

# Plant taxonomy and nomenclature

## Taksonomia i nazewnictwo roślin

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### Abstract

Scientific classification of organisms is a very important task but also an extremely difficult one. Taxonomic analyses allow the reconstruction of a pedigree of plants and also the degree of relationship to each other. The paper describes basic rules of plant taxonomy together with systematics of higher plants indicating families of special aerobiological interest.

**Key words:** taxon, plant nomenclature, plant identification.

### Streszczenie

Naukowa klasyfikacja organizmów stanowi bardzo ważne, ale także wyjątkowo trudne zadanie. Analizy taksonomiczne pozwalają na rekonstrukcję rodowodu roślin oraz stopnia pokrewieństwa pomiędzy nimi. W pracy opisane zostały podstawowe zasady taksonomii roślin. Przytoczono także podział systematyczny roślin wyższych, ze szczególnym zwróceniem uwagi na rodziny mogące zainteresować aerobiologów.

**Słowa kluczowe:** takson, nazewnictwo roślin, identyfikacja roślin.

(PDiA 2003; XX, 4: 218–226)

For obvious reasons, scientists want to classify and sort organisms. This is a very complicated and difficult venture. Many synthetic aspects are used to find out the relationships among plant groups and individuals, such as morphology, anatomy, embryology, palynology, caryology, or phytochemistry. A very important difference in comparison to inanimate objects is the fact, that due to their phylogenetic relationship, organisms have already a hierarchic principle of classification which is independent from the observer.

The rules for classification and nomenclature are documented in the „International Code of Botanical Nomenclature” (latest version: St. Louis Code).

Whenever you give a (preliminary or fancy) name to an organic object (e.g. a plant or a pollen or spore), you have created a taxon. The rank of this taxon within the taxonomic units below may be uncertain or unknown. Especially in palynology, we often make use of such taxa that are of uncertain taxonomic value (so-called „form-genera” if the botanical affiliation is not known) (Table 1.).

Examples for nomenclature in the web:

International Code of Botanical Nomenclature (St. Louis Code):

<http://www.bgbm.fu-berlin.de/iapt/nomenclature/code/SaintLouis/0000St.Luistitle.htm>

<http://employees.csbsju.edu/ssaupe/biol308/naming.htm>

The various results of taxonomic investigations allow the reconstruction of a pedigree of plants and the degree of relationship to each other:

### Plant identification

Practical exercises in plant identification and a lecture will be given during the course. Descriptions and pictures of **allergenic plants** are prepared on the epi homepage: <http://www.polleninfo.org> (allergy info – plants). There are no pictures of pollen grains on these pages.

Examples for pictures of **pollen** grains in the web:

<http://paldat.botanik.univie.ac.at/>

[http://www.alergen.info.pl/alergen/atlas-roslin/atlas\\_roslin.html](http://www.alergen.info.pl/alergen/atlas-roslin/atlas_roslin.html)

<http://www.kv.geo.uu.se/pollen/quickpollen.html>

<http://perso.wanadoo.fr/pollens/frames.htm>

[http://www.aarrc.com/Pollens/Pollens\\_Pictures/pollens\\_pictures.html](http://www.aarrc.com/Pollens/Pollens_Pictures/pollens_pictures.html)

[http://www.geo.arizona.edu/palynology/pol\\_pix.html](http://www.geo.arizona.edu/palynology/pol_pix.html)

<http://www.geo.arizona.edu/palynology/polonweb.html>

pollen database for beekeepers: <http://www.apimo.dk/pollen.htm>

Table 1.

| Taxonomic categories<br>(English, Latin, abbreviation) | Usual endings                             | Taxonomic units<br>(examples, synonyms) |
|--|---|---|
| Kingdom (regnum)                                       | -ota                                      | Eukaryota                               |
| Subkingdom (subregnum)                                 | -bionta                                   | Cormobionta                             |
| Division (phylum)                                      | -phyta, -mycota                           | Spermatophyta                           |
| Subdivision (subphylum)                                | -phytina, -mycotina                       | Angiospermae (=Magnoliophytina)         |
| Class (classis)  | -phyceae, -mycetes and -opsida (or -atae) | Dicotyledoneae (=Magnoliopsida)         |
| Subclass (subclassis)                                  | -idae                                     | Asteridae                               |
| Superorder (superordo)                                 | -anae (or -florae)                        | Asteranae (=Synandreae)                 |
| Order (ordo)   | -ales                                     | Asterales                               |
| Family (familia)                                       | -aceae                                    | Asteraceae (=Compositae)                |
| Subfamily (subfamilia)                                 | -oideae                                   | –                                       |
| Tribe (tribus)   | -eae                                      | Anthemideae                             |
| Genus (genus)  |   | Achillea                                |
| Section (section, sect.)                               |   | Sect. Achillea                          |
| Series (series, ser.)                                  |   | –                                       |
| Aggregate (agg.)                                       |   | Achillea millefolium agg.               |
| Species (species, spec., sp.)                          |   | Achillea millefolium                    |
| Subspecies (subspecies, subsp., ssp.)                  |   | Subsp. sudetica                         |
| Variety (varietas, var.)                               |   | –                                       |
| Form (forma, f.)                                       |   | f. rosea                                |

### Systematic of higher plants ( $\pm$ after TAKHTAJAN, 1973)

from: Sitte P, Ziegler H, Ehrendorfer F, Bresinsky A (1991)

Lehrbuch der Botanik für Hochschulen ('Strasburger'), 33 Aufl., G Fischer-Verlag Stuttgart, Jena, New York

(Families of aerobiological interest in **bold** letters)

#### *Gymnospermae*

1<sup>st</sup> Subdivision: Coniferophytina

1<sup>st</sup> Class: Ginkgoopsida (Ginkgo, Baiera †)

2<sup>nd</sup> Class: Pinopsida

1<sup>st</sup> subclass: Cordaitidae †

2<sup>nd</sup> subclass: Pinidae (=Coniferae)

2.1. Order: Voltziales †

2.2. Order: Pinales

Araucariaceae

**Pinaceae**: subfamilies:

Abietoideae

Laricioideae

Pinoideae

**Taxodiaceae** (Cryptomeria, Sequoia, Taxodium)

**Cupressaceae** (Cupressus, Juniperus, Thuja, Chamaecyparis)

Podocarpaceae

Cephalotaxaceae

3<sup>rd</sup> subclass: Taxidae

**Taxaceae** (Taxus)

2<sup>nd</sup> Subdivision: Cycadophytina

- 1<sup>st</sup> Class: Lyginopteridopsida (=Pteridospermae)
    - 1. Order: Lyginopteridales (=Cycadofilicales)
      - Lyginopteriaceae †
      - Medullosaceae †
      - Glossopteridaceae †
      - Peltaspermaceae †
    - 2. Order: Cyaytoniales
      - Caytoniaceae †
  - 2<sup>nd</sup> Class: Cycadopsida
    - Order: Nilssoniales †
    - Order: Cycadales
      - Cycadaceae
      - Stangeriaceae
      - Zamiaceae
  - 3<sup>rd</sup> Class: Bennettioopsida †
    - subclass: Bennettitidae
      - Order: Bennettitales †
    - subclass: Pentoxylidae
      - Order: Pentoxylales †
  - 4<sup>th</sup> Class: Gnetopsida (=Chlamydospermae)
    - subclass: Welwitschiidae
      - Welwitschiaceae
    - subclass: Gnetidae
      - Gnetaceae
    - subclass: Ephedridae
      - Ephedraceae
- 

Angiospermae (=Magnoliophytina)

- 1<sup>st</sup> Class: Dicotyledonae (=Magnoliopsida)
  - 1<sup>st</sup> subclass: Magnoliidae
    - 1.1. Super-Order: Magnolianae
      - 1.1.1. Order: Magnoliales
        - Winteraceae
        - Degeneriaceae
        - Magnoliaceae
        - Annonaceae
        - Myristicaceae
      - 1.1.2. Order: Aristolochiales
        - Aristolochiaceae
      - 1.1.3. Order: Laurales
        - Austrobayleyaceae
        - Monimiaceae
        - Lauraceae
        - Chloranthaceae
      - 1.1.4. Order: Piperales
        - Piperaceae
    - 1.2. Super-Order: Nymphaeanae
      - 1.2.1. Order: Nymphaeales
        - Cabombaceae
        - Nymphaeaceae
        - Ceratophyllaceae
      - 1.2.2. Order: Nelumbonales
        - Nelumbonaceae
  - 2<sup>nd</sup> subclass: Ranunculidae
    - 2.1 Super-Order: Illicianae
      - Illiciaceae
      - Schisandraceae

- 2.2 Super-Order: Ranunculanae
    - 2.2.1. Order: Ranunculales
      - Ranunculaceae
      - Berberidaceae
    - 2.2.2. Order: Papaverales
      - Papaveraceae
      - Fumariaceae
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- 3<sup>rd</sup> subclass: Caryophyllidae
    - 3.1 Super-Order: Caryophyllales (=Centrospermae)
      - Caryophyllaceae
      - Molluginaceae
      - Phytolaccaceae
      - Aizoaceae
      - Cactaceae
      - Didieraceae
      - Portulaccaceae
      - Basellaceae
      - Nyctaginaceae
      - Chenopodiaceae**
      - Amaranthaceae**
    - 3.2 Super-Order: Polygonales
      - Polygonaceae** (Rumex)
    - 3.3. Super-Order: Plumbaginales
      - Plumbaginaceae
  - 4<sup>th</sup> subclass: Hamamelididae
    - 4.1 Super-Order: Trochodendrales
      - Cercidiphyllaceae
      - Eupteleaceae
    - 4.2. Super-Order: Hamamelidanae
      - 4.2.1. Order: Hamamelidales
        - Hamamelidaceae
        - Platanaceae** (Platanus)
      - 4.2.2 Order: Fagales
        - Fagaceae** (Fagus, Quercus, Castanea, Nothofagus)
        - Betulaceae** (Alnus, Betula)
        - Corylaceae** (Corylus, Carpinus, Ostrya)
      - 4.2.3. Order: Casuarinales (=Verticillatae)
        - Casuarinaceae** (Casuarina)
    - 4.3 Super-Order: Juglandanae
      - 4.3.1. Order: Myricales
        - Myricaceae
      - 4.3.2. Order: Juglandales
        - Juglandaceae**
    - 4.4. Super-Order: Urticales
      - Ulmaceae**
      - Moraceae**
      - Cannabaceae**
      - Urticaceae** (Urtica, Paritaria)
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- 5<sup>th</sup> subclass: Rosidae
  - 5.1 Super-Order: Rosanae
    - 5.1.1. Order: Saxifragales
      - Cunoniaceae
      - Grossulariaceae
      - Crassulaceae
      - Saxifragaceae

- 5.1.2 Order: Gunnerales (Gunnera)
- 5.1.3. Order: Rosales
  - Rosaceae** Subfamilies:
    - Spiraeoideae (Spiraea)
    - Rosoideae (Potentilla, Rosa)
    - Maloideae (Crataegus, Malus, Sorbus...)
    - Prunoideae (Prunus)
- 5.1.4. Order: Podostemales
  - Podostemaceae
- 5.2. Super-Order: Fabanae
  - 5.2.1. Order: Fabales (=Leguminosae)
    - Mimosaceae
    - Caesalpiaceae
    - Fabaceae** (=Papilionaceae) (Robinia....)
- 5.3. Super-Order: Proteanae
  - 5.3.1. Order: Proteales
    - Proteaceae
- 5.4. Super-Order: Myrtanae
  - 5.4.1. Order: Rhizophorales
    - Rhizophoraceae
  - 5.4.2. Order: Myrtales
    - Sonneratiaceae
    - Myrtaceae (Eucalyptus, Myrtus)
    - Punicaceae
    - Melastomataceae
    - Onagraceae
    - Lythraceae
    - Trapaceae
  - 5.4.3. Order: Haloragales (Myriophyllum)
- 5.5 Super-Order: Rutanae
  - 5.5.1. Order: Rurales
    - Rutaceae
    - Anacardiaceae
    - Burseraceae
    - Simaroubaceae
  - 5.5.2. Order: Sapindales
    - Sapindaceae
    - Hippocastanaceae** (Aesculus)
    - Aceraceae** (Acer)
    - Staphyleaceae
  - 5.5.3. Order: Geraniales (=Gruinales)
    - Oxalidaceae
    - Linaceae
    - Erythroxylaceae
    - Zygophyllaceae
    - Geraniaceae
  - 5.5.4 Order: Polygalales
    - Polygalaceae
- 5.6. Super-Order: Celastranae
  - 5.6.1. Order: Celastrales
    - Celastraceae
  - 5.6.2. Order: Rhamnales
    - Rhamnaceae
    - Vitaceae
  - 5.6.3. Order: Santalales
    - Olacaceae
    - Santalaceae

- Loranthaceae
- Viscaceae
- 5.6.4. Order: Balanophorales
  - Balanophoraceae
  - Cynomoriaceae
- 5.6.5. Order: Rafflesiales
  - Hydnoraceae
  - Rafflesiaceae
- 5.7. Super-Order: Euphorbianae
  - 5.7.1. Order: Euphorbiales (=Trioccae)
    - Buxaceae**
    - Euphorbiaceae** (Mercurialis)
  - 5.7.2. Order: Thymelaeales
    - Thymelaeaceae
  - 5.7.3. Order: Eleagnales
    - Eleagnaceae** (Hippophaë, Eleagnus)
- 5.8. Super-Order: Araliansae
  - 5.8.1. Order: Pittosporales
  - 5.8.2. Order: Araliales
    - Araliaceae
    - Apiaceae** (=Umbelliferae)
- 6<sup>th</sup> subclass: Dilleniidae
  - 6.1. Super-Order: Dillenianae
    - 6.1.1. Order: Dilleniales
      - Dilleniaceae
      - Paeoniaceae
  - 6.2. Super-Order: Theanae
    - 6.2.1. Order: Theales (=Guttiferales)
      - Theaceae
      - Hypericaceae
      - Dipterocarpaceae
    - 6.2.2. Order: Sarraceniales
      - Sarraceniaceae
    - 6.2.3. Order: Nepenthales
    - 6.2.4. Order: Droserales
      - Droseraceae
  - 6.3. Super-Order: Violanae
    - 6.3.1. Order: Violales
      - Flacourtiaceae
      - Violaceae
      - Passifloraceae
      - Caricaceae
      - Cistaceae** (Cistus, Helianthemum)
      - Tamaricaceae** (Tamarix)
    - 6.3.2. Order: Capparales
      - Capparaceae
      - Brassicaceae**
      - Resedaceae
    - 6.3.3. Order: Tropaeolales
      - Tropaeolaceae
    - 6.3.4. Order: Salicales
      - Salicaceae** (Populus, Salix)
    - 6.3.5. Order: Begoniales
      - Begoniaceae
    - 6.3.6. Order: Cucurbitales
      - Cucurbitaceae
  - 6.4. Super-Order: Malvanae
    - 6.4.1. Order: Malvales (=Columniferae)
      - Tiliaceae** (Tilia)

- Bombacaceae
  - Sterculiaceae
  - Malvaceae
  - 6.5. Super-Order: Primulanae
    - 6.5.1. Order: Ebenales
      - Styracaceae
      - Ebenaceae
      - Sapotaceae
    - 6.5.2. Order: Primulales
      - Theophrastaceae
      - Myrsinaceae
      - Primulaceae
  - 6.6. Super-Order: Cornanae
    - 6.6.1. Order: Cornales
      - Hydrangeaceae
      - Aquifoliaceae (ilex)
      - Cornaceae (Cornus)
      - Nyssaceae
    - 6.6.2. Order: Ericales (=Bicornes)
      - Clethraceae
      - Ericaceae**
      - Pyrolaceae
      - Monotropaceae
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7<sup>th</sup> subclass: Lamiidae

- 7.1. Super-Order: Gentiananae
  - 7.1.1. Order: Dipsacales (=Rubiales p.p.)
    - Sambucaceae** (Sambucus)
    - Caprifoliaceae
    - Adoxaceae
    - Valerianaceae
    - Dipsacaceae
  - 7.1.2. Order: Oleales (=Ligustrales)
    - Oleaceae** (olea, Ligustrum, Fraxinus...)
  - 7.1.3. Order: Gentianales (=Contortae + Rubiales p.p.)
    - Loganaceae
    - Gentianaceae
    - Menyanthaceae
    - Apocynaceae
    - Asclepiadaceae
    - Rubiaceae** (Galium)
- 7.2. Super-Order: Solananae (=Polemoniales + Solanaceae)
  - 7.2.1. Order: Solanales
    - Solanaceae
    - Convolvulaceae
    - Cuscutaceae
    - Polemoniaceae
  - 7.2.2. Order: Boraginales
    - Hydrophyllaceae
    - Boraginaceae
- 7.3. Super-Order: Lamianae
  - 7.3.1. Order: Scrophulariales
    - Scrophulariaceae
    - Globulariaceae
    - Orobanchaceae
    - Plantaginaceae** (Plantago)
    - Bignoniaceae

- Acanthaceae
  - Pedaliaceae
  - Gesneriaceae
  - Lentibulariaceae
  - 7.3.2. Order: Hippuridales
    - Hippuridaceae
  - 7.3.3. Order: Lamiales
    - Verbenaceae
    - Lamiaceae (Labiatae)
    - Callitrichaceae
  - 8<sup>th</sup> subclass: Asteridae (s.st.) (=Synandreae)
    - 8.1. Super-Order: Asteranae
      - 8.1.1. Order: Campanulales
        - Campanulaceae
        - Lobeliaceae
      - 8.1.2. Order: Asterales
        - Asteraceae** (=Compositae)
        - Asteroideae (=Tubuliflorae) (Artemisia, Ambrosia, Helianthus)
        - Cichorioideae (=Liguliflorae) (Cichorium, Taraxacum...)
- 

- 2<sup>nd</sup> class: Monocotyledonae (=Liliopsida)
  - 1<sup>st</sup> subclass: Alismatidae (=Helobiae)
    - 1.1. Order: Alismatides
      - Butomaceae
      - Alismataceae
    - 1.2. Order: Hydrocharitales
      - Hydrocharitaceae
    - 1.3. Order: Najadales (=Zosterales)
      - Scheuchzeriaceae
      - Juncaginaceae (Triglochin)
      - Potamogetonaceae
      - Zosteraceae
      - Zannichelliaceae
      - Najadaceae
  - 2<sup>nd</sup> subclass: Liliidae
    - 2.1. Super-Order: Lilianae
      - 2.1.1. Order: Dioscoreales
        - Dioscoreaceae
        - Trilliaceae
        - Smilacaceae
      - 2.1.2. Order: Asparagales
        - Convallariaceae
        - Asparagaceae
        - Dracaenaceae
        - Phormiaceae
        - Agavaceae
        - Asphodelaceae
        - Hyacinthaceae
        - Alliaceae
        - Amaryllidaceae
      - 2.1.3. Order: Liliales
        - Melianthaceae
        - Liliaceae
        - Colchicaceae
        - Iridaceae
      - 2.1.4. Order: Orchidales (=Gynandreae, =Microspermae)
        - Orchidaceae Subfamilies:



- Apostasioideae
  - Cypripedioideae
  - Orchidoideae
  - 2.2. Super-Order: Bromelianae
    - 2.2.1. Order: Pontederiales
      - Pontederiaceae
    - 2.2.2. Order: Bromeliales
      - Bromeliaceae
    - 2.2.3. Order: Zingiberales (=Scitaminae)
      - Musaceae
      - Zingiberaceae
      - Cannaceae
      - Maranthaceae
  - 2.3. Super-Order: Juncanae (Junciflorae, Cyperales)
    - 2.3.1. Order: Juncales
      - Juncaceae** (Juncus)
    - 2.3.2. Order: Cyperales
      - Cyperaceae** (Carex, Cyperus...)
    - 2.3.3. Order: Typhales
      - Typhaceae** (Sparganium, Typha)
  - 2.4. Super-Order: Commelinanae (=Farinosae p.p.)
    - 2.4.1. Order: Commelinales
      - Commelinaceae
      - Eriocaulaceae
    - 2.4.2. Order: Poales (=Glumiflorae)
      - Poaceae** (=Gramineae) subfamilies:
        - Bambusoideae (Bambusa)
        - Pooideae** (=Festucoideae) (Lolium, Poa, Bromus, Festuca...)
        - Arundineae (Phragmites..)
        - Stipeae (Stipa)
        - Oryzoideae (Oryza)
        - Eragrostoideae (Cynodon,...)
        - Panicoideae (Panicum, Pennisetum, Setaria)
        - Andropogonoideae (Saccharum, Sorghum, Zea...)
- 3<sup>rd</sup> subclass: Arecidae (=Spadiciflorae)
- 3.1. Super-Order: Arecanae
    - 3.1.1. Order: Arecales (=Principes)
      - Arecaceae** (=Palmae)
    - 3.1.2. Order: Pandanales
      - Pandanaceae
  - 3.2. Super-Order: Aranae
    - 3.2.1. Order: Arales
      - Araceae
      - Lemnaceae

#### Selected examples of more taxonomic systems:

1. Cronquist A: The taxonomic significance of the structure of plant proteins: A classical taxonomist's view. *Brittonia* 1976, 28: 1-27.
2. Dahlgren RMT: A revised system of classification of the angiosperms. *Bot J Linnean Society*, 1980, 80: 91-124.
3. Frohne D, Jensen U: *Systematik des Pflanzenreichs*. Stuttgart: G. Fischer Verlag, (3. Aufl.) 1985.

*The 6<sup>th</sup> European Course On Basic Aerobiology, Poznan, Poland*  
Siegfried Jäger