

REVISION OF THE GENUS TITHONIA.

By S. F. BLAKE.

INTRODUCTION.

The genus *Tithonia*, originally described in 1789 in Jussieu's *Genera*¹ without citation of species, was adopted by J. F. Gmelin² two years later, and the single known species was given the binomial *T. uniflora*, a name which has been universally displaced by the later *Tithonia tagetiflora*, published by Desfontaines in 1802 with a full description and plate. The same plant, grown by Philip Miller in his Chelsea garden from seed sent presumably from Veracruz by William Houstoun, had been described in the eighth edition of the *Gardeners' Dictionary* in 1768 as *Tagetes rotundifolia*, and as this is the earliest binomial given the species it must now be known as *Tithonia rotundifolia*. It is a showy annual with large, orange or golden-yellow heads, much like the common sunflower in appearance except for the yellow disk, and seems worthy the attention of horticulturists.

As here recognized, the genus *Tithonia* includes ten species, native from northern Mexico to Panama. One species, *T. rotundifolia*, occurs also in the Greater and Lesser Antilles, and in Venezuela (where certainly introduced), and another, *T. diversifolia*, has become a weed in Ceylon and Burma and at Singapore. As the relationships of the genus to *Helianthus* and *Viguiera* have already been considered in some detail by the writer in another publication,³ only brief notice of them is necessary here. The typical pappus-bearing members of the genus are separated from *Helianthus* by their persistent pappus of awns and squamellae, and from *Viguiera* chiefly by their fistulose peduncles and by certain details of involucre. The four species in which the achene is always glabrous and the pappus wanting, together with *T. brachypappa*, in which glabrous epappose achenes occur in the same head with pubescent pappiferous ones, are to be distinguished from the species of *Viguiera* in which the pappus is likewise absent chiefly by their fistulose peduncles.

Tithonia, being originally based on a species with pappiferous achenes, has by Bentham and Gray been restricted to such species, the plants of similar habit but with epappose achenes being referred to *Gymnolomia*. Schultz Bipontinus, describing *Tithonia calva* in

¹ Desf.; Juss. Gen. Pl. 189. 1789.

² Syst. Nat. 1259. 1791.

³ Contr. Gray Herb. n. ser. 54: 8-10, 19, 21. 1918.

the Botany of the Herald, founded on it the subgenus *Mirasolia*, characterized by its glabrous epappose achenes. In Bentham and Hooker's *Genera Plantarum* *Mirasolia* was raised to generic rank, and included Schultz's species and one earlier described by Bentham as *Tithonia scaberrima*. Schultz's name *Perymeniopsis*, published only in synonymy by Klatt, was, if Klatt's disposition may be trusted, based on the latter species. *Tithonia* was taken by O. Hoffmann in the *Pflanzenfamilien* to include both pappose and epappose species, and the propriety of this treatment has been shown by the writer in the introduction to his Revision of *Viguiera* cited above.

The name *Tithonia*, from Tithon, consort of Aurora, was given by Desfontaines in allusion to the orange rays of his species. Otto Kuntze, rejecting *Tithonia* because of the use by Linnaeus in 1735 of the name *Tithona* for the genus later named by him *Rivina*, proposed *Urbanisol* as a substitute, a name which may be relegated to synonymy under both the American and the International Codes of Nomenclature.

SYSTEMATIC TREATMENT.

TITHONIA Desf.

Tithonia Desf. (Juss. Gen. Pl. 189. 1789, hyponym); Gmel. Syst. Nat. 1259. 1791.

Tithonia subgenus *Mirasolia* Schultz Bip.; Seem. Bot. Voy. Herald 305. 1856-57.

Mirasolia Schultz Bip.; Benth. & Hook. Gen. Pl. 2: 367. 1873.

Urbanisol Kuntze, Rev. Gen. Pl. 1: 370. 1891.

Herbaceous or shrubby; leaves alternate or sometimes opposite below, linear-lanceolate to ovate, triplinerved; heads medium or large, heterogamous, yellow, the rays neutral, 1-seriate, the disk flowers numerous, fertile; involucre hemispheric or broadly campanulate, 2 to 5-seriate, graduated or subequal, the phyllaries lanceolate to oblong or oval, indurate, ribbed, and vittate below, with herbaceous or membranaceous-chartaceous, rounded to acute tips; receptacle convex, the pales rigid, striate, usually aristate-acuminate, concave and embracing the achenes, persistent; ray corollas 8 to 20, oblong to oval, emarginate or tridenticulate; disk corollas with slender tube, longer cylindric or funnellform throat, and 5-toothed limb; anthers cordate-sagittate at base, with ovate appendages; style branches slender, recurved, dorsally hispid above, with lanceolate or linear-lanceolate, acuminate, hispid sterile appendages; achenes oblong, strongly thickened or subquadrangular, pubescent or glabrous; pappus of one or two paleaceous awns and 4 to 12 free or united squamellae, or of more or less united squamellae only, or entirely wanting.

Type species, *Tithonia uniflora* Gmel., which is *T. rotundifolia* (Mill.) Blake.

KEY TO SPECIES.

Phyllaries 2 or 3-seriate, subequal or the outer longer, all with long loose acute herbaceous tips, or the inner rarely with mucronulate or obtuse membranaceous-chartaceous tips, but then shorter than the outer.

Leaves ovate, long-petioled; involucre 1.3 to 3 cm. high; pappus present.

Involucre and apex of peduncles densely hispid-pilose with long hairs; pale long-aristate; leaves not lobed.....1. *T. tubaeformis*.

Involucre and apex of peduncles pilosulous or rarely short-pilose, in age often glabrate; pales acuminate to short-aristate; leaves often 3-lobed.

2. *T. rotundifolia*.

Leaves linear-lanceolate to narrowly lance-ovate, sessile by a cordate-auriculate base; involucre 7.5 to 9 mm. high; pappus none.....6. *T. auriculata*.

Phyllaries 3 to 5-seriate, graduated, at least the inner with rounded or rarely acute, broadened, more or less membranaceous-chartaceous or rarely subherbaceous tips.

Petiole bases strongly auriculate-decurrent.....3. *T. brachypappa*.

Petiole bases sometimes auriculate but never decurrent.

Pappus present.

Leaves unlobed.

Plant annual; stem sparsely hispid-pilose.....4. *T. thurberi*.

Plant shrubby; stem densely and canescently pilose-tomentose.

9. *T. fruticosa*.

Leaves 3 to 5-lobed, or the upper sometimes entire.

Leaves densely and usually canescently pilosulous beneath.

10. *T. diversifolia*.

Leaves green beneath, merely sparsely puberulous or nearly glabrous except on the veins.....10a. *T. diversifolia glabriuscula*.

Pappus none.

Innermost phyllaries acute or rarely obtuse at apex.

Leaves lance-ovate to ovate, distinctly petioled.

Stem densely silky-villous with long spreading hairs; disk 2.5 to 3 cm. thick.....5. *T. calva*.

Stem hispid-pilose or pilose with short hairs; disk 1.2 to 2.2 cm. thick.

5a. *T. calva lancifolia*.

Leaves linear-lanceolate to lance-ovate, sessile, cordate-auriculate at base.....6. *T. auriculata*.

Innermost phyllaries broadly rounded at apex.

Heads medium-sized, the disk 1.1 to 2 cm. thick; stem hispidulous and sparsely hispid-pilose.....7. *T. pittieri*.

Heads large, the disk usually 2 to 3.5 cm. thick; stem usually densely hispid-pilose.....8. *T. scaberrima*.

1. *Tithonia tubaeformis* (Jacq.) Cass. Dict. Sci. Nat. 35: 278. 1825.

Helianthus tubaeformis Jacq. Pl. Hort. Schönbr. 3: 65. pl. 375. 1798.

Tithonia helianthoides Weinm.; Steud. Nom. Bot. ed. 2. 2: 689. 1841, as synonym.

Urbanisol tubiformis Kuntze, Rev. Gen. Pl. 1: 371. 1891.

Tithonia tubaeformis var. *bourgaeana* Pampanini, Bull. Soc. Bot. Ital. 1908: 134. 1908.

Erect branching annual, 1 to 2 meters high; stem densely and rather harshly hispid-pilose with spreading hairs with several-celled subglandular base, in age subglabrate below; leaves alternate, the blades 7 to 18 cm. long, 3.8 to 14.8 cm. wide (excluding the margined apex of the petiole), ovate to deltoid-ovate, not lobed, acuminate, cuneately narrowed from a truncate or subcordate base into the petiole, crenate-serrate or dentate, 3-nerved, deep green above, harshly hispid-pilose with slightly tuberculate-based hairs, beneath paler, densely gland-dotted, canescent or subcanescent with dense incurved hairs, in age often green, subglabrate, and harsh, the uppermost much smaller and lanceolate; petioles hispid-pilose, subglabrate, scarcely margined below, 1.5 to 10 cm. long; peduncles usually strongly clavate above, densely and canescently hispid-pilose near the head, 30 cm. long or less; heads 4 to 9 cm. wide; disk in anthesis 1.2 to 1.8 cm. high, 1.5 to 3.3 cm. wide, in fruit 1.5 to 2.5 cm. high; involucre 2 or 3-seriate, 1.5 to 3 cm. high, densely and canescently pilose or hispid-pilose with long spreading hairs, the phyllaries lanceolate or oblong-lanceolate (1.5 to 4, rarely 5.5 mm. wide), acute or acuminate, subequal or obgraduated, with indurate ribbed base and longer, slightly broader, loose, herbaceous tip; rays 12 to 14, golden-yellow or orange, elliptic, 3.3 cm. long or less; disk corollas yellow, slenderly tubular, hispidulous chiefly on the swollen base of the throat, subglabrous

above except on teeth, 6 to 7 mm. long, the very short tube only 0.5 mm. long; pales finely tuberculate-hispidulous above, long-aristate; achenes strongly thickened, pilose, 4.5 to 5.5 mm. long; awns 2, lanceolate, acute or aristate-acuminate, unequal, 1 to 3.5 mm. long; squamellae about 12 to 14, more or less united, lacerate-fimbriate, 0.3 to 1.2 mm. long.

TYPE LOCALITY: Mexico.

ILLUSTRATIONS: Jacq. Pl. Hort. Schönbr. 3: pl. 375. 1798; Lindl. Bot. Reg. 18: pl. 1519. 1832.

SPECIMENS EXAMINED:

CHIHUAHUA: Valley near Chihuahua, 1886, *Pringle* 768 (N).

DURANGO: Santiago Papasquiario, 1896, *Palmer* 420 (N). Tepehuanes, 1906, *Palmer* 277 (N). Durango, 1896, *Palmer* 690 (N), 691 (N). Rincón, 1895, *C. & E. Seler* 1145 (N).

SAN LUIS POTOSÍ: Without definite locality, altitude 1,830 to 2,440 meters, 1878, *Parry & Palmer* 456 (N), 459 (N); in 1880, *Schaffner* (K).

TEPIC: In 1892, *Palmer* 1851 (N).

JALISCO: Río Blanco, 1886, *Palmer* 900 (N).

AGUASCALIENTES: Aguascalientes, 1903, *Rose & Painter* 7755 (N).

VERACRUZ: Orizaba, *Botteri* 507 (N); in 1865, *Bourgeau* 3244 (K). Zacuapan, 1916, *Purpus* 7558 (N). Mirador, 1838, *Linden* 1174 (K).

COLIMA: Manzanillo, 1890, *Palmer* 1076 (N). Without definite locality, 1891, *Palmer* 1220 (N).

MEXICO (STATE): Tacubaya, 1865-66, *Bourgeau* 152 (K, N). Near Guadalupe, 1903, *Rose & Painter* 7273 (N). Valley of Mexico, December 20, 1865, *Bourgeau* 1566 (type collection of *T. tubaeformis* var. *bourgaeana*; K).

PUEBLA: Teocalli de Cholula, 1908, *Arsène* (N). Rancho Posadas, near Puebla, 1909, *Nicolas* (N).

MORELOS: Valley, Jojutla, altitude 915 meters, 1901, *Pringle* 9306 (N).

OAXACA: Sierra de San Felipe, altitude 2,135 to 2,440 meters, 1894, *C. L. Smith* 617 (N). Mountain ridge on west side, valley of Cuicatlán, altitude 1,980 to 2,400 meters, 1894, *Nelson* 1899 (N). Maize fields, Cordillera of Oaxaca, 1840, *Galeotti* 2003 (K).

GUATEMALA: Chupadero, altitude 1,525 meters, 1892, *Heyde & Lux* 4204 (N). Pacaya, Department of Amatitlán, altitude 1,765 meters, 1890, *J. D. Smith* 2390 (N). Santa Rosa, Baja Verapaz, 1904, *Cook* 233 (N). Huehuetenango, 1914, *Tejada* 329 (N). Dueñas, 1861, *Salvin & Godman* (K). Without definite locality, 1865, *Bernoulli* 162, 217 (K).

This species is closely related to the next, but is generally easily distinguished by the long dense pubescence of the involucre and peduncles, the long-aristate pales, and the always unlobed leaves. In Oaxaca, according to Galeotti, it is known as "camalote." It is known in Mexico also as "acaute" and "acahuale."

2. *Tithonia rotundifolia* (Mill.) Blake, Contr. Gray Herb. n. ser. 52: 41. 1917.

Tagetes rotundifolia Mill. Gard. Dict. ed. 8. *Tagetes* no. 4. 1768.

Tithonia uniflora Gmel. Syst. Nat. 1259. 1791.

Tithonia tagetiflora Desf. Ann. Mus. Hist. Nat. 1: 49. pl. 4. 1802.

Helianthus speciosus Hook. in Curtis's Bot. Mag. 61: pl. 3295. 1834.

Leighia ? speciosa DC. Prodr. 5: 583. 1836.

Tithonia aristata Oerst. Naturhist. For. Kjöbenhavn Vid. Medd. 1852: 114. 1852.

Tithonia heterophylla Griseb. Bonplandia 6: 9. 1858.

Tithonia speciosa Hook.; Griseb. Cat. Pl. Cub. 155. 1866.

Tithonia macrophylla S. Wats. Proc. Amer. Acad. 26: 140. 1891.

Urbanisol tagetifolius Kuntze, Rev. Gen. Pl. 1: 370. 1891.

Urbanisol tagetifolius α *normalis* Kuntze, Rev. Gen. Pl. 1: 370. 1891.

Urbanisol tagetifolius β *speciosus* Kuntze, Rev. Gen. Pl. 1: 370. 1891.

Urbanisol aristatus Kuntze, Rev. Gen. Pl. 1: 371. 1891.

Urbanisol heterophyllus Kuntze, Rev. Gen. Pl. 1: 371. 1891.

Tithonia vilmoriniana Pampanini, Bull. Soc. Bot. Ital. 1908: 133. 1908.

Stoutish erect branched annual, up to 2 meters high; stem pale or purplish, striatulate, the younger parts densely pilosulous or canescent with rather short soft spreading hairs with slightly enlarged bases, in age subglabrate; leaves alternate, the blades 7 to 27 cm. long (excluding the cuneate decurrent base), 4 to 19.5 cm. wide, ovate to deltoid-ovate, three-lobed near the middle with subcaudate lobes or entire, acuminate, abruptly cuneate-decurrent into the petiole from a rounded or slightly cordate base, serrate with depressed-deltoid teeth, thin, 3-nerved, hispid-pilose on both sides along the veins with slightly harsh hairs and rather densely tuberculate-hispidulous between them, gland-dotted and slightly paler beneath; petioles scarcely margined below, spreading-pilose, 2 to 14 cm. long; peduncles striatulate, pubescent like the stem but in age glabrate except just below the heads, usually fistulose above, naked or with a few leafy bracts, 30 cm. long or less; heads 4 to 8 cm. wide; disk in anthesis 1.5 to 2 cm. high, 2 to 3 cm. thick, in fruit 2 to 3.5 cm. thick; involucre 2-seriate, subequal or obgraduated, 1.3 to 2.8 cm. high, the outer phyllaries ovate to ovate-oblong or sometimes lanceolate, acute or acuminate, finely subcanescent-pilosulous, in age sometimes subglabrate, indurate, pale, and multistriatulate about to the middle, the herbaceous apex reflexed or loose, the inner similar but usually much shorter, and with shorter, less herbaceous apex; rays 9 to 13, golden-yellow or orange, 2 to 2.5 cm. long; disk corollas yellow, slenderly tubular, puberulous especially at base of throat and on the teeth, 9 mm. long, the throat strongly dilated at maturity, the tube 1 to 1.5 mm. long; pales stiff, lanceolate, cuspidate-acuminate, striatulate, hispidulous above, the outer and sometimes the inner becoming purplish above, 1.2 to 1.8 cm. long; achenes subquadrangular, often striate, blackish or mottled, appressed-pilose or ascending-pilose, 6 to 7 mm. long; awns 2, easily deciduous, minutely strigillose, unequal, 4 to 6.2 mm. long; squamellae firm, united nearly or quite to apex, irregularly dentate, spinulose at apex, 2 to 2.2 mm. long.

TYPE LOCALITY: Veracruz.

ILLUSTRATIONS: Lam. Tabl. Encycl. 3: pl. 708. 1798; Ann. Mus. Hist. Nat. 1: pl. 4. 1802; Lindl. Bot. Reg. 7: pl. 591. 1822; Curtis's Bot. Mag. 61: pl. 3295. 1834.

SPECIMENS EXAMINED:

COAHUILA: Vicinity of Saltillo, 1898, *Palmer* 558 (N).

TEPIC: Cuesta de San Luisito, Sierra Madre, altitude 1,370 meters, 1905, *Goldsmith* 168 (G).

JALISCO: Barranca of Tequila, 1893, *Pringle* 4601 (G, N). Barranca near Guadalajara, September 25, 1889, *Pringle* 2798 (type collection of *T. macrophylla*; G, N). Near Guadalajara, 1903, *Rose & Painter* 7405 (N). On road between Bolaños and Guadalajara, 1897, *Rose* 3053 (G, N).

VERACRUZ: *Houston* (type of *Tagetes rotundifolia*; B).

COLIMA: Colima, 1891, *Palmer* 1250 (N).

GUERRERO: Plain of Iguala, altitude 730 meters, 1900, *Pringle* 9058 (G, N). Acapulco, *Sinclair* (K); in 1894-95, *Palmer* 631 (N).

YUCATÁN: *Gaumer* 899 (N).

GUATEMALA: Mazatenango, altitude 330 meters, 1905, *Kellerman* 5139 (N). In cultivated field, Gualán, altitude 125 meters, 1905, *Deam* 333 (N). Escuintla, altitude 335 meters, 1890, *J. D. Smith* 2380 (N), 2385 (N). San Sebastián, altitude 305 meters, 1891, *Shannon* (*J. D. Smith*, no. 596; N).

SALVADOR: Vicinity of Izalco, altitude 400 to 800 meters, 1907, *Pittier* 1976 (N). San Salvador, 1905, *Velasco* (*J. D. Smith*, no. 8869; N). Without definite locality, *Renson* 19 (N).

NICARAGUA: Granada, 1870, *Lévy* 279 (K). Realejo, *Sinclair* (K).

COSTA RICA: Nicoya, 1899, *Tonduz* 13614 (N). Ojo de Agua, *Hoffmann* 349 (G).
San José, 1851, *Oersted* 107 (K).

PANAMA: Between Aguadulce and Río Chico, Coclé, altitude 20 meters, 1911,
Pittier 5009 (N). Taboga Island, 1912, *Celestino* 41 (N).

CUBA: Without definite locality, *Drummond* (K). Vicinity of Vento, Havana,
1904, *Wilson* 1325 (N).

SANTO DOMINGO: Without definite locality, 1871, *Wright, Parry & Brummel*
267 (N).

PORTO RICO: Near Coamo, 1885, *Sintenis* 3179 (N). Coamo Springs, 1899, *Cook*
& *Collins* 707 (N); in 1901, *Underwood & Griggs* 509 (N).

MONTSERRAT: Roadside near Grove, 1907, *Shafer* 129 (N).

GUADELOUPE: Rather rare, Désirade, 1892 and 1894, *Duss* 2806 (N).

MARTINIQUE: Scarce, Rivière-Salée, 1903, *Duss* 4682 (G, N).

ST. VINCENT: Introduced and sparingly naturalized, *H. H. & W. G. Smith*
1222 (K).

VENEZUELA: Waste places (introduced), Agua Salud, Caracas, 1917, *Pittier*
7435 (N).

CULTIVATED: Garden of Montpellier, *Delile* (K). Jardin des Plantes, Paris,
October 19, 1839, *J. Gay* (K). Kew Gardens (type of *Helianthus speciosus*;
K). Government House Grounds, Trinidad, 1907, *Broadway* 2880 (K).

This species, whose natural range is the widest of any member of the genus, may be separated from *T. tubaeformis*, its only near relative, by the merely canescent or pilosulous involucre and peduncles, the cuspidate-acuminate, not aristate pales, and the often three-lobed leaves. The types of *T. aristata*, *T. heterophylla*, and *T. vilmoriniana* have not been examined, but from description all clearly belong to *T. rotundifolia*. The type of *T. aristata* was collected by Oersted on Mount Aguacate, Costa Rica, and that of *T. heterophylla* by Duchassaing on Taboga Island, Panama. *T. vilmoriniana* was described from specimens grown in the Botanic Garden of Florence from seed received from Vilmorin-Andrieux, said to have been collected at "Jacona, Mexico." Miller's type was grown at Chelsea Garden from seed sent from Veracruz by William Houstoun about 1730; Desfontaines's from seed sent from the same locality by Thiéry in 1778. The species is well worthy of reintroduction into cultivation. Like its close relative *T. tubaeformis*, it is known in Mexico as "acaute."

Some of the second-growth heads of Donnell Smith's no. 2385 show a curious condition of the disk flowers. The apparently infertile ovaries are linear, 9 mm. long, and the awns are replaced by linear-spatulate, very unequal, flat, 1 to 3-nerved, pilose, upwardly subherbaceous appendages 0.8 to 7.5 mm. long, the longer more or less denticulate above; the squamellae are absent. The style branches are 5.3 to 6 mm. long, including the lance-subulate attenuate appendage, which is 1.3 mm. long, and the anther appendages are lance-ovate, acuminate, 1.5 mm. long. The older heads in these specimens are normal.

3. *Tithonia brachypappa* Robinson, Proc. Amer. Acad. 27: 174. 1892.

Stem herbaceous, slender, striatulate, 2 to 3.3 meters high, sparsely hispid-pilose or hispidulous with spreading, slightly tuberculate-based hairs, subglabrate; leaves alternate, the blades 3 to 6.7 cm. long, 1.6 to 4.7 cm. wide, ovate or triangular-ovate, unlobed or deeply three-lobed with attenuate lobes (the lateral ones sometimes again lobed at base on outer side), cuneate or rounded-cuneate at base, dentate-serrate, hispidulous and rather densely gland-dotted on both sides, with stouter glandular-tuberculate-based hairs along the veins beneath, deep green above, slightly paler beneath; petioles hispid-pilose or hispidulous with tuberculate-based hairs, 1 to 5 cm. long, narrowly or rather broadly margined, at base dilated into serrulate or entire auricles decurrent on stem for 4.8 cm. or less; peduncles striate, fistulose, rather densely hispid-pilose or hispidulous, gland-dotted, 22 cm. long or less; heads 3.5 to 5 cm. wide; disk 1.4 to 1.7

cm. high, 2 to 2.4 cm. thick; involucre 3-seriate, strongly graduated, 12 to 16 mm. high, the phyllaries obovate to cuneate-obovate, bluntly rounded or barely acutish, tuberculate-hispidulous chiefly on the exposed portions and gland-dotted, sometimes sparsely hispid, strongly indurate, pale, and vittate to middle, with broader herbaceous apex, the inmost submembranaceous-herbaceous above and 6 to 8 mm. wide; rays apparently about 8, yellow, oblong-oval, 2 cm. long, 6 mm. wide; disk corollas glandular-hispidulous below, 6 mm. long (tube 0.6 to 0.8 mm.); pales subglabrous, abruptly cuspidate-acuminate, with a tooth on each side below the cusp, 8 to 10 mm. long; achenes subquadrangular, blackish or mottled, glabrous or sparsely appressed, pilose, 5 to 6 mm. long; pappus none, or in achenes of the same head of about 6 basally united dentate squamellae 0.6 to 0.8 mm. long.

TYPE LOCALITY: Las Palmas, San Luis Potosí.

SPECIMENS EXAMINED:

SAN LUIS POTOSÍ: Las Palmas, October 15, 1890, *Pringle* 3675 (type; G).
Limestone hills, Las Palmas, 1894, *Pringle* 6143 (K, N).

Tithonia brachypappa is easily recognized by its auriculate-decurrent petiole bases. This species is remarkable in showing in the same heads calvous glabrous achenes and others which are pubescent, and have a pappus of several basally united squamellae without awns.

4. *Tithonia thurberi* A. Gray, Proc. Amer. Acad. 8: 655. 1873.

Tithonia palmeri Rose, Contr. U. S. Nat. Herb. 1: 104. 1891.

Urbanisol thurberi Kuntze, Rev. Gen. Pl. 1: 371. 1891.

Rather slender branching annual, 0.5 to 2 meters high; stem whitish, striate, sparsely or rather densely tuberculate-hispid-pilose with spreading hairs and finely hispidulous, glabrate; leaves opposite below, alternate above, the blades 5 to 28 cm. long, 3 to 27 cm. wide, ovate to broadly triangular-ovate, unlobed, short-pointed to acuminate, cuneately decurrent into the petiole from a cuneate to broadly cordate base, thin, triplinerved, crenate-dentate with low, broadly triangular, mucronulate teeth, above deep green, tuberculate-hispidulous with incurved hairs and especially along the veins tuberculate-hispid-pilose, beneath paler green, rather sparsely granular or hispidulous and along the veins hispid-pilose; petioles margined to the slightly ampliate, not decurrent base, 2 to 10 cm. long, the margin irregularly toothed in the larger leaves; peduncles striate, fistulose, spreading-hispid-pilose and finely hispidulous, 30 cm. long or less; heads 2.5 cm. wide or more; disk 1.5 to 2 cm. high, 1 to 2.4 cm. thick; involucre 3-seriate, graduated or obgraduated, 1 to 2 cm. high, the two outer series of phyllaries lanceolate, oblong-ovate, or obovate, acute to acuminate, tuberculate-hispid-pilose and hispidulous, with indurate vittate base, usually contracted above, and shorter to longer, ovate to triangular-ovate, loose, herbaceous tip, the innermost broadest, with short, triangular-ovate, submembranaceous-herbaceous, merely granular or strigillose, obtuse or mucronulate tip; rays about 8, orange-yellow, oval-oblong, about 7 to 10 mm. long; disk corollas glandular-pilosulous especially below, hispidulous on teeth, 6.2 mm. long (tube 1 mm.); pales nearly smooth, striate-ribbed, with a tooth on each side below the abruptly cuspidate-acuminate tip, 1 to 1.5 cm. long; achenes oblong-obovate, thickened, appressed-pilose, 8.5 mm. long; awn solitary (on outer angle of achene), linear-subulate, 5.8 to 8 mm. long; squamellae about 4 to 8, lanceolate, very unequal (the central shortest), 4 mm. long or less.

TYPE LOCALITY: Magdalena, Sonora.

SPECIMENS EXAMINED:

SONORA: Magdalena, October, 1851, *Thurber* 910 (type collection; G, K). Along watercourses and in canyons, Alamos, September, 1890, *Palmer* 721 (type collection of *T. palmeri*; G, K, N).

This species may be recognized by its usually sparsely hispid-pilose stem, characteristic involucre, and pappose achenes.

5. *Tithonia calva* Schultz Bip.; Seem. Bot. Voy. Herald 305. 1856-57.

Mirasolia calva Benth. & Hook.; Hemsl. Biol. Centr. Amer. Bot. 2: 168. 1881.

Gymnolomia calva A. Gray; Hook. & Jacks. Ind. Kew. 1²: 1076. 1893.

Stout branching leafy herb; stem in youth densely silky-villous with wide-spreading hairs 5 to 6 mm. long, tardily subglabrate; leaves alternate, the blades 8 to 14 cm. long, 3.3 to 8.5 cm. wide, ovate or triangular-ovate, acute to acuminate, cuneately or abruptly narrowed into the cuneately margined petiole, somewhat irregularly serrate or serrulate with bluntish teeth, triplinerved, above densely and harshly glandular-tuberculate-hispidulous and rather sparsely hispid-pilose, in age subglabrate and lepidote, beneath slightly paler green, densely and finely glandular-hispidulous and especially along veins hispid-pilose with tuberculate-based spreading hairs; petioles 4 to 6 cm. long, margined nearly or quite to base, there usually widened into auricles; peduncles fistulose, spreading-hispid-pilose and finely glandular-hispidulous, 8 cm. long or less; heads 5.5 to 6 cm. wide; disk 1.7 cm. high, 2.5 to 3 cm. wide; involucre 3-seriate, slightly graduated, 13 mm. high, the two outer series of phyllaries lance-ovate (the outermost narrower), acuminate, tuberculate-hispid-pilose and finely tubercular, with ribbed and vittate, subindurate base and equal or shorter, subherbaceous, appressed apex, the innermost series oval, much broader (5 mm.), acute or obtusish, with appressed, subherbaceous, densely tuberculate or tuberculate-hispidulous and sparsely hispid-pilose apex; rays about 13, golden-yellow, oblong, emarginate, finely glandular-hispidulous on back, 18 mm. long, 7 mm. wide; disk corollas hispidulous chiefly at base of tube and on teeth, 6 mm. long (tube 0.6 mm.); pales firm, minutely hispidulous at the abruptly pointed but not cuspidate apex, 9 to 10 mm. long; achenes thickened, glabrous, blackish, 3 to 3.5 mm. long; pappus none.

TYPE LOCALITY: Sierra Madre of northern Mexico. Type collected by Seemann (no. 2045). Sketch in United States National Herbarium.

SPECIMEN EXAMINED:

DURANGO: Without definite locality, August 15, 1897, *Rose* 2293 (N).

Tithonia calva is easily distinguished from the other epappose species by its usually acutish inner phyllaries and densely silky-villous stem.

5a. *Tithonia calva lancifolia* (Robins. & Greenm.) Blake.

Gymnolomia calva var. *lancifolia* Robins. & Greenm. Proc. Bost. Soc. Nat. Hist. 29: 103. 1899.

Stem rather sparsely tuberculate-hispid-pilose with ascending hairs 1 to 2.5 mm. long; leaf blades 5 to 12 cm. long, 1.8 to 4.5 cm. wide, lance-ovate to lanceolate or rarely ovate, acuminate, sometimes subentire, usually cuneate into the margined, often auriculate-based petiole, pubescent like the stem but with more incurved hairs; petioles 1.5 to 4 cm. long; peduncles more slender than in the type form, 2.5 to 8.5 cm. long; heads 4.5 to 5 cm. wide; disk 9 to 12 mm. high, 12 to 22 mm. thick; involucre 9 to 12 mm. high, 3 to 4-seriate, often more sparsely pubescent than in the typical form, the outer phyllaries sometimes with loose tips; disk corollas 5 mm. long; achenes as in the typical form.

TYPE LOCALITY: Acaponeta, Tepic.

SPECIMENS EXAMINED:

TEPIC: Tepic, 1892, *Palmer* 1975 (N). Acaponeta, February, 1895, *Lamb* 539 (type collection; G, N).

Distinguished from the typical form of the species chiefly by its smaller leaves, sparsely hispid-pilose stem, and smaller heads.

6. *Tithonia auriculata* (T. S. Brandeg.) Blake, Contr. Gray Herb. n. ser. 54: 9. 1918.

Gymnolomia auriculata T. S. Brandeg. Zoe 5: 223. 1905.

Herbaceous many-stemmed perennial, 30 to 50 cm. high; stems simple or sparsely branched, pale fuscous, striatulate, densely hispid with tuberculate-based upcurved

hairs and finely hispidulous and gland-dotted; leaves opposite, at least below, usually alternate above, the blades 8.5 to 15.5 cm. long, 8 to 16 mm. wide, linear-lanceolate to narrowly lance-ovate, long-acuminate, at base slightly broadened and cordate-auriculate, obscurely and remotely denticulate, penninerved, rather sparsely hispid-pilose and hispidulous with incurved tuberculate-based hairs on both sides and gland-dotted, slightly paler below; petioles hispid-pilose, 2 mm. long, or obsolete; peduncles naked, slightly fistulose, striate, pubescent like the stem, 8 to 12 cm. long; heads 3.8 to 6 cm. wide; disk 1.2 cm. high, 1.8 to 2.1 cm. thick; involucre 3-seriate, 7.5 to 9 mm. high, the two outer series of phyllaries slightly graduated, lanceolate to oblong, acutish to acuminate, tuberculate-hispid-pilose, toward tip tuberculate-hispidulous, with indurate, ribbed, and vittate base and shorter loose herbaceous apex, the innermost shorter, oblong, indurate to the short deltoid acute mucronulate subherbaceous tip; rays about 15, oval-oblong, emarginate, gland-dotted and finely hispidulous dorsally, 1.4 to 2.4 cm. long, 4 to 6.5 mm. wide; disk corollas pilose or puberulous at base of throat, hispidulous on the teeth, 5 mm. long (tube 0.3 mm.); pales ribbed, abruptly short-pointed, tuberculate-hispidulous above, about 8 mm. long; achenes plump, obscurely quadrangular, blackish, glabrous, 3.5 mm. long; pappus none.

TYPE LOCALITY; Cerro Colorado, Cofradia, Sinaloa.

SPECIMENS EXAMINED:

SINALOA: Cerro Colorado, Cofradia, November 5, 1904, *Brandege* (type collection; G, N). Openings in woods, road to La Tigre, San Ignacio, 1918, *Salazar* 446 (N).

Tithonia auriculata is easily recognized by its narrowly linear-lanceolate or lance-ovate, sessile, auriculate-based leaves. It is perhaps most closely related to *T. calva lancifolia*.

7. *Tithonia pittieri* (Greenm.) Blake, *Contr. Gray Herb.* n. ser. 54: 9. 1918.

Gymnolomia pittieri Greenm. *Proc. Amer. Acad.* 39: 101. 1903.

Herbaceous, the base not seen; stem slender or stoutish, branched, striatulate, hispid-pilose with short incurved or ascending hairs with slightly enlarged bases and more or less finely hispidulous; leaves opposite below, alternate above, the blades of the middle and upper ones 7.3 to 11 cm. long (including the margined portion of the petiole), 1.5 to 2.3 cm. wide, lanceolate, acuminate, usually oblique or falcate, tapering or somewhat abruptly contracted into a cuneately margined petiole, crenate-serrulate (teeth 5 to 13 pairs, very depressed), above dark green, rather dense, hispidulous with tuberculate-based, more or less persistent hairs and gland-dotted, beneath paler or in youth griseous, rather densely incurved-pilose with short hairs scarcely enlarged at base, or hispidulous-pilosulous, gland-dotted, triplinerved and somewhat veiny; naked portion of petiole hispid-pilose and gland-dotted, 2 to 4 mm. long; peduncles fistulose, striate, 2.5 to 11 cm. long, pubescent like the stem; heads 3.5 to 5.5 cm. wide; disk 8 to 15 mm. high, 1.1 to 2 cm. thick; involucre 4-seriate, strongly graduated, 7 to 14 mm. high, the outermost phyllaries oblong or obovate-oval, 3 to 5 mm. long, obtuse or abruptly subacute, indurate and ribbed below with shorter or longer, subherbaceous, appressed or loose tip, rather densely appressed-hispid-pilose or hispidulous and ciliate or ciliolate; the next series indurate and ribbed to middle or above and sparsely tuberculate-hispidulous, with subherbaceous, densely tuberculate-hispidulous and gland-dotted, obtuse or rounded, more or less spreading tip; the inner obovate, 3 to 7 mm. wide, indurate and vittate to above the middle and there subglabrous, with submembranaceous, densely tuberculate, minutely ciliolate and somewhat gland-dotted, broadly rounded or obtuse tip; rays 12, yellow, narrowly oblong, emarginate or bidenticulate, 2.3 cm. long, 4 to 5 mm. wide; disk corollas yellow, in youth cylindraceous, with very obscure proper tube, hispidulous below and on teeth, 5 mm. long, in age developing a short glabrous tube 0.5 to 0.8 mm. long; receptacle convex, strongly tuberculate; pales firm, abruptly acute, usually with a lateral tooth on each side, ribbed, sparsely tuberculate above, in maturity

purplish, 7 to 8 mm. long; achenes thickened, blackish brown, glabrous, slightly striatulate and pustulose or smooth, 3.3 to 3.8 mm. long, the base inclosed by the conspicuous, whitish or at length brownish, scarious-chartaceous development (0.7 mm. long) of the short carpopod; pappus none.

TYPE LOCALITY: Along the Río Ceiba, Buenos Aires, Costa Rica. The species was based on *Pittier* 3136 (in part), from the Río Tiliri, San José; *Pittier* 3735, from the Río Ceiba at Buenos Aires; and *Pittier* 10631, from Ujarras de Buenos Aires, Costa Rica, the second of which is here selected as the type.

SPECIMENS EXAMINED:

GUATEMALA: Hills between Cajval and Cahabón, Alta Verapaz, altitude 400 meters, 1905, *Pittier* 226 (N). Vicinity of Secanquím, Alta Verapaz, altitude 550 meters, 1905, *Pittier* 201 (N).

COSTA RICA: Along the Río Ceiba, Buenos Aires, altitude 200 meters, February, 1891, *Pittier* 3735 (type; G).

Tithonia pittieri may be distinguished from *T. scaberrima* by its smaller heads and more sparsely pubescent stem and leaves.

8. *Tithonia scaberrima* Benth.; Oerst. Naturhist. For. Kjöbenhavn Vid. Medd. 1852: 91. 1852.

Tithonia platylepis Schultz Bip.; Benth. & Hook. Gen. Pl. 2: 368. 1873, nomen nudum.

Mirasolia scaberrima Benth. & Hook.; Hemsl. Biol. Centr. Amer. Bot. 2: 168. 1881.

Gymnolomia platylepis A. Gray, Proc. Amer. Acad. 19: 5. 1883.

Gymnolomia decurrens Klatt, Leopoldina 23: 90. 1889.

Perymeniopsis perfoliata Schultz Bip.; Klatt, Leopoldina 23: 90. 1889, as synonym.

Tithonia glaberrima Kuntze, Rev. Gen. Pl. 1: 371. 1891.

Gymnolomia scaberrima Greenm. Field Mus. Bot. 2: 268. 1907.

Stout branching herb, 1.3 to 5 meters high; stem usually densely pilose or hispid-pilose with spreading hairs and hispidulous, sometimes incurved-hispid; leaves opposite below, alternate above, the blades 8.5 to 17 cm. long (excluding the margined petiole), 2.5 to 9.8 cm. wide, ovate-lanceolate to broadly ovate, rarely lanceolate, acuminate, cuneately or abruptly contracted into the petiole, thickish, crenate-serrate, above scabrous with short incurved hairs with glandular-tuberculate bases, along the veins hispid-pilose, beneath pale or canescent, densely and softly pilosulous or pilose with more or less spreading hairs, triplinerved and rather veiny; petioles cuneately margined nearly to the base, not auriculate, 1 to 3.5 cm. long; heads few, 5 to 7 cm. wide, on fistulose, sparsely or densely hispid-pilose and hispidulous, naked or bracteate peduncles up to 12 cm. long; disk 1.8 to 2.5 cm. high, 1.3 to 3.5 cm. thick; involucre 4-seriate, strongly graduated, 1.2 to 1.8 cm. high, the phyllaries oval or obovate, broadly rounded at tip, the two outer series indurate-subherbaceous, with thinner tip, rather densely hispid-pilose with subtuberculate-based hairs and ciliate or ciliolate, the inner with indurate, more or less pubescent base and submembranaceous, ciliolate, otherwise subglabrous apex; rays yellow, 14 to 18, 2.5 to 3.5 cm. long; disk corollas yellow, puberulous below and on teeth, 5 to 7 mm. long (tube 0.5 to 1.1 mm. long); pales acute or acuminate, not cuspidate, hispidulous or tuberculate toward tip, 8 mm. long; achenes glabrous, slightly thickened, blackish brown, 3 to 4.3 mm. long; pappus none.

TYPE LOCALITY: Coniferous region, vicinity of Chinotega, Province of Segovia, Nicaragua, altitude 1,525 meters.

SPECIMENS EXAMINED:

VERACRUZ: Valley of Córdoba, 1866, *Bourgeau* 1851 (N). Cerro del Borrego, Orizaba, altitude 1,370 meters, 1895, *Pringle* 6087 (N). Hacienda Mirador, altitude 1,095 to 1,220 meters, 1894, *Nelson* 65 (N). Open forests, Zacuapan, 1907, *Purpus* 2183 (N). Rocky soil, Fortín, Zacuapan, 1907, *Purpus* 2852 (N).

OAXACA: Vicinity of Totontepec, altitude 1,675 to 2,135 meters, 1894, *Nelson* 772 (N).

CHIAPAS: Between San Sebastián and Pantepec, 1907, *Collins & Doyle* 211 (N).

GUATEMALA: Cobán, altitude 1,350 meters, 1908, *Türckheim* II. 2053 (N). Near Santa María, Department of Quezaltenango, altitude 1,500 to 1,800 meters, 1905, *Maxon & Hay* 3595 (N). Quezaltenango, altitude 1,980 meters, 1917, *Holway* 729 (G).

SALVADOR: Opaneca, Department of Ohuachapan, altitude 1,460 meters, 1907, *Pittier* 2007 (N).

HONDURAS: Between Llano de la Puerta and El Salto, Copán, altitude 900 meters, 1907, *Pittier* 1854 (N).

COSTA RICA: Along the Río Tiliri, 1892, *Tonduz* 7196 (N).

Tonduz 7196 is peculiar in having the leaves beneath green, merely hispidulous-puberulous, and rather densely gland-dotted, in this respect approaching *T. calva lancifolia*, but it is otherwise typical of *T. scaberrima* and possesses the characteristic involucre of the latter species. *T. scaberrima* is readily told by its densely pubescent stem and leaves, large heads, and large, broadly rounded phyllaries.

9. *Tithonia fruticosa* Canby & Rose, *Contr. U. S. Nat. Herb.* 1: 104. *pl.* 5. 1891

Stout shrub, 3 to 4 meters high, the woody stem becoming 10 cm. in diameter, glabrate and clothed with a grayish bark; younger branches densely and canescently pilose-tomentose with spreading hairs; leaves opposite below, alternate above, the blades 6.5 to 30 cm. long, 2.2 to 14 cm. wide, ovate or lanceolate, acuminate or attenuate and often falcate, cuneate into the margined petiole, crenate-serrate, triplinerved and veiny beneath, canescent-pilose on both sides but particularly beneath with rather soft incurved tuberculate-based hairs and gland-dotted; petioles 3 to 5 cm. long, margined but not auriculate; heads terminal and axillary, 7 to 9.5 cm. wide, on fistulose striate peduncles shorter than the leaves; disk 2 to 2.5 cm. high, 2.5 to 4.5 cm. thick; involucre 4-seriate, strongly graduated, 2 to 2.8 cm. high, the phyllaries broadly oval or obovate-oval (the median 8 to 12 mm. wide), broadly round-tipped or rarely obtuse, the outer densely canescent-pilosulous with tuberculate-based appressed hairs, the inmost less pubescent and greenish, all with obscurely indurate base and shorter submembranaceous tip, the inmost with submembranaceous-subherbaceous tip; rays about 14 to 20, yellow, narrowly elliptic, 2 to 3.5 cm. long; disk corollas hispidulous throughout, or only below and on the teeth, 8 to 9 mm. long (tube 1 mm.); pales ovate-lanceolate, stiff, abruptly pointed but not cuspidate, finely tuberculate-hispidulous and gland-dotted above or subglabrate, 12 to 14 mm. long; achenes appressed-pilose, 4 to 5 mm. long; squamellae connate into a laciniate-fimbriate paleaceous crown 1 to 1.5 mm. high, the awns obsolete or represented merely by teeth only twice as long as the crown.

TYPE LOCALITY: Alamos, Sonora.

ILLUSTRATION: *Contr. U. S. Nat. Herb.* 1: *pl.* 5. 1891.

SPECIMENS EXAMINED:

SONORA: Among bushes near a watercourse, Alamos, March or April, 1890, *Palmer* 303 (type collection; G, N). Huehuerachi, altitude 1,220 meters, 1890, *Hartman* 301 (G, N). High up on the Sierra de Alamos, 1910, *Rose, Standley & Russell* 13085 (N).

CHIHUAHUA: Near Batopilas, 1898, *Goldman* 232 (N).

DURANGO: San Ramón, 1906, *Palmer* 68 (G, N).

SINALOA: Arroyo de la Labor, San Ignacio, altitude 380 meters, 1918, *Montes & Salazar* 309 (N).

This very distinct species is quickly recognized by its shrubby habit, densely canescent-pubescent stem and leaves, and large rounded phyllaries.

10 *Tithonia diversifolia* (Hemsl.) A. Gray, Proc. Amer. Acad. 19: 5. 1883.*Mirasolia diversifolia* Hemsl. Biol. Centr. Amer. Bot. 2: 168. pl. 47. 1881.*Urbanisol tagetifolius* var. *diversifolius* Kuntze, Rev. Gen. Pl. 1: 370. 1891.*Urbanisol tagetifolius* var. *diversifolius* f. *grandiflorus* Kuntze, Rev. Gen. Pl. 1: 370. 1891.*Urbanisol tagetifolius* γ *flavus* Kuntze, Rev. Gen. Pl. 1: 371. 1891.*Tithonia speciosa* Klatt, Bull. Soc. Bot. Belg. 31¹: 203. 1891, excluding name-bringing synonym. Not *T. speciosa* Hook. 1866.*Tithonia triloba* Schultz Bip.; Klatt, Bull. Soc. Bot. Belg. 31¹: 203. 1891, as synonym.

Stout branching perennial, or perhaps shrubby, 3 to 9 meters high; stem striate, sparsely hispid-pilose to sordidly pilose-tomentose, in age usually glabrate; leaves alternate, the blades 7 to 20 cm. long, 4 to 18.5 cm. wide, ovate or deltoid-ovate, unlobed or usually 3 to 5-lobed, acuminate to attenuate, at base cuneate, rounded, or subtruncate, then cuneately narrowed into the petiole, crenate-serrate, triplicated, green but rather densely tuberculate-hispidulous with at length deciduous hairs above, beneath paler green or subcanescent, everywhere, but particularly along the veins, pilosulous or pilose with rather soft hairs and gland-dotted; petioles narrowly margined nearly to base, there biauriculate, 2 to 10 cm. long; heads 6 to 14 cm. wide, on fistulose, striate, sparsely hispid-pilose or subglabrous peduncles 27 cm. long or less; disk 1.5 to 2.3 cm. high, 1.5 to 4 cm. wide; involucre 4-seriate, strongly graduated, 2 cm. high or less, the phyllaries broadly oval, or the outer lance-ovate or oval-ovate, broadly round-tipped or the outer acutish or acute, sparsely appressed-hispid-pilose or subglabrous, the outermost indurate and vittate nearly throughout, with short subherbaceous apex and narrow scarious margin, the innermost with ampliate and elongate submembranaceous apex, all appressed or the inner somewhat loose at apex; rays 12 to 14, golden-yellow, elliptic, tridenticulate, 6 cm. long or less; disk corollas hispidulous below, 7.5 to 8 mm. long (tube 0.5 to 0.8 mm.); pales stiff, abruptly pointed, sparsely hispidulous above, 9 to 11.5 mm. long; achenes appressed-pilose, 4.5 to 5.6 mm. long; awns 2, unequal, 2.8 to 4 mm. long; squamellae 6 to 10, connate below, lacerate at apex, 1.5 to 2.5 mm. long.

TYPE LOCALITY: Valley of Orizaba, Veracruz. The species was based by Hemsley on *Bourgeau* 2319, from the Valley of Orizaba; *Bourgeau* 1562, from the Valley of Córdoba; and plants collected by *Fraser* and *Salvin* at Dueñas, Guatemala. Of these the first is here selected as type.

ILLUSTRATION: Hemsl. Biol. Centr. Amer. Bot. pl. 47.

SPECIMENS EXAMINED:

VERACRUZ: Orizaba, *Botteri* 483 (G). Valley of Orizaba, May 12, 1866, *Bourgeau* 2319 (type collection; G, K, N). Orizaba, altitude 1,220 meters, 1891, *Seaton* 462 (G, N). Valley of Córdoba, 1865, *Bourgeau* 1562 (G, K). Mirador, *Liebmann* 603 (sketch, G). Atoyac, 1882, *Kerber* 161 (N).

MICHOACÁN OR GUERRERO: El Ocote, Cerro Pedregoso, 1898, *Langlassé* 528 (G, N).

OAXACA: Sierra de Clavellinas, altitude 2,590 meters, 1894, *Pringle* 5806 (G).

YUCATÁN: Mérida, 1896, *Valdez* 93 (G). Without definite locality, *Gaumer* 944 (N).

GUATEMALA: Cubilquitz, altitude 350 meters, 1902, *Türckheim* 8235 (G, N). Bank of Cahabón River, between Cajval and Chimaste, altitude 200 meters, 1905, *Pittier* 223 (N). Cobán, 1907, *Türckheim* II. 1589 (N). Gualán, 1912, *Mrs. W. P. Cockerell* 50 (N). Guatemala City, 1890, *J. D. Smith* 2371 (G, N). Las Cruces, Department of Santa Rosa, altitude 1,830 meters, *Heyde & Luz* 6166 (G, N). Antigua, 1915, *Holway* 65 (G). San Antonio, 1916, *Holway* 526 (G). San Felipe, 1917, *Holway* 701 (G). Volcán Fuego, 1873, *Salvin & Godman* (K).

SALVADOR: San Salvador, 1905, *Velasco* (J. D. Smith, no. 8868) (G, N). Without definite locality, *Renson* 19 (N).

COSTA RICA: San Vicente, altitude 1,200 meters, 1888, *Cooper* (Pittier & Durand, no. 565; G, N). San José, 1889, *Pittier* 1442 (G); in 1893, *Tonduz* 7140 (G, N). San Francisco de Guadalupe, altitude 1,100 meters, 1895, *Tonduz* (J. D. Smith, no. 7066; G, N). Near Guadalupe, 1892, *Tonduz* 7186 (N).

JAMAICA: Introduced, Hope Grounds, altitude 210 meters, 1915, *Harris* 11877 (G).

CEYLON: *Trimen* (G, K).

BURMA: "A plant which is becoming a pest in Burma," 1912, *Lace* (K).

STRAITS SETTLEMENTS: Singapore, 1861, *T. Anderson* (K); in 1875, *Kuntze* 607A (K).

CULTIVATED: Mount Jackson, Fontabelle, Barbados, 1895, *Waby* 116 (K).

Government House Grounds, Trinidad, 1909, *Broadway* 3605 (K).

Tithonia diversifolia is easily distinguished from the other species of the genus by its large heads, broadly rounded phyllaries, and usually 3-lobed leaves. It is described on some collectors' labels as a shrub, but is more probably an herbaceous perennial. In spite of its widely different characters, it was treated by Otto Kuntze as a variety of *T. rotundifolia* (*Urbanisol tagetifolius* of Kuntze), with several forms of no real consequence.

The species has become somewhat widely spread as a weed in Ceylon and parts of farther India. *Trimen* has noted on a sheet in the Kew Herbarium: "After *Lantana*, the commonest weed in Ceylon. Originally escaped from Peradeniya, where it is called 'Verbesina.'" In his flora of Ceylon, he says:⁴ "*Tithonia diversifolia*, Gray, a native of Mexico and California, though only introduced as a garden plant so recently as 1851, is now one of the commonest and most conspicuous plants in the island, and is generally known as the 'Wild Sunflower.' It doubtless spread from Peradeniya, but is now completely established by roadsides and waste ground over the whole of the moist region up to 5,000 ft., and in places in the dry region also." In Jamaica, *Harris* speaks of it as "introduced but now widely spreading in gardens and as an escape in waste places." In Salvador, according to *Renson* and *Velasco*, it bears the vernacular names "jalacate" and "guasmará."

10a. *Tithonia diversifolia* glabriuscula Blake, subsp. nov.

Stem essentially glabrous; leaves less pubescent above, very sparsely puberulous beneath, especially along the veins, and gland-dotted.

Type in the United States National Herbarium, no. 256799, collected north of Tuxtepec, Oaxaca, Mexico, altitude 90 meters, April 9, 1894, by E. W. Nelson (no. 346).

OTHER SPECIMENS EXAMINED:

VERACRUZ: Tlacotalpam, 1894, *Nelson* 496 (N). Without definite locality, 1910, *Orcutt* 3427 (N).

OAXACA: About Santo Domingo, altitude 275 meters, 1895, *Nelson* 2666 (G, N). Tolosa, 1898, *Deam* (G, N).

Intermediates between this and the typical form are represented by *Langlassé* 528, *Gaumer* 944, and *Holway* 526 and 701.

EXCLUDED SPECIES.

TITHONIA ANGUSTIFOLIA Hook. & Arn. Bot. Beechey Voy. 435. 1841.

This is *Viguiera angustifolia* (Hook. & Arn.) Blake.⁵

TITHONIA ARGOPHYLLA D. C. Eaton; S. Wats. in King, Geol. Expl. 40th Par. 5: 423. 1871.

This is *Enceliopsis argophylla* (D. C. Eaton) A. Nels.

⁴ Hand-book Fl. Ceylon 3: 39. 1895.

⁵ Proc. Amer. Acad. 51: 518. 1916.

TITHONIA DECURRENS A. Gray, Mem. Amer. Acad. n. ser. 4: 85. 1849.

This is *Viguiera decurrens* A. Gray.⁶

TITHONIA EXCELSA DC. Prodr. 5: 585. 1836.

This is *Viguiera excelsa* (Willd.) Benth. & Hook.

TITHONIA GLUTINOSA Collie; Hook. & Arn. Bot. Beechey Voy. 33. 1830, as synonym.

This is *Flourensia thurifera* (Molina) DC.

TITHONIA HUMILIS Kuntze, Rev. Gen. Pl. 2: 552. 1891.

This is *Rivina humilis* L., of the family Phytolaccaceae.

"TITHONIA LACINIATA Raeusch. Nom. ed. 3: 251. 1797."

⁶ Proc. Amer. Acad. 19: 5. 1883.