

Types of Chromosomes:

Autosomes – these are found in the each cell of all individuals of the species.

Allosome - these are not found in the cells of each individuals of the species. They differ from autosomes by their specialised functional role.

Autosomes are present in all cells of all organism but the existence of allosomes is not always universal.

Allosomes are of different types. All types are not necessarily present in one organism.

(a) Sex Chromosomes:

- i. Chromosomes that are connected with the determination of sex, are called sex chromosomes.*
- ii. There are two types of sex chromosomes; X and Y.*
- iii. X chromosome is found in both males and females although one sex has only one and the other sex has two X-chromosomes.*

iv. Y-chromosome occurs only in one of the two sexes of a species, e.g., male fruit fly, human, male mice, some male plants and female birds, reptiles.

v. Y-chromosome contains mostly heterochromatin and only few genes are located in it. On the other hand, X-chromosome is made of euchromatin and many genes are located on it.

(b) B Chromosomes or Super Numerary Chromosome or Accessory Chromosome:

- i. These are the chromosomes found in some individuals of the species as extra chromosome in addition to normal autosomes*
- ii. These are not genetically necessary for the individual and not homologous to any of the normal chromosomes.*
- iii. These chromosomes differ from the normal ones in their variable number.*

smaller size and greater degree of heterochromatinisation.

iv. These chromosome do not usually have any effect on the phenotype and, hence, they are not genetically desirable.

v. In some plant their presence results some deleterious effect, i.e., loss of vigour.

vi. B-chromosomes do not usually pair with normal chromosome during meiosis though they may pair with each other without the formation of chiasmata when present in even number.

vii. B-chromosomes may be eliminated from certain tissues or organs during embryogenesis.

viii. . They may have been originated from the ordinary chromosome. It has been suggested that the centric heterochromatin part of an autosome is gradually converted into B-

chromosome by the elimination of euchromatin part.

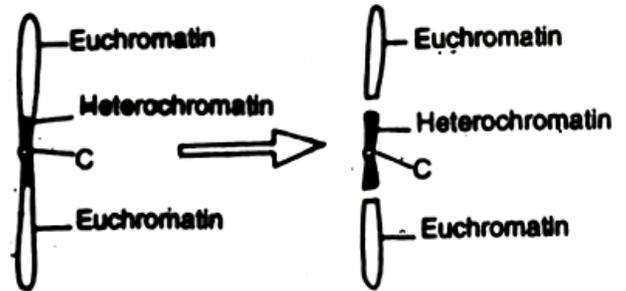


Fig - Derivation of B- Chromosome
(C=centromere)

ix. They are found more commonly in plant than in animals (*Locusta migratoria*, *Camunla pellucida*, *Helix pomatia*).

(c) **Micro-Chromosome:** also known as minute or m- chromosomes.

i. They are so-called because of their extremely small, dot like size (about $0.5 \mu m$).

ii. Micro-chromosomes are known both in plant (in many species of bryophyte) and animals [in insects of coreidae (*Heteroptera*), birds etc.].

iii. They have been found mainly during meiosis and occasionally during mitosis.

iv. Micro-chromosomes are seen along with large chromosomes or bivalents.

v. They contain DNA and undergo pairing into bivalents which are sometimes arranged in a rectangle like a quadripartite group.

vi. In a peat moss *sphagnum* there are 19 large bivalents and two *m*-chromosomes consisting of univalents and four *m*-chromosomes arranged in quadripartite fashion (Fig)

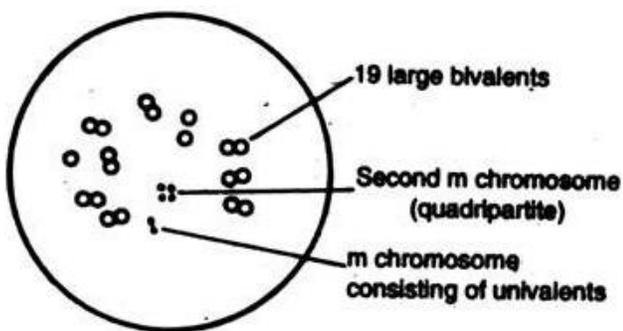


Fig Presence of *m*-chromosome in *sphagnum* peat moss

(d) Mega-Chromosomes:

i. Mega-chromosomes are non polytenic and many times longer than the length of normal chromosomes.

ii. They are not found in all cells and occur only in a small population of somatic cells. Generally, there is only one mega-chromosome per cell. Sometimes more than one mega-chromosomes have been reported.

iii. Mega-chromosomes may be mono-centric, dicentric or acentric.

iv. They are found in the successive generations but they are not transmitted through the gametes.

Hence mega-chromosomes are inheritable but the cells are able to produce them.

v. Mega-chromosomes have been reported in a few species of *Nicotiana* hybrids.

(e) Limited Chromosomes: or L chromosome

i. Limited chromosomes are large in size and limited in distribution, i.e., they are found only in the germ cells.

ii. During the embryonic developmental stage particularly the fifth and sixth cleavages limited chromosomes are eliminated from the somatic tissue but are retained in the germ line cells.

iii. They are found in insects of the family Sciaridae (Diptera).

iv. Fig. shows the schematic representation of L-chromosome in the Sciaridae where the germ line cells of both male and female contain six autosome, sex chromosomes (two X-chromosomes in female and one X-chromosomes in male) and two L-chromosomes.

In somatic cells of both male and female L-chromosomes are absent. Because L-chromosomes are present in all individuals of species in which they

are found they are considered to be B-chromosomes.

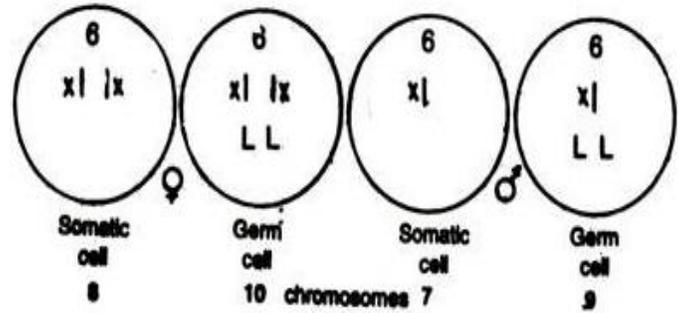


Fig - Diagram of Limited chromosome (L Chromosome)

(f) Somatic Chromosome and Eliminated Chromosome:

i. In some organism there is a special situation in which some chromosomes are retained in both somatic and germ line cells but other chromosomes are eliminated only in somatic cell during early cleavage stages of the embryo. These are called S and E chromosome.

ii. Example - S and E chromosome have been found in gall insects (fam. Cecidomyiidae) and the insects belonging to the family chironomidae

iii. In case of a gall insect both male and females have 48 chromosome in their germ cell and there is no loss of chromosomes. But in somatic cell, 36 chromosomes are lost in female and 42 chromosomes from male.

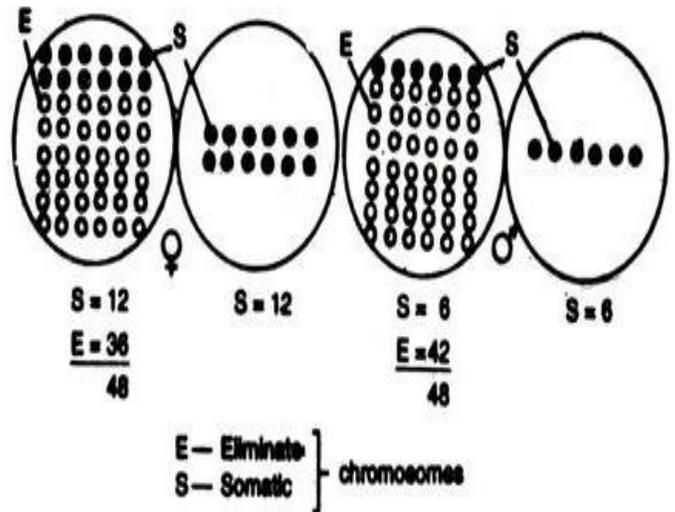


Fig - Somatic Chromosome and Eliminated Chromosome

Hence out of 48 chromosomes, 12 chromosome are present in somatic cell female and 6 chromosomes in male. Chromosomes which are retained in both germ line cells as well somatic cells are referred to as *S*-chromosomes. Those which are lost or eliminated from the somatic cells but are retained in germ cell are known as eliminated chromosome or *E*-chromosome.