

and dissolved in hydrochloric acid, and the analysis was conducted by the ordinary methods. Magnesia was not determined owing to lack of material. The optical study of the insoluble portion showed that the augite and titanite crystals had not been attacked, so no correction is needed for impurities introduced from this source. The results are as follows, an average of four out of many fairly accordant analyses of Vesuvian nephelite being given for comparison.

	A	B	C	Ba	
SiO <sub>2</sub> .....	40.27	43.34	42.93	0.722	0.722 2.26
Al <sub>2</sub> O <sub>3</sub> .....	31.05	33.45	33.84	0.320	0.320 1.00
Fe <sub>2</sub> O <sub>3</sub> .....	2.42	2.60	0.40	0.016	
MgO.....	—	—	0.15		
CaO.....	0.81	0.87	2.08	0.015	
Na <sub>2</sub> O.....	15.11	16.28	15.39	0.263	} 0.315 0.99
K <sub>2</sub> O.....	3.22	3.46	5.08	0.037	
H <sub>2</sub> O.....	—	—	0.18		
Insol.....	7.51	—	0.12		
	<u>100.39</u>	<u>99.99</u>	<u>100.17</u>		

A. Nephelite. Monte Ferru, Sardinia. H. S. Washington analyst.

B. Same, calculated free from insoluble.

C. Nephelite. Monte Somma. J. Morozewicz, analyst. Bull. Acad. Sci. Crac. 8: 979-983. 1907.

Ba. Molecular ratios of B.

BOTANY.—*The North American tribes and genera of Amaranthaceae.*<sup>1</sup> PAUL C. STANDLEY, National Museum.

The North American representatives of the family Amaranthaceae have received little attention from American botanists in either early or recent years. This may have resulted from the unattractive aspect of most of the plants composing the group, but more probably from the circumstance that their generic and specific characters are based chiefly upon very minute floral structures. Because of the small size and often complicated structure of their flowers the plants have, indeed, been considered a "difficult" group, when, as a matter of fact, they are remarkably easy of recognition, and of disposition, provided that generic limits are agreed upon. The species, as a rule, are sharply differentiated. Confusion as to generic limits

<sup>1</sup> Published by permission of the Secretary of the Smithsonian Institution.

has resulted largely from an attempt to recognize in certain tribes too large a number of genera, these based upon vegetative or inconstant characters.

The only monograph of the North American Amaranthaceae is that of Uline and Bray, which appeared about 20 years ago in the *Botanical Gazette*.<sup>2</sup> The conclusions reached by these authors need scarcely be modified now except for certain changes of names necessitated by modern systems of nomenclature. The species treated, however, included only a small part of those found in tropical North America. Moquin had in 1849<sup>3</sup> described all the North American Amaranthaceae then known, in his monograph of the whole family, but naturally many additional species have been discovered in the intervening 66 years, about 155 species being known in North America at the present time. Several of the tribes, particularly the Amarantheae, reach their highest development on this continent. The family being chiefly tropical, South America possesses a larger number of species than North America. Many species are to be found also in Africa and Australia, and a few in Europe and Asia.

The following arrangement of tribes and genera is proposed by the writer for use in a monograph of the family now in preparation for the North American Flora:

I. CELOSIEAE. Differentiated from all other tribes of the family by the presence of 2 or more ovules in the ovary, instead of a single ovule. Only one genus, *Celosia*, occurs in North America, being represented by 6 species.

II. AMARANTHEAE. Five genera are represented in North America: *Lagrezia*, *Chamissoa*, *Amaranthus*, *Aenida*, and *Acanthochiton*.

1. *Lagrezia* has not been reported previously from outside of Africa, nor has it always been referred to the Amarantheae. Moquin placed it in this tribe, but Dr. Schinz in his treatment of the family in Engler and Prantl's *Natürlichen Pflanzenfamilien* considered it a synonym of *Celosia*. There is no doubt that *Lagrezia* is closely related to that genus, but it seems to be quite distinct in having only a single ovule in the ovary. If the Celosieae and Amarantheae are to be maintained

<sup>2</sup> 19: 267-272. 1894; 20: 155-161, 337-344, 449-453. 1895; 21: 348-356 1896.

<sup>3</sup> In DC. Prodr. 13<sup>2</sup>: 231-424.

as separate tribes, *Lagrezia* must be therefore placed in the latter. In Dr. Schinz's key to the tribes there is no means of telling to which of them a plant with a 1-seeded utricle should be referred. In 1895 Dr. J. N. Rose described a new plant from Manzanillo, Mexico, which he called *Celosia ? monosperma*.<sup>4</sup> This should be referred to the genus here discussed, and may be known as **Lagrezia monosperma**. The few other species of the genus are natives of Madagascar and southern Africa.

2. *Chamissoa* is represented in tropical North America by two species, the widely distributed *Chamissoa altissima*, and *C. maximiliani*, known within our limits only from Costa Rica. *Chamissoa macrocarpa* H. B. K. has been reported frequently from the West Indies and Central America, but the specimens so determined are *C. altissima*.

3. *Amaranthus* seems to have its center of distribution in the southwestern United States and northern Mexico. A large number of species are found in the somewhat similar region of Argentina, a number that doubtless will be increased when that country is better explored botanically. About 40 species are known from North America. Most of these are common weeds of cultivated land, but several species are known only from the southwestern mesas and foothills.

Several segregates from *Amaranthus* have been proposed by different authors, notably *Mengea*, *Euxolus*, and *Scleropus*. With our present knowledge of the group it seems impossible to maintain any of these genera, for the characters depended upon to separate them will not hold when all the species of the genus are taken into consideration.

4. *Acnida* is a wholly North American genus. Five species are found in salt marches along the eastern and southern coasts of the United States, on the southwest coast of Mexico, and in the West Indies. Three others occur in the central and southwestern United States. The genus is very closely related to *Amaranthus*, differing only in the absence of a perianth in the pistillate flowers. *Acnida tuberculata* is so closely allied to *Amaranthus torreyi* that it is practically impossible to distinguish staminate plants of the two species, whose ranges largely overlap.

5. *Acanthochiton* consists of a single species, a native of the sand-hills of western Texas, New Mexico, Arizona, and northeastern Mexico. It is distinguished from *Acnida* only by a vegetative character—the large size and peculiar form of the bracts; but it has always been accepted as a valid genus.

<sup>4</sup> Contr. U. S. Nat. Herb. 1: 352.

III. CENTROSTACHYDEAE. Two genera of this tribe occur in North America, *Centrostachys* and *Cyathula*. The group has always been known as the Achyrantheae; but since the name Achyranthes must be applied to a genus of the Gomphreneae, as explained recently by the writer,<sup>5</sup> it is necessary to form a new tribal name, typified by the best known genus of the group.

The Centrostachydeae reach their highest development in Africa, the East Indies, and Australia. Two Old World species of *Centrostachys* have become established in tropical and subtropical North America. Two species of *Cyathula* are found in the same region, *C. prostrata*, a native of the Old World, being established in Jamaica and Panama; while *C. achyranthoides*, an American species, occurs in the Greater Antilles, where it may be adventive, and ranges from southern Mexico to Panama, Brazil, and Chile.

IV. BRAYULINEAE. This is a new tribe, here proposed for the genus *Brayulinea*, better known by the name *Guilleminea*, which, unfortunately, is a homonym. The genus is related to the Gomphreneae, with which it has usually been placed, but is distinguished by the perigynous androecium. Apparently Dr. Schinz at one time considered this segregation, for in his key to the tribes of the Amaranthaceae in Engler and Prantl's *Natürlichen Pflanzenfamilien*<sup>6</sup> he separates the tribe *Guillemineae*. When the text for this part of the family appeared, at a later date than the key, we find no mention of such a tribe, the genus *Guilleminea* being referred to the Gomphreneae.

In general appearance the species of *Brayulinea* are quite similar to those of *Gossypianthus*. One species is found in North America.

V. FROELICHIEAE. It seems desirable to place the genus *Froelichia* in a tribe separate from the Gomphreneae, to which it has always been referred. The group is characterized by the gamophyllous perianth which becomes indurated and variously appendaged in fruit, characters which are not found in any Gomphreneae.

The genus is an American one, seven species occurring in southern North America, with others in South America. Most of the species are closely interrelated and are separated with difficulty. It is still a matter of doubt how specific limits are to be determined with precision in the genus.

VI. GOMPHRENEAE. Half of the North American genera of the family fall into this tribe, which is, however, best represented in north-

<sup>5</sup> Journ. Wash. Acad. Sci. 5: 72-76. 1915.

<sup>6</sup> 3<sup>12</sup>: 97. 1893.

ern South America. Different authors have proposed very different divisions of genera for the group, but the characters used often have been vegetative or else they proved unreliable as additional species have been discovered. Martius, who was perhaps the most careful student of the group, proposed a large number of genera, based chiefly upon Brazilian species, but scarcely any of his genera are recognized today. The treatment here proposed follows closely that suggested by Otto Kuntze,<sup>7</sup> which was later adopted by Dr. Schinz, and very recently by Dr. Stuchlik.<sup>8</sup> It is based almost wholly upon flower structure, and chiefly upon the characters of the gynoecium and androecium. The North American genera are ten in number, as follows.

1. *Cladothrix* is closely related to both *Gossypianthus* and *Achyranthes* and is distinguished principally by the form of the inflorescence, the flowers being glomerate rather than spicate or capitate. Three species occur in the southwestern United States and in northern Mexico.

2. *Gossypianthus* is wholly North American, four species being known. One is confined to Cuba, a second is common to Hispaniola, the southwestern United States, and northeastern Mexico, while the other two are found in Texas and Oklahoma.

3. *Pfaffia* consists of a large number of South American species of diverse habit, some of them resembling the better known species of *Gomphrena*, while others are tall shrubs or vines. In Mexico and Central America there is a single species which closely resembles some of the species of *Iresine*. *Hebanthe* of Martius must be considered a synonym of *Pfaffia*, although not all the plants described under *Hebanthe* are true *Pfaffias*. One plant described by Hemsley as a *Hebanthe* is to be referred to an older species of *Iresine*. The proper place of two other Mexican species described by Hemsley is still uncertain. Dr. Watson in 1883 applied the name *Hebanthe palmeri*<sup>9</sup> to another Mexican plant which is not a *Pfaffia*, but should be known as ***Iresine palmeri***.

4. *Achyranthes* has been discussed by the writer very recently<sup>10</sup> and need not be treated further here.

5. *Woehleria* is one of the so-called "monotypic" genera. It is endemic in Cuba and is apparently very rare. In general appearance

<sup>7</sup> Rev. Gen. Pl. 2: 534-545. 1891.

<sup>8</sup> Repert. Sp. Nov. Fedde 12: 350-359. 1913.

<sup>9</sup> Proc. Amer. Acad. 18: 144.

<sup>10</sup> Journ. Wash. Acad. Sci. 5: 72-76. 1915.



the plant is similar to some species of *Achyranthes*, but the androecium consists of only a single stamen, and the stigma is bilobate rather than capitate.

6. *Gomphrena* is represented in North America by some fifteen species. Thirteen of these are low plants, with usually large, sessile, and globose heads, closely related to the cultivated globe amaranth, *Gomphrena globosa*. The other two are tall plants with narrow, long-pedunculate, cylindric heads, closely simulating certain forms of *Achyranthes*. A large number of species of *Gomphrena* have been described from South America, no less than 66 being reported from Brazil 40 years ago.

7. *Iresine* is one of the most interesting genera of the *Amaranthaceae*, chiefly because the plants are of an attractive rather than a "weedy" appearance. About 30 species are known within our limits. The segregates *Trommsdorffia* and *Rosea* were proposed by Martius, but it seems impracticable to maintain them as distinct genera.

8. *Dicraurus* is distinguished from all other genera of the *Gomphreneae* by the alternate leaves; otherwise it is too closely related to *Iresine*, and, indeed, it seems probable that ultimately it may be united with that genus. Two species are known, *D. leptocladus* and *D. alternifolius*. The first, a plant of western Texas and northeastern Mexico, has all its leaves alternate; but in the second, a native of Lower California, while most of the leaves are alternate, the lower ones frequently are opposite.

9. *Lithophila* was based by Swartz upon a plant which is common on the seashores of the West Indies. Some authors have referred the genus to *Iresine*, but it may be maintained because of the strongly compressed perianth and 2 rather than 5 stamens. Besides the type species, three others, of somewhat diverse habit, are known, all inhabitants of the Galapagos Islands: *Lithophila radicata* (*Alternanthera radicata* Hook. f., 1847), *L. rigida* (*Alternanthera rigida* Rob. & Greenm., 1895), and *L. subscaposa* (*Alternanthera subscaposa* Hook. f., 1847).

10. *Philoxerus* was proposed by Robert Brown in 1840. The plants of this group have usually been referred to *Iresine* and *Lithophila*. *Philoxerus* seems, however, a valid genus, distinguished from *Iresine* not only by habit but by the compressed perianth, and from *Lithophila* by the different structure of the androecium and by the stipitate flowers. Many species of the genus have been proposed, but how many of them are valid is an unsettled question. In North America only a single one is known.