Observation of mitosis

Science, Biology

Observationof Mitosis Introduction: Reproduction is the biological process by which new individual organisms are produced. There are two types of reproduction, which are; asexual and sexual reproduction. Asexual reproduction is creation of offspring whose genes all come from one parent. Sexual reproduction is creation of offspring by fusion of male gametes (sperm) and female gametes (eggs) to form zygotes. Asexual reproduction involves a type of cell division known as mitosis. Mitosis is the scientific term for nuclear cell division, where the nucleus of the cell divides, resulting in two sets of identical chromosomes.

Mitosis is accompanied by cytokinesis in which the end result is two completely separate cells called daughter cells. There are four phases of mitosis: prophase, metaphase, anaphase and telophase. The active sites of cell division in plants are known as meristems and they are convenient source of mitotic cells for observation under the light microscope. In this experiment two different methods had been used. One of the methods that have been used was; Feulgen Reaction, root tips have been fixed and stained using this reaction.

This histochemical method is specific for DNA which is stained deep red-purple. Aim: Investigate the stages of mitosis under light microscope. Method 1: Preparation of Root Squash and Observation of Mitosis in Garlic Root Meristems Firstly, one root tip was taken from a container by using a pipette. This root tip was putted on a slide and a drop of 80% glycerol was added, than a coverslip applied. After coverslip was applied, slide was covered with a sheet of blotting paper and squashed gently.

Lastly this sample was observed under light microscope both with low power and high power objective. Method 2: Observation of Mitosis in Allium SP. Root Meristems Slides of Allium sp. Root tip squashes was prepared and provided. These ready slides were observed under light microscope both low and high power objectives and stages of mitosis were drawn. Disscusion: Meiosis has many similarities to mitosis. However, there are major differences that it is essential to note. The table below shows the comparison of the stages of mitosis and meiosis. Stages| Meiosis| Mitosis|

Interphase| - begins with a diploid cell| - begins with a diploid cell| Prophase| - four chromosomes combine to form two tetrads - the chromosomes in the tetrad cross over each other, allowing them to exchange genetic material| - four chromatids combine to form two chromosomes linked by a centromere| Metaphase| - the two tetrads line up in the centre| - the two chromosomes line up in the centre| Anaphase| - the two tetrads split up into four chromosomes which go to both poles| - the two chromosomes split up into four chromatids which move to both of the poles| Telophase| - the two sets of chromosomes become enclosed by the nuclear envelope| - the two sets of chromatids are enclosed by the nuclear envelope| Cytokinesis| - two cells are formed with two sets of chromosomes in each one| - Two cells are created with two chromatids in each one. - Mitosis is now complete. | Prophase II| - DNA replication is skipped and the two cell's nuclear envelope are dissolved and the spindle reformed - the four chromatids in each cell are connected together to form two chromosomes| | Metaphase II| - the two chromosomes line up in the centre| | Anaphase II| - the two chromosomes are split up into

their daughter chromatids and moved towards opposites poles| | Telophase II| -

The nuclear envelope is reformed around the two poles on each cell. | Cytokenesis| - the cells are split up again and four haploid cells remain as a result - meiosis is now complete| | The second table below shows the general difference between mitosis and meiosis. Mitosis| Meiosis| Produces body cells(Somatic cells) cells for growth and repair| Produces sex cells(Gametes) cells for sexual reproduction| One nuclear division, separating chromatids| Two nuclear divisions, first separating homologous chromosomes and second separating chromatids| Two daughter cells produced| Four daughter cells produced| Chromosome number remains same| Chromosome number halved| No association between homologous chromosomes| Homologous chromosomes associate and form bivalents| No crossing over ccurs| Crossing over many occur at chiasmata| Chromosomes only form single row at equator at metaphase| At metaphase 1, chromosomes form double row at equator| Daughter cells genetically identical with each other and parent cell| Daughter cells differ genetically from each other and parent cell| Daughter cells have two sets of chromosomes(pairs)| Daughter cells have only one member of each pair of chromosomes| In metaphase chromosomes line up singly| In metaphase I chromosomes line up as homologous pairs (synapsis). The two double chromosomes are called a tetrad when they are lined| Comparison of the biological significance of mitosis and meiosis: * The Significance of Mitosis

The significance of mitosis is its ability to produce daughter cells which are exactly the same as the parent cell. It is important for three reasons... 1.

Growth If a tissue wants to get bigger by growth needs new cells that are identical to the existing ones. Cells division must therefore be by mitosis. 2. Repair Damaged cells have to be replaced by exact copies of the organism so that it repairs the tissues to their former condition. Mitosis is the means by which this is achieved. 3. Asexual reproduction If a species is good at colonizing a habitat, there might be no point, in producing offspring which are different from the parents, because they might be less effective at survival.

Therefore it might be better, in the short term, to make a colony which is similar to the parents. In simple animals and most plants this is achieved by mitotic division. * Significance of Meiosis The long term survival of a species depends on its ability to adapt to a changingenvironment. To do this the offspring need to be different from their parents and each other. These are three ways in which variety occurs because of meiosis. 1. Production and fusion of haploid gametes: The variety of offspring is increased by mixing the genotype of one parent with that of the other. It involves the production of special sex cells, called gametes, which fuse together to produce a new organism.

Each gamete contains half the number of chromosomes of the adult. It is important that meiosis, which halves the number of chromosomes in daughter cells, happens at some stage in the life cycle of a sexually reproducing organism. Therefore Meiosis is important in order for variety in organisms, and allowing them to evolve. 2. The creation of genetic variety by the random distribution of chromosomes during metaphase 1. When the pairs of homologous chromosomes arrange themselves on the equator of the

spindle during metaphase 1 of meiosis, they do it randomly. Even though each one of the pair determines the same general features, they’re detail of the feature is different.

The randomness of this distribution and independent assortment of these chromosomes produces new genetic combinations. 3. The creation of genetic variety by crossing over between homologous chromosomes. During prophase 1 of meiosis, equal portions of homologous chromosomes may be swapped. In this way new genetic combinations are made and linked genes separated. The variety which meiosis brings vital for to the process of evolution. By providing a varied stock of individuals it allows the natural selection of those best suited to the existing conditions and makes sure that species constantly change and adapt when these conditions change. This is the main biological significance of meiosis. Gizem KARAGOZLU 19026857.