



FACULTY OF
**HUMANITIES
& SCIENCES**

Module Name	Introduction to Biology
Module Code	SC1143
Title of Experiment	Observe Mitosis cell division under light microscope
Number of the Experiment	06
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BSc (Hons) Biotechnology

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Objective:- To identify different stages of mitosis in division cell.

To compare mitosis in plant and animal cell.

Compare the location of the chromosomes in each phase of mitosis.

Introduction:-

Somatic or body cells divide at the end of a process called the cell cycle. During the cell cycle there is a division of replicated or doubled chromosomes (karyokinesis) and a division of the cytoplasm or non-chromosome parts of the cell (cytokinesis). All new cells come from previously existing cells. New cells are formed by karyokinesis (the process in cell division that involves replication of the cell's nucleus) and cytokinesis (the process in cell division that involves division of the cytoplasm).

There are two types of nuclear division that is called mitosis and meiosis. Mitosis, cell division of non-reproductive cells, results in new somatic cells ($2n$) that are genetically identical to the parent cell.

Mitotic cell division is involved in the formation of an adult organism from a fertilized egg, asexual reproduction, regeneration, and maintenance or repair of body parts. Meiosis results in the formation of gametes in plants, fungi, and animals. These cells have half the chromosome number of the parent cell ($1n$).

The cell cycle (life cycle for a cell) consists of

A) Interphase

B) Mitosis

C) Cytokinesis (cell division).

A) Interphase

A cell spends most of its time in what is called interphase, and during this time, replicates its chromosomes, it grows, and prepares for cell division. Interphase has 3 stages:

1. G₁- organelles begin to double.

During this time, the cell grows in preparation for DNA replication, and certain intracellular component

2. S- DNA doubles.

S phase / Synthesis Phase is the phase of the cell cycle in which DNA is replicated, occurring between G1 phase and G2 phase.

3. G2- synthesis the proteins which controls cell division.

The G2 phase is the during time which a cell replicates its organelles in preparation for mitosis. Not only does the DNA need to be divided, but so do the organelles. G2 is the last chance for the cell to make more protein in preparation for division.

B) Mitosis

Mitosis is a process of nuclear division in eukaryotic cells that occurs when a parent cell divides to produce two identical daughter cells. The major purpose of mitosis is for growth and to replace worn out cells. Mitosis has 4 stages.

1. Prophase

Because DNA is replicated in Interphase, when chromosomes are first seen in the prophase, they are already doubled with each chromosome consisting of a centromere and 2 sister chromatids. The centromere is the specialized DNA sequence of a chromosome that links a pair of sister chromatids. A chromatid is one of two identical halves of a replicated chromosome. In prophase,

2. Metaphase meta

In metaphase, the chromosomes attach to spindle fibers by their centromeres in the middle of the cell. Somewhere between metaphase and anaphase the centromeres split.

3. Anaphase ana

The chromatids separate at the centromere and move to the poles or ends of the cell. Ex-sister chromatids separate and begin to migrate toward poles of cells and Each ex- sister chromatid now has its own centromere and is considered a chromosome.

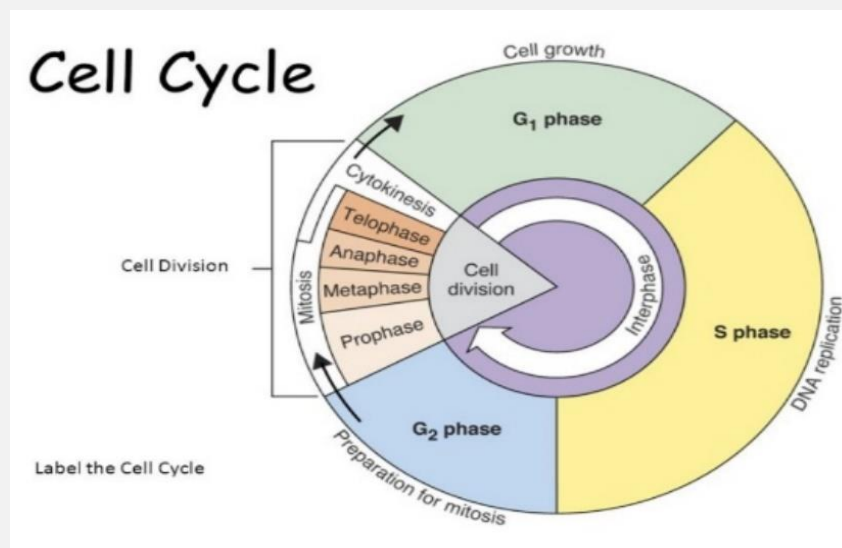
4.Telophase telos

The chromatids are at the poles. The chromatids uncoil and become less and less visible in the light microscope.

C) cytokinesis (cell division)

Frequently, but not always, telophase is followed by cytokinesis-cell division.

In animal cells, cytoplasm pinches in half from the sides toward the middle with a cleavage furrow and In plants cells, a cell plate starts in the middle and moves to the edges to divide the cell.



Materials:

- Light microscope
- prepared slides of allium root tip mitosis
- prepared slides of ascaris

Methods / procedure:

Allium root tip and ascaris slides were prepared, and microscope was placed. Slide of allium cepa root tips were observed under the light microscope. The root tip was examined with lower power to find the region of cell division. After the root tip was observed with high power to identify the phases of cell cycle. Different stages were drawn that we see.

Results:

1. observation stage of cell cycle in allium root cell (plant cell)

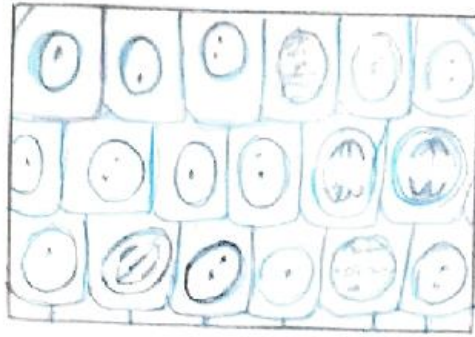


Figure 1.1 observed in root cell
(400x magnification)

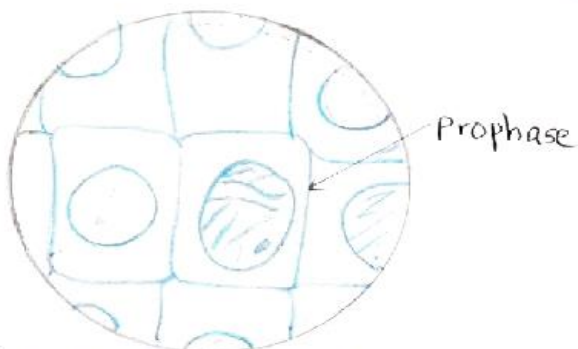


Figure 1.2 stage of prophase
(1000x magnification)

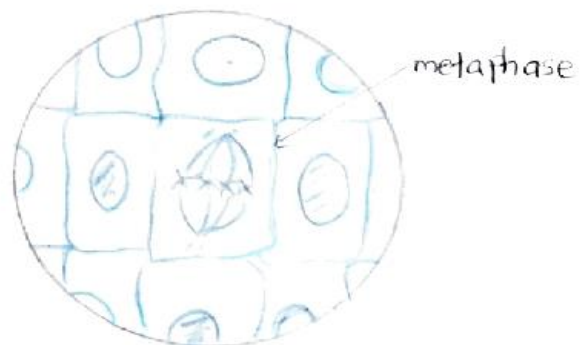


Figure 1.3 stage of metaphase
(1000x magnification)

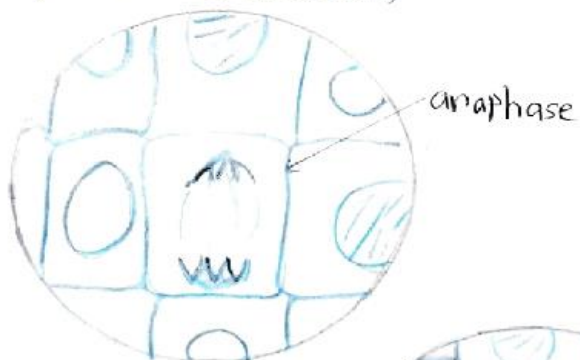


Figure 1.4 stage of anaphase
(1000x magnification)

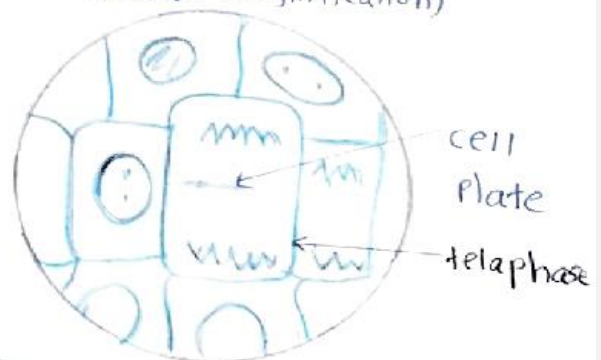


Figure 1.5 stage of telophase
(1000x magnification)

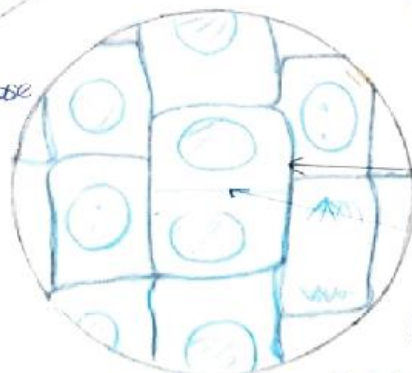


Figure 1.6 stage of cytokinesis

cytokinesis
cell plate

(x1000 magnification)

2. observation stage of cell cycle in ascaris cell (animal cell)

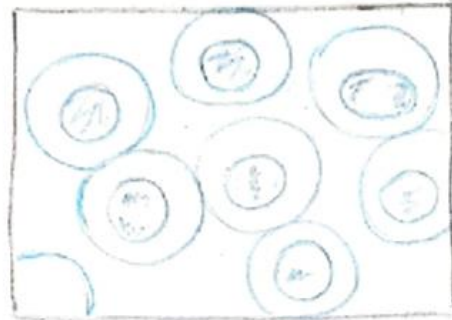


Figure 2.1 observed in *Ascaris* cell
(400 x magnification)

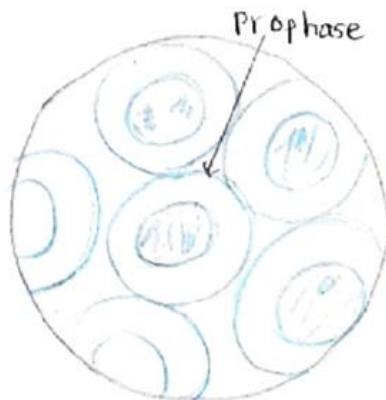


Figure 2.2 Stage of Prophase
(1000x magnification)

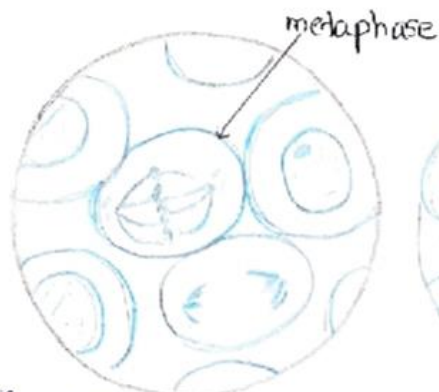


Figure 2.3 stage of metaphase
(1000x magnification)

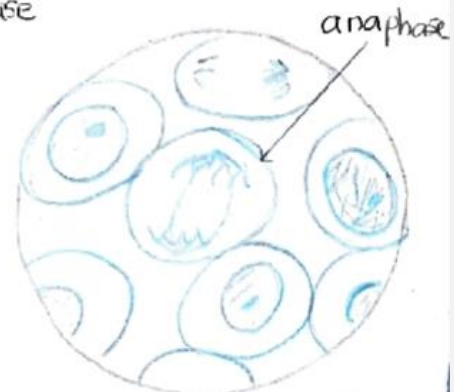


Figure 2.4 stage of anaphase
(1000x magnification)

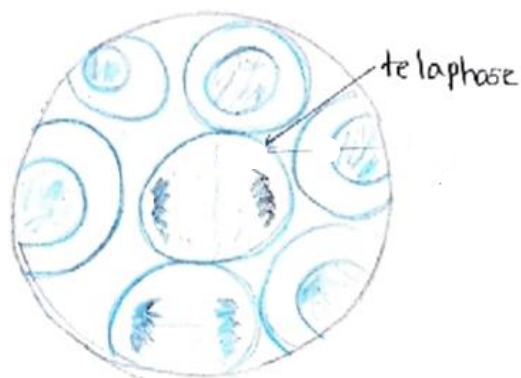


Figure 2.5 stage of telophase
(1000x magnification)

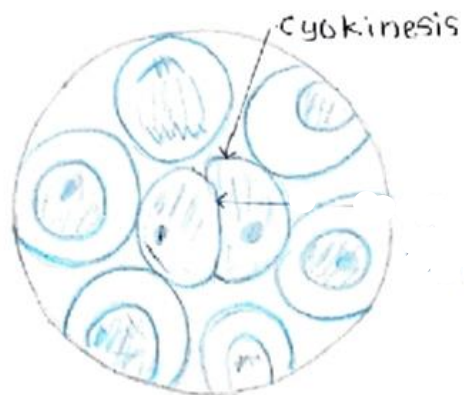


Figure 2.6 Stage of cytokinesis
(x 1000 magnification)

Discussion:

Mitosis is a process where a single cell divides into two identical daughter cells or called cell division. Mitosis have 4 various and there are various structures within the cell, but many stages were too difficult to see. A thread like species were in some cells and that was called chromosomes.

Before observing the root tip cell, it submerged in water because to lengthen its root. Then various stages of mitosis can be observed. Due to want to see stages of cell cycle, root cells were stained.

The most obvious difference between interphase and mitosis involves the appearance of a cell's chromosomes and nucleolus was still appeared in interface. During interphase, individual chromosomes were not visible, and the chromatin were appeared diffuse and unorganized.

The nuclear envelope was broken down, and the nucleolus was disappeared. The cytoskeleton also was disassembled, and those microtubules form the spindle apparatus. Thick strands of DNA loose were observed at a cell in prophase. Chromosomes were condensed and thicken.

The easiest stage of mitosis to identify under the microscope was the metaphase stage. The stage was characterized by the alignment of chromosomes at the center of the cell forming what was called as the metaphase plate. A special region was middle of chromosomes and that was called centromere. It was where the two identical sister chromatids and contact as the chromosomes attaches to the spindle in mitosis. a chromatid was one half of a duplicated chromosomes. There are 46 chromosomes in metaphase. During metaphase, each of the 46 chromosomes were lined up along the center of the cell at the metaphase plate.

When observe mitosis under the microscope, the chromatids were separated and pulled to opposite poles of the cell and that was called anaphase stage. That separation results in 92 separate chromatids in the cell which were considered 92 chromosomes.

When observe at a cell in telophase under a microscope, the DNA at either pole was observed. It may still be in its condensed state or thinning out. The new nucleus were reappeared and the spindle fibers were disappeared including the nucleolus and nuclear membrane. A cell membrane or cell wall was not seen between the two daughter cells. Chromosomes were got stringy and then became chromatin granules.

Mitosis of different in plant and animal cells were seen by the way cytokinesis takes place in them. In animals, cytokinesis was taken place through the formation of a furrow

in the plasma membrane whereas, in the case of plants, cytokinesis was taken place through the formation of a cell wall. In cytokinesis, the cytoplasm of the cell was spilt in two, making two new cells. Cytokinesis usually begins just as mitosis is ending, with a little overlap.

When observed under microscope in mitosis cell cycle, immersion oil was used and was involved it with specimen because then stages of cell cycle can observed clearly. When use the microscope, specimen should be observed under the right focus. Sometimes clear stage could not see.

Conclusion:

Mitosis is the process of nuclear division, which occurs just prior to cell division. Cell chromosomes condense and the spindle assembles, during this multistep process.

Reference:

<https://www.google.com/url?sa=t&source=web&rct=j&url=https://www.birmingham.ac.uk/teachers/study-resources/stem/biology/stem-legacy-mitosis.aspx&ved=2ahUKEwi6vf2NppTzAhX97XMBHZI2AvkQFnoECAQQAQ&usg=AOvVaw2OlwHqagRN3jd3h01a2kwI>

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