MITOSIS OR SOMATIC CELL DIVISION

Mitosis, which was first worked out by Flemming; a German histologist, in 1882, takes place in the processes connected with growth .

Mitosis is mostly restricted to the meristematic regions (of plts) such as the root-tip leaf apices stem-tips; where active cell elongation is going on.

During mitosis two identical daughter cells are produced; and there is the same number of chromosomes in the daughter cells as in the parent cell.

Mitosis takes place in four (4)

Continuous stages:

1. Prophase
2. Metaphase
3. Anaphase and
4. Telophase

Prophase and telophase are lengthy stages, while metaphase and anaphase take place rapidly. Typically the entire process takes about an hour and is followed by interphase.

Interphase: When a cell is not undergoing division, the nucleus contains numerous crooked, often coiled, delicate thread-like structures called chromonemata. These chromonemata cannot be seen by light microscope.

PROPHASE

Cell division starts with early prophase. During early prophase, the thread-like chromosomes could be well identified, because they will be duplicated consisting of two chromatids joining at a region called CENTROMERE .

A chromosome with a median centromere (metacentric) will have arms of approx. equal size. A submetacentric or acrocentric chromosome has arms of distinctly unequal size. If a chromosome has its centromere at or very near one end of the chromosome it is called telocentric.

Nucleolus will start to disappear in the nucleus as the chromosomes continue to coil and become shorter and thickened. Each chromosome is quite separate, and they begin to move out of the periphery of the nucleus.

Late prophase – As the chromosomes begin to move out of the nucleus, periphery the nuclear membrane will begin to disintegrate. A small body outside the nucleus.

1. CENTRIOLE divides into two halves, each migrates away from one another until they are found opposite side of the nucleus. As the daughter centrioles move apart they give rise to the spindle fibre.
2. METAPHASE:- From the beginning, there has been little movement of the chromosomes from their position of formation, but now during meta-phase, the chromosomes will reach the equator of the spindle, led by their centromeres, and get attached to the spindle fibres at the region of the centromere.
3. ANAPHASE
   (a) Early anaphase - When all the chromosomes have arranged themselves, each separates into two independent chromatids, the separation commencing at the centromere and gradually extending away from this point in both directions.
   (b) Late Anaphase:- With the centric mere leading, the chromatids, formed from each chromosome, continue to migrate towards opposite poles of the spindle at a steady rate. As this continues, the shape of the spindle will change to be in form of a cylinder. The new structure is termed stem body.
4. TELOPHASE:- This is more or less a reversal of the events taking place in prophase. The divided chromosomes reach their respective poles and begin to hydrate i.e. assemble.

   A nucleolus will re-appear

   The nuclear memberane is reconstituted.

   The spindle degenerates and the cytoplasm divides in a process called cytokinesis.

   In animals, cytokimesis is accomplished by the formulation of a cleavage furrow which deepens and eventually "pinches the cell in two as shown below.

   Drawings

   Cytokinesis in most plants involves the construction of a cell plate of pectin originating in the center of the cell and spreading laterally to the cell wall. Later, cellulose and other strengthening materials are added to the cell plate, converting it into a new cell wall.

   The two products of mitosis are called daughter cells and may or may not be of equal size depending upon where the plane of cytokinesis sectious the cell. Thus while there is no assurance of equal distribution of cytoplasmic components to daughter cells, they do contain exactly the same type and number of chromosomes and hence possess exactly the same gnetic constitution (genotype).

In mitosis, the chromosome number of each daughter cell remain constant i.e. it exactly the same with that of the original mother cell (Diploid), or 2n) The brief period between two cycles of cell division is known as interphase.

MITOSIS IN DIAGRAMS

MEIOSIS OR REDUCTION DIVISION

Meiosis (first worked out by strasburger, a German botanist in 1888) is a complicated process of nuclear division whereby the chromosome no is reduced to half (n) in the four nuclei so formed by this method.

Meisis occurs in reproductive cells resulting in the formation of spores or gametes. It is the mechanism for the transmission of hereditary xters, which are carried by the chromosomes.

Meiosis actually involves two divisions. The first meiotic division (meiosis I) is a reductional division producing two haploid (n) cell from a single diploid (2n) cell.

The second meiotic division (meiosis II) is an equational division with separates the sister chromatids of the haploid cells. MEIOSIS I

The prophase of meiosis I differs from that of a mitotic division in that homologous chromosomes come to lie side by side in a pairing process called SYNAPSIS. Each pair of synapsed homologues is called a bivalent; since it consists of four chromid strands, a bivalent is also called a tetrad. During synapsis non-sister chromatids may break and re-write with one another in a process called crossing over. The point of exchange appears in the microscope as an overlapping region called a chiasm (chiasmata, plural).

During metaphase I, the bivalent orient themselves at random on the equatorial plate.

At first anaphase the centromeres do not divide, but continue to hold sister chronatids together. The homologues separate and move to opposite poles. That is, whole chromosomes (each consisting of two chromatids) move apart. This in effect is the movement which reduces the chromosome number from the diploid (2n) condition to the haploid (n) state.

Cytokinesis in telophase I divides the diploid mother cell into two haploid daughter cells. This ends the first meiotic division. The brief period between the first and second meiotic divisions is called INTERKINESIS.

By metaphase II, the centromeres have lined up the equational plate.

During anaphase II the centromeres of each chromosome divides, allowing sister chromatids to separate.

Cytokinesis in telophase II divides the cells into four meiotic products.