Trinomial system :

(1) Proposed by **Huxley** and **Strickland**

(2) According to this system name of any plant or species is composed of three names –

(i) Generic name (ii) Specific name (iii) Subspecific name (name of variety)

When members of any species have large variations then trinomial system is used. On the basis of dissimilarities this species is classified into sub species –

eg. ***Brassica oleracea*** var. ***botrytis*** (Cauliflower)
Brassica oleracea var. ***capitata*** (Cabbage)
Brassica oleracea var. ***cauorapa*** (Knot-khol)

CLASSIFICATION

Biological classification :

The art of identifying distinctions among organisms and placing them into groups that reflect their most significant features and relationship is called biological classification.
The purpose of biological classification is to organize the vast number o known plants into categories that could be named, remembered and studied.

According to **"A.P. de Candolle" ,** Classification is of two types

(1) Empirical Classification (2) Rational Classification

1. Empirical Classification :

(i) In this type, the actual nature of character of plants is not consider3d.
(ii) Plant are classified on the basis of their **alphabetical order** i.e. on the basis of the name of plant.
(iii) On the basis of name, plant kingdom can be classified in 26 groups.

(Their are 26 alphabets in English - According to this classification, all plants having same initial alphabet, are placed in one group. For example : If the name of plants starts from 'A', then it is placed in "a- group". Similarly if it starts with 'B', then it is placed in 'B-group")

(iv) This is not a true classification. It has only one application : "Listing of flora".
(v) If any scientist, writes the flora of a particular area then he uses empirical classification.
Flora $\rightarrow$ Plants growing in a particular area.
eg. Flora of Rajasthan $\rightarrow$ Two books in which flora of India is written :
(i) Flora British Indica $\rightarrow$ By **J.D. Hooker (ii) Flora Indica** $\rightarrow$ By **William Rouxburgh**

2. Rational Classification:

In this classification, plants are classified on the basis of their actual character or nature i.e. by viewing the characters.

Type of rational classification

(i) Practical classification : In this type of classification, plants are classified on the basis of their economic importance. In this type of classification morphology of plants in not considered.
Oil yielding plants $\rightarrow$ Coconut, Walnut, Soybean
Fibre yielding plants $\rightarrow$ Jute, Cotton
Medicinal plants $\rightarrow$ Rauwolfia, Cinchona, Eucalytus

Note : In this classification any one plant can be a member of more than one group.
eg. Turmeric : Multi uses plant, it gives both medicines and spices

.

(ii) Artificial classification : In this type of classification plants are classified on the basis of one or two morphological characters i.e. over all morphology is not considered.
for e.g. - Classification proposed by Linnaeus if Artificial
Linnaeus classified plant kingdom on the basis of only two characters.

(1) **Stamens** (2) **Style**

On the basis of stamens and style, Linnaeus classified plant kingdom in to 24 classes.

(1) Monadria - Those flowers in which only 1 stamen is present
(2) Diandria - 2 stamens in flower
(3) Triandria - 3 stamens in flower

↓

(23) Polyandria - Many stamens
(24 Nonandria/Cryptogamina - No stamens

Note : Linnaeus divided flowering plants into 23 classes starting with class monandria with a single stamen (eg. Canna) and plants with twenty or more stamens attached with calyx were assigned to class **Icosandia.** He also included all non-flowering plants such as algae, fungi, lichens, mosses and ferns in a separate class called cryptogamia or nonandria.

(iii) Natural classification : In this type, plants are classified on the basis of their **complete morphology.** In it the classification of whole plant is included (stem, root, Leaves, flower etc.) Maximum characters are taken as base in this classification.

Importance -
Natural classification is believed to be the **best classification,** because it represents the natural similarities and dissimilarities of plants i.e. it represents the interrelationship among plants.
In this classification, the plants belonging to the same group shows many similarities, while is artificial classification, the plants belonging to the same group shows only, 1 or 2 similar characters. They have many dissimilarities.

Natural classification is of two types

(a) Natural formal (b) Natural phylogenetic
(a) Natural formal → In this classification, the phylogeny of the plant is not considered i.e. only the morphology of the plant is considered.
(b) Natural phylogenetic → In this classification, both morphology and phylogeny are considered. In phylogentic classification, the plants are arranged on the basis of their evolution.

Lamarck : Proposed the term “Phylogeny”

Ernest haeckel : Gave the concept of phylogeny

Charles Darwin : Gave broad explanation of phylogeny in his book “ORIGIN OF SPECIES (1859)”

(Geneology → Sequence of evolution)

Geneology of plant kingdom :

Thallophyta → Bryophyta → Pteridophyta → Gymnosperm → Angiosperm (most advanced plants)

Note : Phylogenetic classification also known as cladistic classification.

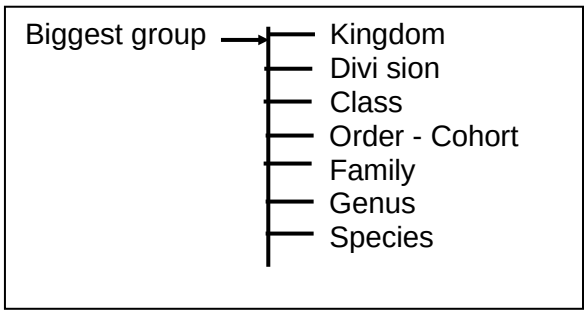
(iv) Adansoniam system or phenetic classification or Numerical classification :

Proposed by "Sokel and Sneath". In it plants are classified on the basis of numbers of similarities and dissimilarities.

Note :

In this, importance to any one character is not given, all characters have same importance. While in natural classification floral (reproductive) characters have more importance than vegetative (root, stem and leaves) characters.

TAXONOMIC CATEGORIES



Their are **7 main** taxonomic categories. They are **obligate categories** i.e. they are strictly used the time of any plant classification.

There are some extra categories, like sub division, sub order, sub family tribe, sub tribe, etc. They are not regularly used. They are used only when they are needed.

Classification Raddish :

Categories			Taxons
Kingdom	-	Plantae	
Division	-	Spermatophyta	
Class	-	Dicotyledonae	
Order	-	Parietales	
Family	-	Brassicaceae	
Genus	-	Raphnus	
Species	-	R. sativus	

- **Taxon -** Plant groups or animal groups included in categories are called Taxon.
- **Adolf Mayer :** First proposed the term "Taxon" - for animals
- **H.J. Lan :** First proposed the term "Taxon" for plants
- The classification of any plant or animal is written is descending order.
- Hierarchy - Descending arrangement of taxonomic categories is known as hierarchy.
- **Species :** Smallest taxonomic category $\rightarrow$ It is basis unit of classification.

Suffix for texa		**(Taxon)**
Division	-	Phyta
Sub div	-	phytina
Class	-	opsida, phyceae, ae
Order	-	ales
Sub-order	-	ineae
Family	-	aceae
Sub Family	-	oideae
Tribe	-	eae
Sub tribe	-	inae

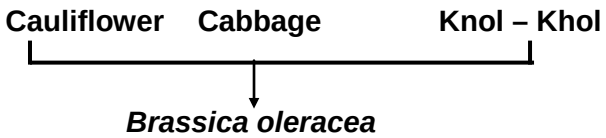
Note : There is no suffix for Genus, Species and Kingdom

SPECIEIS CONCEPT

John Ray : Proposed the **term** and **concept of species**
To explain the species different concepts were proposed, which are as follows

(A) Biological concept of species :

(1) **Mayr** proposed the **biological concept of species.**
(2) Mayr defined the "species" in the form of biological concept.
(3) According to Mayr "All the members that can interbreed among themselves and can produce fertile offspring's are the members of same species"
But this definition of Mayr was incomplete because this definition is applicable to sexually reproducing living beings because there re many organisms that have only asexual mode of reproduction.
eg. Bacteria, Mycoplasma, BGA
(4) The main character in determination of any species is interbreeding. But character is not used in taxonomy. In taxonomy, the determination of species is based on other characters.
eg. Mainly morphological characters
(5) In higher plants, the determination of species is mainly based on the morphology of flower (floral morphology). Because floral (reproductive) characters are more conservative s compared to vegetative (Root, Stem, Leaf) characters i.e. they do not shows any major changes.
(6) When the species is determined on the basis of interbreeding then it is called as biological species.
e.g. All the humans is this world can interbreed among themselves.
so all the humans are the members of one biological species.
(7) When the determination of species is based on other characters then it is called as **taxonomic species.**
eg.



These 3 have same morphological characters. Therefore they belong to same taxonomic species i.e. **one taxonomic species.** But these three can not interbreed among themselves. Therefore on the basis of interbreeding these are **three biological species.**

(B) Static concept of species :

(1) The static concept of species was proposed by Linnaeus. According to Linaneus "species is un-changeable" i.e. there is no change in the character of species. The species of present day are same as they were in past and they will remains same in future.
(2) Linnaeus believed in the **"Theory of Special creation"**
Father Suarez - gave the principle of special creation. According to this theory "All the living organisms are created by God (Every life is created by God) and God gave the basis size and shape of all living organisms, they are still present in their actual former form. But lamarck rejected this hypothesis.

(C) Dynamic concept of species :

(1) It was proposed by **"Lamarck"**
(2) According to this concept "Species is always changeable". Changes always occur in the characters of species from one generation to next generation. And these changes are know as "evolution".

(D) Typological concept :

(1) It was proposed by "Aristotle" and "Plato'.

(2) According to this concept "There is a definite type or pattern of characters in the each species of every living organisms and all the members of species show maximum resemblance with this pattern. (Typological concept is based on single individual of species)

The species in which a fixed pattern of characters is present are called as **monotypic** species.

eg. Bacteria, BGA

(3) In many species more than one type or pattern of characters are present. These are called **"Polytypic species"** or **"Macrospecies"**

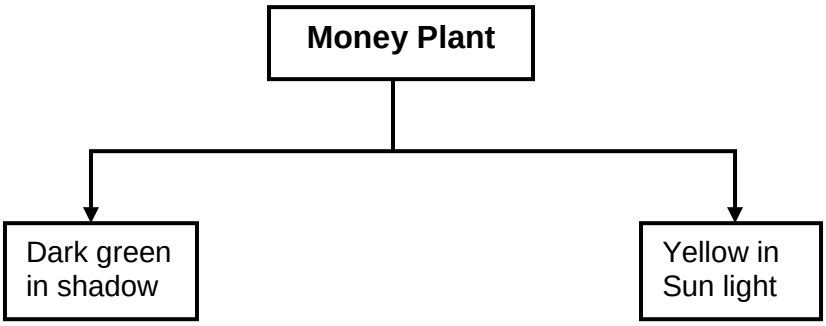
eg. *Brassica aleracea* $\rightarrow$ Cauliflower, Cabbage, Knol-Khol

Polytypic Species are of three types

- **Biotype -** Member o same species inhabiting similar environment and having some genetic variations are known as biotypes. Variations found in these members are permanent. These members can not interbreed among them selves.
  eg. Cauliflower, Cabbage, Knol-Khol are three biotypes of one species.

- **Ecotypes -**Members of same species inhabiting different environment and having some genetic variations are known as ecotypes. Variations are permanent. These members can interbreed among them selves but due to geographical barrier they can not interbreed.
  eg. Crow (***Corvus splendense***) found in different regions are ecotypes of one species
  Corvus splendense splendense - Indian crow
  Corvus splendense insolense - Mynamer crow
  Corvus splendense protegatus - Srilankan crow

- **Ecads or Ecophense -** members of same species having some non genetic variations due to environment These variations re temporary.
  eg. Every living being



Note : This hypothesis is believed to be most acceptable

SOME DEFINITION RELATED TO SPECIES

(1) **Linneon species :** Those taxonomic species whose determination is bases on morphology. They are called as linneon species. They are also called morpho-species or taxonomic species.

eg. Most of species in taxonomy are linneon species

(2) **Microspecies or Joardan's species :** Those species in which variations are very less. They reproduce asexually so they have very less variations.

(3) **Sibling species or Cryptic species :** Members of species which are morphologically similar but reproductively isolated are known as sibling species i.e. they can not interbreed among themselves.
Sibling species is one taxonomic species (because these members have similar morpholoty) but they are different biological species. [Because they can not interbreed]

eg. *Brassica oleracea*

(4) **Allopatric species :** Those species that are found in different geographical regions and have geographical barriors between them are known as allopratic species.

Geographical barriors like hills, oceans, Himalayan mountains

(5) **Sympatric species:** The species found in similar geographical regions.

(6) **Allocronic species :** The species found in different time periods.

eg. Man and Dinosaurs

(7) **Synchronic species :** Those species hat are found in same era

eg. Dinosaurs and Archaeopteryx

(8) **Palaeo species :** Those species that are extinct now and are found in the form of fossils.

eg. Dinosaurs

(9) **Neontological species :** Those species which are living presently.

Note : biochemical resemblances are used in the identification of **Moneran species.**

TYPE OF TAXONOMY

(A) Alpha taxonomy or classical taxonomy : It is based on **external** morphology, origin and evolution of plants.

(B) Beta taxonomy or Explorative taxonomy : Besides **external** morphology, it also includes **internal** characters like embryological, cytological, anatomical characters etc.

(C) Omega taxonomy or Encyclopaedic taxonomy: Omega taxonomy has widest scope. It is based on **all the informations** or data available about plants.

(D) Cytotaxonomy : The use of cytological characters of plants in classification or in solving taxonomic problems is called ctotaxonomy. Cytological characters constitute an important aid to plant taxonomy, especially in determining affinities at the generic and infrageneric levels.

(E) Chemotaxonomy : The uses of chemical characters of plants in classification or in solving taxonomic problems is called chemotaxonomy or chemical taxonomy. It is based on the chemical constitution of plants. The fragrance and taste vary from species to species.
The basis chemical compounds used in chemotaxonomy are alkaloids, carotenoids, tannis, polysaccharide, nucleic acids, fatty acids, amino acids, aromatic compounds etc.

(F) Karyotaxonomy : Based on characters of nucleus and chromosomes. Pattern of chromosomal bands (dark bands and light bands) is most specific characters.