

## **Introduction to Taxonomy:**

The term taxonomy is derived from the Greek words ('taxis' means arrangement and 'nomos' means law). The term first proposed by the Swiss originated botanist Augustin Pyramus de Candolle in 1813 for the plant classification. He used the term in his famous book—Theory elementaire de la botanique (Elementary Theory of Botany). So taxonomy is the arrangement of the plants and animals on the basis of some laws.

Simpson (1961) has defined taxonomy as the theoretical study of classification including its bases, principles, procedures and rules. Ernst Mayr also defines taxonomy as the theory and practice of classifying organisms. So the science of classification is known as taxonomy.

Christoffersen (1995) has defined taxonomy as “the practice of recognising, naming, and ordering taxa into a system of words consistent with any kind of relationships among taxa that the investigator has discovered in nature”.

### **The process of taxonomy involves two distinct steps:**

(i) Correct recognition and definition of the organisms and their relationships and

(ii) Application of suitable designations for the organisms and to different groups which include them.

## **Branches of taxonomy**

### **1. Cytotaxonomy:**

It is classification based on information provided by comparative cytological studies, number of chromosomes, structure and meiotic behaviour of chromosomes. It is known that fewer and larger chromosomes have been formed in many cases by fusion of smaller chromosomes. Herbaceous plants have larger chromosomes than those of woody plants. Naturally, herbaceous plants are more advanced than the woody plants.

In many genera the same basic chromosome number has been found in different species, e.g., 12 in *Solanum* species and 9 in *Chrysanthemum* species.

## **2. Chemotaxonomy (Biochemical Systematics):**

The system of classification is based on characteristics of various chemical constituents of organisms like amino acids, proteins, DNA sequences, alkaloids, crystals, betacyanins, etc. Chemical constituents of plants are generally specific and stable.

They do not change easily. Ancient medical men based their identification of plants on fragrance, taste and other chemical characteristics. Crystals of calcium oxalate like raphides are restricted to 35 families. Similarly, certain alkaloids are restricted to a few related families, e.g., benzyloquinoline alkaloid in Papaveraceae, Berberidaceae and Ranunculaceae.

## **3. Numerical Taxonomy:**

It evaluates resemblances and differences or primitiveness and advancement through statistical methods based on a large number of characters obtained from all disciplines of biology.

This is followed by assigning them number and codes of computer like plus (+), minus (-),  $\theta$  (data not available), followed by computer analysis. It establishes the numerical degree of relationship among individuals. The relationship or affinity values are then used to erect taxonomic categories.

However, its effectiveness depends upon the judgement of the biosystematics in selecting characters and current knowledge about them.

## **4. Cladistics Taxonomy (Gk. *clados*- sprout):**

It searches similarity due to common phylogeny or origin from a common ancestor. These are two types of characters, ancestral and derived. Ancestral characters are traits of basic body design which would be present in an entire group.

Derived characters are those traits whose structures and functions differ from those of ancestral characters. They appear during

evolution and cause the formation of new subgroups. One or more derived characters would be shared by an entire subgroup.

In cladistics taxonomy (cladistics) each evolutionary step produces a branching. All the members of a branch would possess the derived character. It will be absent below the branch point. Arranging organisms on the basis of their shared similar or derived characters that differ from ancestral characters, will produce a phylogenetic tree called cladogram. Depending upon the type of system of classification, organisms are classified into two kingdoms or three kingdoms, four kingdoms, five kingdoms and now into six kingdoms.