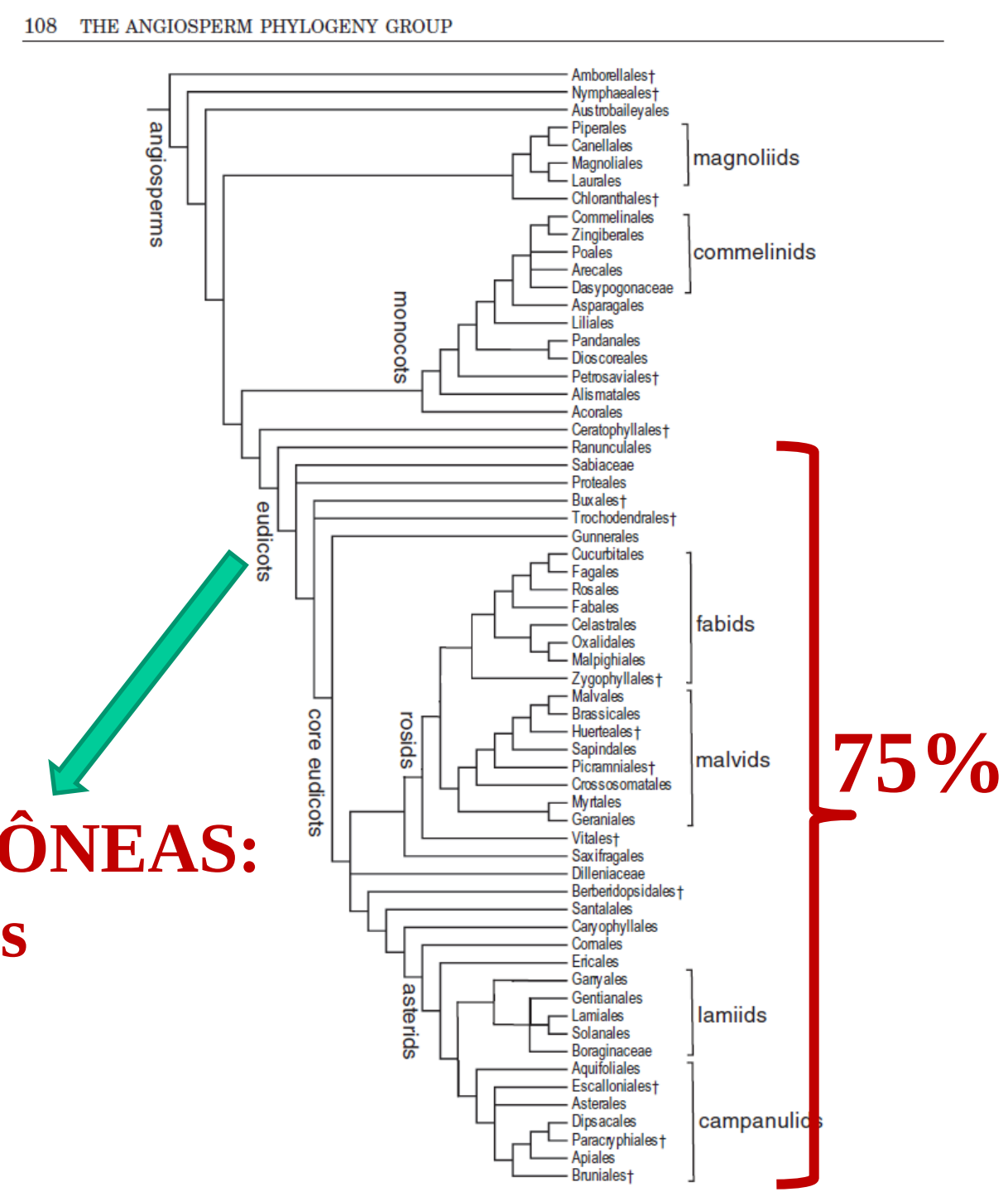
APG-III 2009

18S rDNA
***rbc*L**
atp*B*
***atp*1**
***mat*R**

+ 61 genes de 45 táxons

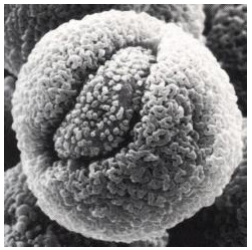


EUDICOTILEDÔNEAS: 41 ordens

Amborellales

Nymphaeales

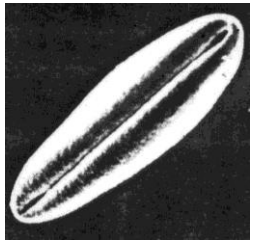
Austrobaileyales

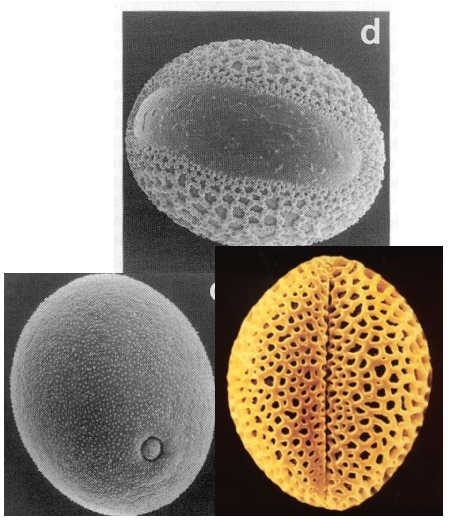


APG III 2009

Chloranthales

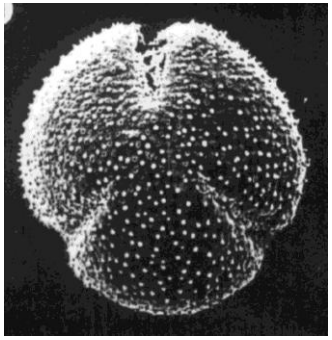
Magnoliídeas



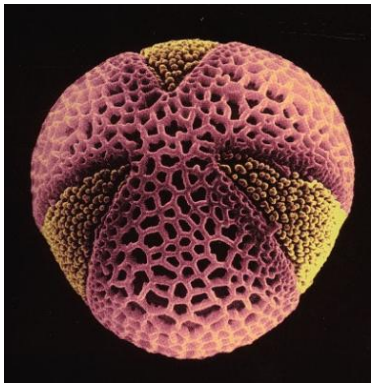


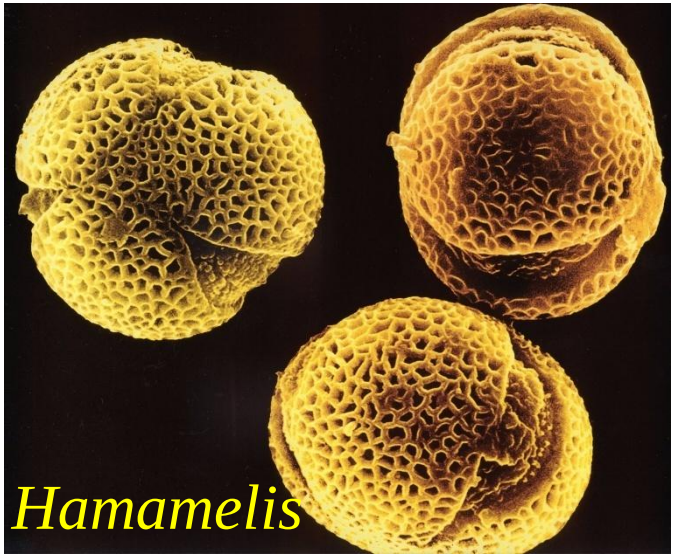
Monocotiledôneas

Ceratophyllales

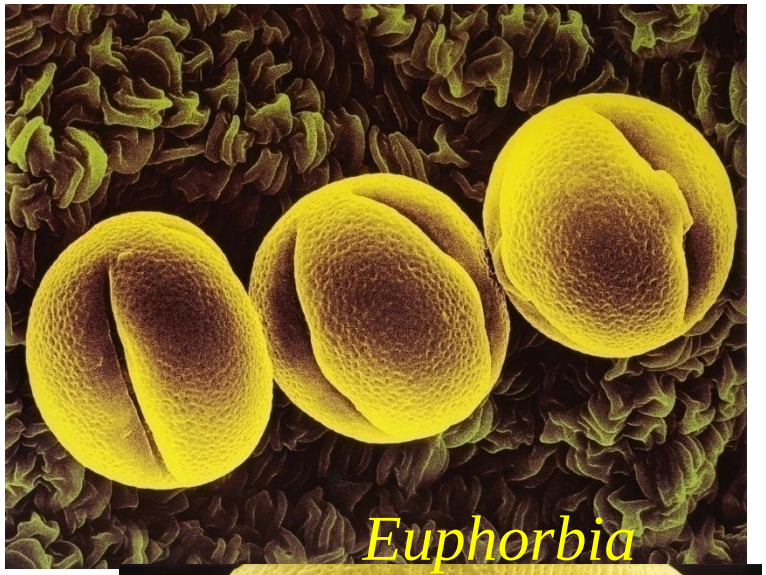


Eudicotiledôneas (ou Tricolpadas)



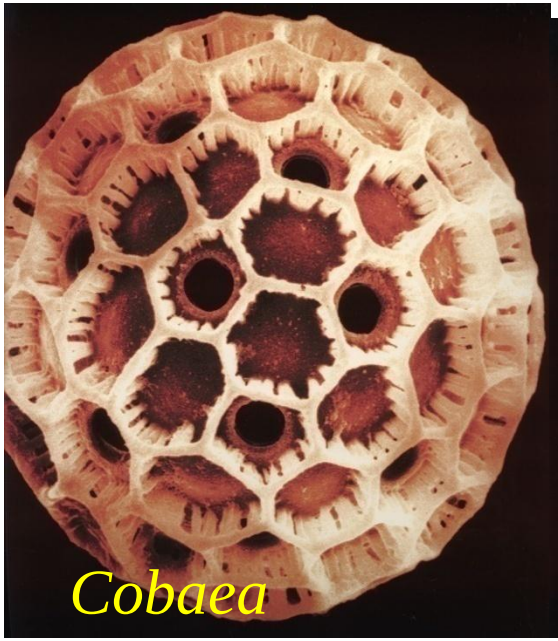


pólen tricolpado

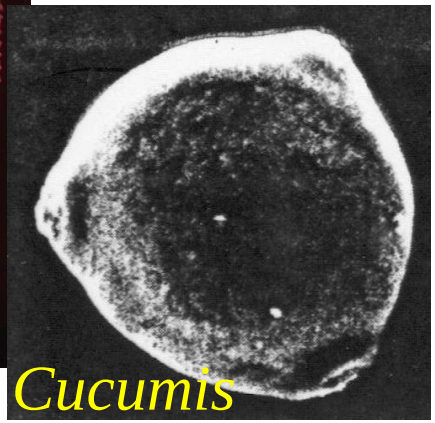


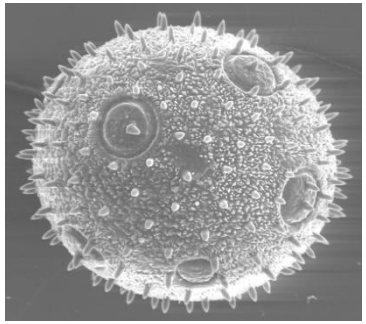
pólen tricolporado

EUDICOTILEDÔNEAS



pólen porado



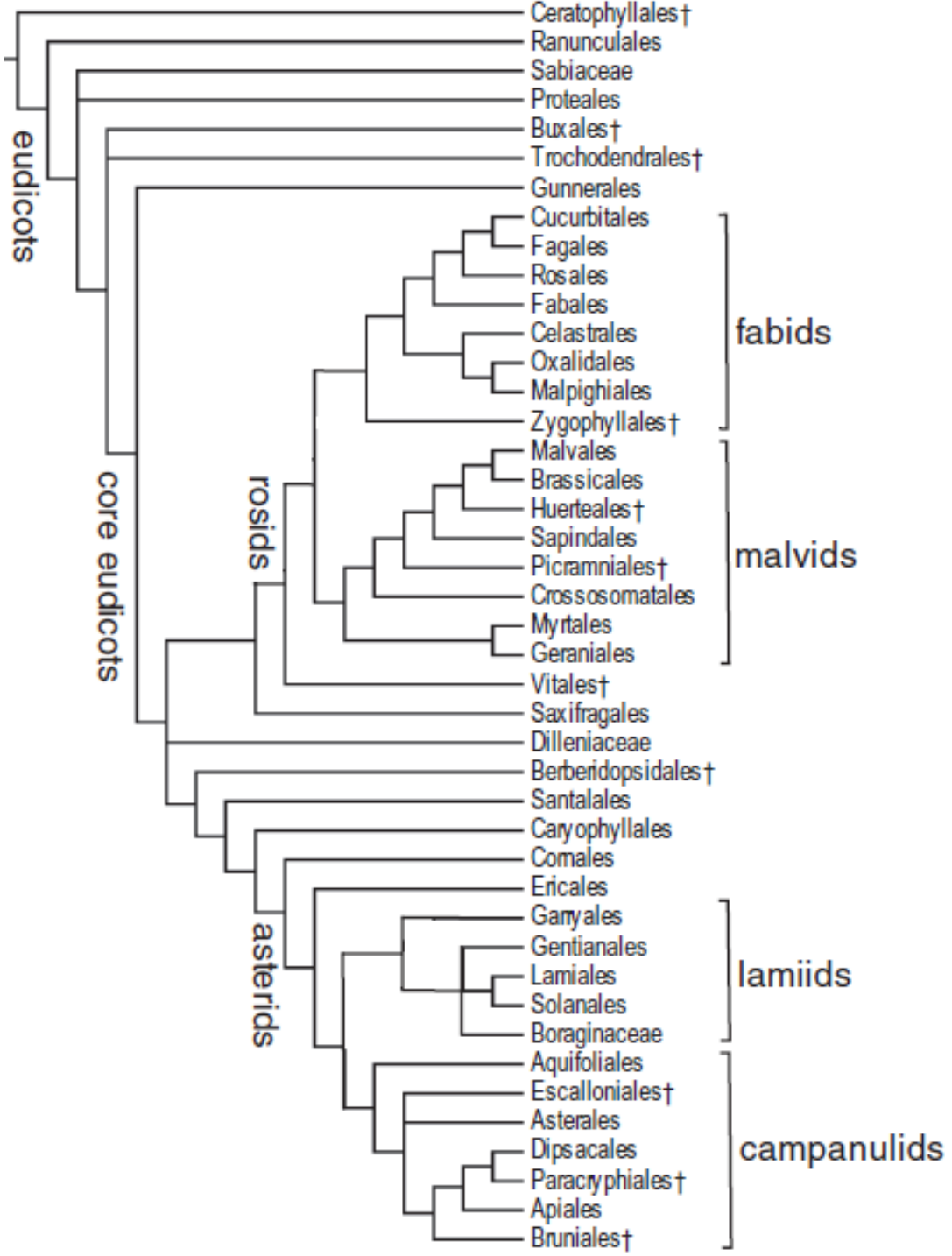


Cucurbita

APG-III 2009

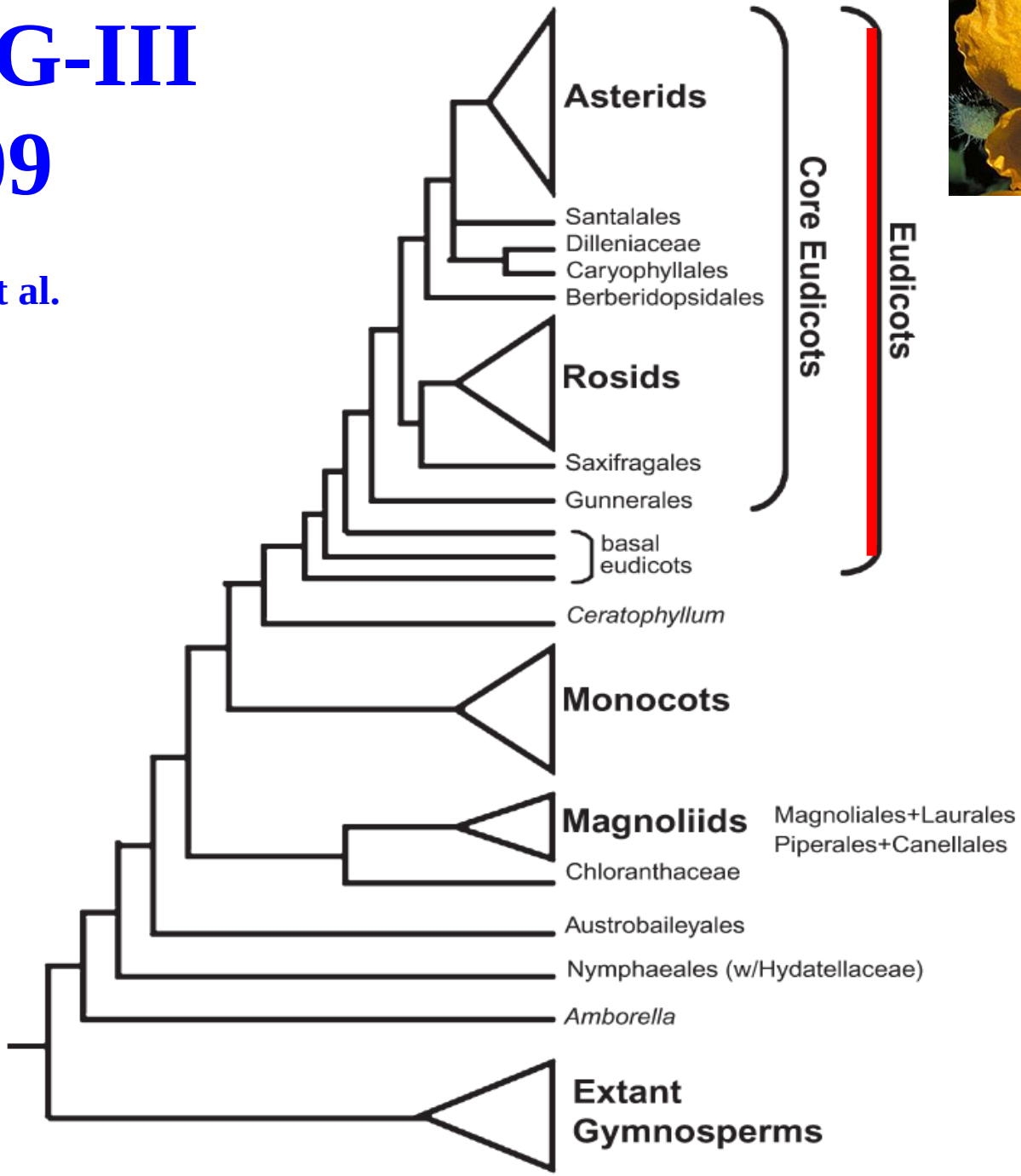
18S rDNA
***rbc*L**
atp*B*
***atp*1**
***mat*R**

+ 61 genes



APG-III 2009

Soltis et al. 2009



Ranunculales

Proteales

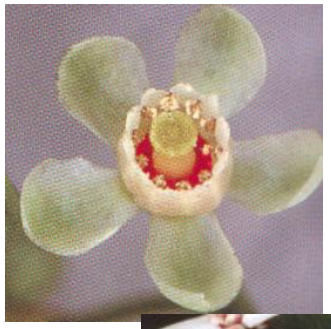
Trochodendrales

Gunnerales

2-meria

Eudicots nucleares

ROSÍDEAS



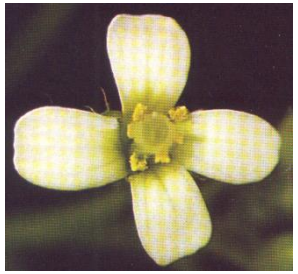
5-meria

PENTAPETALE

Santalales

Caryophyllales

ASTERÍDEAS



Ranunculales

Proteales

Trochodendrales

Gunnerales

2-meria

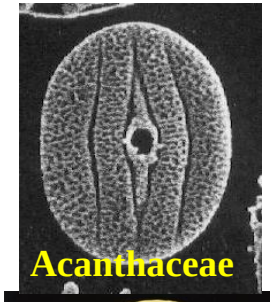
ROSÍDEAS

4-5-meria

Santalales

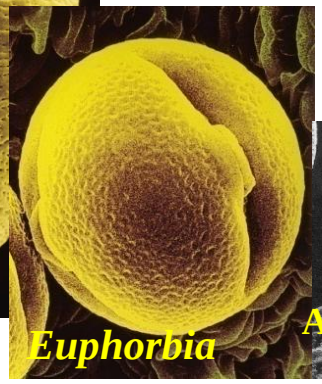
Caryophyllales

ASTERÍDEAS

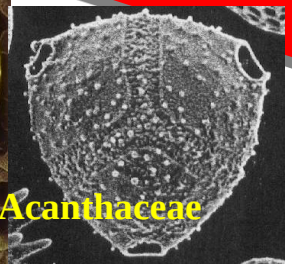


Acanthaceae

Aesculus

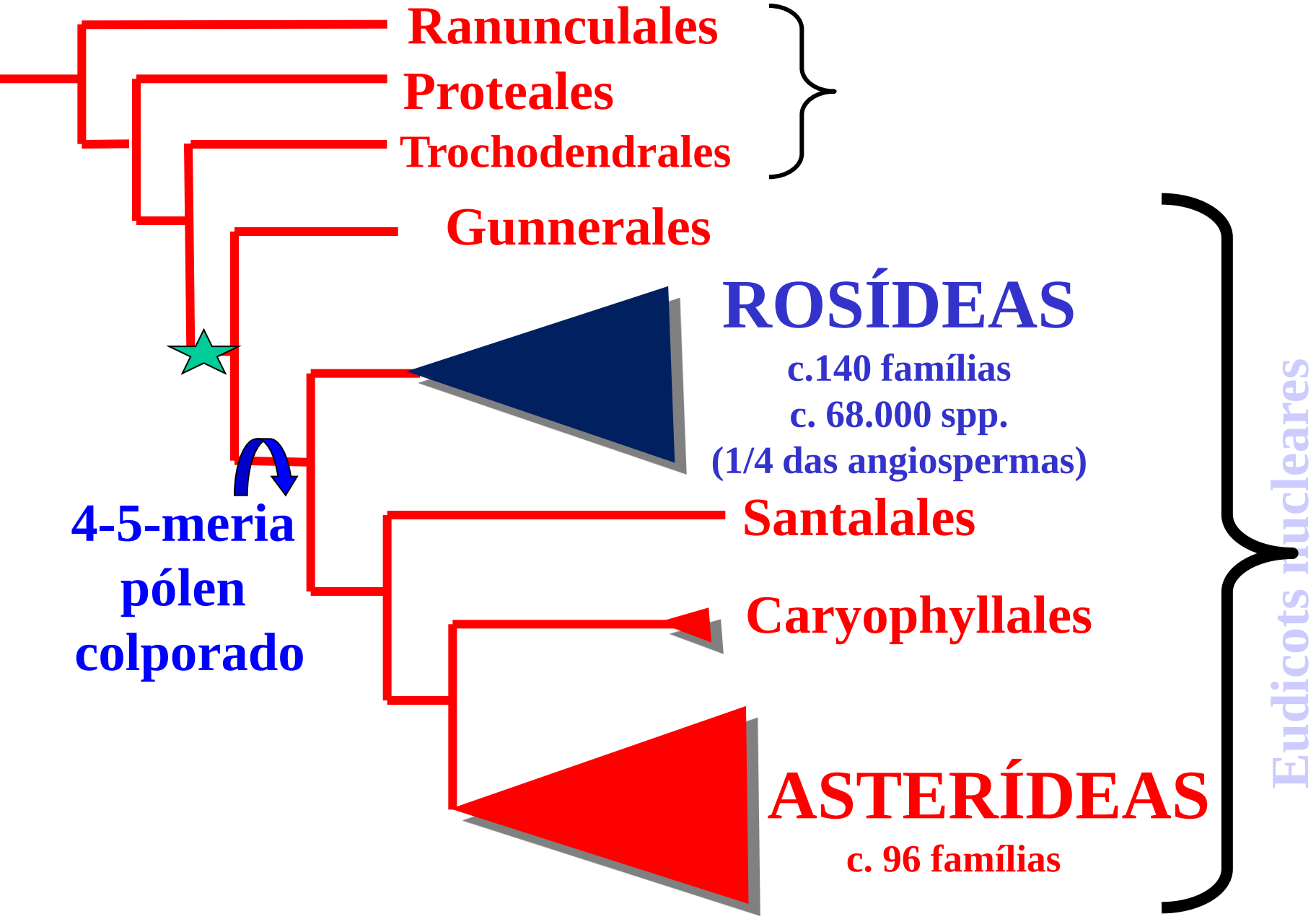


Euphorbia



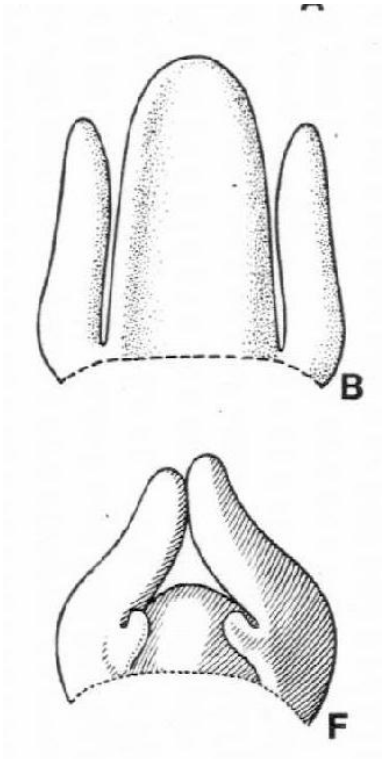
Acanthaceae

pólen colporado a porado


Ranunculales
Proteales
Trochodendrales
Gunnerales
ROSÍDEAS
c.140 famílias
c. 68.000 spp.
(1/4 das angiospermas)
4-5-meria
pólen
colporado
Santalales
Caryophyllales
ASTERÍDEAS
c. 96 famílias
Eudicots nucleares

ROSÍDEAS - sinapomorfias

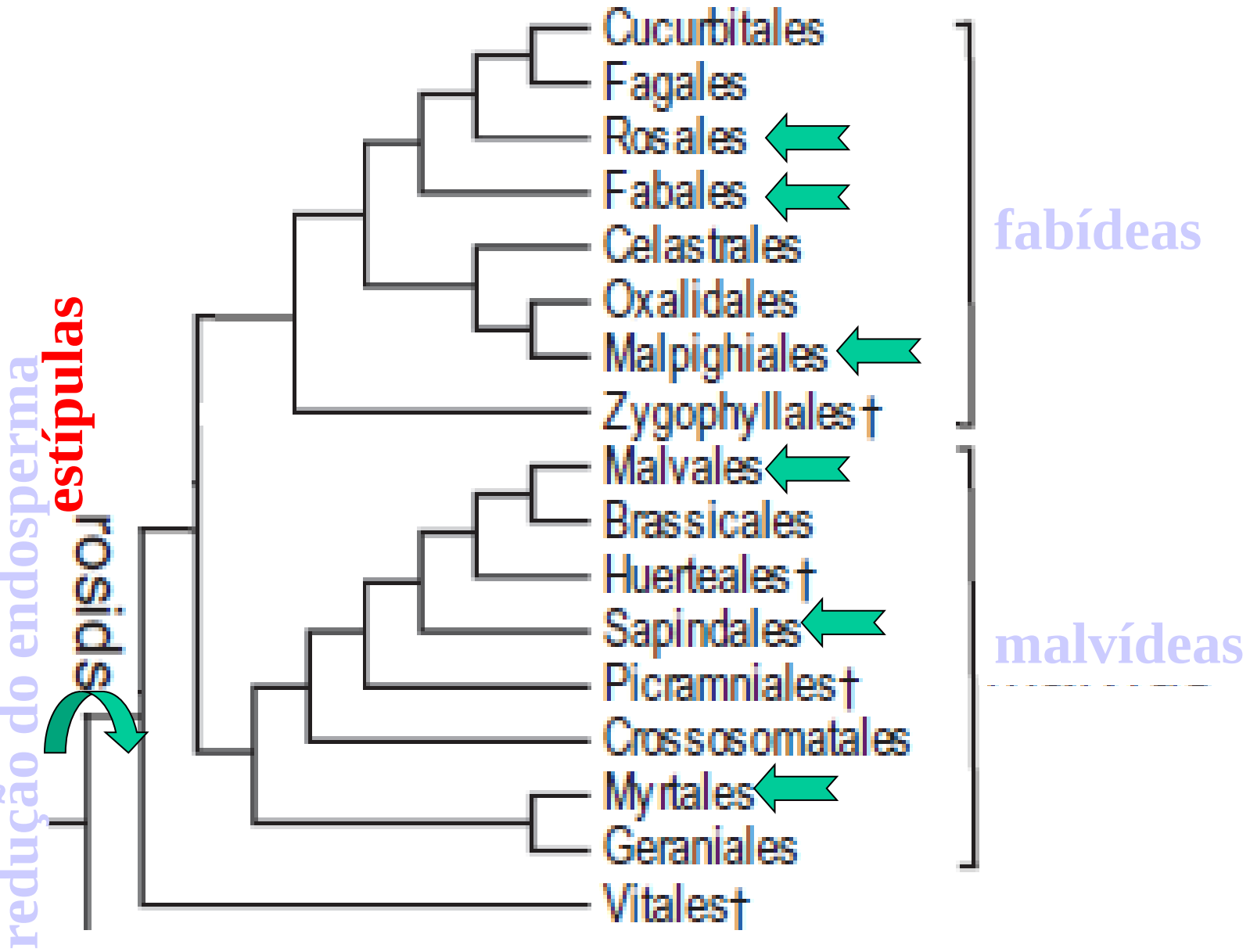
estípulas **redução do endosperma** **diplostemonia**



APG-III 2009

ROSÍDEAS

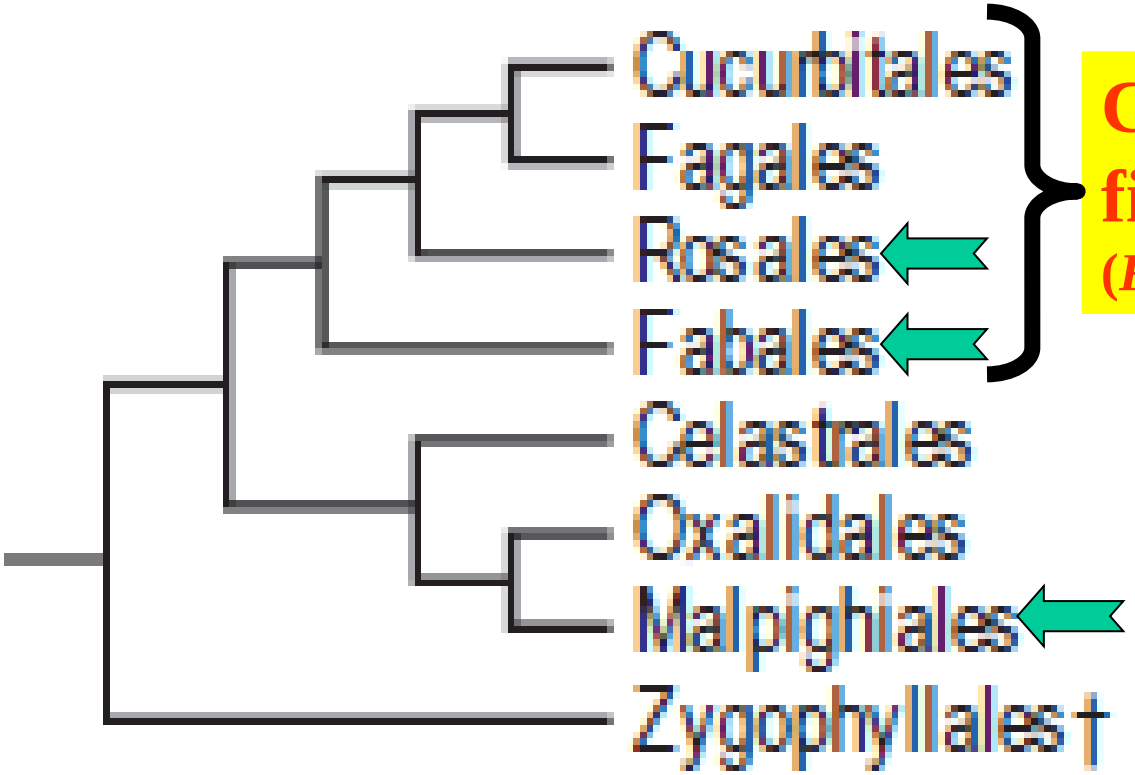
18S rDNA
***rbc*L**
atp*B*
***atp*1**
***mat*R**



ROSÍDEAS FABÍDEAS

8 ordens/ c. 76 famílias

Sinapomorfias macromoleculares!

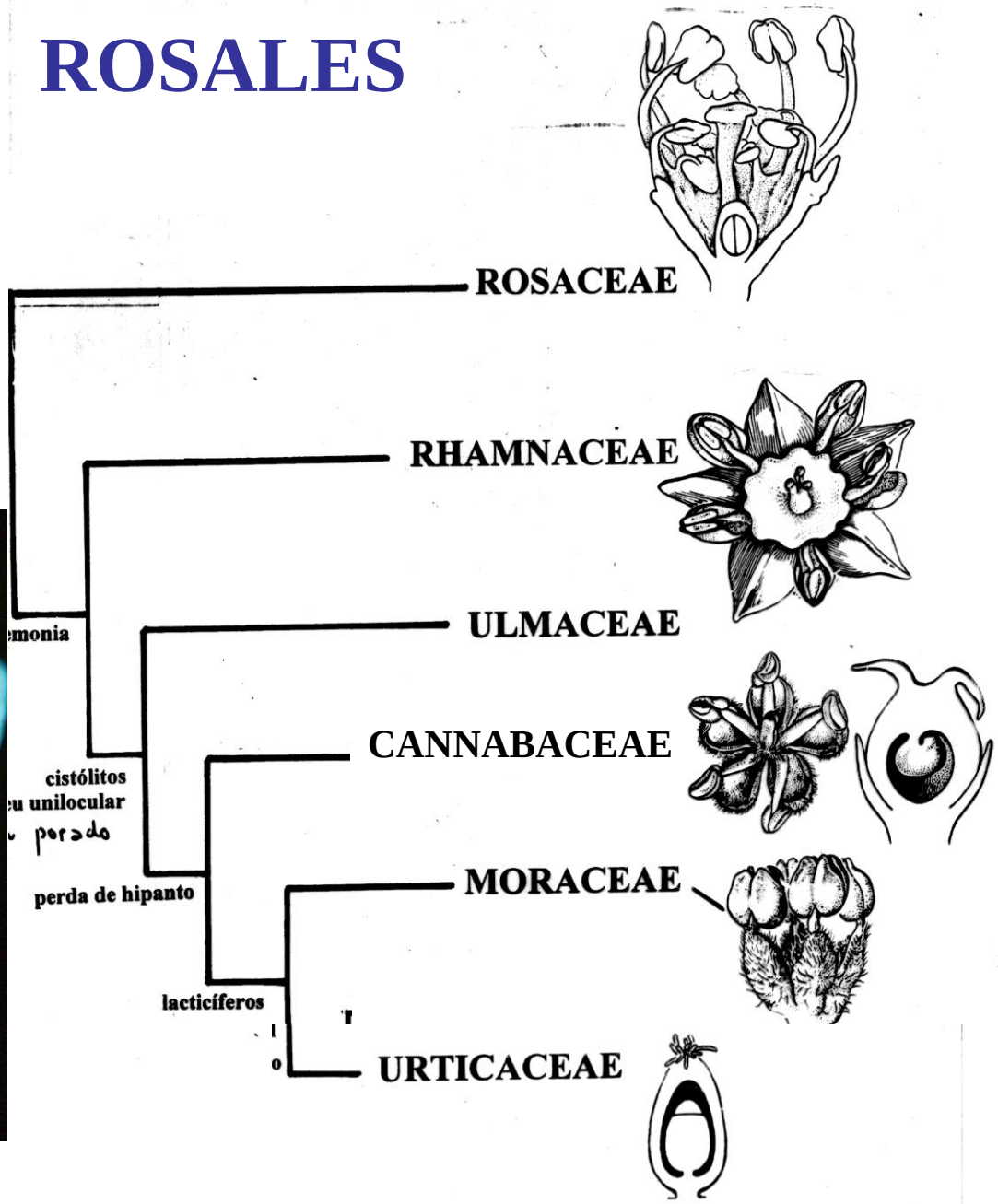


Clado fixador de N2
(*Frankia* ou *Rhizobium*)

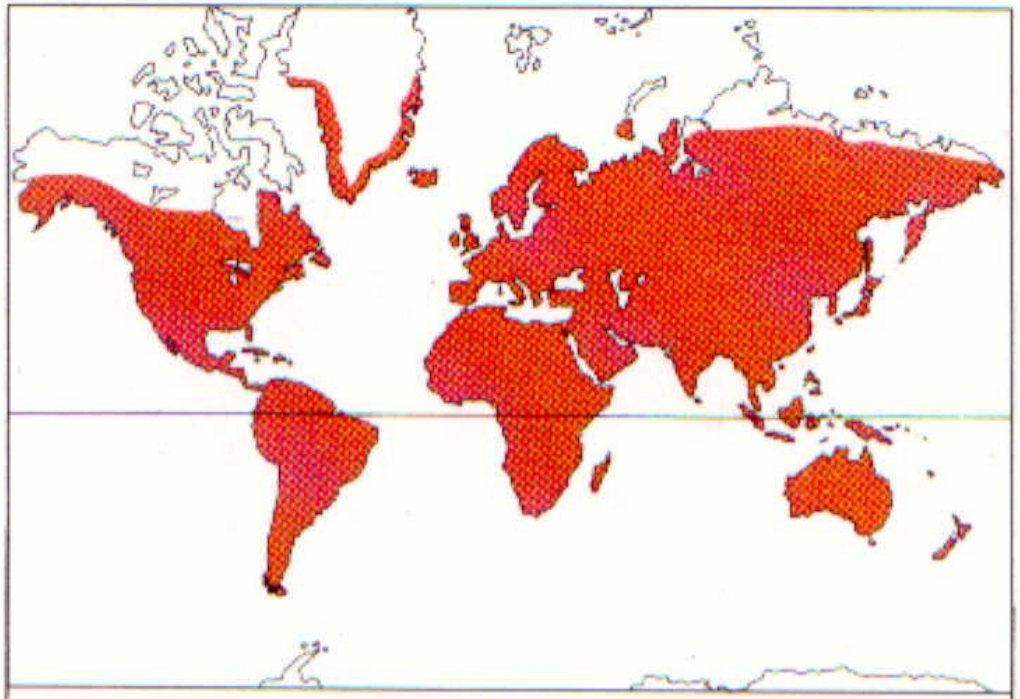
10 famílias
6300 spp.

ROSALES

hipanto



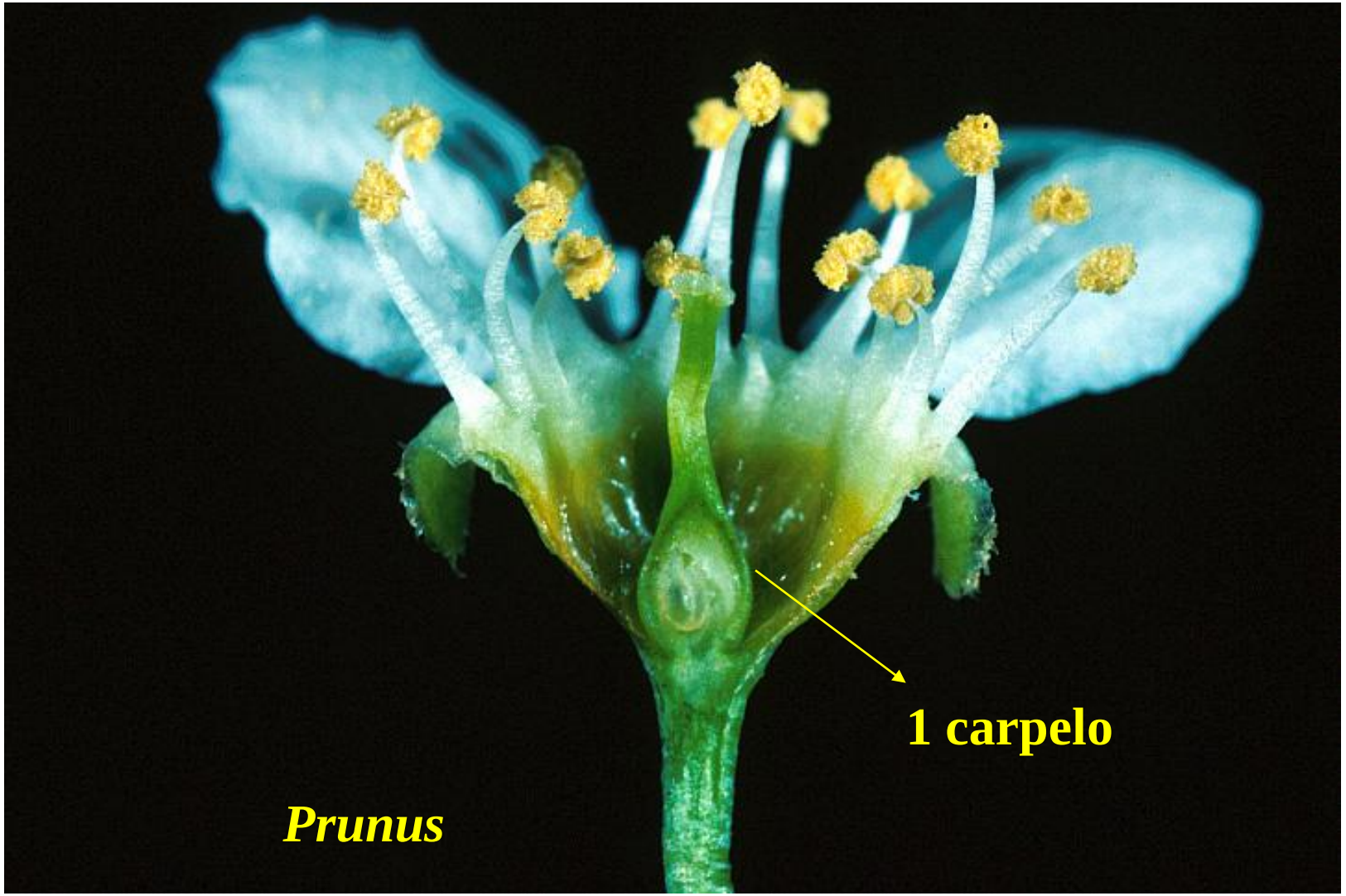
ROSACEAE



Number of genera: 122
Number of species: 3,370
Distribution: worldwide, centered in N temperate regions.
Economic uses: major bush and tree fruits of temperate regions (apples, pears, cherries, plums etc) and many valued ornamentals (roses, *Spiraea, Filipendula, Sorbus, Cotoneaster* etc).

Prunus

ROSACEAE
ROSALES



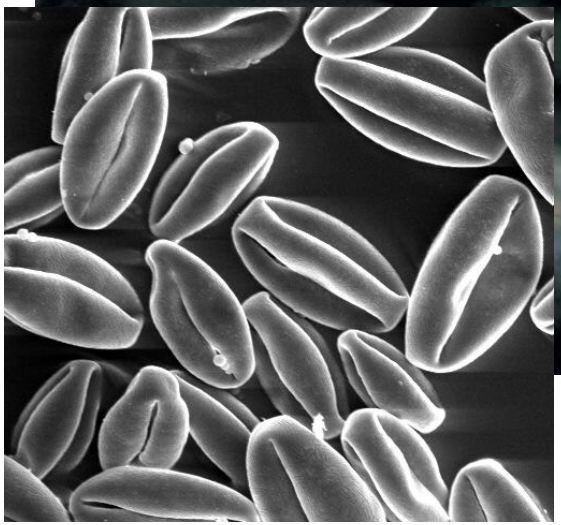
ROSACEAE **ROSALES**

Fragaria

ROSACEAE

Rosa rugosa


Rosa



Malus robusta

ROSACEAE **ROSALES**

Malus robusta

ROSACEAE
ROSALES

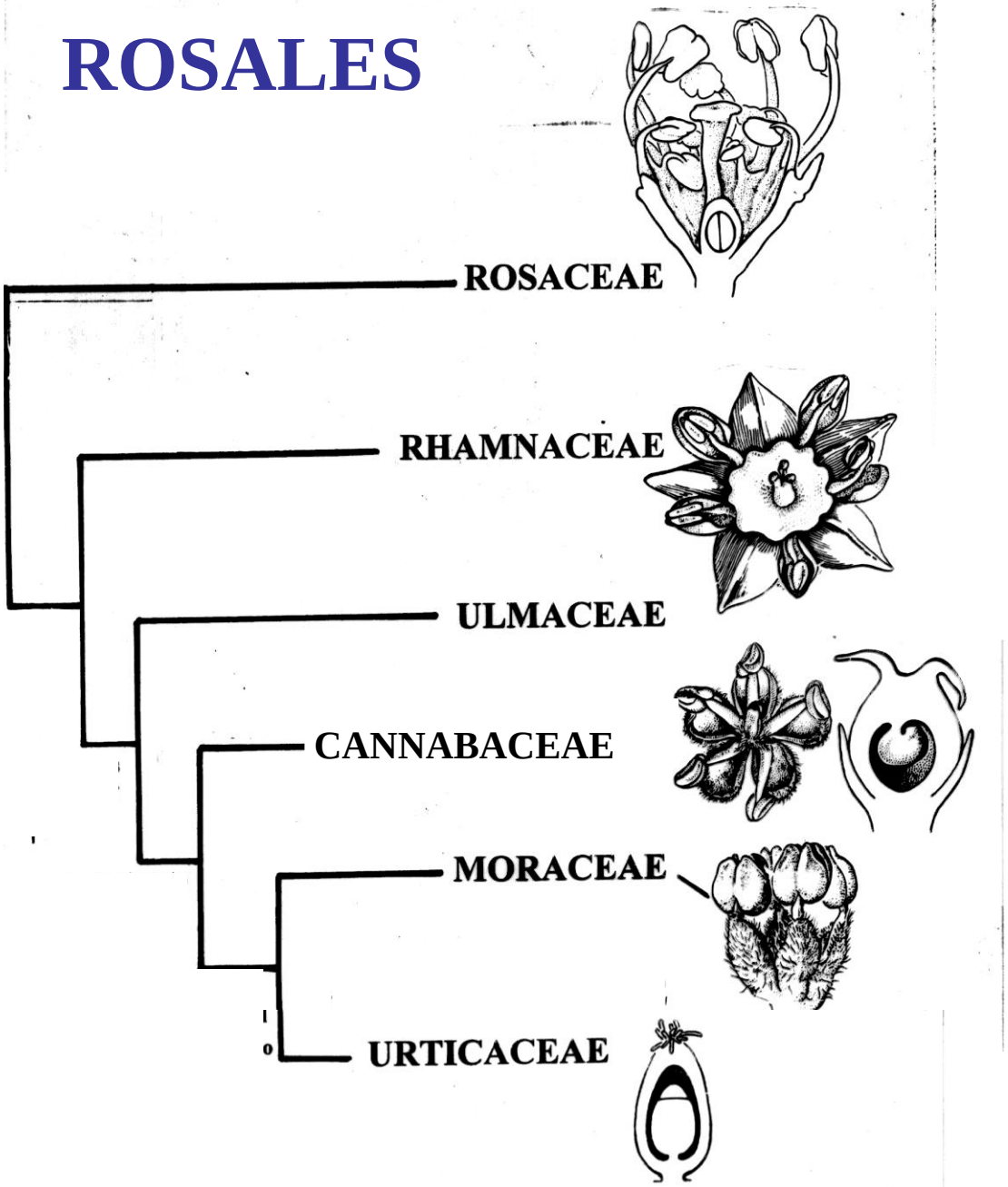
Flor perígina

Flor epígina

ROSALES

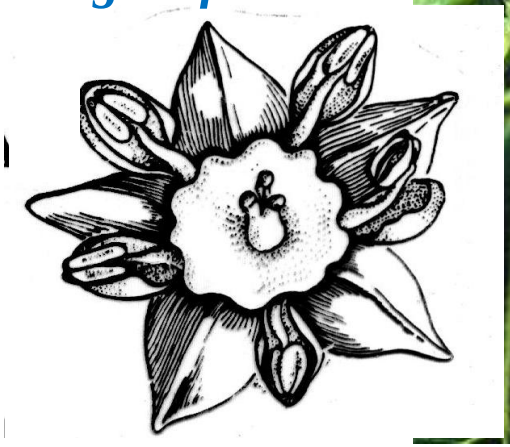
hipanto

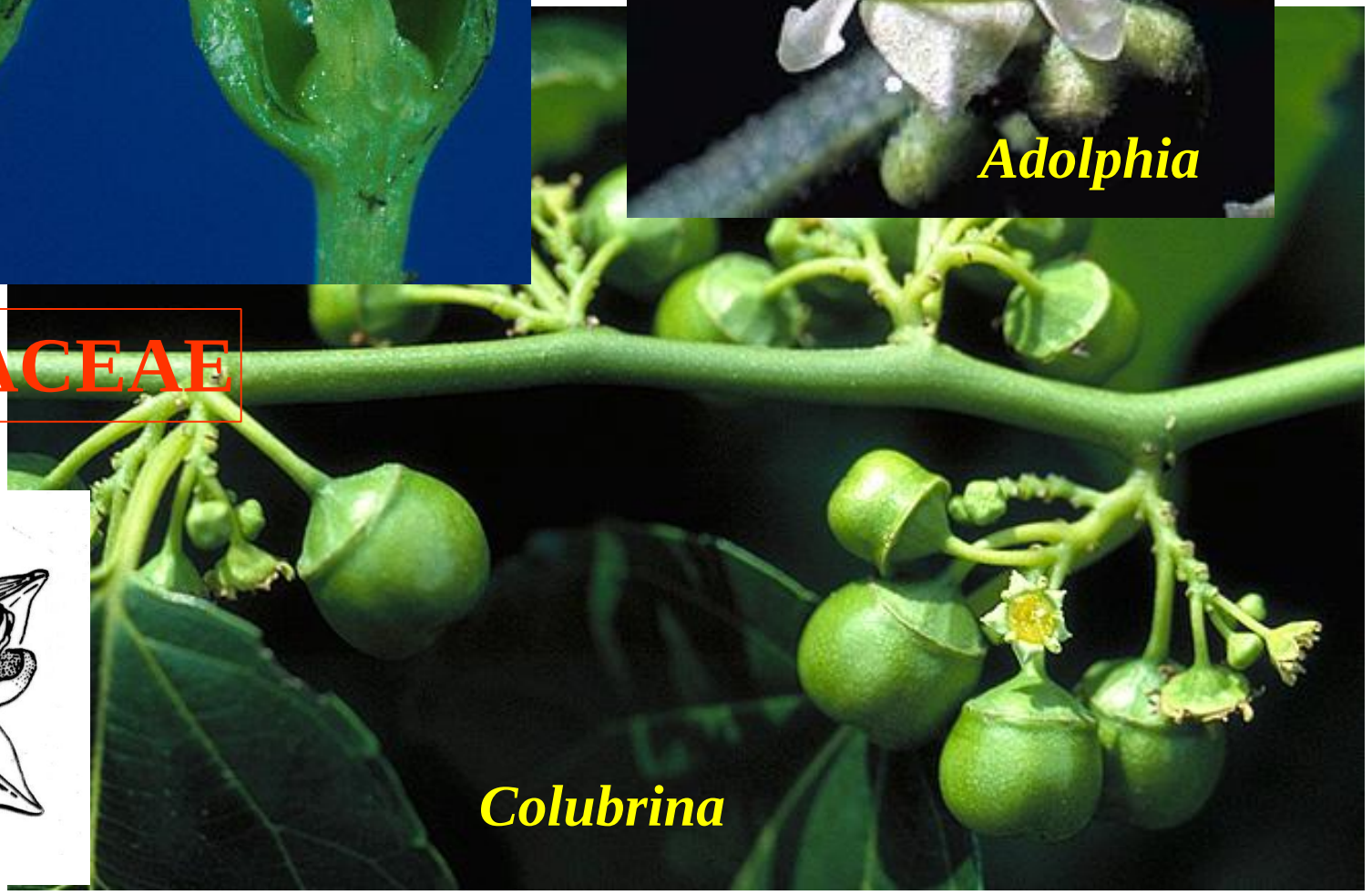
haplostemonia



RHAMNACEAE

6 gên. fixam N2





ROSALES

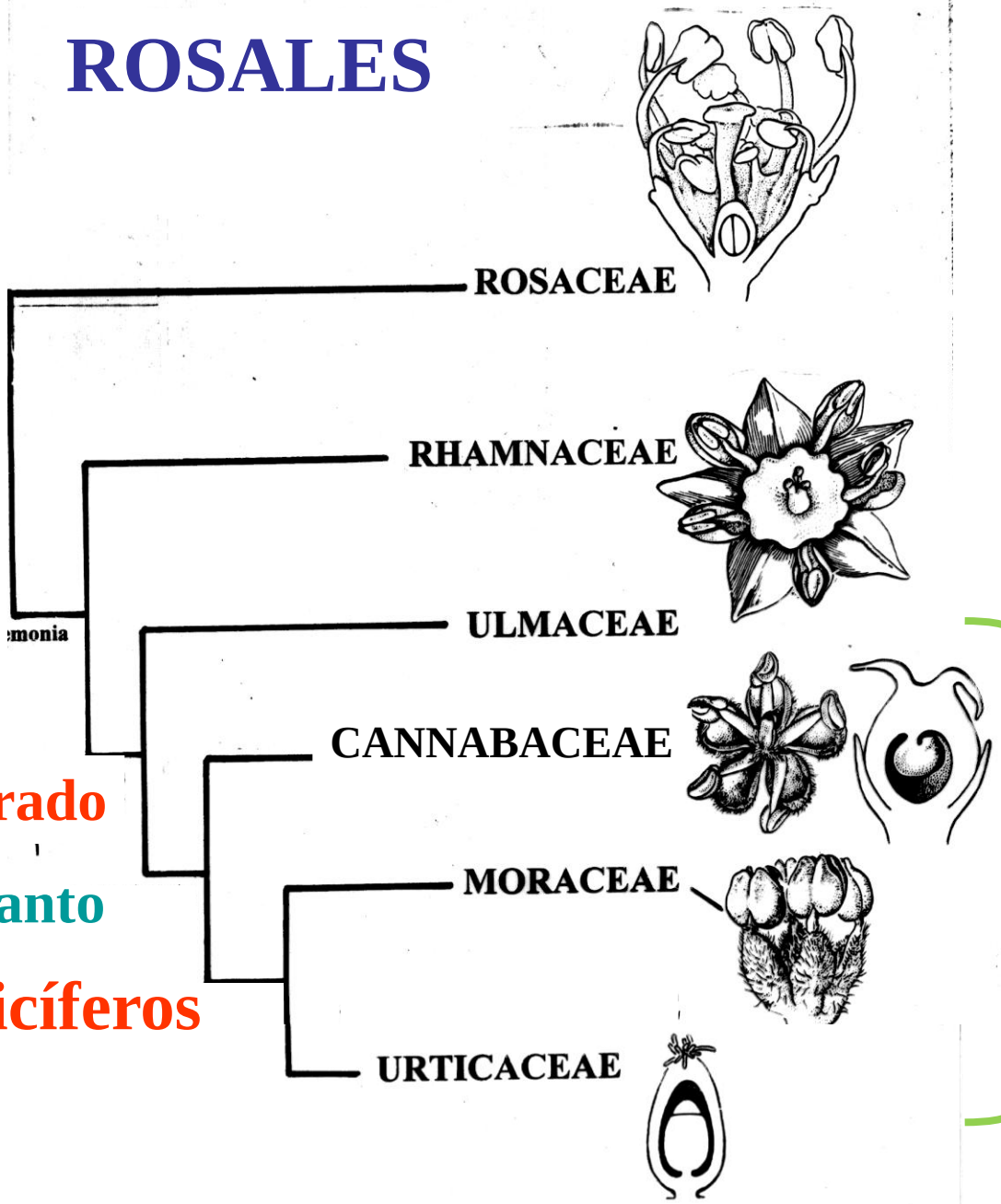
hipanto

haplostemonia

cistólitos, pólen porado

perda de hipanto

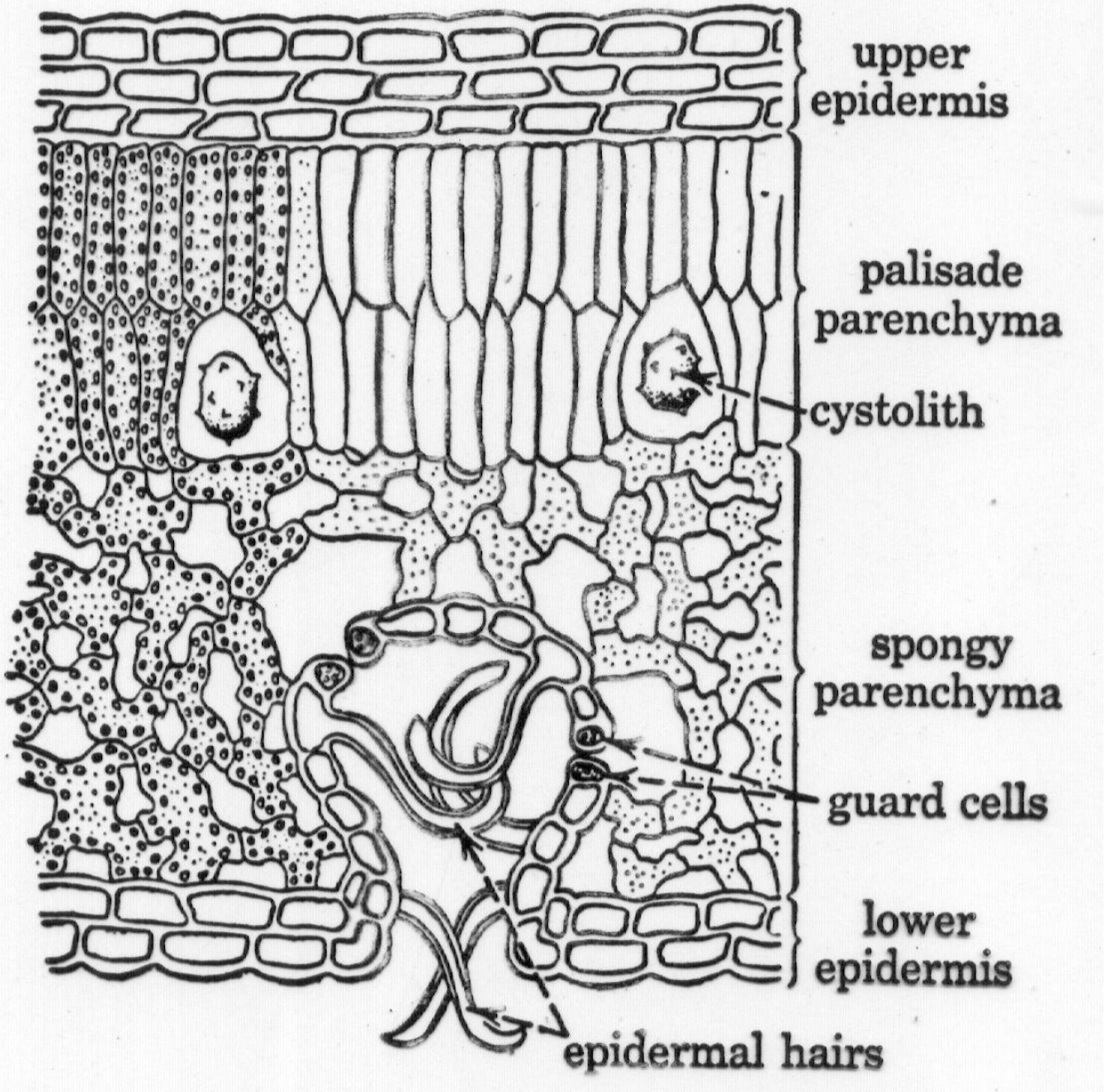
laticíferos



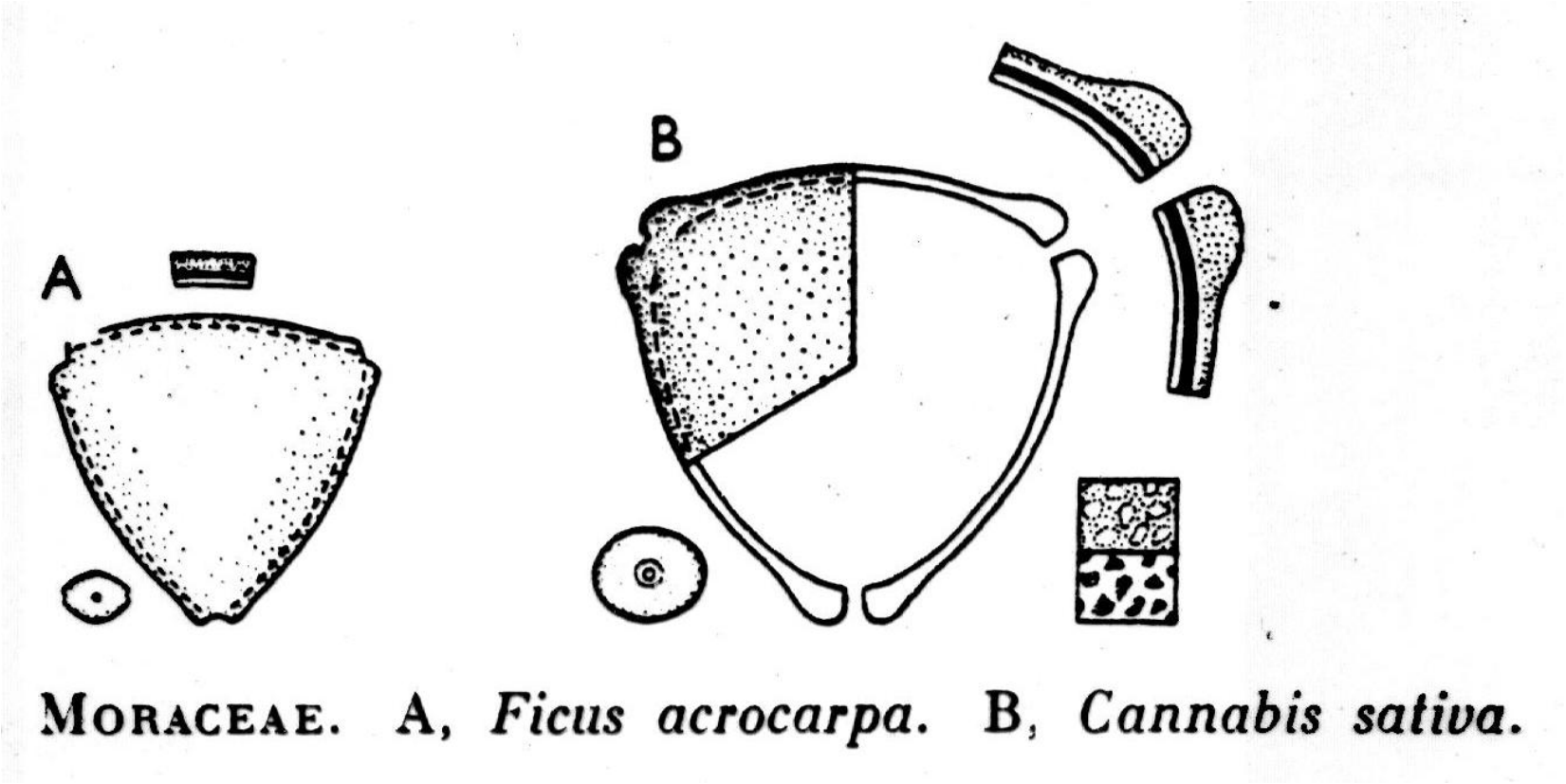
MORACEAE

Ficus elastica

folha



Robbins & Weier 1950



MORACEAE. A, *Ficus acrocarpa*. B, *Cannabis sativa*.

Erdtman 1952

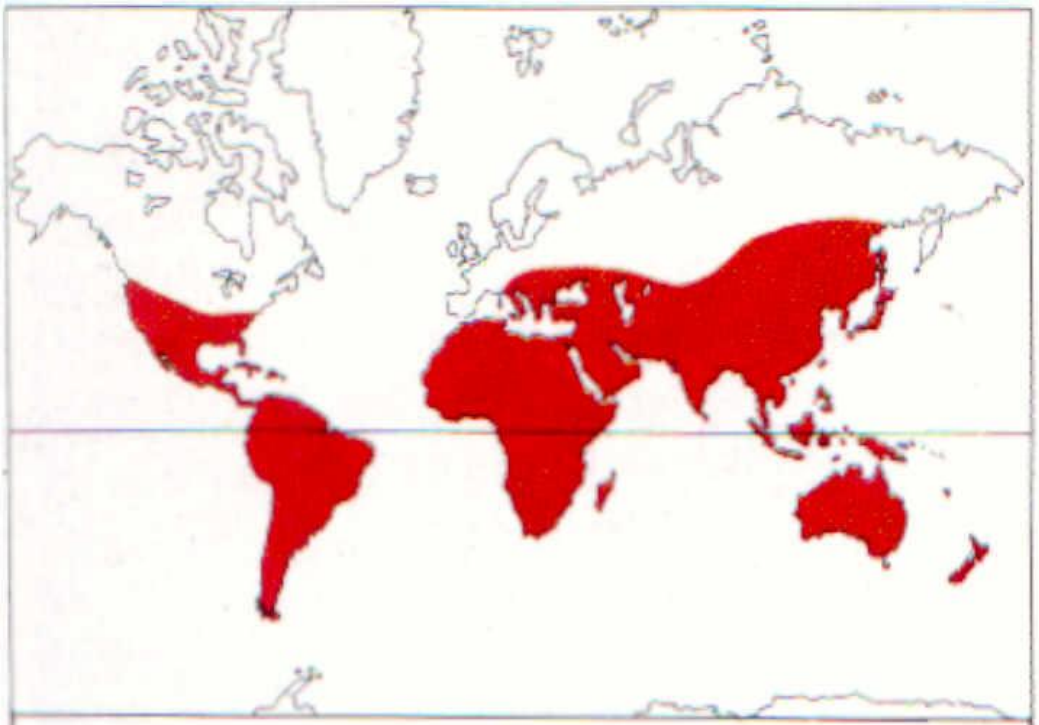
Pólen triporado

Cannabis sativa

CANNABACEAE

ROSALES

MORACEAE



Number of genera: 75
Number of species: about 3,000.
Distribution: centered in tropics and subtropics but some temperate.
Economic uses: important fruits (figs, mulberries, breadfruit),

Heywood 1974

MORACEAE

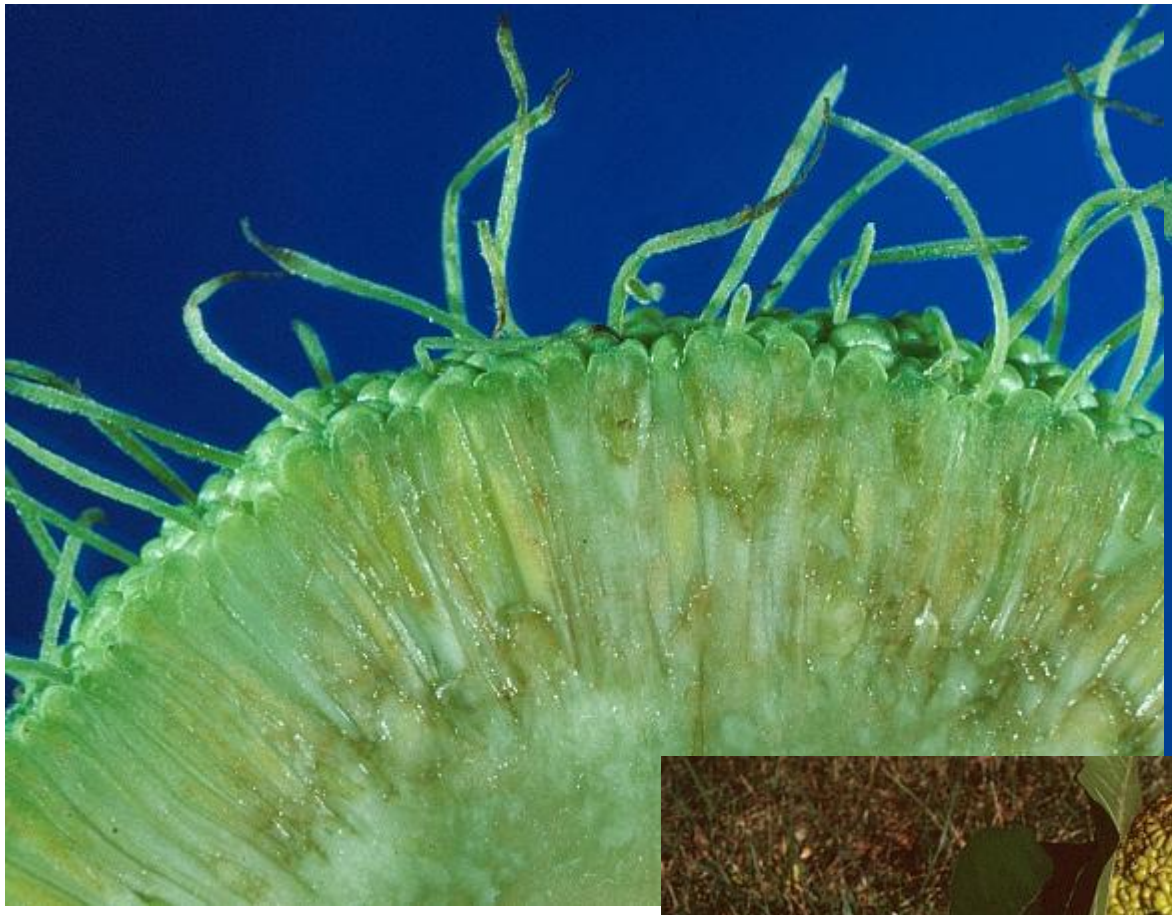
estípula terminal

látex

cistólitos

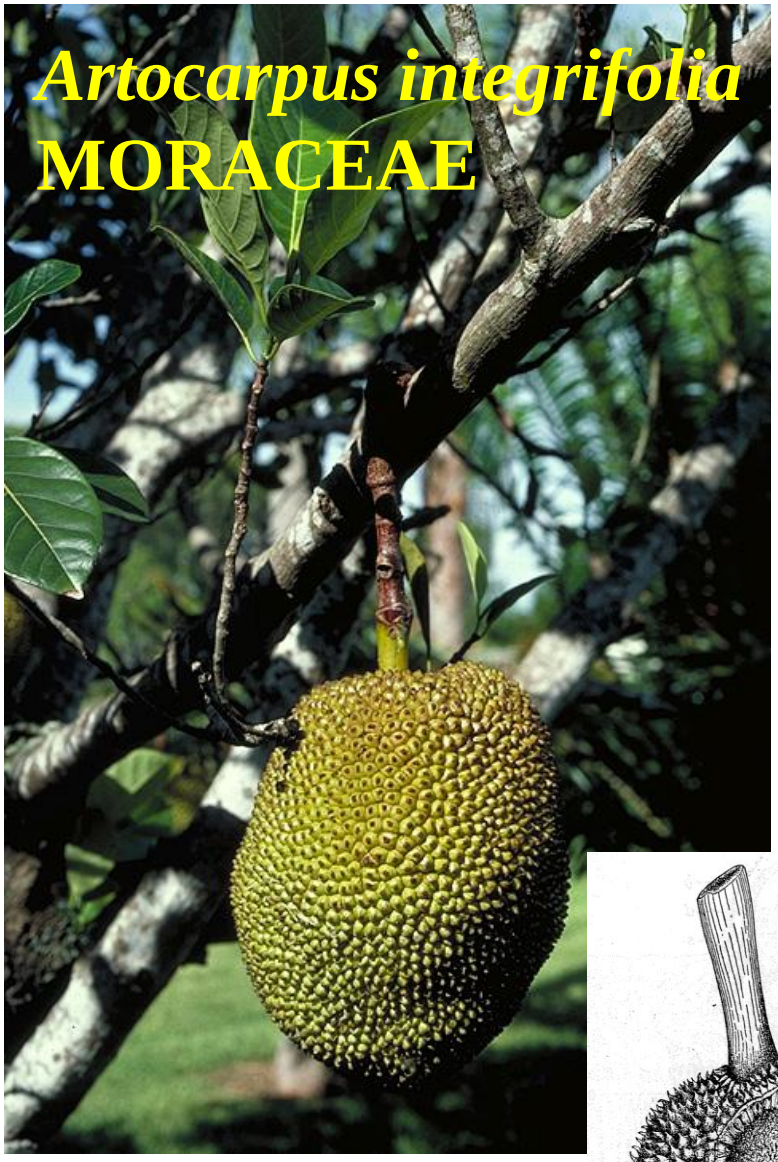
Maclura
MORACEAE

flores monoclamídeas unissexuadas

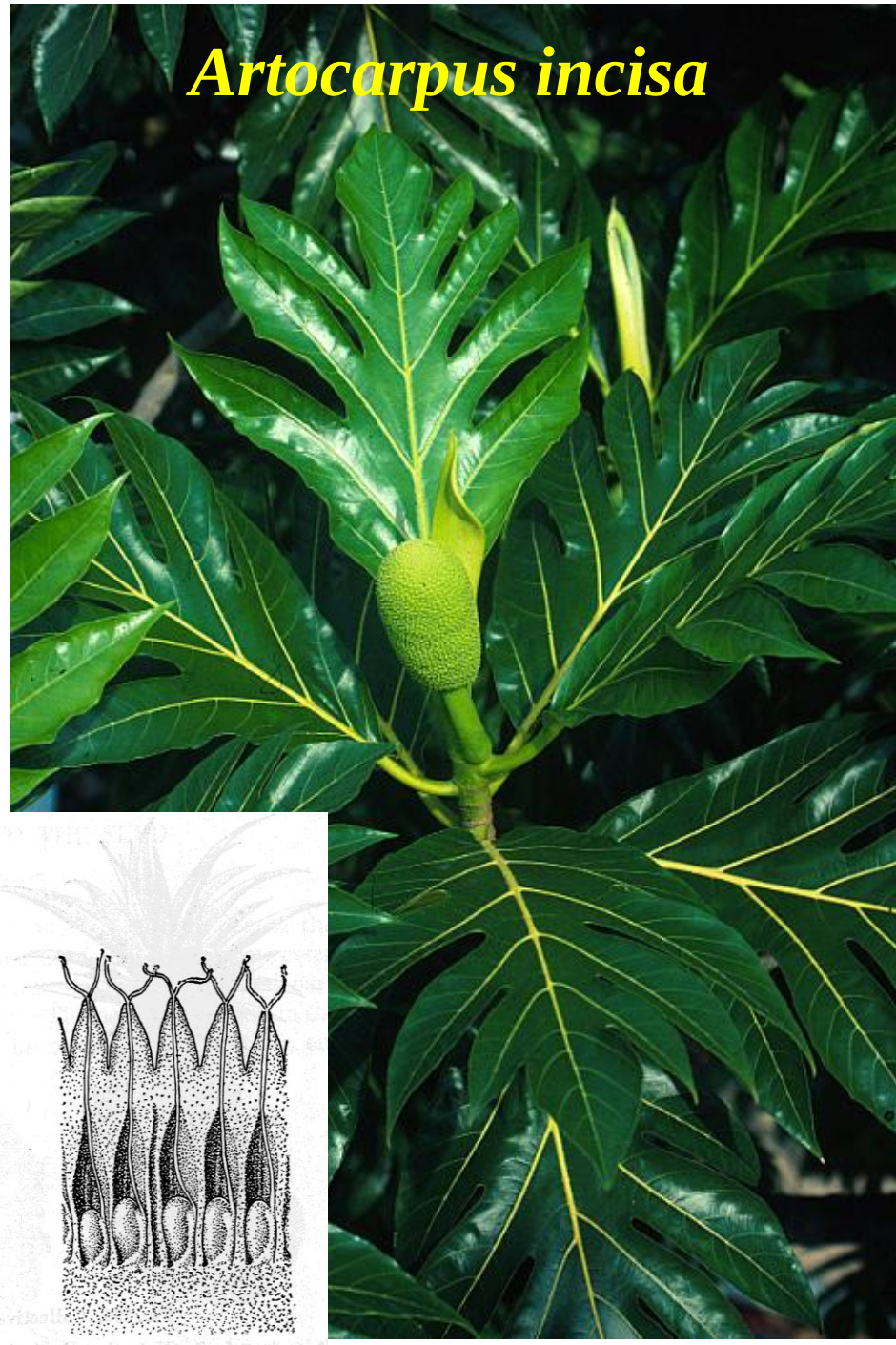


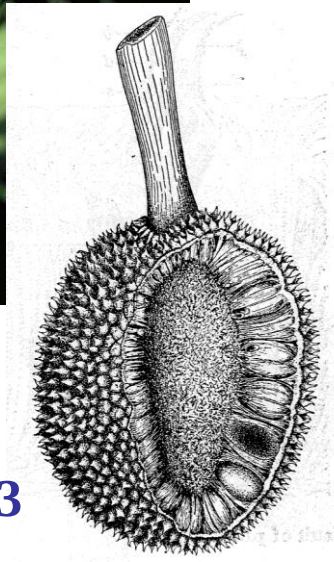
Maclura pomifera
MORACEAE

Artocarpus integrifolia
MORACEAE



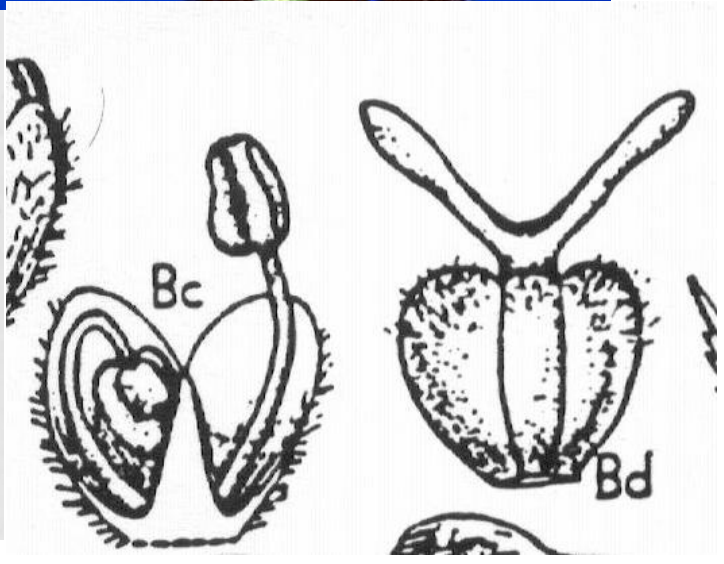
Artocarpus incisa





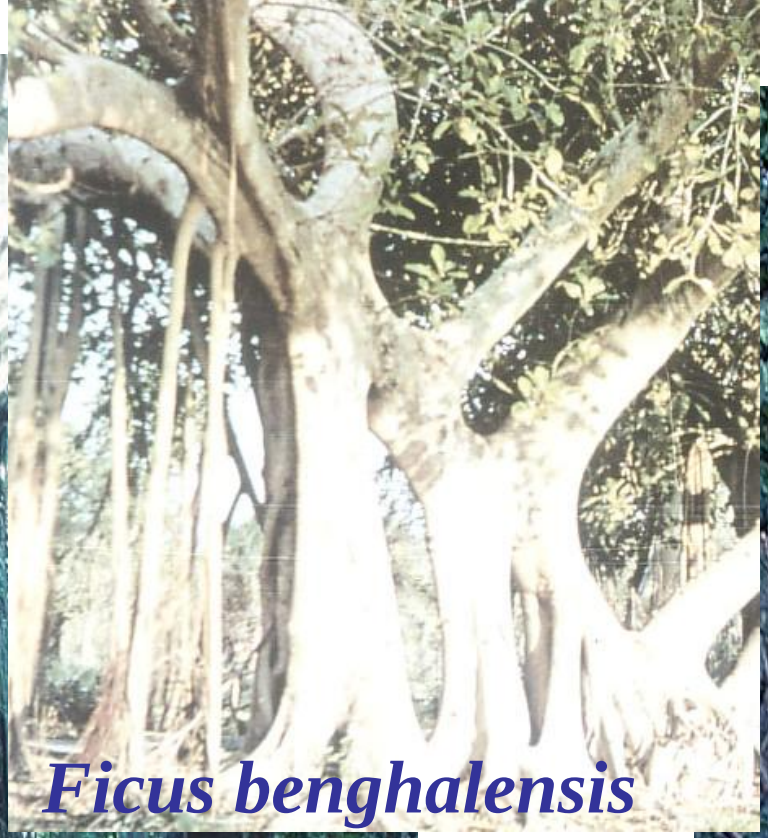
Brown 1963

Morus nigra
MORACEAE



ROSALES

MORACEAE



Ficus benghalensis

Ficus virens

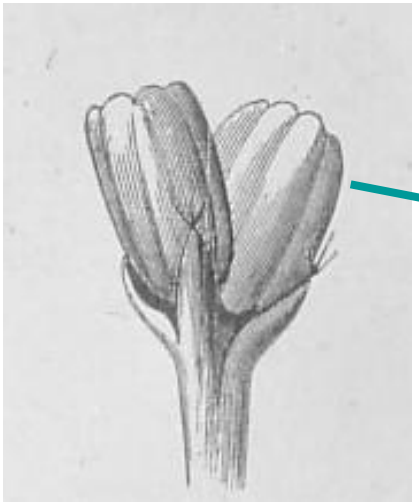
Ficus aurea

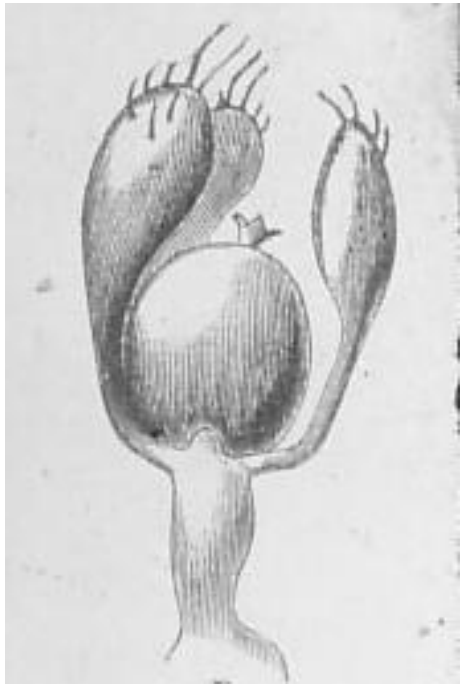
Ficus tremula

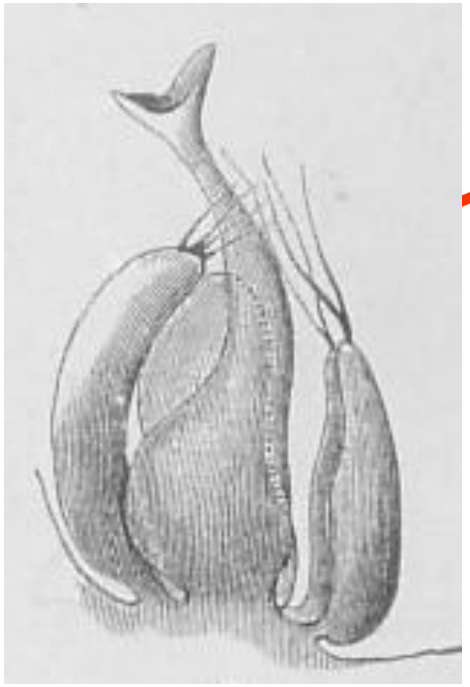
Ficus carica

MORACEAE

Ficus pumila







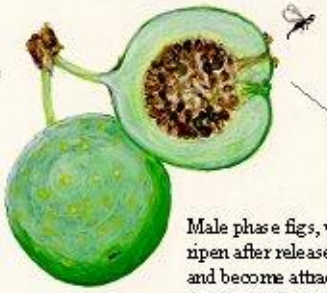
MORACEAE

www.figweb.org

Ficus tremula with female phase figs receptive for pollination and oviposition.

Philocaenus clairae – a galling non-pollinating fig wasp that enters the fig for oviposition at the same time as the pollinator.

Pollinator female *Courtella wardi*. On leaving the natal fig she homes in on volatiles released by receptive figs on other trees.

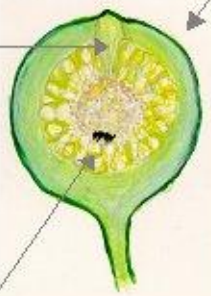


Male phase figs, which will ripen after release of wasps and become attractive to frugivores for seed dispersal.

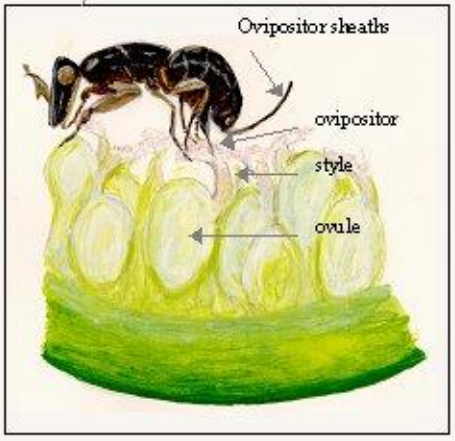
Pollinator male *Courtella wardi*. After mating with females, males chew an exit hole through the fig wall, allowing

Cycle of the fig – fig wasp mutualism

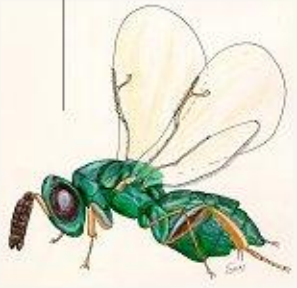
Cross-section through a receptive fig.



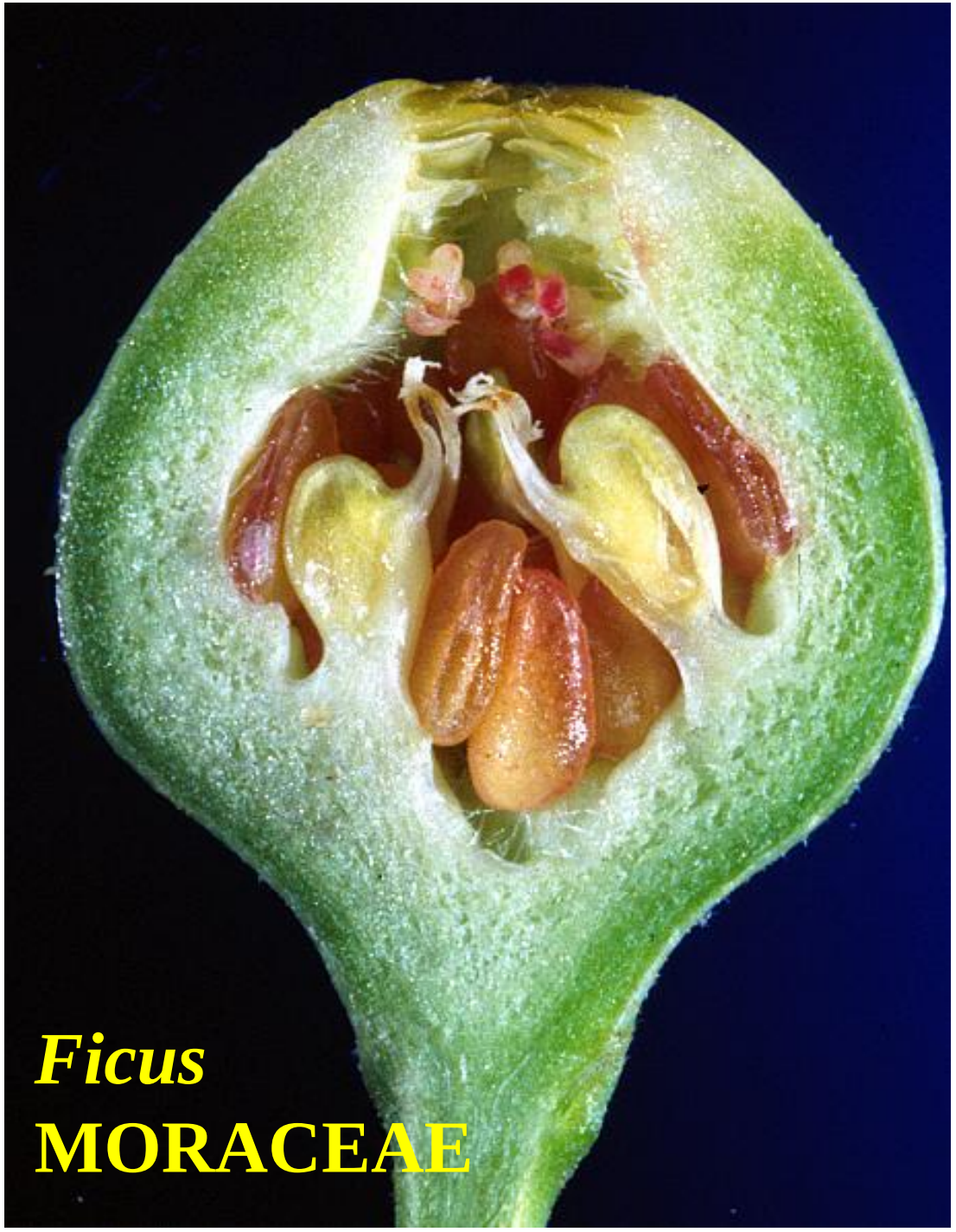
Interfloral phase – fig and wasp larval development taking 3 – 20 weeks.



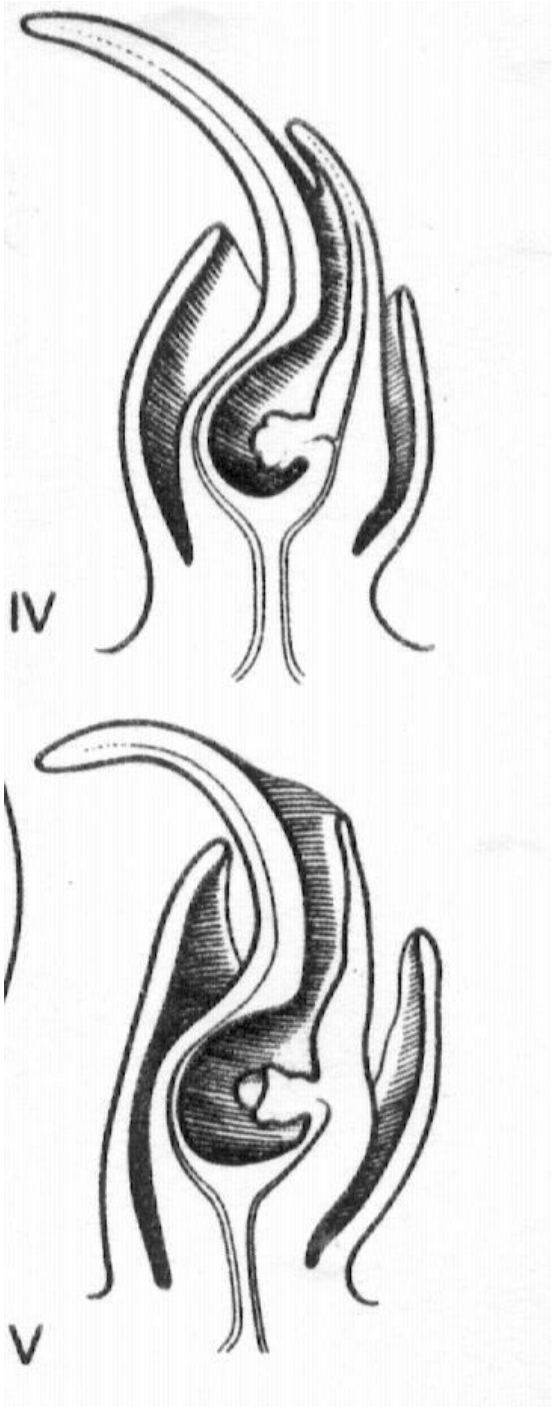
Pollinator ovipositing down style of floret inside fig and simultaneously placing pollen on the stigmas with her fore legs. She loses her wings and most of her antennae when negotiating the ostiole.

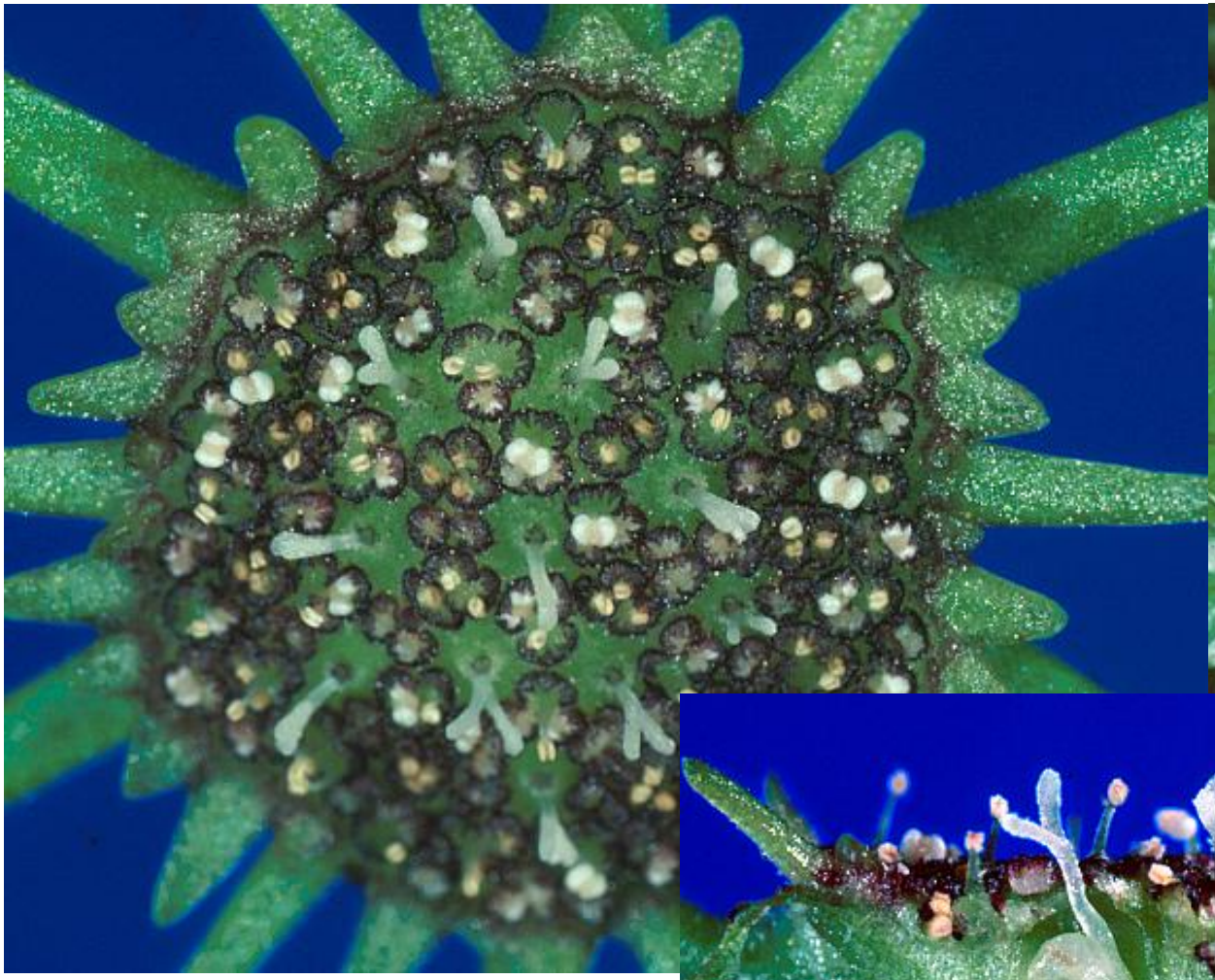


Otitesella (righ
two non-pollin
oviposit throug
interfloral phas
gall formers an
parasitoids of g

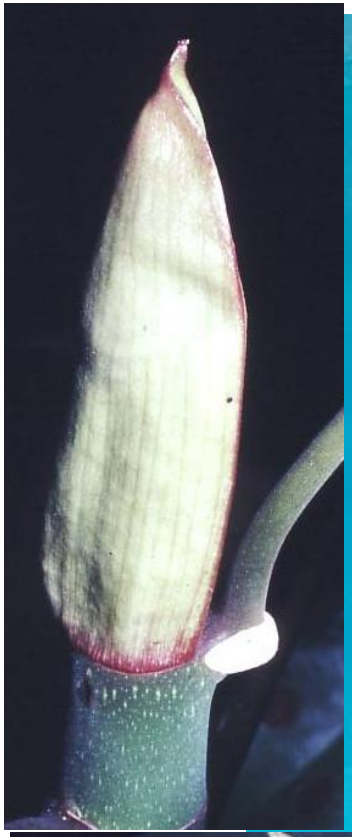


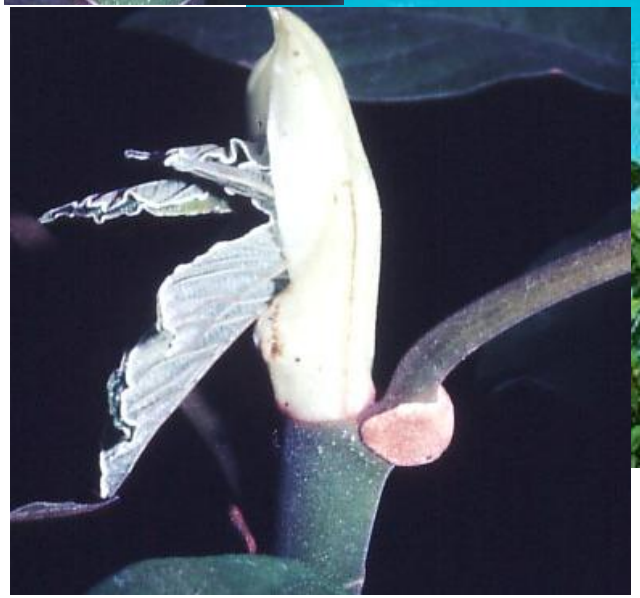
Ficus
MORACEAE



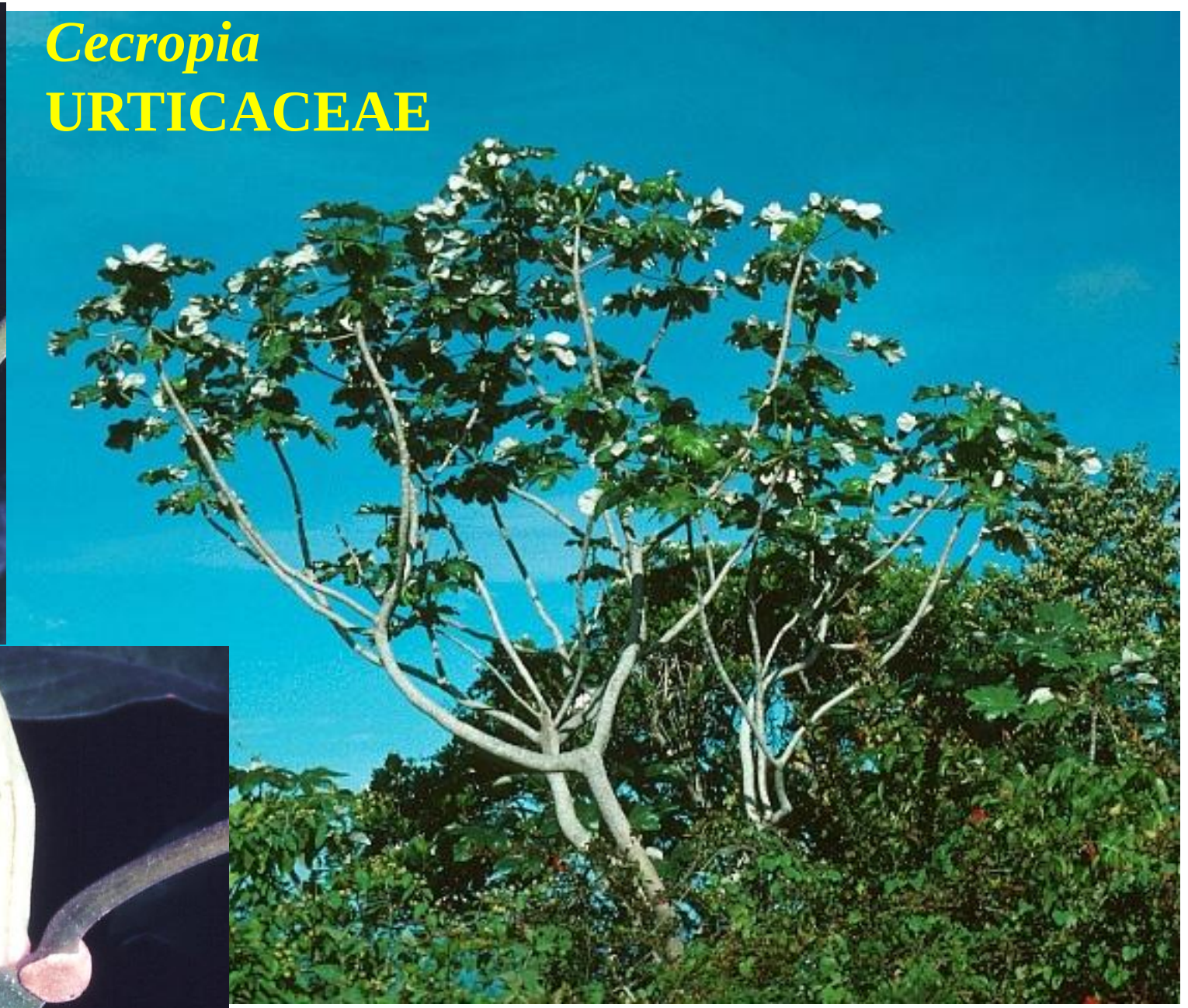


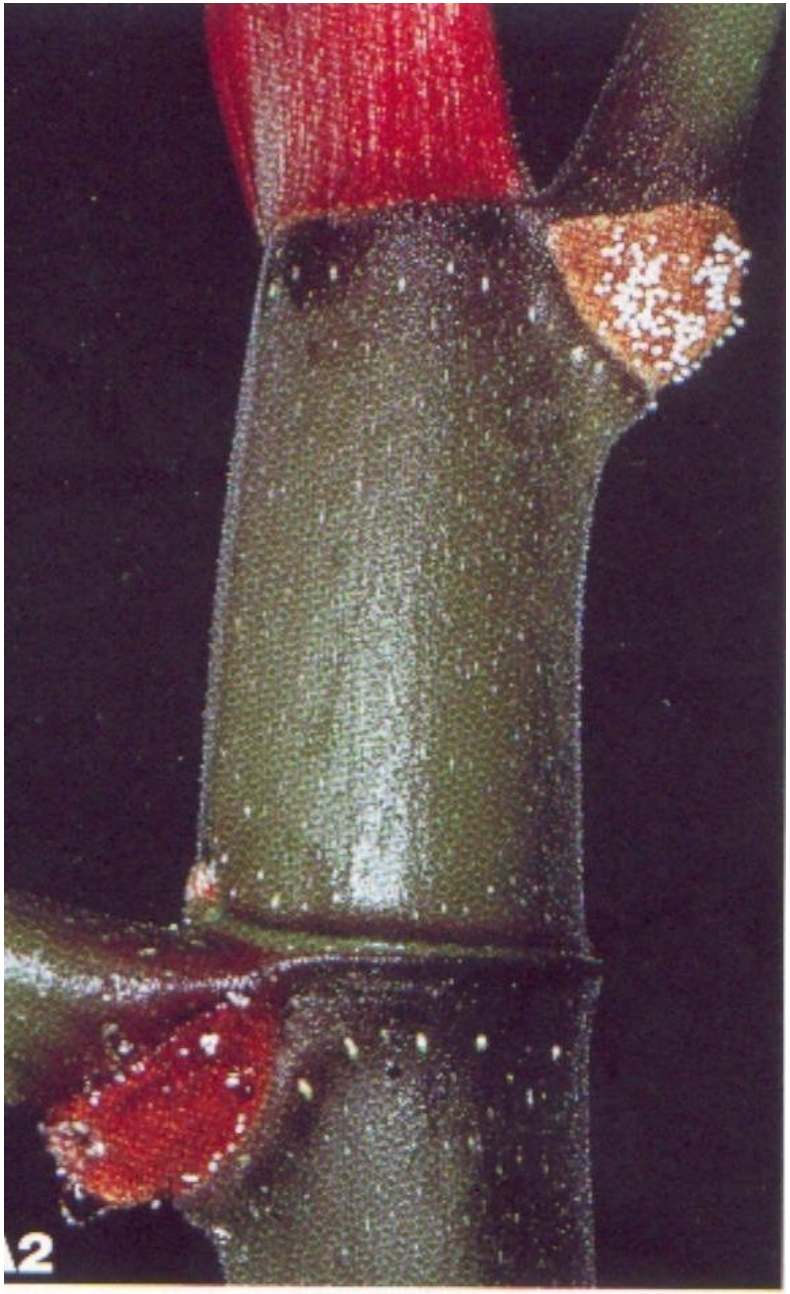
Dorstenia radiata
MORACEAE





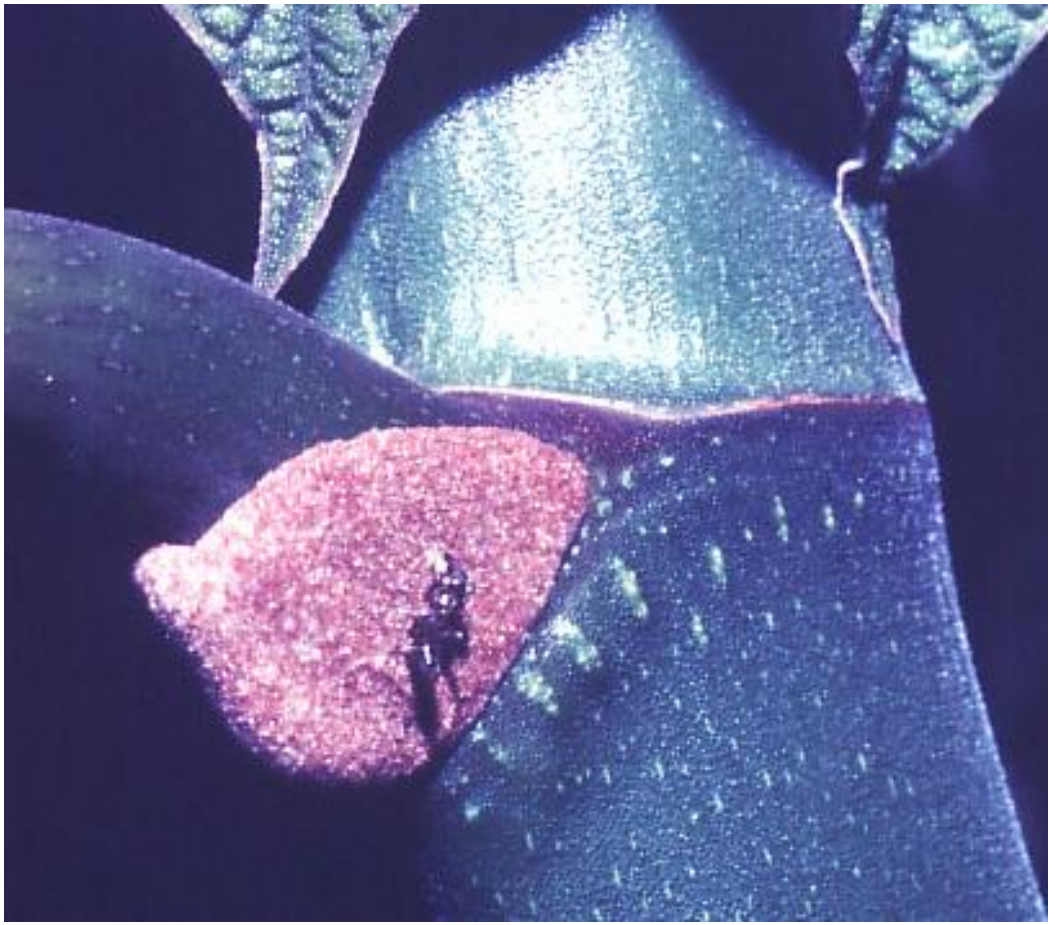
Cecropia
URTICACEAE





Cecropia pachystachya

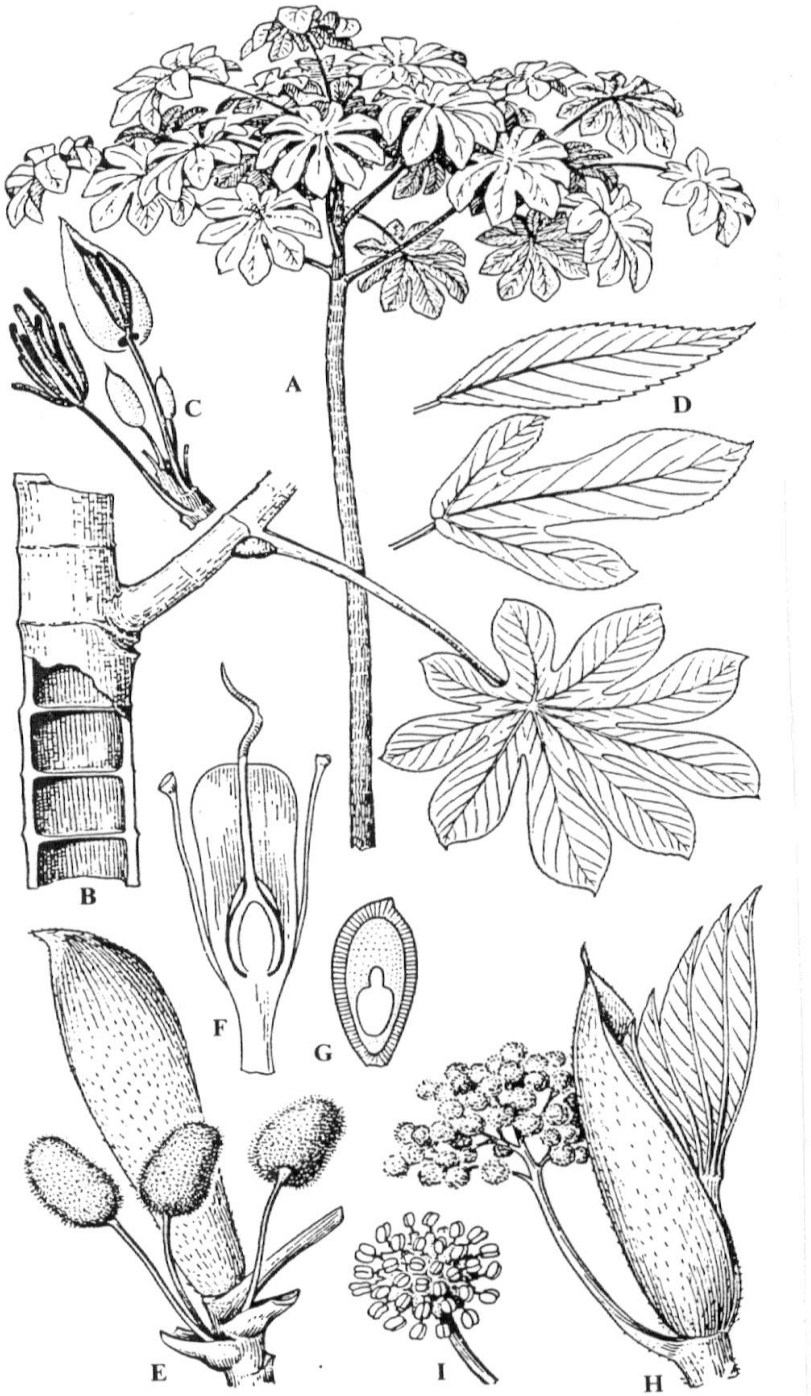
URTICACEAE



URTICACEAE

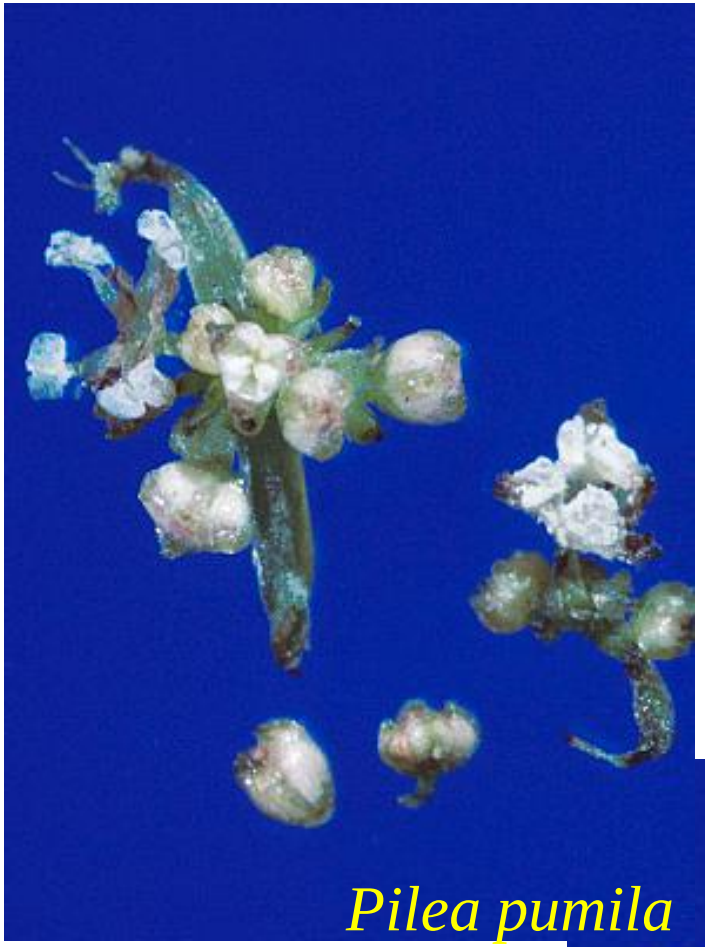
Cecropia (A-D)

Musanga (E-I)



Kubitzki et al. 1993

Pilea microphylla



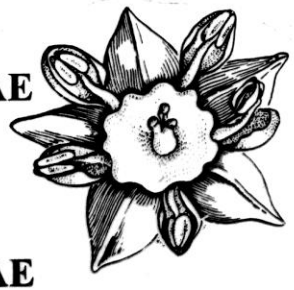
Pilea pumila

URTICACEAE
ROSALES

ROSALES

ROSACEAE

hipanto



RHAMNACEAE

haplostemonia

ULMACEAE

CANNABACEAE

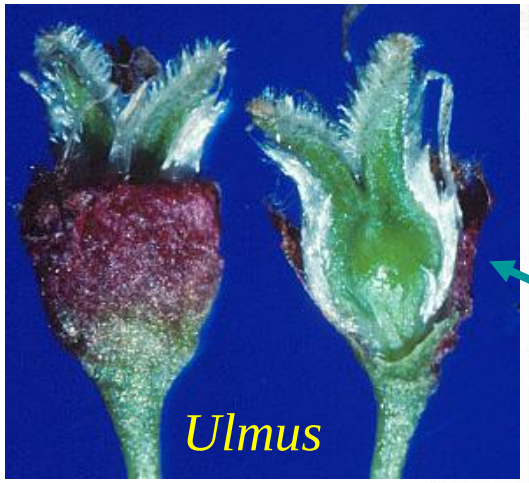
cistólitos, pólen porado

MORACEAE

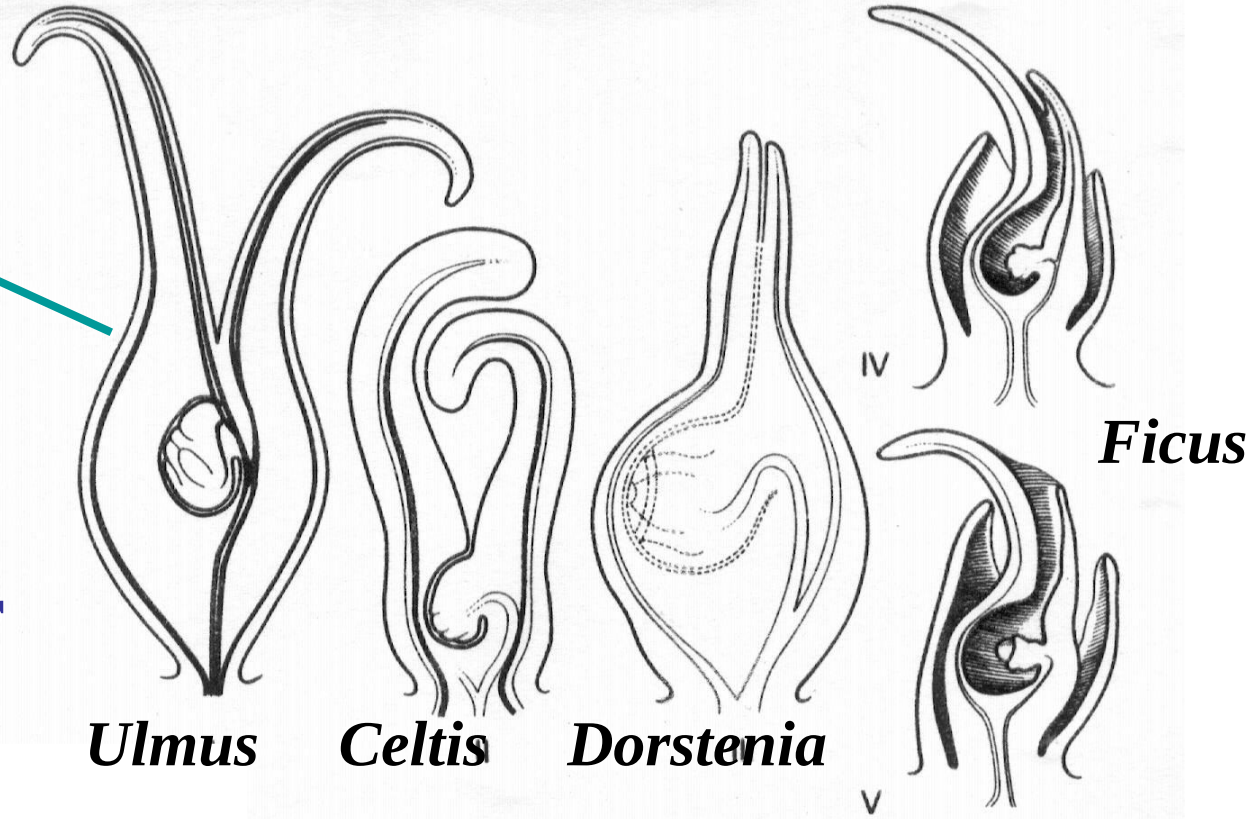
perda de hipanto

laticíferos

URTICACEAE

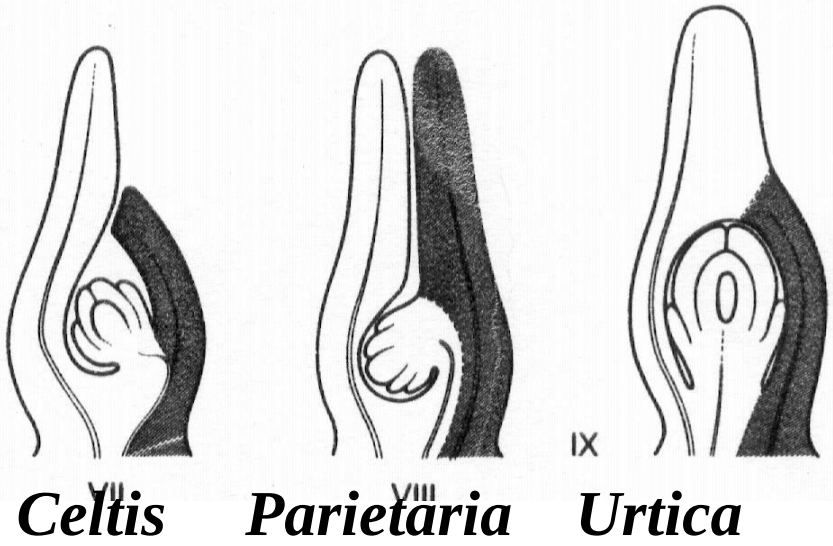


Gineceu bicarpelar



Gineceu pseudomonômero

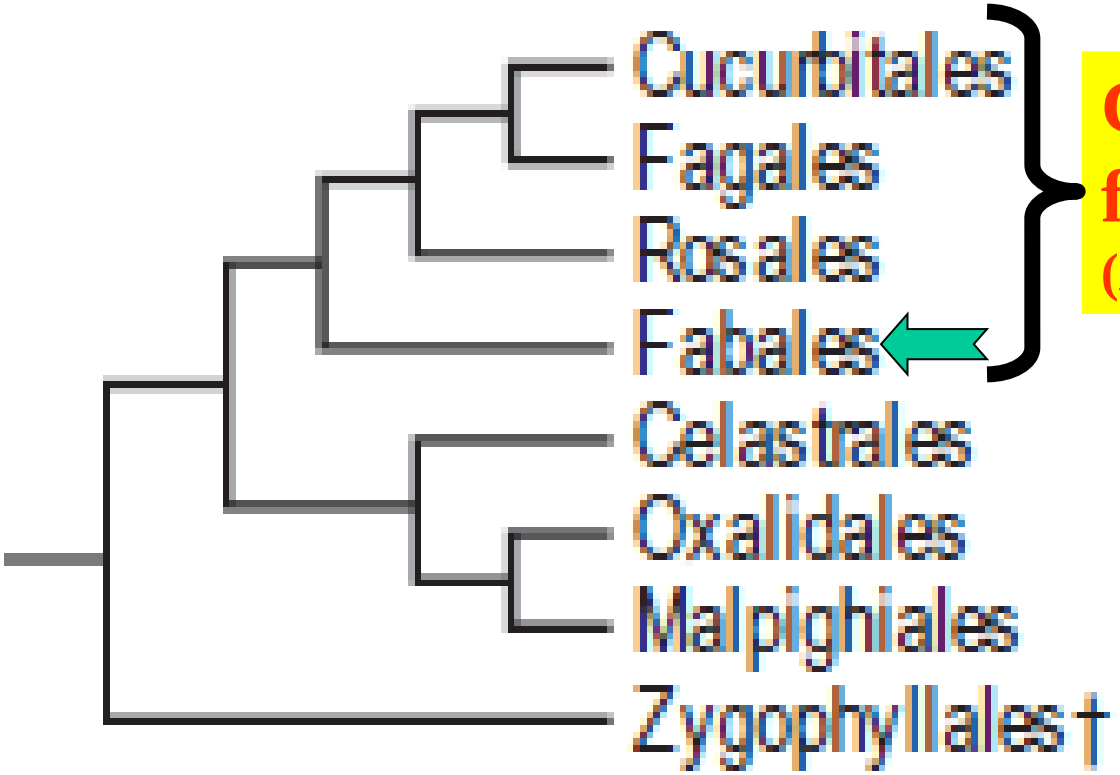
clado urticóide



ROSÍDEAS FABÍDEAS

8 ordens/ c. 76 famílias

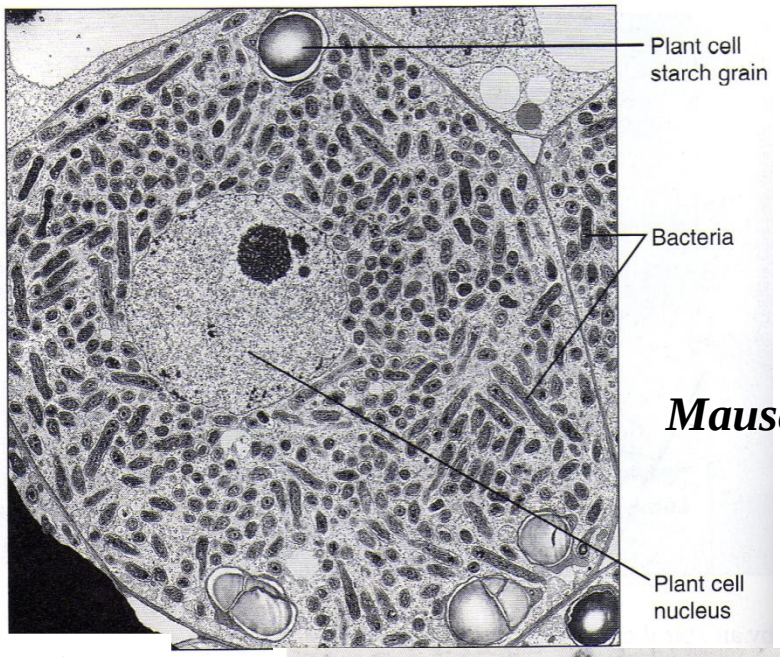
Sinapomorfias macromoleculares!



Clado fixador de N2
(*Frankia* ou *Rhizobium*)

Nódulos radiculares - fixação de N2 (*Frankia* ou *Rhizobium*)

alfafa - *Medicago*



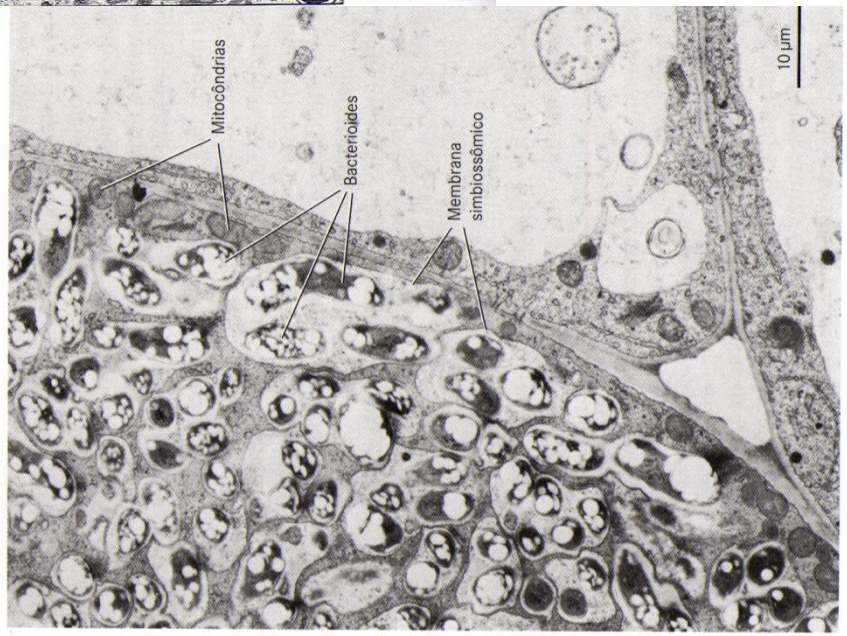
Mauseth 1995

Vigna

Lotus

soja *Glycine* - simbiossomos com bacterióides formados a partir dos rizóbios

(Brezinsky et al. 2012)



FABALES

4 famílias { **Fabaceae** **Polygalaceae** **Surianaceae** **Quilajaceae**

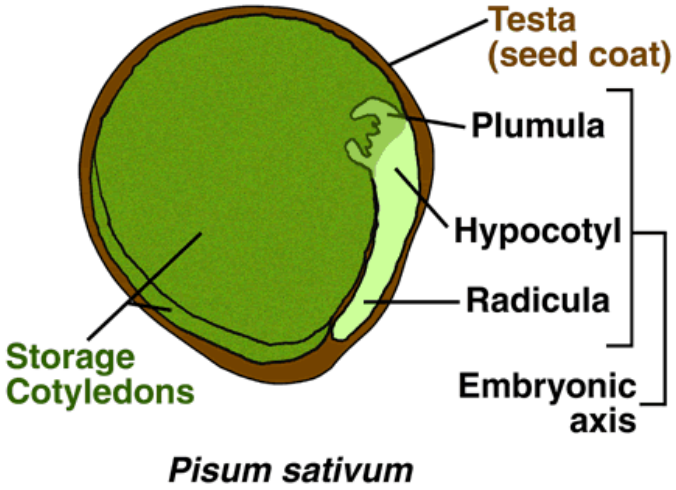
ca. 20.000 spp.

- *rbc*L

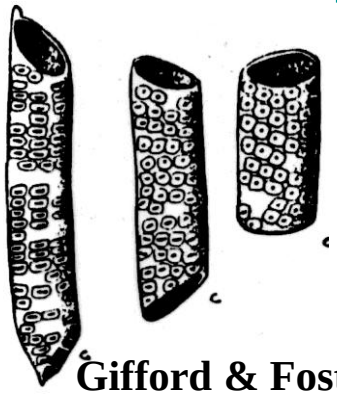
- Embrião verde e grande

- Pontoações guarnecidas

- Placa de perfuração simples



Pisum sativum



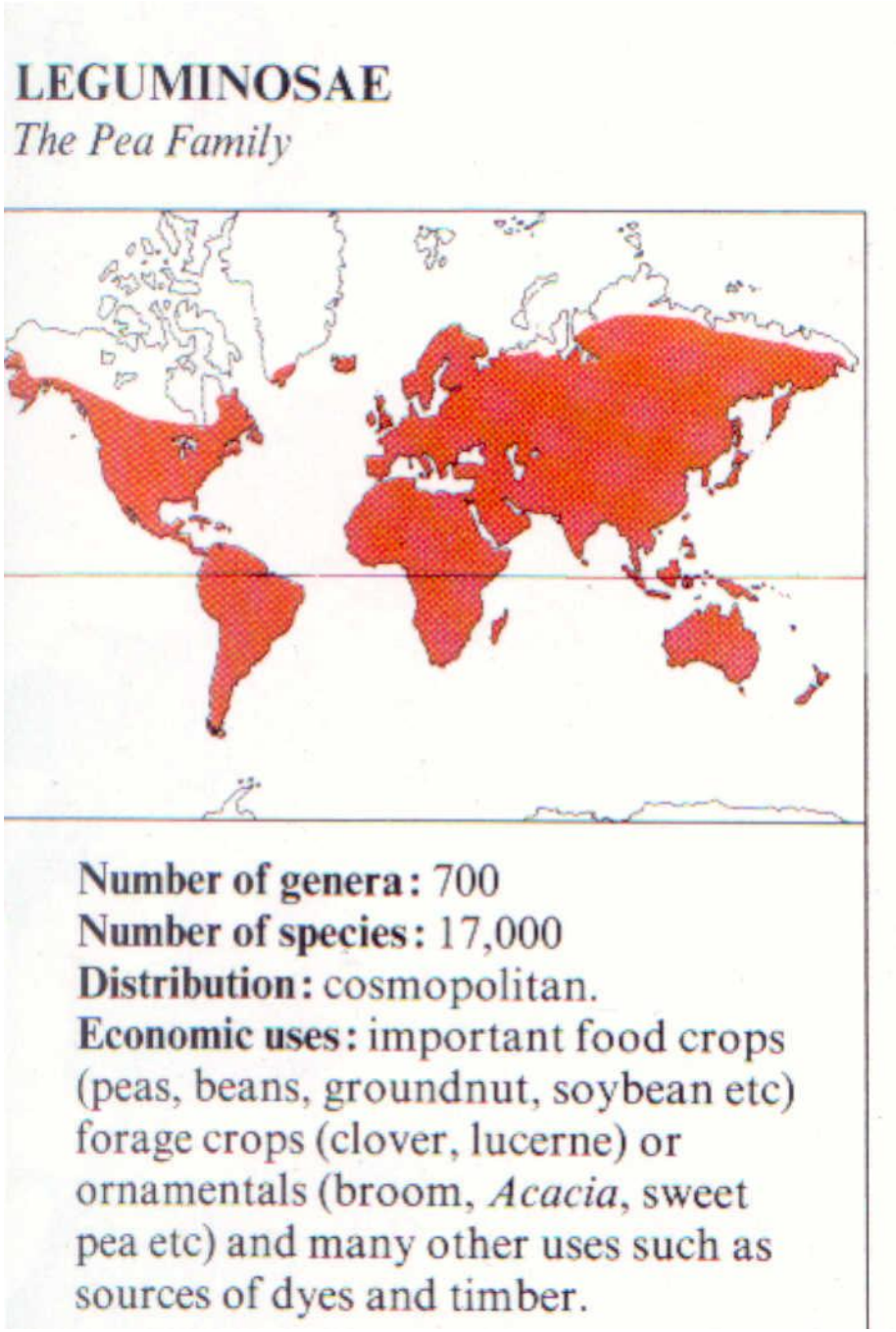
Gifford & Foster 1996

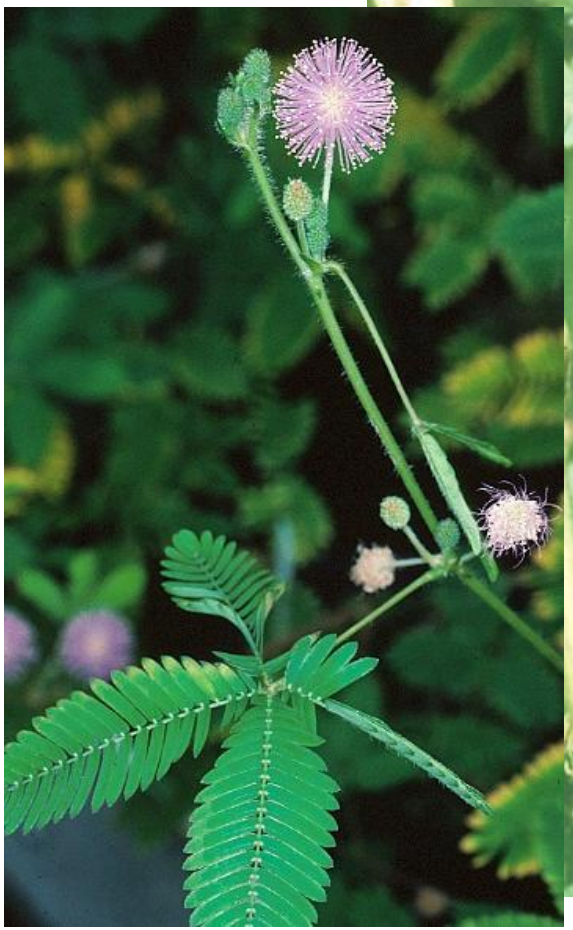
Swartzia apetala

FABALES

FABACEAE ou LEGUMINOSAE

19.400 spp.





FABACEAE
ou
LEGUMINOSAE

Folhas compostas

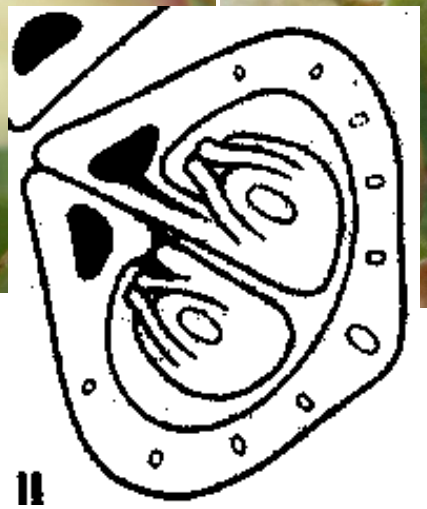
Pulvinos

Mimosa pudica


Bauhinia

jatobá

Hymenaea stigonocarpa

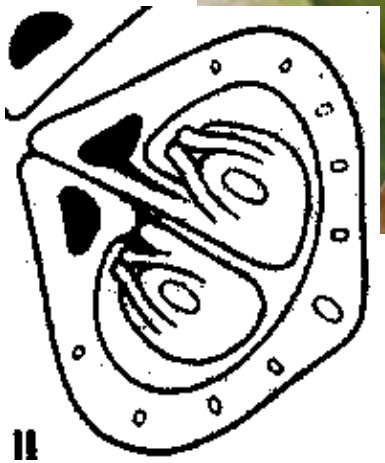


LEGUMINOSAE

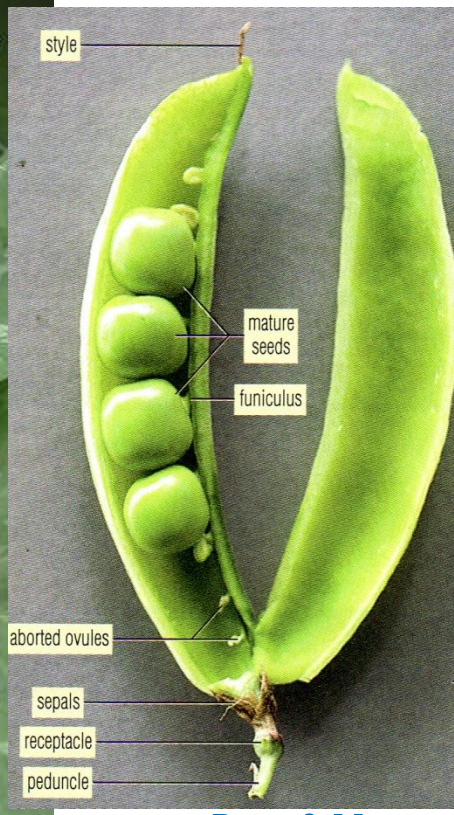
FABACEAE ou LEGUMINOSAE

Rosídeas

jatobá
Hymenaea



LEGUME



Perry & Morton 1996

ervilha ***Pisum sativum***

FABACEAE - “CAESALPINIOIDEAE” (2.200 spp.)

prefloração imbricada ascendente

FABACEAE
CAESALPINIOIDEAE

Caesalpinia pluviosa

Caesalpinia echinata

Senna

Chamaecrista

Cassia

FABACEAE
CAESALPINIOIDEAE

Delonix regia

FABACEAE MIMOSOIDEAE

Mimosa

FABACEAE MIMOSOIDEAE

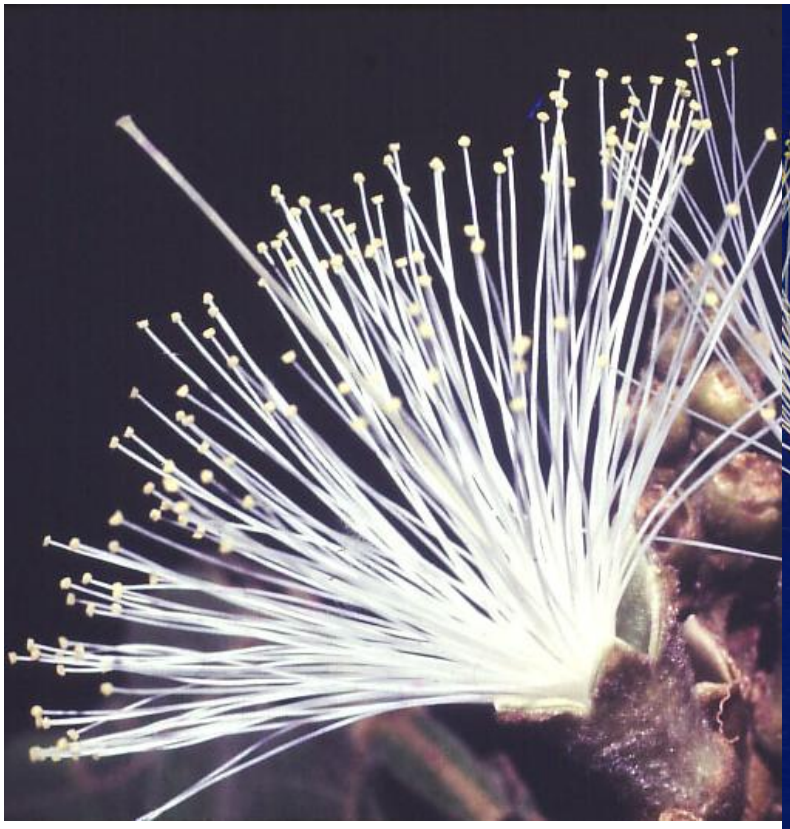
3.000 spp.

Mimosa foliolosa

Albizzia julibrissin

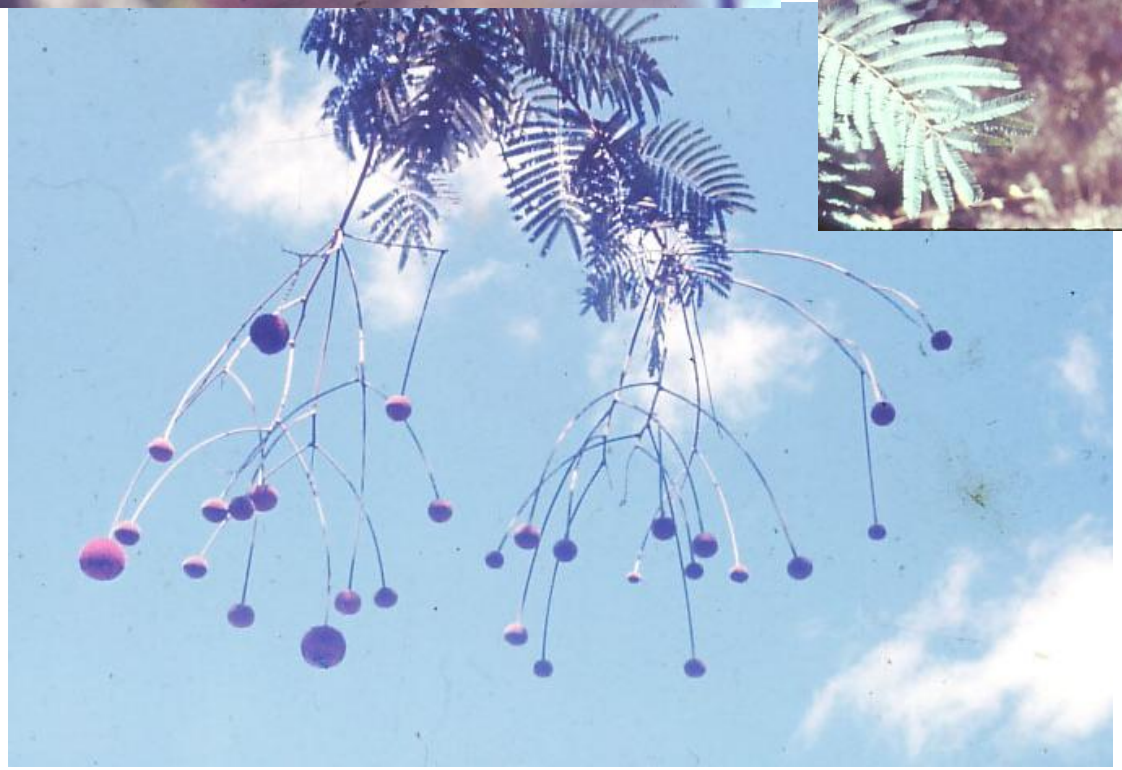
FABACEAE
MIMOSOIDEAE

Albizzia julibrissin



Inga

Leguminosae
MIMOSOIDEAE

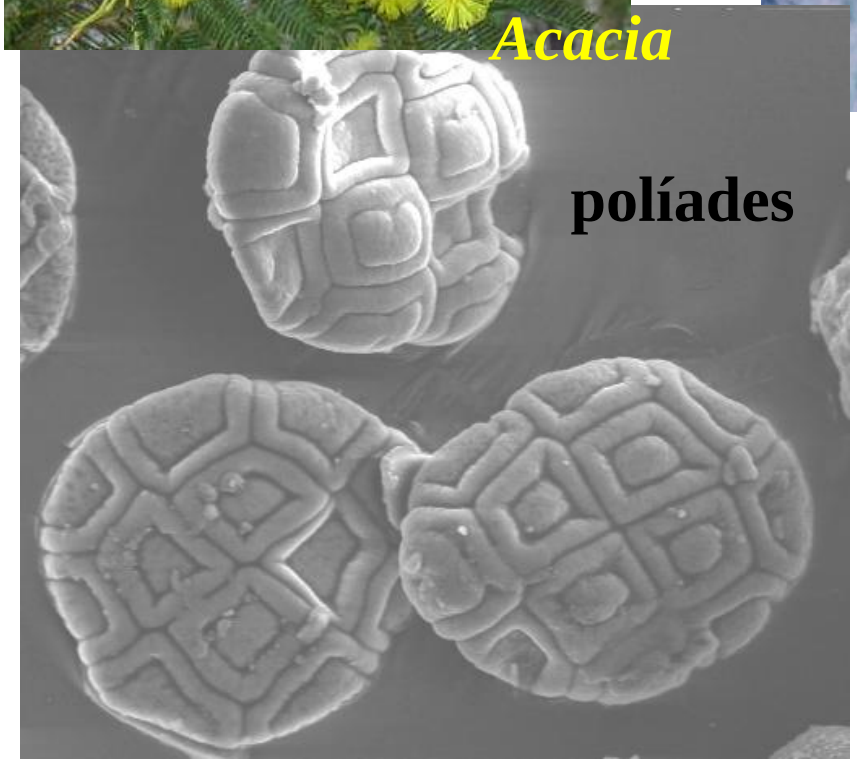


Parkia

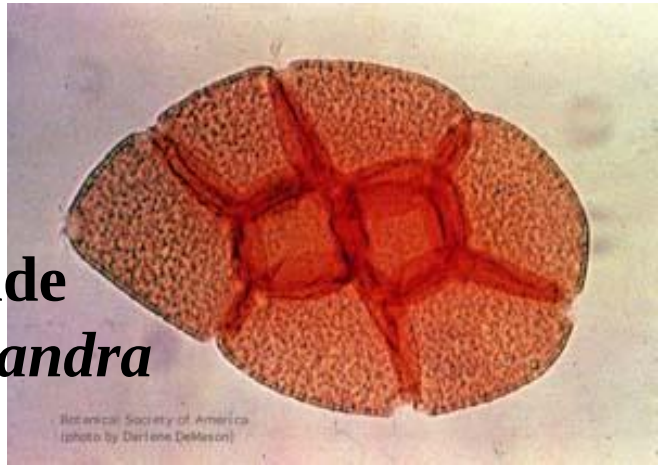
FABACEAE
MIMOSOIDEAE

Acacia

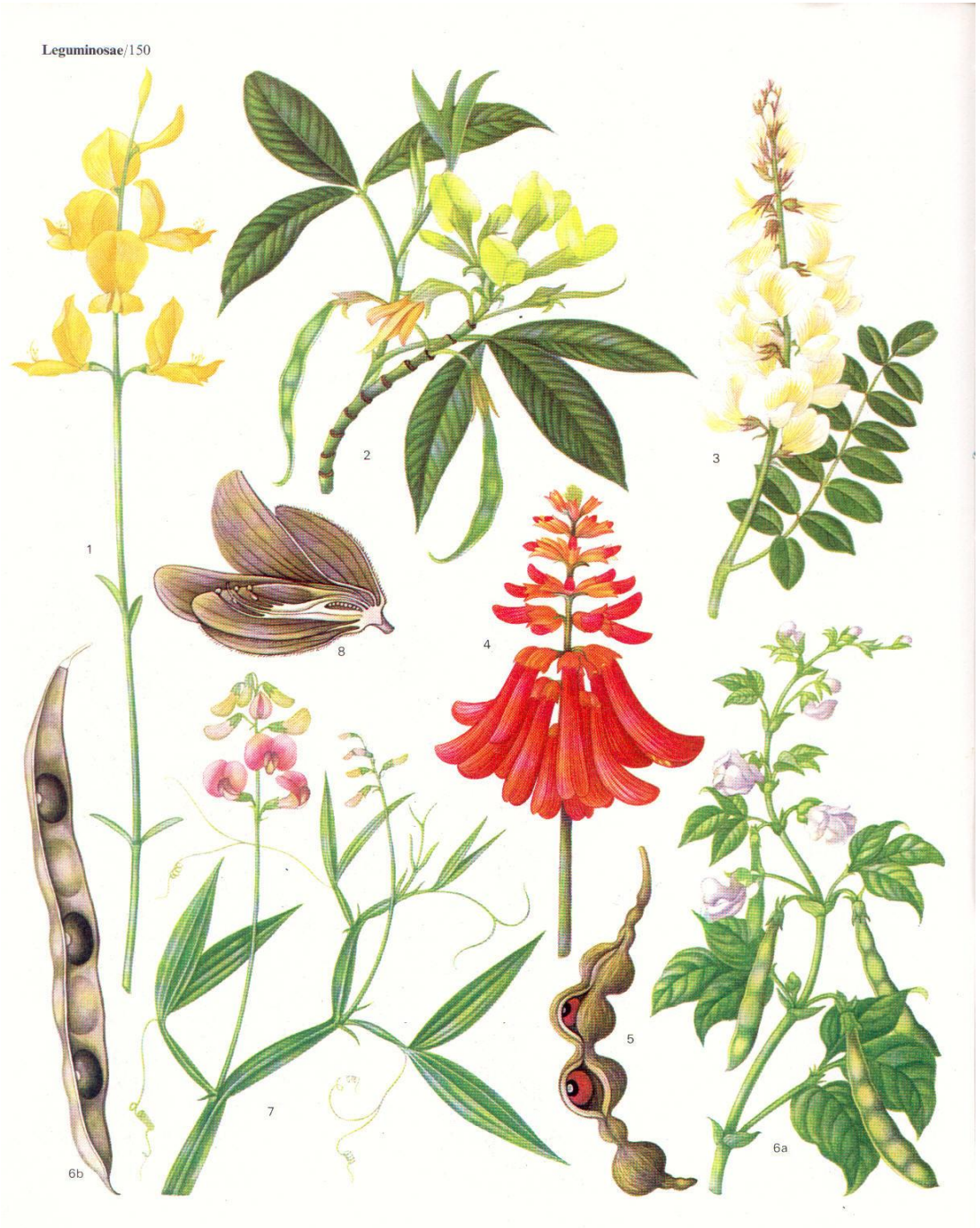
Piptadenia



políades



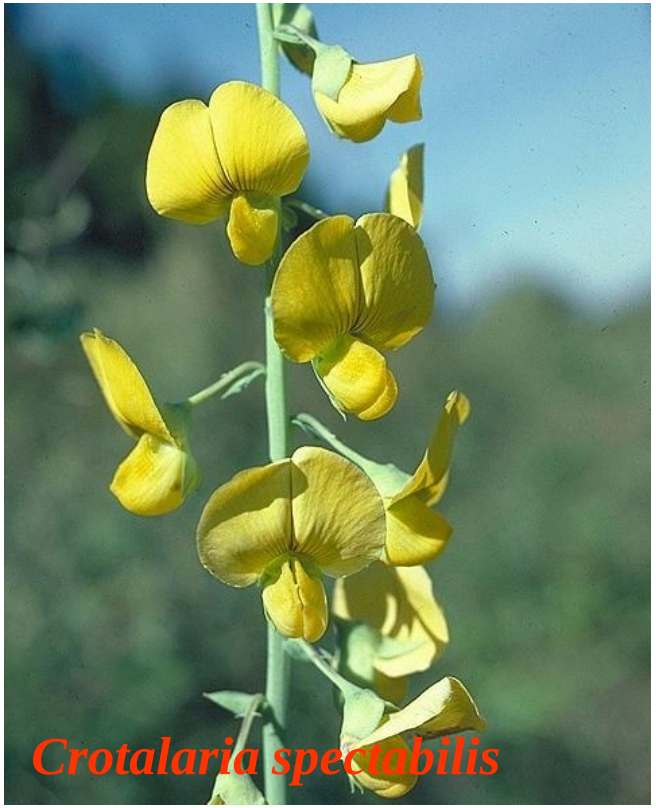
políade
Calliandra



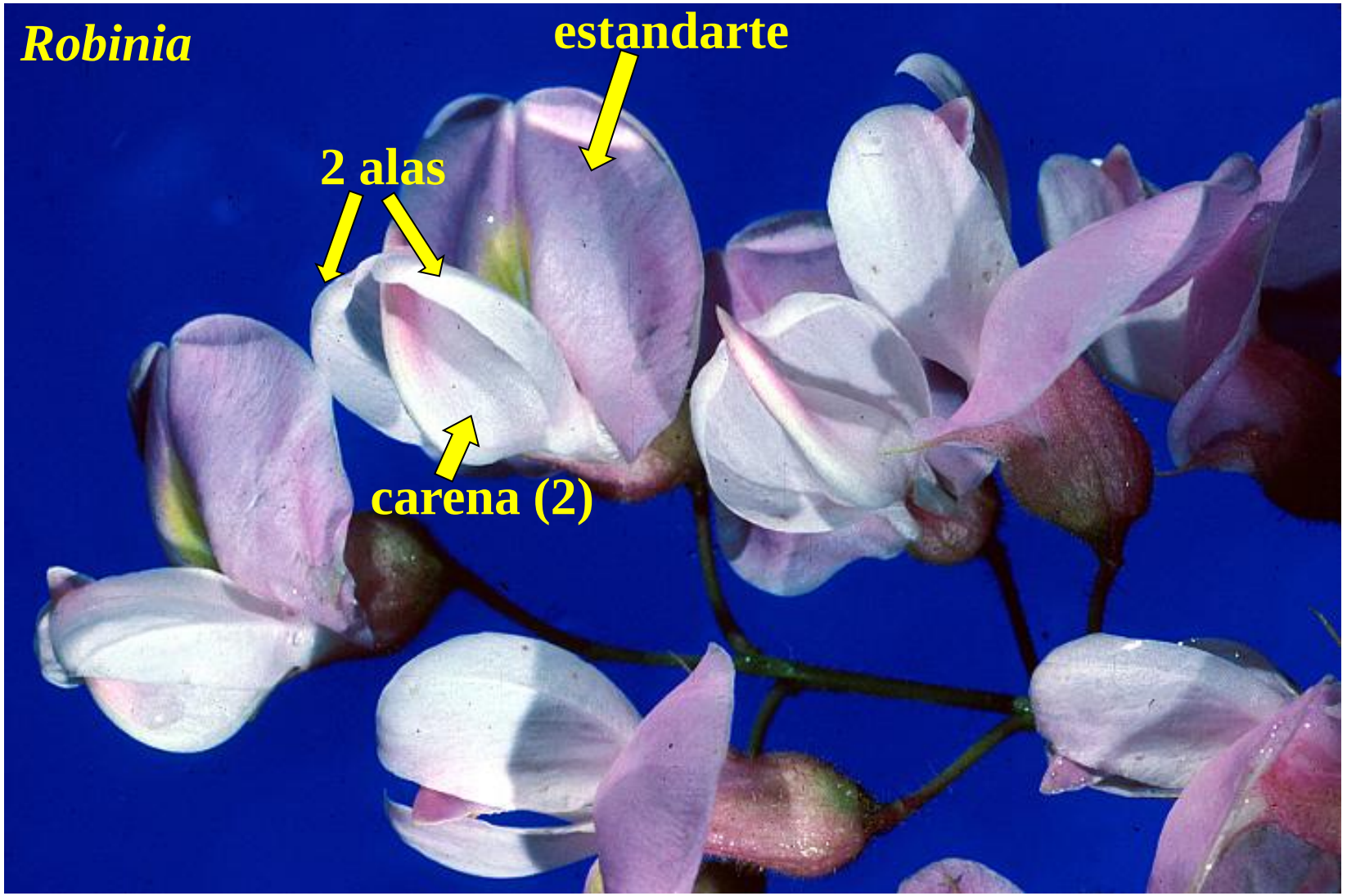
FABACEAE

PAPILIONOIDEAE ou FABOIDEAE

12.000 spp.



FABACEAE PAPILIONOIDEAE ou FABOIDEAE




Collaea

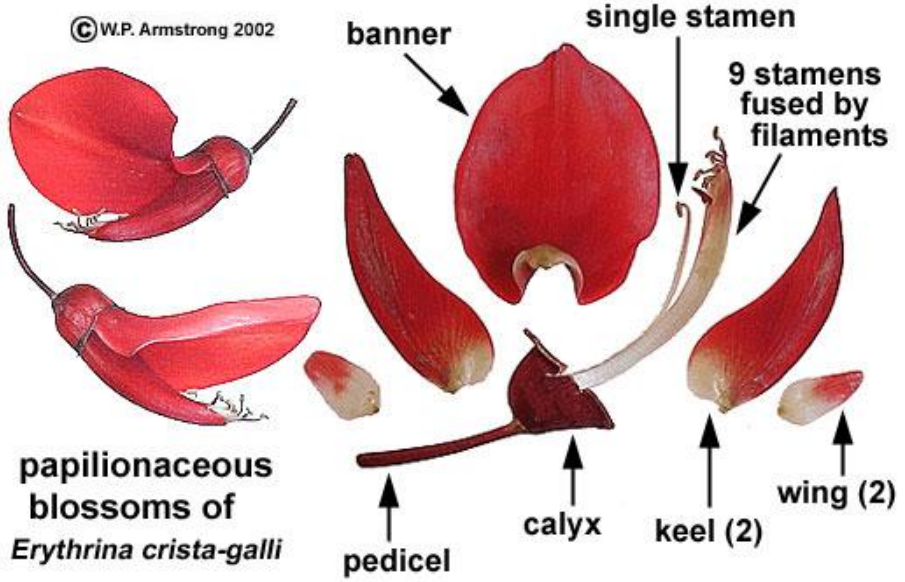

Erythrina


Mucuna

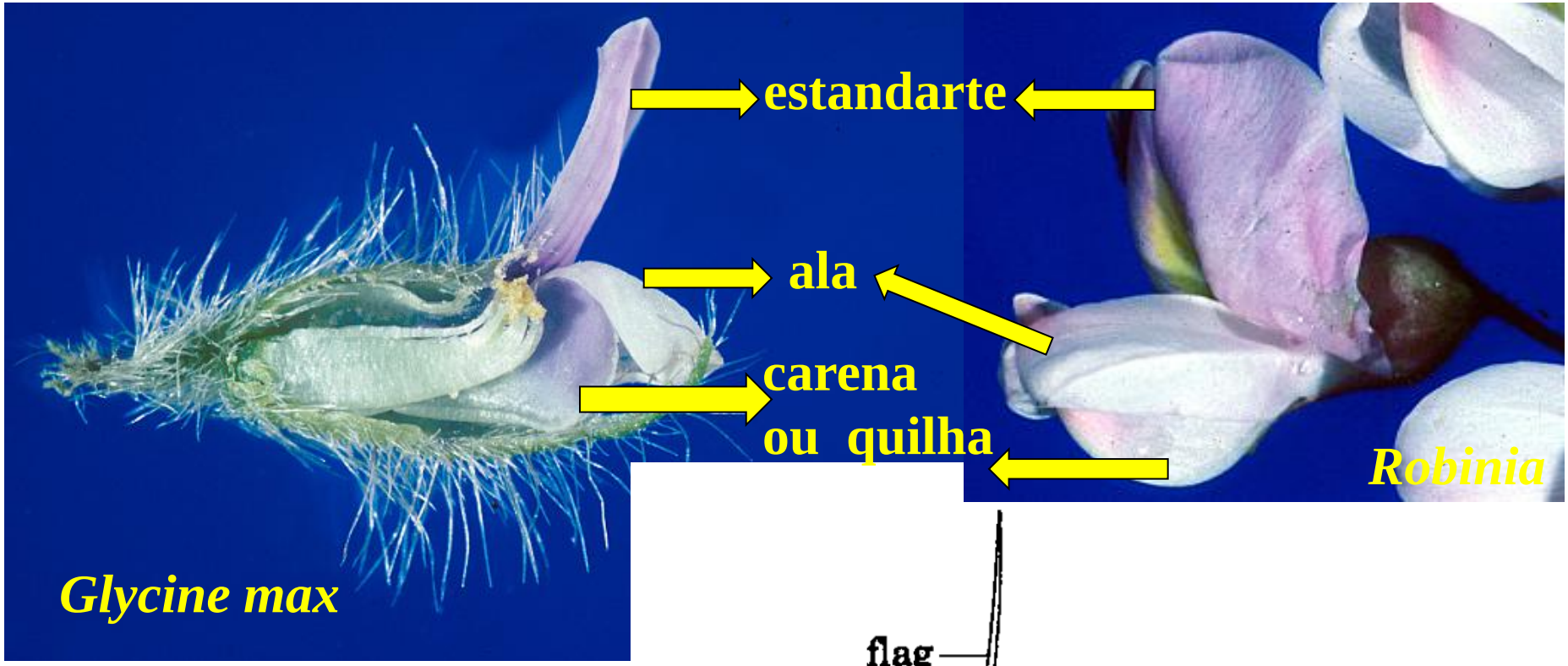
Centrosema

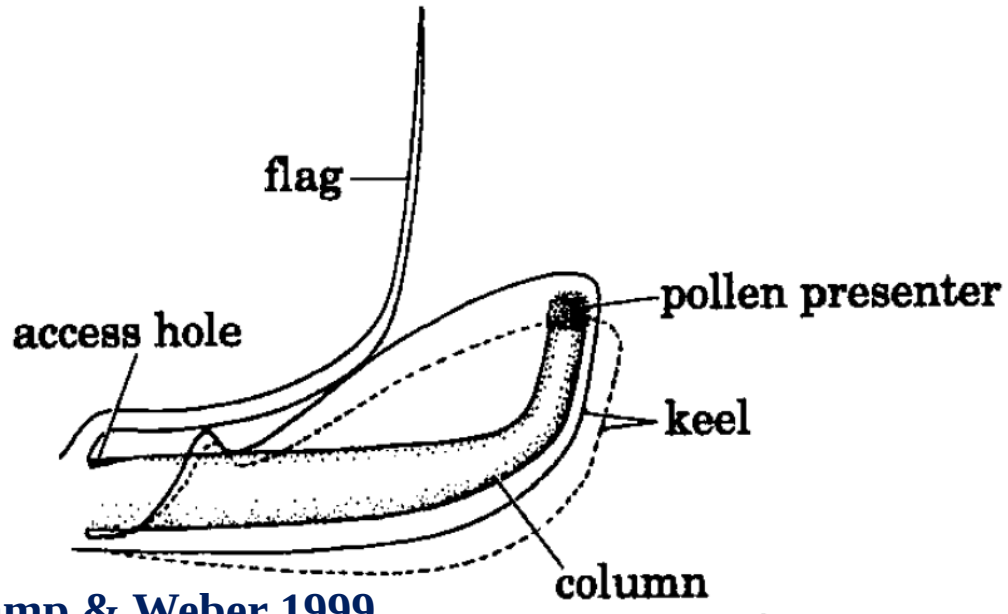

Erythrina
1 cm


Camptosema


©W.P. Armstrong 2002
banner
single stamen
9 stamens fused by filaments
papilionaceous blossoms of *Erythrina crista-galli*
pedicel
calyx
keel (2)
wing (2)

FABACEAE PAPILIONOIDEAE ou FABOIDEAE



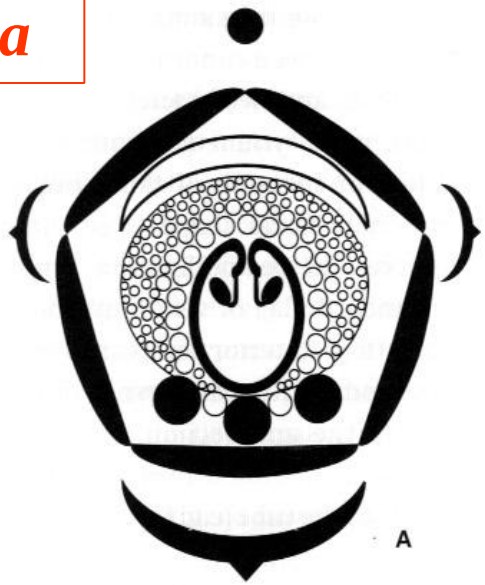


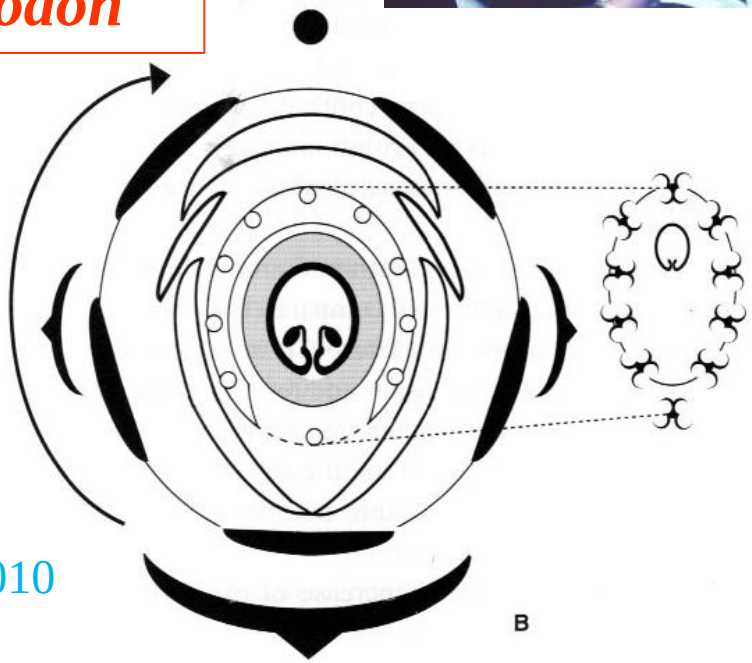
Westerkamp & Weber 1999

FABACEAE - PAPILONOIDEAE

Swartzia

Strongylodon

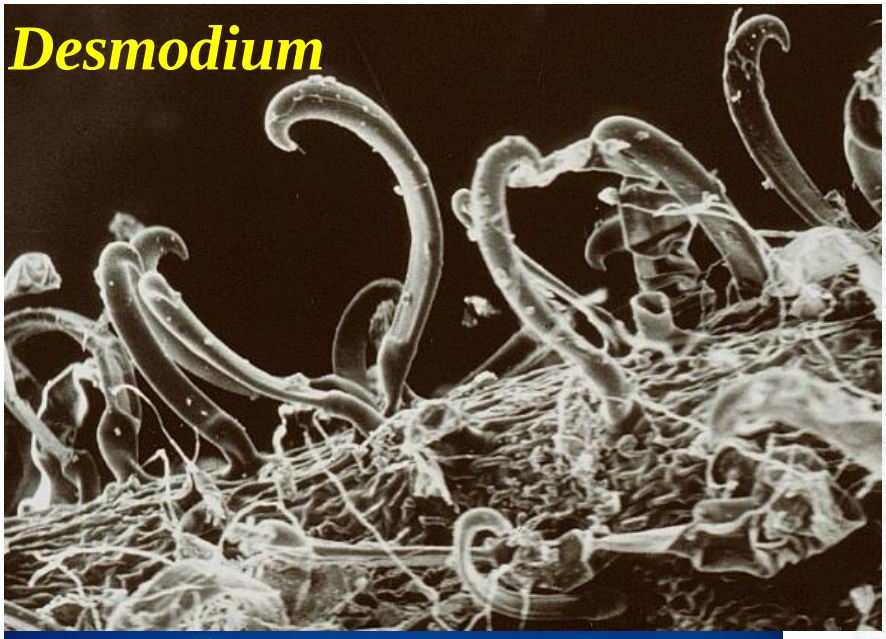




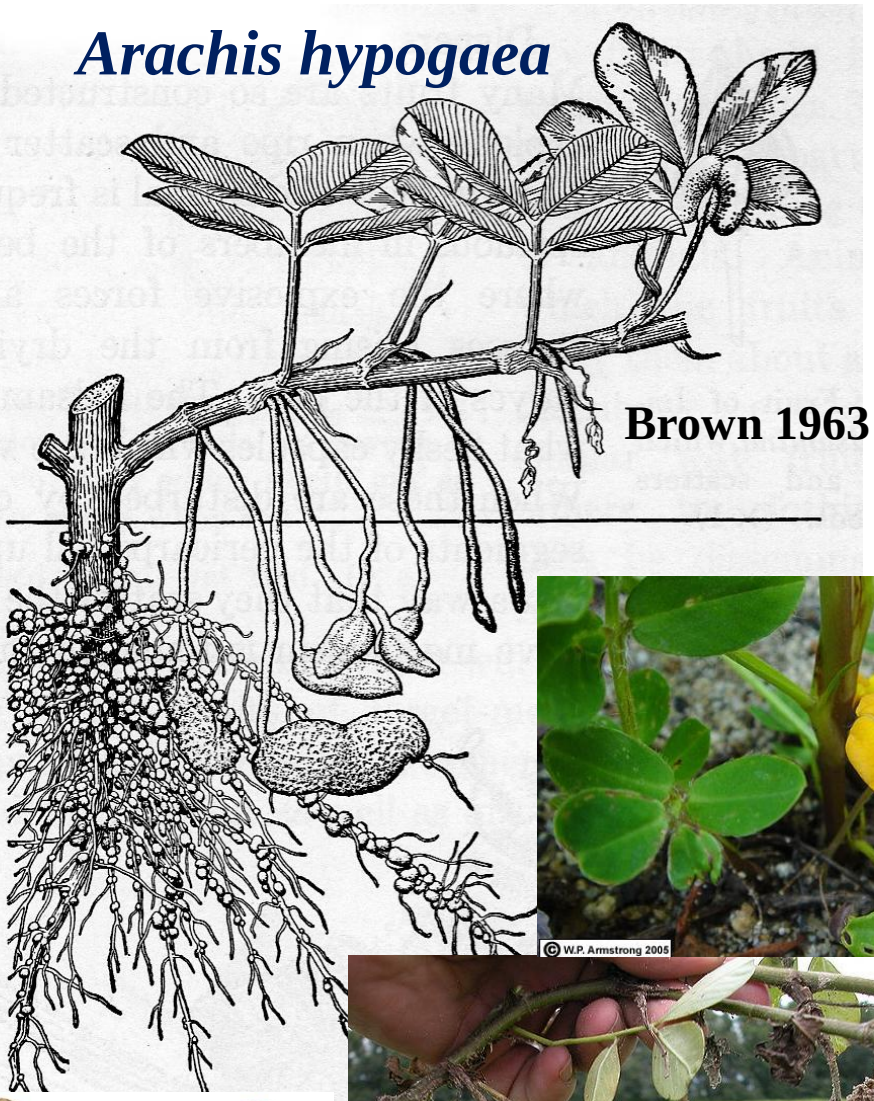
Ronse De Craene 2010

FABACEAE

frutos

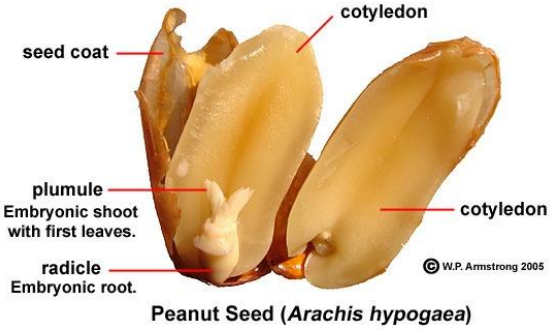

Desmodium


Plant Systematics


Arachis hypogaea
Brown 1963

© W.P. Armstrong 2005


Wikipedia


cotyledon
seed coat
plumule
Embryonic shoot
with first leaves.
cotyledon
radicle
Embryonic root.
© W.P. Armstrong 2005
Peanut Seed (Arachis hypogaea)


Armstrong 2005
© W.P. Armstrong 2005

FABACEAE

pólen

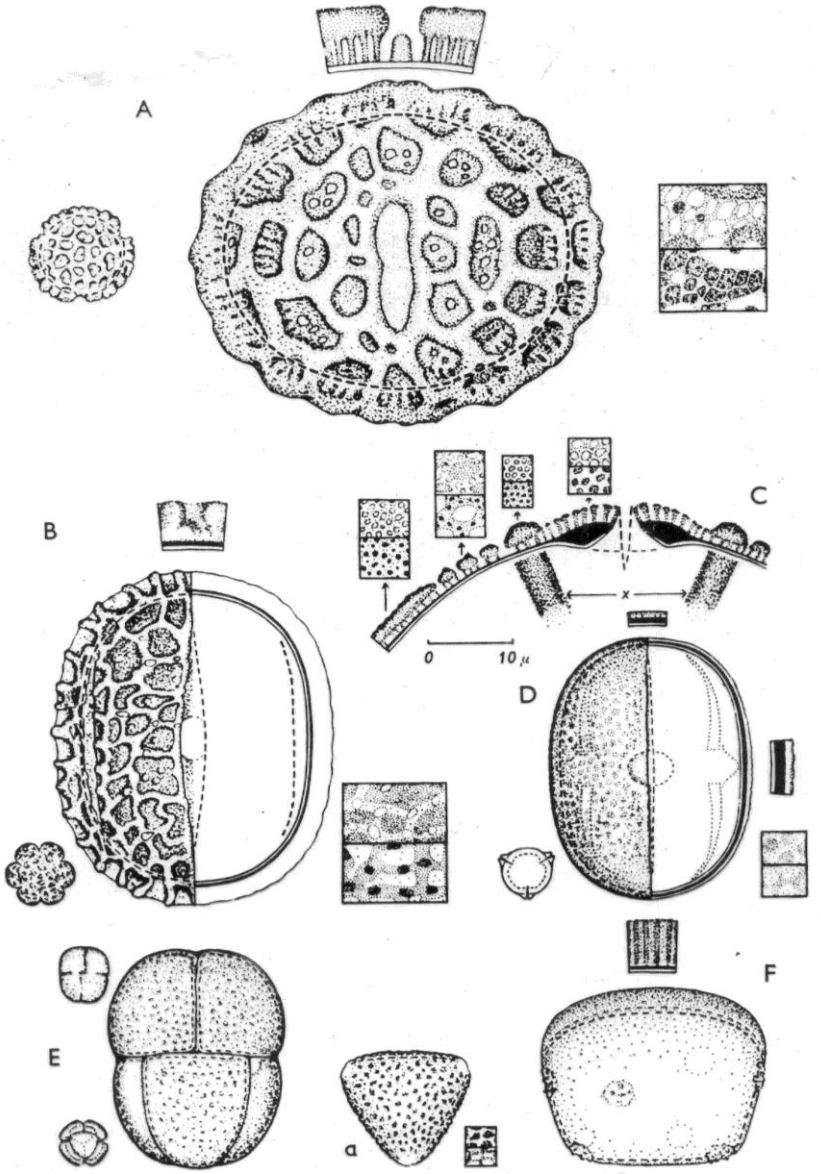


Fig. 135. LEGUMINOSAE. A, *Aprevalia floribunda*. B, *Afzelia quanzensis*. C, *Mezoneuron kauaiense*. D, *Lathyrus vernus*. E, *Gagnebina commersoniana*; a, monad. F, *Inga leptoloba*.

Erdtman 1954

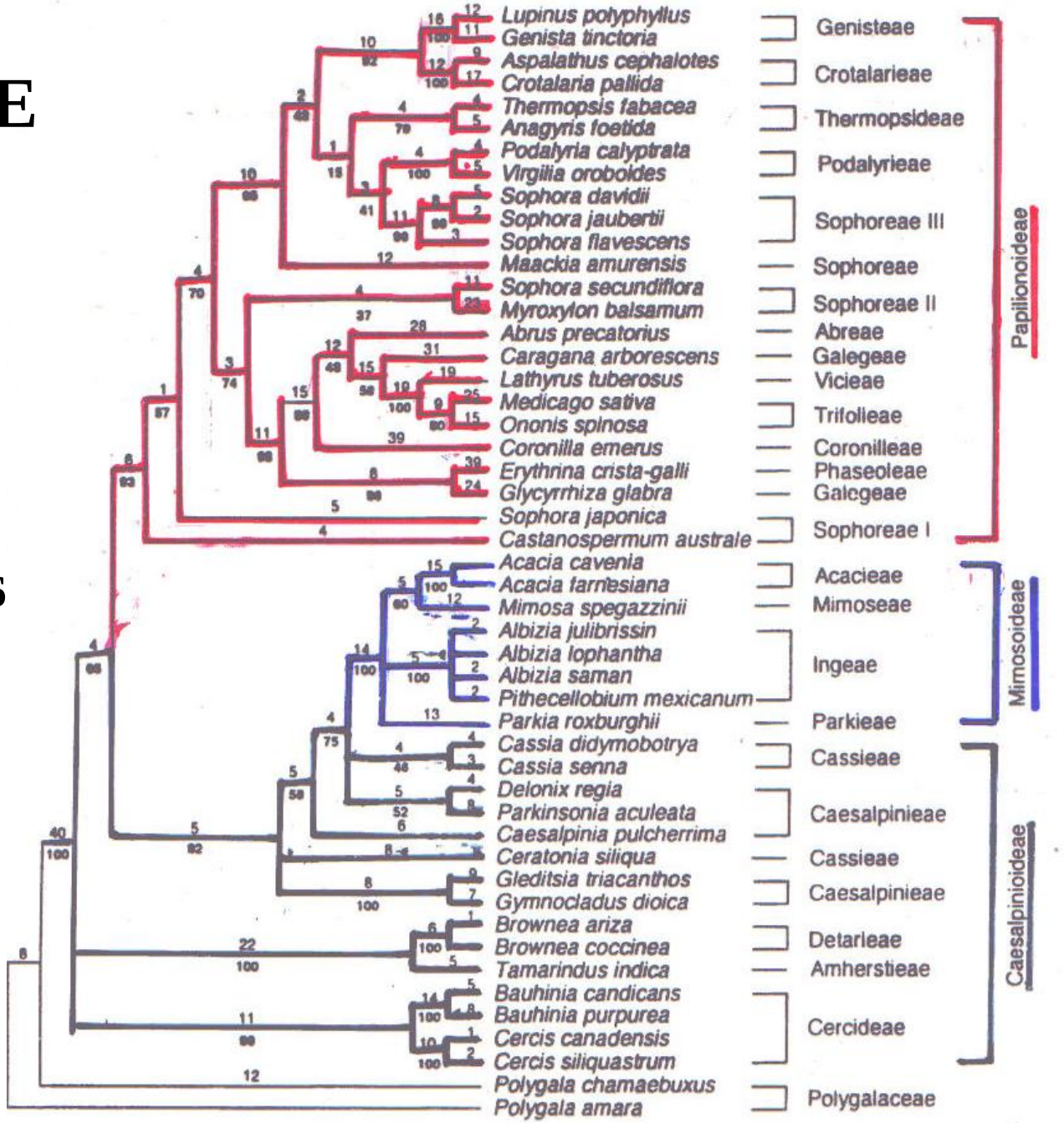

Albizzia
Cassia
Abrus

FABACEAE

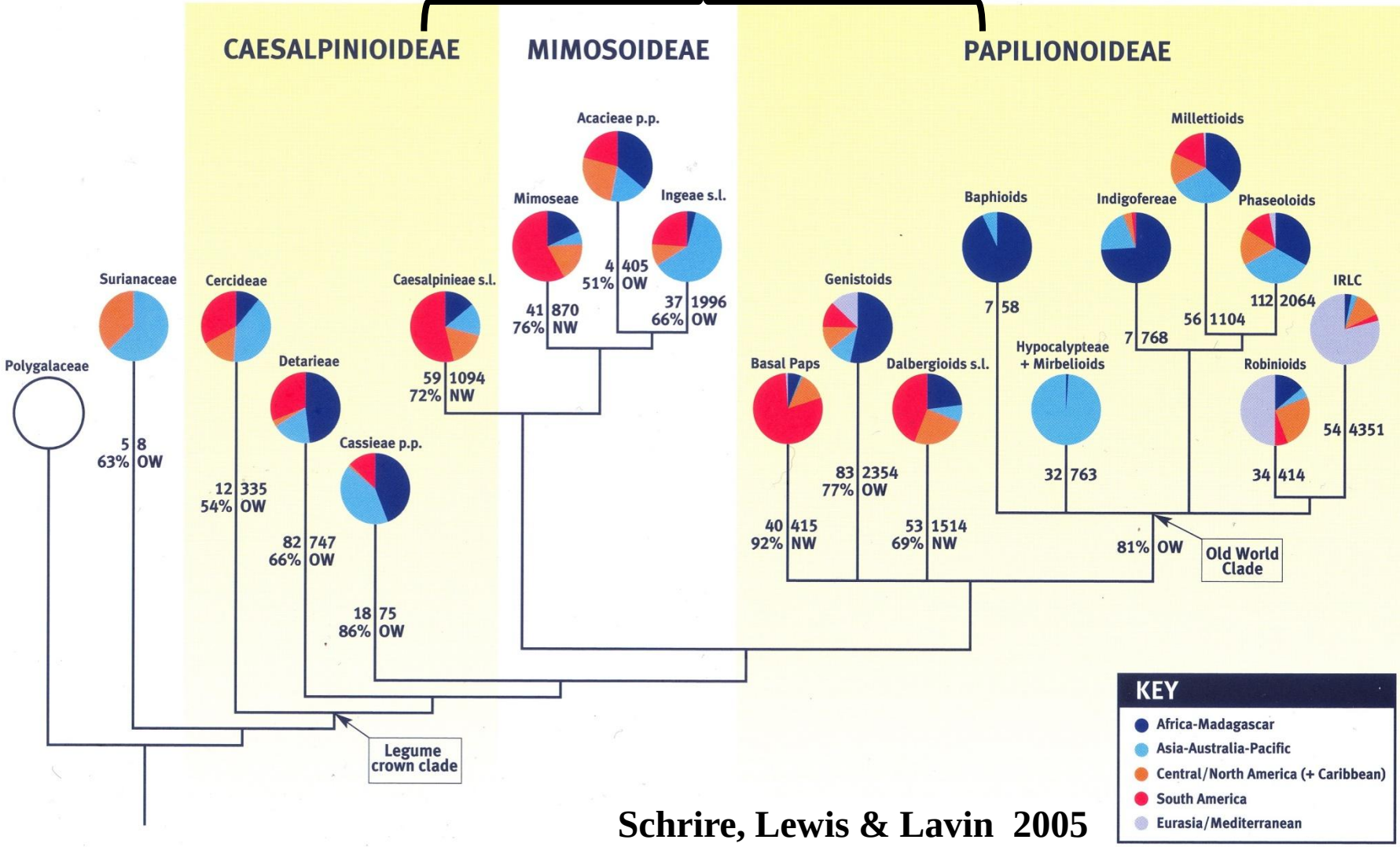
Filogenia

*rbc*L

Kass & Wink 1996



Filogenia - Leguminosae



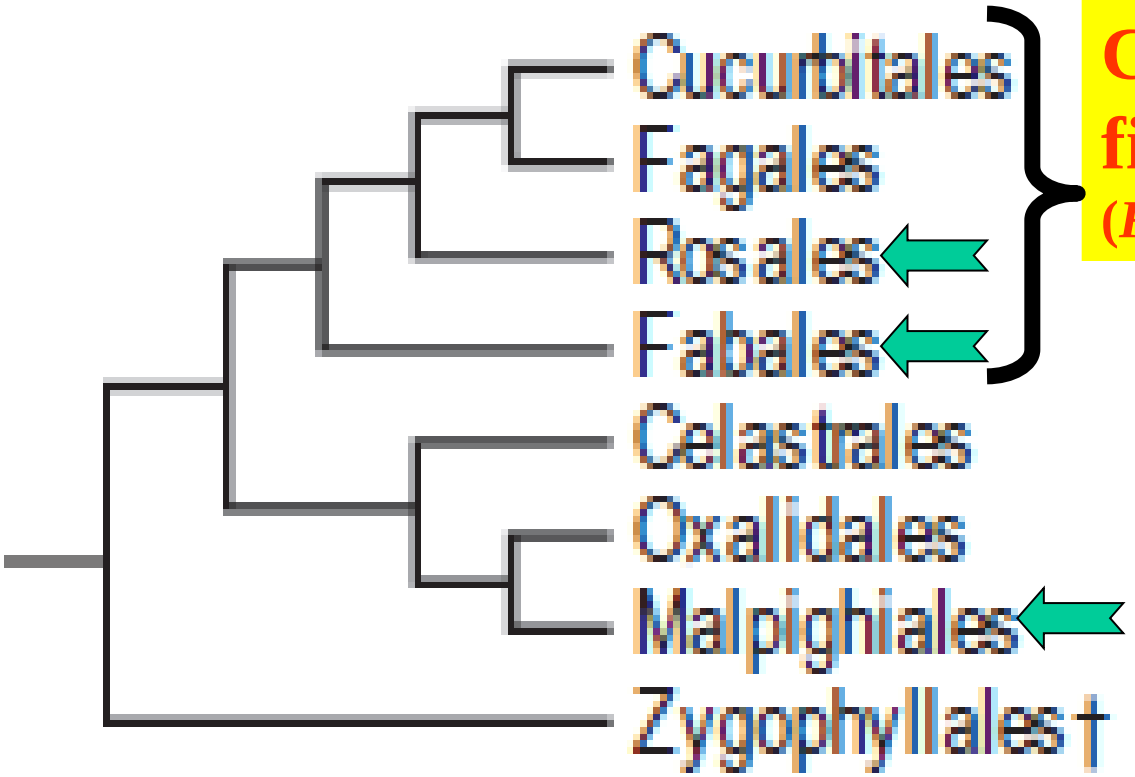
Schrire, Lewis & Lavin 2005

FIG. 3 **Simplified phylogeny of Leguminosae based on Doyle *et al.* (2000); Bruneau *et al.* (2000; 2001); Pennington *et al.* (2001); Kajita *et al.* (2001); Luckow *et al.* (2000; 2003); Fougère-Danezan *et al.* (2003); Herendeen *et al.* (2003a); Wojciechowski (2003); Wojciechowski *et al.* (2004); Forest (unpubl.). Pie charts highlight the percentage of species of each group per major geographic region, and the numbers of genera and species in each of the major subclades. Occurrences in each of the major subclades in the Old World (OW) and New World (NW) are reported (whichever is highest). Predominantly Neotropical versus Palaeotropical and temperate clades are readily visualized in colour combinations, with red and brown denoting the New World, dark and light blue for the Old World, and grey for temperate subclades**

ROSÍDEAS FABÍDEAS

8 ordens/ c. 76 famílias

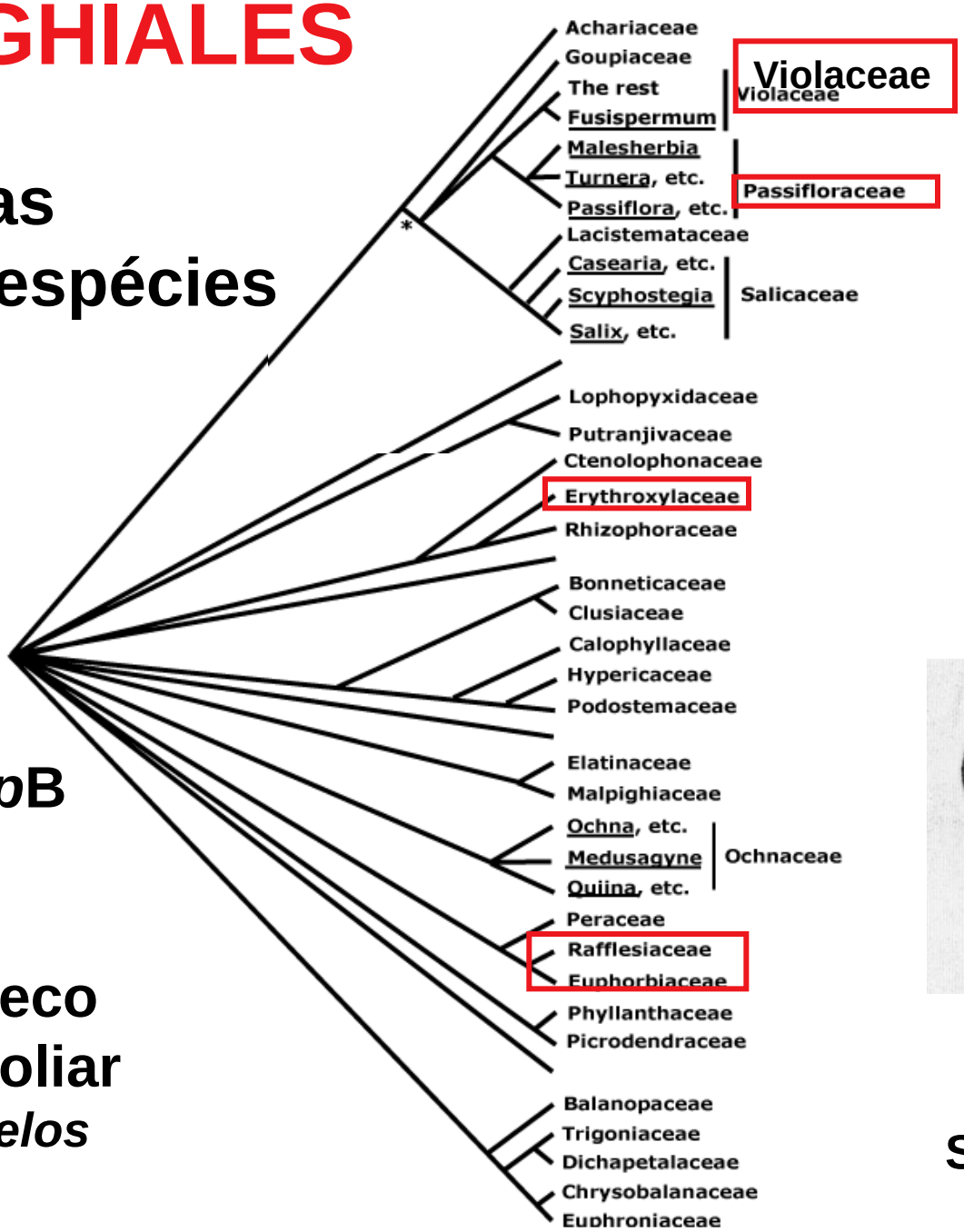
Sinapomorfias macromoleculares!



Clado fixador de N2
(*Frankia* ou *Rhizobium*)

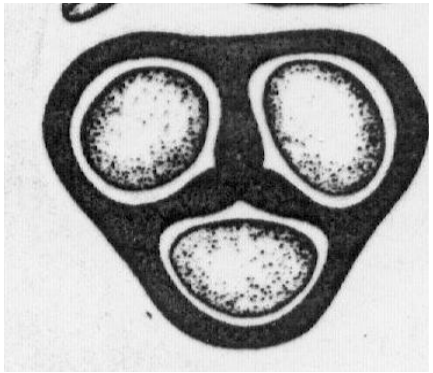
MALPIGHIALES

39 famílias
c.16.000 espécies



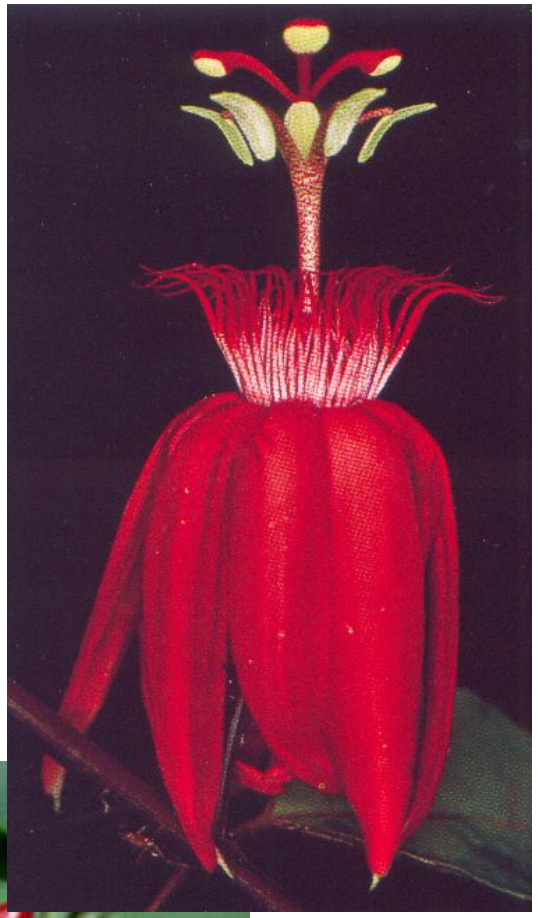
***rbc*L + *atp*B**

estigma seco
venação foliar
3 carpelos



Stevens 2010

PASSIFLORACEAE




Passifloraceae
Gordon Daida


siflora mollissima
sifloraceae
rge K. Linney

PASSIFLORACEAE

- androginóforo

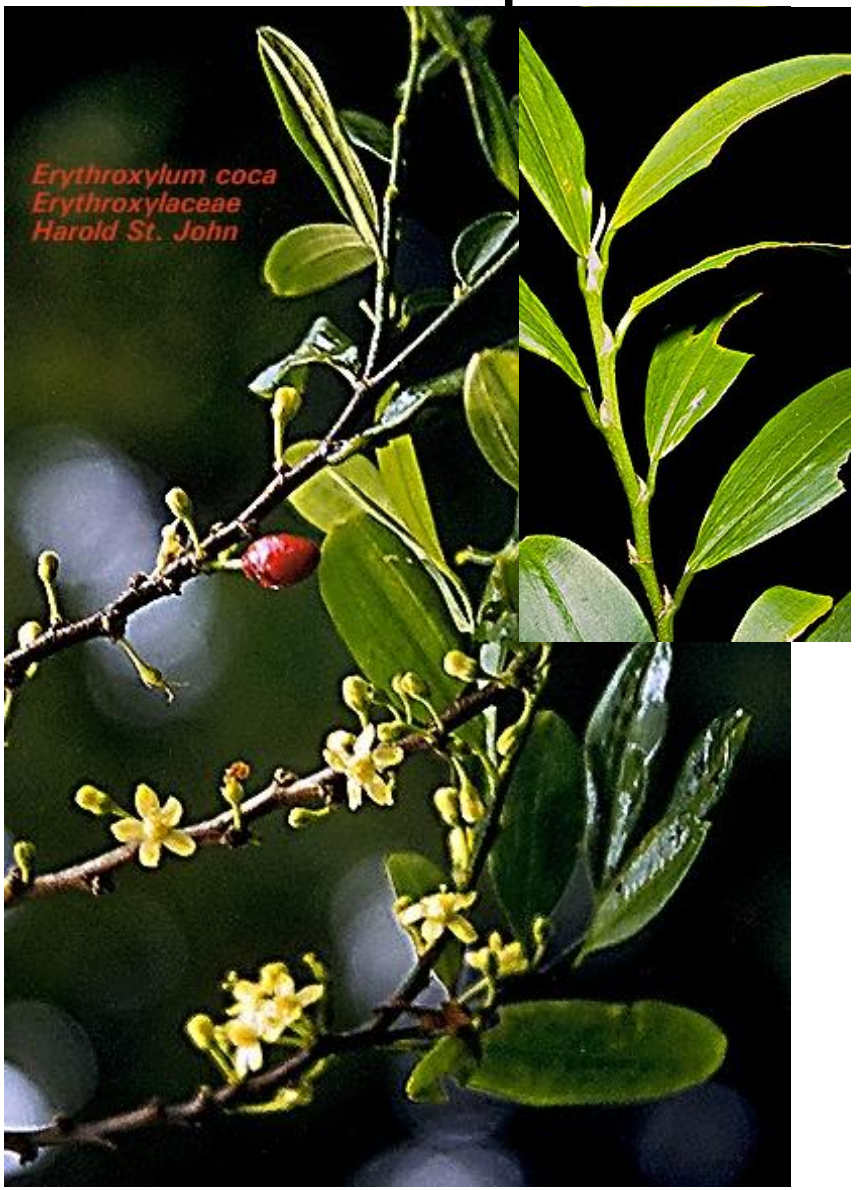
- arilo

VIOLACEAE

Viola

ERYTHROXYLACEAE

Estípulas intrapeciolares - drupas



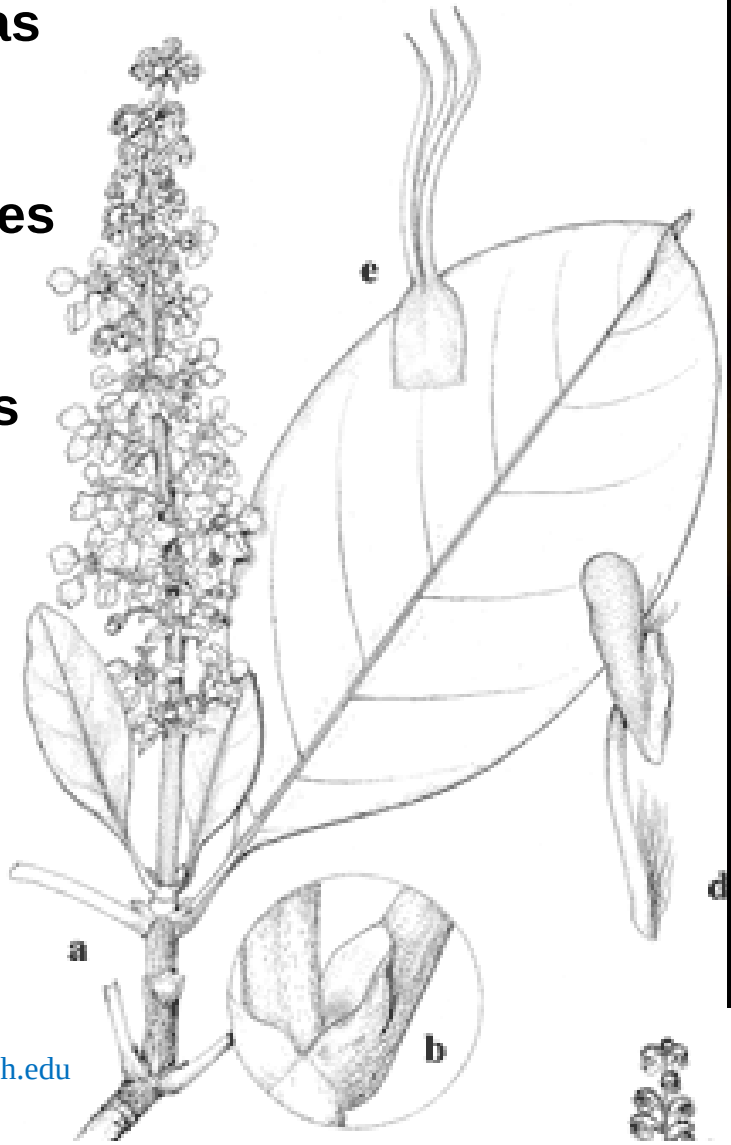
MALPIGHIACEAE

68 gên./1250 spp.

-Folhas opostas

- Estípulas intrapeciolares

- Pétalas unguiculadas



http://herbarium.lsa.umich.edu


Malpighia sp.
Malpighiaceae
© G. D. Carr


Malpighia sp.
Malpighiaceae
© G. D. Carr

MALPIGHIACEAE

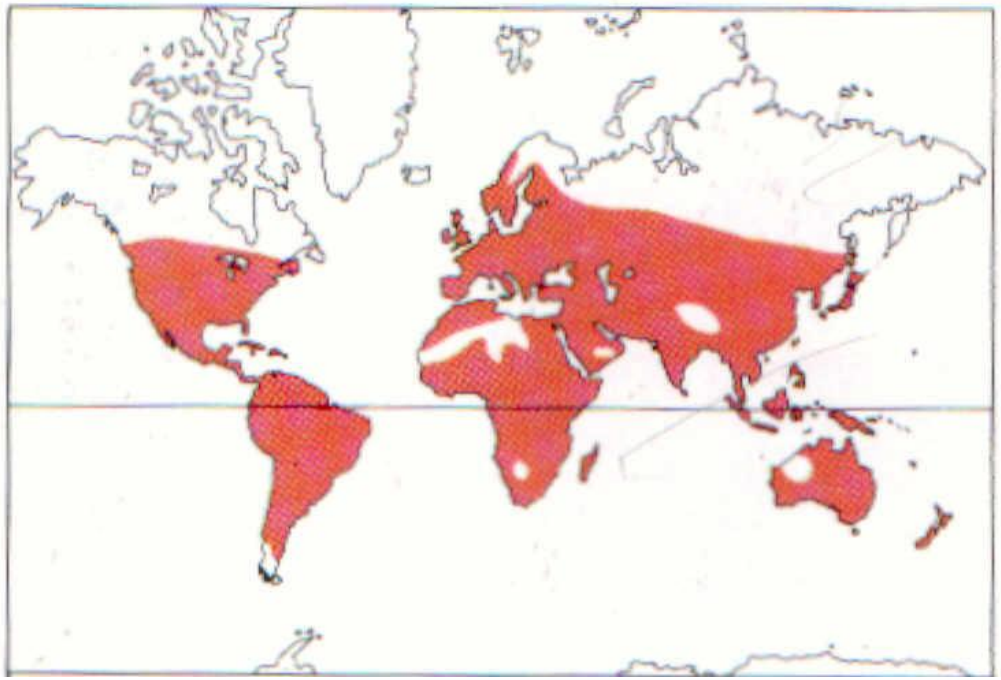
Byrsonima lucida

Robertson 1972


Acerola
Malpighia punicifolia
Malpighiaceae
© Ken Love

EUPHORBIACEAE

222 gên./5970 spp.



Distribution: mostly tropical, but with some temperate species.
Economic uses: rubber, castor oil, cassava, tung oil, vegetable tallow, timber, purgatives, dyes, many ornamental species, including the poinsettia.

EUPHORBIACEAE

Látex

Hevea brasiliensis
seringueira

EUPHORBIACEAE

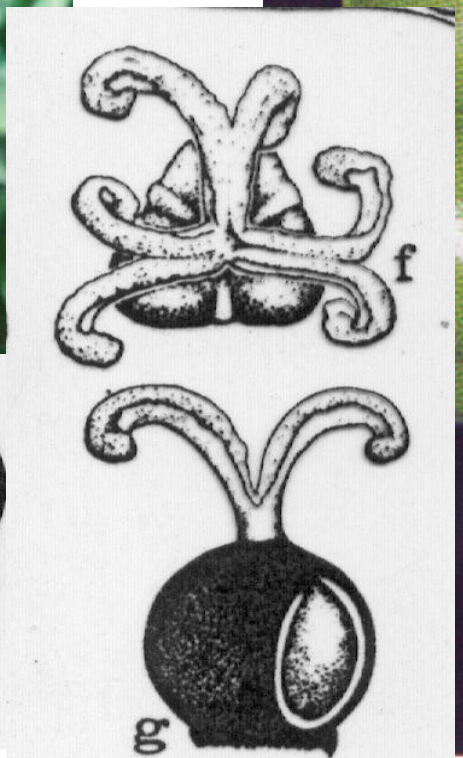
Ricinus communis

mamona

Flores monoclamídeas ou nuas, unissexuadas

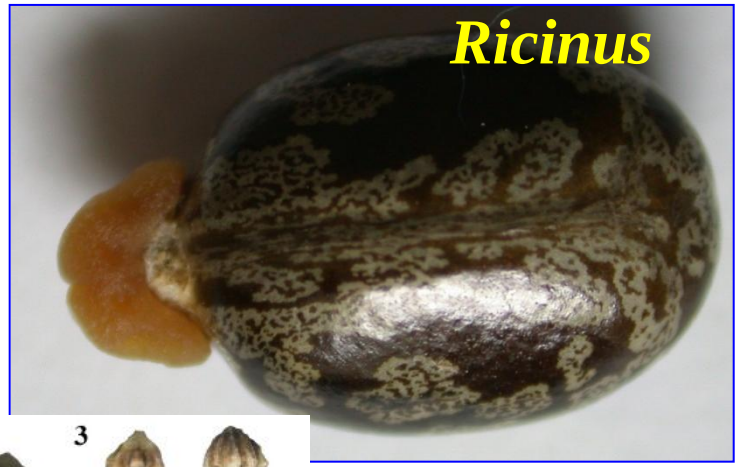
EUPHORBIACEAE

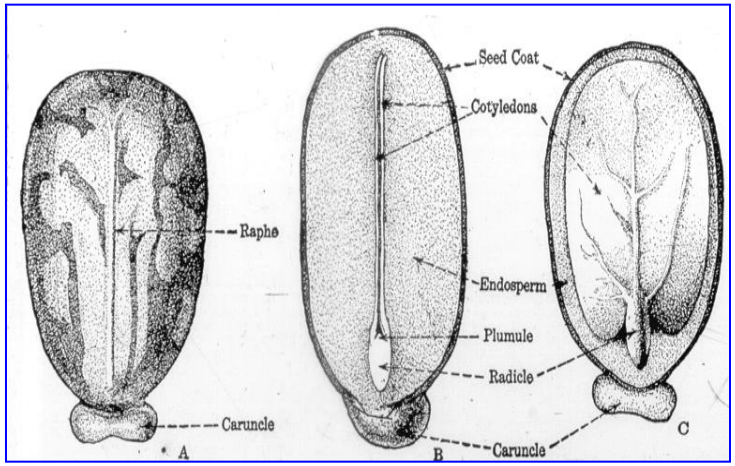
Estiletes divididos
Fruto tricoca (deiscência explosiva)
1 óvulo por lóculo



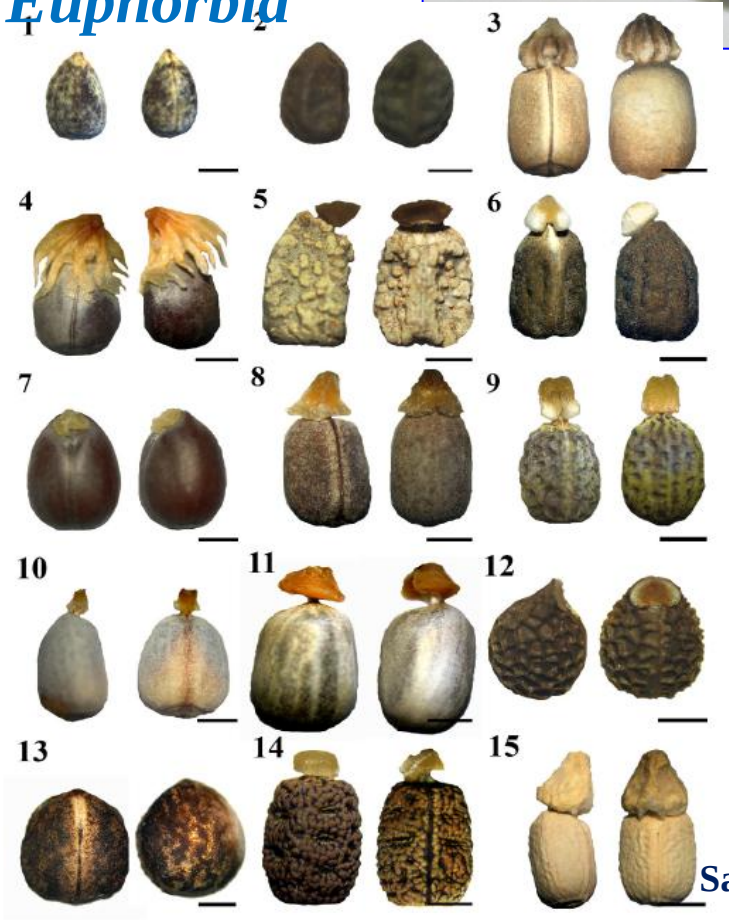
EUPHORBIACEAE

Rosídeas

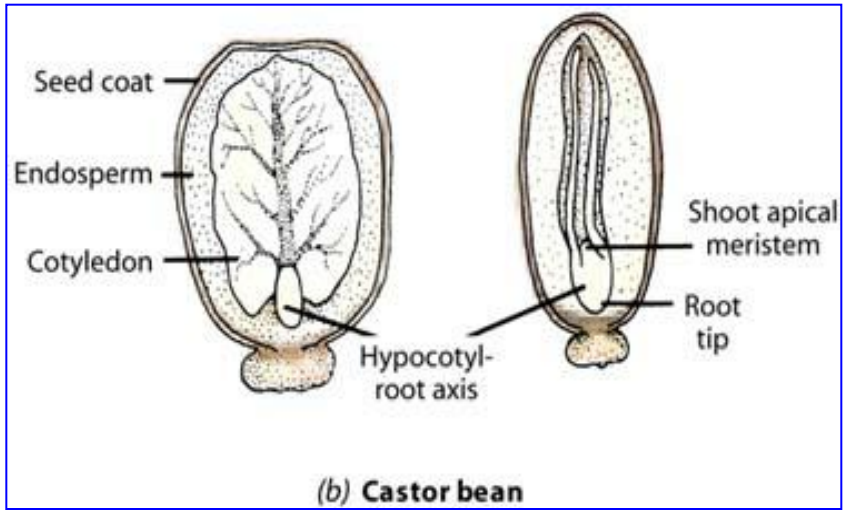




Euphorbia



Salmaki et al. 2011



Semente com endosperma oleaginoso

Pseudantos

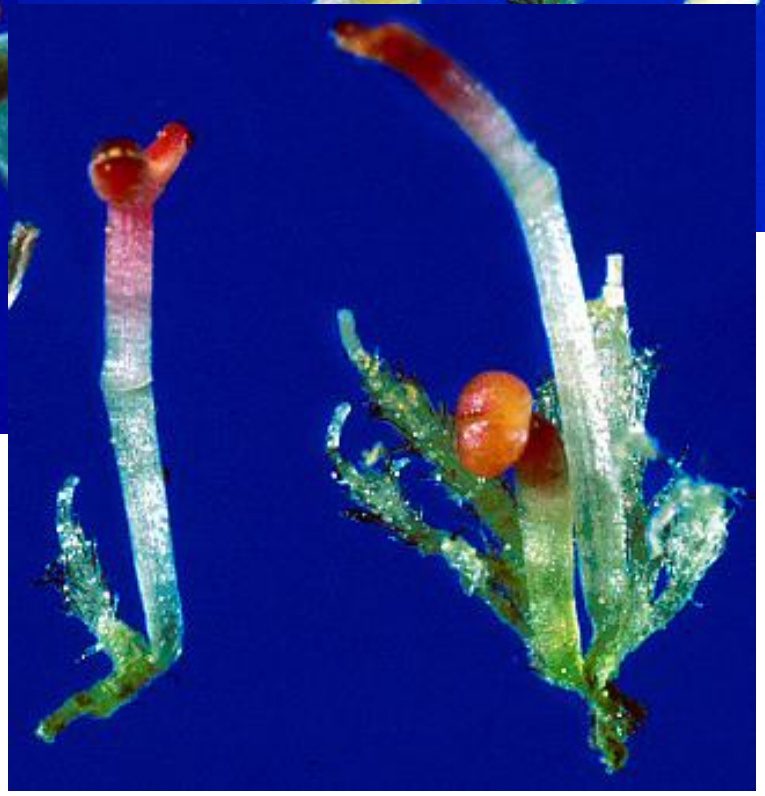
Pedilanthus

Dalechampia

EUPHORBIACEAE

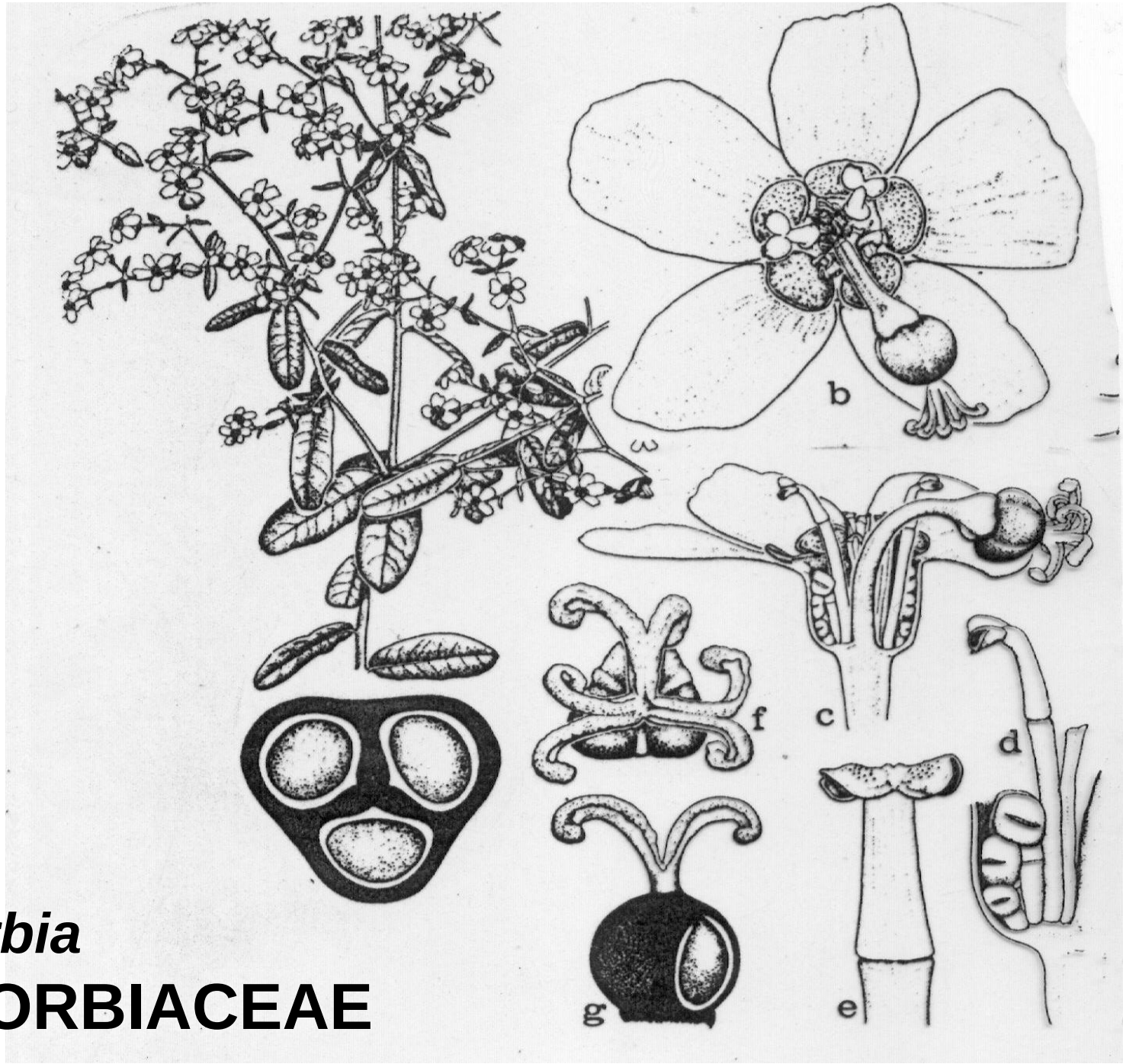
Pseudanto: CIÁTIO ***Euphorbia millii***

Euphorbia pulcherrima



Pseudanto:

CIÁTIO



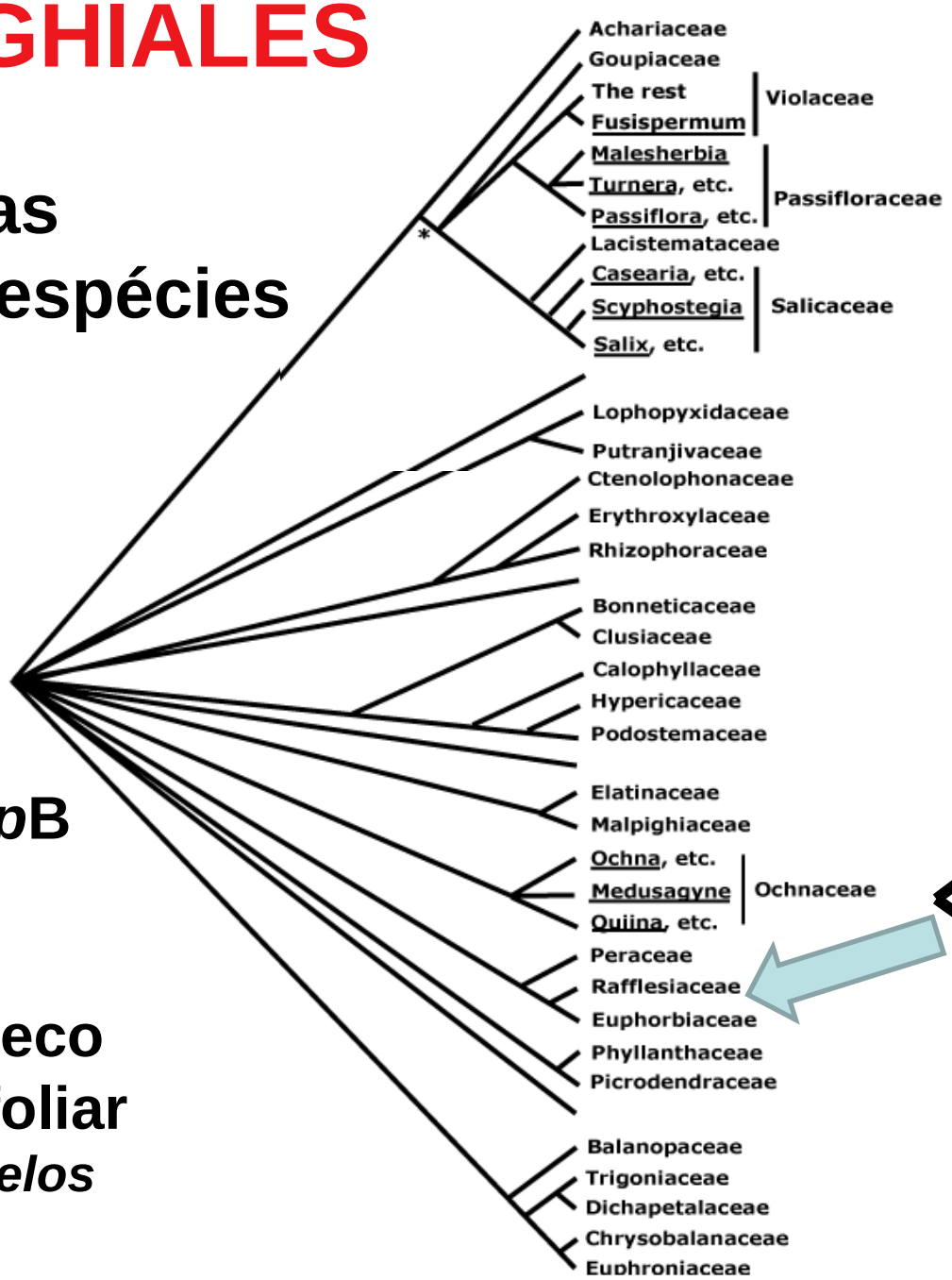
Euphorbia

EUPHORBIACEAE

Euphorbia cooperi

MALPIGHIALES

39 famílias
c.16.000 espécies



***rbc*L + *atp*B**

estigma seco
venação foliar
3 carpelos

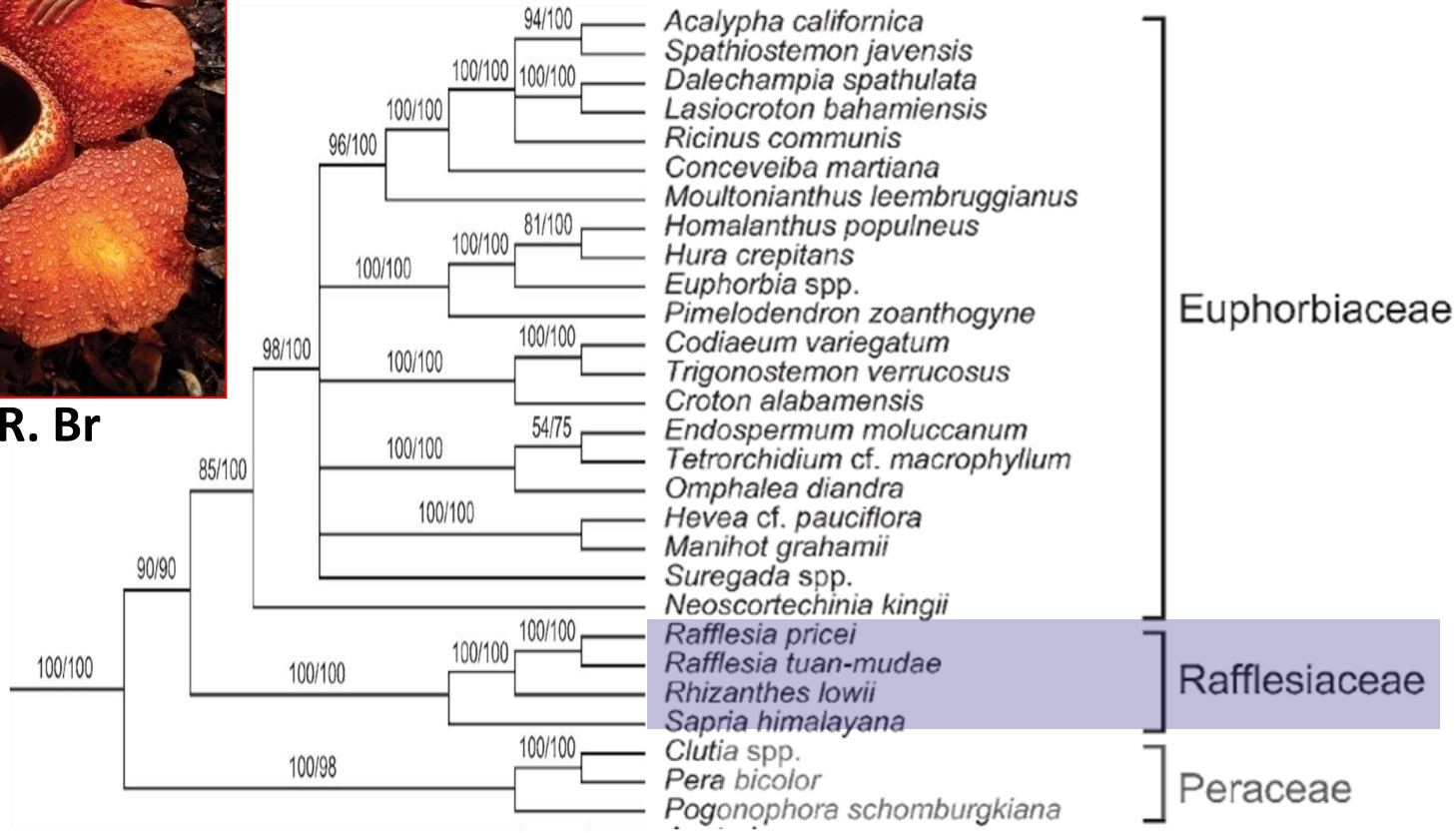
Peraceae
Rafflesiaceae
Euphorbiaceae

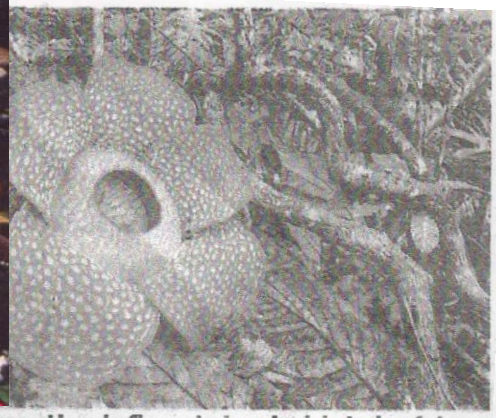
Stevens 2010

Barkman *et al.* 2004: Rafflesiaceae em Malphigiales!

Davis *et al.* 2007,
Wurdack & Davis 2009

***Rafflesia arnoldii* R. Br**





A *Rafflesia*, flor nativa da floresta tropical da Indonésia

Folha de São Paulo

12 de janeiro de 2007

BOTÂNICA

Maior flor do mundo é prima da mandioca

DA REPORTAGEM LOCAL

Ela não é flor que se cheire, apesar de ser a maior do mundo. E apesar da descoberta de que tem parentes importantes.

Com um metro de largura e até sete quilos de peso, a *Rafflesia* é uma parasita de outras plantas. Apesar da sua bela cor vermelha, não é recomendável para um arranjo: tem cheiro de carne podre, que atrai moscas polinizadoras.

Conhecida há 200 anos, essa flor da Indonésia não tinha até agora sido classificada. Uma equipe liderada por Charles Davis, da Universidade Harvard, estudou seu material genéti-

BOTÂNICA

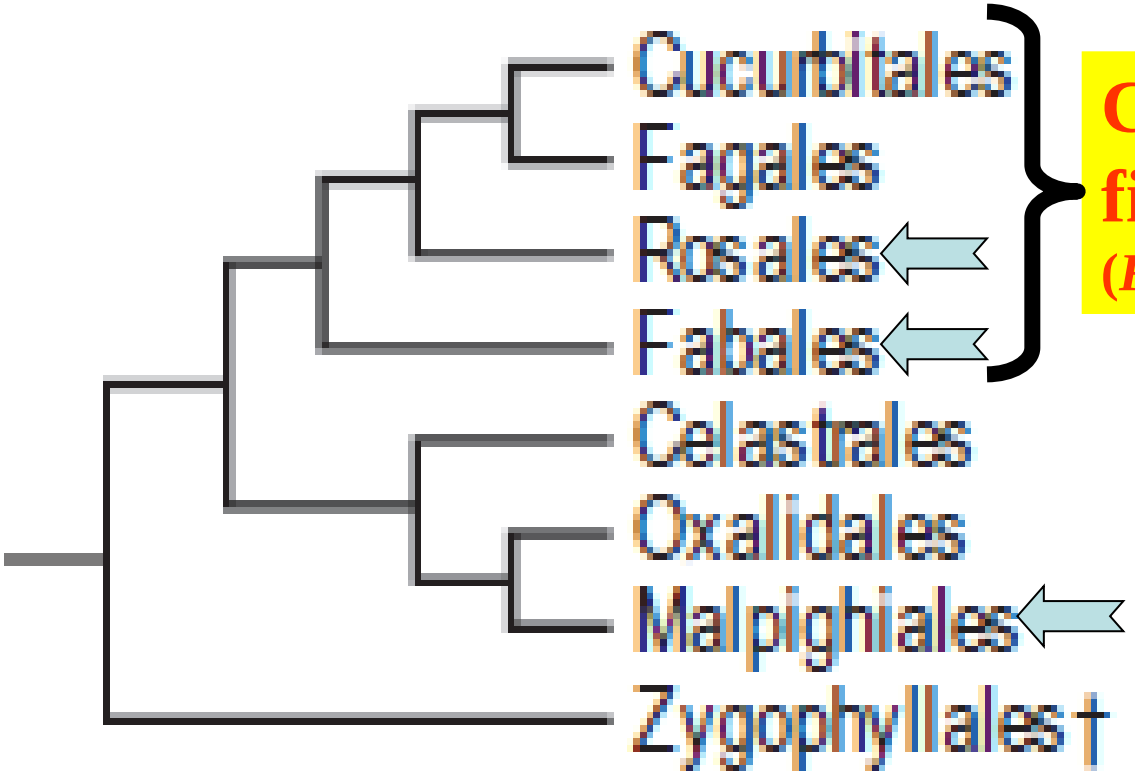
Maior flor do mundo é prima da mandioca

DA REPORTAGEM LOCAL

ROSÍDEAS FABÍDEAS

8 ordens/ c. 76 famílias

Sinapomorfias macromoleculares!

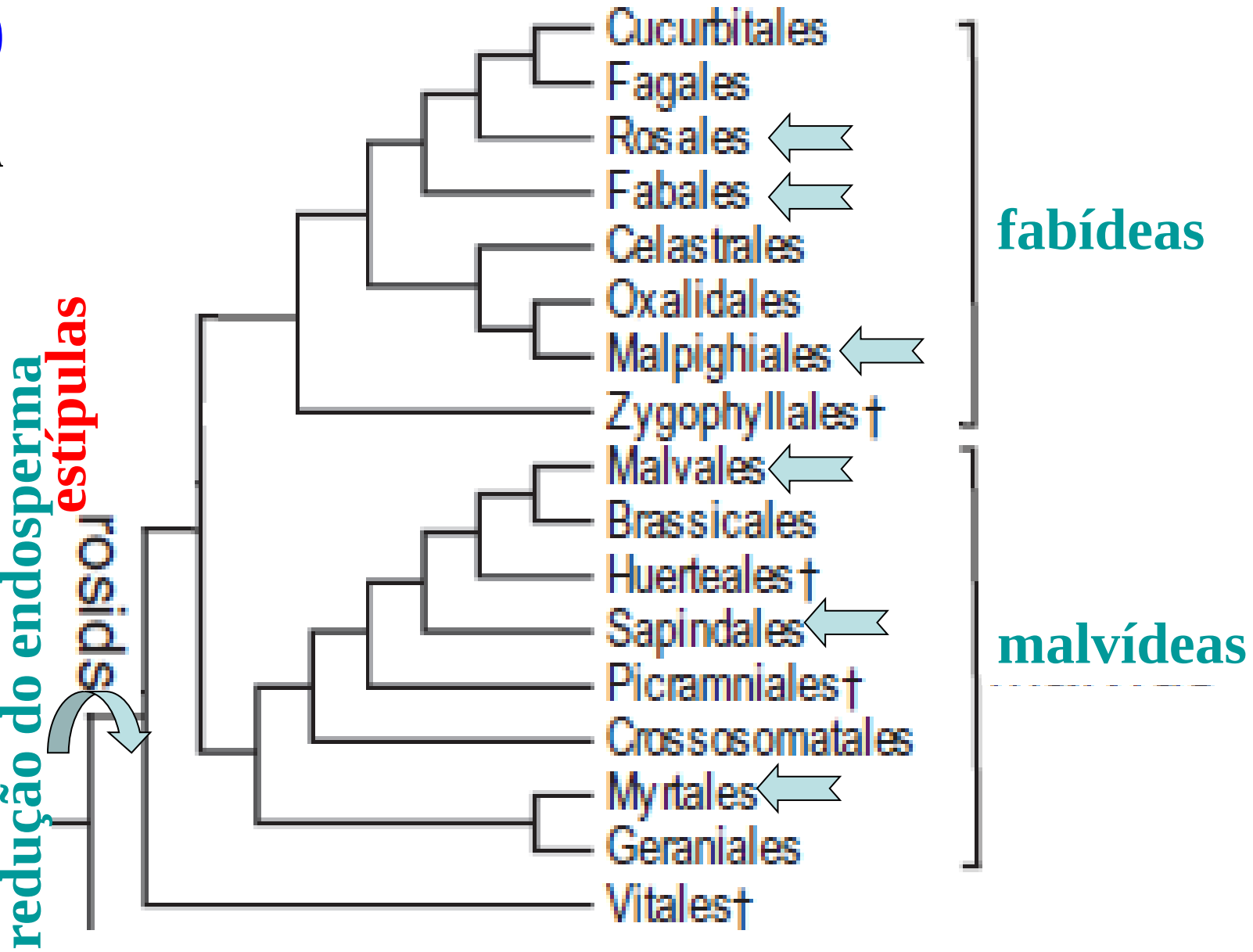


Clado fixador de N2
(*Frankia* ou *Rhizobium*)

APG-III 2009

ROSÍDEAS

18S rDNA
***rbc*L**
atp*B*
***atp*1**
***mat*R**



Ranunculales

Proteales

Trochodendrales

Gunnerales

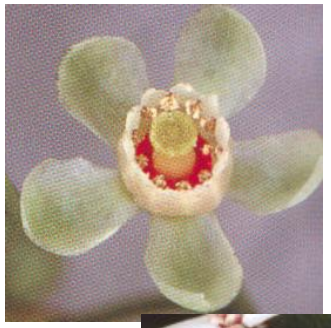
2-meria

Eudicots nucleares

PENTAPETALE

5-meria

ROSÍDEAS



Santalales

Caryophyllales

ASTERÍDEAS