

# *Phylogeny & Morphology of Fagus & Fagaceae*



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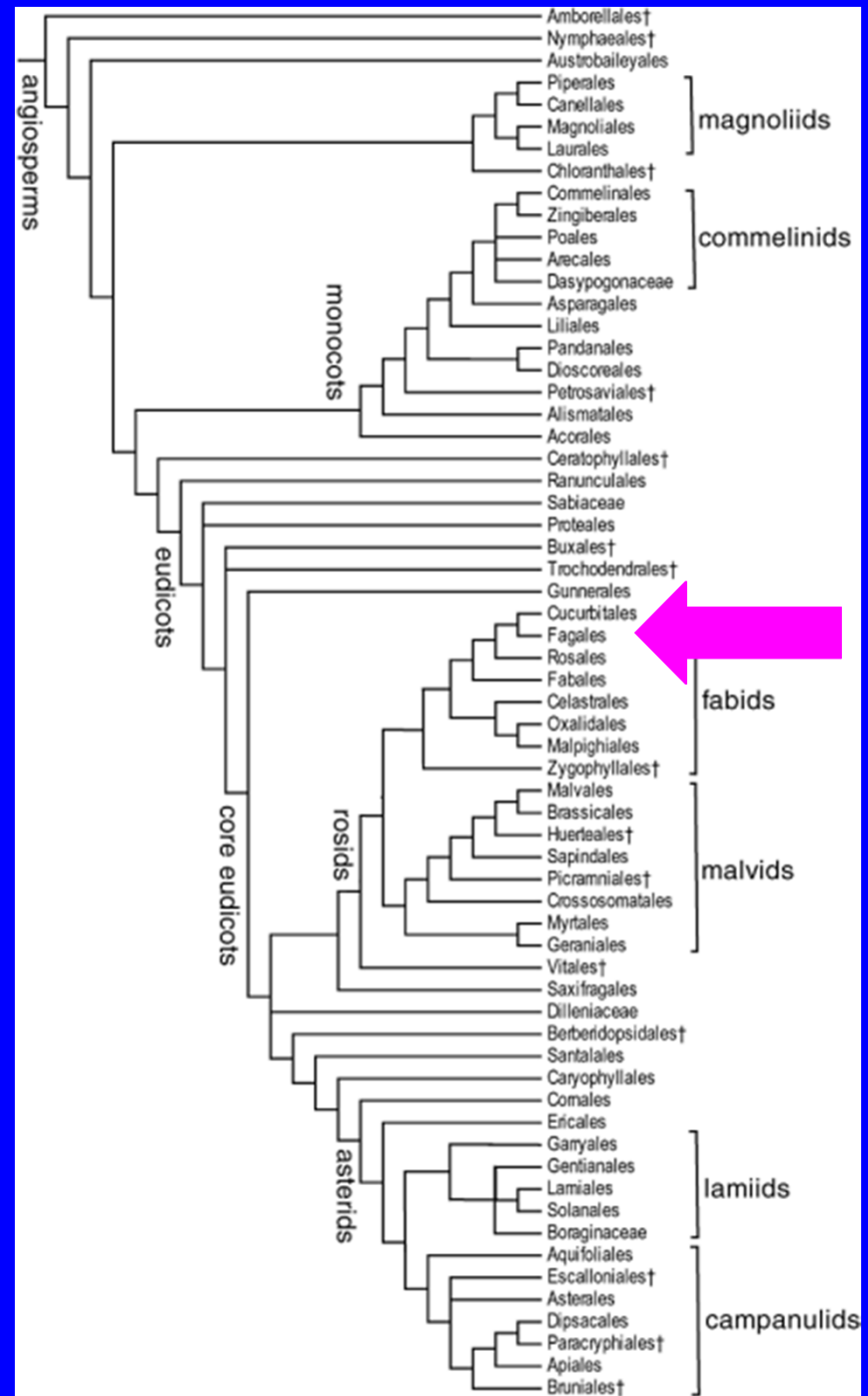
**APG III (2009)**  
**(Angiosperm Phylogeny Group)**

**Eudicots**

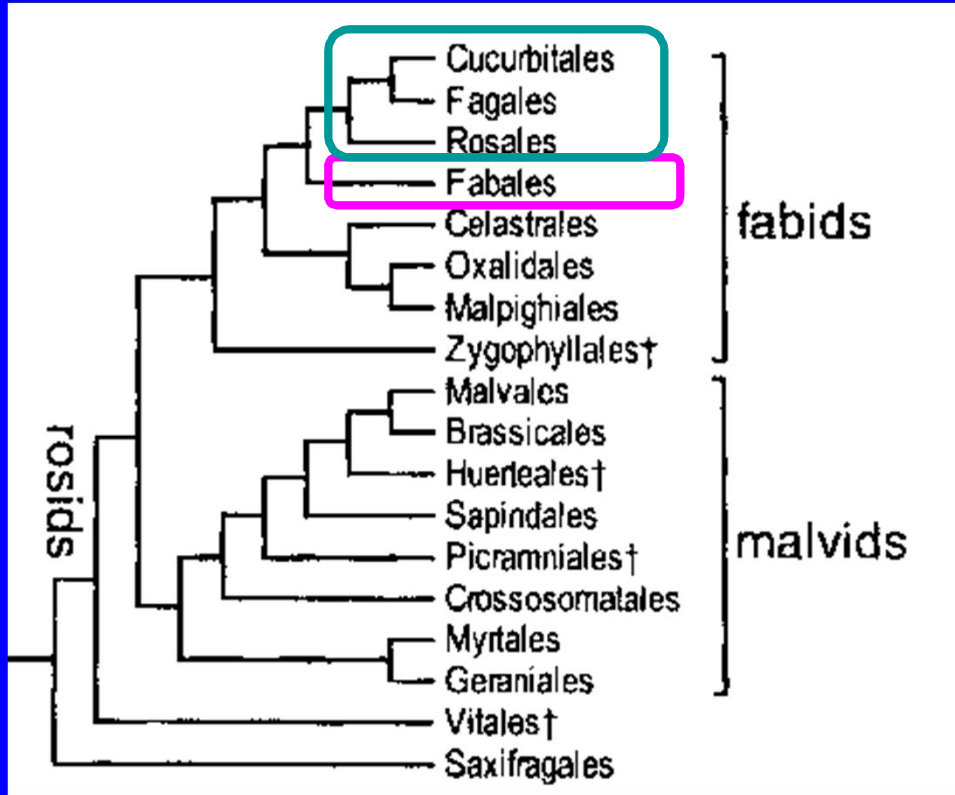
**Rosids**

**Fabids**

**Fagales**



**Rosids (APG III 2009) : *Rhizobium* & *Frankia alni***



**Rule of the inverse :**

**Symbiosis with 1 F**

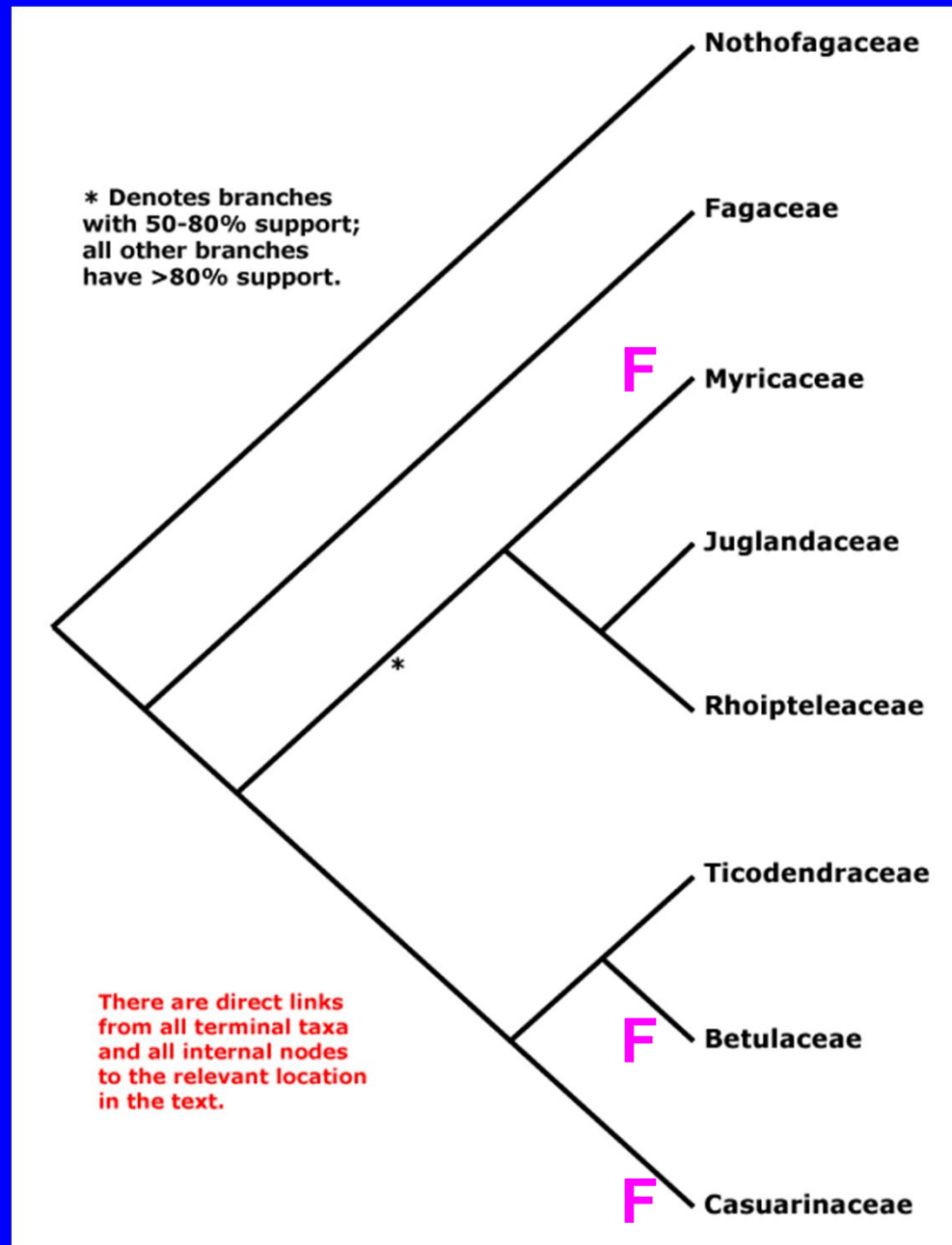
**Frankia nodules on Alnus**

**3 O / 8 F / 25 G**

# Fagales

*pp with actinorhiza*

(Stevens 2001 onwards)



# *Fagaceae (+ Nothofagaceae) area worldwide*

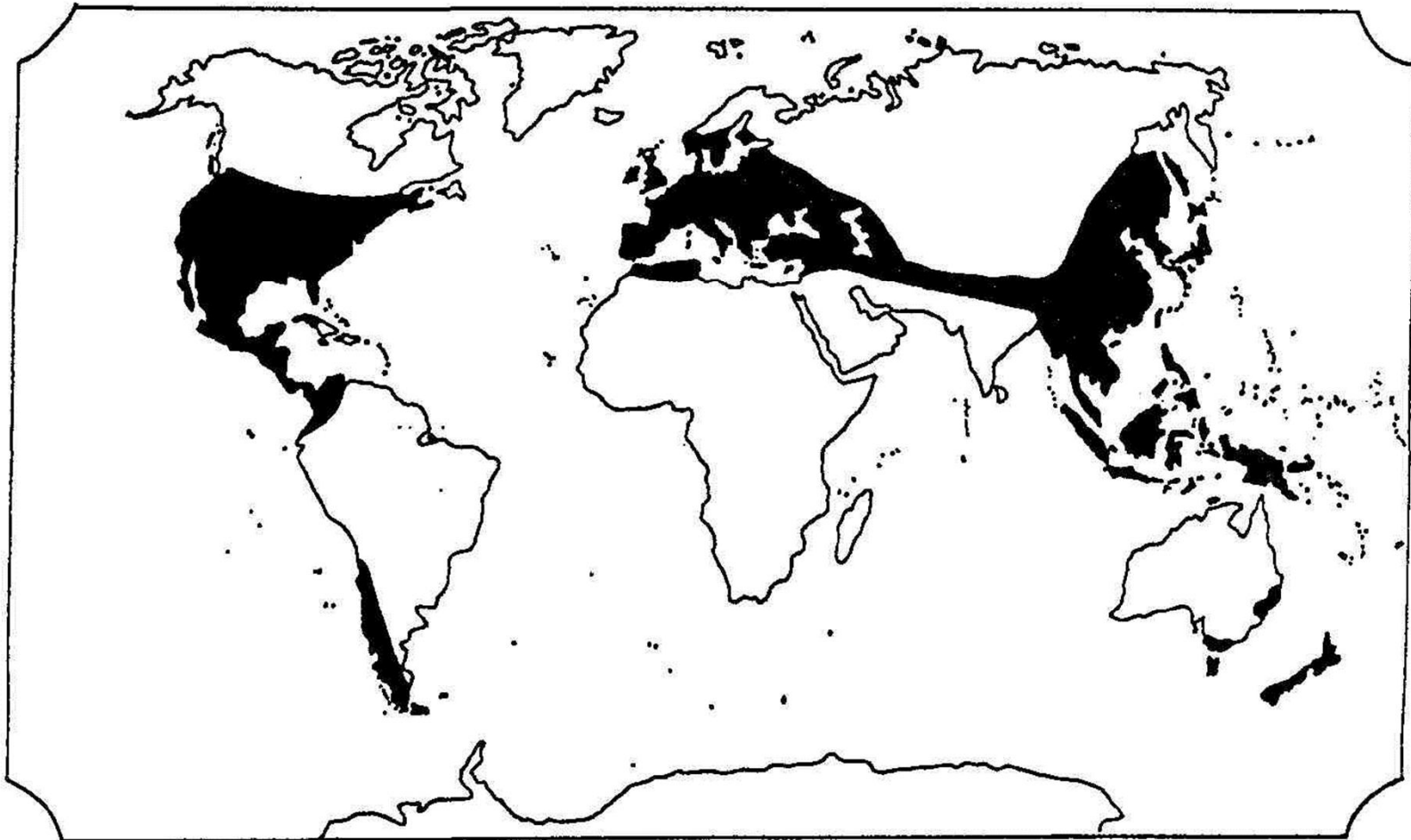


Fig. 1. Present distribution of the Fagaceae (redrawn from Soepadmo, 1976).

**(Jenkins 1993)**

## Area of *Fagus* (N) and *Nothofagus* (S)

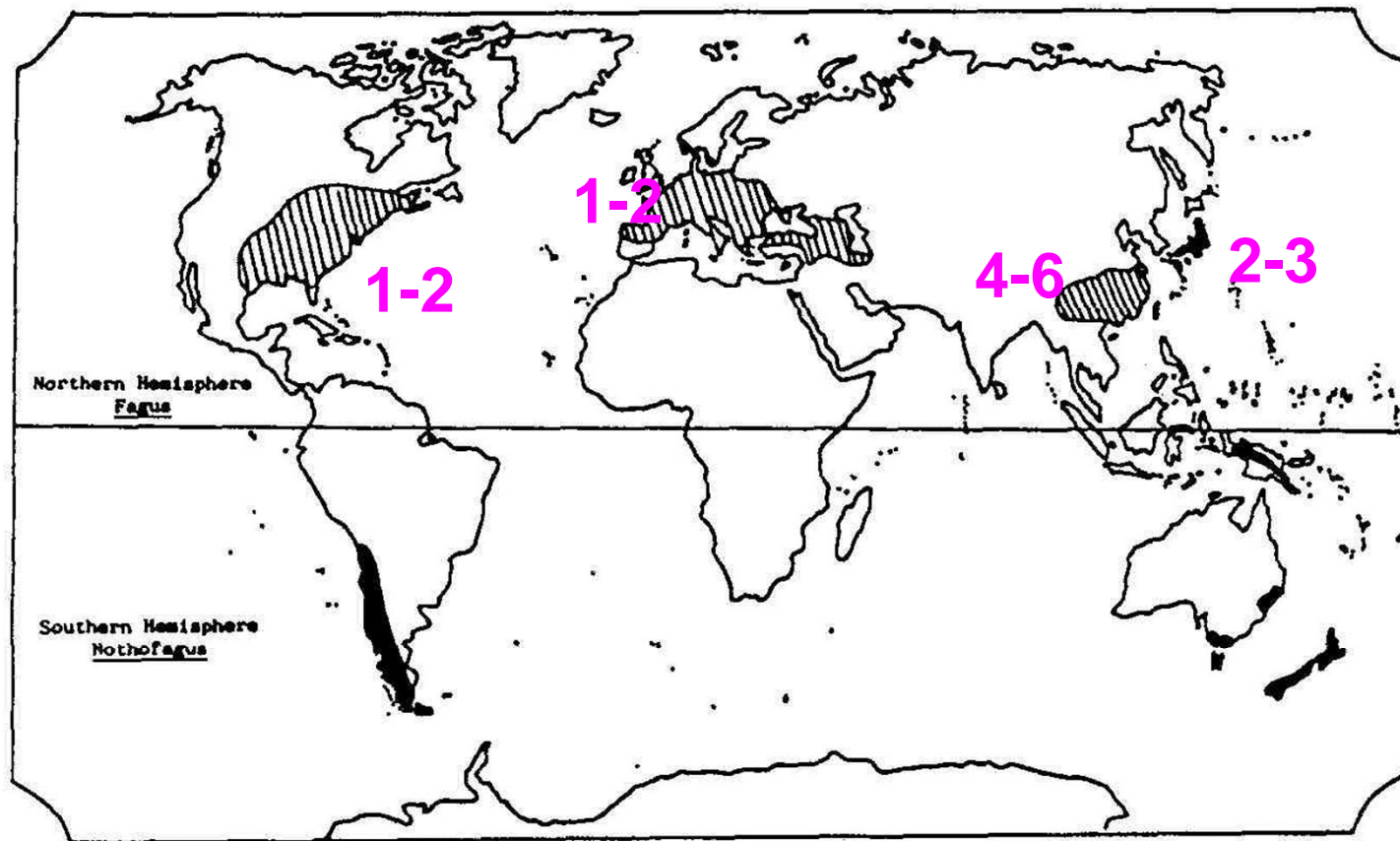
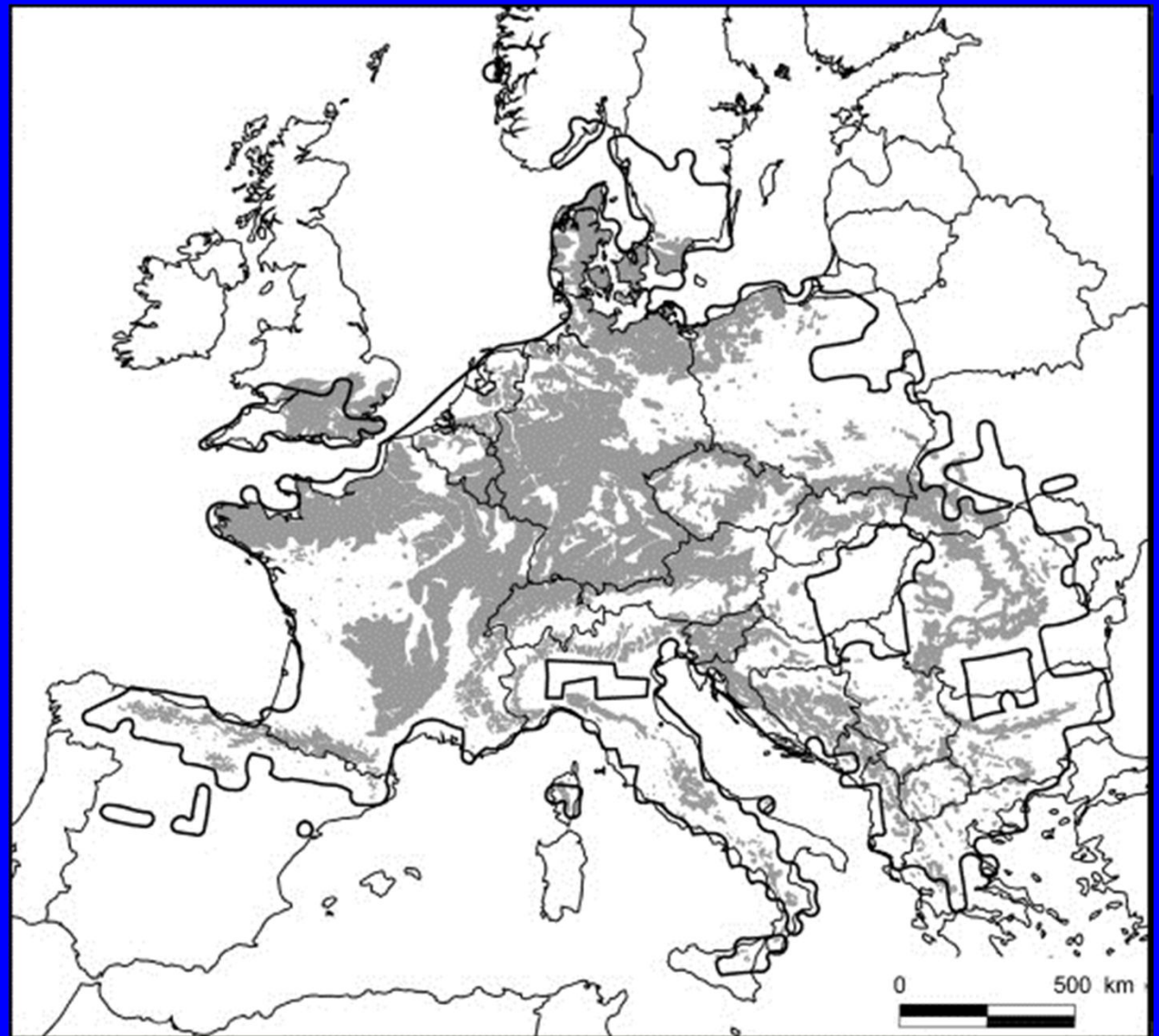


Fig. 4. The bi-hemispherical distribution of *Fagus* (shown in stripes) and *Nothofagus* (black) (adapted from Soepadmo, 1976).

(Jenkins 1993)

***Fagus sylvatica*  
area**



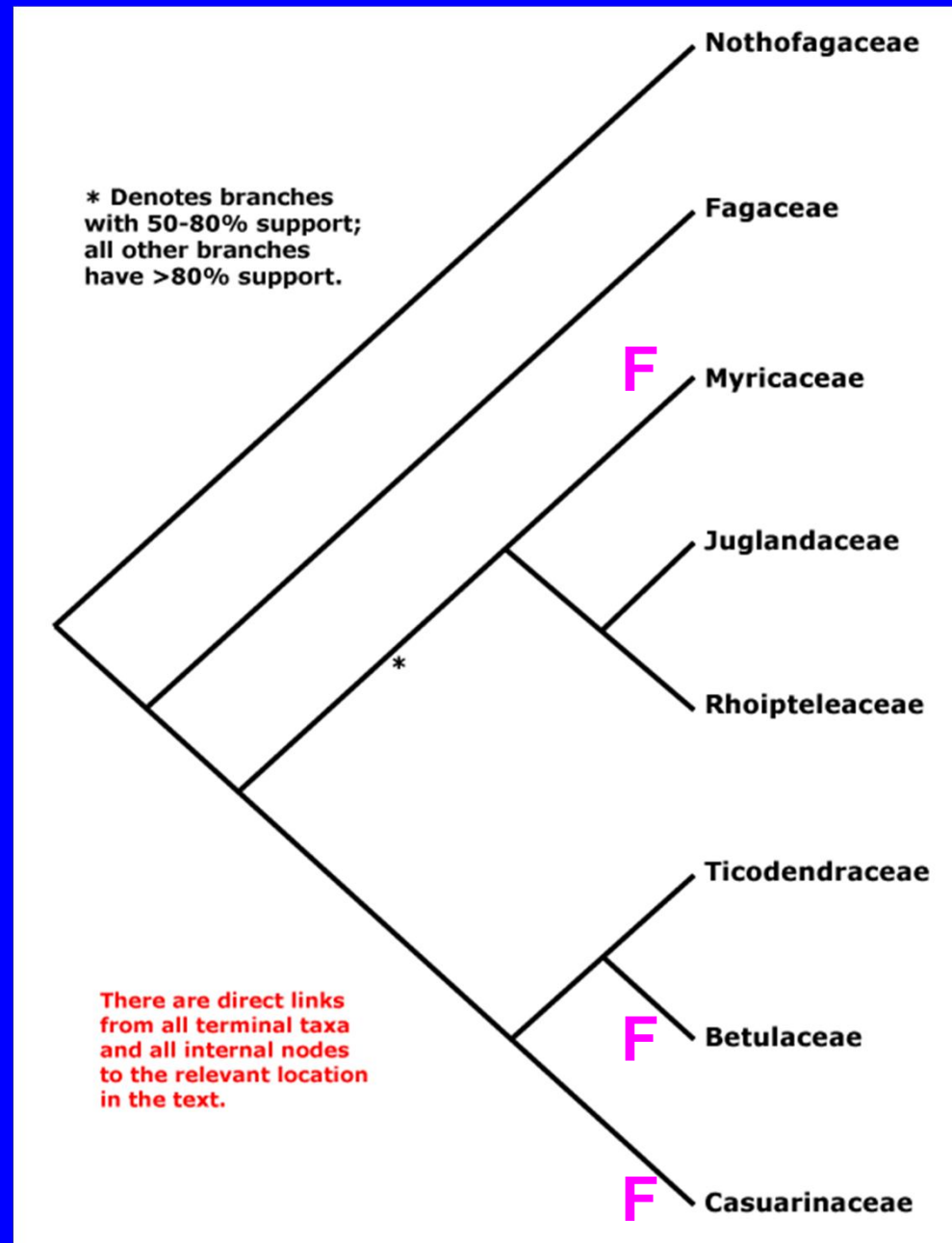
**(Bradshaw et al. 2010)**

# Fagales

the “Calimero” pattern

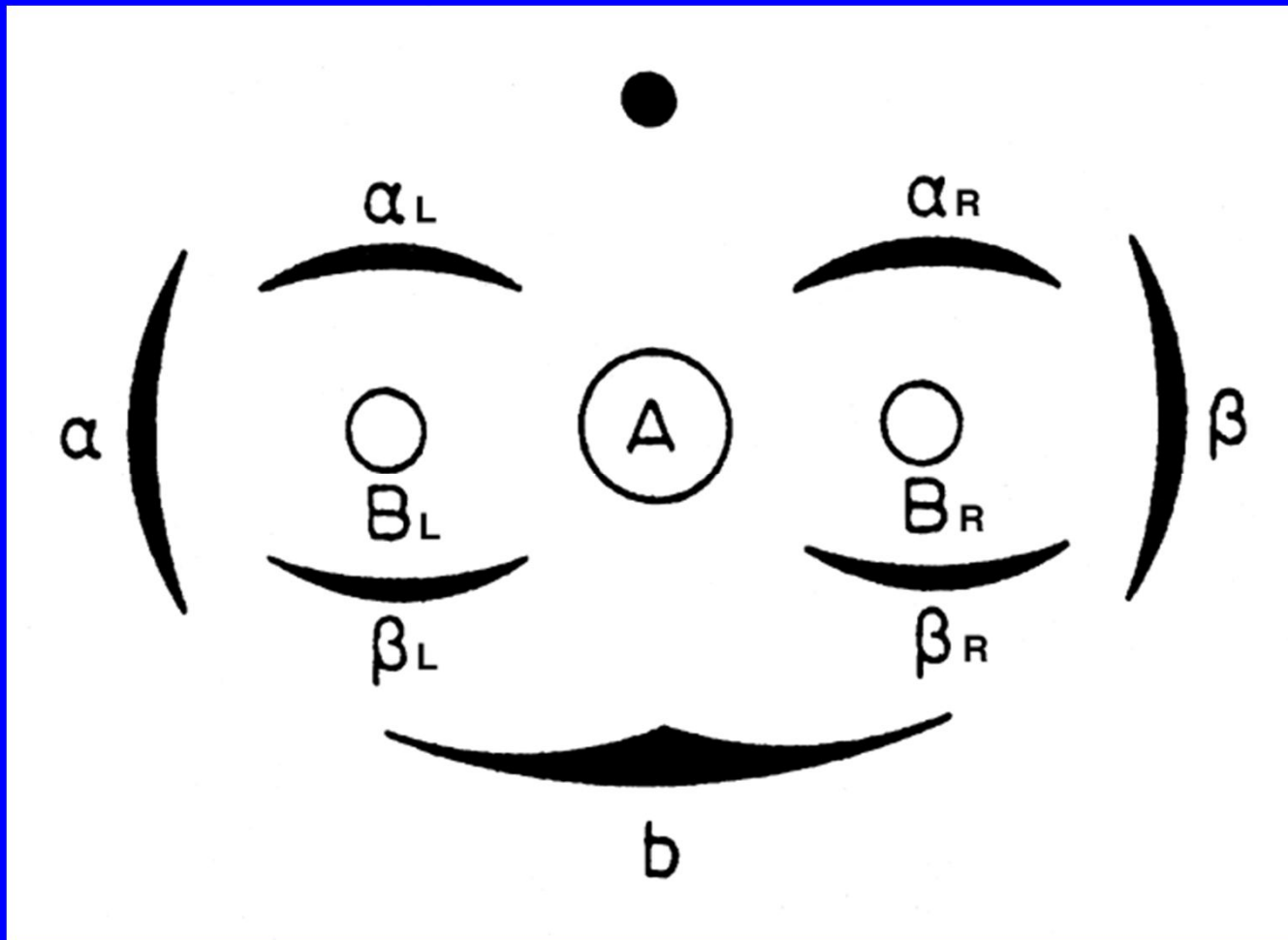
1 genus  
sister group of  
32 genera

(Stevens 2001 onwards)

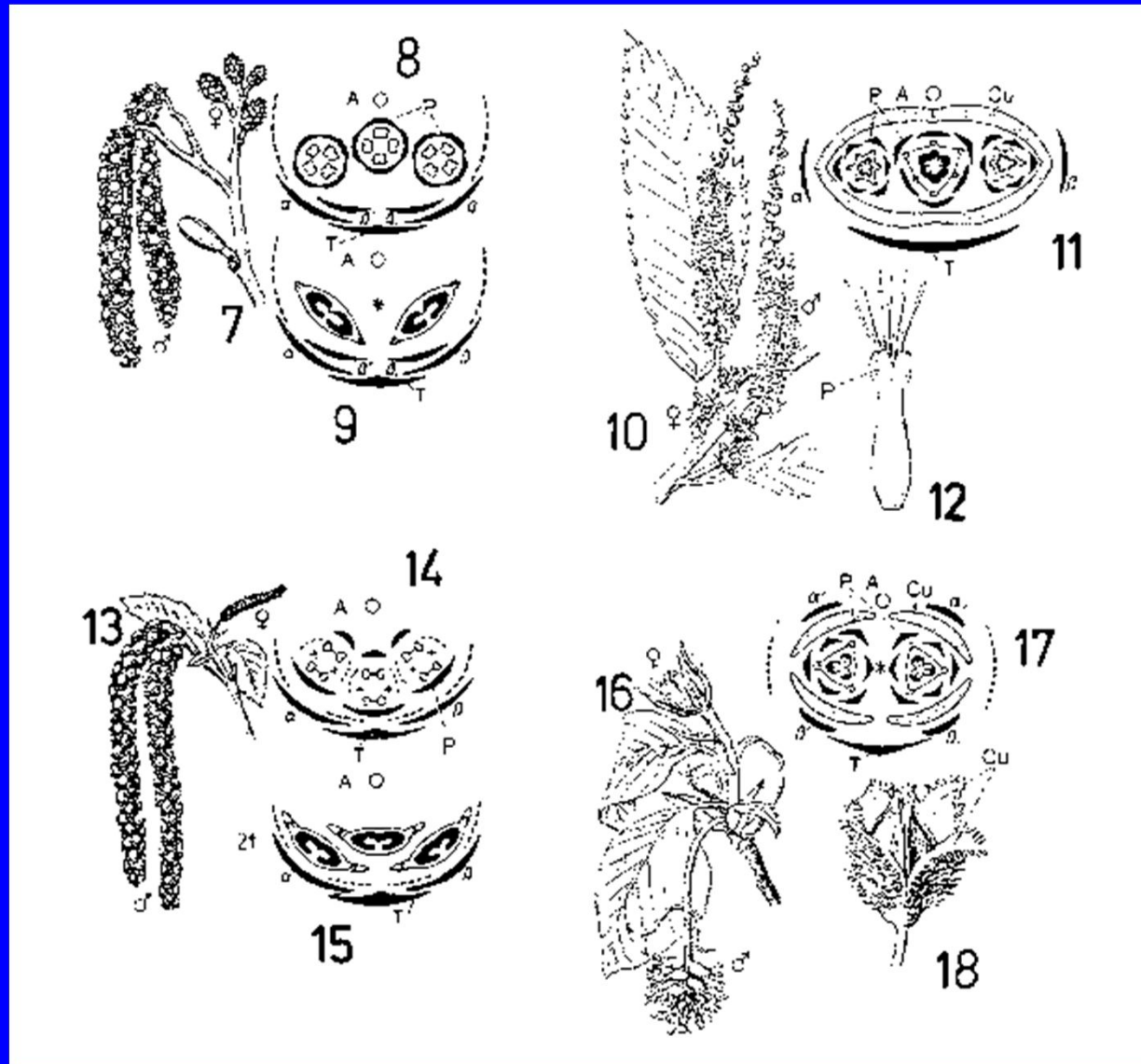




## *Cyme, the basic pattern*



***False catkins = raceme of cymes, + cupula !***



**(Graf 1975)**

## ***Nothofagus vs Fagaceae***

**chromosome number**

**2n = 26**

**2n = 24**

**pollen morphology**

**5- or 8-colpate**

**3-colporate**

**stipule morphology**

**basal swelling**

**thin scale**

***Nothofagaceae* *Nothofagus pumilio***



*Nothofagus moorei*



***Nothofagus dombeyi***



## *Nothofagus B&B (El Chaltén, Argentina)*



## ***Fagoideae (= Fagus) vs Quercoideae***

<b><i>Germination</i></b>	phanerocotylar	cryptocotylar (exc. <i>Trigonobalanus</i> )
<b><i>Staminate inflor.</i></b>	capitate	catkin-like
<b><i>Cupules</i></b>	solitary	grouped into catkins



***Fagus seedling = phanerocotylar***



*Fagus seedling*



*Fagus seedling*



*Fagus seedling*

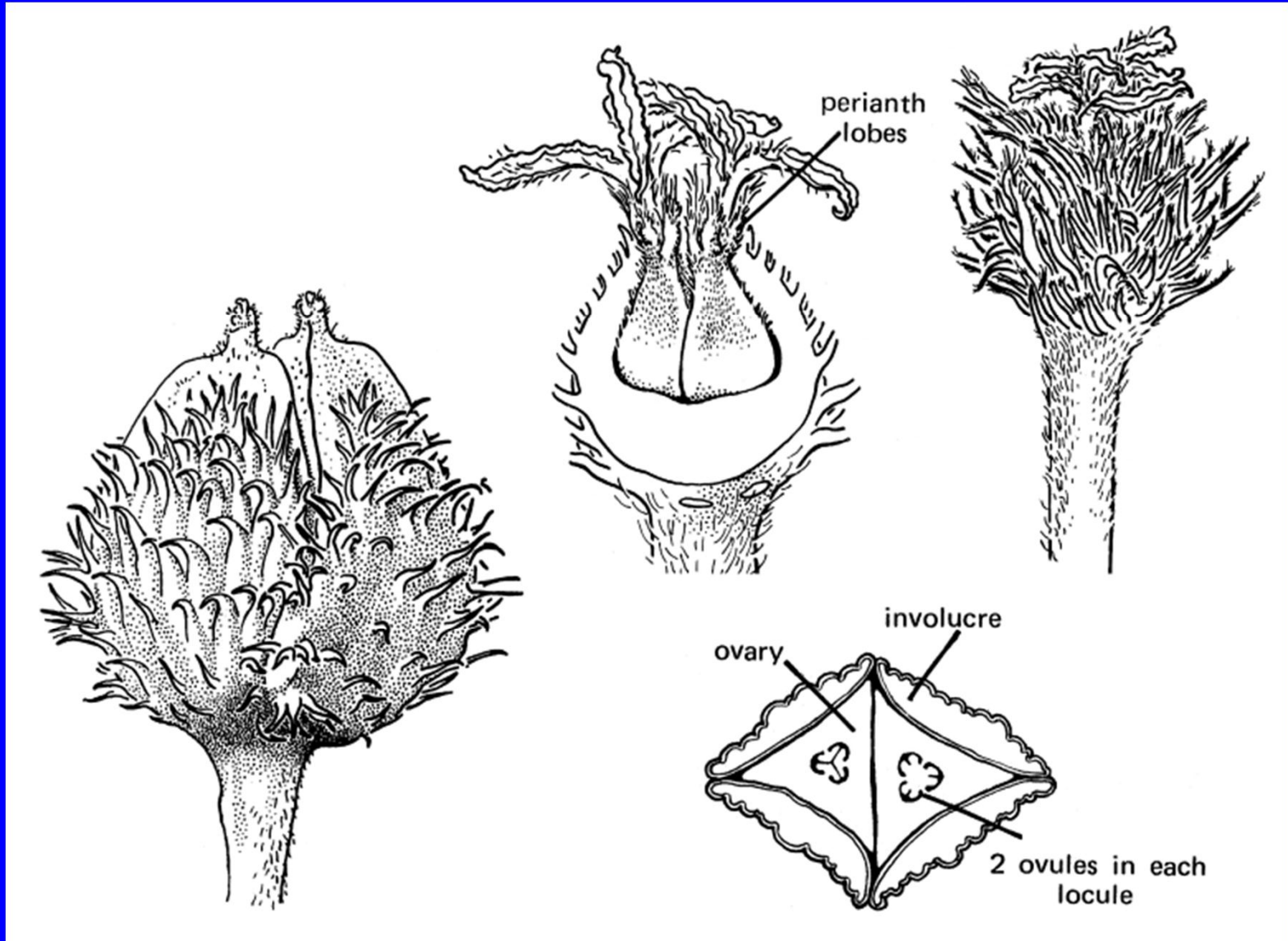


***Fagus grandifolia*, staminate flower & inflorescence**



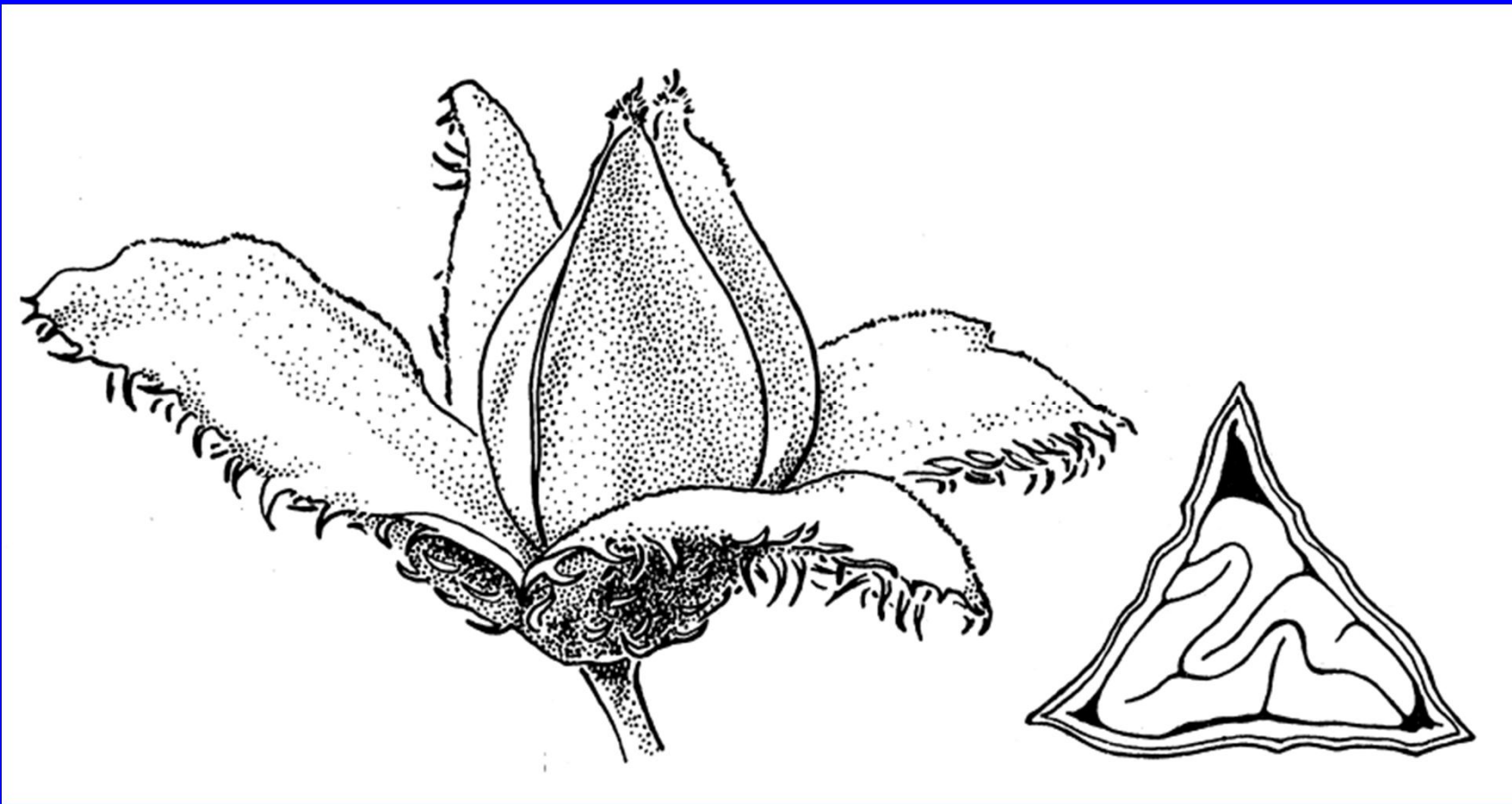
**(Wood 1974)**

# *Fagus grandifolia*, pistillate inflorescences



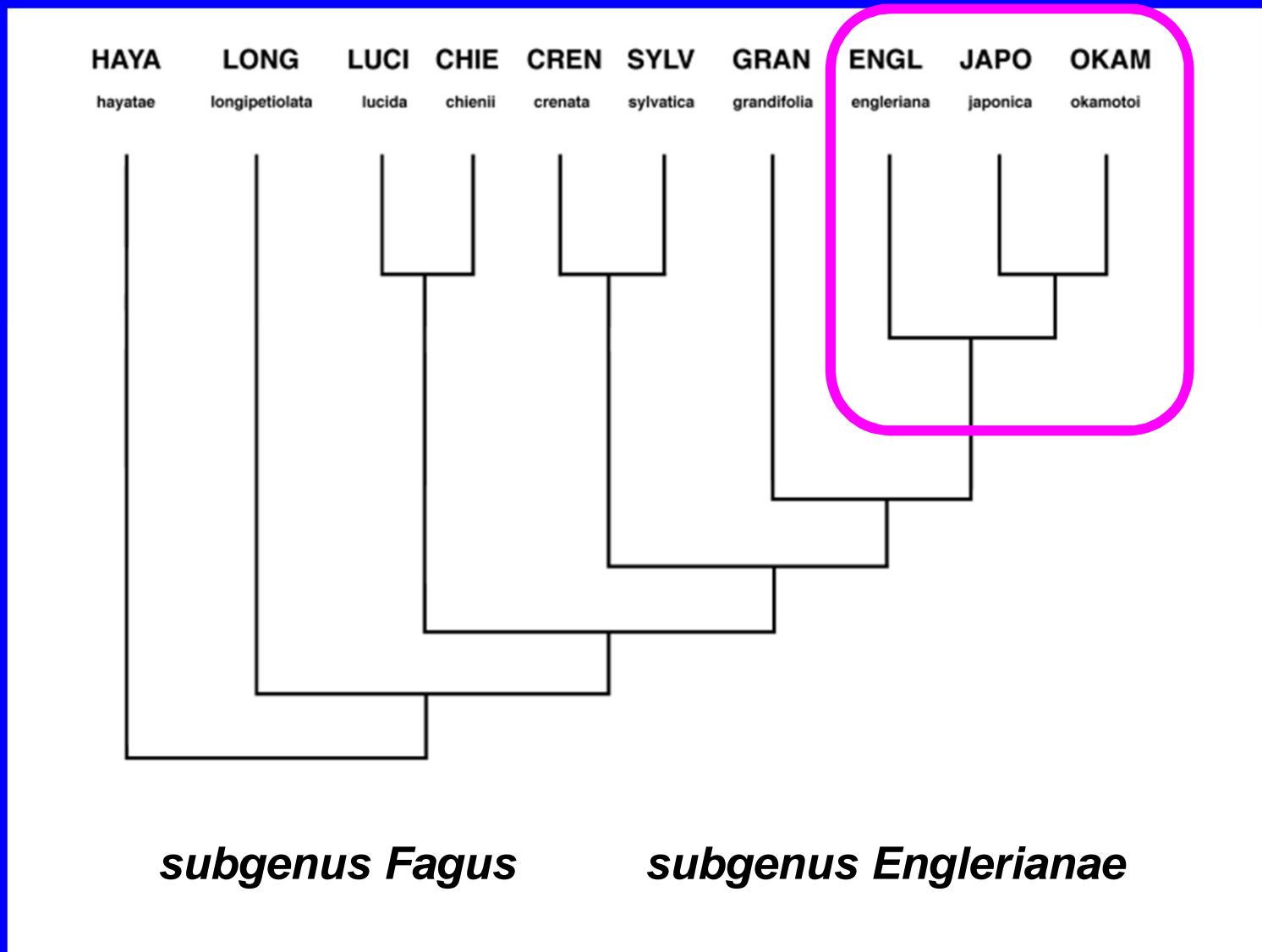
(Wood 1974)

***Fagus grandifolia*, mature cupule & fruits**



**(Wood 1974)**

# Phylogeny of *Fagus* (after Denk et al. 2005)



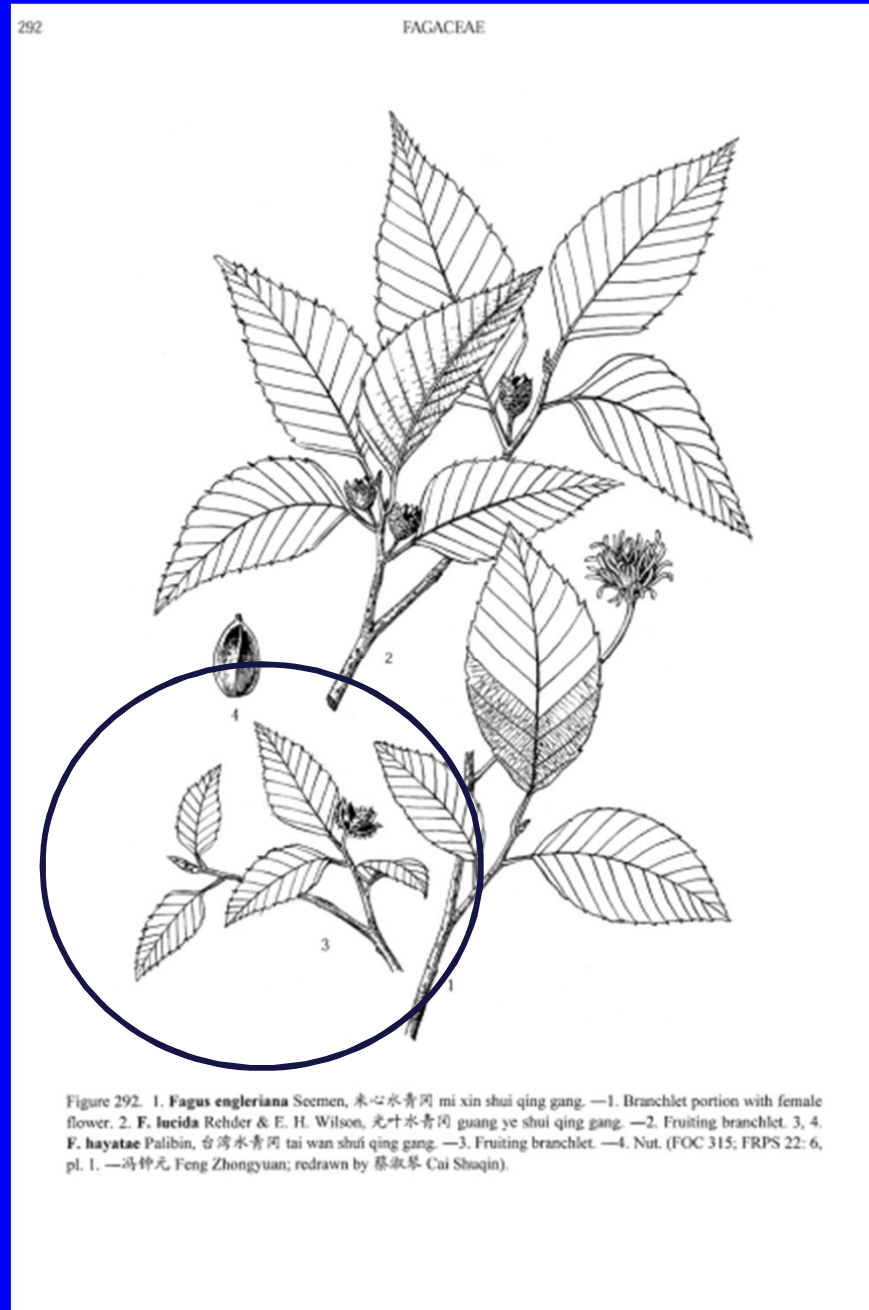


## *Fagus subgenus Fagus*

- single-stemmed high-branching trees
- lenticels small, inconspicuous
- “buds sessile”

(Denk 2003: 58)

# *Fagus hayatae*



(Huang et al. 1999)

*Fagus hayatae*

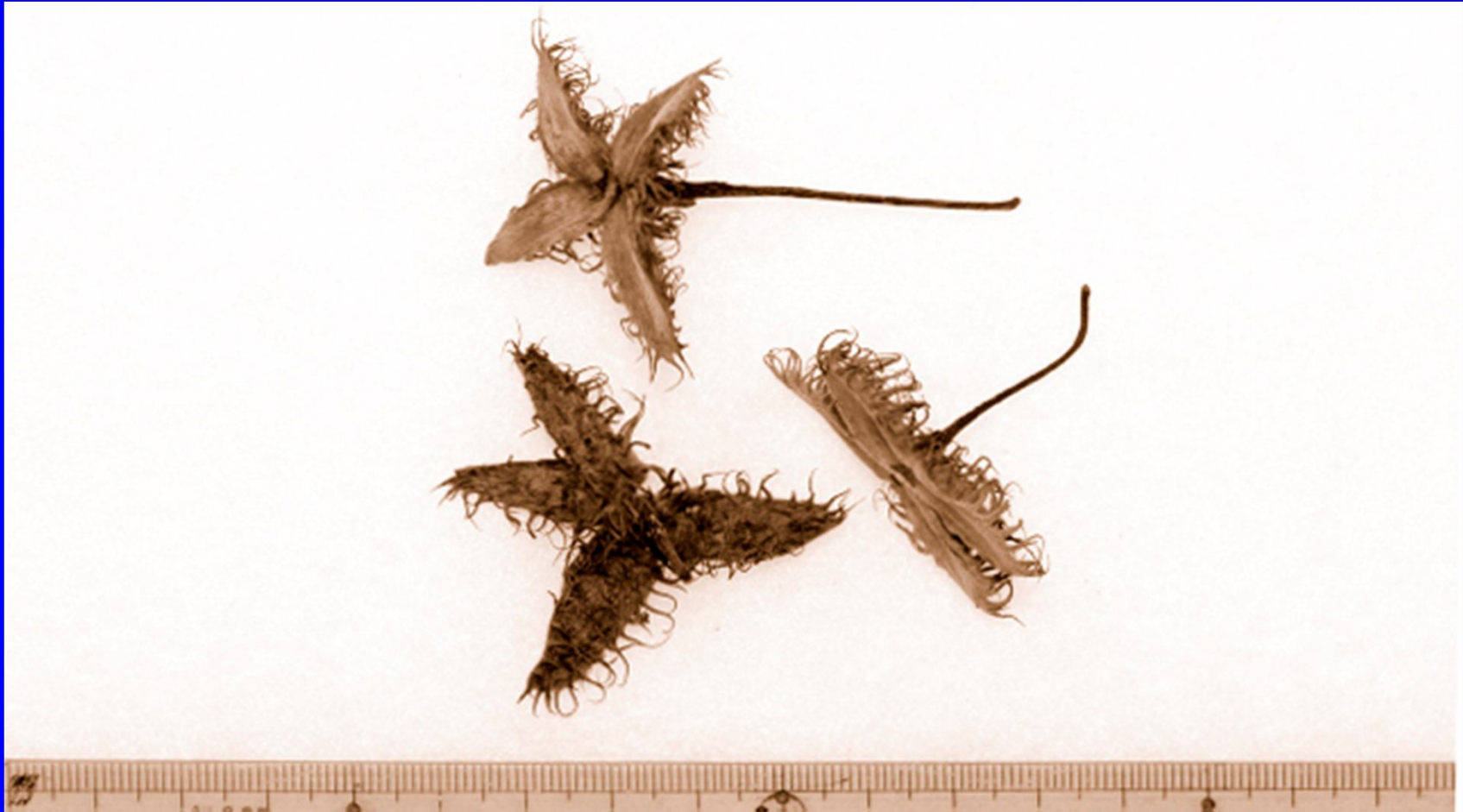


***Fagus longipetiolata* (= *sinensis* ?)**



Scans made by Jan De Langhe, available on [www.arboretumwespelaar.be](http://www.arboretumwespelaar.be)

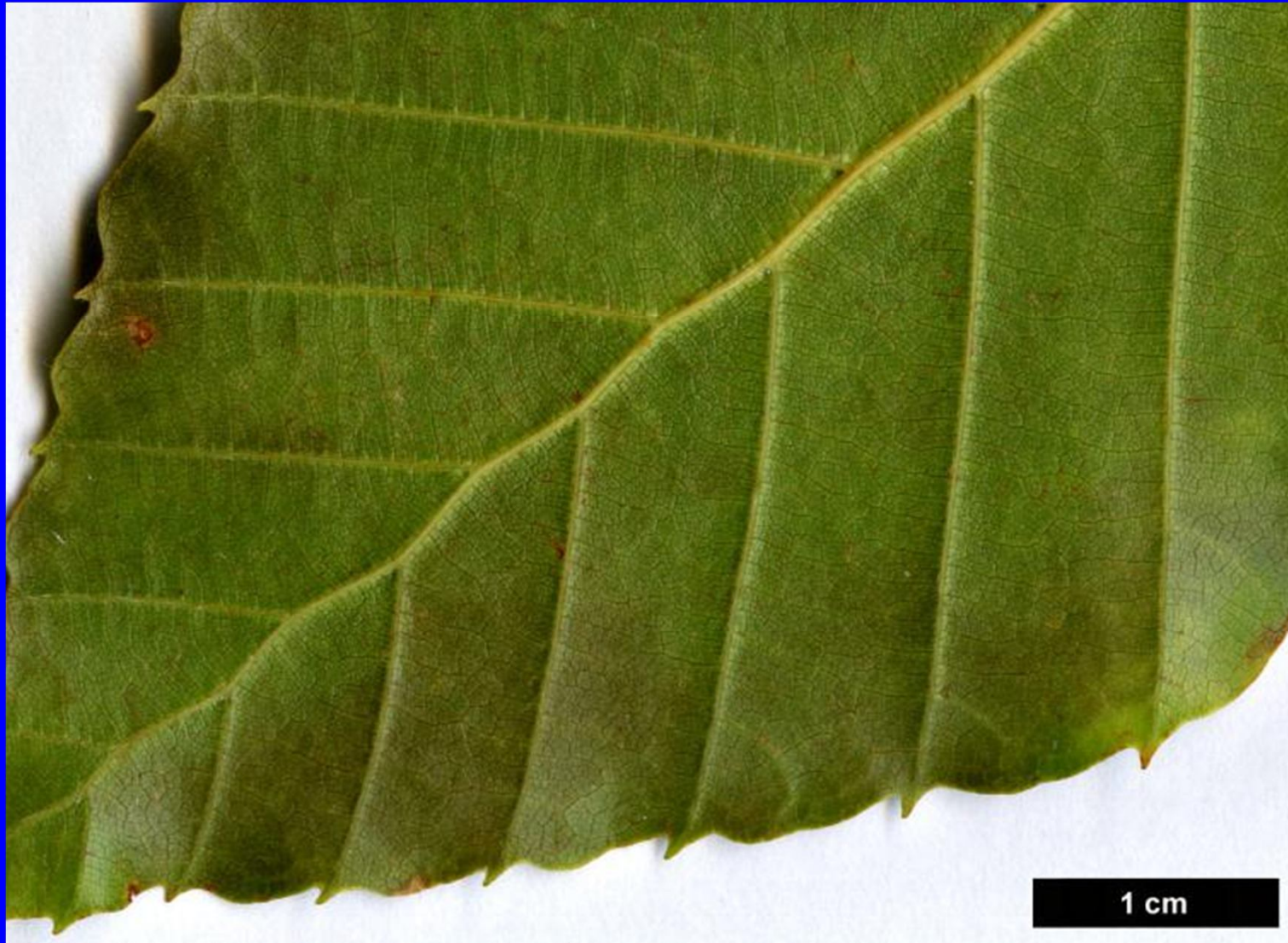
*Fagus longipetiolata* (= *sinensis* ?)



# *Fagus lucida*



*Fagus lucida*

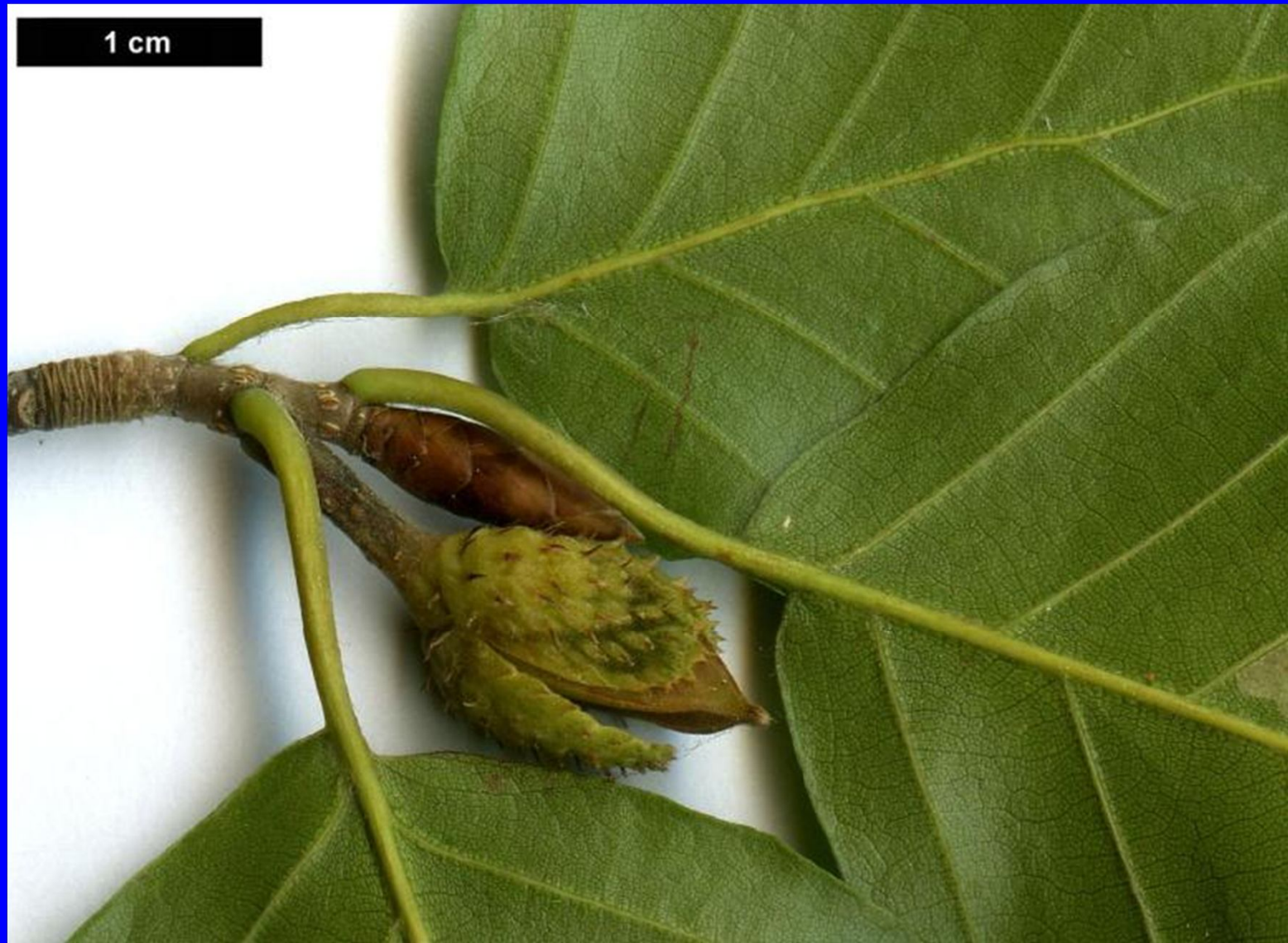


# *Fagus lucida*





# *Fagus lucida*



# *Fagus chienii*

Scan of isotype specimen,  
University of Michigan Herbarium

Only known from the type specimen (N Sichuan)

Similar to *Fagus lucida*,  
but the cupule bracts longer and recurved

*Fagus crenata* (Mt Zao)



# *Fagus crenata*



*crenate*



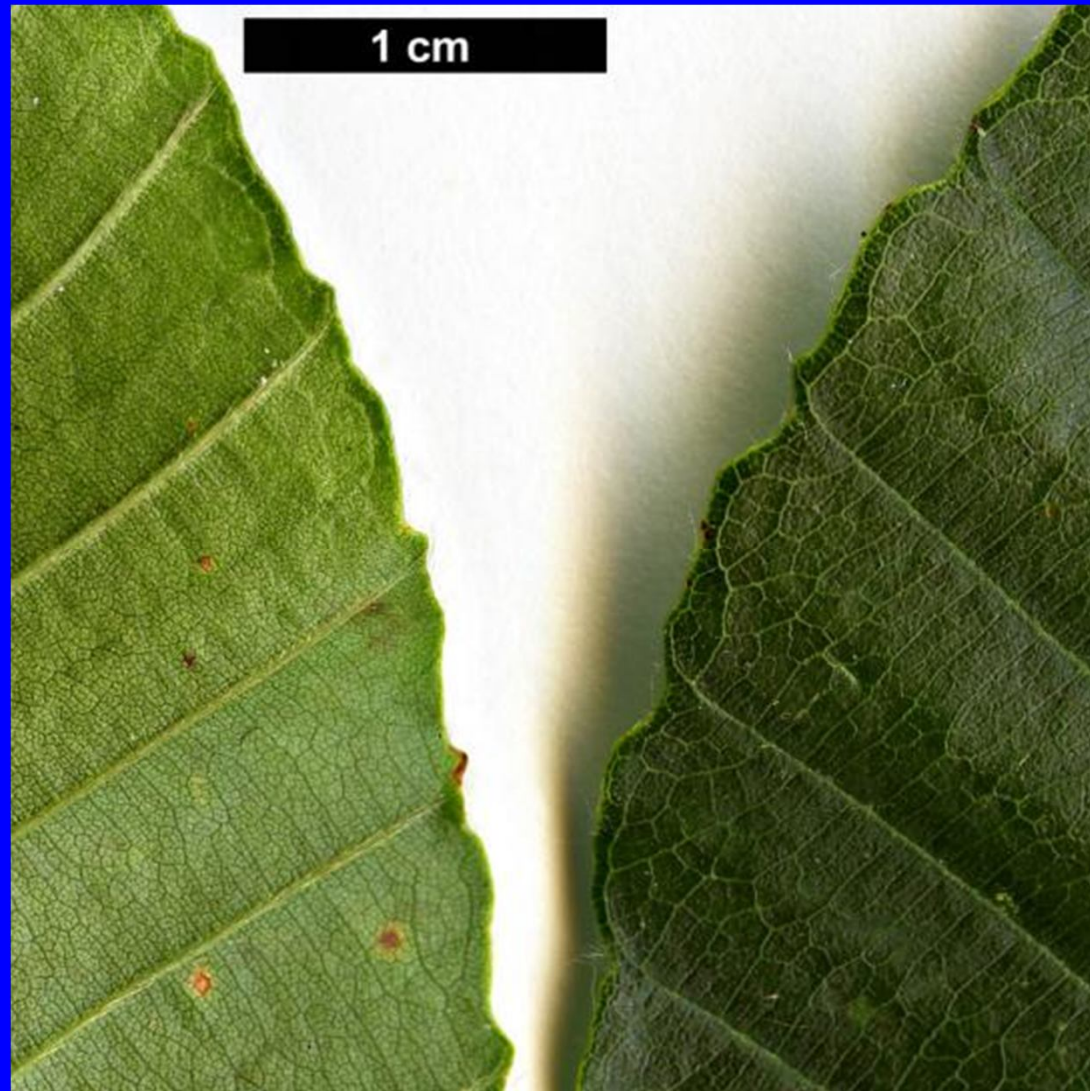
***crenate***



***Fagus crenata* (Mt Fuji)**



***Fagus crenata* (Mt Fuji)**





# *Fagus sylvatica*



*Fagus sylvatica*



***Fagus sylvatica* 2013-06-19**



# *Fagus orientalis*



# *Fagus orientalis*



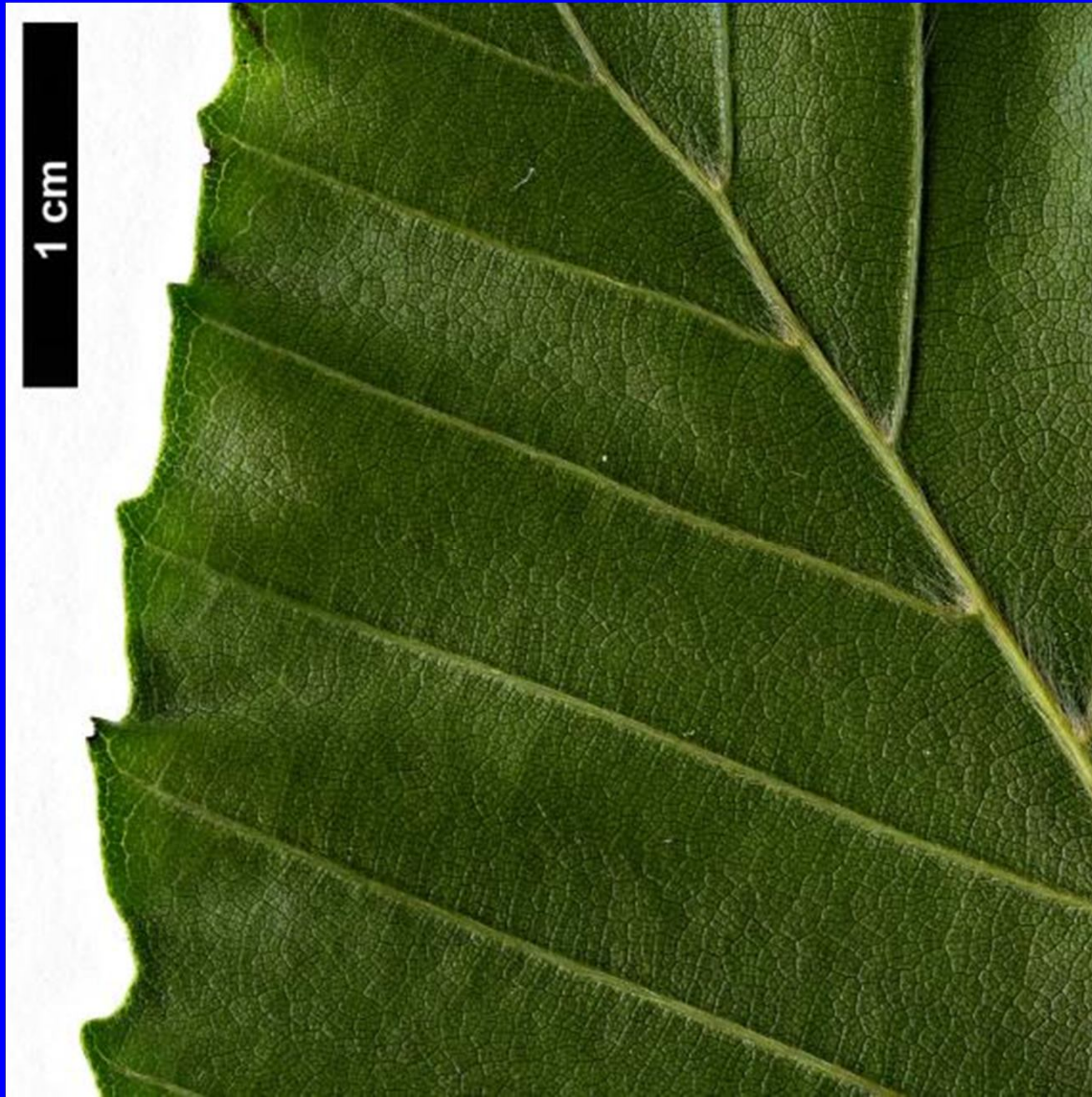
*Fagus orientalis*



*Fagus orientalis* (Georgia)



*Fagus orientalis* (Georgia)

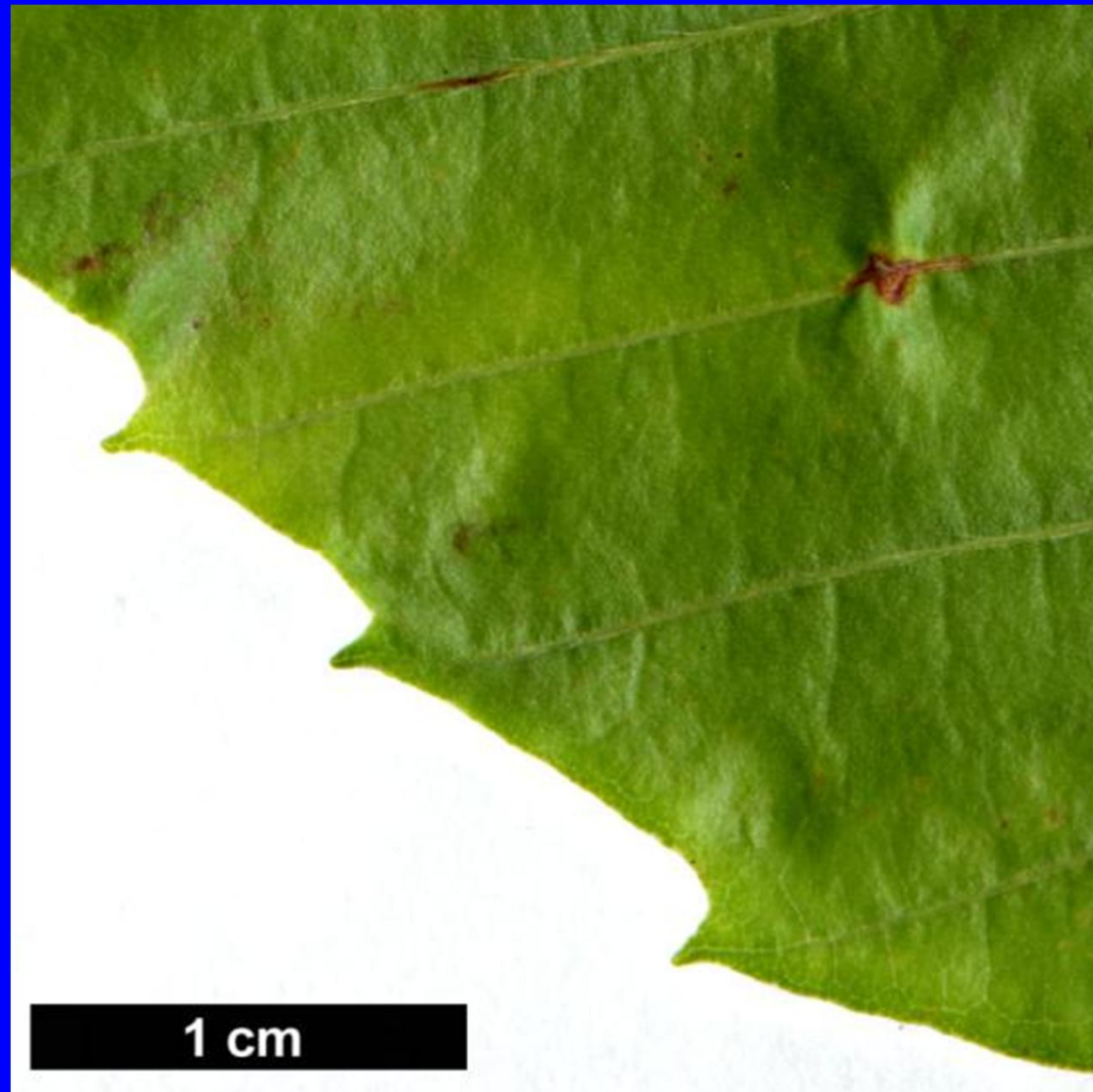




# *Fagus grandifolia*



*Fagus grandifolia*



***Fagus grandifolia***



***Fagus grandifolia* subsp. *mexicana***



***Fagus grandifolia* subsp. *mexicana***



## ***Fagus subgenus Englerianae***

- multi-stemmed or low-branching trees
- lenticels large rhombic or elongated
- “buds stipitate”

(Denk 2003: 58)

# *Fagus engleriana*



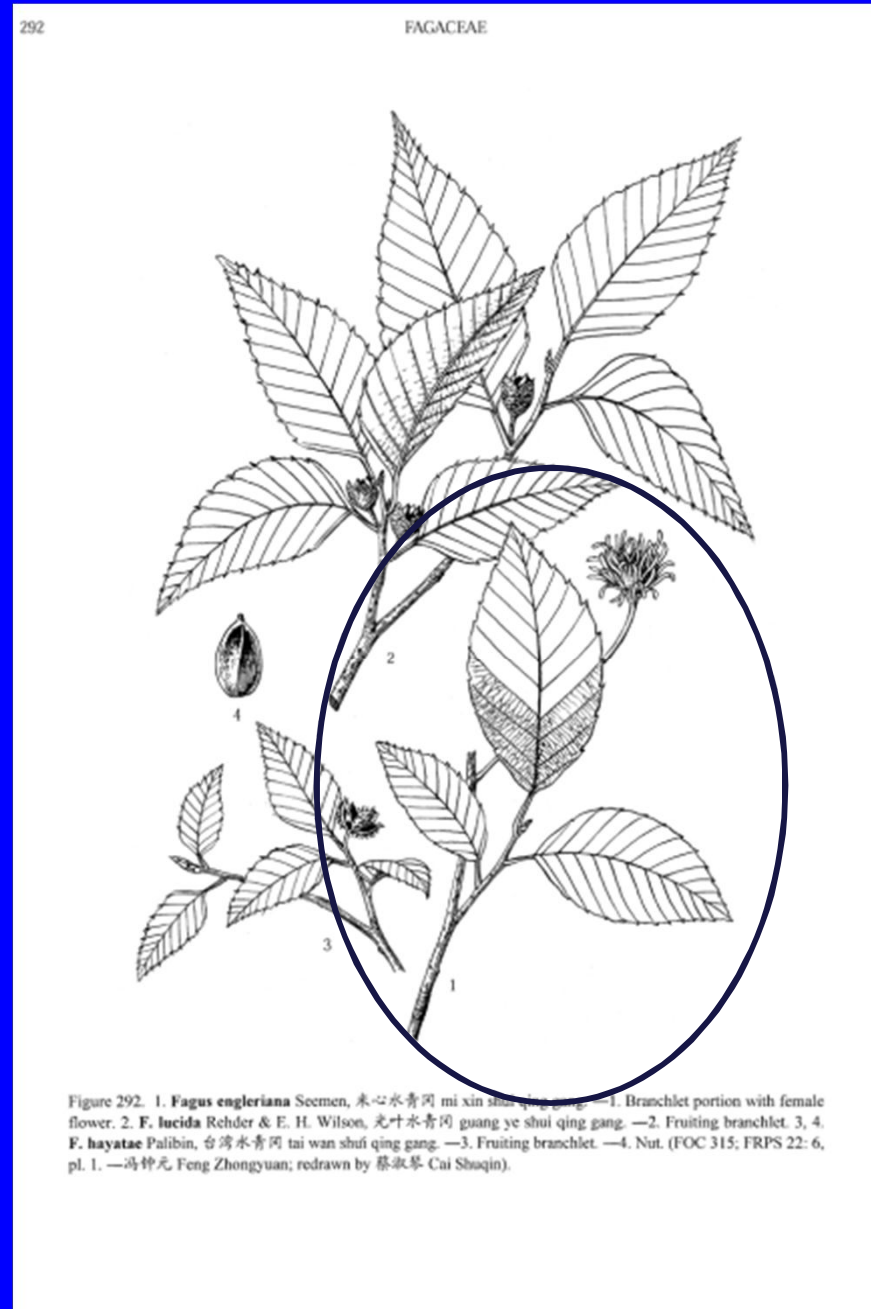
# *Fagus engleriana*





# *Fagus engleriana*

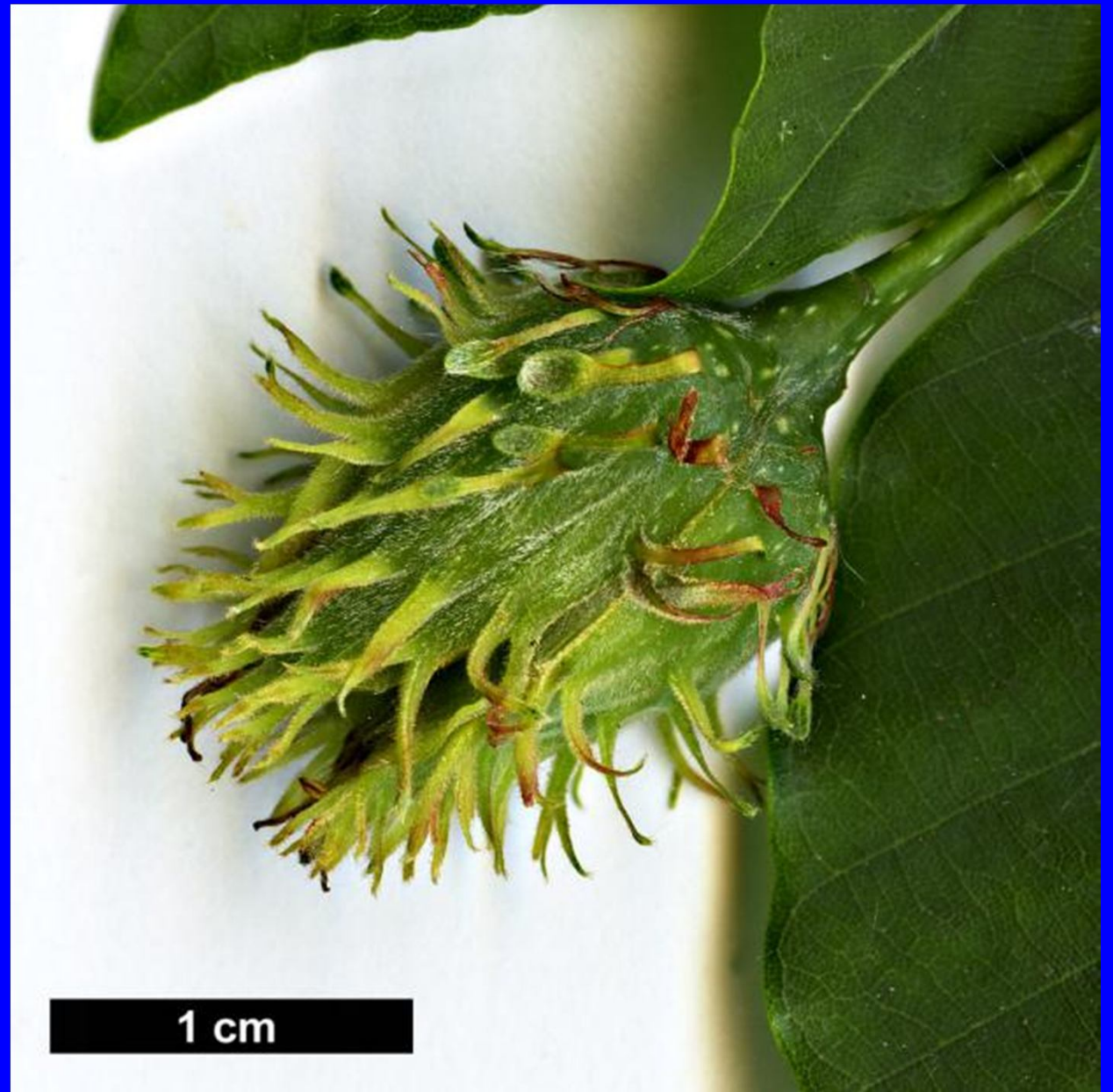
(Huang et al. 1999)



***Fagus multinervis* (= *engleriana* ?)**



***Fagus  
multinervis  
(= engleriana ?)***



# *Fagus japonica*



# *Fagus japonica*



## *Fagus okamotoi*

No data, name in PhD thesis of Chen 1992

Not yet published ?

Similar to *Fagus japonica*, but

- nuts longitudinally winged
- lamina relatively wider

# ***Life history of a *Fagus sylvatica* specimen***

**As observed in the Botanical Garden,  
Ghent University**

**Spring – autumn 2013**

*Fagus sylvatica* 2013-03-13





*Fagus sylvatica* 2013-05-02



*Fagus sylvatica* 2013-05-06



*Fagus sylvatica* 2013-06-11



*Fagus sylvatica* 2013-06-19



***Fagus sylvatica* 2013-06-19**



*Fagus sylvatica* 2013-07-02



*Fagus sylvatica* 2013-08-13



*Fagus sylvatica* 2013-08-27





***Fagus sylvatica* 2013-08-27**



*Fagus sylvatica* 2013-08-27



*Fagus sylvatica* 2013-08-13



*Fagus sylvatica* 2013-08-27



## ***The take home message***

***Fagus* in Fagaceae, in Fagales, in Fabids, in Rosids, in Eudicotyledons**

***Nothofagus* (the false beech) in separate family  
(stipules with basal swelling)**

***Fagus* different from all other Fagaceae  
(germination, staminate & pistillate inflorescences)**

**Bud scales = pairs of stipules**

***Fagus* subgenus *Fagus* = paraphyletic basal group**

***Fagus* subgenus *Englerianae* = monophyletic crown group**

# ***Acknowledgements***

***Belgische Dendrologie***

***Jan De Langhe***

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Christina Pluhar  
Andreas Scholl  
Wikipedia***

***And to whom I might forget...***

***Thank you very much,  
sincerely !***

**Avrupa kayını**

**Fagul**

**Routbuch**

**Faggio selvatico**

**Haya**

**Fayard**

**Euroopanpyökki**

**Pago arrunta**

**Faiu**

**Faig**

**Faou**

**Fó**

**Hète**

**Bok**

**Fagaro**

**Bøk**

**Közönséges bükk**

**Faia**

**Türkçe**

**Romana**

**Lëtzebuergesch**

**Italiano**

**Español**

**Arpitan**

**Suomi**

**Euskara**

**Corsu**

**Català**

**Brezhoneg**

**Lumbaart**

**Picard**

**Svenska**

**Vèneto**

**Norsk**

**Magyar**

**Galego**