.tropicos.org/Image/800>), MO101652 (<http://legacy.tropicos.org/Image/801>), and US00106246 (<https://collections.nmnh.si.edu/search/botany/search.php?action=10&height=5096&width=4000&irn=10109525>).

= *Amaranthus annectens* S.F. Blake, J. Bot. 53: 103. 1915. TYPE: Mexico, Yucatan, 12.5.1865, *H. W. Schott 360* (holotype BM000993090!, image of the holotype available at <https://data.nhm.ac.uk/object/c87706db-0a18-499b-9513-b9238a6c1ff2/1587600000000>).

**Amaranthus greggii** S. Watson var. **muelleri** Uline & W.L. Bray, Bot. Gaz. 19(7): 272. 1894. TYPE: Mexico, *Vera Cruz*, 1853, *F. Müller s.n.* (lectotype NY00324456!, here designated; image of the lectotype available at <http://sweetgum.nybg.org/science/vh/specimen-details/?irn=263293>).

**Amaranthus myrianthus** Standl., Bull. Torrey Bot. Club 506-507. 1914. TYPE: Mexico, Tamaulipas, Vicinity of La Barra, Tamaulipas, 8 km east of Tampico, at sea level, 1-8.02.1910, *E. Palmer 266* (holotype US00106252!, image of the holotype available at <https://collections.nmnh.si.edu/search/botany/search.php?action=10&height=640&width=454&irn=10133786>); isotypes: GH00037026! (<https://s3.amazonaws.com/huhwebimages/D2D7764EA2854E6/type/full/37026.jpg>), MO0241406 (<https://plants.jstor.org/stable/10.5555/al.ap.specimen.m0241406?searchUri=plantName%3D%2522Amaranthus%2Bgreggii%2Bvar.%2Bmuelleri%2522%26syn%3D1>), MO101653! (<http://legacy.tropicos.org/Image/10248>), RM0000394! (<https://rmh.uwoy.edu/gmapviewer.php?Image=RM0000394&Show=1>), US00106253! (<https://collections.nmnh.si.edu/search/botany/search.php?action=10&height=640&width=454&irn=10133787>).

= *Amaranthus arenicola* I.M. Johnston, J. Arnold Arbor. 29: 193. 1948, **syn. nov.** TYPE: U.S.A., Hamilton County, Kansas, Sand hills, 03.08.1895, *A. S. Hitchcock 428A* (holotype GH00036981!, image of the holotype available at <https://s3.amazonaws.com/huhwebimages/770B6741B3484AA/type/full/36981.jpg>); isotypes: KSC15256 (*non vid!* *fide* Sauer 1955: 39); MO247457! (<http://legacy.tropicos.org/Image/674>), US00106231! (<https://collections.nmnh.si.edu/search/botany/search.php?action=10&height=640&width=454&irn=10133783>).

**Amaranthus watsonii** Standl., Bull. Torrey Bot. Club 41(10): 505-506. 1914. TYPE: Mexico, Sonora, 1887, *E. Palmer 312* (holotype US00106268!, image of the holotype available at <https://collections.nmnh.si.edu/search/botany/search.php?action=10&height=10319&width=7319&irn=10052723>); isotypes: US01013502 (<https://collections.nmnh.si.edu/search/botany/search.php?action=10&height=640&width=454&irn=10140115>) and US01013512 (<https://collections.nmnh.si.edu/search/botany/search.php?action=10&height=640&width=454&irn=10140205>).

#### Selected specimens examined

##### **Amaranthus greggii**

MEXICO. **Tamaulipas**. Mouth of the Rio Grande, 1848-1849, *Gregg s.n.* (GH00036997); *ibidem* (MO101651); *ibidem* (MO101652); *ibidem* (US00106246); Vicinity of Tampico, 3-6.06.1910, *Palmer 511* (US00888501). **Campeche**. Ciudad del Carmen, 10.04.1933, *Mell 2015* (US03541462). **Yucatán**. 12.05.1865, *Schott 360* (BM000993090); Progreso, 14.01.1938, *Crockett 69* (US03541461); Progreso, 23.07.1938, *Lundell & Lundell 8061* (US03541467). U.S.A. Texas; Galveston, 05.09.1920, *Fisher 303* (US03540538). Texas, Strand, Jefferson Co., 04.09.1924, *Tharp 3131* (US03540536).

<sup>1</sup> See the online database of the Herbarium KSC: <http://www.konza.ksu.edu:8080/SearchVascular/detail.jsp?record=15256.0&column=0&styleDir=style>

***Amaranthus myrianthus***

MEXICO. **Tamaulipas**. Vicinity of La Barra, Tamaulipas, 8 km east of Tampico, at sea level, 1-8.02.1910, *Palmer* 266 (US00106252); *ibidem* (GH00037026); *ibidem* (MO0241406); *ibidem* (MO101653); *ibidem* (RM0000394); *ibidem* (US00106253). U.S.A. **Kansas**. Hamilton County, Sand hills, 03.08.1895, *Hitchcock* 428A (GH00036981); *ibidem* (MO247457); *ibidem* (US00106231). South Dakota; Sandhills, eastern Pennington Co., 15.07.1914, *Over* 2384 (US 03540040). **Virginia**. Dinwiddie County, Southeastern Virginia, Petersburg, 21.07.1939, *Fernald & Long* 10633 (US 03540031). **Kansas**; Haviland, 09.1944, *Rinkel s.n.* (US03540035). **Colorado**. Baca County, Region of the Mesa de Maya. Along U.S. 160. 2 miles east of the Las Animas County line, 08.09.1948, *Rogers* 6435 (US03040125). **Colorado**. San Bernardino County, Coliseum Mine, Clark Mts., eastern Mohave Desert., 05.08.1950, *Roos & Roos* 4905 (US03540124). Nebraska, Hall. Along Wood River about 1 mile south of Alda, 13.08.1962, *Lemaire* 2347 (US03540037).

***Amaranthus palmeri***

ITALY. **Emilia-Romagna**. Cervia, via Romea Nord (SS16), 2 m a.s.l., road embankment with ruderal vegetation, 08.10.2014, *Faggi, Iamónico & Ardenghi s.n.* (HFLA! five sheets). **Veneto**. Among the localities Cesere, Zanon and Ferro, Camposampiero (PD) (45°33'16.3"N 11°57'05.2"E), soybean field, 02.08.2018, leg. *Milani*, det. *Milani & Iamónico* (FI); Verona Porta Vescovo (Verona), stazione ferroviaria (WGS84: 45.43572008N; 11.01641108E), decine di esemplari lungo i binari morti della stazione dei treni, 54 m, no esp., 17.10.2019, *Bertolli* (FI). Tunisia. **Bizerta**. North-Bizerta, Nadhour, 03-08 m a.s.l., 29.07.2015, *El Mokni & Iamónico s.n.* (HFLA). USA. **California**. Banks of Rio Grande, July 1834, *Berlandier* 2407 (GH00037007); *ibidem* (MO247471, NY1043131); San Diego, Larkin station, 1875, *Palmer* 323 (GH00037006); *ibidem* (MO247470); *ibidem* (K000814911); **Massachusetts**. Malden, 04 Sep 1886, *Collins s.n.* (NEBC00735067); South Lawrence, 23.09.1902, *Pease* 510 (NEBC00735066). **Los Angeles**. N La Verne, light sunny soil in Citrus grove, 01.10.1932, *Wheeler* 1418 (P05159602).

***Amaranthus tuberculatus***

ITALY. **Emilia-Romagna**. Castel San Giovanni (Piacenza), sponda del Po, 1 October 1981, *Soldano s.n.* (HFLA!); Modena, quartiere Sacca, rudere, *Alessandrini s.n.* (HFLA!); golena del Po tra ponte lagoscuolo e Ravalle (Ferrara), 16 August 2006, *Pellizzari* 3481 (FER!). **Marche**. Fossombrone, alveo del fiume Metauro, 2006, *Gubellini & Pinzi s.n.* (PESA!); *ibidem*, 15.09.2020, *Iamónico s.n.* (HFLA); Falconara marittima (Ancona), località Fiumesino (WGS84: 43.637329°N; 13.369258), incolti adiacenti Via del Fiume, 5 m s.l.m., 15.11.2020, *Iamónico, Noor Hussain, Hofmann* (HFLA, IS, PESA). **Lombardia**. Castelnovo nella riva sinistra del Po, spiazzone di sabbie asciutte, 5 September 1974, *Cacciato s.n.* (RO!); Mantova, Borgoforte, alveo asciutto del Po, 31 August 1993, *Truzzi* 83 (*Herb. Truzzi*!); *ibidem*, 15 September 2002, *Truzzi* 283 (*Herb. Truzzi*!). **Toscana**. Pistoia, Larciano, area del Padule di Fucecchio, loc. Le Morette, 15 m a.s.l., 10 August 2004, *La Rosa s.n.* (FI!). **Veneto**. Belluno, Lambioi di Belluno, incolti, individuo femminile, 340 m s.l.m., 8 September 2000, *Argenti* 9839/3 (*Herb. Argenti*!); *ibidem*, male individual (*Herb. Argenti*!).

***Amaranthus watsonii***

MEXICO. **Baja California**. San José del Cabo, Lower California, 27.09.1890, *Brandegee* 492 (US03541668); Lower California. From Santo Domingo to Matancita, 14-15.11.1905, *Nelson & Goldman* 7282 (US03541666); Lower California. Magdalena Island, 03.1917, *Orcutt* 32 (US03541681); Las Animas, ranch at river-fork near base of El Picacho Peak, Sierra de la Laguna, 12.10.1941, *Hammerly* 292 (US03541677); Distrito del Sur. Behind large sand dunes on Gulf side near east end of El Mogote, the established sand dune peninsula extending into La Paz Bay, 13.04.1949, *Carter* 2727 (US03541676). **Sonora**. Guaymas, 1887, *Palmer* 675 (US03541662); Hillsides near Guaymas bathing beach at Miramar, 28.02.1933, *Wiggins* 6357 (US03541664); Guaymas, 23.10.1939, *Gentry* 4686 (US03541680). U.S.A. **Arizona**. San Bernardino Ranch, Mexican Boundary Line. The headquarters of the San Bernardino Ranch were in Cochise county, 22.08.1893, *Mearns* 2006 (US00888860).



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