[Academic Script]

Classification of Plants

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Academic Script

1. Overview

One of the first classification systems for organisms is plant taxonomy. Taxonomy is the science of systematically naming and arranging organisms into similar groups. Plant taxonomy is an old science that uses the gross morphology (physical characteristics, [i.e., flower form, leaf shape, fruit form, etc.]) of plants to separate them into similar groups. Quite often the characteristics that distinguish the plants become a part of their name. For example, *Brassica nigra* is a black mustard named because the seeds are black in color.

These days the science of plant taxonomy is being absorbed into the new science of systematics. The development of more sophisticated microscopes and instrumentation, detailed chemical analysis and novel tools and techniques has made this new science possible. Systematics is based on the evolutionary similarities of plants such as chemical make-up and reproductive features.

It should be noted that plant taxonomic classification changes with continuing research, so inconsistencies in nomenclature will be found among textbooks. Do not get caught-up in which is correct, as it is moving target. Rather focus on "are you communicating?"

2. Introduction

The scientific system of classification divides all living things into groups called **taxa** (singular, **taxon**). Plants are in the kingdom

of ***Plantae***. Other kingdoms include ***Fungi***, ***Protista*** (one-celled organisms including yeasts, bacteria, and protozoans), and ***Animalia*** (animals).

The plant kingdom is divided into two taxa: **broyophytes** (including mosses and liverworts) and **vascular plants** (plants with a vascular system of xylem and phloem).

Vascular plants (sometimes called higher plants) are divided into two subgroups: seedless (pteridophytes) and seeded. The seeded plants divide into two taxa, viz classes **Gymnospermae (Gymnosperms)** and **Angiospermae (Angiosperms).** These make up most of the plants in the landscape.

These taxa divide into ***Divisions*** (or Phylum). Division names end in 'psida'. Examples of phyla include ***Ginkgopsida*** (ginkgo), ***Coniferopsida*** (conifers), and *Magnoliopsida* (flowering plants).

- **Gymnosperms** (meaning naked seed) do not produce flowers, but rather produce seeds on the end of modified bracts, such as pine cone. Many have scaly or needle-like leaves. Arborvitae, Junipers, Douglas-fir, fir, pine, and spruce are examples of gymnosperms.
- **Angiosperms** (covered seeded or broadleaf flowering plants) produce seeds through flowering. Most have broadleaf leaves. Angiosperms are divided into two taxa: (monocots) and (dicots).

Distinguishing between monocots and dicots is a common practice in landscape management. For example, some of our common herbicides work at the monocot/dicot level. Lawn

weed sprays (such as 2,4-D and Dicamba) kill dicots (broadleaf plants like dandelions) but not monocots (the grass). Other herbicides will kill monocots but not dicots, allowing the gardener to kill grass (a monocot) in the shrub or flowerbed (dicots).

Additional taxa in descending order include **family, genus,** and **species**.

Also classification of plants as given by Bentham and Hooker is

Families

Families of higher plants are separated from one another by characteristics inherent in their reproductive structures (flowers, fruit, and seed). Many family members share common characteristics in plant appearances, seed location and appearance, and growth habit. However, some families have a lot of diversity in appearance for e.g. Fabaceae.

Families have primary importance in gardening as they generally share comparable cultural requirements and similar insect and disease problems. Pest management and cultural techniques are often discussed at the family level.

Family names end in *'aceae'.* Examples of common families include the following:

- ***Annacardiaceae*** – mango family including cashewnut, marking nut etc.
- ***Fabaceae*** – Pea family,

- ***Rosaceae*** – Rose family including apples, cotoneaster, crabapples, potentillas, peach, plum, mountain ash, and 250 common landscape plants
- ***Moraceae-***Fig family including banyan, peepal, rubberplant, mulberry etc.
- ***Zingiberaceae-*** the ginger family including turmeric etc.
- ***Poaceae-*** the grass family including cynodon etc.

Genera (plural of genus) are groupings whose members have more characteristics in common with each other than they do with other genera within the same family. Similarity of flowers and fruits is the most widely used feature, although roots, stems, buds, and leaves are also used.

Common names of plants typically apply to genera. *Juniperus* of the junipers and *Pinus* of pines and *Cocus* of coconut. The specific epithet name is always used in conjunction with the genus.

When genus and specific epithet names are written, they should always be underlined or italicized to denote they are Latin words. The genus name is always capitalized, but the specific epithet name is not.

The singular and plural spelling of *species* is the same. In writing, the abbreviation "sp." following the genus indicates a single unidentified species and "spp." indicates multiple species. For example, "*Acer* sp." would indicate an unidentified species of maple, and "*Acer* spp." refers to multiple species in the maple genus. The "sp." or "spp." is not underlined or italicized.

In technical papers, the person who first identified the species, called the **Authority**, follows the specific epithet names. For example, Japanese Maple would be written *Acer palmatum* Thunberg or *Acer palmatum* T. The Irish potato would be written *Solanum tuberosum* Linnaeus or *Solanum tuberosum* L.

Variety or **Subspecies** is a sub-grouping of species assigned to individuals displaying unique differences in natural populations. The differences are inheritable and reproduce true-to-type in each generation. For example cauliflower and cabbage are varieties of the same species *Brassica oleracea.*

In technical writing, variety and subspecies names must be denoted with "var." or "ssp." when following a species name. Names are italicized or underlined, while var. or spp. is not italicized or underlined. For example, the thornless variety of honeylocust would be written *Gleditsia triacanthos* var. *inermis*. The bigfruit evening primrose would be written *Oenothera macrocarpa* ssp. *incana*.

3. Scientific Names

Scientific names of plants are Latinized. When Linnaeus published the first books on classification, Latin was used in Western Europe as the language of science. Linnaeus continued this trend using Latin and Greek names.

To date a no. of classification systems are there but all these are for pure joy of learning.

The Chronological list of systems are chiefly

1. Pre-Linnaean eg. Theophrastus classification as *Historia Plantarum* (*Enquiry into Plants*), c. 300 BC and classification as *De Materia Medica*, c. 60 AD or Caesalpino classification as *De Plantis*, 1583 and John Ray classification *Historia Plantarum*, dating back to 1686–1704
2. From Linnaeus to Darwin (pre-Darwinian) eg Linnaean systems in Systema Naturae, 1st edition, 1735. To Systema Naturae, 10th edition, 1758 (vol. 1), 1759 (vol. 2). This was also the Starting point of zoological nomenclature. Species Plantarum, 1753. Starting point of botanical nomenclature. Genera Plantarum, 1737 (1st ed.), 1753. Philosophia Botanica, 1751 Then Lindley system and the famous Bentham & Hooker system in (three volumes, 1862–1883). *Genera plantarum.*
3. Post Darwinian (Phyletic) this includes Eichler system and Engler system also Bessey system, Hutchinson system, Goldberg system, Dahlgren system, Thorne system (2000) and Judd system (1999-2008). (APG system called Angiosperm Phylogeny Group classification is around 2008 and still to add.
4. Other system includes the Tippo system, Mez system etc.

4. Classification of Plant Kingdom

Kindom plantae is further divided into divisions- cryptogams (nonflowering) and phanerogams (flowering).

Cryptogams: A **cryptogam** (scientific name **Cryptogamae**) is a plant (in the wide sense of the word) that reproduces by spores,

without flowers or seeds. "Cryptogamae" (Greek κρυπτός *kryptos*, "hidden" + γαμέω, *gameein*, "to marry") means hidden reproduction, referring to the fact that no seed is produced, thus cryptogams represent the non-seed bearing plants.

Cryptogams are further divided into

(A) Thallophyta:

Thallophyta is the most primitive and the largest division of Cryptogams. The plant body is not differentiated into root, stem and leaves and such a plant body is termed as thallus. The thalloid plant body is either unicellular or multicellular.
The division thallophyta is classified into (1) Algae and (2) Fungi (3) lichens.

(1) ALGAE

Alage are chlorophyll bearing, thalloid , autotrophic, largely aqutotrophic and chiefly aquatic (fresh water and marine water) plants . They also occur in a variety of other habitats as moist stones, soils and wood. They are unicellular and some-times occur in association with fungi to form Lichens. E.g.: Spirogyra.

(2)FUNGI

Fungi are achlorophyllous (non-green) heterotrophic thallophytes. They live as saprophytes with algae to form lichens.
E.g.: Rhizopus.

(3) Lichens are specific formed by symbiotic relation of algae and fungi as said before the examples are Usnea- old man's beard etc.

(B) Bryophyte:

Bryos means moss, these plants are endowed with foot, setae and capsule, e.g. marchantia etc. Bryophytes are chlorophyllous, autotrophic, embryo-bearing and atracheophytic cryptogams. They are mostly found on damp and shady places. They are called amphibians of plant kingdom. E.g. is Funaria.

(C) Ptertidophyta: here leaves are appearing like feather, e.g. ferns. The Pteridophytes are chlorophyllous, autotrophic, embryophytic and tracheophytic cryptogams. They are the non-flowering plants possessing vascular tissues. Hence they are also called VASCULAR CRYPTOGAMS. E.g.: Pteris and nephrolepis

(D) PHANEROGAMAE (phanerogams) : Phanerogams are flower bearing,seed producing tracheoptytes . This sub kingdom has only one division SPERMATOPHYTA. Sub divisions are Gymnospermae and Angiospermae

- **Gymnosperms**: these include naked seeded plants like cycus, pinus, ginkos, gnetum roughly all conifers. Gymnosperms are phanerogams or spermatophytes without ovary and fruit. The seeds are naked without a fruit wall. E.g: Cycus , Pinus , Gnetum.

- **Angiosperms**: the seeds are covered with testa and tegmen Angiosperms are the flowering plants in which the seeds are enclosed by fruits. The angiosperms are divided into two classes: the dicotyledonous and the monocotyledonous. DICOTYLEDONOUS : They have two cotyledon in their seeds. Whereas Monocots have seed with one cotyledon only. eg. : Maize, sorghum, etc.

5. Summary

The scientific classification divides living things into groups called Taxa/ranks ie first taxon is Kingdom, the plants are in the Kingdom of Plantae. Others include fingi, Protista and Animalia. Plant kingdom is divided into bryophytes and vascular plants. The latter is divided into two subgroups i.e. pteridophytes (seedless) and gymnosperms and angiosperms plants. Gymnosperms lack true flowers and are naked seeded, these are pine, fir, etc. angiosperms are flowering plants with clad seeds and have one cotyledon called as monocots e.g. all grains, while dicots have seeds with two cotyledons e.g. all pulses. The further classification extends to orders as polypetalae, gamopatalae etc., finally to family and then to genus and species.