

III. — A REVISION OF THE GENUS ZINNIA.

ZINNIA, L. (Dedicated to *Professor Johann Gottfried Zinn*, of Göttingen, born 1727, died 1759). — Heads radiate: disk-flowers hermaphrodite, fertile; ray-flowers pistillate, fertile, with suborbicular oval or oblong sessile persistent white, yellow, red, or purple ligules. Involucre ovate-cylindric or campanulate, the scales 3 – many-seriate, broad, closely imbricated, obtuse or rounded, often more or less colored and slightly inflated or subsquarrose just beneath the summit. Disk conical to columnar: chaff scarious, more or less carinate, enveloping the flowers, often erose at the mostly obtusish apex. Corollas of the disk-flowers tubular with narrow scarcely ampliate throat and 5-toothed limb. Anthers appendaged at the apex, entire at the base. Style-branches obtuse, scarcely or not at all appendaged. Achenes laterally compressed, glabrous or ciliate on the edges, 2-toothed at the summit and frequently 1-awned from the inner angle or rarely 2-awned; the achenes of the rays triquetrous, 3-toothed, with or without 1 to 3 short or long awns. — Gen. ed. 6, no. 974; Gray, Pl. Wright. i. 105; Benth. & Hook. f. Gen. ii. 357; Hoffm. in Engl. & Prantl, Nat. Pflanzenf. iv. Ab. 5, 225. *Crassina*, Scep. in Diss. and *Lejica*, Hill, Exot. Bot. t. 29, *fide* Endl. *Sanvitaliopsis*, Schz. Bip. acc. to Benth. & Hook. f., l. c. — Annuals, perennial herbs, or suffrutescent plants with opposite mostly entire leaves and showy terminal pedunculate or subsessile heads. About a dozen species known in nature, and three or four others somewhat doubtfully distinguished in horticulture, beside obviously artificial varieties and hybrids. The range of the genus is from the S. United States to Chili and Brazil, but it attains its greatest specific diversity in Mexico.

§ 1. Low caespitose perennials, shrubby at the base and many-stemmed: stems (or perhaps better subsimple branches) erect, crowded, or fastigiate: root stout, ligneous: leaves strictly linear to acerose, often fascicled and rigidulous, mostly rather pale. — §§ *Diplothrix* & *Heterogyne*, Gray, l. c.

* Ligules showy, much exceeding the achenes, white or pale yellow.

† Leaves 1-nerved.

1. *Z. acerosa*, GRAY. Leaves acerose, obscurely 1-nerved, much crowded, rather sharp-pointed but scarcely pungent, 6 to 8 or 10 lines long. — Pl. Wright. i. 106. *Diplothrix acerosa*, DC. Prodr. v. 611. — Hills of W. Texas, near Pecos, Wright, no. 324, Thurber, no. 125; Mexico, San Luis Potosi, Berlandier, no. 1343, Parry & Palmer, no. 440½; Coahuila, Palmer, nos. 577, 578.

2. *Z. pumila*, Gray. Very similar to the preceding: leaves linear, flat, mostly less than half inch long, prominently 1-nerved. — Pl. Fendl. 81, Pl. Wright. i. 105, & ii. 86. — Hills, W. Texas, *Wright*, nos. 323, 1215, to Arizona, Camp Grant, *Palmer*, no. 122, near Tucson, *Greene*, no. 1106, Camp Lowell, *Pringle*, *Lemmon*, nos. 91, 92, near Sta. Catalina, *Lemmon*, no. 3033, Lowell Mts., *W. F. Parish*; Mexico, on high plains near San Juan de la Vequeria and at "Castaniola" (= Castanuela?), *Gregg*, no. 279; on llanos of Sonora, *Schott*; east of Guadalupe Cañon, *E. K. Smith*; near Carneros Pass, Coahuila, *Pringle*, no. 2390 (distrib. as *Z. acerosa*); San Luis Potosi, *Schaffner*, no. 336, and *Parry & Palmer*, nos. 439, 440. The technical distinctions between this and the preceding are unsatisfactory at best, although the specimens are for the most part pretty readily distinguished upon the foliar differences.

+ + Leaves 3-nerved.

3. *Z. juniperifolia*, Gray. Leaves somewhat longer than in the related species, the larger ones inch or more in length, usually whitish beneath: rays oblong, mostly 2 or even 3 times as long as broad, of deep orange color. — Pl. Wright. i. 105. *Diplothrix juniperifolia*, DC. Prodr. v. 612. — North Mexico, mountains near San Juan de Vanegas, *Berlandier*, 1359; without locality, *Gregg*, no. 68; Santillo, *Parry*, no. 40, and near same locality, *Palmer*, no. 576; and on limestone hills, Carneros Pass, *Pringle*, no. 2404.

4. *Z. grandiflora*, Nutt. Leaves less than an inch in length: rays pale or sulphur yellow, very broad, suborbicular in outline. — Nutt. in Torr. & Gray, Fl. ii. 298; Torr. in Emory, Report Recon. Calif. t. 4. — Colorado, on bluffs near Pueblo, *Greene*, to W. Texas, *Wright*, nos. 322, 1213, *Pope*, Ft. Davis, *Girard*; New Mexico, *Fendler*, no. 400, near Santa Fé, *Wislizenus*, no. 415; Arizona, near Ft. Whipple, *Coues & Palmer*, no. 2821, Ft. Apache, *Palmer*, no. 583, Mustang Mts., *Pringle*, Huerfano, *Parry*, no. 106, Upper Canadian River, *Emory*; Sonora, *Thurber*, no. 312, *Smith*; San Cedro, *Lloyd*, no. 401.

* * Ligules almost obsolete, shorter or scarcely longer than the achenes.

5. *Z. anomala*, Gray. Scabrous-pubescent: leaves 9 lines to inch in length, line to line and a half in breadth: heads 3 to 5 lines in diameter, appearing discoid or with evident but short yellow rays: disk-flowers apparently orange-red; the limb velvety-margined. — Pl. Wright. i. 106. — Prairies of W. Texas, *Wright*, nos. 325, 1216; near Saltillo, Coahuila, Mexico, *Palmer*, no. 581. First coll. (acc. to Gray, l. c.) by *Berlandier* in Northern Mexico.

§ 2. Erect or procumbent herbs, sometimes a little woody at the base; stems and branches loosely spreading; leaves linear, lance-linear, or elliptic-oblong: rays rather short, suborbicular or quadrate to oblong, 2 to 6 lines in length, white or sulphur yellow.

* Achenes with interrupted callous margins and somewhat tufted ciliation: slender erect annual with small heads and very pale or bright white rays.

6. *Z. bicolor*, Hemsl. Becoming a foot or so in height: leaves linear to lance-oblong, an inch to inch and half long, 1 to 4 lines broad, obtuse. — Biol. Cent.-Am. Bot. ii. 153, as to syn., but not as to specimens cited, except that of *Mendez*. *Z. maritima*, Gray, Proc. Am. Acad. xxii. 423, in part. *Mendezia bicolor*, DC. Prodr. v. 533; Deless. Icon. iv. t. 29. — West of Guanajuato, *Mendez*; San Luis Potosi, *Schaffner*, no. 337; Jalisco, at Tequila, *Palmer*, no. 355, and on slopes of cañons near Guadalajara, *Pringle*, no. 2313. The last two distributed as *Z. maritima*, from which this erect white-rayed plant of the inland is amply distinct.

* * Achenes evenly margined and regularly ciliated; rays yellow or orange.

7. *Z. Greggii*. Slender pubescent herb, becoming scabrous, erect or decumbent merely at the base: leaves linear or nearly so, 1-3-nerved, sessile: heads slender-peduncled, terminating the spreading nearly naked branches, these bearing mostly only a single pair of linear leaves: rays varying from very short-oblong to half inch in length: disk-flowers orange; ray-flowers pale yellow; ray-achenes about a line in length: disk-achenes bearing a single slender awn. — *Z. bicolor*, Hemsl. l. c. as to plants of *Coulter* and of *Seemann*, but not as to syn. *Z. maritima*, Gray, Proc. Am. Acad. xxii. 423, as to narrow-leaved form, not HBK. — Mexico, without locality, *Gregg*, 1848-1849, no. 1082; also *Baites*; W. Mexico, *Seemann*; none of these specimens show the base perfectly, but a plant apparently identical, collected by *F. H. Lamb* on plains at Zopelote, Tepic, 9 February, 1895, no. 555, has a thickish perennial root.

8. *Z. littoralis*. Procumbent spreading herb, probably of biennial or perennial duration: stems leafy, branched, striate, puberulent: leaves elliptic-oblong or elliptic-lanceolate, obtuse or obtusish at both ends, 3 (or obscurely 5)-nerved and reticulated, green on both sides, 4 to 10 lines long, a third to half as broad: heads scarcely peduncled, borne at the ends of leafy branches: rays orbicular or nearly so, pale yellow, striate and greenish toward the ends beneath: disk-flowers bright orange-colored; chaff oblong, very obtuse or truncate: achenes with a very narrow cartilaginous margin, ciliated: pappus of a single awn with or without a shorter second one: achenes of the ray-flowers about $1\frac{1}{2}$ lines long, tuberculate. — Collected at Mazatlan by *Th. Coulter*, and redis-

covered on dry hills of the coast at the same point by *W. G. Wright*, January, 1889, no. 1201 (distributed as *Z. maritima*?); also by *F. H. Lamb* on dry rocky cliffs at same place, 26 December, 1894, no. 325 (distributed as *Z. maritima*). In the presence of good material of all three species we cannot doubt the complete distinctness of this species from the preceding and from the following.

§ 3. Herbs with ovate or elliptic-oblong leaves: heads strongly bicolorous; disk dark purple-brown, nearly black; rays oblong, bright yellow.

9. *Z. maritima*, HBK. Prostrate, much branched from the base: stems spreading: leaves elliptic or elliptic-oblong, obtuse at the apex, rather abruptly contracted to short but distinct pubescent petioles: heads 8 to 10 lines in diameter (incl. rays), terminal, mostly borne on long naked peduncles: chaff narrowed above although obtusish at the dark-colored point; achenes of the disk-flowers strongly callous-margined: rays oblong, golden yellow; ray-achenes $1\frac{1}{2}$ to 2 lines long. — Nov. Gen. & Spec. iv. 251, not Gray, l. c. — Acapulco, *Humboldt & Bonpland*; rediscovered at the same point by *Palmer*, February, 1895, no. 523. From its peduncled heads, oblong rays, callous-margined achenes, etc., we cannot doubt that Dr. Palmer's plant represents the real *Z. maritima* which came from the same locality so long ago. Yet Palmer's plant has leaves considerably larger than those described by Kunth.

10. *Z. Palmeri*, Gray. Erect branched annual, a foot or so in height: leaves ovate, or lanceolate from an ovate cordate or subcordate closely sessile base, acute or acuminate at the apex. — Proc. Am. Acad. xxii. 423. — Jalisco, at Tequila, *Palmer*, no. 386, *Pringle*, no. 4557; also at Manzanillo, *Palmer*, no. 893, and Colima, *Palmer*, no. 893 a.

§ 4. Erect perennials with spreading branches and narrow linear or oblong leaves: rays oblong, 4 to 12 lines in length, deep orange-colored as well as the disk-flowers.

11. *Z. linearis*, Benth. Much branched, 8 inches to a foot or two in height: heads many and very showy, of intense orange color (persisting even in old dried specimens): leaves linear or nearly so. — Pl. Hartw. 17. — Aguas Calientes, *Hartweg*, no. 117; San Luis Potosi, near Morales, *Schaffner*, no. 210, and in same state by *Parry & Palmer*, no. 441; Jalisco, on the Rio Blanco, *Palmer*, no. 54, and on hills near Guadalajara, *Pringle*, no. 1778.

Var. *latifolia*, Rose. Leaves somewhat broader, oblong. — Contrib. U. S. Nat. Herb. i. 102. — Alamos, *Palmer*, no. 352.

§ 5. Distinctly annual herb with showy flowers: disk and rays concolorous, yellow, red, or purple, or if discolorous the disk-flowers yellow or greenish and the rays red or purple: leaves ovate, lanceolate, or elliptic.

* Leaves sessile or nearly so, entire.

+ Achenes of the disk-flowers short and broad, obovate, 2 to $2\frac{1}{2}$ lines in length: stems hirsute with spreading hairs.

12. *Z. angustifolia*, HBK. Branching, $1\frac{1}{2}$ to 2 feet high: leaves lance-linear from a sessile ovate base: disk very convex, orange-yellow from the abundant acute exserted chaff (orange-yellow minutely tipped with purple at the very summit); disk-flowers at first orange and becoming darker with age: rays paler yellow. — Nov. Gen. & Spec. iv. 251; DC. Prodr. v. 536. — Originally collected in the neighborhood of Guanajuato by *Humboldt & Bonpland*, and described as having leaves "scarcely 2 lines broad." Our only authentic specimen of this species is one of *Mendez* sent by De Candolle to Dr. Gray and mentioned in the Prodr. as of this species. From other details of the description we cannot doubt that De Candolle was right in referring this plant to Kunth's species, although in it and in all the following specimens attributed to this species the leaves are considerably broader than originally described, varying from 3 to 8 lines in breadth. Evidently identical with *Mendez*' plant are specimens collected at Morelia, *Ghiesbreght*; no. 369 (?*Z. Ghiesbreghtii*, Verlot, Rev. Hort. 1862, 368; Vilmorin, Fl. Pl. Terre, 971, = *Z. Mexicana*, Hort. *fide* Vilmorin, l. c.), and near La Barca, Jalisco, *Pringle*, no. 3866; also cultivated plants from the Harvard Botanic Garden, dated 1861 and 1865. From this species, notwithstanding its still broader leaves, we cannot confidently separate the horticultural *Z. Haageana*, Regel, Gartenfl. x. 355, *ex char.*

13. *Z. elegans*, Jacq. Erect: stems less branched: leaves broader, ovate or elliptic, closely sessile and clasping, inch or so in breadth: disk-flowers yellow or orange, scarcely or not at all exceeded by the purplish tipped chaff; rays numerous, purple or lilac. — Coll. & Icon. Pl. Rar. iii. t. 589; Sims, Bot. Mag. t. 527. — South Mexico, Zitacuaro, *Hartweg*; mountains of Tixtla near Cuernavaca, *Berlandier*, no. 975; also without locality, *Ghiesbreght*, no. 306. Extensively cultivated in various countries.

+ + Achenes longer, narrower, oblong, 3 or 4 lines in length.

++ Hirsute with spreading hairs: rays rather broad, patulous, yellow as well as the disk.

14. *Z. pauciflora*, L. Erect roughish-pubescent annual, somewhat corymbosely branched above: peduncles at maturity enlarged upwards and fistulous: the yellow heads about an inch in diameter. — Spec. ed. 3, 1269; Lam. Ill. t. 685, f. 1; DC. Prodr. v. 535. *Z. lutea*, Gärtn. Frucht. ii. 459, t. 172. — Chiapas, Mexico, *Nelson*, no. 3074; Andes of Peru, *Mathews*, no. 456, and Bolivia, *Mandon*, no. 38; also St. Thomas, W. I., *Eggers*, no. 400. Introduced in W. Africa at Cape Verd.

++ ++ Pubescence of the stem much finer, appressed or very rarely spreading: rays red or purple, mostly narrow and suberect or scarcely spreading.

15. *Z. multiflora*, L. l. c. Erect annual with habit of the preceding, or subsimple: leaves ovate and acute or ovate-oblong and obtusish: peduncles (frequently short or none) often thickened upwards. — L. f. Dec. Ups. 23, t. 12; Curtis, Bot. Mag. t. 149. *Z. tenuiflora*, Jacq. Icon. Pl. Rar. iii. 590. *Z. leptopoda*, DC. Prodr. v. 535 (merely weak form or state with more slender peduncles). *Z. Floridana*, Raf. New Fl. iv. 70. *Z. intermedia*, Engelm. in Wislitz. Tour N. Mex. 107. *Z. Mendocino*, Philippi, Sert. Mendoc. Alt. 27, *fide* Baker, Fl. Bras. vi. pt. 3, 178. — The commonest and most widely distributed species extending from Florida, *Chapman*, *Curtiss*, no. 1417, to Texas, *Drummond*, no. 115, *Lindheimer*, no. 93 (but in these localities probably introduced; see Gray, Syn. Fl. i. pt. 2, 253); S. Arizona near Ft. Huachuca, *Lemon*, no. 2761; throughout Mexico, Sonora, *Wright*, no. 1213, *Thurber*, no. 920, *Schott*, *Hartman*, no. 104; Chihuahua, *Thurber*, no. 832, *Schott*, *Wislizenus*, *Palmer*, nos. 115, 156, *Pringle*, no. 316; Coahuila, *Palmer*, nos. 574, 575; San Luis Potosi, *Parry & Palmer*, no. 438; Orizaba, *Bourgeau*, no. 1682, *Botteri*, nos. 73, 516, 940, *Seaton*, no. 345; Cordova, *Bourgeau*, no. 1633; Guadalupe, *Bourgeau*, no. 500; Oaxaca, *Andrieux*, no. 314, *L. C. Smith*, nos. 813, 957; Chiapas, *Ghiesbreght*, no. 126; Guatemala, *Heyde & Lux* (no. 3808 of Donnell Smith's sets); Venezuela, *Fendler*, no. 1974; Bolivian Andes, *Mandon*, nos. 39, 40, and *Bang*, no. 207.

The yellow-rayed specimens, referred by various authors to this species, have in most instances, if not always, the pubescence of *Z. pauciflora*, to which it seems best to refer them.

* * Leaves elliptic, petiolate, dentate.

Z. Liebmannii, Benth. & Hook. f. Leaves squamulose-hirsute above, ferruginous beneath: peduncles quadrangular-sulcate: chaff

aculeate or uncinatæ. — Benth. & Hook. f. acc. to Klatt, Leopoldina, xxiii. 2, where first described. — Mexico on the Rio Taba, *Liebmann*, no. 552.

Doubtful species known chiefly or exclusively from cultivated specimens.

Z. RÆZLII, Hort. Gard. Chron. 1872, page 1392; Hook. f. & Jackson, Ind. Kew. ii. 1251, is a mere horticultural name for a yellow-flowered annual species said to come from Mexico, but never properly described.

Z. VERTICILLATA, Andrews, Bot. Rep. iii. t. 189, is apparently only a robust cultivated form of *Z. multiflora*, with verticillate leaves, and double series of rays: said also to come from S. Mexico.

Z. HYBRIDA, Römer & Usteri, Mag. Bot. St. 1 (1787), 49; Curtis, Bot. Mag. t. 2123 (*Z. grandiflora*, Hort. *fide* DC. Prodr. v. 536, not Nutt.), is an annual with deep red rays, greenish disk, and chaff not fringed at the apex: apparently only a form of *Z. multiflora*, with rays becoming broad and somewhat double by cultivation.

Z. AMBIGUA, Salm-Dyck, and *Z. DISCOLOR*, Hort., are names only, and wholly obscure.

IV. — REVISION OF THE MEXICAN AND CENTRAL AMERICAN SPECIES OF THE GENUS CALEA.

CALEA, L., R. Br. (Name of obscure origin. The derivation from *καλός*, beautiful, is unsatisfactory, and at best very doubtful.) — Heads mostly small or of medium size, radiate or discoid. Involucre ovoid, cylindrical, or campanulate; its scales pluriseriate, imbricated, usually very unequal, the outer gradually shorter, all scarious or the outer (rarely all) herbaceous or herbaceous-tipped. Receptacle small, convex, or flattish, paleaceous: chaff scarious, concave, rigid or thin and hyaline. Ray-flowers when present fertile; ligules yellow, white, or roseate, entire or denticulate at the apex. Disk-flowers fertile, yellow or white; the limb of the corolla regular, deeply 5-cleft. Anthers appendaged at the apex and shortly sagittate-lobed at the base. Style-branches subtruncate or with a very short appendage. Achenes slender, subterete or more or less distinctly 4-5-angled, usually pubescent: pappus of 4 to 20 subequal scales; these mostly fringed or ciliolate, rarely wanting, when numerous narrow and acuminate or when fewer usually short and blunt. — About 85 species of shrubs and perennial herbs (rarely climbers), extending from Mexico to Tropical S. America. Leaves opposite, simple, mostly ovate, oblong, or lanceolate, sessile or petiolate, mostly



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