

Botanical nomenclature

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- ❑ Botanical nomenclature is the naming of plants and the related principles and rules**
- ❑ Principles and rules of Botanical nomenclature are developed and adapted in series of International Botanical congresses**
- ❑ Principles and rules are listed in International Code of Botanical Nomenclature (ICBN)**
- ❑ The main goal of ICBN is to provide one correct name for each taxonomic group within a stable system of names or classification**

What is scientific name?

- ❑ A name is merely a conventional symbol or cipher that serves as **a means of reference** and avoid the need for continue use of a cumbersome descriptive phrases.
- ❑ The fundamental principle of scientific nomenclature is that names must be **unambiguous** and **universal**
- ❑ The formation and use of scientific names of organism for nomenclatural purposes are governed by **codes of nomenclature**

Codes of Nomenclature

- | International Code of Botanical nomenclature (*ICBN*) for Plants (including Fungi and Cyanobacteria)
- | International Code for Nomenclature of Cultivated plants (*ICNCP*) only for cultivated plants (www.actahort.org/books/647/)
- | International Code of Zoological Nomenclature (*ICZN*) for Animals
- | International Code of Nomenclature of Bacteria (*ICNB*) - for Bacteria
- | International Committee on Taxonomy of Viruses (*ICTV*) for Viruses (<http://www.virustaxonomyonline.com>)

Some differences between codes

- ❑ These Codes differ:
- ❑ For example, the *ICBN* does not allow **tautonyms** whereas the *ICZN* does
- ❑ The starting points, the time from which these *Codes* are in effect (retroactively), vary from group to group.
 - In Botany the starting point will often be in 1753 (the year Linnaeus first published *Species Plantarum* in Zoology in 1758.
 - Bacteriology started anew, with a starting point in 1980
- ❑ A **Biocode** has been suggested to replace several codes, although implementation is not in sight.
- ❑ There is also a debate concerning development of a **Phylocode** to name clades of phylogenetic trees rather than taxa.

Comparison between Scientific names and Common (vernacular) names

- ❑ Botanical names are universal while common names are limited to a single language or to a particular geographical region
- ❑ Sometime one vernacular name may be used to different taxa or one taxon may have different common names e.g. *Mnafu* is a swahili name for about 30 species of section *Solanum*
- ❑ Common names may be misleading e.g. “*Nyanya chungu*” is not “common tomatoes”. But *Solanum aethiopicum* while common tomato is *Solanum lycopersicon*
 - There are no eggs in egg plant = *Solanum melongana*

Characteristics of Species scientific names

- ❑ Species Scientific names are binomials (composed of two words i.e. **generic and species**)
- ❑ Binomial system was founded by Jean Bauhin but used consistently first by Linnaeus in *Species plantarum* (1753)
- ❑ The first word of a species name is of a **Genus** to which the plant belongs and the second word is of a **species**
- ❑ A **generic** name is a 'collective name' for a group of plants that all share similar characteristics.
- ❑ The **specific name**, allows us to distinguish between different plants within a genus.
 - There are over 2000 *Solanum* species in the genus *Solanum* differentiated by specific names

Characteristics of Species epithets

- ❖ Specific epithets refer to different things:
 - ❑ May refer to distinctive morphological, ecological or chemical features e.g. *Alafia multiflora*, *Ipomoea aquatica*, *Tabernaemontana elegans*, *Ficus religiosa*
 - ❑ Honor individual who first collected the species or a scientist who have contributed much to the botanical knowledge of a particular region or a taxonomic group e.g. *Solanum isabellii*, for Isabella, *Trichaulax mwasumbii* Vollesen after Mwasumbi (UDSM), *Sanrafaelia ruffonammari* Verdc. after Christopher K. Ruffo and Mmari
 - ❑ May refer to geographical origin

Geographical epithets

- ❑ Geographical epithets may reflect countries and localities:
 - *saharae* = of the sahara
 - *puguensis* of Pugu
 - *sanctae-helenae* = of St. Helena
 - *umalilaense* = of Umalila
 - *usambarensis* = of Usambara
 - *ugandaense* = of Uganda
 - *tanganyikaense* = of Tanganyika
 - *aethiopicum* = of Ethiopia
- ❑ The ICBN recommends however that epithet taken from geographical names should be adjective and end with *-ensis* (-e), *-anus* (-a, -um), or *-icus* (-a, -um)
- ❑ The specific name may not be tautonymous (repeat the generic name) as in *Benzoin benzoin*

Writing a botanical name and the protologue

- ❑ The specific epithet may be followed by one or more Authorities
- ❑ Authority is a name or names of a person or persons who first described the species
 - *Solanum americanum* Miller (Miller = Mill.)
- ❑ **The protologue** is the ensemble of all the elements associated with the original publication of a taxon name
 - e.g.*** *Solanum americanum* Miller, The Gardeners Dictionary, Ed. 8, art. *Solanum* no. 5 (1768). **Type:** Cult. Chelsea Physic Garden, origin Virginia, *Miller s.n.* (Holotype BM!)

Rank of taxonomic categories

Category	Standard suffix (ending)
Kingdom	-bionta
Phylum/Divisio	-phyta
Subphylum	-phytina
Class	-opsida
Subclass	-idae
Superorder	-anae
Order	-ales
Suborder	-ineae
Superfamily	-ariae
Family	-aceae (see exceptions)
Subfamily	-oideae
Tribe	-eae
Subtribe	-inae
Genus	None, italicize, start with capital letter
Species	None, genus name plus specific epithet, italicize
Subspecies	None, genus name species and sub. name italicize
Variety	
Forma	

Major or obligatory ranks appear in boldface

Features of the Taxonomic Hierarchy

Allowed alternative family names

Apiaceae = Umbelliferae

Arecaceae = Palmae

Asteraceae = Compositae

Brassicaceae = Cruciferae

Clusiaceae = Guttiferae[Hypericaceae Guttiferae]

Fabaceae = Leguminosae

Lamiaceae = Labiatae

Poaceae = Gramineae

Features of the Taxonomic Hierarchy

- Names above the rank of GENUS are based upon the name of an included genus. Each rank has a distinctive ending that is attached to the stem of the name of the genus. e.g. *Solanum* is a genus in the family SOLANACEAE
- The word **TAXON** is used to refer to a taxonomic category of any rank. The plural is **TAXA**.
- The name of a genus is always underlined or italicized; the first letter is capitalized. The names of genera are treated as NOUNS. The plural of genus is GENERA.

Features of the Taxonomic Hierarchy end

- The scientific name of a species is the combination of the name of the genus with the specific epithet. To be complete, the scientific name includes the **authority** e.g. *Solanum nigrum* Linnaeus
- The word **species** is both singular and plural
- It is always correct to write the specific epithet in all lower case [species named after people and after old generic names may be capitalized]
- The specific epithet is usually considered to be an adjective that modifies the genus (noun), and it agrees in gender with the genus
- When several species of one genus are given in sequence, the name of the genus can be abbreviated to its first letter e.g. *Hunteria congolana* and *H. zeylanica*.

Features of the Taxonomic Hierarchy

- The authority can be abbreviated to save space, especially for authors who described a large number of species.
- The author's name is never italicized or underlined.
- The names of subspecific ranks (subspecies, variety, form) consist of the name of the species followed by an abbreviation of the rank, the subspecific epithet, and the authority for the subspecific name e.g.

Solanum villosum subsp. *miniatum* (Bernh. ex Willd)

Edmonds

Principles of Botanical Nomenclature

- ❑ The naming of plants is covered by the ICBN
- ❑ New edition of ICBN is published after each International Botanical Congress, referred to by the city where the Congress took place.
 - The most current is the Vienna Code of 2006
- ❑ Application of names is determined by nomenclatural types
- ❑ Nomenclature is based upon priority of publication

Principles of Botanical Nomenclature

- ❑ Each taxonomic group can have only one correct name, which is the earliest that is in accordance with the rules, except in specified cases
- ❑ Scientific names are in Latin
- ❑ Rules of nomenclature are retroactive (conservative) unless expressly limited

Transfer between ranks

- When a genus, species, or subspecies is described at one rank and then transferred to another rank, the original author is placed in parentheses followed by the author who made the transfer
 - Linnaeus named an alfalfa: *Medicago polymorpha* var. *orbicularis* L. But, Allioni thought it was deserving of species status, so: *Medicago orbicularis* (L.) Allioni
 - The name "orbicularis" is called the **basionym** and has priority.
 - The type for *Medicago orbicularis* is that of *Medicago polymorpha* var. *orbicularis* L.
 - The same occurs when a species is transferred from one genus to another e.g. Linnaeus named a fern: *Cheiranthus tristis* L. but R. Brown thought it deserved a generic status so: *Matthiola tristis* (L.) R. Brown

Transfer between ranks-Autonym

- When a subspecific taxon is named, another subspecific taxon of the same rank is automatically created that repeats the name of the species. This is called the **Autonym**
 - e.g. Edmonds created *Solanum villosum* subsp. *miniatum* (Bernh.ex Willd.)Edmond. By so doing. *S. villosum* Mill. subsp. *villosum* was automatically created
 - Rehder created a variety under ***Rosa carolina*** i.e. *Rosa carolina* var. *villosa* (Best) Rehder this automatically lead to creation of another variety *R. carolina* var. *carolina*

Names of Hybrid Taxa

- ❑ Hybrids are indicated with the "X" sign
- ❑ The sign may be given in two form:
 - Where the parental taxa are indicated e.g.
Quercus alba L. X *Q. michauxii* Nutt
 - Where the hybrid taxon is given a new name *Quercus X beadlei* Trelease

Priority of names and synonyms

- ❑ Nomenclature is based upon **priority of publication** i.e. the earliest **legitimate name** is the correct name (but note exceptions below)
- ❑ Each taxonomic group can have only one correct name, which is the earliest that is in accordance **with the rules**, except in specified cases
- ❑ Priority begins with the publication of Linnaeus' *Species Plantarum* on May 1, 1753 and applies to the rank of family and below
- ❑ The correct name of a species is the combination of the **earliest published valid generic name** with the **earliest published valid specific epithet**.

How do synonyms occur

- ❑ In some instances, the original author who describes the plant may **place it in a particular genus** but subsequent authors, often with a more complete understanding of the taxon and its representatives, may move that species **into a new genus**, reflecting a more accurate classification
- ❑ *Haumaniastrum minor* A.J. Paton
 - ❑ *Acrocephallus minor* Briq. (1894)
 - ❑ *A. hptoides* Baker (1900)
 - ❑ *A. welwitschii* Briq. (1900)
 - ❑ *A. cononensis* G. Taylor (1931)

How do synonyms occur cont.

- ❑ Another instance is for highly variable or **wide-ranging species**. Such species are often described independently and unknowingly under different names. Or, **slight and subtle variations** in a species can be named as new species before it is understood that many of these are **merely the result of natural variation within the species**. Example
 - ❑ *Solanum chenopodioides* Lam. Botanique 2:18(1794)
 - *S. chenopodiofolium* Dunal
 - *S. gracile* Dunal
 - *S. gracile* Dunal var. *microphyllum* Dunal
 - *S. gracilius* Herter
 - *S. isabellii* Dunal
 - *S. ottonis* Hylander

Priority of names and Synonyms and Homonyms

- ❑ If the same taxon has often been described and named more than once. The later names are called **synonyms** and are illegitimate
 - e.g. *Aloe walastonii* Rendle (1908) this same species was also published under other different names:
 - *Aloe angiensis* De Willd. (1921)
 - *Aloe beguaertii* De Willd. (1921)
 - *Aloe lanuriensis* De Willd. (1921)
- ❑ A **homonym** is a name that has been used for more than one taxon
 - *Convolvulus coeruleus* Sprengel, 1824
 - *Convolvulus coeruleus* Schumacher, 1827
 - *Convolvulus coeruleus* Martens & Galeotti, 1854

Conservation of names

- ❑ To avoid the disadvantages of a strict application of the rule of priority, the International Botanical Congresses have authorized the **conservation** of widely used names, even though they are NOT the oldest names. These nomina conservanda (conserved names) may be at the family, genus, and species ranks.

Types and Nomenclature

- ❑ The names of taxa of a rank of a family and below are based on **nomenclatural types**, which permanently fixes a name to an actual physical specimen
- ❑ **The nomenclatural type** (*typus*) of a taxon is an element to which the name of a taxon is permanently attached, whether as a correct name or a synonym
- ❑ The nomenclatural type is not necessarily the most typical or representative element of a taxon

Types and Nomenclature

- ❑ **Holotype** is the specimen or illustration used by the author or designated by him/her as the nomenclatural type
- ❑ **A lectotype** is a specimen or illustration selected from the original material to serve as a nomenclatural type when no holotype was indicated at the time of publication or is missing
- ❑ An **isotype** is any duplicate of the holotype, it is always a specimen
- ❑ A **synetype** is any one of two or more specimens cited by the author when no holotype was designated, or any of one of two or more specimens simultaneously designated as types

Types and Nomenclature

- ❑ A **paratype** is a specimen or illustration cited in the protologue that is neither the holotype nor an isotype, nor one of the syntypes if two or more specimens were simultaneously designated as types
- ❑ A **neotype** is a specimen or illustration cited in the protologue selected to serve as a nomenclatural type as long as all of the material on which the name of the taxon was based is missing
 - When a holotype or a previously designated lectotype has been lost or destroyed and it can be shown that all the other original material differs taxonomically from the destroyed type a neotype may be selected to preserve the usage established by the previous typification