



Acta Botánica Mexicana

ISSN: 0187-7151

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Instituto de Ecología, A.C.

México

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Acta Botánica Mexicana, núm. 101, octubre, 2012, pp. 127-149

Instituto de Ecología, A.C.

Pátzcuaro, México

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A SYNOPSIS OF *DIGITARIA* (PANICEAE, PANICOIDEAE, POACEAE)  
IN MEXICO, INCLUDING THE NEW SPECIES *DIGITARIA*  
*MICHOACANENSIS*

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ABSTRACT

A new species, *Digitaria michoacanensis* from northern Michoacán and the adjacent part of the state of México in the central-west region of Mexico, is described. Pending an updated phylogenetic infrageneric classification of the genus; the new species is placed in the group *Ternata* with spikelets in groups of three or more. A synopsis with a key to the Mexican species of the genus *Digitaria* is also provided.

Key words: *Digitaria badia*, *Digitaria michoacanensis*, Mexico, Paniceae, *Ternata* group.

RESUMEN

Se describe *Digitaria michoacanensis* una nueva especie del norte de Michoacán y áreas adyacentes del estado de México, en la región centro-oeste de México. En espera de una clasificación filogenética infragenérica actualizada, la nueva especie puede ser clasificada en el grupo *Ternata* con espiguillas en grupos de tres o más. Se provee una sinopsis y una clave para las especies mexicanas del género *Digitaria*.

Palabras clave: *Digitaria badia*, *Digitaria michoacanensis*, grupo *Ternata*, México, Paniceae.

The genus *Digitaria* Heller (subfamily Panicoideae Link, tribe Paniceae R. Br., subtribe Anthephorinae Benth.) is a worldwide and morphologically diverse as-

semblage primarily found in tropical to warm temperate regions (Clayton and Renvoize, 1986; Vega et al., 2009). It is economically important because some species are used as forage and several others are noxious weeds (Henrard, 1950; Veldkamp, 1973). The genus is characterized by having cartilaginous, glabrous fertile lemmas with membranous margins, and due to the great morphological variation among the species, some authors have divided it into several subgenera and sections (e.g., Henrard, 1950; Veldkamp, 1973; Rúgolo de Agrasar 1974; Clayton and Renvoize, 1986). One of the most comprehensive and complete studies of *Digitaria* was done by Henrard (1950), who studied all known species and classified them into four subgenera, one of them, *Digitaria* subgen. *Digitaria* (as *Eudigitaria* (Stapf) Hernrard, nom. inval)), with 32 sections. Other authors have rearranged this classification by merging several sections (e.g., Veldkamp, 1973; Rúgolo de Agrasar, 1974; Clayton and Renvoize, 1986). In the most recent study, Vega et al. (2009) tested Henrard's classification with a cladistic analysis using morphological traits. Their results did not support the infrageneric classification and only a few of Henrard's sections received some support as monophyletic groups.

With 230 species worldwide, *Digitaria* is the second largest genus in the tribe Paniceae, after *Paspalum* L. (Clayton et al., 2006 onwards; Vega et al., 2009; Sánchez-Ken, 2010). Beetle et al. (1987) reported 21 species for Mexico, Dávila et al. (2006) cited 26, whereas Zuloaga et al. (2003) reported 27. The database of the Global Biodiversity Information Facility (<http://data.gbif.org/>) contains more than 58 species names for Mexico, many of them probably erroneously identified. According to Henrard's (1950) classification, the subgenera *Leptoloma* (Chase) Henrard and 11 sections of subg. *Digitaria* are present in Mexico. When using other classifications, the number of sections in the country decreases to eight, seven and three following Veldkamp (1973), Rúgolo de Agrasar (1974), and Clayton and Renvoize (1986), respectively.

As a result of the revision of the genus *Digitaria* for Flora del Bajío y Regiones Adyacentes (Sánchez-Ken, in prep.), I propose a new species that is described and illustrated here. I also provide a synopsis, including a key, of the genus in Mexico.

## MATERIALS AND METHODS

Several important Mexican grass collections were studied (ENCB, IEB, and MEXU). A preliminary list of names was taken from The Global Biodiversity Infor-

mation Facility (GBIF, [www.gbif.org](http://www.gbif.org)), which includes the UNIBIO database (Unidad de Informática para la Biodiversidad of the Instituto de Biología, UNAM, <http://unibio.ibiologia.unam.mx>); and the Catalogue of the New World Grasses (<http://mobot.mobot.org/W3T/Search/nwgc.html>). To verify the identity of the species, online databases from NY, MO, P, and US were also consulted, including images of types and representative specimens as available (acronyms according to Index Herbariorum, <http://sciweb.nybg.org/science2/IndexHerbariorum.asp>). Fertile florets of the newly proposed species were coated with gold and photographed using a (JEOL-JSM-5310LV) scanning electron microscope.

## RESULTS

### ***Digitaria michoacanensis* Sánchez-Ken sp. nov.** Figs. 1, 2.

Plants perennial, tufted, caespitose, with a knotty rhizomatous base, the rhizomes short and thin; culms 15-30(-55) cm tall; nodes 2-3, branching below, puberulent to scabrellous; internodes short covered by the sheaths, glabrous, puberulent to shortly hirtellous near the nodes; leaves basal, sheaths 3-4(7) cm long, longer than the internodes, the upper with a reduced blade below the synflorescence, the lowermost purple and short-hirsute, the next green and glabrous, margins short-pilose; ligules 0.3-0.6 mm long, membranous, hyaline to brown, glabrous, erose; auricles formed at the apex of the sheath, short and usually fused to the ligule; blades 3.2-5.7(-10) cm long, 3-6 mm wide, lanceolate, flat, thick slightly sclerophyllous, base slightly rounded to subcordate, adaxially sparsely long-pilose, the hairs up to 4 mm long, more abundant toward the ligular area, abaxially glabrous, margins scabrellous, apex acute; synflorescence with 2(-3) racemes, digitately inserted or on a short axis about 1 cm long; racemes 2-6.5 cm long, equal or unequal, appressed; peduncle glabrous, sparsely puberulent below the base of the synflorescence; pulvinus puberulent to hirtellous; rachis 0.4-0.5 mm wide, triquetrous, the sides narrower than the midvein, scabrous to scabrellous; pedicels 1-4.5 mm long, hirtellous, mostly toward the apex, apex discoid; spikelets 2.6-2.7 mm long, 1.3-1.4 mm wide, elliptic, usually in groups of threes up to the middle of the raceme, paired and solitary toward the apex, apex acute-apiculate, densely brown pilose, the hairs up to 0.4 mm long, clavate, with bulbous, truncate to rounded tips, ascending and appressed; first glume 0.3-0.5 mm long including the hairs, hyaline, truncate, lobed

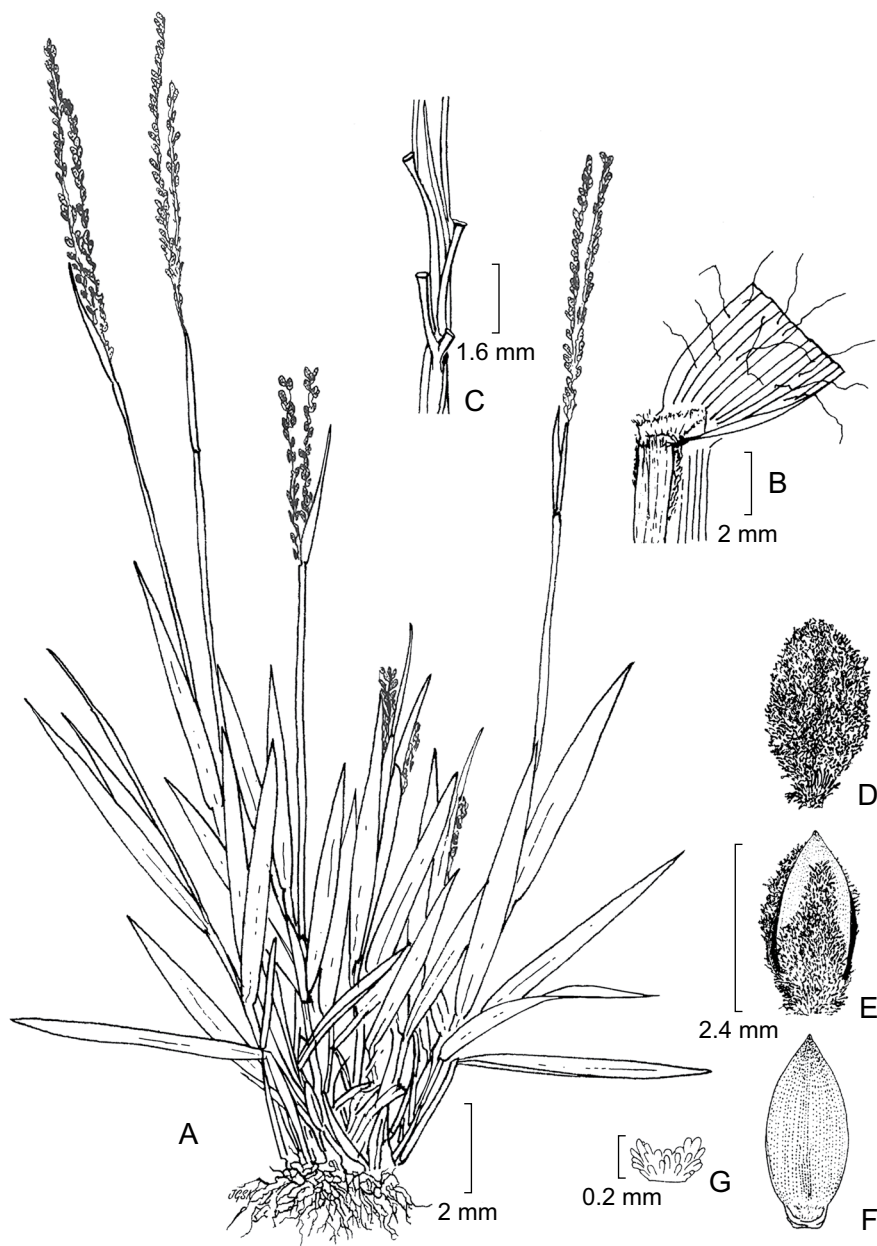


Fig. 1. *Digitaria michoacensis* Sánchez-Ken. A. plant; B. ligular area; C. raceme close-up; D. spikelet frontal view; E. spikelet dorsal view; F. fertile floret; G. sterile palea. From the type (*H. Díaz Barriga y & E. Pérez 5930*, IEB).

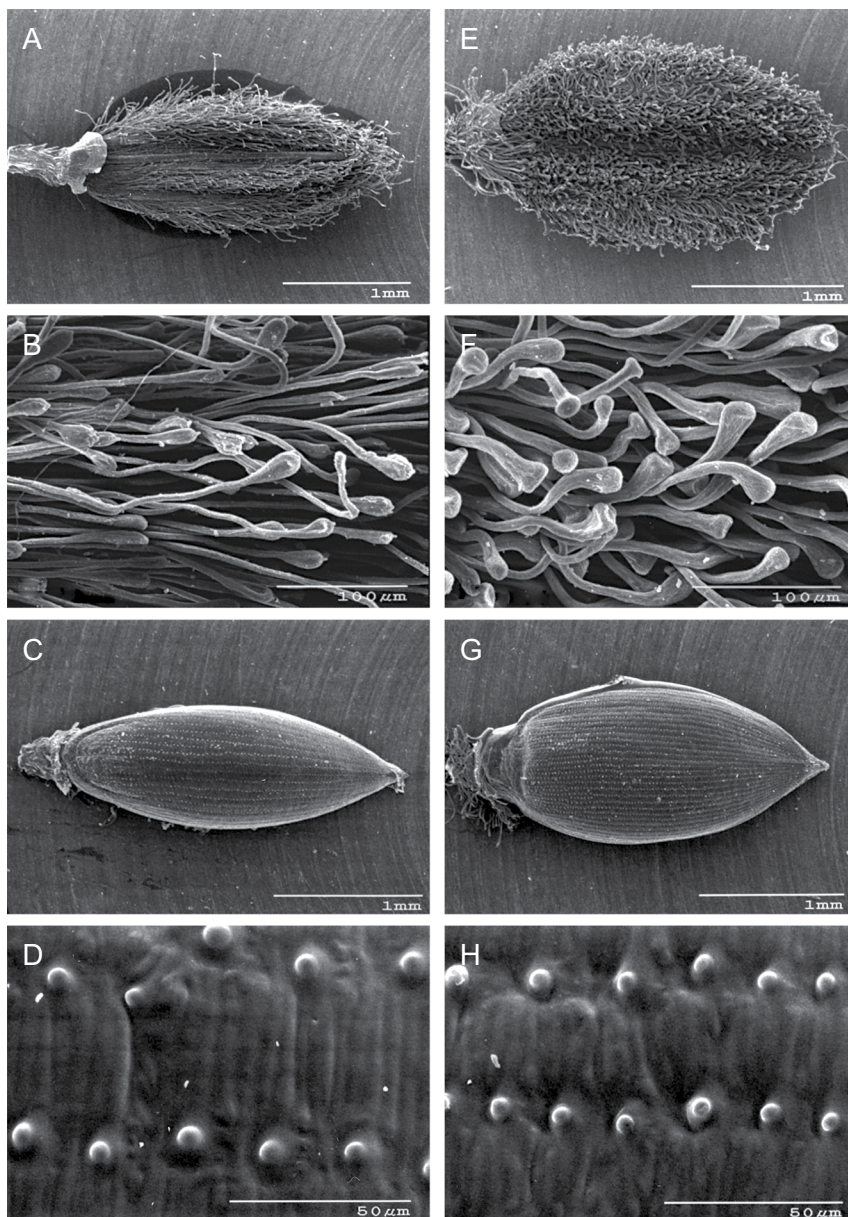


Fig. 2. Scanning electron microscope images of the florets of *Digitaria badia* (A. Avalos M. 94, IEB, MEXU) A-D. A. spikelet ventral view; B. spikelet dorsal view; C. fertile lemma; D. fertile lemma close-up. *Digitaria michoacensis* E-H (H. Díaz Barriga y E. Pérez 5930, IEB). E. spikelet ventral view; F. spikelet dorsal view; G. fertile lemma; H. fertile lemma close-up.

or somewhat acute, veinless, pilose, the hairs clavate, brown, with bulbous apices that are truncate or slightly rounded, the hairs exceeding the glume apex and longer than the hairs of the sterile lemma; second glume 2-2.7 mm long including the hairs, 0.9-1 mm wide, 3-5-veined, densely pilose in the spaces between the veins, veins glabrous, the hairs clavate, brown, with bulbous apices that are truncate or slightly rounded; sterile lemma slightly shorter than the spikelet, leaving free the apex of the fertile floret, 5-veined, the veins unequally spaced, sometimes the outer ones reduced, densely pilose in the spaces between the veins, the hairs clavate, brown, with bulbous apices that are truncate or slightly rounded; sterile palea minute; lodicules fused; fertile lemma, 2.6-2.7 mm long, 1-1.1 mm wide, slightly ovate, slightly acuminate-acute, light to dark brown, finely papillose-striate, margins hyaline over the palea, apex pale to white; fertile palea similar in texture to the fertile lemma; stamens 3, anthers 1.3-1.4 mm long; caryopsis not seen.

**Micromorphology.** SEM images clearly show that the glumes and sterile lemma are densely pilose with long clavate macrohairs which have a bulbous truncate or slightly rounded tip (Fig. 2 E-H). Some hairs appear flattened and this might be due to dehydration. The hairs of the first glume are longer than the hairs on the fertile or sterile florets. The fertile lemma epidermis has long cells that are much wider than long, with strongly sinuous walls, and there is a single papilla with a smooth surface.

**Type:** Mexico. Michoacán, municipio de Tingambato, Llano de Cananguio, al NE de Pichátaro, pastizal secundario, 2600 m, 31.VIII.1989, *H. Díaz Barriga y E. Pérez 5930* (holotype: IEB).

**Paratypes.** Mexico. Estado de México. Por la carretera de Villa Victoria a El Oro, zacatonal de *Muhlenbergia y Festuca*, 2570 m, 9.VIII.1981, *R. Guzmán & P. Guerrero 4251* (MEXU). Michoacán, municipio de Quiroga, Cerro Azul, al N de Quiroga, vegetación secundaria derivada de bosque de pino-encino, 2420 m, 23.VII.1980, *J. Caballero y C. Mapes 1190* (MEXU); 14 km S of the junction of hwys 15 and 37 at Carapan, 2070 m, 20.VIII.1975, oak-pine forest, *G. Davidse & J. Davidse 9904* (MO).

**Distribution, habitat and phenology.** This new species is restricted to Mexico in the states of Michoacán and México, the type from El Bajío region. The habitat is grassland or transition to pine-oak forest, at elevations between 2,070 to 2,600 m. Flowering and fruiting occur in July and August.

Key to the Mexican species of *Digitaria*

- 1 Spikelets in groups of three or more at least in the middle of the raceme or branch.
  - 2 Sterile lemma and second glume glabrous.
    - 3 Plants annual; spikelets 1.6-2 mm long ..... *D. filiformis* var. *laeviglumis*
    - 3 Plants perennial; spikelets 2.3-2.4 mm long ..... *D. bakeri*
  - 2 Sterile lemma and second glume pilose, or at least one of them with some hairs on the apex or margins.
    - 4 Hairs of the spikelet bracts brown.
      - 5 Spikelets 2.3-2.6 mm long, 1-1.1 mm wide; first glume glabrous; sterile lemma 7-veined; anthers 1-1.1 mm long ..... *D. badia*
      - 5 Spikelets 2.6-2.7 mm long, 1.3-1.4 mm wide; first glume pilose; sterile lemma 5-veined; anthers 1.3-1.4 mm long ..... *D. michoacensis*
    - 4 Hairs of the spikelet bracts white or yellowish.
      - 6 Rachis winged; hairs of the spikelet bracts with verrucose walls ..... *D. violascens*
      - 6 Rachis triquetrous; hairs of the spikelet bracts with smooth walls.
        - 7 Hairs of the sterile lemma of two types, the first type yellow to gold, glassy, setaceous with an acute apex, up to 0.8 mm long, mixed with the second type which are shorter, whitish and more delicate with bulbous tips ..... *D. argillacea*
        - 7 Hairs of the sterile lemma of one kind with bulbous tips.
          - 8 Second glume and sterile lemma 7-veined ..... *D. paniculata*
          - 8 Second glume 0-3-veined; sterile lemma 5-7-veined.
            - 9 Second glume up to 0.5 mm long, less than half the length of the spikelet, 0-veined.
              - 10 Spikelets 1.3-1.5 mm long; plants annual; anthers ca. 0.5 mm long ..... *D. breedlovei*
              - 10 Spikelets 1.8-2.7 mm long; plants perennial; anthers 1.3-1.5 mm long ..... *D. curtigluma*
            - 9 Second glume 0.5-0.8 mm long, more than half the length of the spikelets, if less, then 3-veined.
              - 11 Second glume half the length of the spikelets, with some hairs toward the apex; plants perennial; sterile lemma 7-veined ..... *D. bakeri*
              - 11 Second glume more than half the length to as long as the spikelets, pilose; plants annual or perennial; sterile lemma 5-7-veined.



- 12 Fertile lemma 1.4-1.9 mm long; anthers 0.3-0.5 mm long; plants annual ..... *D. filiformis* var. *filiformis*
- 12 Fertile lemma 1.9-2.5 mm long; anthers 0.8-1.1 mm long; plants annual or perennial.
- 13 Plants annual; spikelets elliptic, with base and apex rounded. .... *D. ternata*
- 13 Plants perennial; spikelets ovate-lanceolate, with base and apex attenuate.
- 14 Ligule 0.6-0.8 mm long; blades up to 9(13) cm long; plants geniculate at the base ..... *D. obtusa*
- 14 Ligule 1.3-2.6 mm long; blades 15-25 cm long; plants erect ..... *D. leucocoma*
- 1 Spikelets paired or solitary.
  - 15 Synflorescence an open panicle; spikelets long pedicellate.
    - 16 Spikelets 2.3-3.3 mm long; second glume 3-veined ..... *D. pubiflora*
    - 16 Spikelets 3.5-4.6 mm long; second glume 5-7-veined ..... *D. arenicola*
  - 15 Synflorescence a raceme; spikelets short pedicellate.
    - 17 Spikelets of the pair dimorphic ..... *D. bicornis*
    - 17 Spikelets of the pair homomorphic.
    - 18 Sterile lemma veins equidistant.
      - 19 First glume a minute rim less than 0.1 mm long or wanting; spikelets 1.5-2 mm long; sterile lemma 7-veined ..... *D. velutina*
      - 19 First glume triangular or ovate, 0.3-1 mm long; spikelets 2.5-5 mm long; sterile lemma 5-veined.
      - 20 Spikelets 4-5 mm long; spaces between the veins of sterile lemma glabrous; sterile lemma hairs long, usually yellow, sometimes whitish ..... *D. sellowii*
      - 20 Spikelets 2.5-3.1 mm long; spaces between the veins of the sterile lemma pilose; sterile lemma hairs short, white to purple ..... *D. hitchcockii*
  - 18 Sterile lemma central veins distant to each other, leaving wide intervening spaces.
    - 21 Sterile lemma scabrous or scabrellous on the central or lateral veins.
    - 22 Spaces between the veins of the sterile lemmas glabrous; central veins glabrous, only the lateral veins scabrellous above the middle; plants annual ..... *D. sanguinalis*

- 22 Spaces between the lateral veins of the sterile lemmas pilose; central veins scabrous or scabrellous from the base to the apex or only above the middle, sometimes just few prickles toward the apex seen with high magnification; plants perennial.
- 23 Racemes whorled or more commonly along the axis; ligule eciliate ..... *D. milanijana*
- 23 Racemes on a short axis, several whorls; ligule ciliate ..... *D. eriantha*
- 21 Sterile lemma with glabrous veins.
- 24 Sterile lemma hairs 1.5-6 mm long.
- 25 Space between the central veins of the sterile lemma pilose; hairs of the sides of the central veins yellow to whitish ..... *D. insularis*
- 25 Space between the central veins of the sterile lemma glabrous; hairs of the sides of the central veins white to purplish.
- 26 Racemes stiffly ascending or spreading; terminal pedicels of the racemes more than 7.4 mm long ..... *D. patens*
- 26 Racemes appressed to the axis; terminal pedicels of the racemes less than 7 mm long ..... *D. californica*
- 24 Sterile lemma hairs up to 1 mm long.
- 27 Sterile lemmas glabrous or with sparse and minute hairs at the margins ..... *D. abyssinica*
- 27 Sterile lemmas pilose between the veins toward the sides and margins.
- 28 Second glume nearly as long as the spikelet.
- 29 Sterile lemma hairs 0.5-0.6 mm long ..... *D. leucites*
- 29 Sterile lemma hairs 0.1-0.3 mm long ..... *D. texana*
- 28 Second glume up to a third as long as the spikelet.
- 30 Rachis of the racemes with very few long hairs, usually in the lower half ..... *D. horizontalis*
- 30 Rachis of the racemes without long hairs.
- 31 First glume triangular to ovate, 0.2-0.8 mm long; sterile lemma hairs 0.5-1 mm long; second glume (1.2-)1.5-2.7 mm long ..... *D. ciliaris*
- 31 First glume wanting or a truncate rim up to 0.1 mm long; sterile lemma hairs 0.1-0.2 mm long; second glume 0.5-1.3 mm long ..... *D. setigera*

## DISCUSSION

The new species belongs to the 'group *Ternata*' of *Digitaria* sections *Calvulae* (Stapf) Henrard or *Leianthae* Henrard (Henrard, 1950). These sections were merged into the section *Phaeotrichae* Rúgolo (Rúgolo de Agrasar, 1974), section *Filiformis* (Honda) Veldkamp (Veldkamp, 1973) or section *Ischaemum* Ohwi (Clayton and Renvoize, 1986). However, the monophyly of these taxa has not been tested. The inclusion of the new species into the *Ternata* is based on the morphological similarity shared with *D. badia*.

The new species is allied to *D. badia*, with which it is morphologically similar. Both species possess the same type of pubescence on the spikelet bracts, which consists of brown, capitate or clavate hairs. Also, both species share brown fertile florets, a perennial habit with knotty rhizomes, and synflorescences with 2 or 3(-5) racemes. However, there are vegetative and reproductive characters that separate these species (Table 1). Vegetatively, the plants of *D. badia* are taller, with long internodes, and have leaves that are normally caulinar with blades up to 20 cm long, whereas plants of *D. michoacanensis* are smaller with short, reduced internodes, and have basal leaves up to 10 cm long. In *D. badia* there are usually (2-)3-4(-5) racemes and the spikelets are smaller and narrower; in contrast in the new species there are only 2(-3) racemes, and the spikelets are larger. The first glume of *D. badia* is clearly glabrous (Fig. 2A), but it is pilose in *D. michoacanensis* (Fig. 2E). The hairs of *D. badia* (Fig. 2B) are slender and longer than in the new species, and the tip is apiculate or pointed. In *D. michoacanensis* the hairs (Fig. 2F) are thick and stout with the tip truncate or rounded, or clavate and calvous according to the terminology of Veldkamp (1973). The fertile lemma of *D. michoacanensis* (Fig. 2G) is slightly ovate, contrary to the narrowly elliptic fertile lemmas of *D. badia* (Fig. 2C).

Other species from *Digitaria* section *Clavipilae* (Stapf) Henrard from South America that might be related to the new species are *D. atra* Lucas and *D. killenii* A.S. Vega & Rúgolo (Vega and Rúgolo de Agrasar, 2001, 2002), but these have shorter hairs.

Thirty-one species and two varieties of *Digitaria* are now documented as occurring in Mexico. A similar number is present in North America, north of Mexico (Wipff, 2003) and Central America (Vega and Rúgolo de Agrasar, 2007) with 31 and 30 species respectively. Of the 31 species in Mexico, four are endemic, and when compared to other regions, 22 are shared between Canada/U. S. A. and Mexico (endemic, cultivated, and weeds), from which five are restricted to the United States and Mexico. Seventeen species are shared with Central America and six species are

Table 1. Differences between *Digitaria michoacanensis* and *D. badia*.

| Character                         | <i>D. michoacanensis</i>  | <i>D. badia</i>                               |
|-----------------------------------|---------------------------|-----------------------------------------------|
| Height (cm)                       | 15-30(-55)                | 60-80                                         |
| Internode length                  | short                     | elongated                                     |
| Node indumentum                   | puberulent to scabrellous | short hirsute to glabrous                     |
| Sheath margin indumentum          | short pilose              | short hirsute to glabrous                     |
| Ligule length (mm)                | 0.3-0.6                   | 0.5-1.3                                       |
| Blade length (cm)                 | 3.2-5.7(-10)              | (4-)7-20                                      |
| Blade abaxial indumentum          | glabrous                  | papillose-hirsute toward apex                 |
| Raceme number                     | 2(-3)                     | (2-)3-4(-5)                                   |
| Peduncle indumentum               | glabrous                  | sparsely to dense long-pilose toward the apex |
| Spikelet length (mm)              | 2.6-2.7                   | 2.3-2.6                                       |
| Spikelet width (mm)               | 1.3-1.4                   | 1-1.1                                         |
| Spikelet hair tips                | truncate to rounded       | apiculate                                     |
| 1 <sup>st</sup> glume length (mm) | 0.3-0.5                   | up to 0.2                                     |
| 1 <sup>st</sup> glume indumentum  | pilose                    | glabrous                                      |
| 2 <sup>nd</sup> glume length (mm) | 2-2.7                     | 1.9-2.2                                       |
| Sterile lemma vein number         | 5                         | 7                                             |
| Fertile lemma length (mm)         | 2.6-2.7                   | 2.2-2.4                                       |
| Fertile lemma width (mm)          | 1-1.1                     | 0.7-0.9                                       |
| Anther length (mm)                | 1.3-1.4                   | 1-1.1                                         |

widely distributed from Mexico to Central and South America. Of the 31 species, eight are introduced weeds and are distributed worldwide. Regarding the diversity of the genus by state in Mexico, the five richest states are Jalisco with 18 spp., Oaxaca and Veracruz with 17 spp., Chiapas with 16 spp., and Michoacán with 13 spp. A similar pattern of diversity distribution occurs with the genera *Paspalum* and *Urochloa* P. Beauv. (Sánchez-Ken, 2010, 2011).

The Global Biodiversity Information Facility website contains as many as 58 names within the genus for Mexico, which includes valid names, synonyms and invalid names. Some of these names belong to cultivated species that do not have Mexican collections represented in herbaria examined (e.g., *D. ischaemum* (Schreb.) Muhl., *D. natalensis* Stent, and *D. smutsii* Stent).

There are several morphologically similar and not well understood species of annuals that form a complex related to *D. filiformis*. One of them, *Digitaria curvinervis*, is cited for Durango and Sonora in the GBIF database; however, the same specimen is cited as *D. panicea* (Sw.) Urb. by Herrera (2001). According to McVaugh (1983), *D. panicea* is a Caribbean species and may represent a form of *D. filiformis*; *D. curvinervis* could also represent a form of *D. filiformis*. Wipff (1996) made two combinations *D. filiformis* var. *dolichophylla* (Hernard) Wipff and *D. filiformis* var. *laeviglumis* (Fernald) Wipff that he applied to taxa restricted to North America (Wipff, 2003) north of Mexico. In Mexico, after reviewing the scarce material of *D. filiformis*, I found a herbarium sheet from Oaxaca, with two specimens, one with glabrous spikelets and the other with pilose spikelets. The specimen with glabrous spikelets belongs to *D. filiformis* var. *laeviglumis* and the second to the typical variety. According to Wipff (2003), the typical variety was the only one that extended into Mexico, but based on my observations *D. filiformis* var. *laeviglumis* can no longer be considered endemic to the United States. Furthermore, there are other specimens that appear morphologically similar to *D. filiformis* var. *dolichophylla* by having glabrous basal sheaths. However, the Mexican specimens have much wider blades, and I retain these specimens under the typical variety until further investigation. *Digitaria ischaemum*, a European weed, is cited from Coahuila, Durango, Sonora, and Tamaulipas from two specimens deposited in ANSM, ARIZ, and US that I was not able to verify.

The citation of *D. longiflora* for Mexico was an error listed in TROPICOS ([www.tropicos.org](http://www.tropicos.org)) since the specimen was collected in Costa Rica; this has since been corrected. Two other species *D. natalensis* and *D. smutsii* were cited from specimens of the Banco Nacional de Germoplasma of the Universidad Autónoma de Chapingo, and it is possible that these species were grown from seed and tested for forage.

*Digitaria eriantha* Steud., or under the names of *D. pentzii* Stent, *D. eriantha* subsp. *pentzii* (Stent) Kok or *D. decumbens* Stent., has been cited as a cultivar for several states; however, after reviewing all available material only one specimen in the herbarium collection fits the description of the species. The rest of the specimens belonged mostly to *D. bicornis* (Lam.) Roem. & Schult. and *D. ciliaris* (Retz.) Koeler. It seems possible that most of the specimens identified as *D. pentzii* var. *minor* were used to include the species in Las Gramíneas de México (Beetle et al., 1987).

*Digitaria leucomoma* (Nash) Urb. has been treated as a synonym of *D. villosa* (Walter) Pers. by several authors (Zuloaga et al., 2003; Soreng et al., 2003 and onwards); however, I agree with Hernard (1950) that these two species are distinct.

The former is a tall perennial plant with long leaf blades and the second glume is shorter than the spikelet. In contrast *D. villosa* is a short perennial plant with short leaf blades and the second glume is nearly as long as the spikelet. The latter species once was treated as a variety of *D. filiformis*, a delicate annual (Soreng et al., 2003 and onwards). Henrard (1950) suggested that *D. pilosa* Michx. is a synonym of *D. villosa* because the small habit of the species; however, it is more similar to some forms of *D. filiformis*.

In a similar situation, I agree with Swallen (1953) that *D. obtusa* Swallen is a distinct species, although morphologically similar to *D. leucocoma*. In addition to the characters mentioned in the key, *D. obtusa* is shorter with short leaf blades and short racemes whereas *D. leucocoma* is taller with longer basal and caulinar leaf blades, and longer racemes. Therefore, it is possible that *D. villosa* does not occur in Mexico, and it is here excluded.

Finally, the separation of *D. filiformis* and *D. cayoensis* Swallen is often difficult. In the original description of *D. cayoensis* Swallen (1938) indicates that the sterile lemmas have 3 veins, and this feature was also mentioned in the Grasses of Guatemala (Swallen, 1955). Henrard (1950), Pohl and Davidse (1998), and Rúgolo de Agrasar (Pers. comm.) indicate that the sterile lemmas have 5-7 veins which would match the description of *D. filiformis*. Therefore, I consider *D. cayoensis* a synonym of *D. filiformis*, although more study of these entities is needed.

## SYNOPSIS OF THE SPECIES OF *DIGITARIA* OCCURRING IN MEXICO

Herbarium acronyms in parenthesis, according to Index Herbariorum (Thiers, B. (continuously updated). Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium, <http://sweetgum.nybg.org/ih/>). (U.S.A. = United States of America, Ags. = Aguascalientes, B.C. = Baja California, B.C.S. = Baja California Sur, Camp. = Campeche, Coah. = Coahuila, Col. = Colima, Chih. = Chihuahua, Chis. = Chiapas, D.F. = Distrito Federal, Dgo. = Durango, Gro. = Guerrero, Gto. = Guanajuato, Hgo. = Hidalgo, Jal. = Jalisco, Mex. = Estado de México, Mich. = Michoacán, Mor. = Morelos, N.L. = Nuevo León, Nay. = Nayarit, Oax. = Oaxaca, Pue. = Puebla, Q.R. = Quintana Roo, Qro. = Querétaro, S.L.P. = San Luis Potosí, Sin. = Sinaloa, Son. = Sonora, Tab. = Tabasco, Tamps. = Tamaulipas, Talx. = Tlaxcala, Ver. = Veracruz, Yuc. = Yucatán, Zac. = Zacatecas, C. Amer. = Central America, S. Amer. = South America, Car. = Caribbean, O. W. = Old World).

1. ***Digitaria abyssinica*** (Hochst. ex A. Rich.) Stapf, Bull. Misc. Inform. Kew 1907: 213. 1907. *Panicum abyssinicum* Hochst. ex A. Rich., Tent. Fl. Abyss. 2: 360-361. 1851. Type: Ethiopia, 22.IX.1837, *W. Schimper* 82 (holotype: P; isotypes: BR, K, L, US).

Distribution: U.S.A., Mexico (Ver.), C. Amer., S. Amer., O. W. Introduced, weed.

Reference: Veracruz: Mpio. Tlaquilpan, camino de terracería entre Tequila y Tehuapan, 18.VI.1997, *M. J. Lizama* 878 (MEXU).

2. ***Digitaria arenicola*** (Swallen) Beetle, Leaf. W. Bot. 6(8): 162. 1951. *Leptoloma arenicola* Swallen, Tex. Res. Found. Contrib. 1: 1. 1950. *Leptoloma cognatum* (Shult.) Chase var. *arenicola* (Swallen) Gould, Southw. Naturalist 15: 391. 1971. *Digitaria cognata* (Schult.) Pil. var. *arenicola* (Swallen) R. Webster, Syst. Bot. 13(4): 594. 1988. Type: United States of America, Texas, Kennedy Co., 8 mi S of Sarita, 24.IV.1949, *Swallen* 10122 (holotype: US; isotypes: MO, US).

Distribution: United States of America, Mexico (Tamps.). Native.

Reference: Tamaulipas: Mpio. San Fernando, Barra de Catán, 18.III.1989, *M. H. Cervera* 518 (MEXU).

3. ***Digitaria argillacea*** (Hitchc. & Chase) Fernald, Rhodora 22(258): 104. 1920. *Syntherisma argillaceum* Hitchc. & Chase, Contr. U.S. Natl. Herb. 18(7): 296. 1917. Type: Puerto Rico, Monte Alegrillo, near Maricao, 20.X.1913, *A. Chase* 6221 (holotype: US; isotypes: L, NY).

Distribution: Mexico (Chis., Col., Dgo., Gto., Jal., Mex., Mich., Mor., Nay., Oax., Son.), C. Amer., S. Amer., Car. Native.

Reference: Oaxaca: San Isidro Monjas del Centro, 20.XI.1991, *L. García P. s.n.* (MEXU).

4. ***Digitaria badia*** (Scribn. & Merr.) Fernald, Rhodora 22: 104: 1920. *Panicum badium* Scribn. & Merr., Bull. Div. Agrostol., U.S.D.A. 24: 12. 1901. Type: Mexico, Oaxaca, Sierra de San Felipe, 6.X.1894, *C. L. Smith* 915 (holotype: US; isotypes: MO, US).

Distribution: Mexico (Chis., D. F., Gto., Hgo., Jal., Mex., Mich., Oax., Qro., Tlax., Zac.). Endemic.

Reference: Querétaro: Mpio. Amealco, El Asserín, 19.IX.1994, *A. Ávalos M. 94* (MEXU).

5. *Digitaria bakeri* (Nash) Fernald, Rhodora 22(258): 102. 1920. *Syntherisma bakeri* Nash, Bull. Torrey Bot. Club 25(6): 296. 1898. Type: United States of America, Florida, Grasmere, no date, *C. H. Baker 47* (holotype: NY; isotype: US).

Distribution: U.S.A., Mexico (Chis., Ver.), C. Amer., S. Amer. Native.

Reference: Veracruz: La Barranca, carretera a Coscomatepec, 22.VII.1982, *R. Guzmán M., A. A. Beetle & E. Manrique 3855* (MEXU).

6. *Digitaria bicornis* (Lam.) Roem. & Schult., Syst. Veg. 2: 470. 1817. *Panicum bicornis* Lam., Tabl. Encycl. 1: 176. 1791. Type: Mauritius?, no date, *T. F. W. Sieber 42* (holotype: P-LAM; isotype: US fragm. ex P-LAM).

Distribution: U.S.A., Mexico (B.C.S., Camp., Chis., Chih., Col., D. F., Gro., Hgo., Jal., Mex., Mich., Mor., Nay., N. L., Oax., Pue., Q. R., Qro., Sin., Son., Tab., Tamps., Ver., Yuc.), C. Amer., S. Amer., Car. Weed.

Reference: Michoacán: Mpio. Arteaga, N end of town, 8.V.2002, *V. W. Steinmann, G. Puime & B. Vrskovy 2424* (MEXU).

7. *Digitaria breedlovei* R.W. Pohl & Davidse, Novon 2(2): 106. 1992. Type: Mexico, Chiapas, Mpio. de Villa Corzo, 65 km S of Mexican highway 190, on road from Tuxtla Gutiérrez to Nueva Concordia, 12.IX.1974, *D. E. Breedlove 37709* (holotype: MO; isotypes: CAS, MEXU).

Distribution: Mexico (Chis., Dgo.). Endemic.

Reference: Chiapas: Mpio. Tuxtla Gutiérrez, Mexican highway 190, Nueva Concordia, 12.IX.1974, *D. E. Breedlove 37709* (CAS, MEXU).

8. *Digitaria californica* (Benth.) Henrard, Blumea 1(1): 99. 1934. *Panicum californicum* Benth., Bot. Voy. Sulphur. 55-56. 1844. Type: Mexico: Baja California, Bay of Magdalena, in 1841, *Hinds s.n.*, (holotype: K, isotype: US fragm. ex K).

Distribution: U. S. A., Mexico (Ags., B.C., B.C. Sur., Chih., Coah., Dgo., Gto., Hgo., Jal., N.L., Pue., Qro., S. L. P., Sin., Son., Tamps., Zac.), C. Amer., S. Amer. Native.



Reference: San Luis Potosí: Mpio. Matehuala, Ejido Calabacillas, 7.VIII.1986, *H. Bravo M.* 207 (MEXU).

9. ***Digitaria ciliaris*** (Retz.) Koeler, Descr. Gram. 27. 1802. *Panicum ciliare* Retz., Observ. Bot. 4: 16. 1786. Type: China: Guangzhou, no date, *Wennerberg s.n.* (lectotype: LD, designated by Blake, Roy. Soc. Queensland 81: 11. 1969).

Distribution: U. S. A., Mexico (Ags., B.C., B.C. Sur., Camp., Chih., Chis., Coah., Col., D.F., Dur., Gro., Gto., Hgo., Jal., Mex., Mich., Mor., Nay., N.L., Oax., Pue., Qro., Q.R., S.L.P., Sin., Son., Tab., Tamps., Ver., Yuc.), C. Amer., S. Amer., Car., O. W. Introduced, weed.

Reference: Querétaro: Mpio. Landa, alrededores de Puerto de Guadalupe, 10.XII.1996, *L. G. Rincón N.* 433 (MEXU).

10. ***Digitaria curtigluma*** Hitchc., Proc. Biol. Soc. Wash. 40: 84. 1927. Type: Panama: Chiriqui, El Boquete, 28.IX.1911, *A.S. Hitchcock* 8176 (holotype: US; isotypes: K, L, SI).

Distribution: Mexico (Chis., D.F., Gto., Jal., Mex., Mich., Oax., Pue.), C. Amer. Native.

Reference: Michoacán: Mpio. Pátzcuaro, Estación de Ajuno, 8.XI.1985, *J. M. Escobedo* 602 (IEB).

11. ***Digitaria eriantha*** Steud., Flora 12(2): 468-469. 1829. Type: South Africa; Cape of Good Hope, no date, *von Ludwig s.n.* (holotype: probably P).

Distribution: U.S.A., Mexico (Oax., Tamps., Ver., Zac.), C. Amer., S. Amer., O. W. Introduced, pasture.

Reference: Zacatecas: Mpio. Calera, Campo agrícola experimental INIFAP, 20.X.1989, *J. J. Balleza C.* 2600 (MEXU).

12a. ***Digitaria filiformis*** (L.) Koeler var. ***filiformis*** Descr. Gram. 26: 1802. *Panicum filiforme* L., Sp. Pl. 1: 57. 1753. Type: United States of North America, no date, *Kalm s.n.* (lectotype: LINN-90.38, designated by Hitchcock, Contr. U. S. Natl. Herb. 12(3): 117. 1908).

Distribution: U.S.A., Mexico (Chih., Chis., Coah., D.F., Dgo., Gto., Jal., Mex., Mich., Nay., Oax., Son., Ver., Zac.), C. Amer., S. Amer., Car., O. W. Native.

Reference: Guanajuato: Mpio. Comonfort, Rancho Rinconcillo de los Remedios, 27.VII.1994, *J. C. Castañeda L. 194* (MEXU).

12b. *Digitaria filiformis* (L.) Koeler var. *laeviglumis* (Fernald) Wipff, *Phytologia* 80(5): 348. 1996. *Digitaria laeviglumis* Fernald, *Rhodora* 22(258): 102. 1920. Type: United States of America: New Hampshire; Hillsborough Co., Manchester, 11.IX.1901, *F.W. Batchelder s.n.* (holotype: GH).

Distribution: U.S.A., Mexico (Oax.). Native.

Reference: Oaxaca: about 66 mi NW of Tehuantepec, 29.VIII.1953, *J. R. Reeder & C. G. Reeder 2171* (MEXU).

13. *Digitaria hitchcockii* (Chase) Stuck., *Annuaire Conserv. Jard. Bot. Genève* 17: 287. 1914. *Valota hitchcockii* Chase, *Proc. Biol. Soc. Wash.* 24: 110. 1911. Type: United States of America: Texas, San Antonio, 24.VI.1910, *A.S. Hitchcock 5329* (holotype: US).

Distribution: U.S.A., Mexico (Coah., N.L., Oax., Qro., S.L.P., Tamps.). Native.

Reference: San Luis Potosí: in the valley of the Rio Verde and in the Sierra de Cuates, along the route Rio Verde-San Francisco-Patros-Cardunes Rayon, 14.IX.1954, *E. R. Sohns 1299* (MEXU).

14. *Digitaria horizontalis* Willd., *Enum. Pl.* 1: 92. 1809. Type: Dominican Republic; Santo Domingo, no date, *Anon. s.n.* (holotype: B-W; isotypes; MVFA, US).

Distribution: U.S.A., Mexico (Chis., Coah., Col., Gro., Jal., Mex., Mich., Mor., Nay., N.L., Oax., Pue., Q.R., S.L.P., Sin., Son., Tab., Tamps., Ver., Yuc.), C. Amer., S. Amer., Car. Weed.

Reference: Chiapas: Mpio. Ocosingo, 1.5 km al SW de la Colonia Benito Juárez Miramar, sobre el camino a Tierra y Libertad, 25.VIII.1993, *A. Reyes & M. Sousa S. 2289* (MO).

15. *Digitaria insularis* (L.) Mez ex Ekman, *Just's Bot. Jahresber.* 31(1,5): 778. 1904. *Andropogon insularis* L., *Syst. Nat.* (ed. 10) 2: 1304. 1759. Type: Jamaica, no date, *P. Browne s.n.* (lectotype: LINN-1211.20, designated by Hitchcock, *Contr. U. S. Natl. Herb.* 12: 126. 1908).

Distribution: U.S.A., Mexico (Ags., Camp., Chih., Chis., Coah., Col., Dgo., Gro., Gto., Hgo., Jal., Mor., Nay., N.L., Oax., Pue., Qro., Q.R., S.L.P., Son., Tab., Tamps., Ver., Yuc.), C. Amer., S. Amer., Car. Native weed.

Reference: Querétaro: Mpio. Jalpan, al ENE de carretera a Tancama, 14.VIII.1985, *E. Carranza* 1970 (MEXU).

16. ***Digitaria leucites*** (Trin.) Henrard, Meded. Rijks-Herb. 61: 6. 1930. *Panicum leucites* Trin., Gram. Panic. 85. 1826. Based on *Milium velutinum* DC., Cat. Pl. Horti Monsp. 126. 1813. Type: Mexico, cultivated in Hort. Monsp. from seeds sent in 1804 by Sessé from Mexico, (holotype: MPU-DC; isotypes: US fragm. ex MPU-DC).

Distribution: Mexico (Chis., D.F., Dgo., Hgo., Jal., Mex., Mich., Mor., Oax., Pue., Tab., Tlax., Ver.), C. Amer., S. Amer. Native.

Reference: Michoacán: Mpio. Villa Escalante, Ejido Cuitzitan, potrero Huaniqueo, 8 km SE de Villa Escalante, 24.X.1941, *J. García P.* 1555 (MEXU).

17. ***Digitaria leucomoma*** (Nash) Urb., Symb. Antill. 8: 24. 1920. *Syntherisma leucomomum* Nash, Bull. Torrey Bot. Club 25(6): 295. 1898. Type: United States of America: Florida, Lake Co., Lake Ella, 3.VII.1894, *N. Nash* 1155 (holotype: NY; isotype; US).

Distribution: U.S.A., Mexico (Chis.), C. Amer., Car. Native.

Reference: Chiapas: Mpio. Ocosingo, 5 km NE of Ocosingo on road to Palenque, 9.XI.1981, *D. E. Breedlove & G. Davidse* 55194 (MEXU).

18. ***Digitaria michoacanensis*** Sánchez-Ken, sp. nov. Type: México. Michoacán, municipio de Tingambato, Llano de Canaguio, al NE de Pichátaro, pastizal secundario, 2600 m, 31.VIII.1989, *H. Díaz Barriga & E. Pérez* 5930 (holotype: IEB).

Distribution: Mexico (Mex., Mich.). Endemic.

Reference: Michoacán: Mpio. Quiroga, Cerro Azul, al N de Quiroga, 23.VII.1980, *J. Caballero & C. Mapes* 1190 (MEXU).

19. ***Digitaria milanjiana*** (Rendle) Stapf, Fl. Trop. Afr. 9: 430. 1919. *Panicum milanjanum* Rendle, Trans. Linn. Soc. London, Bot. 4: 56. 1894. Type: Malawi: Mount Milanje, October, *A. Whyte s.n.* (holotype: BM).

Distribution. U.S.A., Mexico (Col., Hgo., Jal., Mor., Pue., Qro., Tab., Tamps., Ver.), O. W. Introduced, pasture.

Reference: Querétaro: Mpio. Jalpan de Serra, Rancho Panelilla, 18.VII.1994, *R. Ramírez L. s.n.* (MEXU).

20. ***Digitaria nuda*** Schumach., Beskr. Guin. Pl. 45. 1827. Type: Ghana, no date, *P. Thonning* 367 (holotype: C; isotype: L).

Distribution: U.S.A., Mexico (Chis., Col., Gro., Gto., Jal., Mex., Mich., Mor., Nay., Oax., Pue., Q.R., S.L.P., Sin., Ver., Yuc.), C. Amer., S. Amer., Car., O. W. Introduced, pasture.

Reference: Guanajuato: S del poblado de Acámbaro, km 15 carretera Acámbaro-Zinapécuaro, 3.XI.1992, *J. C. Castañeda L.* 82 (MEXU).

21. ***Digitaria obtusa*** Swallen, Phytologia 4(7): 425. 1953. Type: Guatemala; Alta Verapaz, VIII.1912, *H. von Tuerckheim* 3793 (holotype: US; isotype: MO).

Distribution: Mexico (Chis., Ver), Guat. Native.

Reference: Chiapas: Mpio. Teopisca, Belem, 8 km NW of Teopisca, along hwy to San Cristóbal de las Casas, 15.XI.1984, *G. Davidse et al.* 29778 (MEXU).

22. ***Digitaria paniculata*** Soderstr. ex McVaugh, Fl. Novo-Galiciana, 14: 143-144. 1983. Type: Mexico: Jalisco; 13 mi SSW of Autlan, 12.VIII.1969, *R. L. Wilbur & C. R. Wilbur* 2267 (holotype: MICH).

Distribution: Mexico (Jal.). Endemic.

Reference: Jalisco: Entre el crucero La Rosa y Las Marías, 27.VIII.1991, *B. R. Benz, F. J. Santana M. & J. Cevallos* 1230 (MEXU).

23. ***Digitaria patens*** (Swallen) Henrard, Blumea 1(1): 99. 1934. *Trichachne patens* Swallen, Amer. J. Bot. 19(5): 442. 1932. Type: United States of America: Texas, near Lake Mitchell, San Antonio, 24.VII.1910, *A. S. Hitchcock* 5328 (holotype: US; isotypes: LL, MO).

Distribution: U.S.A., Mexico (Coah., N.L., Son.). Native.

Reference: Coahuila: 12 mi W of San Buenaventura, 1.X.1966, *J. R. Reeder & C. G. Reeder* 4573 (US).

24. ***Digitaria pubiflora*** (Vasey) Wipff, Sida 19(4): 923. 2001. *Panicum autumnale* Bosc ex Spreng. var. *pubiflorum* Vasey, Dept. Agric. Bot. Div. Bull. 8: 35. 1889. Type: United States of America: Texas, El Paso Co., Mts. Near Paso del Norte, 1881, *G. R. Vasey s.n.* (lectotype: US; isotype: US, designated by Wipff & Hatch, Syst. Bot. 19(4): 625. 1994).

Distribution: U.S.A., Mexico (Chih., Coah., Dgo., Gto., Jal., N.L., S.L.P., Son., Tamps., Ver., Zac.). Native.

Reference: Guanajuato: Mpio. Xichú, restos de la mina Zarco, 19.IX.1981, *J. Sánchez C. 201* (MEXU).

25. ***Digitaria sanguinalis*** (L.) Scoop., Fl. Carniol. (ed. 2) 1: 52. 1771. *Panicum sanguinale* L., Sp. Pl. 1: 57. 1753. Type: cultivated (LINN-80.31).

Distribution: U.S.A., Mexico (Ags., B.C. Sur., Chih., Jal., Mich., N.L., Qro., S.L.P., Son., Tamps., Zac.), C. Amer., S. Amer., Car., O. W. Introduced, weed.

Reference: Michoacán: Tuxpan de Michoacán, 1.IX.1981, *A. Díaz, A. Vargas & A. Méndez 273* (MEXU).

26. ***Digitaria sellowii*** (Müll. Hal.) Henrard, Blumea 1: 99. 1934. *Trichachne sellowii* Müll. Hal., Bot. Zeitung (Berlin) 19(43): 315. 1861. Type: Brazil: Brasilia, no date, *Sellow s.n.* (holotype: B).

Distribution: Mexico (Chis., Hgo., N.L., Oax., Pue., Qro., S.L.P., Tamps., Ver., Yuc.), C. Amer., S. Amer., Car. Native.

Reference: Veracruz: about 1 mi N of Omealco, 15.XII.1972, *J. R. Reeder & C. G. Reeder 6020* (MO).

27. ***Digitaria setigera*** Roth, in Roem. & Schult. Syst. Veg. 2: 474. 1817. Type: India, no date, *B. Heyne s.n.* (holotype: B; isotypes: B, K).

Distribution: U.S.A., Mexico (Camp., Chis., Oax., Ver.), C. Amer., S. Amer., Car., O. W. Introduced, pasture.

Reference: Chiapas: ejido Las Golondrinas lower slopes of Cerro Ovando, along road between Golondrinas and Los Cacaos, 22.VIII.1996, *T. B. Croat 78528* (MO).

28. ***Digitaria ternata*** (A. Rich.) Stapf, Fl. Cap. 7: 376-377. 1898. *Cynodon ternatus* A. Rich., Tent. Fl. Abyss. 2: 405. 1851. Type: Ethiopia: Tigray, prope Adoua, no

date, no collector (lectotype: P; isolectotypes: B, K, L, US, WAG, designated by Hernard, Monogr. *Digitaria* 738, 1950).

Distribution: Mexico (Ags., D. F., Dgo., Gto., Hgo., Jal., Mex., Mich., Mor., Oax., Pue., Qro., Zac.), S. Amer., O. W., Introduced, weed.

Reference: Michoacán: 5 km al S of La Piedad, 6.XII.1980, *A. A. Beetle*, *G. Hardin & R. Guzmán M. 6321* (MEXU).

29. ***Digitaria texana*** Hitchc., Proc. Biol. Soc. Wash. 41: 162. 1928. Type: United States of America: Texas, Sarita, 27.VI.1910, *A.S. Hitchcock 5479* (holotype: US).

Distribution: U.S.A., Mexico (Ver.). Native.

Reference: Veracruz: Veracruz, 31.VIII.1910, *A. S. Hitchcock 6554* (US).

30. ***Digitaria velutina*** (Forssk.) P. Beauv., Ess. Agrostogr. 51, 173. 1812. *Phalaris velutina* Forssk., Fl. Aegypt.-Arab. 17. 1775. Type: Yemen, no date, *Forsskal 115* (holotype: C).

Distribution: Mexico (D.F., Mor., Oax., Pue.), C. Amer. O. W. Introduced, weed.

Reference: Distrito Federal: Campus of Universidad Nacional Autónoma de México, 1.XII.2011, *J. G. Sánchez-Ken s.n.* (MEXU).

31. ***Digitaria violascens*** Link, Hort. Berol. 1: 229. 1827. Type: Brazil; Brasilia, no date, *Anon. s.n.* (holotype: B; isotype; BAA fragm. ex B).

Distribution: U.S.A., Mexico (Chis., Ver.), C. Amer., S. Amer., Car. Native.

Reference: Veracruz: carretera Xalapa-Coatepec por Briones, vivero anexo a Asuntos Ecológicos, frente al Jardín Botánico, 24.VI.1997, *M. J. Lizama 697* (MEXU).

## ACKNOWLEDGMENTS

Many thanks to M. B. Mendoza G. for the scanning electron microscope (SEM) images.

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Recibido en septiembre de 2011.

Aceptado en julio de 2012.