

Project Systematics of Annonaceae  
Project leader: Dr. P.J.M. Maas

Recently a multidisciplinary investigation program on the systematics of Annonaceae was started at Utrecht with special emphasis on the Neotropics. This project will be carried out largely within the framework of the UNESCO-project Flora Neotropica. The first goal is to provide a modern classification of the family as a whole, the second is the publication of a series of monographs for Flora Neotropica. The project has been planned and started in close consultation with leading botanists on the Neotropical flora.

The Annonaceae are a family of pantropical distribution with between 2000 and 2500 species in ca. 130 genera as presently understood. In the Neotropics the family is represented by ca. 750 species and 35 genera. It is a family of trees, shrubs, and lianas. Its place is within the order of the Magnoliales and its supposedly closest relative is the family of the Myristicaceae. The Annonaceae, although generally considered primitive in many features, nevertheless offer a number of specialized features as well. This makes it a promising object using various kinds of comparative morphological, karyological, and anatomical data. Besides, many species are of medicinal or commercial value, such as various species of Annona and Rollinia, the fruits of which are commonly eaten in most countries of Central America and South America; the Soursop (Annona muricata) is widely cultivated throughout the tropics.

The Swedish botanist R.E. Fries, a lifelong student of Annonaceae, published many papers on the family during a period from about the beginning of this century up until the late fifties, mostly in *Acta Horti Berg.* and in *Ark. Bot.* He also published a generic revision in Engler & Prantl's "Die Natürlichen Pflanzenfamilien" ed. 2, vol. 17a II (1959). Although Fries added considerably to our knowledge of the family, the systematic

relationships within the family and especially the delimitation of genera and their mutual relationships remained problematical. As a result of many recent explorations particularly in Amazonian Brazil (e.g. by Prance et al.), Venezuela (e.g. by Steyermark et al.), and Central America (by various staff members of the Missouri Botanical Garden), the number of collections has increased considerably after R.E. Fries' death. Therefore, a new revision of the Neotropical representatives of this family is much needed.

#### Collaborators

The following botanists take part in the project. Unless otherwise stated, they are attached to the Institute of Systematic Botany, State University, Utrecht, the Netherlands.

Dr. P.J.M. Maas (project leader; taxonomy)

Prof. R. Hegnauer, Leiden (chemotaxonomy)

Prof. E. Hennipman (phylogenetics)

Drs. E.C.H. van Heusden (floral structure, worldwide)

Dr. J. Koek-Noorman (leaf anatomy)

Prof. R.P. Labadie, Utrecht (pharmacognosy)

Dr. A. Le Thomas, Paris, France (pollen morphology)

Dr. W. Morawetz, Wien, Austria (cytotaxonomy, leaf surfaces)

Prof. R. Parameswaran, Hamburg, FRG (bark anatomy)

Prof. F. Weberline, Ulm, FRG (inflorescence)

Ing. B.J.H. ter Welle (wood anatomy)

Drs. L.Y.Th. Westra (gross morphology)

Botanists with an interest in Annonaceae as a research object for all kinds of studies are kindly requested to participate in this project. It is our intention to publish an annual report on the progress of the work on Annonaceae, including requests for material. Facilities for visiting botanists are available to all who would like to undertake part of their studies at Utrecht.

Program: first stage. Introduction.

This was started in January, 1983. Preliminary study of the neotropical genera is presently carried out by several staff members: study of flowers by Drs. E.C.H. van Heusden, study of fruits and seeds by Dr. P.J.M. Maas, study of inflorescence structure by Drs. L.Y.Th. Westra, and study of leaf structure by Dr. J. Koek-Noorman. This study will result in a synoptical key to all neotropical genera (in the course of 1983) which will be distributed amongst those interested in the systematics of the family.

Karyological investigations in Annonaceae have been carried out at the "Botanisches Institut und Botanischer Garten der Universität Wien" during the last years. A collection of ca. 500 permanent slides has been built up.

Second stage. Generic revision.

Drs. F.C.H. van Heusden already has started with a character analysis of the flowers of Neotropical and Palaeotropical Annonaceae. This study is scheduled to have been completed within 3 years. It is intended that a similar study will be carried out for fruits and seeds. It has not been decided yet who will undertake this.

The wood and leaf anatomy will be studied as still another approach towards the generic subdivision of the family (to be published in 1984).

Third stage. Monographs and revisions.

Between September and October 1983, Dr. P.J.M. Maas intends to visit various herbaria in the U.S.A. (e.g. A, F, GH, MO, NY, US), whereas visits to various European herbaria are planned for 1984. The order in which the genera will be taken up has not been decided on yet: this will be done after Dr. Maas's return from the U.S.A.

Preliminary taxonomic studies conducted by our former staff member Drs. J.J. van Rooden and undergraduate students under his supervision

include the revision of Anaxagorea (ca. 20 species; completed), and the genera Stenanona, Desmopsis, Sapranthus, and Rollinia (in preparation).

The specific delimitation often seems to be correlated with ecological differences. Therefore the need for field observations, ecological studies, and population collections should be emphasized in order to get a more natural and realistic species concept than Fries had.

Material. General.

We will be glad to be informed about investigations in Neotropical Annonaceae conducted elsewhere.

We will appreciate to receive for identification duplicates of as many collections of Neotropical Annonaceae as possible. During the forthcoming 2 years many identifications necessarily will have a provisional character. Identifications down to species can be expected after 1985.

Living material.

We are trying to build up a large collection of living Annonaceae in the greenhouses of the Universities both at Utrecht and at Wien. Therefore we invite all collectors working in the Neotropics to send living seeds for cultivation to Utrecht (care of Mr. J. Tolsma) as well as to Wien (care of Dr. W. Morawetz).

Preserved material. Wood samples.

Since dried flowers and fruits of Annonaceae are often difficult to handle and to dissect, we would like to urge all collectors to gather material preserved in alcohol 70%, FAA, or any other good preservative. Those wishing to fixate material for karyological study may obtain a sheet with instructions from Dr. W. Morawetz, Wien, or from Dr. P.J.M. Maas.

Wood samples should be cut from mature wood and should include bark. A maximum size of 15 x 5 x 4 cm is sufficient (it is not necessary, therefore, to cut down large trees: a piece of the indicated size taken out of the trunk will suffice!). Apart from a dried sample, a smaller block of approx. 2 x 2 x 2 cm preserved in alcohol or FAA will be most welcome for sectioning purposes.

## SYNOPTICAL KEY TO THE NEOTROPICAL GENERA IN ANNONACEAE

(Numbers cited under more than one lead of a couplet are underlined. Numbers for which a given character is unknown are cited in brackets. For explanation of (genus) numbers used, see p. 11)

## FLOWER

1. Aestivation of calyx (\*)

- a. valvate (rarely apert): 1 - 2 - 3 - 4 - 5 - 6 - 12  
- 14 - (16) - 17 - 18 - 19 - 20 - 21 - 22 -  
23 - 24 - 25 - 26 - 27 - 28 - 29 - 30 - 31 -  
32 - 33 - 34 - 35 - 36

- b. imbricate: 2 - 7 - 8 - 9 - 10 - 11 - 13 - 15 - (16)  
- 37 - 38

(\*) Needs very careful observation.

2. Number of sepals

- a. = 2 : 15 - 16

- b. ≥ 4 : 15 - 38

- c. = 3 : 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 -  
12 - 13 - 14 - 15 - 17 - 18 - 19 - 20 - 21 -  
22 - 23 - 24 - 25 - 26 - 27 - 28 - 29 - 30 -  
31 - 32 - 33 - 34 - 35 - 36 - 37

3. Fusion of sepals

- a. free: 1 - 2 - 3 - 4 - (5) - 7 - 8 - 9 - (10) - 11 -  
(12) - 13 - 14 - 15 - (16) - 17 - 19 - 20 -  
21 - 25 - 26 - 27 - 28 - 29 - 30 - 34 - 36 -  
37 - 38

- b. connate (at least basally): 2 - 3 - 4 - (5) - 6 - 8  
- 9 - (10) - 11 - (12) - (16) - 17 - 18 - 21  
- 22 - 23 - 24 - 26 - 27 - 28 - 29 - 30 - 31  
- 32 - 33 - 34 - 35 - 36 - 37 - 38

4. Aestivation of corolla (\*)

- a. valvate (rarely apert): 3 - 18 - 19 - 20 - 21 - 22 -  
23 - 24 - 25 - 26 - 27 - 28 - 29 - 30 - 31 -  
32 - 33 - 34 - 36

- b. imbricate: 1 - 2 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 -  
12 - 13 - 14 - 15 - 16 - 17 - 27 - 34 - 35 -  
37 - 38

(\*) Needs very careful observation.

**5. Number of petals**

- a. < 6 : 11 - 16 - 27
- b. > 6 : 15 - 38
- c. = 6 : 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11  
 - 12 - 13 - 14 - 15 - 17 - 18 - 19 - 20 -  
 21 - 22 - 23 - 24 - 25 - 26 - 27 - 28 - 29  
 - 30 - 31 - 32 - 33 - 34 - 35 - 36 - 37

**6. Fusion of petals**

- a. connate (at least basally): 1 - 6 - 27 - 28 - 29 -  
 30 - 34 - 35
- b. free: 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 12  
 - 13 - 14 - 15 - 16 - 17 - 18 - 19 - 20 -  
 21 - 22 - 23 - 24 - 25 - 26 - 27 - 31 - 32  
 - 33 - 35 - 36 - 37 - 38

**7. Petals of the two whorls**

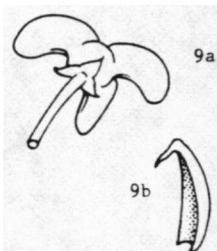
- a. unequal in size: 4 - 5 - 14 - 18 - 20 - 24 - 25 -  
26 - 27 - 28 - 36
- b. (sub)equal in size: 1 - 2 - 3 - 4 - 6 - 7 - 8 - 9  
 - 10 - 11 - 12 - 13 - 14 - 15 - 16 - 17 -  
18 - 19 - 21 - 22 - 23 - 24 - 26 - 27 - 28  
 - 29 - 30 - 31 - 32 - 33 - 34 - 35 - 36 -  
 37 - 38

**8. Length of (largest) petals**

- a. < 1 cm: 3 - 9 - 11 - (12) - 13 - 14 - 15 - 16 -  
 (18) - 20 - 21 - 22 - 23 - 24 - 25 - 26 -  
27 - 28 - 29 - 30 - 31 - 32 - 33 - 37 - 38
- b. > 1 cm: 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 10 - (12)  
 - 13 - 14 - 15 - 17 - (18) - 19 - 20 - 21 -  
24 - 25 - 26 - 27 - 28 - 29 - 30 - 34 - 35  
 - 36 - 37 - 38

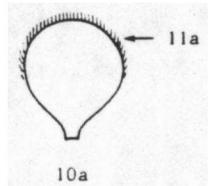
**9. Appendages of petals**

- a. dorsal, wing-like, spur-like, or semiglobose: (12)  
 - 29 - 30
- b. apical: (12) - 23
- c. absent: 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 -  
 11 - (12) - 13 - 14 - 15 - 16 - 17 - 18 -  
 19 - 20 - 21 - 22 - 24 - 25 - 26 - 27 - 28  
 - 31 - 32 - 33 - 34 - 35 - 36 - 37 - 38



**10. Base of petals**

- a. unguiculate: 7 - (12) - 22 - 36
- b. not unguiculate: 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 -
  - 9 - 10 - 11 - (12) - 13 - 14 - 15 - 16 -
  - 17 - 18 - 19 - 20 - 21 - 22 - 23 - 24 - 25
  - 26 - 27 - 28 - 29 - 30 - 31 - 32 - 33 -
  - 34 - 35 - 36 - 37 - 38

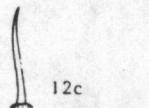
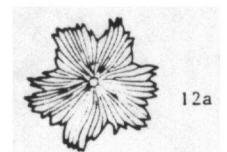


**11. Margin of petals**

- a. ciliate: 7 - 8 - 9 - 11 - (12) - 13 - 16
- b. entire: 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 -
  - 11 - (12) - 13 - 14 - 15 - 16 - 17 - 18 -
  - 19 - 20 - 21 - 22 - 23 - 24 - 25 - 26 - 27
  - 28 - 29 - 30 - 31 - 32 - 33 - 34 - 35 -
  - 36 - 37 - 38

**12. Indument of flowers**

- a. scales: 4 - (12)
- b. stellate hairs: 4 - (12) - 26 - 27 - 29 - 38
- c. simple hairs: 1 - 2 - 3 - 5 - 6 - 7 - 8 - 9 - 10
  - 11 - (12) - 13 - 14 - 15 - 16 - 17 - 18
  - 19 - 20 - 21 - 22 - 23 - 24 - 25 - 27 -
  - 28 - 29 - 30 - 31 - 32 - 33 - 34 - 35 - 36
  - 37



**13. Texture of perianth**

- a. membranaceous: 1 - 2 - 4 - (12) - 14 - (15) - (22)
- b. (sub)coriaceous to fleshy: 1 - 3 - 4 - 5 - 6 - 7
  - 8 - 9 - 10 - 11 - (12) - 13 - (15) - 16 -
  - 17 - 18 - 19 - 20 - 21 - (22) - 23 - 24 -
  - 25 - 26 - 27 - 28 - 29 - 30 - 31 - 32 - 33
  - 34 - 35 - 36 - 37 - 38

**14. Sex distribution**

- a. polygamous (andro-dioecious): 7 - 11 - 12 - 13 -
 25 - 27
- b. bisexual: 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10
  - 11 - 12 - 13 - 14 - 15 - 16 - 17 - 18 - 19
  - 20 - 21 - 22 - 23 - 24 - 26 - 27 - 28 -
  - 29 - 30 - 31 - 32 - 33 - 34 - 35 - 36 - 37
  - 38

15. Staminodes

- a. present between petals and stamens: 6
- b. present between carpels and stamens: 24 - 26
- c. absent: 1 - 2 - 3 - 4 - 5 - 7 - 8 - 9 - 10 -
   
11 - 12 - 13 - 14 - 15 - 16 - 17 - 18 - 19
   
- 20 - 21 - 22 - 23 - 24 - 25 - 27 - 28 -
   
29 - 30 - 31 - 32 - 33 - 34 - 35 - 36 - 37
   
- 38

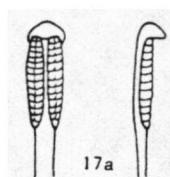
16. Number of stamens

- a. few (up to 25): 11 - (12) - (13) - 15 - 22 - 25 -
   
26 - 32 - 33
- b. many (more than 25): 1 - 2 - 3 - 4 - 5 - 6 - 7 -
   
8 - 9 - 10 - (12) - (13) - 14 - 16 - 17 -
   
18 - 19 - 20 - 21 - 23 - 24 - 25 - 26 - 27
   
- 28 - 29 - 30 - 31 - 34 - 35 - 36 - 37 -
   
38

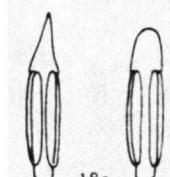
17. Anthers (\*)

- a. locellate: (12) - 24 - 31 - 33 - 34 - 35 - 36 - 37
- b. not locellate: 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 -
   
10 - 11 - (12) - 13 - 14 - 15 - 16 - 17 -
   
18 - 19 - 20 - 21 - 22 - 23 - 25 - 26 -
   
27 - 28 - 29 - 30 - 32 - 38

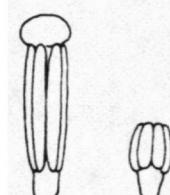
(\*) Only visible under high magnification.



17a



18a



18b



18c

18. Apex of connective

- a. conical to tongue-shaped: 1 - 4 - 11 - 12 - 15 -
   
22 - 23 - 26 - 27 - 31 - 32 - 38
- b. more or less flattened: 2 - 3 - 4 - 5 - 6 - 7 - 8
   
- 9 - 10 - 12 - 13 - 14 - 16 - 17 - 18 - 19
   
- 20 - 21 - 24 - 25 - 27 - 29 - 30 - 33 -
   
34 - 35 - 36 - 37
- c. not prolonged: 4 - 28

19. Pollen arrangement

- a. tetrads: 5 - 6 - 9 - 14 - 15 - (16) - (18) - 24 -
   
25 - 27 - 28 - (32) - (35)
- b. polyads: (16) - (18) - 24 - 31 - (32) - 33 - 34 -
   
(35) - 36 - 37
- c. monads: 1 - 2 - 3 - 4 - 7 - 8 - 10 - 11 - 12 - 13
   
- (16) - 17 - (18) - 19 - 20 - 21 - 22 - 23
   
- 26 - 27 - 29 - 30 - (32) - (35) - 38

20. Number of ovules per carpel

- a. = 1 : 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 12 -  
           13 - 17 - 18 - 19 - 20 - 21 - 27 - 28 - 29  
           - 30
- b. > 1 : 1 - 2 - 3 - 14 - 15 - 16 - 21 - 22 - 23 - 24  
           - 25 - 26 - 31 - 32 - 33 - 34 - 35 - 36 -  
           37 - 38

21. Placentation of ovules

- a. basal: 4 - 5 - 6 - 7 - 10 - 11 - 12 - 13 - 17 - 18  
           - 19 - 20 - 26 - 27 - 28 - 29 - 30
- b. lateral: 1 - 2 - 3 - 8 - 9 - 10 - 14 - 15 - 16 - 21  
           - 22 - 23 - 24 - 25 - 31 - 32 - 33 - 34 - 35  
           - 36 - 37 - 38

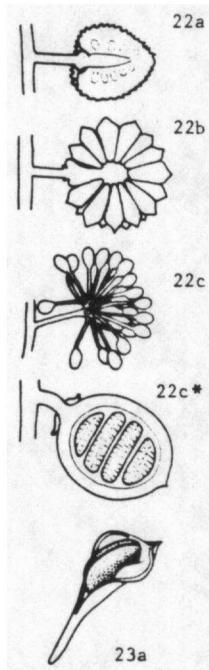
## FRUIT

22. Fruit type

- a. wholly syncarpous: 6 - 27 - 28 - 29
- b. partly connate monocarps: 4 - 5
- c. apocarpous: 1 - 2 - 3 - 7 - 8 - 9 - 10 - 11 - 12  
           - 13 - 14 - 15 - 16 (\*) - 17 - 18 - 19 -  
           20 - 21 - 22 - 23 - 24 - 25 (\*) - 26 - 30  
           - 31 (\*) - 32 - 33 - 34 - 35 - 36 - 37 - 38
- (\*) In 16 - 25 - 31 the number of monocarps is sometimes reduced to one.

23. Dehiscence of fruit

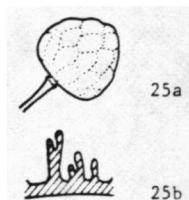
- a. dehiscent: 24 - 26 - 36
- b. indehiscent: 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 -  
           10 - 11 - 12 - 13 - 14 - 15 - 16 - 17 - 18  
           - 19 - 20 - 21 - 22 - 23 - 24 - 25 - 27 -  
           28 - 29 - 30 - 31 - 32 - 33 - 34 - 35 - 37  
           - 38

24. Thickness of fruit wall

- a. ca. 1 mm thick (and often fleshy): 1 - 3 - (5) -  
           7 - 8 - 9 - 10 - 11 - (12) - 13 - 17 - 18  
           - 19 - (20) - 21 - 22 - 24 - 26 - 27 - (28)  
           - 30 - (32) - (33) - 34 - 35 - 36
- b. several mm's thick (and often woody): 2 - 4 - (5) -  
           6 - (12) - 14 - 15 - 16 - (20) - 23 - 25 -  
           27 - (28) - 29 - 31 - (32) - (33) - 37 - 38

**25. Surface of fruit**

- a. areolate (with flat, elevated or sunken areoles):  
4 - (5) - 6 - 27 - (28) - 29 - (32)
- b. crested: 1 - 2 - (5) - (28) - (32)
- c. with muricate, aculeate, or tuberculate protuberances: 4 - (5) - 27 - (28) - 29 - (32)
- d. smooth (except for an apiculate apex): 2 - 3 -  
(5) - 7 - 8 - 9 - 10 - 11 - 12 - 13 - 14  
- 15 - 16 - 17 - 18 - 19 - 20 - 21 - 22 -  
23 - 24 - 25 - 26 - (28) - 30 - 31 - (32)  
- 33 - 34 - 35 - 36 - 37 - 38



25a



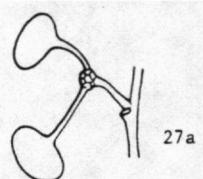
25b

**26. Attachment of monocarps**

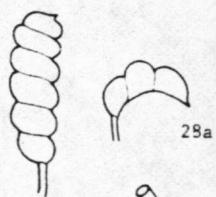
- a. sessile: 1 - 2 - 4 - 5 - 11 - 14 - 15 - 17 - 23  
- 25 - 30 - (32) - 38
- b. stipitate: 2 - 3 - 7 - 8 - 9 - 10 - 11 - 12 - 13  
- 14 - 16 - 17 - 18 - 19 - 20 - 21 - 22 -  
24 - 26 - 31 - (32) - 33 - 34 - 35 - 36 -  
37 - 38

**27. Shape of monocarps**

- a. transversely ellipsoid: 10 - (12)
- b. not transversely ellipsoid: 1 - 2 - 3 - 4 - 5 -  
7 - 8 - 9 - 11 - (12) - 13 - 14 - 15 - 16  
- 17 - 18 - 19 - 20 - 21 - 22 - 23 - 24 -  
25 - 26 - 30 - 31 - 32 - 33 - 34 - 35 -  
36 - 37 - 38



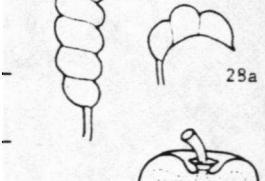
27a



27b

**28. Constriction of monocarps**

- a. constricted: 3 - 14 - 24 - (32) - 34 - 35 - 36 -  
38
- b. not constricted: 1 - 2 - 3 - 4 - 5 - 7 - 8 - 9 -  
10 - 11 - 12 - 13 - 14 - 15 - 16 - 17 -  
18 - 19 - 20 - 21 - 22 - 23 - 25 - 26 -  
30 - 31 - (32) - 33 - 37 - 38



28a



28b



29a

**29. Basal collar of syncarpous fruit**

- a. formed by male torus: (5) - 6
- b. formed by many, sterile, connate carpels: 4 - (5)
- c. absent: (5) - 27 - 28 - 29



29b



29c

**30. Number of seeds per monocarp or locule**

- a.  $\geq 2$  : 1 - 2 - 3 - 14 - 15 - 16 - 21 - 22 - 23 - 24  
     - 25 - 26 - 31 - (32) - 34 - 35 - 36 - 37 - 38  
 b. = 1 : 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 12 -  
     13 - 17 - 18 - 19 - 20 - 21 - 22 - 24 - 27 -  
     28 - 29 - 30 - (32) - 33 - 34 - 35 - 36 - 38

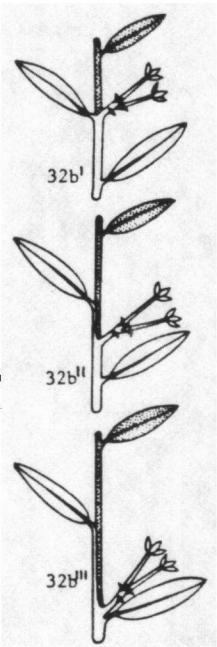
**INFLORESCENCE****31. Mode of flowering**

- a. cauliflorous: 1 - 2 - 3 - 4 - 8 - 17 - 21 - 24 - 26  
     - 27  
 b. ramiflorous: 1 - 2 - 3 - 4 - 6 - 8 - 9 - 11 - 13 -  
     14 - 17 - 18 - 21 - 22 - 23 - 24 - 26 - 29  
 c. on leafy twigs: 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 -  
     10 - 11 - 12 - 13 - 14 - 15 - 16 - 17 - 18 -  
     19 - 20 - 21 - 24 - 25 - 26 - 27 - 28 - 29 -  
     30 - 31 - 32 - 33 - 34 - 35 - 36 - 37 - 38

**32. Position of inflorescence or single flower (\*)**

- a. axillary: 2 - 7 - 8 - 9 - 10 - 11 - 12 - 13 - 14 -  
     15 - 16 - 17 - 18 - 19 - 20 - 21 - 22 - 23  
     - 24 - 25 - 26 - 38  
 b. leaf-opposed or terminal: 1 - 2 - 3 - 4 - 5 - 6 -  
     7 - 8 - 17 - 20 - 25 - 26 - 27 - 28 - 29 -  
     30 - 31 - 32 - 33 - 34 - 35 - 36 - 37

(\*) 'Leaf-opposed' (I) includes 'supra-axillary' (II) and 'pseudo-axillary' (III).

**33. Inflorescence type**

- a. paniculate, racemose, umbellate, or fasciculate:  
     8 - 9 - 11 - 14 - 17 - 19 - 21 - 22 - 23 -  
     24 - 25 - 26 - 27 - 29 - 31 - 33 - 37 - 38  
 b. flowers solitary or in single rhipidia: 1 - 2 -  
     3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 12 -  
     13 - 14 - 15 - 16 - 17 - 18 - 19 - 20 - 21  
     - 22 - 23 - 24 - 26 - 27 - 28 - 29 - 30 -  
     31 - 32 - 33 - 34 - 35 - 36 - 37

34. Articulation of pedicels

a. absent: (10) - 14 - 15 - (16) - (25) - (26) -  
(28)



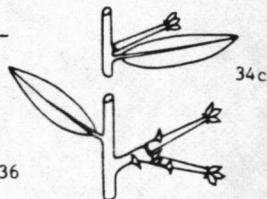
34b

b. distal: 8 - 9 - (10) - 11 - (16) - 17 - 18 - 19  
- 20 - (25) - (26) - (28) - 38



34b

c. (sub)basal: 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 -  
(10) - 11 - 12 - 13 - (16) - 21 - 22 -  
23 - 24 - (25) - (26) - 27 - (28) - 29 -  
30 - 31 - 32 - 33 - 34 - 35 - 36 - 37



34c

35. Number of bracts per flower (\*)

a. 0 : 14 - 15 - (28) - 31 - 32 - 33 - 34 - 35 - 36  
- 37 - 38

basal articulation  
in stalked rhipidium

b. 1 to 3 : 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 -  
12 - 16 - 21 - 22 - 23 - 24 - 26 - 27 -  
(28) - 29 - 30

c. > 3 : 9 - 11 - 13 - 16 - 17 - 18 - 19 - 20 - 22  
- 24 - 25 - (28) - 38

(\*) Bracts are mostly small (< 3 mm) and in many cases are easily overlooked, especially in specimens with densely indumented pedicels. Flowers without bracts are always single, the reverse not being always true.

36. Size of bracts (\*)

a. at least one bract > 10 mm: 2 - 3 - 4 - (10) - 17

b. at least one bract between 3 and 10 mm: 2 - 3 -  
4 - 6 - 7 - (10) - 17 - 25 - 26

c. bracts < 3 mm: 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 -  
9 - (10) - 11 - 12 - 13 - 14 - 15 - 16 -  
17 - 18 - 19 - 20 - 21 - 22 - 23 - 24 -  
25 - 26 - 27 - 28 - 29 - 30 - 31 - 32 -  
33 - 34 - 35 - 36 - 37 - 38

(\*) In 14, cataphylls may appear bract-like. In some species of 33 and in 37, foliage leaves in the floral region are extremely reduced, thereby appearing as bracts. In 38, bracts are found on the stalk of the first flower only.

LEAF

37. Indument on lower side of lamina

a. persistent: 1 - 2 - 3 - 4 - 7 - 8 - 11 - (12) -  
13 - 14 - 15 - 17 - 18 - 19 - 21 - 23 - 24  
- 26 - 27 - 28 - 29 - 30 - 31 - 33 - 36 - 38

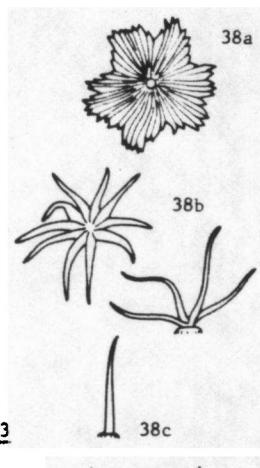
b. absent or present on juvenile leaves only: 3 -  
5 - 6 - 7 - 8 - 9 - 10 - 11 - (12) - 13  
- 14 - 16 - 17 - 20 - 21 - 22 - 23 - 24  
- 25 - 26 - 27 - 28 - 29 - 31 - 32 - 34  
- 35 - 36 - 37

38. Type of indument

a. scales: 4 - (12) - 26

b. stellate hairs: (12) - 26 - 27 - 29 - 38

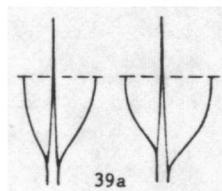
c. simple hairs or absent: 1 - 2 - 3 - 5 - 6 - 7 -  
8 - 9 - 10 - 11 - (12) - 13 - 14 - 15 -  
16 - 17 - 18 - 19 - 20 - 21 - 22 - 23 -  
24 - 25 - 26 - 27 - 28 - 29 - 30 - 31 -  
32 - 33 - 34 - 35 - 36 - 37



39. Symmetry of leaf base (\*)

a. asymmetrical: 11 - (12) - 13 - 17 - 21 - 22 - 23  
- 24 - 27 - 31 - 33 - 34 - 35 - 36 - 37

b. symmetrical: 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8  
- 9 - 10 - 11 - (12) - 13 - 14 - 15 -  
16 - 17 - 18 - 19 - 20 - 21 - 23 - 24  
- 25 - 26 - 27 - 28 - 29 - 30 - 32 -  
33 - 36 - 38



(\*) Applies to the majority of leaves in a given specimen.

40. Leaf base

a. obtuse, rounded, or cordate: 1 - 2 - 3 - 4 -  
5 - 6 - 8 - 9 - 10 - 11 - (12) - 13 -  
14 - 15 - 17 - 18 - 19 - 21 - 22 - 23  
- 24 - 25 - 26 - 27 - 28 - 29 - 30 -  
31 - 33 - 36 - 37

b. acute, cuneate, or decurrent: 1 - 2 - 3 - 4 -  
7 - 8 - 9 - 11 - (12) - 13 - 14 - 16 -  
17 - 19 - 20 - 21 - 22 - 23 - 24 - 25  
- 26 - 27 - 28 - 29 - 30 - 31 - 32 - 33  
- 34 - 35 - 36 - 37 - 38

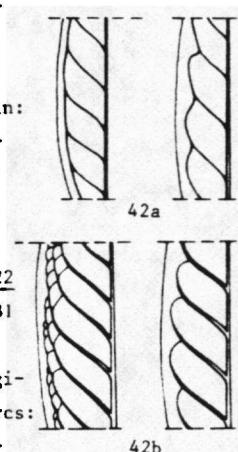
41. Leaf apex

- a. obtuse to acute with obtuse tip: 2 - 3 - 4 - 10 -  
 (12) - 14 - 15 - 20 - 22 - 23 - 24 - 26 - 27  
 - 29 - 30 - (32) - 33 - 34 - 35 - 36 - 37
- b. acuminate to sharply acute: 1 - 2 - 4 - 5 - 6 - 7  
 - 8 - 9 - 11 - (12) - 13 - 14 - 16 - 17 - 18  
 - 19 - 20 - 21 - 22 - 23 - 24 - 25 - 26 - 27  
 - 28 - 29 - 30 - 31 - (32) - 33 - 35 - 36 -  
37 - 38

42. Venation

- a. secondary veins forming a pronounced marginal vein:

4 - 6 - 7 - 8 - 9 - 11 - (12) - (16) - 17 -  
 18 - 19 - 25 - 26 - (32) - 33 - 36



- b. secondary veins laterally connected by loops or

arcs: 1 - 2 - 3 - 4 - 5 - 7 - 9 - 11 - (12) -  
13 - 14 - 15 - (16) - 17 - 19 - 20 - 21 - 22  
 - 23 - 24 - 25 - 26 - 27 - 28 - 29 - 30 - 31  
 - (32) - 33 - 34 - 35 - 36 - 37 - 38

- c. secondary veins neither forming a pronounced marginal vein nor ending in distinct loops or arcs:

10 - (12) - 13 - 14 - (16) - 21 - 22 - 23 -  
27 - 29 - (32) - 36 - 37

42b

43. Leaf arrangement

- a. spiral: 38

- b. distichous: 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10  
 - 11 - 12 - 13 - 14 - 15 - 16 - 17 - 18 - 19  
 - 20 - 21 - 22 - 23 - 24 - 25 - 26 - 27 - 28  
 - 29 - 30 - 31 - 32 - 33 - 34 - 35 - 36 - 37

## GEOGRAPHY

44. Distribution

- a. U.S.A.: 14 - 15

- b. Mexico: 2 - 3 - 7 - 16 - 17 - 24 - 27 - 29 - 36

- c. Central America: 1 - 2 - 3 - 4 - 7 - 11 - 17 - 21  
 - 24 - 26 - 27 - 29 - 36 - 37

- d. West Indies: 3 - 4 - 11 - 17 - 21 - 24 - 27 - 29

- e. South America: 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 -  
 12 - 13 - 17 - 18 - 19 - 20 - 21 - 22 - 23  
 - 24 - 25 - 26 - 27 - 28 - 29 - 30 - 31 -  
 32 - 33 - 34 - 35 - 36 - 37 - 38

LIST OF GENERA

(The sequence is according to Fries, R.E. in Engler, A. & K. Prantl, Die Natürlichen Pflanzenfamilien, ed. 2 (Annonaceae), Vol. 17 a II (1959). The genus Pseudephedranthus is added. The mexican genus Reedrollinsia is very incompletely known and therefore is left out of the key).

- |                       |                       |
|-----------------------|-----------------------|
| 1. Stenanona          | 20. Heteropetalum     |
| 2. Sapranthus         | 21. Unonopsis         |
| 3. Desmopsis          | 22. Bocageopsis       |
| 4. Duguetia           | 23. Onychopetalum     |
| 5. Duckeanthus        | 24. Xylopia           |
| 6. Fusaea             | 25. Diclinanona       |
| 7. Malmea             | 26. Anaxagorea        |
| 8. Cremastosperma     | 27. Annona            |
| 9. Pseudoxandra       | 28. Raimondia         |
| 10. Ruizodendron      | 29. Rollinia          |
| 11. Oxandra           | 30. Rolliniopsis      |
| 12. Pseudephedranthus | 31. Trigynaea         |
| 13. Ephedranthus      | 32. Bocagea           |
| 14. Asimina           | 33. Hornschuchia      |
| 15. Deeringothamnus   | 34. Cardiopetalum     |
| 16. Tridimeris        | 35. Froesiodendron    |
| 17. Guatteria         | 36. Cymbopetalum      |
| 18. Guatteriella      | 37. Porcelia          |
| 19. Guatteriopsis     | 38. Tetrrameranthus   |
|                       | ( 39. Reedrollinsia ) |

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E.C.H. van Heusden  
J. Koek-Noorman  
L.Y.Th. Westra

Model of a Checklist to be used in connection with the synoptical key.  
(one sheet is required for each specimen).

Couplet number →						
Genus nr.						
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