

MEIOSIS

Meiosis is a type of cell division where the parent nucleus divides into four daughter nuclei each having half the number of chromosomes as the parent cell. Before the active division occurs, the cell first undergoes interphase. During Interphase there is replication of chromosomes, storage of ATP for the meiotic cell division and replication of organelles.

Meiosis has two successive divisions known as division I and division II. Each division is subdivided into four stages, which are not distinct but grade into each other.

Thus Meiosis I is subdivided into Prophase I, Metaphase I, Anaphase I, and Telophase I. Also

Meiosis II is subdivided into Prophase II, Metaphase II, Anaphase II, and Telophase II

Meiosis I

Prophase I

Prophase I

During this phase the chromosomes first appear as thin threads that are not divided into chromatids and centromere is not visible. Then the pair of homologous chromosomes are attracted to each other and come together and they pair up. Then the chromosomes become shorter and thicker by coiling; they also coil around each other and each appears to have two chromatids. Then crossing over occurs breaks occur in homologous chromatids due to the strain of their coiling; they then join up cross-wise with the chromatids of the homologous chromosome. Then the chromatids of homologous chromosomes are no longer attracted to each other and so try to move apart but are held together at the point where they crossed over. This point known as a chiasma and appears as visible cross. By the end of prophase, the nucleolus and the nuclear membrane have broken down and in animals and lower plants a spindle is organized in the cytoplasm by the centrioles.

Metaphase I

In the second stage (metaphase), of division I the chromosomes orientate themselves on the spindle. Their centromeres come to lie on either side of the equatorial plate and are equidistant from it..

Anaphase I,

Metaphase I is followed by Anaphase I, when the spindle contracts and elongates. The pairs of homologous centromeres finally separate and move towards their respective poles, each pulling the rest of the chromosome after it.

Telophase I

Telophase I follows Anaphase I,. During Telophase I the spindle disappears and a nuclear membrane usually forms around each group of chromosomes. The length of Telophase varies in

different species: two complete nuclei form and cell division occurs. 2 cells are formed and these are haploid.

Meiosis II

The second division is mechanically very similar to mitosis except that the two cells are dividing at the same time.

Prophase II

The length of the second prophase is longer than that of the Telophase I. At the end of it, the chromosomes have appeared, the nuclear membrane has broken down and the spindle is organized.

Metaphase I

In metaphase II, the chromosomes come to lie on the equatorial plate.

Anaphase II

The chromatids of the chromosomes separate in anaphase II

During Telophase II the spindle disappears and a nuclear membrane usually forms around each group of chromosomes resulting in four nuclei.

Meiosis can occur only in diploid or polyploid cells. It occurs in the process of gamete formation in animals, in the production of the pollen grains and embryo sac in higher plants and in the formation of spores in ferns and mosses. In fungi also meiosis results in the production of spores.

ASSIGNMENT

- i) Draw the diagrams of the meiosis in a gamete forming cell.(page 187 Introduction to Biology).
- ii) What is the significance of meiosis to living organisms?
- iii) State the differences between Meiosis and Mitosis.
- iv) Define the terms; haploid, diploid and polyploid.
- v) Draw the diagrams to show crossing over during meiosis (page 242 New Biology for tropical schools by Stone and cozens.)