

M.Sc ZOOLOGY
SEMESTER 2
PAPER CC 8
CYTO-TAXONOMY

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Cyto-taxonomy:

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.

Definition

Cytotaxonomy is a branch of biology dealing with the classification and relationships of organisms using detail studies of chromosomes during meiosis. The properties i.e. number, structure, and behaviour of chromosomes are of great value in taxonomy, because the chromosome number being the most widely used and quoted character in biology. Chromosome numbers are mainly determined at mitosis as the diploid number ($2n$). Another important taxonomic character is the position of the centromere. Meiotic behaviour sometimes shows the heterozygosity of inversions. Cytological data is significant than other taxonomic evidence. They provide an idea of genetic relationship between animal populations.

BASIS OF CYTOTAXONOMY:

1. Based on chromosome number:

- The chromosome number is constant and same on individual of species.
- It is used as a confirmative property to distinguish a species from members of other species as separation at

species level, separation at generic level and separation at family level.

2. Based on chromosome morphology

- Karyotypes of animals are now very useful for the classification.
- The shape of metaphase chromosome is considered for classification.
- The position of centromere and satellite is considered for classification e.g.

1. **Acrontric:** Centromere at one end

2. **Acentric:** No centromere.

3. **Metacentric:** Centromere at the middle

4. **Telocentric :** Centromere near one end

3. Based on chromosomal behaviour:

- It provides clues about the cause of sterility and fertility among population.
- Structural differences in the parental chromosome are the main cause for the sterility.
- If the two sets of chromosomes are homologous the animal seems to be fertile.

APPROACHES IN CYTOTAXONOMICAL CLASSIFICATION

1. THE GENETIC COMPLIMENT

DNA is the essential materials of heredity as it comprises the genome and plasma. It is believed that the heterochromatic segments are associated with differences in the metaphase thickness. Even now, it is unknown that a given amount of DNA and protein is stimulated at mitosis to become distributed into a particular member of chromosomes.

2. DNA Hybridization:

The hybridization between single stranded DNA components from different origins can occur provides a psychochemical means for assuming genetic relatedness among the species. It is known that DNA is extracted from organisms and made to hybridise in vitro with the cell lines of other organisms. The DNA matching techniques is much easier for solving complex taxonomic problems. The taxonomy implications of those have been studied by **Hoyer et.al. 1960 "The Incomplete fossil"**.

3. Karyological Studies:

Chromosomal cytology has been more extensively used by taxonomists. The Karyotypes characterised by chromosome numbers, size and morphology, is a definite and constant character of each individual species. The number shape banding of chromosomal can be determined by using various dissecting and staining techniques chromosomal taxonomy can be quite useful both in determining the phylogenetic

relationships of the taxa as well as in the segregation of sibling cryptic species.

SIGNIFICANCE OF CYTOTAXONOMY

The **role of Cytotaxonomy** is very important in taxonomic studies. Cytotaxonomy is more significant over physiological taxonomy because this process is dealing with the comparative study of chromosome and with this method minute variation among the individuals can be detected. DNA is present in the every chromosome and the variations in each DNA are responsible for the variation among the individuals, species, genus and everything.