**College of Science Al-Mustansiriyah University Dep.: Biology**

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**Lecture: 1**

What is Plant Taxonomy: It’s a field of science that includes Description, Identification, Nomenclature, and Classification ( the mnemonic DINC for short). Which is considered a major part of Plant Systematic.

History of Plant Taxonomy:

1- Babylonians are the first who knew plants and named them before 4500 years ago.

2- Theophrastus (370-285 B.C), THE Greek Scientist, which called the father of modern Botany, he classified plants into four groups:- herbs, subshrubs, shrubs, and trees. He also distinguished between the non-flowering plants and the flowering one.

3- Andrew Caesalpino (1519-1603), was the first scientist who worked for achieving a rational scheme of classification of plants.

4- The eighteen century belongs clearly to Carl Linnaeus ( 1707-1778). He is the creator of the modern system of nomenclature, also considered the first taxonomist who showed that the reproductive features were of main importance in taxonomy and originator of sexual system of classification.

5- De Candolle (1778-1841), presented a new classification of sexual system of plants, he followed the approach of the natural system in his scheme and put all alike plants together.

6- The current contributors to plant taxonomy in the world conclude, Armen Takhtajan (Russian) and Cronquist. In Iraq, Ali Al-Musawi and Ali Al-Rawi considered the main contributor to Iraq.

\*\***Classification:** It’s the arrangement of taxa into some type of order, the purpose of this field is to provide a system for cataloguing and expressing relationships between these taxa.

\*\***Taxon**: It’s a group of organisms typically treated at a given rank, ex. Magnolio phyta is a taxon placed on the rank of phylum.

 **Major taxonomic ranks**:

Ranks Taxa

 Phylum (Division) Planta

Class Liliopsida (monocots)

Order Arecales

Family Arecaceae

Genus Crocus

Species Crocus nucifera

**Characters used for plant classification**:

1- Morphological data :- a/ Micromorphology b/ Gross morphology

2- Presence or absence of certain tissues and vegetative organs.

3- Similarity and dissimilarity of reproductive structure.

**Classification Systems** :

1- Artificial classification :- It’s the first system which used one or few characters to classify plants.

Carl Linnaeus (1753) was the first to establish this system based on reproductive parts, several plants totally unrelated were classified together for example, Prunus was classified along with Cactus because of the same number of stamens in his system of classification. This system is compelled after Linnaeus time.

 2- Natural classification :- This system is based upon several to many characters selected for their value in positively correlating characters to form groups in ranks.

George Bentham (1800-1884) and Joseph Dalton Hooker (1817-1911) produced a work of natural classification of all the genera of gymnosperms and angiosperms ( Genera Plantarum), their system based on numerous morphological and anatomical characters such as numbers of carpels and others, for example put Cruciferae with Papaveracae according to the same number of petals.

3- Phyletic or Evolutionary system of classification :- This system arise after the theory of evolution, which emphasizes on relationships by descent of the groups in their systems. The first clearly phyletic system of classification was produced by German botanist, August Wilhelm Eichler, he dealt with the entire plant kingdom. Another system was produced by Adolf Engler and Eugen Prantl based on Eichler system.

Charles Bessey (1915) which his concept of his system are still basically followed today which depending on primitiveness versus characters of descent between and among characters.

4- Cladistic classification system :- It’s the most recent comprehensive classification of angiosperm that derived from Angiosperm Phylogeny Group (APG). The rise of this classification combined since 1990 with new DNA sequence data. The APG classification are important for two reasons :-

**1/** They represent the first comprehensive classification of the angiosperm done quantitatively.

**2/** They were done by a consortium of more than two dozen workers.

**3/** Construction of cladograms as a means of understanding Macroevolutionary pattern for example, relationship among higher taxa, the timing of their divergence and shift in character syndromes.

\*\***The applications of this system**:

**A-** A very important application of cladistics is for plotting characters changes on the newly generated phylogenies (evolutionary character analysis).

**B-** Another application is conservation, which evolution of rarity within a group of organisms.

**C-** Also extended to ecology in understanding community, interactions among organisms in the environment.

**\*\*Identification**:- It’s the process of associating an unknown taxon with a known one or recognizing, plant taxa can be identified in many ways:-

**1/** **Taxonomic Keys:-** It’s the most useful method of identification, a key is an identification device that consists of sequentially choosing among list of possibilities until these possibilities are narrowed down to one. Types of taxonomic key:

A- Dichotomous key:- This consists of a sequence of two contrasting statements, each statement known as a lead; the two leads together comprise a **couplet**. It’s the most common type of key, particularly in floras and monographic treatments. ex: (just for notice )

1. Annual ;leaves>>1 cm long; flowers1-4 cm

Couplet Lead: 2. Leaves opposite, pairs fused around stem; flowers axillary

 Lead: 2, Leaves alternate above, free; flowers in terminal cyme; petal

1, Generally perennial herbs to shrubs; leaves< 1cm; flowers

B- Polyclave (Multi-access key):- Its consists of a list of numerous characters, where by the user selects all characters that match the specimen. The great advantages of this key over Dichotomous key is that they permit the use of limited subset of information to narrow down the possibilities ex. If a Dichotomous key lists only the floral characters, its usefulness will be limited of the specimen lack flowers.

**2/ Written Description:-** A second means of identification is to compare features of unknown plant with written descriptions of possible known taxa.

**3/ Specimen comparison:-** A third method of identification is to compare the plant in question to alive or preserved plant collection( identified herbarium specimen). This is an excellent method, as many features of plant (coloration and surface features) are often not denoted in written descriptions or visible from photographs or illustrations.

**4/ Image comparison:-** A fourth method by which unknown plant may be identified by visually comparing it to photographs or illustrations of known taxa. These are usually obtained from books (Floras) and webpage images;.

A practical problem with this method:

1- Its available only for a small subset of possible taxa.

2- It may be impractical to locate the matching photograph or illustration, requiring an examination of all those possible.

\*\* **Nomenclature:-** It’s the formal naming of taxa according to some standardized systems. For plants, algae, and fungi; the rules and regulations for naming them are provided by the International Code of Botanical Nomenclature ( ICBN). These formal names are known as scientific names.

The scientific name of a species traditionally consists of two parts (typically underlined or italicized), the genus name; always capitalized, while the specific epithet is not, for example Vicia faba.

\*\***Description:-** It’s the assignment of features to a taxon, these features are called characters.

\*\*\*\* **General Descriptive terminology:-**

**\* Plant habit :** It refers to the general form of plant, including a variety of terms:

1- Herbaceous plant:- It’s a plant in which any above ground shoots( whether vegetative or reproductive), which die back at the end of annual season, although the shoots are annual, the herb itself may be annual, biennial, and perennial.

2- Woody plants:- They usually have stems and large roots which reinforced with wood produced from secondary xylem.

3- Vine :- It’s a plant with elongate, weak stems, that are generally supported by means of scrambling, twining, tendrils or roots; vines may be herbaceous, or woody, annual or perennial.

4- Shrub :- It’s a perennial, woody plant with several main stems arising at ground level like Nerium oleander.

5- Subshrub :- It’s a short shrub that is woody only at the base and that seasonly bears new, non woody, annual shoots above.

6- Trees :- Its generally tall, perennial, woody plant having one main stem (the trunk) arising at ground level like date palm Phoenix dactylifera.