Angiosperm Phylogeny Group (APG) Classification
UNIT 2: Part 2
BBZ
Semester 3

Previous Classifications were based on Morphology and biochemistry:

Countries	Scientists
Europe	Engler system
Britain	Bentham and hooker
Soviet union	Takhtajan system
United nation	Cronquist System

After 1980 phylogenetic method based on genetic evidence is been accepted due to which these existing classifications start facing problems .

APG classification was published in 1998.

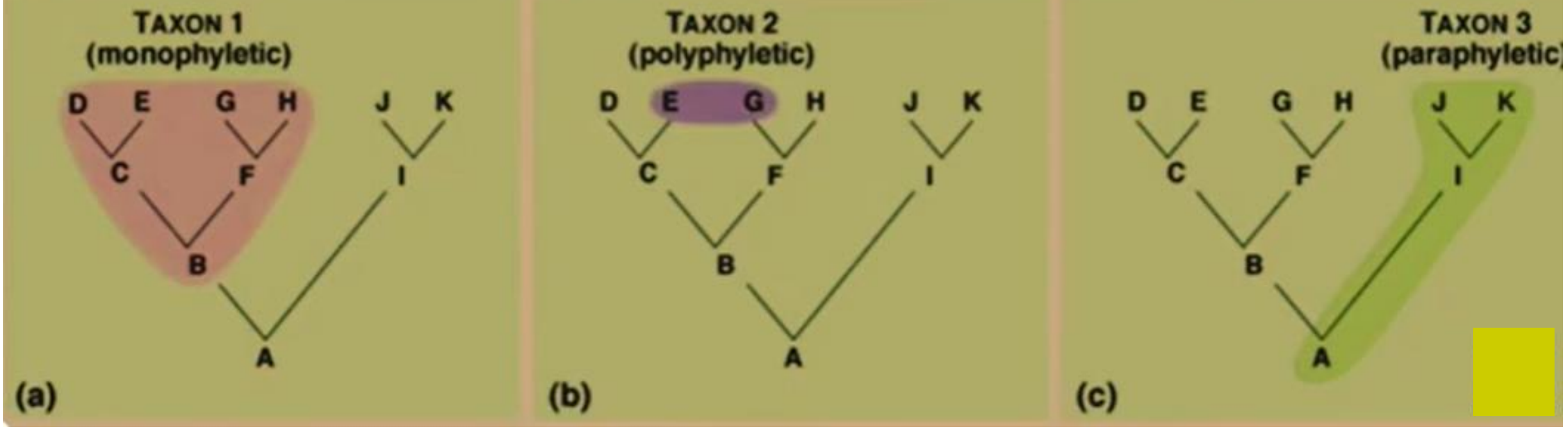
3 Revision [2003,2009,2016]

What is APG classification?

- In the late 1990s, an informal group of botanists from major institutions of world that have been carrying out the analysis of plant genetic material came together under the title of the 'Angiosperm Phylogeny Group' or APG.
- Their intention was to provide a widely accepted and more stable point of reference for angiosperm classification.
- Their first attempt at a new system was published in 1998 (the APG system). Three revisions have been published, in 2003 (APG II) , 2009 (APG III) and 2016 (APG IV), each superseding the previous system.

Why APG classification is required?

Earlier classifications were not based on Monophyletic group [Group that includes all descendants of a common ancestor].



Principles of APG classification

- The Linnean system of orders and families should be retained.
- Groups should be Monophyletic.
- Broader approach should be taken i.e. families with single genus and orders with single family should be avoided.
- Clades term should be used more freely above or parallel to the level of order.

APG I (1998)

- Proposed as "Reference tool of broad utility" .
- Recognition of 40 orders.
- Instead of scientific terms Clade is often used .
- Many families are given places but still 25 families are having **"uncertain position"**.

Result:- Division of Angiosperm into Monocots and Dicots were discontinues. New term Eudicot or true dicots now introduc

APG II(2003)

- Smaller families were placed in larger groups "Bracketed families" .

For Example:- The large Asparagaceae family includes 7 Bracketed families.

APG III(2009)

- Major change was, use of "Bracketed families" we discontinued .
- Result:- APG III contain only 415 families instead of 457 of APG

For Example:- Agavaceae and Hyacinthaceae are no long regarded as distinct from Asparagaceae

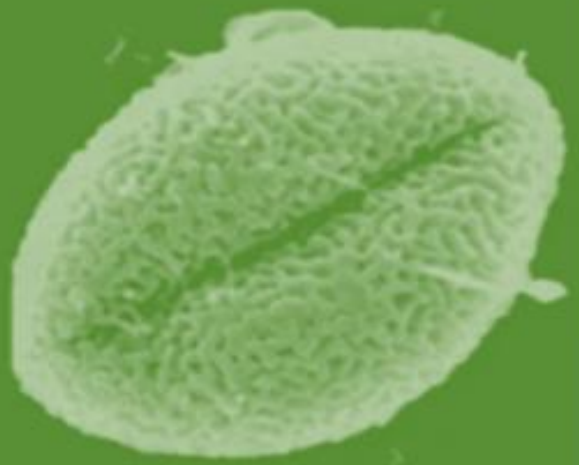
APG IV (2016)

- Peter Stevens questioned the validity of discussion regarding fam
  delimitation in the absence of changes of phylogenetic relationsh
- The large gene banks (plastid mitochondrial and nuclear ribosom
  are used.
- Total no. of orders - 64 and families -416.

Eudicot(Tricolpates) :- It is true Dicot.

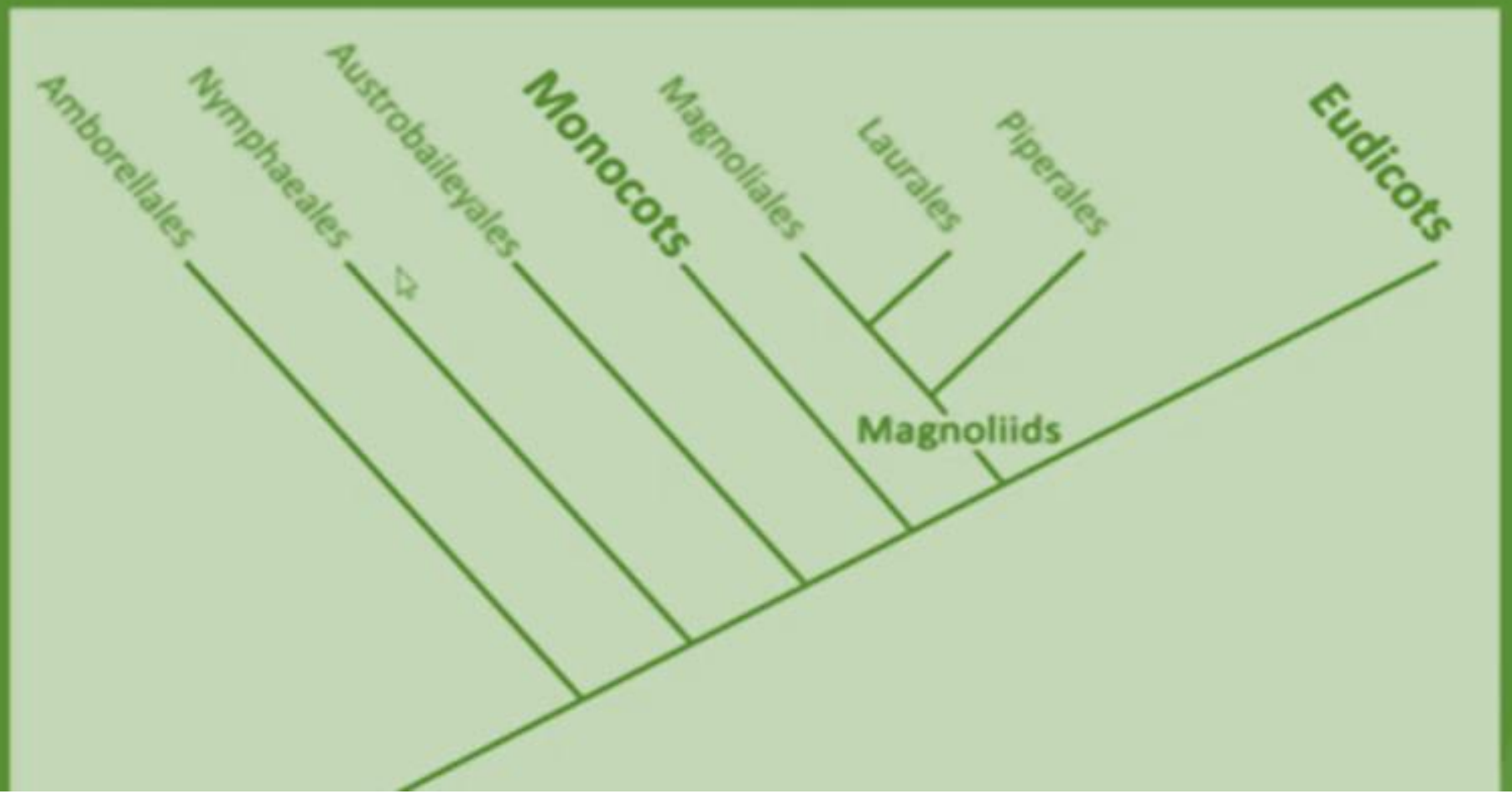
- It is the largest group of flowering Angiosperm
- In this a pollen grain has three long grooved apertures.
- It is also known as tricolpates because of three colpi in its pollen grain.

Seed plant	ANGIOSPERMS	CLADES	1. Eudicots or tricolpates constituting over 70% of angiosperm species. Eudicot is a monophyletic gr
			2. Monocot-Monocolpates
	MAGNOLIIDS OR PALEODICOTS OR BASAL AMGIOSPERM		• Paleodicots refer to angiosperms which are n monocots or Eudicots. • MAGNOLIIDS OR PALEODICOTS OR BASA



MONOCOTS	EUDICOTS
Seeds having one cotyledon.	seeds having two cotyledons.
Parallel venation.	Reticulate venation.
Fibrous root system.	Tap root system.
Flower part in multiple of three.	Flower part in multiple of four or five.
Usually herbaceous , never woody.	Woody or herbaceous.
Pollen grain has 1 aperture.	Tricolpate pollen grain has 3 aperture.
Vascular bundles in stem are scattered.	Vascular bundles in stem is arrange in ring.
Vascular tissue in root is arrange in ring.	Root xylem is usually star shaped and phloem is b/w arms of star.

CONCLUSION:-


Amborellales
Nymphaeales
Austrobaileyales
Monocots
Magnoliales
Laurales
Piperales
Eudicots
Magnoliids

APG IV

The APG IV classification system of flowering plants is the fourth version of a modern, molecular-based, system of plant taxonomy for angiosperms. It was developed by the angiosperm phylogeny group, and was published in 2016 (7 years after the APG III system was published in 2009 and 18 years after the APG I system was published in 1998).

In 2009, a linear arrangement of the system was published in APG III paper; the APG IV system also includes such an arrangement. In contrast to the APG III system, the APG IV system recognises 5 new orders (Boraginales, Dilleniales, Icacinales, Metteniusales, and Vahliales), and some new families, forming a total 64 angiosperm orders and 416 families.

Below is a summary of APG IV classification:

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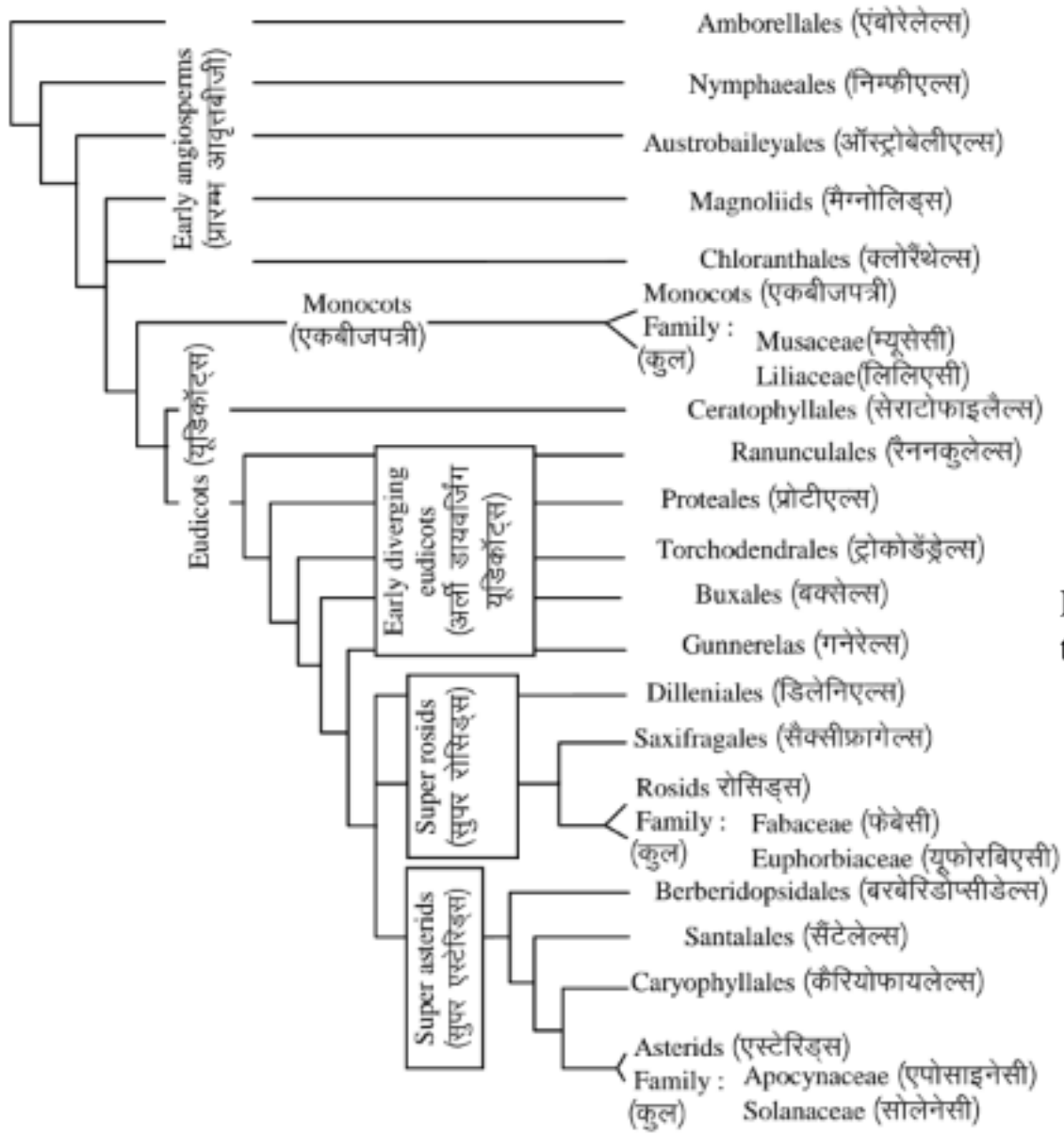

Early angiosperms, monocots, and eudicots are the three types into which angiosperms are divided.

Figure 2.3: Simplified Version of APG IV Classification
(Source: Plant Gateway's The Global Flora, Vol. 1 January, 2018)
(चित्र 2.3– APG IV वर्गीकरण का सरलीकृत संस्करण (स्रोत– प्लांट गेटवे दि ग्लोबल फ्लोरा, वॉल्यूम 1 जनवरी, 2018))

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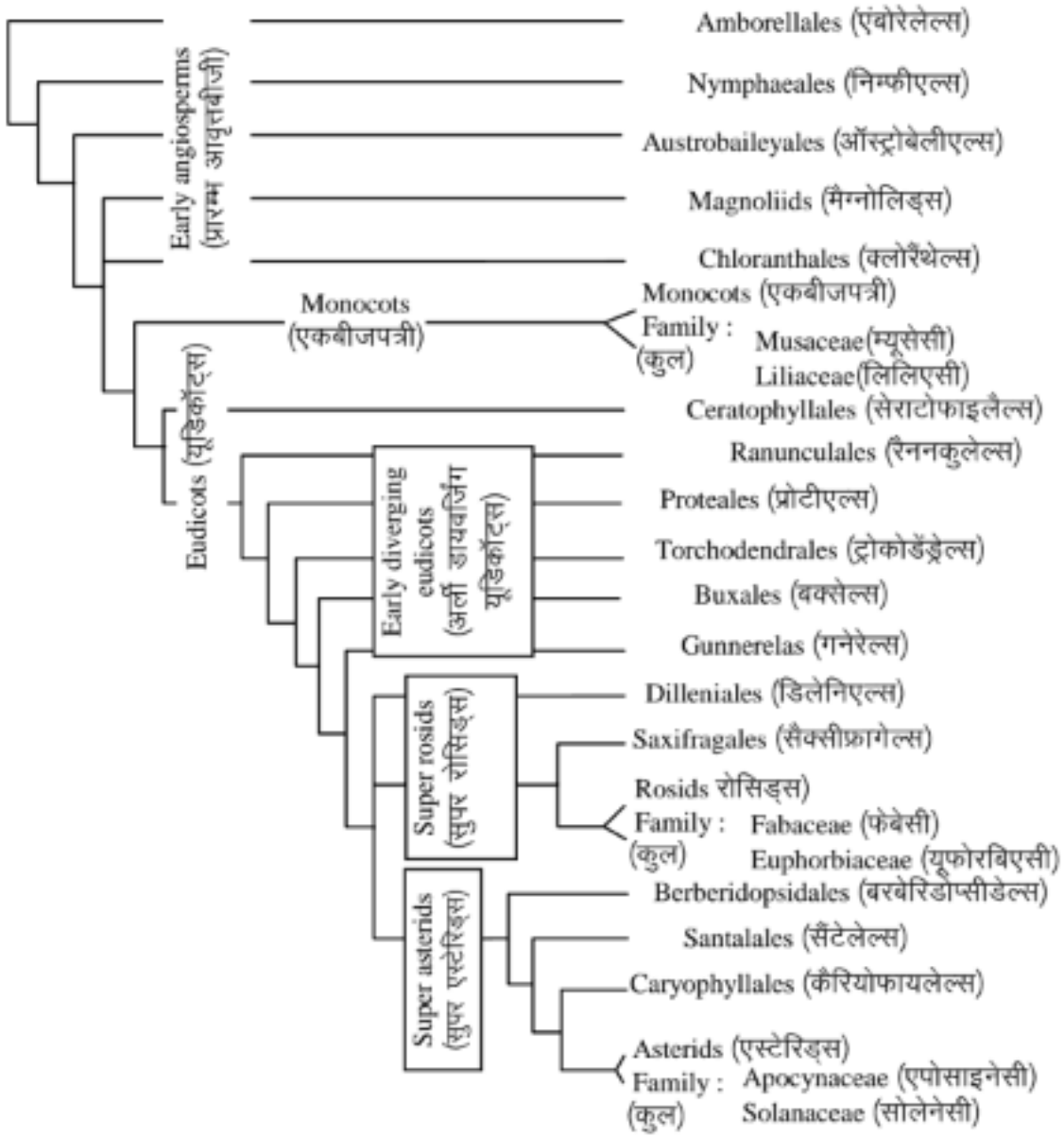

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8 orders and **26 families** (ANA-grade + Magnoliids + Chloranthales) are used to categorise early angiosperms. (ANA: Amborellales Nymphaeales Austrobaileyales):

1) Seeds have two cotyledons.
2) Ethereal oils are present
3) Leaves always have simple net veins.
4) Each flower whorl has numerous components.
5) Perianth is typically spirally organised or divided into three parts.
6) Stamens are broad and filamented.
7) Anthers are tetrasporangiate.
8) Pollen is monosulcate.
9) Nectaries are rare.
10) Carpels are typically free
11) Embryo is tiny.

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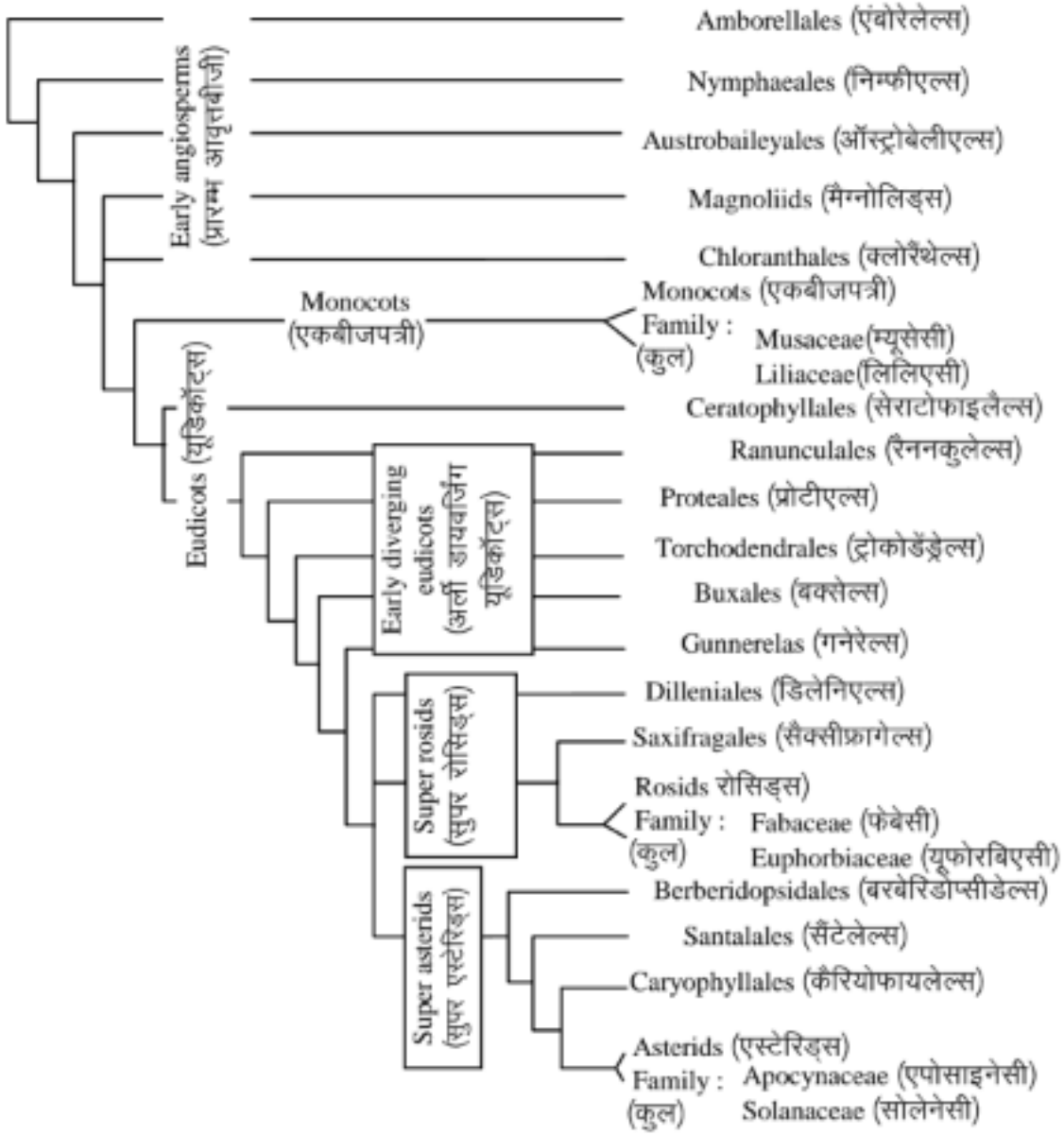

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Basal monocots + Lilioids + Commelinids make up the **11 orders** and **77 families** that constitute the monocot kingdom:

1) Seeds only have one cotyledon.
2) Primary root is short-lived.
3) Single ataxia prophyll.
4) Ethereal oils are present rarely.
5) Predominantly herbaceous.
6) Vascular cambium is absent.
7) Vascular bundles are dispersed throughout the stem.
8) Leaf is simple with parallel-veins.
9) Floral parts are usually in threes.
10) Tepals frequently make up the perianth.
11) Pollen is monosulcate.
12) Styles are mostly hollow.
13) Successful microsporogenesis.

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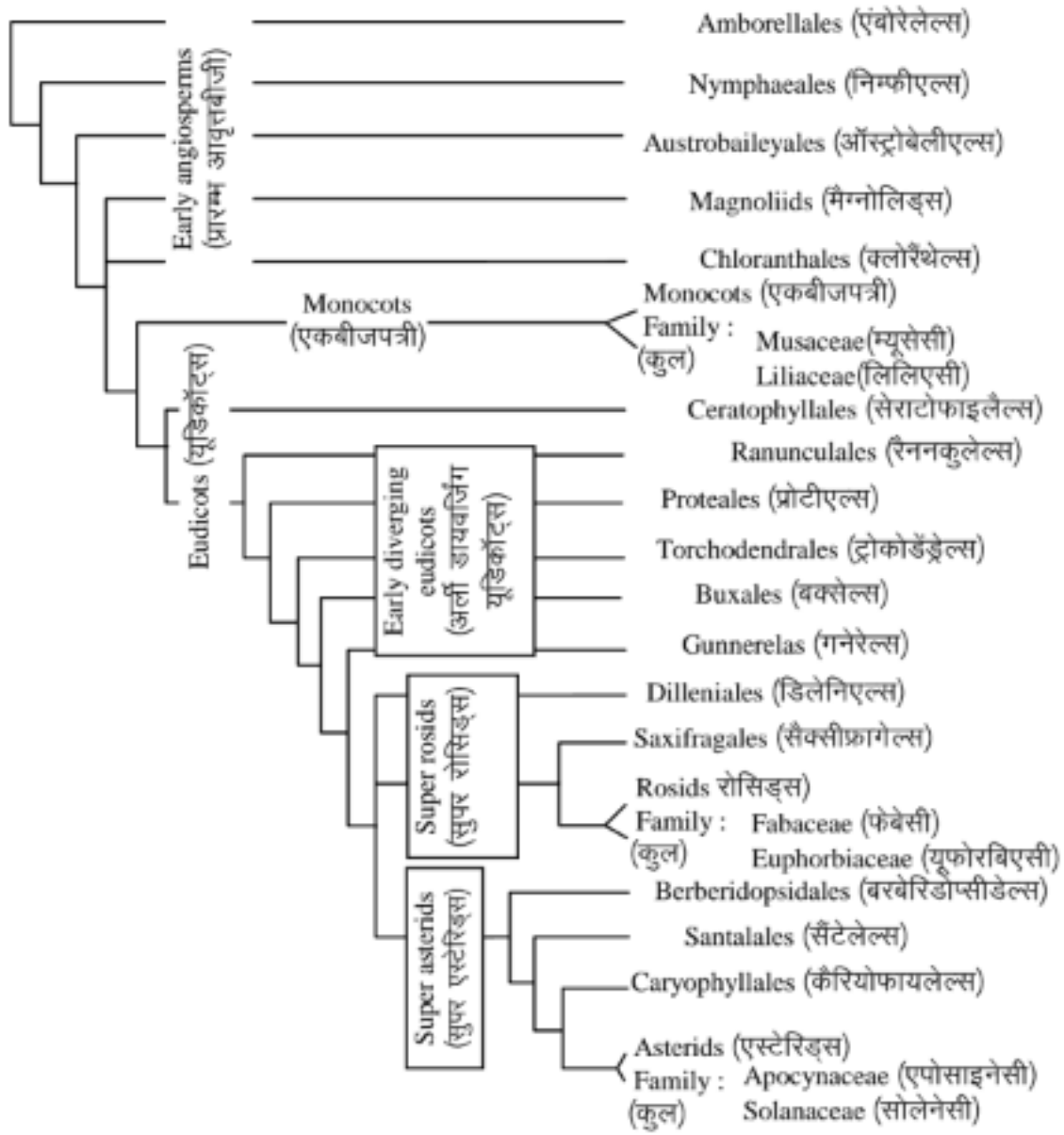

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Early diverging Eudicots + Super rosids + Super asterids make up the **313 families** and **45 orders** that constitute the eudicot kingdom.

1) Seeds have two cotyledons.
2) Nodes are trilacunar and have three leaf traces.
3) Stomata are anomocytic.
4) Ethereal oils are present rarely.
5) Herbaceous or woody plants.
6) Simple or complicated leaves are typically net-veined.
7) Most flower components come in groups of two, four, or five.
8) Simultaneous microsporogenesis.
9) Style is solid.
10) Pollen is tricolpate.

2.1.6.7. Merits of APG Classification

1) It adopts the phylogenetic principle of monophyly.
2) It obtains information from morphology, embryology, molecular biology, anatomy, palynology, and phytochemistry.
3) It provides formal names only where monophyly has been firmly established.
4) It is based on the recent advances in research and is gaining authority.

2.1.6.8. Demerits of APG Classification

1) It is limited to the taxonomic level of order and family.
2) It is not very prevalent.
3) Several families or genera have not been placed yet.
4) The orders are recognised under informal groups, like Magnoliids, Eudicots. These names do not conform to the ICBN.

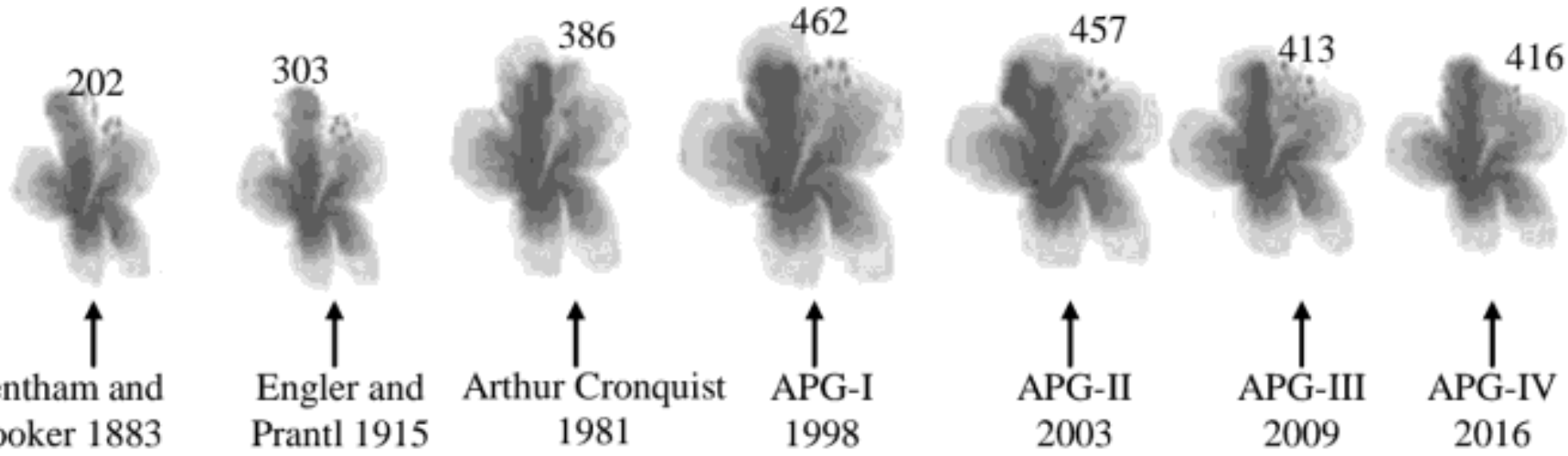

Figure 2.4: A Timeline showing the History of Classifying Flowering Plants into Families
(Source: Royal Botanic Garden Kew State of World's Plant, 2017) (चित्र 2.4—पुष्पी पादप को कुलों में वर्गीकृत करने के इतिहास को दर्शाने वाली एक समयरेखा (स्रोत रॉयल बॉटैनिकल गार्डन क्यू स्टेट ऑफ वर्ल्ड प्लांट, 2007))

THANK YOU