

BDB Hydrangea study day 2016

Comments with the slides of the presentation of Paul Goetghebeur

Slide 1

Diagnostic features of the genus *Hydrangea*

Leaves decussate

Inflorescence = corymb

Marginal flowers enlarged

Slide 2

APG = Angiosperm Phylogenetic Group

IV = fourth edition

Slide 3

Phylogeny of Cornales

Many branches are poorly supported

One node unresolved = polytomy

Slide 4

No extra comment

Slide 5

One of the four families of Flowering Plants with (evolutionary independently developed) stinging hairs :
Boraginaceae, Euphorbiaceae, Loasaceae, Urticaceae.

Slide 6

Cornus

- leaves decussate

- with eucamptodromous venation

- T-hairs on twigs & leaves

subgenus *Kraniopsis*

- inflorescence a corymb, with bluish black fruits

Slide 7

Cornus

- leaves decussate

- with eucamptodromous venation

- T-hairs on twigs & leaves

subgenus *Syncarpea*

- inflorescence compacted into a head, with red fruits

Slide 8

Nyssaceae, a poorly understood family, with 5 genera.

Cultivated in W Europe : *Camptotheca*, *Davidia*, *Nyssa*.

Two more genera from (sub)tropical Asia : *Diplopanax*, *Mastixia*.

Slide 9

The family Hydrangeaceae is resolved into three clades :

- *Jamesia* clade

- *Philadelphus* clade
- *Hydrangea* clade

Slide 10

Jamesia clade, with two genera, *Jamesia* & *Fendlera*

Philadelphus clade, with three subclades each with two sister genera,

Whipplea & *Fendlerella*

Kirengeshoma & *Deutzia*

Philadelphus & *Carpenteria*

Hydrangea clade = tribus *Hydrangeeae*

Slide 11

All of the genera of the tribe *Hydrangeeae* were revealed as nested in the genus *Hydrangea* sensu stricto.

In order to comply with the need for monophyletic taxa (= evolutionary units), two solutions are possible :

- splitting
- lumping

Slide 12

No extra comment

Slide 13

The typical inflorescence of *Hydrangea* is corymbose (but often erroneously described as umbellate). The regular flower has 5 small sepals, 5 larger petals, 5 + 5 stamens, and a pistil with (2-) 3 (-4) styles and stigmas.

The enlarged marginal flowers are often reduced in merosity.

Scan Jan De Langhe

Slide 14

Hydrangea davidii

Marginal flower of the corymb with greatly enlarged sepals, small petals, stamens. But ! Reduced in number, i.c. 3-4-merous.

Sometimes also the pistil might be functional.

These flowers are not really "sterile".

Slide 15

A page from the comic series "Nero"

His wife is anxiously awaiting news from her disappeared husband.

A magician tells her that he is hiding somewhere in a Louis XIII cupboard.

Slide 16

She is placing an advertisement in a local journal, with her address : Hortensiastraat 1 !

Slide 17

Clearly the couple has moved from their address in an older series, in the Pompstraat 1.

Slide 18

From the old (pre-molecular) classification to ...

Slide 19

... a new molecularly based classification.

Slide 20

In this new classification the 8 former genera of the tribe Hydrangeeae are now included in the genus *Hydrangea* sensu lato, encompassing 16 sections.

Slide 21

Phylogenetic tree, based on combined data of 4 chloroplast genes.
Length of branches = degree of divergency.

Slide 22

Sectio *Chinenses* is rather easily recognized morphologically, by the many scattered and small inflorescences, the narrow leaves, and the more or less straggling branches.
Many names are available for taxa in this species complex, a proper delimitation is not yet available.
Sectio *Hirtae*, with the single species *Hydrangea hirta* is kept separate, both on molecular and morphological grounds.

Slide 23

Shima = island
konterigi = ? (still unknown)

Slide 24

Species described from the Philippines

Slide 25

Gaku = fringed
utsugi = plant with hollow stems, i.c. *Deutzia crenata*

Slide 26

No extra comment

Slide 27

ko = small
ajisai = hortensia
This species originally was described as a species of the genus *Viburnum*, as *Viburnum hirtum* Thunberg (1784).
It was recognized as a species of the genus *Hydrangea* by von Siebold (1828). Remarkably, although this species is lacking the typical enlarged marginal flowers, it was later on always considered as a right member of the genus *Hydrangea*.

Slide 28

No extra comment

Slide 29

No extra comment

Slide 30

Sectio *Macrophyllae* has two closely related Japanese species, *Hydrangea macrophylla* and *Hydrangea serrata*.

Slide 31

gaku = fringed

azu = gathering

sa = blue

ai = colour

Hydrangea macrophylla is the lowland species.

Slide 32

No extra comment

Slide 33

No extra comment

Slide 34

yama = mountain

ajisai = hortensia

Hydrangea serrata is the upland species. A wide morphological range of marginal flower forms is easily recognized.

Slide 35

ama = sweet

cha = tea

This selection is the source of a well known tea, made from dried and powdered leaves.

Slide 36

No extra comment

Slide 37

Two more sections, a (sub)tropical section *Dichroa*, and the rather enigmatic section *Stylosae*.

Slide 38

The genus *Dichroa* is easily recognized and different from other Asian species of *Hydrangea* by several features :

- evergreen
- no enlarged marginal flowers
- berries

Furthermore its (sub)tropical area is so unlikely for "true" *Hydrangea*...

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No extra comment

Slide 40

The section *Stylosae* is rather enigmatic, with many uncertainties.

What exactly is *Hydrangea stylosa* ? We have received "*Hydrangea stylosa*" from several sources, and these plants really do not match each other.

The treatment in the "Flora of China" is not really helping.

Slide 41

No extra comment

Slide 42

No extra comment

Slide 43

The single species from the section *Broussaisia* is representing the first oceanic migration event, reaching Hawaii.

This species is showing polygamy (with bisexual and unisexual plants and/or populations, and a clear trend towards dioecy), the fruits are berries, and the styles seem to be united into one single structure.

Slide 44

Endemic on Hawaii

Polygamous to dioecious shrubs

Berries

Slide 45

No extra comment

Slide 46

No extra comment

Slide 47

No extra comment

Slide 48

Finally the ocean is crossed, and *Hydrangea* has reached the American continent, for a first time in its evolution.

The two species treated here most probably do present two widely divergent (molecularly & morphologically !) branches of a single migration event.

Slide 49

Hydrangea arborescens is the type species of the genus, being the first to be described by Carl Linnaeus in 1753 from an American collection, "habitat in Virginia". Natural area in E USA & Canada. The genus was therefore longtime considered a North American genus.

Slide 50

Stems with longitudinal stripes.

Inflorescences with a small number of enlarged marginal flowers, and their sepals rather poorly developed.

Slide 51

Flower structure :

sepals 5, small

petals 5, triangular & cucullate

stamens 5 + 5

pistil of 2 carpels, with semi-inferior ovary and two separate styles
The fruit with its two halve follicles is very similar to the situation in the family Saxifragaceae, hence the former allocation of *Hydrangea* in this (completely unrelated) family.

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Hydrangea quercifolia is the second American species, described by John Bartram in 1791.

Slide 53

No extra comment

Slide 54

No extra comment

Slide 55

Back to Asia !

The section *Asperae* is composed of one large species-complex, the *Hydrangea aspera* group, and three more divergent evolutionary lines.

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No extra comment

Slide 57

No extra comment

Slide 58

First collected in 1907, by E.H.Wilson 772, with living specimens from seed received in 1908 still in Edinburgh (and in Ghent University Botanical Garden).

Second collection made in 2012, by Yannick De Smet & Kenneth Bauters YDS 1437, and growing from seed in the Ghent University Botanical Garden as 2015 2525 W.

Slide 59

baika = cherry flower

amacha = sweet tea

Platycrater = wide cup

A species whose affinities with *Hydrangea aspera* are not readily evident !

Most conspicuous are the connate sepals of the marginal flowers, forming a clear cup-like structure.

Slide 60

One of the many beautiful plates in the masterly *Flora Japonica*...

Slide 61

No extra comment

Slide 62

yahazu = arrow head

ajisai = *Hydrangea*

Another unusual species in the section *Asperae*.

Slide 63

Scan made by Jan De Langhe

Slide 64

tama = ball

ajisai = hortensia

The presence of a well developed involucre is a feature that will reappear in the next section, remarkably.

The Taiwan population probably is representing a second, and closely related species.

Slide 65

No extra comment

Slide 66

No extra comment

Slide 67

In section *Cornidia* a second transoceanic migration event is recognized.

The basalmost clade (*Hydrangea integrifolia*) still is Asian, but all other species are American, from Mexico to deep south into Chile.

The PhD study of Carolina Granados Mendoza was devoted to this section. On the recent XX symposium (September 2016) of the Mexican Botanical Society this thesis was awarded the first price in the category of PhD studies...

Slide 68

Hydrangea integrifolia is known from Taiwan and the Philippines.

All species of this section are evergreen climbers. The inflorescences are protected by a large involucre during their development.

In Central and South America many (all ?) species are dioecious, well documented in several species, expected in other ones.

Slide 69

Probably the more commonly cultivated species in UK, covering large walls, a rather unexpected hydrangeaceous habit.

Slide 70

No extra comment

Slide 71

The uncovered inflorescences (after the shedding of the involucre bracts) do resemble small cauliflowers...

Slide 72

Esteban Martinez climbing a tree to look for flowering *Cornidia*'s...

Slide 73

A newly described species, *Hydrangea albostellata* (2014), by Marie-Stéphanie Samain, Francisco Hernandez Najarro and Esteban Martinez Salas.

Dioecious species, collected from S Mexico (Chiapas) to Costa Rica.

Slide 74

No extra comment

Slide 75

No extra comment

Slide 76

No extra comment

Slide 77

Sectio *Calyptranthe* is the sister group of sectio *Cornidia*.

Climbers, but with deciduous foliage.

First described from the Himalayas (as *Hydrangea anomala*), later on described from Japan (as *Hydrangea petiolaris*).

Again a species complex ?

Slide 78

tsuru = vine, climber

ajisai = hortensia

Calyptranthe = petals connate, and deciduous as a cap

Slide 79

No extra comment

Slide 80

Two more sections, both molecularly and morphologically divergent.

All species are unusual in *Hydrangea*, because they are NOT woody. The above-ground parts of these plants are disappearing during the winter, the rhizome is the surviving structure.

Slide 81

kusa = herbaceous

ajisai = hortensia

Species of this genus have alternate leaves, a most unusual feature in *Hydrangea*.

Slide 82

No extra comment

Slide 83

The name *Cardiandra* was based on the heart-shaped anthers.

Slide 84

Another oddity in *Hydrangea*.

The marginal flowers are really sterile, and small.

The central flowers have become very large and showy, demonstrating "The Rule of the Inverse".

This species is endemic to the Hubei province of China.

Slide 85

gin = silvery

bai = flower of Japanese apricot (*Prunus mume*)

sô = plant

The Japanese sister species, with its beautiful silvery flowers.

Slide 86

No extra comment

Slide 87

No extra comment

Slide 88

Three more sections both molecularly and morphologically divergent.

All three are climbing species, evergreen or deciduous.

Slide 89

shima = island

yuki = ? (several translations possible)

kazura = climber

Pileostegia = cap covering, i.e. the petals are connate and deciduous as a cap.

No enlarged marginal flowers present.

Slide 90

Finally in section *Decumaria* a third transoceanic migration event is recognized.

Only two species are known, one Asian (*Decumaria sinensis*) and the (SE) North American *Decumaria barbara*.

The flowers have doubled their merosity, the floral parts are present in 10-fold.

Slide 91

iwa = rock

garami = climber

The gracious habit of these inflorescences is due to the tongue-like enlarged marginal flowers, where only one single sepal has grown into a semaphyll.

Slide 92

No extra comment

Slide 93

Finally there is the sectio *Heteromallae*, with two Asian species.

Slide 94

heteromalla = with woolly indumentum on one side

Hydrangea heteromalla is a Himalayan species, with a wide range from NW India to SC China, representing a similar morphological range of taxa whose status is not yet clear.

Slide 95

nori = fiber paste (for preparing paper)

utsugi = plant with a hollow stem, i.c. *Deutzia crenata*

Again a species with a wide geographical range, from SE China up to E Russia (Sakhalin).

Remarkable and easy recognized by the tricussate position of the leaves (at least on strong branches).

Slide 96

No extra comment

Slide 97

No extra comment

Slide 98

No extra comment